

# 25th International Congress of the European Association for Endoscopic Surgery (EAES) Frankfurt, Germany, 14–17 June 2017

## Oral Presentations

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### KARL STORZ—EAES AWARD SESSION

#### O001 - Different Endoscopic Approaches

##### Sils in Colorectal Surgery: A Comparison with Conventional Multiport Laparoscopy

U. Gibor

Soroka Medical Center, Beer Sheva, Israel

**Aim:** Single-incision laparoscopic surgery (SILS) was introduced to further the enhanced outcome of conventional multiport laparoscopy (CML). We compared the short- and long-term outcomes of both techniques in colorectal surgery.

**Methods:** Retrospective review of patients who underwent elective laparoscopic colorectal surgery during 2 years was performed. Patients' data, surgery outcomes and oncological results of SILS and CML were compared.

**Results:** 61 patients (33 male and 28 female) with mean age of 67.4 years underwent laparoscopic colonic resections: 28 SILS and 33 CML. 23 (37.7%) patients had previous abdominal surgery, and 3 of these were colonic resections. There were 19 (31.2%) right, 9 (14.7%) left and 2 (3.3%) total colectomies, 16 (26.2%) sigmoidectomies, 13 (21.3%) anterior and 2 (3.3%) abdominoperineal resections. Colonic malignancy was a main indication for the surgery in 46 (75.4%) patients. The mean surgery time and postoperative stay were 92.0 min (range, 41–251) and 9 days (range, 4–49), respectively. Pathological stage I colon cancer was found in 13 (28.2%), stage II in 21 (45.7%), stage III in 10 (21.8%) and stage IV in 2 (4.3%) patients. Mean number of retrieved lymph nodes number was 19 (range, 3–86). There were no differences between groups in demographic data, types of surgery, surgery time and hospital stay, pathological results and tumor staging. In the SILS group placement of additional trocar was required in 7 (25%) and conversion in 3 (10.7%) cases: 1 to conventional laparoscopy due to rupture of the SILS system and 2 to a laparotomy. Conversion to formal laparotomy was necessary in 1 (3%) case in the CML group. Overall postoperative morbidity was 18.0% and mortality rate 1.6%. There were 6 (9.8%) types I–II, and 5 (8.2%) types III–IV complications according to Clavien-Dindo classification, without statistical difference between the groups. The mean postoperative follow-up was 24.9 months (range, 1–36) in the CML and 12.9 months in SILS group (range, 1–34), which was statistically different ( $p=0.00$ ) due to later start using SILS technique. During the study period 3 patients from the CML group had cancer recurrences (2 anastomotic and 1 splenic metastases). Second primary tumor was found significantly more often in SILS group (4 patients,  $p=0.017$ ).

**Conclusions:** SILS is feasible and safe technique comparable to CML in terms of surgical and oncological outcomes.

#### O002 - Liver and Biliary Tract Surgery

##### Effect of High Perioperative Oxygen Fraction on Inflammatory Markers in Laparoscopic Cholecystectomy

S. Colozzi, M. Schietroma, M. Clementi, B. Pessia, F. Carlei,  
G. Amicucci

Ospedale Civile San Salvatore, L'aquila, Italy

**Background:** This study assessed effect of administration of high-concentration supplemental perioperative oxygen on systemic inflammatory and immune response in patients undergoing elective LC.

**Materials and Methods:** 177 patients were assigned randomly to an oxygen/air mixture with a fraction of inspired oxygen ( $FiO_2$ ) of 30% ( $n=88$ ) or 80% ( $n=89$ ). White blood cells, peripheral lymphocytes subpopulation, human leukocyte antigen-DR (HLA-DR), neutrophil elastase, interleukin (IL)-1 and IL-6, and C-reactive protein (CRP) were investigated.

**Results:** Significantly higher concentration of neutrophil elastase, IL-1, IL-6 and CRP was detected postoperatively in the 30%  $FiO_2$  group patients in comparison with the 80%  $FiO_2$  group ( $p<0.05$ ). Statistically significant change in HLA-DR expression was recorded postoperatively at 24 h, as a reduction of this antigen expressed on monocyte surface in patients from 30%  $FiO_2$  group.

**Conclusions:** This study demonstrated that high-concentration (80%) supplemental perioperative oxygen can lead to a reduction in postoperative inflammatory response and avoid postoperative immunosuppression.

## O003 - Intestinal, Colorectal and Anal Disorders

### Laparoscopic Lavage Versus Suction Only in Complicated Acute Appendicitis: A Prospective Randomised Control Study

I. Sardiwalla, M.Z. Koto

Sefako Makgatho Health Sciences University, Garankuwa, South Africa

**Aim:** To determine if lavage vs. suction only in complicated appendicitis during laparoscopic surgery influences post operative complications.

**Methods:** A prospective single blinded randomised control trial was conducted. Ethics clearance was obtained from the review board. Registered on research registry UIN 1718. Patients with suspected acute appendicitis were consented to be enrolled in the study. Those found to have complicated appendicitis (perforation, localised pus or four quadrant pus) at laparoscopy were randomised according to computer generated allotment to either lavage or suction only. Patients that did not have the appendix removed or that were converted to laparotomy were excluded. Lavage consisted of a strict protocol of three litres of lavage with normal saline. Operative time was documented. All patients had a 8 mm pencil drain placed. Postoperatively a minimum of five days of intravenous coamoxiclav. Complications (relook, percutaneous drain), hospital stay and return of bowel function were recorded.

**Results:** A total of 43 patients were assessed. 10 were excluded—7 were converted to laparotomies. 3 had abscesses but appendix was not removed. 33 patients were analysed. The mean age was 26 years (14–74). 15 (45%) patients were lavaged and 18 (55%) were suctioned. Four quadrant pus was present in 4 (26%) of the lavage group vs. in 6 (33%) of suction group. Complications developed in 7 (46,7%) of the patients that were lavaged. 5 patients (27,8%) developed complications with suction only. The absolute risk increase is 20% with lavage giving a number needed to harm of 5. The study was stopped from recruiting further patients by the safety monitoring committee because of this large difference. Operative time was longer in the lavage group by 30 min (p 0,086). If a complication developed then the hospital stay was significantly prolonged 13,5 days vs. 5 days (p<0,001).

**Conclusions:** This pilot study of lavage vs. suction only in complicated appendicitis revealed a higher rate of complications in those randomised to lavage. There was also a trend toward longer operating time in those that were lavaged. If a patient develops a complication then the hospital was significantly prolonged.

## O004 - Abdominal Cavity and Abdominal Wall

### Laparoscopic Drainage of Abdominal Ascites in Umbilical Hernia Repair in Cirrhotic Patients

S. Pisarenco<sup>1</sup>, Gh. Anghelici<sup>1</sup>, O. Crudu<sup>2</sup>, T. Zugrav<sup>1</sup>

<sup>1</sup>State University of Medicine and Pharmacy ‘Nicolae Testemitanu’, Chisinev, Moldova; <sup>2</sup>IMSP SCM ‘Sfinta Treime’, Chisinev, Moldova

**Aim:** The objective of this study is to provide management of patients with cirrhosis ascites and hernia and to distinguish the importance of laparoscopic drainage in this case.

**Methods:** Was performed a randomized study on 102 patients with an umbilical hernia combined with liver cirrhosis and massive ascites, in the period between 2011 and 2015 year. To all patients was applied combined surgical treatment. I group: 48 cirrhotic patients operated on high urgently, including 36 (75%)—with hernia sac erupts with ascites fluid overflow and 12 (25%) with strangulated hernias. 9 (18.8%) patients was performed endoscopic hemostasis simultaneously for variceal bleeding.

II group : 54 cirrhotic patients with massive ascites and spontaneous eruption risk of hernia, operated in postponed emergency way, after laporoscopic drainage of abdominal ascites and abdominal cavity lavage with antibacterials.

To all patients was performed postoperative drainage with lavage and, also, examination of ascitic fluid. Surgical treatment consist of laparoscopic drainage of ascites and hernia repairs method—“tension-free no mesh”. Sealing prophylactic endoscopic variceal was performed in 29 (53,7%) patients.

**Results:** Mortality consist of 7 (14,6%) patients, all developed hepatic failure, from witch 4 patients with variceal bleeding and 3 developed ascites-peritonitis. In group II was 1 (1,9%) death caused by hepato-renal failure. Postoperative ventration 3–6 months: I group—10 (20,8%); II group—2 (3,7%). Suppuration of postoperative wound: I lot—8 (16,7%), II group without complications.

**Conclusion:** Laparoscopic abdominal drainage and lavage with antibacterials reduces the risk of ascites-peritonitis and improves wound healing. Umbilical hernias in cirrhotic patients with ascites preferable operated planned. The preferably solution is hernioplastia “tension-free no mesh”.

## O005 - Clinical Practice and Evaluation

### Classification of Intraoperative Morbidity in Laparoscopic Colorectal Surgery

N. Curtis<sup>1</sup>, J.D. Foster<sup>1</sup>, J.A. Conti<sup>2</sup>, G.B. Hanna<sup>3</sup>, N.K. Francis<sup>1</sup>

<sup>1</sup>Yeovil District Hospital NHS Foundation Trust, Yeovil, United Kingdom; <sup>2</sup>Queen Alexandra Hospital, Portsmouth, United Kingdom; <sup>3</sup>Imperial College London, London, United Kingdom

**Introduction:** Surgical outcomes are traditionally measured by histopathological or morbidity data but these can be indiscriminate variables, influenced by multi-factorial events and do not reliably reflect surgical skill. Recently, there has been growing interest in the objective measurement of intraoperative events including errors to aid training, credentialing and trial quality assurance. The aim of this research was to classify operative events to generate a novel intra-operative morbidity classification.

**Methods:** This ad-hoc analysis utilised the data from a multi-centre randomised controlled trial (EAES funded 2D vs. 3D laparoscopic total mesorectal excision (ISRCTN59485808)). All surgeons were credentialed prior to trial involvement as fully trained laparoscopic experts. Unedited case videos were analysed using the objective clinical human reliability analysis (OCHRA) methodology where errors were identified by an assessor blinded to all clinical and operative data. This ongoing trial is powered for 72 cases.

**Results:** At the time of submission, preliminary analysis of 15 cases demonstrated 339 errors (median 20, range 14–49). A novel classification is proposed: Grade I—Minor error, no damage or corrective action (210 errors, 62%); Grade II—Minor consequential error requiring corrective action but no change in postoperative care (120, 35%); Grade III - consequential error requiring major corrective action and/or change in postoperative pathway (9, 2,7%); Grade IV—Life-threatening complication that requires major corrective action and/or return to theatre or ITU admission (0 errors) and grade V—Major consequential errors resulting in death (0 errors). The classification did not add to case analysis time or require additional training.

**Conclusion:** Addition of a clinical applicable severity classification to the objective clinical human reliability analysis is feasible and complements the objective assessment of intra-operative performance of laparoscopic colorectal surgery. We aim to present at the congress a complete analysis of the trial data along with a consensus statement to refine and validate our classification.

## O006 - Liver and Biliary Tract Surgery

### Major Robotic Liver Hepatectomy: Is It a Good Option? Experience from a Single Surgical Center

S. Ferretti, F. Caniglia, N. De Lio, V. Perrone, F. Costa, N. Napoli, E. Kaufaman, C. Lombardo, F. Vistoli, U. Boggi

Azienda Ospedaliero Universitaria Pisana, Pisa, Italy

**Introduction, Materials and Methods:** We present our experience on consecutive patients undergoing robotic major hepatectomy (resection of  $\geq 3$  liver segments) with a review of literature and a video on robotic right hepatectomy. Data were collected prospectively and analyzed retrospectively.

**Results:** Robotic major hepatectomy was performed in 26 patients. There were 6 left hepatectomies, 16 right hepatectomies, 2 extended right hepatectomies, 1 fully robotic ALPSS (1st step), 1 en-bloc resection of segments VI, VII and VIII. The mean operating time was 420 min (240–725 min). Overall conversion rate and postoperative complication rate were 3.8% and 26.9%, respectively. The mean length of hospital stay was 10.5 days (6–22 days).

**Conclusion:** Our experience confirms the feasibility of all commonly performed major hepatic resections under robotic assistance. While the possible advantages of robotic assistance (vs. laparoscopy) cannot be derived from this yet limited experience, especially in the absence of a comparison arm, several considerations can instead be made. First, this series reflects the initial experience of a group with preemptive experience in advanced laparoscopy but without specific experience with laparoscopic major hepatectomy. As such, this series includes our learning curve but still shows satisfactory results. Second, robotic assistance allowed us to master all the procedures without taking any technical compromise with respect to our open approach. Third, and final, although impossible to show in figures the enhanced dexterity offered by robotic assistance allowed all procedures to be completed with ease and with the feeling of a yet large margin of safety during each surgical step.

## O007 - Education

### Impact of Visual-Spatial Ability on Learning of Laparoscopic Camera Navigation

P.J. Roch<sup>1</sup>, H.M. Rangnick<sup>2</sup>, J.A. Brzoska<sup>1</sup>, L. Benner<sup>1</sup>, P.C. Müller<sup>1</sup>, H.G. Kenngott<sup>1</sup>, B.P. Müller-Stich<sup>1</sup>, F. Nickel<sup>1</sup>

<sup>1</sup>Universitätsklinikum Heidelberg, Heidelberg, Germany;

<sup>2</sup>Universitätsklinikum Dresden, Dresden, Germany

**Background:** Technical limitations of minimally invasive surgery do not only challenge the surgeons but also the camera assistants. Current research indicates that visual-spatial ability (VSA) has impact on learning of laparoscopic camera navigation (LCN). However, it remains unclear, if complexity of LCN tasks influences impact of VSA.

**Aim:** of this study was to examine the influence of VSA on LCN training within tasks of different complexity levels.

**Methods:** The present study was conducted as a monocentric prospective trial. VSA was assessed with a cube comparison test before participants underwent LCN training. LCN training consisted of three tasks with increasing complexity. Each task was performed four times and performance was assessed each time. Correlations and multivariate regression analysis were used to assess influence of VSA on LCN skills.

**Results:** Seventy-one participants were included in the study (35 males). A significant improvement of performance and required times was found from first to fourth trial of all three LCN training tasks. Significant positive correlations between VSA and performance on LCN task 3 were found (Performance:  $r_s = -0.47$ ;  $p < 0.001$ , Time:  $r_s = -0.43$ ;  $p < 0.001$ ). Multivariate regression revealed that trainees with higher VSA were faster to complete the second trial of LCN training task 3 ( $R = -1.67$ ,  $p = 0.031$ ). Subgroup analysis found significantly better and faster performance for men than for women for LCN training task 1 (Performance: Men:  $18.7 \pm 1.5$ , Women:  $17.4 \pm 2.1$ ;  $p = 0.004$ ; Time: Men:  $220.9 \pm 61.82$ , Women:  $274.1 \pm 53.7$ ;  $p > 0.001$ ), and LCN training task 2 (Performance: Men:  $17.8 \pm 2.3$ , Women:  $16.8 \pm 2.5$ ;  $p = 0.031$ , Time: Men:  $357.5 \pm 78.8$ , Women:  $396.5 \pm 65.5$ ;  $p = 0.032$ ).

**Conclusion:** This study found impact of VSA on LCN performance and training progress. There was improvement of LCN performance during all three training tasks for all trainees irrespective of VSA performance. However, in particular complex 3D-environments seem to require higher VSA. Furthermore, the effect of higher VSA promoting the initial learning progress of complex tasks should be taken into consideration. Gender differences on LCN were found in the beginning of training suggesting a delayed learning progress for women that is overcome in the course of training.

## GERHARD BUESS-TECHNOLOGY AWARD SESSION

## O008 - Robotics, Telesurgery and Virtual Reality

### Mobile, Real-Time and Point-of-Care Augmented Reality: A Prospective Pilot Study

A. Preukschas<sup>1</sup>, M. Wagner<sup>1</sup>, N. Bellemann<sup>1</sup>, B. Radeff<sup>1</sup>, H.U. Kauczor<sup>1</sup>, M. Müller<sup>2</sup>, H.P. Meinzer<sup>2</sup>, C. Stock<sup>1</sup>, M. Gondan<sup>1</sup>, M.W. Büchler<sup>1</sup>, H.G. Kenngott<sup>1</sup>, B.P. Müller<sup>1</sup>

<sup>1</sup>University Clinic Heidelberg, Heidelberg, Germany; <sup>2</sup>German Cancer Research Center, Heidelberg, Germany

**Aim:** Medical imaging is essential for the diagnosis and therapy of patients across a broad spectrum of medical disciplines. Imaging data is required at the patient's bedside, but is usually accessed at desktop workstations. Advances in mobile technology make real-time, point-of-care medical applications possible. Traditional ways of viewing medical imaging data in a stacked fashion removed from the patient may change with augmented reality. Mobile augmented reality can assist surgeons in many clinical tasks that rely on anatomical knowledge, such as the visualization of adequate resection lines, identification of structures at risk, facilitation of trocar placement, and visual assistance in punctures. Our aim was to evaluate a mobile, real-time and point-of-care augmented reality system for medical diagnosis and therapy with regard to feasibility and accuracy in a pilot study involving phantom, animal, and human models.

**Methods:** After computed tomography imaging a tablet computer was positioned above the patient and a semi-transparent 3D-representation of structures of interest were superimposed on top of the patient's image resulting in augmented reality. Live camera images and the three-dimensional volume were registered by fiducial markers. Feasibility and accuracy were evaluated in a static model using the open source Heidelberg Laparoscopy Phantom. The system was further analyzed in a porcine animal study. The reprojection error was defined as the average offset of the back-projected two-dimensional image points and the manually defined points in the three-dimensional volume. Finally the setup was tested with a human volunteer to prove basic feasibility for clinical application.

**Results:** In the phantom model 83.9% AR-positions were successfully realized. The reprojection error was  $2.83 \pm 2.68$  mm. 95% of the measurements were below 6.71 mm. In the animal model 79.3% AR-positions were successfully realized. In the animal study the reprojection error was  $3.52 \pm 3.00$  mm. 95% of the measurements were below 9.49 mm. The reprojection error was significantly lower in the phantom model compared to the porcine model ( $P < 0.001$ ). At last augmented reality was successfully realized in a clinical case.

**Conclusion:** Mobile, real-time and point-of-care augmented reality systems for clinical purposes are feasible and accurate in a realistic experimental setting.

## O009 - Robotics, Telesurgery and Virtual Reality

### Colorectal Perfusion with Indocyanine Green in Colonic Resection Performed in Robotic Surgery: Reducing the Risk of Anastomotic Leakage?

W. Ramphal, R.M.P.H. Crolla, P.D. Gobardhan, J.H. Wijsman, G.P. van der Schelling, J.M.J. Schreinemakers

Amphia Hospital, Breda, The Netherlands

**Aim:** Anastomotic leakage is a major complication in colorectal surgery. Perfusion abnormalities of the bowel is a factor which has significant impact on the healing of anastomosis. In this study we use a relative new technique to obtain a more consistent measurement of the in situ perfusion of colorectal anastomoses. This technique is near-infrared (NIR) fluorescence with Indocyanin green (ICG). The aim of this study is to determine the utility and feasibility of intra-operative perfusion assessment using ICG-induced NIR fluorescence (ICG-NIR), at the time of primary anastomosis in patients with colorectal malignancy who underwent robotic resection.

**Methods:** This retrospective study of a prospective database includes patients who had robotic colorectal cancer surgery performed by three surgeons between 2012 and 2016. The option of fluorescence was introduced late 2014. Since then traditional indications to create a temporary protective ileostomy were no longer applied and the decision was left to the surgeon. The outcome of anastomotic leakage was analyzed according to per-operative use of ICG-NIR to objectify colorectal perfusion. A second outcome was the number of protective ileostomies after resection in patients between robotic surgery with or without ICG-NIR.

**Results:** Three-hundred and thirty-three patients were operated. Of those, 122 patients had surgery with per-operative use of Indocyanine green and 211 patients without. Of the patients operated with ICG-NIR, 107 patients (88%) had a primary anastomosis. In the group without ICG-NIR, 134 (64%) had a primary anastomosis. Both groups had seven patients with anastomotic leakage (6.5% vs. 5.2%,  $p=0.664$ ). Secondly, only 31 (29%) patients had a protective ileostoma in the group who had surgery with ICG-NIR vs. 74 (55%  $p<0.001$ ) patients in the group who had surgery without ICG-NIR.

**Conclusions:** In our study the per-operative use of ICG-NIR in patients who had robotic surgery because of colorectal malignancy did not result in less anastomotic leakages. However, with the use of ICG-NIR surgeons decided to create a significant lower number of protective ileostomies.

## O010 - Technology

### Ex vivo Sentinel Lymph Node Mapping in Colorectal Cancer Using Invisible Near-Infrared Fluorescence Light

A. Picchetto, F.M. Magliocca, F. de Laurentis, A. Seitaj, L. Palmieri, A. Monfrecola, G. d'Ambrosio

University of Rome 'Sapienza', Hospital Policlinico 'Umberto I', Roma, Italy

**Background:** The sentinel lymph node (SLN) mapping is widely used, during oncological surgery, for several type of tumors (Head and Neck, Breast and Melanoma).

This procedure can be performed by using both blue dyes and gamma ray-emitting radiotracers. However, both have disadvantages like the involvement of a nuclear medicine physician, or difficulty to identify nodes through fatty tissue.

The SLN procedure has been proposed to improve nodal staging even in colorectal cancer patients.

Occult tumor cells and micrometastases are easily missed by conventional histopathologic examination. Various retrospective studies have shown poor prognosis for patients with micrometastases compared with patients without metastases.

**Aim:** The aim of this ongoing prospective study was to assess the value of near-infrared (NIR) fluorescence imaging for *ex vivo* SLN mapping in conventional surgical resection for colorectal tumors and the detection of micrometastases.

**Materials and Methods:** We enrolled 5 consecutive patients undergoing surgery with curative intent for colorectal cancer.

All patients underwent a standard oncological laparoscopic resection. After specimen extraction, we submucosally injected a premixed cocktail of the near-infrared lymphatic tracer around the tumor for detection of SLN. Each SLN was investigated with ultrastaging techniques for the detection of micrometastases using serial sectioning and additional immunohistochemistry or reverse transcriptase-polymerase chain reaction.

We used the *Quest Spectrum™ Platform* imaging system for fluorescence imaging.

**Results:** In 100% of patients, we identified at least one sentinel lymph node. Overall, from the specimens were found 64 lymph nodes. A total of 13 SLN were identified. After ultrastaging anatomopathological investigations, no tumor cells nor micrometastases were present in SLN, nor in the remaining nodes.

SLN located deeper in the mesenteric fat could easily be identified by NIR fluorescence.

**Conclusions:** We reported our preliminary data of this ongoing prospective study about the use and value of the NIR fluorescence guided surgery to identify the *ex vivo* SLN in colorectal cancer and micrometastases research.

In our series, the histological sentinel lymph nodes' asset rightly predicts the status of loco-regional nodes.

## O011 - Training

### Complications of Endoscopy in Surgical Endoscopy Center During Surgical and Residency Training Program

S. Pietruszka, B. Siarkiewicz, A. Zajac, P. Richter

Jagiellonian University Medical College, Faculty of Medicine, Kraków, Poland

**Aim:** The aim of the study is to determine the influence of residency training program on overall complication rate of endoscopic procedures in single surgical and endoscopy center.

**Methods:** A retrospective analysis of data of patients who underwent endoscopic procedure in 2014–2016 in single institution. Complications defined as adverse events occurring within 7 days of the procedure. Analysis performed for diagnostic and surgical-type procedures, separately for upper and lower GI endoscopy.

**Results:** Among 5006 colonoscopies (1680 interventional) and 4611 gastroscopies (417 interventional) overall complications rate was 0,3%. Adverse events were observed more common in interventional procedures (0,1 vs. 0,95) and more common among procedures performed by supervised residents vs. experienced endoscopist (0,25 vs. 0,06). Some rare complications occurred in resident group (surgical-type procedures)—tympanic membrane rupture, tympanic membrane bleeding, transient global amnesia, extensive subcutaneous emphysema.

**Conclusion:** Training program from residents is associated with increased number of complications after endoscopic surgical-type procedures.

## O012 - Training

### Force-Based Learning Curve Tracking in Laparoscopic Skills Training

S.F. Hardon<sup>1</sup>, T. Horeman<sup>2</sup>, H.J. Bonjer<sup>1</sup>, W.H.J.H. Meijerink<sup>3</sup>

<sup>1</sup>VU University Medical Center, Amsterdam, The Netherlands; <sup>2</sup>Delft University of Technology, Delft, The Netherlands; <sup>3</sup>Radboud University Medical Center, Nijmegen, The Netherlands

**Background:** Within Minimally Invasive Surgery (MIS), structural implementation of courses and structured assessment of skills are challenged by availability of trainers, time and money. We aimed to establish an objective measurement tool for preclinical skills acquisition in an at-home training program, for fundamental laparoscopic skills.

**Methods:** This pilot study was conducted between February 23 and July 12, 2016. A mobile laparoscopic simulator was equipped with a state-of-the-art force, motion and time tracking system (ForceSense, MediShield B.V., Delft, the Netherlands). These performance parameters, respectively representing tissue manipulation and instrument handling, were continuously tracked during every trial in this course. Proficiency levels were set by clinical experts for the six exercises used. Resident's acquisition and development of fundamental skills were evaluated by comparing pre- and post-assessment measurements and OSATS outcomes. A questionnaire was distributed at the end of the curriculum to determine face and content validity.

**Results:** Out of 1842 captured attempts by novices, 1594 successful trials were evaluated. A decrease in maximum exerted absolute force was shown in pre- and post-test comparison of four exercises ( $p \leq 0,02$ ). Three of the six comparisons also showed lower mean forces during tissue manipulation ( $p \leq 0,02$ ). Lower instrument handling outcomes (i.e. time and motion parameters) were observed in five tasks (resp. ( $p \leq 0,02$ ) and ( $p \leq 0,03$ )). Simultaneously, OSATS form outcomes increased in every exercise outcome ( $p \leq 0,03$ ). A power analysis indicated that all parameter outcomes become significant when the number of participants is 13.

**Conclusions:** The ForceSense system showed to be effective in determining acquisition and development of basic laparoscopic skills. Therefore we were able to get insight in the amount of training needed to reach certain levels of competence. Skills improved after sufficient amount of training at home. Questionnaire outcomes indicated that skills and self-confidence improved and that this training should be therefore part of the regular residency training program.

## O013 - Robotics, Telesurgery and Virtual Reality

### Virtual Reality Exploration and Planning for Precision Colorectal Surgery

L. Guerriero<sup>1</sup>, G. Quero<sup>2</sup>, M. Diana<sup>2</sup>, L. Soler<sup>3</sup>, J. Marescaux<sup>3</sup>, F. Corcione<sup>1</sup>

<sup>1</sup>Monaldi Hospital, AORN dei Colli, Naples, Italy; <sup>2</sup>Institute of Image-Guided Surgery (IHU Strasbourg), Strasbourg, France; <sup>3</sup>Research Institute against Cancer of the Digestive System (IRCAD), Strasbourg, France

**Background:** Medical software can build a digital clone of the patient by 3D reconstruction of DICOM images. The virtual clone can be manipulated (rotations, zooms, etc.), and the various organs can be selectively displayed or hidden in order to facilitate a Virtual Reality (VR) preoperative surgical exploration and planning. We present preliminary cases showing the potential interest of VR in colorectal surgery.

**Methods:** Two patients underwent Laparoscopic Left Hemicolectomy (LLH) for diverticular disease and 1 patient underwent Laparoscopic Right Hemicolectomy (LRH) for cancer. The 3D virtual models were obtained from preoperative CT-scans using the Visible Patient® software. The virtual model was used to perform preoperative exploration and planning. Intraoperatively, one of the surgeons was manipulating the VR model, using the touch screen of a tablet wrapped into a sterile cover, which was interactively displayed to the surgical team.

**Results:** In one patient undergoing LLH, an abnormal origin of the left colic artery originating as an extremely short common trunk from the IMA was clearly seen in the VR model. This finding was missed at the CT scan by the radiologist. The precise identification of such vascular variant enabled a safe and adequate surgery. In the remaining cases, the VR model helped to precisely estimate the vascular anatomy, providing important landmark for a safer dissection.

**Conclusion:** VR can provide enhanced understanding of crucial anatomical details, both preoperatively and intraoperatively which could contribute to improve safety in colorectal surgery.

## O014 - Robotics, Telesurgery and Virtual Reality

### Robot-Assisted Colorectal Surgery: A Cohort Study of 152 Consecutive Patients

K. Dogan, F. Polat

Canisius-Wilhelmina Ziekenhuis, Nijmegen, The Netherlands

**Aim:** Minimally invasive surgery is an important modality in colorectal surgery. Robot-assisted surgery made its appearance the last years. Although there is lacking of high evidence literature, robot-assisted colorectal surgery (RACRS) seems to be an auspicious technique and it gains interest of colorectal surgeons. The aim of this present study was to evaluate the feasibility and safety of RACRS.

**Methods:** Prospectively collected peri-operative data of 152 consecutive patients who underwent surgery (from Dec-2014 to Dec-2016) for colorectal cancer or a benign pathology were analyzed. All procedures were performed with the Davinci Xi Robot. All procedures were performed by dedicated GI surgeons who had extensive experiences in laparoscopic colorectal surgery. Primary outcomes were oncologic outcomes (radical margins, lymph nodes). Secondary outcomes were major complications (e.g. anastomotic leakage, re-operations, mortality), hospitalization and operation time.

**Results:** In total 153 procedures were analyzed. One patient underwent a right colon resection and low-anterior resection in the same session because of double tumor. There were 101 male (66%) patients, mean BMI was  $26 \pm 4$  kg/m<sup>2</sup> and mean age of  $68 \pm 10$  years. Thirty-three patients were classified as ASA 1, 94 as ASA 2 and 25 as ASA 3. Twenty-one patients had a benign pathology and 132 malignant pathology (carcinoma). Type of operation was distributed as: 63 sigmoidal resections, 41 low-anterior resections, 11 abdomino-perineal resections, 35 right colon resections, and 3 left colon resections. 126 (96%) malignant tumors were radically resected. The average harvested lymph nodes in patients operated for a malignant tumor was  $16 \pm 7$ . The conversion rate was 4.6% (7/153). The re-operation rate was 11% (16/153) and the anastomotic leakage rate was 6% (8/134). The median hospital stay was 5 days. 30-day mortality rate was 0.7% (1/152). The average of total operating time was  $183 \pm 47$  min; the average incision time was  $138 \pm 44$  min.

**Conclusion:** Robot-assisted colorectal surgery seems feasible and safe. The oncologic outcomes and complications are comparable with other conventional techniques.

## ORAL PRESENTATIONS

### O015 - Abdominal Cavity and Abdominal Wall

#### Prospective Study on Mesh Shrinkage with MRI Visualization After Laparoscopic Ventral Hernia Repair with Intra-Peritoneal Iron Oxide Loaded PVDF Mesh

F. Muysoms, R. Beckers, E. Heindryckx, K. Carels, C. Schoofs, I. Kyle-Leinhase

Maria Middelaers Ghent, Gent, Belgium

**Background:** Current data on shrinkage of intra-peritoneal meshes come mainly from animal studies. Novel mesh that can be visualized with MRI allow the opportunity to prospectively evaluate mesh shrinkage after implantation.

**Methods:** Intra-peritoneal PVDF mesh enhanced with iron particles (Dynamesh IPOM visible, Dahlhausen) was implanted during laparoscopic ventral hernia repair. Mesh was fixed with a double crown of absorbable tackers (Securestrap, Johnson & Johnson). MRIs were performed at 1 month and 13 months postoperatively. The width and length of the mesh were measured by four blinded radiologists independently and were compared to the measurements at baseline by the surgeon at time of implantation. (ClinicalTrials.gov identifier NCT02177214).

**Results:** 15 patients underwent a laparoscopic ventral hernia repair and were included in the study. 13 of the 15 patient received an MRI exam at both 1 month and 13 months.

The mean width was 198 mm at baseline, 190 mm at 1 month and 191 mm at 13 month. Mean difference in width compared to baseline was 3.8% at 1 month and 3.1% at 13 month.

The mean length was 262 mm at baseline, 244 mm at 1 month and 242 mm at 13 month. Mean difference in length compared to baseline was 6.6% at 1 month and 7.2% at 13 month.

The mean shrinkage of the width between 1 month and 13 month was -0.7% (range: -6.0% & 4.2%) and the mean shrinkage of the length between 1 month and 13 month was +0.7% (range: -6.1% & 6.4%).

**Conclusion:** Although the measured width and length on postoperative MRI differs from the measurement at implantation, no significant shrinkage after implantation was observed in either dimension.

### O016 - Anaesthesiology

#### Low Dose Ketamine for Outpatient Hysteroscopy: A Prospective, Randomized, Double Blind Study

D. Goswami, S. Ankur, N. Nise

AIIMS, New Delhi, India

**Introduction:** Hysteroscopy for diagnostic and therapeutic purpose is routinely carried out on out patient basis. Although a safe procedure, it is associated with pain with discomfort which is associated with bradycardia and hypotension in 1.2–20%. Ketamine is an indirectly acting sympathomimetic drug that acts through the release of catecholamines from the adrenal medulla. It causes tachycardia and hypertension as side effects but the same may be exploited to counteract the bradycardia and hypotension during hysteroscopy.

**Aim:** To observe if low dose ketamine ( $\leq 1$  mg/kg  $\leq 20$  mcg/kg/min) reduces the pain score alongwith lowering incidence of bradycardia during hysteroscopy.

**Methodology:** Prospective, randomized double blinded study in 90 consecutive ASA I&II women scheduled for outpatient hysteroscopy. Cervical priming by Misoprostol and all received midazolam 50 mcg/kg were Randomized into:

Group I: Paracervical block plus Pentazocine and Promethazine.

Group II: Paracervical block plus Ketamine.

Hemodynamic parameters at the beginning and every 5 min, Lowest recorded heart rate, blood pressure, level of sedation, visual analogue score (VAS) were analysed. Patients comfort and overall experience of the anesthesia technique in 3 point scale (1=poor, 2=good, 3=excellent). Rescue analgesic being Fentanyl 0.5 mcg/kg.

The surgical stimulation was kept constant and hysteroscope of 4 mm size used. Statistical analysis done using SPSS software with P value < 0.05.

**Results:** The demographic and intraoperative characteristics were similar. In group II, Bradycardia and need for assisted ventilation was lower ( $p < 0.045$ ), Hypotensive episodes were pronounced in group I ( $P < 0.03$ ). Severe tachycardia was not seen in either group. In group II postoperative pain was less (VAS  $2.3 \pm 0.8$  vs.  $2.8 \pm 1.0$ )  $P < 0.023$ . All patients were satisfied after surgery. One patient in group II had disorientation while another had dizziness. However all (Group I & II) were discharged within 6 h.

**Conclusion:** Low dose ketamine in day care hysteroscopy is an effective and safe agent. Ketamine predicts haemodynamic alterations without interfering other functions. Apnoeic spells are reduced, along with recovery time without effecting discharge time from hospital. Patient satisfaction is also very high.

## O017 - Basic and Technical Research

### Gastrointestinal Hormones Manipulation to Counteract Metabolic Syndrome Using Duodenal Artery Targeted Embolization

M. Diana<sup>1</sup>, S.H. Kong<sup>1</sup>, R. Pop<sup>2</sup>, A. Langlois<sup>3</sup>, F. Marchegiani<sup>1</sup>, E. Heuillard<sup>1</sup>, R. Beaujeux<sup>2</sup>, S. Sigrist<sup>3</sup>, A. Legner<sup>1</sup>, J. Marescaux<sup>4</sup>

<sup>1</sup>Institute of Image-Guided Surgery (IHU Strasbourg), Strasbourg, France; <sup>2</sup>University Hospital of Strasbourg, Strasbourg, France; <sup>3</sup>European Centre for the Study of the Diabetes, Strasbourg, France; <sup>4</sup>Research Institute against Cancer of the Digestive System (IRCAD), Strasbourg, France

**Background:** Bariatric embolization is a fascinating concept consisting in the manipulation of the gastrointestinal (GI) hormonal milieu by modulating the blood supply. Our aim was to evaluate the possibility of modulating foregut activity (sugar absorption and GI hormones secretion) by embolization of the gastroduodenal artery (GDA).

**Materials and Methods:** Under angiographic control, the coeliac trunk was catheterized and the main duodenal branch originating from the GDA was embolized, in 12 Yucatan pigs. Embolization was achieved using 100–300  $\mu\text{m}$  (group A; n=4) or 300–500  $\mu\text{m}$  (group B; n=4) calibrated microspheres followed by the placement of a coil at the origin of the branch. In 4 animals (sham), only saline was injected. The levels of GI hormones (ghrelin, GIP, GLP-1, insulin, PYY, leptin) were assessed before (T0), 1h (T1), 1 month (T2), 3 months (T3), and 6 months (T4) after embolization. At the same time points, duodenal biopsies were performed, in which the gene expression of sodium-glucose-linked transporter 1 (SGLT-1) and glucose transporter 2 (GLUT-2) was quantified using qPCR.

**Results:** In group A, a short segmental duodenal stenosis occurred in all cases, which required balloon dilatation. Ghrelin levels were significantly reduced in group A, when compared to baseline, and were significantly lower at T2 ( $p=0.003$ ) and T3 ( $p=0.004$ ) when compared to group B and at T1 ( $p=0.02$ ) and T3 ( $p=0.04$ ) when compared to sham. Insulin levels were significantly lower in group A vs. group B at T1 ( $p=0.04$ ) and at T4 ( $p=0.002$ ), but not when compared to the sham group. Remaining GI hormones did not express relevant differences. SGLT-1 gene expression increased significantly in group B and sham when compared to baseline at T4 ( $p=0.02$  and  $p=0.009$  respectively), while it remained stable over time in group A. GLUT-2 expression increased significantly in the sham group when compared to baseline values (T0= $29.65\pm 0.61$  vs. T4= $38.19\pm 0.51$ ;  $p=0.00004$ ) but not significantly in group A or B.

**Conclusions:** In this experimental setting, GDA embolization induced a decrease in ghrelin production and modified the expression of glucose carriers in the foregut mucosa. Further experiments are required to establish the optimal embolization material to balance efficacy and ischemic complications.

## O018 - Basic and Technical Research

### Feasibility of Near-Infrared-Guided Hybrid Full-Thickness Resection to Remove Gastric Wall Lymphatic Pathways and Sentinel Node Basin

S.H. Kong<sup>1</sup>, F. Marchegiani<sup>1</sup>, M. Diana<sup>1</sup>, R. Soares<sup>1</sup>, Y.Y. Liu<sup>2</sup>, Y.S. Suh<sup>3</sup>, H.J. Lee<sup>3</sup>, B. Dallemagne<sup>4</sup>, H.K. Yang<sup>3</sup>, J. Marescaux<sup>4</sup>

<sup>1</sup>Institute of Image-Guided Surgery (IHU Strasbourg), Strasbourg, France; <sup>2</sup>Chang Gung Memorial Hospital, Linkou, Chang Gung University, Taoyuan, Taiwan; <sup>3</sup>Seoul National University Hospital, Seoul, Republic of Korea; <sup>4</sup>Research Institute against Cancer of the Digestive System (IRCAD), Strasbourg, France

**Background:** Full-thickness resection (FTR) and sentinel node basin (SNB) dissection are under investigation as minimally invasive procedures for gastric cancer with low risk of lymph node metastasis. However, there is a risk of leaving cancer cells in the lymphatic channels within the gastric wall, even in the presence of negative nodes. Near-infrared fluorescent imaging using IndoCyanine Green (ICG) enables highlighting the lymphatic spreading pathways, in real-time. Our aim was to assess the feasibility of a newly developed hybrid endoscopic/laparoscopic non-exposed FTR technique combined with fluorescence image-guided lymphatic pathway and SNB assessment.

**Materials and Methods:** Eight swine were included (4 acute and 4 survival models). ICG (0.2 mg/mL) was injected submucosally around a pseudo-tumor located in the anterior wall of the gastric body at 4 points. A potential lymphatic spreading pathway was identified using a near-infrared laparoscopic camera, and the hybrid FTR was performed removing all fluorescent lymphatic channels. Lymph node dissection at the GC and infrapyloric area was performed preserving the intragastric artery in all cases. At the LC, lymph node dissection was performed by preserving 3–4 gastric branches of the gastric artery in all acute animals and in 2 surviving ones (group A), and by preserving 1–2 branches in remaining 2 survival models (group B). Ischemia in the remaining posterior wall was examined using fluorescent angiography after systemic ICG injection (0.5 mg/kg). Gastric motility was evaluated using a dynamic MRI before and after the procedure.

**Results:** The hybrid FTR with bilateral sentinel lymph node basin dissection was successfully performed and fluorescent signals were well identified immediately after ICG injection. Mean specimen size was  $62.7\pm 17.0$  cm<sup>2</sup>. ICG angiography confirmed the good perfusion of the remaining stomach. A dynamic MRI revealed a preserved emptying function in acute animals and in group A survival animals, while a loss of peristaltic function was observed in animals of group B.

**Conclusions:** Fluorescent lymphangiography coupled with a novel FTR technique was feasible and allowed for the complete removal of a large part of the gastric wall including all possible lymphatic spreading pathways and sentinel basins. Further optimization is required to reduce the risk of postoperative motility dysfunction.

## O019 - Basic and Technical Research

### Stapler Cartridge Design Features and Relationship to Tissue Stress and Local Tissue Trauma

M. Godek, M. Eschbach, E. Contini, K. Fogarty, M. Powell, R. Cain

Medtronic, North Haven, United States of America

**Aim:** Surgical staplers are designed to expedite surgical procedures and to support ease of tissue apposition and subsequent healing events. Significantly, stapler design features and clamping mechanisms differ from manufacturer to manufacturer, and these design features may impact tissue health and functional staple line creation. Minimizing tissue trauma and associated post-operative complications is of great interest, as this may lead to better patient outcomes, reduced hospital stays and lower costs. The purpose of this experimental work was to examine the effect of stapler design elements on acute tissue trauma and to understand strengths and weaknesses of different stapler designs.

**Methods:** We examined cartridge design features of commonly utilized commercially available stapling systems (Medtronic, Ethicon) and compared and contrasted key design elements that may impact stress on tissue and subsequent tissue trauma. Of particular interest was the cartridge shape/profile (stepped vs. flat cartridge style) and cartridges with “cleats” versus cartridges without them). We performed a series of tests to compare stapler design features including evaluating the effect of clamping on Fuji film (bench top testing) and in live tissue, and examined post clamp tissue trauma (e.g., bruising, hematoma formation, serosal tearing).

**Results:** Results indicated specific design features such as cartridge shape, architectural features (i.e., cleats) and clamping mechanism do impact the stress profile created by flat and stepped face cartridge styles. This was demonstrated in bench top testing (i.e., Fuji film) and, subsequently, in live tissue. Local tissue trauma may result in tissue damage (i.e., bruising, hematoma formation and tissue tearing). Further, tissue characteristics such as thickness, density and hydration state may play a role in the extent of tissue damage observed. These acute observations may translate to clinically relevant outcomes, especially when the same tissue is stressed repeatedly, as might be expected if tissue is clamped and released before the stapler is fired, or when a staple line is crossed (e.g., sleeve gastrectomy).

**Conclusions:** Design features are intended to enhance surgical stapler performance; however, some design features introduce unnecessary local tissue trauma.

## O020 - Basic and Technical Research

### Barriers to Quality Assurance of Surgical Intervention in Clinical Trials: A Systematic Review of the Literature

J.W. Butterworth, P.R. Boshier, G.B. Hanna

Imperial College London, London, United Kingdom

**Aim:** Where surgery forms the primary curative modality within oncological trials, the ‘quality’ of this intervention may directly influence patient outcomes. The majority of randomised controlled trials are however conducted without a robust framework in place to both assess and ensure surgical quality. Accordingly the aim of this systematic review was to define the existing barriers and mitigating strategies to quality assurance of surgical intervention within clinical trials and to propose a comprehensive checklist for the assessment of this in future trials.

**Method:** A systematic on-line literature search of the Medline, EMBASE and Cochrane Library databases was conducted using the following search terms: challenge; barrier; quality; quality assurance; randomised controlled trial; clinical trial; surgery; surgical, and; performance. Two reviewers independently screened titles and abstracts of identified studies and the full texts of potentially relevant articles were obtained. Results were presented in accordance with PRISMA guidelines for the preferred reporting of systemic reviews and meta-analyses.

**Results:** Of 384 articles identified through electronic searches, 12 met the inclusion criteria and were selected for this systematic review. Challenges to quality assurance of surgical intervention identified by included studies were: resistance from senior clinical staff (n=1); a lack of understanding of clinical epidemiology amongst trial surgeons (n=2); surgeon learning curve (n=7); inadequate monitoring of quality (n=2); unclear definition of intervention (n=3); deviancies from protocol (n=2), and; poor reporting of adherence to trial protocol (n=2). Mitigating strategies that were proposed to overcome these challenges, included: adherence to IDEAL and/or CONSORT guidelines (n=1); iterative co-design of trials between academics and clinicians with a culture collaboration (n=1); training of trial surgeons in relation to clinical epidemiology (n=1); pre-trial credentialing of surgeons (n=6); standardisation of surgical intervention (n=4); proficiency assessment and monitoring with video and photographic evidence (n=5); statistical assessment of learning curve using hierarchical models (n=2), and; standardisation of histological assessment and reporting of specimens (n=1).

**Conclusion:** This systematic review has identified multiple barriers to quality assurance of surgical intervention in clinical trials. Utilising existing recommendations and mitigating strategies proposed by included studies a comprehensive checklist for the assessment of surgical quality in clinical trials is proposed.

## O021 - Clinical Practice and Evaluation

### Transanal Assisted Colon Resection and Rectopexy for Rectal Prolapse

S.R. Minot

Markus Krankenhaus, Frankfurt am Main, Germany

**Introduction:** Transanal Hybrid Colon Resections (taCR) for different indications have been successfully introduced into clinical practice in the past 5 years. With the concept of NOTES, reduction of access trauma can be reduced by using the anus as a natural orifice and therefore restrict transabdominal access to 3–5 mm instruments. The technique of resection-rectopexy was applied in taCR.

**Methods:** In this study we summarize our experience with resection-rectopexy for rectal prolapse in the transanal laparoscopic assisted technique. We selected patients with a BMI<30, and no major previous abdominal surgery. Transanal access was used for all operative steps requiring access of more than 5 mm, such as staplers, large graspers, swaps and specimen retrieval. Data acquisition and analysis was performed for OR-Time, complications, postoperative well-being and quality of life.

**Results:** 25 patients underwent taCR-resection-rectopexy, all females, median age 56 (45–74); complications: intraoperative: none; postoperative 1 abscess with revision. Gastrointestinal Quality of Life index: pre/post: 96/119.

**Conclusion:** taCR for resection-rectopexy is a safe NOTES Hybrid technique for rectal-prolapse, which has been successfully integrated in our clinical program.

## O022 - Clinical Practice and Evaluation

### Does the Number of Operating Consultants Influence the Outcome of Laparoscopic Colorectal Cancer Surgery?

N. Francis<sup>1</sup>, E. Noble<sup>1</sup>, N. Curtis<sup>1</sup>, T. Dyke<sup>1</sup>, R. Hipkiss<sup>1</sup>, R. Dalton<sup>1</sup>, A. Allison<sup>1</sup>, J. Ockrim<sup>1</sup>, E. Salib<sup>2</sup>

<sup>1</sup>Yeovil District Hospital NHS Foundation Trust, Somerset, United Kingdom; <sup>2</sup>Liverpool University, Liverpool, United Kingdom

**Aim:** Laparoscopic technique in colorectal cancer surgery have been widely accepted due to short term patient benefits. It is not clear how can the impact of laparoscopy be enhanced in high risk patients. The aim of this study was to investigate the influence of dual specialist operating surgeons on the outcomes following laparoscopic colorectal surgery.

**Method:** A prospectively populated colorectal cancer surgery database was reviewed. Cluster analysis and odds ratio (OR) were used to identify risk factors. The outcome measures included conversion to open and overall survival (OS), which was calculated using Kaplan–Meier method at five years.

**Results:** 750 patients underwent laparoscopic colorectal cancer resection between 2002 and 2015 (median age 73 [range 25–96], 319 (42.5%) female, 282 (37.6%) rectal malignancies. Median follow up was 48 months (range 0–168). Two step cluster analysis identified two groups with no demographic differences between them. Cluster I (lower risk)—461 patients, 10.6% converted (27% rectal; 33% previous surgery, 4% neoadjuvant, 23% stoma created and 20% had two consultants operating). Cluster II (higher risk) -287 patients of higher conversion rate (23.3%), but less previous surgery (28%), higher rectal cases (54%), more neoadjuvant therapy (15%), more stoma (52%) and lower percentage of dual consultant operating (13%). The two most significant predictors for conversion were single surgeon (OR 4.4, 95% CI 1.87–10.2, p<0.001) and neoadjuvant treatment (OR 3.0, 95% CI 1.7–5.4, p<0.001). Five year OS was significantly inferior for converted cases compared to the laparoscopic group (63% vs. 77%, p<0.001).

**Conclusion:** In high risk laparoscopic colorectal cases, dual specialist operating is associated with four times less likely to convert to open and is likely to improve long term survival.



## O023 - Clinical Practice and Evaluation

### Does Perioperative Glycemic Control for Diabetic Patients Reduce Post Operative Complications? A Systematic Review and a Review of Meta-analysis

M. Hardan<sup>1</sup>, I. Khalil<sup>1</sup>, S. Plummer<sup>2</sup>

<sup>1</sup>Ramadi Teaching Hospital, Ramadi, Iraq; <sup>2</sup>Canterbury Christ Church University, Kent, United Kingdom

**Introduction:** Diabetes is a well-known risk factor for complications after surgery, causing longer hospital stay, higher health care resource utilisation and more deaths. One of the most important medical complications is the increased risk of infection in the period around a surgical procedure. However, it is still not clear whether targeting more intensive blood glucose control (glycaemic control) is better than targeting conventional blood glucose control for the reduction of surgical risk in people with diabetes mellitus.

**Aim:** To assess the effects of perioperative glycaemic control for diabetic patients undergoing surgery.

**Methods:** Trials were obtained from searches of The Cochrane Library, Medline, EMBASE, LILACS, CINAHL and ISIS (all up to December 2016).

**Results:** Twelve trials randomised 694 diabetic participants to intensive control and 709 diabetic participants to conventional glycaemic control. The duration of the intervention ranged from just the duration of the surgical procedure up to 90 days.

**Conclusion:** In this systematic review, we did not find evidence that tight perioperative glycaemic control produces a clinically significant effect on the postoperative outcomes of participants with diabetes mellitus as compared with conventional perioperative blood glucose control. The implementation of intensive glycaemic control was associated with a higher number of patients experiencing hypoglycaemic episodes. Therefore, based on the available randomised controlled clinical trials, intensive glycaemic control protocols with near-normal blood glucose targets cannot be generally recommended for patients with diabetes mellitus undergoing surgical procedures.

## O024 - Clinical Practice and Evaluation

### Epoch-Making Technique of Full-Thickness Resection for The Colorectal Tumor by Using Laparoscopy Endoscopy cooperative Surgery (LECS)

Y. Tamegai, Y. Fukunaga, T. Ide, A. Chino, M. Igarashi, T. Akiyoshi, S. Nagayama, Y. Fujimoto, T. Konishi, S. Saito, J. Fujisaki, M. Ueno

Cancer Institute Hospital, Tokyo, Japan

**Aim:** We established a full-thickness resection technique for the colorectal tumor by using laparoscopy endoscopy cooperative surgery (LECS) procedure to overcome the limit of endoscopic treatment. The aim of this study was to investigate the feasibility and safety of LECS procedure applied with endoscopic submucosal dissection (ESD) technique obtained adequate surgical margin.

**Methods:** We performed ESD on 1,376 colorectal tumors in 1,341 patients (male: female=777:564; mean age, 66.1years). Among these cases, six cases had perforation (0.4%), and three of six cases required emergent surgery. We examined the cause of perforation and the limit of ESD from the view point of safety.

We completed a full-thickness one-piece resection for 11 cases (male: female=7:4; mean age, 63.5years) of colorectal tumors using LECS procedure. Indications of the LECS procedure were thought to be as follows: (1) Tis carcinoma and adenoma (Vienna Classification; Category 3, 4) accompanied by wide and severe degree fibrosis in the submucosal layer (tumor recurrence after endoscopic and surgical resection), (2) submucosal tumors, (3) Tis carcinoma and adenoma involved appendix or diverticle. We examined the clinicopathological outcomes of the above-mentioned 11 cases.

**Results:** Four of six cases that caused perforation in ESD were cases with fibrosis in the submucosal layer. Three cases of those were moderate to severe degree fibrosis cases, and a limit of ESD seemed to exist in these lesions from the viewpoint of safety and curability.

We accomplished full-thickness resection successfully for 11 cases using LECS procedure as follows: 5 cases of Tis cancer, 4 cases of adenoma, 1 case of schwannoma, and 1 case of GIST. The reasons that we judged as the indication of LECS procedure were as follows: three cases accompanied by severe degree fibrosis, 2 cases involved diverticle, 3 cases involved appendix, 2 cases of submucosal tumor, and 1 case of poor endoscopic operability. We experienced no complications, and average postoperative hospital stay was 7.7 (6 to 12) days.

**Conclusion:** We developed a LECS procedure to overcome the limit of endoscopic treatment including ESD, and completed full-thickness one-piece resection of the tumors considered as high risk of perforation.

## O025 - Clinical Practice and Evaluation

### 3d Laparoscopic Donor Nephrectomy Versus Robot-Assisted Donor Nephrectomy: A Detailed Comparison of Two Prospective Cohorts

E.E.A.P. Mulder

Erasmus Medical Center, Rotterdam, The Netherlands

**Background:** The major disadvantage of live kidney donation is that complications may occur in healthy individuals. Subsequently, maximizing donor safety during the procedure and minimizing discomfort is pivotal. Visual misperception, an important cause for surgical accidents, could be overcome by restoring three-dimensional (3D) view during endoscopic procedures. Consecutively, improvement in depth perception can boost surgeons' confidence and satisfaction. This could result in both less surgical accidents, as well as decreased performance time. During the hilar phase (dissecting the renal vessels), surgeons should feel confident. There are two surgical techniques which implement 3D vision: 3D endoscopy and the da Vinci® surgical system. The latter smoothens instruments' manoeuvring, but lacks tactile feedback. In this study we evaluated the results of endoscopic donor nephrectomies with 3D vision compared to robot-assisted donor nephrectomies (RADN). The purpose of our study was to find out whether 3D imaging alone could enhance this procedure.

**Methods:** Data on perioperative results of endoscopic procedures that were performed under 3D vision, donor kidney function, surgeon satisfaction, and recipient and graft survival were collected. These data were compared to robot-assisted procedures.

**Results:** Forty 3D endoscopic procedures were performed by two da Vinci certified surgeons. Baseline characteristics, and three-months post-operative outcomes demonstrated no significant difference between both groups. Intraoperative, median skin-to-skin time of 3D endoscopic procedures was significantly shorter compared to RADN, 138.5 min. (85.0–231.0) versus 169.0 (110.0–269.0) min. respectively (P=0.016). In addition, both surgeons stated to feel comfortable during 3D endoscopic procedures, especially when encountering the renal vessels, with a significant shorter hilar phase for both single- and multiple anatomy (P=0.009 and P=0.040, respectively) in favour of the 3D endoscopic group.

**Conclusions:** 3D endoscopy for donor nephrectomy is feasible and safe for donors, and has good outcomes for recipients. It showed a significant shorter median skin-to-skin time and hilar phase, along with good surgeon confidence. Future studies should indicate if 3D endoscopy could improve the surgical technique for donor nephrectomy.

## O026 - Clinical Practice and Evaluation

### Ropivacaine 1% Pre-emptive Local Anesthesia for Pain Relief After Laparoscopic Cholecystectomy

I.Y. Feidorov, I.E. Khatkov, Z.M. Abdulatipova

Moscow Clinical Scientific Center, Moscow, Russia

It's generally known, that postoperative pain after laparoscopic cholecystectomy is less than after laparotomy. At the same time postoperative pain is still main reason for prolonging hospitalization. There are some data about benefits from a pre-emptive local anesthesia in minimally invasive surgery. This study presents the effects of peritrocal and intraperitoneal administration of 1% ropivacaine solution.

**Aim:** To make an assessment of peritrocal and intraperitoneal ropivacaine 1% solution administration for postoperative pain prevention.

**Methods:** There were 104 consecutive patients with laparoscopic cholecystectomy (LC). All patients was separated in two groups by randomisation: 48 patients in the main group (MG) and 56 in control group (CG). For pre-emptive local anesthesia (PLA) 30 ml 1% ropivacaine solution were used: 20 ml for peritrocal infiltration and 10 ml at the end of surgery was sprayed under the left diaphragm dome. For MG ropivacaine PLA were use, for CG PLA weren't use. Pain assessment was performed by the VAS (visual analogue scale) via 2,4,8,24,48 and 72 h after surgery.

**Results:** In the all period of pain assessment in MG there was much more lower pain rate was registered than in CG (p<0.001), with the max VAS rate 1.02±0.18. In CG pain rate via 4,8,24 h was more than 3 VAS points (p<0.001). 10.4% patients in MG has felt shoulder pain, in CG there was 48,2% patients with shoulder pain (p<0.001). For 56,2% patients MG postoperative analgesia wasn't required. For adequate postoperative analgesia in CG more than 50% patients required 3 ketorolac 30 mg injections. Postoperative hospital stay in MG was less on 1.05 days than in CG (p<0.001). There was no difference in side effects level (nausea, vomiting ect.).

**Conclusion:** This study has demonstrated that ropivacaine PLA is simple and effective procedure for prolonging postoperative analgesia after laparoscopic cholecystectomy, reducing shoulder pain, analgesics requirements and postoperative hospital stay.

## O027 - Clinical Practice and Evaluation

### Crossover in Minimally Invasive Surgery Randomised Controlled Trials for Gastrointestinal Cancer

S. Markar, G. Garas, G. Malietzis, H. Ashrafian, G.B. Hanna, L.R. Jiao, A. Darzi, T. Athanasiou

Imperial College London, London, United Kingdom

**Background:** Randomised Controlled Trials (RCTs) inform clinical practice have provided the evidence base for the introduction of Minimally Invasive Surgery (MIS) for gastrointestinal cancer treatment. Crossover from MIS to open surgery may affect clinical outcomes and the effect size generated from RCTs with homogenisation of randomised groups. The objectives of this review were to identify modifiable factors associated with crossover and the impact of crossover upon clinical endpoints.

**Methods:** A systematic literature search was undertaken (1990–2016). Included publications were RCTs that compared MIS and open surgery for gastrointestinal cancer treatment. Correlation and regression were employed to analyse factors associated with crossover and the influence of crossover upon endpoints including 30-day mortality, anastomotic leak rate, early complications and 5-year overall survival (OS).

**Results:** Forty RCTs were included reporting on 11,625 patients from 320 centres. The composite RCT quality score ( $\beta = -7.182$ ;  $p < 0.001$ , univariate,  $\beta = -5.016$ ;  $p < 0.001$ , multivariate) and surgeon volume ( $\beta = -0.150$ ;  $p = 0.004$ , univariate,  $\beta = -0.088$ ;  $p = 0.043$ ) before entering the trial showed an inverse relationship with crossover. Importantly, multivariate weighted linear regression revealed a statistically significant positive correlation between crossover and 30-day mortality ( $\beta = +0.125$ ;  $p = 0.033$ ), anastomotic leak rate ( $\beta = +0.550$ ;  $p = 0.004$ ), and early complications ( $\beta = +1.255$ ;  $p = 0.001$ ), based upon intention-to-treat analysis. Finally, a statistically significant negative correlation was observed between crossover and 5-year OS ( $r = -0.630$ ,  $p = 0.012$ ).

**Conclusion:** The presence of crossover within RCTs in surgical oncology increases 30-day mortality, anastomotic leak rate, early complications, and reduces 5-year OS within the MIS group based upon intention-to-treat analysis. Credentialing surgeons by procedural volume is an important method to ensure surgeons are through their proficiency-gain curve and thus minimising the incidence of crossover. If crossover does persist in substantial numbers authors must consider several alternative.

**Methods:** of statistical methodology rather than a straight forward intention-to-treat-analysis.

## O028 - Clinical Practice and Evaluation

### Phase II Clinical Trial for the Evaluation of the Efficacy of Transanal Total Mesorectal Excision

S.C. Park

National Cancer Center, Gyeonggi-do, Republic of Korea

**Background:** Transabdominal approach for resection of low rectal tumor has been considered a highly demanding procedure because of the confined anatomy and bony angulations particularly in males with a narrow pelvis or obese patients. For this reason, transanal total mesorectal excision (TME) has been introduced in many institutions. We also performed a pilot study of transanal TME for 12 rectal cancer patients, with acceptable TME quality and postoperative morbidity. Now we report the results from phase II clinical trial of 49 transanal TME procedures.

**Methods:** Forty nine patients with cT0-3 rectal cancer located in 3-12cm from the anal verge were prospectively enrolled in this study. We used GelPOINT® or TEO® for transanal approach. For transabdominal approach, Octoport™ was used at the presumed ileostomy site, and additional ports were used if necessary. The primary endpoint of the study is a successful treatment result defined as nearly complete or complete TME and CRM > 1 mm. This study was designed as Simon's minimax two-stage method, and after at least 86% success rate was achieved in the first stage, we continued further recruitment for a total of 49 patients.

**Results:** From March 2015 to April 2016, we performed transanal TME in 32 male and 17 female rectal cancer patients. The mean age of patients was  $61.2 \pm 11.6$ , and BMI was  $23.3 \pm 2.1$ . Mean operation time was  $170.5 \pm 61.8$ , and estimated blood loss was  $89.3 \pm 139.7$  ml, and there was no intraoperative complication and open conversion.

In the first stage of the study, 23 out of 25 patients (92.0%) achieved successful treatment result, and therefore, all 49 patients were enrolled for the final efficacy analysis. Acceptable TME quality was achieved in 95.9% (47/49), and CRM was more than 1 mm in 91.8% (45/49). So, the successful treatment was observed in 45 among 49 patients (91.8%). There was no postoperative mortality, and postoperative morbidity was observed in 15 patients (30.6%) including 7 cases (14.3%) of anastomosis dehiscence, 5 (10.2%) urinary dysfunction, 2 (4.1%) wound complication, and 1 (2.0%) ileus.

**Conclusions:** In conclusion, this study demonstrated the feasibility and safety of transanal TME based on the acceptable success rate, and postoperative morbidity.

## O029 - Different Endoscopic Approaches

### STUDY of Medical and Surgical Colonoscopies Performed in an Irish University Hospital

S. Quigley, B. Meshkat, D.A. Tofan, C. Timon, M. Regan

Galway University Hospital, Galway, Ireland

**Aim:** Colonoscopy is a widely performed procedure and maintenance of standards is critical. As colonoscopies are performed by medical (ME) and surgical (SE) endoscopists in separate units in our hospital, we aimed to evaluate the differences in indications and key performance indicators between units.

**Methods:** Data from January-2016 to June-2016 were retrospectively retrieved from EndoRad (electronic-database). Data collected included: patient demographics, indication, caecal-intubation-rate, polyp-detection-rate, withdrawal-time, type and quality of bowel preparation, type and volume of sedation, endoscopist speciality and grade, complications (within 24-hours). Statistical analysis was performed using SPSS V. 24. Cross-tabulation was used to compare categorical variables and  $P < 0.05$  considered statistically significant.

**Results:** 1579 colonoscopies were performed, with the majority by ME (64%). The mean age of patients was 58 years, with 11:10 male: female ratio. Overall caecal-intubation-rate was 92% and mean withdrawal time 10.4 min with no statistical difference between units in either category. Polyp-detection-rate was higher in ME (44%) compared to SE (27%),  $p < 0.0001$ . The most common indications for ME were altered-bowel-habit (26%), bleeding-per-rectum (19%), and anaemia (18%). This compared to bleeding-per-rectum (30%), abdominal pain (25%), and history of colon cancer (16%) in SE. Fleet-phospho-soda was the most commonly used bowel-preparation in for SE (56%) compared to moviprep (98%) in ME. The quality of bowel-preparation was satisfactory or above in 86% of SE compared to 82% in ME. Senior endoscopists, Consultants and Registrars, performed 94% of ME and 91% SE.

**Conclusion:** There is variation in style of service between the units; however both meet a high standard of care provision for different patient cohorts.

## O030 - Different Endoscopic Approaches

### Scope of Single Incision Laparoscopic Surgery Using Glove Port: Our Technique

A. Bhardwaj

Fortis Hospital, New Delhi, India

**Aim:** Single-incision laparoscopic surgery (SILS) is an emerging approach which ensures virtually a 'scar less' surgery, the single port scar being hidden in the umbilicus. The aim of this study is to discuss the scope of our technique to perform various surgical procedures by SILS using Glove port.

**Methodology:** The study included 272 patients from January 2010 till October 2016 who underwent wide range of procedures by SILS using Glove port. The glove port is made with sterile surgical glove and flexible rings & low profile trocars sterilized by ethylene oxide. The access is through circum-umbilical incision and sheath aperture of 17–20 mm is achieved which can easily accommodate two 5 mm and one 10 mm instruments/optics. We use normal laparoscopic hand instruments as the bigger sheath incision provides better maneuverability and ease of endo-suturing if needed. Outcome of the procedures including patient demographics, operative time, duration of hospital stay, analgesic usage, cosmetic outcome and complications were evaluated.

**Results:** A total of 272 patients, aged 8 to 62 years (mean-27.2) and BMI 19–37 (mean-23.4) were assessed. The procedures performed included cholecystectomy, appendectomy, varicocele, urology and gynecology procedures. Concomitant procedures were also performed—cholecystectomy and hysterectomy, cholecystectomy and myomectomy, nephrectomy and hysterectomy. Operative time ranged from 30 min to 240 min with no intra-operative complications and minimal blood loss. 5 mm rescue ports were used in 36 cases. Intravenous analgesic agents were given for 24 h, followed by oral analgesics for maximum 5 days. Patients were ambulated soon after recovery from anesthesia and discharged between post-operative day 1 to day 3, with return to work in 1 week. On follow up at 1 week and 1 month, all patients were satisfied with cosmetic outcome. Three patients developed superficial skin infection and were dealt with oral antibiotics and drainage. No case of port site incisional hernia reported till date.

**Conclusion:** Single-incision laparoscopic surgery using Glove port is feasible and safe for a wide variety of surgical procedures. It is cost effective with good cosmetic outcome and faster recovery. It offers additional benefit of specimen retrieval, whether bulky, infected or multiple.

## O031 - Different Endoscopic Approaches

### Retroperitoneoscopic Thoracic Duct Ligation for Chylothorax

B. Seeliger, E. Karakas, P.F. Alesina, M.K. Walz

Kliniken Essen-Mitte, Essen, Germany

**Aim:** Treatment of postoperative chylothorax can be challenging. Conservative treatment includes low fat diet with medium chain triglycerides or parenteral nutrition, somatostatin treatment, chest tube placement with or without pleurodesis as well as thoracic duct embolisation. For persistent chylothorax, surgical management by ligation of the thoracic duct is indicated. Open and minimally invasive transthoracic techniques have been described. We present a new approach using the retroperitoneoscopic access for supradiaphragmatic ligation of the thoracic duct.

**Methods:** Between January 2006 and September 2016 we performed retroperitoneoscopic ligation of the thoracic duct in 4 patients. Three trocars were inserted similarly to the adrenal surgery technique (at the tip of the 12th and 11th rib and in the 10th intercostal space). Due to its anatomical course between aorta and inferior vena cava/azygos vein, the best approach to the thoracic duct is from the right side. The thoracic duct was identified transdiaphragmatically and ligated cranially to the cisterna chyli using resorbable clips.

**Results:** In 2 patients, right sided chylothorax occurred after esophagectomy for esophageal cancer. In patient 3, it emerged after thyroidectomy and neck dissection for papillary thyroid cancer. Thoracoscopic pleurectomy and pleurodesis for persistent chylothorax had failed. Patient 4 had recurrent ovarian cancer and developed chylothorax 3 weeks postoperatively after debulking including supradiaphragmatic lymph node removal on the right side. She underwent surgery 5 days after failed conservative management. Mean operative time was 86 min (range 40–135). Chylothorax did not recur in patients 1–3. In patient 4, the amount of chylous leak declined slowly and the patient was discharged to her home country with the pleural catheter in place (lost to follow-up). There were no complications.

**Conclusion:** Thoracic duct ligation via the retroperitoneoscopic approach is safely feasible. It effectively terminated chylothorax in 3/4 patients. In patients with persistent chylothorax, our approach is an additional therapeutic option. Especially after esophageal surgery it has the advantage of avoiding to cross the previous operative field.

## O032 - Different Endoscopic Approaches

### Single-Incision Surgery and Trocar-Site Hernia: A Systematic Review and Meta-Analysis with Trial Sequential Analysis

S. Hajibandeh<sup>1</sup>, S. Hajibandeh<sup>1</sup>, J. García-Alamino<sup>2</sup>, M. Weitzendorfer<sup>3</sup>, F. Muysoms<sup>4</sup>, F. Grandrath<sup>5</sup>, G. Chalkiadakis<sup>6</sup>, K. Emmanuel<sup>3</sup>, G. Antoniou<sup>7</sup>, M. Gioumidou<sup>8</sup>, S. Iliopoulou-Kosmadaki<sup>8</sup>, M. Mathioudaki<sup>8</sup>, K. Souliotis<sup>8</sup>, S. Antoniou<sup>6</sup>

<sup>1</sup>Royal Blackburn Hospital, Blackburn, United Kingdom; <sup>2</sup>Nuffield Department of Primary Care Health Sciences, Oxford, United Kingdom; <sup>3</sup>University Hospital of Salzburg, Salzburg, Austria; <sup>4</sup>AZ Maria Middelaers, Ghent, Belgium; <sup>5</sup>Neuwerk Hospital, Mönchengladbach, Germany; <sup>6</sup>University Hospital of Heraklion, Heraklion, Greece; <sup>7</sup>The Royal Oldham Hospital, Pennine Acute Hospitals NHS Trust, Manchester, United Kingdom; <sup>8</sup>University of Crete, Heraklion, Crete, Greece

**Aim:** Single-incision laparoscopic surgery (SILS) is a novel concept, aiming at further minimizing abdominal wall trauma and improving cosmesis. Concerns have been raised about the risk of trocar site hernia following SILS. This study aims at assessing the comparative risk of trocar site hernia following SILS and conventional laparoscopic surgery, and investigating whether current evidence is conclusive.

**Methods:** We performed a systematic search of Medline, AMED, CINAHL, CENTRAL and OpenGrey. Randomized clinical trials of SILS and conventional laparoscopic surgery providing trocar-site hernia rates were considered for inclusion. Pooled odds ratios with 95% confidence intervals were calculated using the Mantel Haenszel method. Trial sequential analysis with the Land and DeMets approach was performed to assess the possibility of type I error and to compute the information size.

**Results:** Twenty-three articles reporting on 2471 patients were included. SILS was associated with higher odds of trocar-site hernia compared to conventional laparoscopic surgery (odds ratio 2.37, 95% confidence interval 1.25–4.50,  $p=0.008$ ). There was no evidence of between study heterogeneity or small study effects. The information size was calculated at 1687 patients and the Z-curve crossed the O'Brien Fleming  $\alpha$ -spending boundaries at 1137 patients, which suggests that the evidence of higher risk of trocar-site hernia following SILS compared to conventional laparoscopic surgery can be considered conclusive.

**Conclusion:** Single-incision laparoscopic procedures through the umbilicus are associated with a higher risk of trocar-site hernia compared to conventional laparoscopic surgery.

## O033 - Different Endoscopic Approaches

### Meta-Analysis of Hybrid Natural Orifice Transluminal Endoscopic Surgery Versus Laparoscopic Surgery

P.C. Müller, D.C. Steinemann, P. Probst, A.C. Schwarz, M.W. Büchler, B.P. Müller-Stich

University Clinic of Heidelberg, Heidelberg, Germany

**Background:** Hybrid Natural orifice transluminal endoscopic surgery (NOTES) combining an access through a natural orifice with small-sized abdominal trocars aims at reducing pain and enhancing recovery. The objective of this systematic review and meta-analysis was to compare pain and morbidity in hybrid NOTES and standard laparoscopy.

**Methods:** A systematic literature search was performed to identify randomized controlled trials (RCT) and non-randomized trials (NRT) comparing hybrid NOTES and standard laparoscopy. The main outcome was pain on postoperative day (POD) 1. Secondary outcomes were pain in the further postsurgical course, rescue analgesia, complications, and satisfaction with the cosmetic result. The results of meta-analyses in a random effects model were presented as odds ratio or standard mean difference with 95% confidence intervals.

**Results:** Six RCT and 21 NRT including 2,226 patients were identified. In hybrid NOTES the numeric pain scale was 0.75 points ( $-1.09, -0.42; P<0.001$ ) lower on POD 1 and 0.58 points ( $-0.91, -0.26; P<0.001$ ) lower on POD 2 to 4. The need for rescue analgesia was reduced in hybrid NOTES [OR 0.36 (0.24, 0.54;  $P<0.001$ )]. The reduction in complications [OR 0.52 (0.38, 0.71;  $P<0.001$ )] found for hybrid NOTES was not significant when only RCT were considered [OR 0.83 (0.43, 1.60;  $P=0.570$ )]. The score for cosmetic satisfaction was 1.19 points (0.46, 1.93;  $P<0.001$ ) higher after NOTES.

**Conclusions:** Hybrid NOTES reduces postoperative pain and is associated with greater cosmetic satisfaction. Reduced complications in favor of hybrid NOTES seem to be owed to a selection bias.

## O034 - Different Endoscopic Approaches

### 10 Years Experience of Notes Procedures in a Single Institution

J. Noguera<sup>1</sup>, J. Aguirrezabalaga<sup>1</sup>, S. Builes<sup>1</sup>, N. Sanluis<sup>1</sup>, G. Martín<sup>2</sup>, J. Muñoz<sup>2</sup>

<sup>1</sup>Complejo Hospitalario Universitario A Coruña, A CORUÑA, Spain; <sup>2</sup>Hospital Universitario Son Espases, PALMA DE MALLORCA, Spain

**Aim:** to present the experience on NOTES procedures in a single institution with 220 patients and 10-year's experience.

**Background:** The minimally invasive surgery through natural orifices has revolutionized the laparoscopic surgery for abdominal procedures. The use of the vaginal approach is not new for gynecologists but it is a new concept for the non-gynecological laparoscopic surgeons. The Single Incisión Laparoscopic Surgery (SILS) was the second approach used in our centre for abdominal procedures. Finally, the transrectal access for rectal cancer was the final approach included in our surgical approaches. The use of this new approaches has been used to perform some procedures and to extract specimens after a laparoscopic surgery.

**Results:** We present our clinical experience in 10 years after our first Spanish transvaginal cholecystectomy in October 2007. In our clinical series there are 220 patients. 75 transvaginal cholecystectomies, 20 transvaginal colectomies, and 5 other transvaginal procedures. By a single incision approach we performed 60 cholecystectomies, 30 colectomies and 10 other procedures (bariatric surgery, appendectomy, adrenalectomy,...). Through the transrectal approach we have performed 20 colorectal resections due to colorectal cancer. The most frequent complication was the surgical site infection, most important in SILS- approach. Complications for transvaginal approach were infrequent and no relevant. The complications in the SILS access were 4-time more frequent than in transvaginal approach. In the transanal approach the most related complication was the local infection due to partial dehiscence.

**Discussion:** With ten year of experience with the new approaches we can talk about the safety of them when they are performed by trained and experienced teams. The complications that we have found in the new approaches are the same that we had at the abdominal wall, infection and hemorrhage, and at the anastomotic line, anastomotic dehiscence. The transvaginal approach seems to be better than SILS approach when it is possible (cholecystectomy).

## O035 - Different Endoscopic Approaches

### Risk Factors in Single-Port Laparoscopic Cholecystectomy for Conversion to Multiport Laparoscopic Cholecystectomy

J. Raakow<sup>1</sup>, M. Kilian<sup>1</sup>, M. Biebl<sup>1</sup>, J. Pratschke<sup>1</sup>, R. Raakow<sup>2</sup>

<sup>1</sup>Charité - Universitätsmedizin Berlin, BERLIN, Germany; <sup>2</sup>Vivantes Klinikum Am Urban, BERLIN, Germany

**Aim:** Single-incision laparoscopic surgery (SILS) is safe for elective and acute cholecystectomies and offers patient-related benefits over multiport laparoscopy. However, very little is known about risk factors limiting the single-incision laparoscopic operation. The aim of this study was therefore to investigate risk factors for conversion to conventional multiport laparoscopic cholecystectomy (MPLC) in single-incision laparoscopic cholecystectomy (SILC).

**Methods:** A prospectively maintained database was analyzed identifying patients undergoing SILC cholecystectomy between October 2008 and December 2015. Patients were categorized into two groups: SILC and patients converted to MPLC. Both groups were compared and analyzed to identify risk factors for conversion to MPLC. Statistical evaluation included the description and comparison of demographic factors and perioperative outcome.

**Results:** A total of 481 patients were grouped. Twenty-seven cases (5.6%) underwent conversion to MPLC. The univariate analysis revealed American Society of Anesthesiologists (ASA) score of 3 or higher, patients weight and acute cholecystitis as risk factors for conversion ( $p<0.001$ ,  $p=0.021$  and  $p=0.002$ ). In multivariate analysis, ASA score of 3 or higher and acute cholecystitis were significant risk factors for conversion from SILC to MPLC.

**Conclusion:** When performing a SILC in multimorbid patients with an ASA score of 3 or higher or patients with acute cholecystitis surgeons need to be aware that the risk of adding additional trocars and therefore converting to MPLC is significantly higher.

## O036 - Education

### Successful Self-Directed Training of Laparoscopic Suturing and Knot Tying: Randomized Trial of E-Learning in First-Person View Versus Endoscopic View

F. Nickel, M.W. Schmidt, K.F. Kowalewski, J. De la Garza, M. Friedrich, H. Kenngott, B. Müller-Stich

University of Heidelberg, HEIDELBERG, Germany

**Aim:** Laparoscopic intracorporeal suturing and knot tying (ICKT) is essential for minimally invasive surgery (MIS) and requires training outside of the operating room. Unfortunately, personal instruction by experienced surgeons is of limited availability. E-learning can be a substitute for experts. Blended learning combines e-learning with practical training. We aimed to investigate the training effects of e-learning using different perspectives for ICKT in a self-directed blended learning concept.

**Methods:** 91 Medical students in their clinical years were randomized in two intervention groups. Group 1 used e-learning with videos showing the endoscopic view plus the surgeon's hands (first-person view), whereas group 2 used e-learning with the endoscopic view only. Both groups trained ICKT (C-Loop technique) on box trainers in teams of two until they reached a predefined proficiency level or finished 45 knots. Blinded, trained raters assessed the students' performances using validated checklists (Objective Structured Assessment of Technical Skills (OSATS), Procedural Checklist, Knot quality).

**Results:** All students were able to meet proficiency criteria within 45 knots and showed high performance scores after training (OSATS-Score (max. 37 points): group 1:  $30.1 \pm 2.4$ ; group 2:  $30.8 \pm 2.3$ ;  $p=0.861$ ). Average training time needed to reach proficiency did not differ between groups (group 1:  $6915 \pm 2788$ s, group 2:  $6710 \pm 2816$ s;  $p=0.367$ ). Nonetheless, students in group 1 reported having benefited from the first-person perspective ( $3.81 \pm 1.03$ ; 5-Point-Likert-Scale) and group 2 wished for the first-person perspective in e-learning modalities ( $3.66 \pm 1.06$ ). Results showed great differences within both groups, with students needing between 8 and 43 tries to reach proficiency. Students characteristics (e.g. visuospatial abilities) were assessed prior to training.

**Discussion:** Both groups successfully reached proficiency in ICKT with self-directed blended learning. After training participants showed good scores for procedure specific aspects as well as general laparoscopic skills. This indicates, that personal instruction by experienced surgeons is not ultimately necessary to learn new laparoscopic skills outside of the operating room. Although students evaluated the first-person view as helpful and desirable, we found no difference regarding training time or final performances. Further analysis of our data might highlight beneficial personal characteristics of students performing extraordinarily well or profiting from specific e-learning aspects.

## O037 - Emergency Surgery

### Acute Cholecystitis in the Elderly Population : Population-Based Cohort Study

S. Jamel<sup>1</sup>, S. Markar<sup>1</sup>, T. Wiggins<sup>1</sup>, H. Mackenzie<sup>1</sup>, A. Askari<sup>1</sup>, O. Faiz<sup>1</sup>, S. Karamanakos<sup>2</sup>, G.B. Hanna<sup>1</sup>

<sup>1</sup>Imperial College London, LONDON, United Kingdom; <sup>2</sup>Basildon University Hospital NHS Trust, LONDON, United Kingdom

**Background:** Acute cholecystitis can represent a life-threatening emergency in elderly patients. The aim of this population-based cohort study was to establish the commonly used management strategies for elderly patients presenting with acute cholecystitis, resulting 30- and 90-day mortality and re-admission rates.

**Method:** Data from all consecutive elderly patients ( $\geq 80$  years) admitted with gallstone acute cholecystitis in England from 1997 to 2012 was captured using the HES database. The influence of management strategies upon mortality was analyzed with control of patient demographics and year of treatment.

**Results:** A total of 47,500 patients were emergently admitted with acute cholecystitis. The median age was 85 (80–100), with 16.6% having Charlson Comorbidity Index  $\geq 2$ . The number of elderly patients presenting as emergency increased from 19,062 (1997–2004) to 28,438 (2005–2012). On the index emergency admission the majority of patients (89.7%) received conservative treatment, 7.5% had cholecystectomy and 2.8% underwent cholecystostomy. The 30- and 90-day mortality were 10.2% and 16.3% respectively for the study cohort.

Of the 3,539 patients receiving acute cholecystectomy, 19.9% had this completed laparoscopically (increased from 0% in 1997 to 59% in 2012). Postoperatively 1.3% of patients required an ERCP on that admission and 1.7% an ERCP on a following admission, and 2.1% required further surgery with common bile duct reconstruction. 30- and 90-day mortality was 11.6% and 15.6% respectively for acute cholecystectomy, significantly lower than 13.4% and 22.5% for patients receiving cholecystostomy. Laparoscopic approach to cholecystectomy was an independent predictor of reduced 30-day (OR=0.16, 95% CI 0.10–0.25) and 90-day (OR=0.20, 95% CI 0.13–0.29) mortality.

Whilst conservative treatment was associated with lower levels of mortality, patients were readmitted on average  $3.1 \pm 2.4$  times within the following year or before cholecystectomy, this included 16,088 admissions with further cholecystitis. Only 11% of patients managed initially conservatively or with cholecystostomy received a follow-up cholecystectomy.

**Conclusion:** Acute cholecystitis carries a 30-day mortality rate of 10% in elderly patients. Approximately 50% of patients managed conservatively or with cholecystostomy will represent with a biliary issue within the following year or before cholecystectomy. Selected elderly patients may receive acute cholecystectomy, with mortality substantially improved through a laparoscopic approach.

## O038 - Emergency Surgery

### Laparoscopy for Diffuse Appendicular Peritonitis

A. Sazhin, G.B. Ivakhov, A.T. Mirzoyan, I.V. Ermakov

Pirogov's Russian National Research Medical University, MOSCOW, Russia

**Aim:** Laparoscopic surgery for diffuse appendicular peritonitis (DAP) remains the cornerstone of discussion about safety and feasibility of laparoscopic technology for patients with the most common type of complicated intra-abdominal infection. There are only a few articles confirming safety of laparoscopic appendectomy for DAP. The largest experience was published by Thereaux J. et al. (2014) and includes 144 cases of DAP. The aim of our trial is to determine surgical results of laparoscopic appendectomy in case of DAP for the last 6 years.

**Methods:** This is a retrospective review of prospectively collected data of more than 500 cases of different forms of appendicular peritonitis between January 2011–December 2016. It should be noted the lack of clear criteria of diffuse (or generalized) peritonitis in literature. For this reason we used the same (Thereaux J.) strict definition for DAP: destructive appendicitis with the presence of purulent collections with or without fibrin in at least a hemi-abdomen.

**Results:** It was performed retrospective analysis including 1495 patients with acute appendicitis. Laparoscopic appendectomy were performed for 1406 (94.1%) patients. A total of 504 (35.8%) laparoscopic appendectomy were performed for different forms of appendicular peritonitis. 136 (27%) patients was operated because of DAP with conversion rate 10.3% (14 patients). So, 122 patients were operated by laparoscopic approach. There were no conversions for 368 patients with local peritonitis. Mean age was 43 years. Complications were noted in 19.7% (24 patients). Most often complication was postoperative infiltrate (13.1%—16 patients), that was resolved by conservative treatment (Clavien-Dindo grade 2). Intraabdominal abscess (IAA) were confirmed in 5 (4.1%) patients: (2 patients with IAA were treated by US-drainage, 2 patients need relaparoscopy and one patient is recovered after conservative therapy). There are no Clavien-Dindo grade 4 complications and mortality for all patients in laparoscopic group.

**Conclusion:** Lower incidence of complications let us to conclude, that the laparoscopic approach should be the initial choice for patients with diffuse appendicular peritonitis.

## O039 - Emergency Surgery

### The Experience of Using Videolaparoscopy in Military Field Hospital in Conditions of Anti-terroristic Operations in Eastern Ukraine

V.Y.U. Shapovalov<sup>1</sup>, I.P. Homenko<sup>2</sup>, E.N. Horoshun<sup>2</sup>, M.A. Kashtalyan<sup>1</sup>, O.S. Gerasimenko<sup>1</sup>

<sup>1</sup>Odessa National Medical University, ODESSA, Ukraine; <sup>2</sup>Ukrainian Medico-Military Academy, KYIV, Ukraine

**Aim:** Improvement of the medical support for injured in the battlefield by using endovideosurgical techniques in the hospitals of the 2-3rd Echelon.

**Methods:** In June 2014 mobile military hospital were set up for providing qualified surgical help to wounded or ill in the region of anti-terroristic operation (eastern Ukraine). Videoscopic surgery were performed with the help of the complex for endovideosurgery, "Econtcomplex" (Ukraine). 1460 operations (62 laparoscopic) were carried out during first 9 months.

**Results:** We use data of 23 patients suffered from abdomen and pelvis injuries: 18 had missile and gunshot wounds, 5 had closed traumas. Acute diseases of the abdomen cavity were diagnosed by another 39 patients. Out of the 18 persons with shoot wounds of abdomen, 12 had penetrative and 6 had nonpenetrative character of the injuries.

One patient with penetrative wound underwent laparoscopic suturing of wounds of diaphragm and stomach, by four wounded persons the final stop of hemorrhage from liver wounds in was performed, three persons underwent laparoscopic suturing ruptures of the small intestine's mesentery, and by one person the laparoscopy-assistant resection of the small intestine was performed. Conversions were done in three cases. The penetrative character of shoot wound was excluded by 6 patients using the diagnostic laparoscopy. Out of 5 patients with closed traumas of abdomen, injuries of internal organs were identified in 2 cases, operations were finished laparoscopically.

Suffering from urgent diseases of the abdomen cavity organs, 10 patients underwent the laparoscopic appendectomy for acute appendicitis; 2 persons underwent the laparoscopic diverticulectomy for Meckel's diverticulitis; in 3 cases the ovarian apoplexy were detected during the laparoscopic intervention, the laparoscopic resection of ovarium was performed; 1 patient underwent laparoscopy for pancreonecrosis, 20 laparoscopic cholecystectomy were performed for acute calculous cholecystitis; one laparoscopic cholecystectomy for cancer of the pancreas, obstructive jaundice; 2 patients underwent laparoscopic suturing of perforative ulcers in duodenum.

**Conclusions:** Well-founded approaches of treatment and diagnosis of shoot wounds of abdomen and pelvis by using the videolaparoscopic equipment in the field conditions (first time in the Ukrainian history) were performed.

Application of the endovideosurgical technics allowed to avoid 20 useless laparotomies.

## O040 - Emergency Surgery

### Our Therapeutic Strategy for Acute Appendicitis with an Appendicular Abscess or Mass

R. Kita

Kobe City Medical Center General Hospital, KOBE, Japan

**Background:** The possibility of converting to extended operations and the incidence of complications are said to be high in emergent surgery for acute appendicitis with an appendicular abscess or mass. We applied the therapeutic strategy 'Interval Appendectomy (IA)' since April 2014, regardless of the age or the presence of coprolites.

**Subject and Method:** The indications for IA are follows: (1) Abdominal CT shows an appendiceal mass or abscess ( $> 1$  cm); (2) Abdominal examination does not reveal panperitonitis. In cases which satisfy our criteria, we plan to perform appendectomy 2–3 months after nonoperative treatment with antibiotics or percutaneous drainage. We indicated this protocol for 28 patients by December 2016 from April 2014 and accomplished in 24 cases and performed interval appendectomy (IA). Before this protocol, we performed emergent appendectomy (EA) for similar cases. Between January 2010 and April 2014, we experienced 11 EA cases. We analyzed these two groups (IA and EA).

**Results:** In patient characteristics, there were no significant differences in the age, sex, BMI, mass diameter, but many coprolite cases were seen in EA cases. Operative method (appendectomy/cecum partial resection/ileocecal resection 22/0/0 vs. 3/2/6;  $p < 0.0001$ ), laparotomy extraction rate (laparoscope/conversion to laparotomy/laparotomy 22/0/0 vs. 2/3/6;  $p < 0.0001$ ), operative time (95 min vs. 151 min;  $p = 0.0036$ ), bleeding (0 ml vs. 317 ml;  $p < 0.001$ ) and total financial costs (94,495 vs. 119,486 min;  $p = 0.023$ ) were good for significant difference in IA group. Complications of IA were fewer than those of EA (SSI/abscess formation/ileus 2/0/0 vs. 3/1/1;  $p = 0.0515$ ).

**Conclusions:** In IA cases, conversion to an extended operation was not seen and there were few complications. We don't have longer hospital stays or higher total hospital cost in performing IA. Interval appendectomy is effective for acute appendicitis with an appendiceal abscess or mass.

## O041 - Emergency Surgery

### Antibiotics Versus Appendectomy for Acute Non-complicated Appendicitis: A Systematic Review and Meta-analysis

M. Sajid, S. Rehman, S. Farag, W.F.A. Miles, K.K. Singh, P. Sains  
Brighton & Sussex University Hospitals NHS Trust, BRIGHTON,  
United Kingdom

**Aim:** The objective of this study is to evaluate the surgical outcomes reported in the published randomized, controlled trials comparing the effectiveness of antibiotics vs. operative intervention of appendectomy for acute non-complicated appendicitis.

**Methods:** A systematic review of the literature on the published randomized, controlled trials comparing the effectiveness of antibiotics vs. operative intervention of appendectomy for acute non-complicated appendicitis using the principles of meta-analysis on RevMan 5.3 statistical software was undertaken.

**Results:** Six RCTs on 1469 patients comparing the surgical outcomes in patients with acute non-complicated appendicitis were analysed systematically in this study. The appendectomy group was associated with higher risk of major complications [risk ratio, 0.56 (CI, 0.37–0.83,  $p=0.0004$ )] with statistical significance and minor complications [risk ratio, 0.37 (CI, 0.11–1.22,  $p=0.10$ )] without statistical significance. However, the length of hospital stay [standardized mean difference, 0.28 (CI, 0.09, 0.48,  $p=0.0004$ )] was statistically shorter in patients undergoing appendectomy.

**Conclusions:** In case of uncomplicated appendicitis, antibiotic treatment seems to significantly effective leading to reduced rate of appendectomy without influencing mortality or morbidity. The choice of intravenous antibiotics therapy or appendectomy in patients with clearly uncomplicated appendicitis in decision-making may be considered a routine procedure.

## O042 - Endocrine Surgery

### Factors Determining Length of Hospital Stay Following the Laparoscopic Transperitoneal Lateral Adrenalectomy

J. Dworak, K. Truszkiewicz, M. Natkaniec, P. Major, M. Pedziwiatr,  
M. Wierdak, A. Budzynski

Jagiellonian University Medical College, KRAKOW, Poland

**Aim:** The average length of hospital stay (LOS) is often used as an indicator of efficiency. A shorter stay reduces the cost of hospitalization, other things being equal. The aim of this study was to determine the factors affecting LOS in patients after laparoscopic transperitoneal lateral adrenalectomy (LTA) combined with ERAS protocol.

**Methods:** The study enrolled 248 patients (95 men and 153 women, mean age 58 years) who underwent LTA between 2013 and 2016 at the 2nd Department of Surgery, University Hospital, Krakow, Poland. All patients were treated in accordance with ERAS protocol. Discharge from hospital more than 1 day after surgery was considered as prolonged LOS. An analysis of the impact of gender, age, history of previous abdominal surgery, body mass index, risk of anesthesia measured as ASA scale, size, localization (left/right), histological type, operative time, intraoperative blood loss, conversion rate, intraoperative complications rate, and distance from patient's home to hospital on LOS after LTA was performed. Logistic regression models were used in univariate and corrected multivariate analyses in order to identify the factors related to prolonged LOS. Of all the variables tested in univariate analysis, only those with  $p$  values of  $\leq 0.05$  were entered into multivariate analyses.

**Results:** The mode of LOS after LTA in studied group was 1 day. Univariate analyses to examine the relationships between prolonged LOS after LTA, and each variable revealed that distance from hospital to patient's home, operative time, intraoperative blood loss, risk of anesthesia equal 3 in ASA scale, and pheochromocytoma yielded significant findings (odds ratio, 95% confidence interval,  $p$  value for each, respectively: 2.503, 1.037–6.039, 0.0412; 1.017, 1.009–1.025, 0.0000; 1.004, 1.001–1.008, 0.0117; 4.318, –0.0108 and 3.956, 1.664–9.405, 0.0019). When including these variables into the regression model, it was concluded that there was only statistically significant association between prolonged LOS and histological type—pheochromocytoma (OR 3.599, 95%CI 1.445–8.966,  $p=0.006$ ) and operative time (OR 1.013, 95%CI 1.003–1.022,  $p=0.007$ ).

**Conclusions:** Prolonged length of hospital stay following laparoscopic transperitoneal lateral adrenalectomy combined with ERAS protocol is strongly associated with operative time and histological type of adrenal tumor—pheochromocytoma.

## O043 - Endocrine Surgery

### Factors Determining Difficulty of the Laparoscopic Transperitoneal Lateral Adrenalectomy

J. Dworak, K. Truszkiewicz, M. Natkaniec, M. Pedziwiatr,  
M. Wierdak, P. Major, M. Pisarska, A. Budzynski

Jagiellonian University Medical College, KRAKOW, Poland

**Aim:** Identification of patients in whom adrenalectomy may be more difficult, can help in decision making in borderline and doubtful cases. The aim of the study was to determine factors influencing difficulty of laparoscopic lateral transperitoneal adrenalectomy (LTA).

**Methods:** The study enrolled 275 patients who underwent LTA. We analyzed the impact of gender, age, history of previous abdominal surgery, body mass index, risk of anesthesia measured as ASA scale, size, localization (left/right), and histological type of the tumor on parameters reflecting the level of difficulty of the procedure: operative time, intraoperative blood loss, conversion rate and intraoperative complications rate. Logistic regression models were used in univariate and corrected multivariate analyses in order to identify the factors related to difficulty of the procedure. Of all the variables tested in univariate analysis, only those with  $p$  values of  $\leq 0.05$  were entered into multivariate analyses.

**Results:** Multivariate logistic regression showed that following factors were associated with longer operative time: gender (OR 1.07, 95%CI 2.09–4.09), tumor size (OR 1.02, 95%CI 1.17–1.36) and malignant lesions (OR 1.52, 95%CI 3.67–8.87). In another model it was shown that age (OR 1.04, 95%CI 1–1.06), size of the tumor (OR 1.33, 95%CI 1.15–1.53) and malignancy (OR 3.27, 95%CI 1.36–7.07) were associated with more excessive blood loss. Moreover, it was shown, that tumor size is a predictive factor for conversion (OR 1.81, 95%CI 1.3–2.53). Univariate analysis showed a relation with malignancy, but multivariate analysis revealed no significance.

**Conclusions:** Patient age, gender, size and histological type of the tumor are good predictors of the difficulty of laparoscopic transperitoneal lateral adrenalectomy. Surgery in case of patients with combination of this risk factors should be handled by surgeon with sufficient experience to minimize the risk of adverse events.

## O044 - Endocrine Surgery

### Minimally Invasive Video-Assisted Thyroidectomy in Asian Patients: Experience from Singapore

R.M. Singaporewalla, A.D. Rao, S.H. Yeap

Khoo Teck Puat Hospital, SINGAPORE, Singapore

**Aim:** Minimally invasive video assisted thyroidectomy [MIVAT] in experienced hands, is associated with reduced postoperative pain and improved cosmesis in view of its smaller incision size without a significant increase in the operative time. Most of these studies are carried out in the western literature and there is paucity of data from Asian patients. We studied the results of this procedure in the first 75 cases performed in Singapore.

**Methods:** Data was collected prospectively from patients undergoing hemithyroidectomy using MIVAT from 2012 to 2015. Inclusion criteria were FNAC proven symptomatic benign colloid goitre, recurrent cysts that failed needle aspiration, follicular neoplasms with a lobe volume of upto 35 cc or nodule diameter of less than 35 mm. Patients with known malignancy and previous neck surgery were excluded. Intraoperative nerve monitor was not used in any case.

Incision length, operative time, pain scores (immediate postoperative and the next morning) and thyroid gland volume was recorded. Pain scores was recorded using the visual analogue scale (VAS) in the recovery and day 1 before discharge. The incision length was recorded at the end of the operation. Cosmetic satisfaction was assessed at 3 months follow-up.

**Results:** A total of 75 patients (M:F ratio 3:16) were included with a mean operative time of 111 min (range 75 to 120 min). There were no major complications. One patient had transient hoarseness that recovered completely in 3 weeks. There was one conversion to open surgery due to technical difficulty. The mean incision length at end of surgery was 2.58 cm. The postoperative and day 1 pain scores were 2.38 and 0.85 respectively. Cosmetic satisfaction was reported as excellent in 84%, good in 10% patients while 6% had a poor outcome with hypertrophy of the small neck scar.

**Conclusion:** MIVAT is comparable in results and safety to conventional open thyroidectomy with the advantage of smaller neck scars and reduced pain in Asian patients as long as strict selection criteria are followed. However, there is a slightly increased tendency of developing hypertrophic neck scars in the younger Asian females.

## O045 - Endocrine Surgery

### Robot-Assisted Transaxillary Thyroidectomy (RATT): A Series Appraisal of More Than 240 Cases from Europe

G. Materazzi, L. Fregoli, P. Papini, S. Bakkar, F. Frustaci, P. Miccoli  
University of Pisa, PISA, Italy

**Background:** Robot-assisted transaxillary thyroidectomy (RATT) is widely accepted in Eastern countries. However, concerns regarding the balance between its advantages, safety and cost have been raised by North American authorities. In Europe, assessments have been limited by small numbers. The purpose here is to report the largest European experience with RATT.

**Methods:** A retrospective analysis of 241 patients who underwent RATT for nodular disease between Feb. 2012– Dec. 2016 was conducted. Data collected included: patient demographics, type of pathology, sonographically estimated thyroid volume and nodule size, type of resection, operative time, postoperative pain and morbidity, and the length of hospital stay. Pain was assessed by VAS score 12 h postoperatively. Feasibility, effectiveness and safety were the outcomes of interest.

**Results:** There were 238 females and 3 males with a mean age of 37.2 years. Indications included multinodular goitre (n=52), papillary carcinoma (n=51), indeterminate nodule (n=81), and benign pathology (n=57). Mean thyroid volume and nodule size were 16.9 ml and 25.4 mm, respectively. A hemithyroidectomy was performed in 131 patients and total thyroidectomy in 110. The mean operative time was 77.4 min for the former and 101 min for the latter. Conversion was required in one case. Complications included: transient hypoparathyroidism (2.9%), transient vocal fold palsy (1.23%), tracheal injury (0.4%) and postoperative hematoma (1.23%). Mean VAS score was 2.1 and the mean length of stay was 1.6 and 1.9 days for hemi- and total thyroidectomy, respectively. **Conclusion:** RATT is safe and effective and could serve as a viable treatment modality in selected cases.

## O046 - Endocrine Surgery

### Video-Assisted vs Mini-Incision Parathyroidectomy: Is There a Potential Advantage?

S. Bakkar, V. Matteucci, P. Papini, C. Corsini, G. Materazzi, P. Miccoli

University of Pisa, PISA, Italy

**Background:** Limited surgical exploration has replaced full neck exploration as the preferred surgical approach to primary hyperparathyroidism. The two most widely used focused parathyroid surgeries are the non-endoscopic mini-incision parathyroidectomy and the minimally invasive video-assisted parathyroidectomy (MIVAP). The aim of this study was to assess whether MIVAP offers additional advantages over MIP.

**Methods:** 44 patients with primary hyperparathyroidism and eligible for minimally invasive surgery were randomized to undergo parathyroidectomy by MIP (n=77) or MIVAP (n=77). The primary end points were: the mean length of the surgical incision, the mean operative time, post-operative morbidity, postoperative pain, and adequacy of the procedure (i.e. the need to convert to a standard cervicotomy).

**Results:** The two groups were well matched. MIP and MIVAP were comparable in terms of mean operative time and post-operative morbidity. Although the mean incision length was shorter in the MIVAP group (17 mm vs. 20 mm), the difference was not statistically significant. The only statistically significant difference between the two procedures was the need to convert to a standard cervicotomy in the MIP group when the need for exploration and/or an ipsilateral thyroid lobectomy emerged (conversion rate: 5.2% vs. 0%;  $p < 0.0001$ ).

**Conclusion:** Video-assisted parathyroidectomy offers an additional advantage over its conventional counterpart; the ability to explore and/or perform a thyroid lobectomy through the same incision without the need to convert to a standard cervicotomy.

## O047 - Endocrine Surgery

### Effectiveness of Single Anastomosis Duodeno-Ileal Switch with Sleeve Gastrectomy Procedure on Diabetic Patients

T. Vartanoglu

Bagcilar Training and Research Hospital, ISTANBUL, Turkey

**Aim:** The prevalence of overweight and obesity continues to rise with well over one-third of adults afflicted in the western world. To evaluate the Single Anastomosis Duodeno-Ileal bypass with Sleeve gastrectomy (SADI-S) procedure with regard to metabolic effects on Turkish diabetic patients.

**Methods:** A retrospective chart review was performed on initial 28 patients who underwent laparoscopic-assisted SADI-S between November, 2015 and July, 2016, which were monitored at preoperatively and postoperative 6th months according to their glucose, insulin, C-peptide, hemoglobin, hgb-A1c, ferritin, iron, triglyceride and cholesterol levels, their body mass index (BMI) and percentage of excess body weight loss (%EBWL) with their diabetic medications.

**Results:** A total of 18 female and 10 male patients were included with a mean age of years 51.2 (range, 34–62). The BMI at the time of procedure was 34 kg/m<sup>2</sup> (range, 23.2–52.7). The %EBWL was 61.8% (range, 5.5–296.3) at six months after the procedure. All of patients presented with type II diabetes mellitus at the time of surgery. 21 of these patients (75%) had their diabetes resolved, and 7 of them changed insulin usage to oral antidiabetics after SADI-S. Effects on glucose, insulin, C-peptide, hemoglobin, hgb-A1c, cholesterol and triglyceride were found statistically significant ( $p = 0.01–0.001$ ).

**Conclusions:** SADI-S is an effective operation with a promising weight loss and diabetes resolution in diabetic patients with long-term uncontrolled blood glucose level and need usage of high level insulin. We think that, the procedure is undoubtedly the most effective therapeutic modality for the treatment of type 2 diabetes mellitus.

**Keywords:** Bariatric surgery; SADI-S; Duodenoileal switch; type 2 diabetes mellitus.

## O048 - Endocrine Surgery

### Thoracoscopic Parathyroidectomy in Supine Position for Primary Hyperparathyroidism

Y. Ikeda, T. Hatori, T. Kadomura, N. Nitatori, A. Kato, A. Kato, M. Masaru

International University Health and Welfare, Mita Hospital, TOKYO, Japan

Retrospective studies have suggested that 1–3% of all patients undergoing parathyroid operations have a functional mediastinal parathyroid tumor. Most abnormal parathyroid glands are found in the superior mediastinum within the thymus and can be removed through a cervical incision; however, a few of these glands are not accessible using standard cervical surgical approaches. These glands have required a median sternotomy or thoracotomy for removal. Although we report cases in which superior sternum lifting method was used to remove ectopic large parathyroid gland deep in the anterior mediastinum that would have otherwise required median sternotomy, we report our experience in 3 cases of ectopic parathyroid glands resected successfully by thoracoscopic approach in the supine position.

**Material and Methods:** Three patients with primary hyperparathyroidism presented between January 2016 and January 2017. The patients ranged in age from 45 to 57 years (mean 53.0 years). All patients were women. Methods of preoperative localization included computed tomographic scans and technetium 99 m-sestamibi parathyroid imaging in all patients. All procedures were performed under general anesthesia using a double-lumen endotracheal tube in the supine position. Three 5 mm trocar were used, and all were performed using a 5-mm flexible endoscope. A single chest tube was left in place and removed either in the recovery room or the following day.

**Results:** All patients had their adenomas identified preoperatively by one of the scanning techniques. The average operating time was 75 min (range, 40 to 92 min), and all patients were extubated in the operating room. Average hospital stay was 3 days, and there were no postoperative complication. All patients had parathyroid adenomas. Postoperative calcium concentrations returned to normal in all instances.

**Conclusion:** Although cervical excision using superior sternum lifting method is the alternative in those patients with anterior mediastinal parathyroid glands considered for either median sternotomy or thoracoscopic procedure in the lateral position, where the exact anatomic location of the parathyroid gland is established preoperatively, thoracoscopic approach in supine position was less invasive and better cosmetic results.

## O049 - Endocrine Surgery

### Transoral Endoscopic Thyroidectomy: Preliminary Experience in Italy

M. Lavazza<sup>1</sup>, G. Dionigi<sup>1</sup>, A. Bacuzzi<sup>1</sup>, D. Inversini<sup>1</sup>, V. Pappalardo<sup>1</sup>, R. Tufano<sup>2</sup>, Y.K. Hoon<sup>3</sup>, A. Angkoon<sup>4</sup>

<sup>1</sup>1st Division of General Surgery, VARESE, Italy; <sup>2</sup>Johns Hopkins University School of Medicine, BALTIMORE, United States of America; <sup>3</sup>Minimally Invasive Surgery and Robotic Surgery Center, KUMC Thyroid Center, SEOUL, Republic of Korea; <sup>4</sup>Police General Hospital, Faculty of Medicine, Siam University, BANGKOK, Thailand

**Aim:** Transoral endoscopic thyroidectomy vestibular approach (TOETVA) is a feasible novel surgical procedure that does not need visible incisions. We describe our initial experience with TOETVA.

**Methods:** we recruited 32 patients who were willing to undergo TOETVA. Inclusion criteria were patients who had a ultrasonographically (US) estimated thyroid diameter not larger than 10 cm, US estimated gland volume  $\leq 45$  mL, nodule size  $\leq 50$  mm, a benign tumor, such as a thyroid cyst, single-nodular goiter, or multinodular goiter, follicular neoplasm, papillary microcarcinoma without evidence of metastasis. The procedure is carried out through three-port technique placed at the oral vestibule, one 10-mm port for 30° endoscope and two additional 5 mm ports for dissecting and coagulating instruments. CO<sub>2</sub> insufflation pressure is set at 6 mmHg. An anterior cervical subplatysmal space is created from the oral vestibule down to the sternal notch, laterally to the sternocleidomuscles. Thyroidectomy is done fully endoscopically using conventional endoscopic instruments and intraoperative neuromonitoring.

**Results:** there were 29% total thyroidectomies and 71% hemithyroidectomies. All TOETVA procedures were performed successfully with no conversions. The mean operative time was 77.6 (51–116) min for lobectomy and 98.6 (89–131) min for bilateral procedure. We observed 1 case of transient postoperative hypocalcemia. None recurrent laryngeal nerve palsy. The cosmetic result was excellent by all patients.

**Conclusion:** This is the first case series of TOETVA in Italy. TOETVA may provide a method for ideal cosmetic results. The results are encouraging, and we are optimistic about the future.

## O050 - Gastroduodenal Diseases

### Staging Laparoscopy for Advanced Gastric Cancer: Significance of Preoperative Clinicopathological Factors

H. Hosogi<sup>1</sup>, H. Shinohara<sup>2</sup>, S. Tsunoda<sup>2</sup>, S. Hisamori<sup>2</sup>, K. Hida<sup>2</sup>, K. Obama<sup>2</sup>, H. Okabe<sup>3</sup>, K. Matsuo<sup>1</sup>, Y. Sakai<sup>2</sup>

<sup>1</sup>Kyoto City Hospital, KYOTO, Japan; <sup>2</sup>Kyoto University, KYOTO, Japan; <sup>3</sup>Otsu Municipal Hospital, OTSU, Japan

**Purpose:** Although the use of staging laparoscopy (SL) for detecting peritoneal metastasis (P) and determining peritoneal lavage cytology (CY) is widespread in advanced gastric cancer, an indication for SL based on preoperative clinicopathological factors is controversial.

**Methods:** From May 2006 to September 2015, 120 patients with advanced gastric cancer with primary tumors  $\geq 5$  cm and/or with bulky regional lymph nodes (bulky N) underwent SL for assessment of P/CY status. Clinicopathological factors were analyzed retrospectively to determine their influence on peritoneal spread (P1 and/or CY1). An additional analysis of 379 consecutive patients with clinically T2 or deeper gastric cancer in the same time period was carried out to confirm the SL results.

**Results:** Peritoneal spread was confirmed by SL in 54 cases (45%). The presence of type-4 tumors (n=38,  $p < 0.0001$ ) and diffuse-type tumors (n=85,  $p = 0.04$ ) correlated significantly with peritoneal spread. These two factors were also correlated significantly with increased peritoneal spread in a subgroup analysis among patients with tumors with bulky N (n=44). The additional analysis of 379 patients showed results consistent with the SL results. The frequency of peritoneal spread was 78% among type-4 tumors, 47% among diffuse-type tumors  $\geq 5$  cm, and 38% among diffuse-type tumors with bulky N, whereas among intestinal-type tumors, it was 18% in tumors  $\geq 5$  cm and 13% among tumors with bulky N.

**Conclusions:** Among tumors  $\geq 5$  cm or with bulky N, type-4 tumors and diffuse-type tumors had a high potential for peritoneal spread and patients with such tumors were considered more suitable candidates for SL.

## O051 - Gastroduodenal Diseases

### A Novel Prognostic Scoring System Based on Preoperative Sarcopenia Predicts the Long-Term Outcome of Patients After R0 Resection for Gastric Cancer

C.M. Huang, J. Lu

Fujian Medical University Union Hospital, FUZHOU, China

**Objective:** The relationship between sarcopenia and prognosis of gastric cancer (GC) is unclear. We sought to develop a prognostic scoring system combining sarcopenia with preoperative clinical parameters for patients with GC to predict 3-year overall survival (OS) and 3-year recurrence-free survival (RFS).

**Methodology:** 924 patients with GC underwent radical gastrectomy were retrospectively analyzed. The data were divided into training set and validation set. The skeletal muscle cross-sectional area was measured by preoperative computed tomography, and sarcopenia was diagnosed by the cut-off value of skeletal muscle index (SMI) obtained by X-tile software. COX regression was used to identify preoperative risk factors associated with 3-year OS and RFS.

**Results:** In the training set, 103 (14.8%) patients were sarcopenic based on the cut-off value of the SMI (32.5 cm<sup>2</sup>/m<sup>2</sup> for men and 28.6 cm<sup>2</sup>/m<sup>2</sup> for women). Multivariate analysis showed the following preoperative risk factors for the training set: sarcopenia, and the preoperative T (cT) and N stage (cN), and we developed a prognostic scoring system based on these findings. 3-year OS rates for low-, intermediate- and high-risk patients were 89%, 77.9% and 54.8%, respectively ( $p < 0.001$ ); and 3-year RFS rates were 86.9%, 75.3% and 49.3%, respectively ( $p < 0.001$ ). The area under the receiver operating characteristic curves were 0.708 for 3-year OS rates and 0.713 for 3-year RFS rates. There were no significant differences between the observed and predicted incidence rates for 3-year OS and RFS in the validation set.

**Conclusions:** The prognostic scoring system combining sarcopenia with the cT and cN system can accurately predict 3-year OS and RFS rates after radical gastrectomy for GC.

## O052 - Gastroduodenal Diseases

### A Simplified and Efficient Modified TNM Staging System For Patients with Gastric Cancer After Radical Gastrectomy

C.M. Huang, J.X. Lin

Fujian Medical University Union Hospital, FUZHOU, China

**Objective:** The seventh edition of the American Joint Committee on Cancer (AJCC) staging classification for stomach carcinoma has been used worldwide. However, there were still some controversies regarding this staging system. We investigated the validity of the 7th edition of the American Joint Committee on Cancer (AJCC) classification system and developed a modified TNM (mTNM) staging system for improving the prognostic prediction of patients with gastric cancer after curative surgery.

**Methodology:** Data from 4957 consecutive patients who underwent radical gastrectomy between 1997 and 2014 were retrieved from our database. Kaplan–Meier analyses were performed for each subject's TNM stages in a comparative manner. The relative discriminatory abilities of different staging systems were assessed using the Akaike's Information Criterion (AIC) and Harrell's concordance index (c-statistic). Additional external validation was performed using a dataset (n=3803) from the National Cancer Institute's Surveillance, Epidemiology, and End Result (SEER) database.

**Results:** The 5-year overall survival (OS) of the entire cohort was 58.0%. according to the 7th of the AJCC guidelines, the OS rate in each subgroup of stage IIIB and stage IIIC patients was significantly different, and for patients with the same pN stages, the pT4a and pT4b groups had a similar 5-year OS ( $P > 0.05$ ). Basis on the survival data, we revised the stage grouping system. In the mTNM staging system, the overall survival rates were without statistics different for each subgroup in the same TNM stage. The mTNM staging exhibited superior prognostic stratification with lower AIC values and a higher c-statistic compared to the seventh edition TNM classification. Similar results were found in the external validation dataset from the SEER database.

**Conclusion:** The seventh edition AJCC TNM classification is associated with some stage migration. Our modified TNM staging system seems to be simplified yet showed better predictability of overall survival for patients with gastric cancer after radical gastrectomy.



## O053 - Gastroduodenal Diseases

### Development of a Novel Preoperative Unplanned Reoperation Risk Score for Gastric Cancer Patients Undergoing Laparoscopic and Open Gastrectomy

C.M. Huang, P. Li

Fujian Medical University Union Hospital, FUZHOU, China

**Objective:** To evaluate the risk-factors of unplanned reoperation (URO) for gastric cancer patients undergoing laparoscopic gastrectomy (LAG) and open gastrectomy (OG) and develop a new scoring system to predict the risk of URO.

**Methodology:** The data of 1361 patients who underwent LAG and 1361 patients who underwent OG were selected using the propensity score-matching from a database prospectively constructed between 2005 and 2014. The outcomes of URO were compared between the matched groups, and a predictive scoring system was established.

**Results:** Among the 2722 patients, 39 (1.4%) required URO (LAG 1.2% vs. OG 1.6%,  $p=0.420$ ). Among the 39 cases, the main causes for URO were intraabdominal bleeding, anastomotic leakage and intestinal obstruction in 48.7%(19/39), 12.8%(5/39) and 12.8%(5/39), respectively. The proportion of intraabdominal bleeding was higher ( $p=0.025$ ) and the hospital stay was shorter ( $p=0.040$ ) in the LAG group than the OG group. Multivariate analysis showed that age ( $p=0.001$ ), gender ( $p=0.021$ ), body mass index (BMI) ( $p=0.005$ ) and the Charlson score ( $p=0.015$ ) were independent risk factors for URO. Each of these factors contributed 1 or 2 point to the risk score. Based on these factors, we developed the following predictive scoring: low risk (1 point or less), intermediate risk (2 points), and high risk (3 points or more). The observed risks of URO were 0.6%, 2.9% and 6.2% for the low-, intermediate- and high-risk categories, respectively. The area under the receiver operating characteristic curve for the logistic regression model and the simplified prediction model were 0.738 and 0.728, respectively.

**Conclusions:** The URO rate after LAG was similar to OG but with a faster recovery after URO than OG. Based on four independent risk factors, including age, gender, BMI, and Charlson score, we established a simple and applicable scoring model to predict the risk of URO for gastric cancer patients undergoing gastrectomy preoperatively.

## O054 - Gastroduodenal Diseases

### Our Procedures and Results of Roux-en-Y Reconstruction After Laparoscopic Distal Gastrectomy

Y. Nakamoto<sup>1</sup>, R. Mikami<sup>2</sup>, T. Aihara<sup>1</sup>, H. Yanagi<sup>1</sup>, N. Yamanaka<sup>1</sup>

<sup>1</sup>Meiwa General Hospital, NISHINOMIYA CITY, Japan; <sup>2</sup>Chiba Chuo Medical Center, CHIBA, Japan

**Background:** Since the introduction of Roux-en-Y (R-Y) reconstruction after laparoscopic distal gastrectomy (LDG), we are aiming for improvement of safe R-Y reconstruction with less anastomotic complications.

**Methods:** We reviewed and evaluated the clinical profiles of 180 patients who underwent R-Y reconstruction after LDG between September 2005 and November 2016. At first anastomosis of remnant stomach and jejunum was performed from small incision at left upper abdomen, but there were 5 cases (8.5%) with stenosis of anastomotic site and stasis. With improvement of procedures, totally laparoscopic approach has been conducted since March 2012. After division of stomach with linear staplers, the specimen is removed from an umbilical small incision. At the same time the jejunum is divided and the Y limb is created extracorporeally. Side-to-side gastrojejunostomy is performed intracorporeally using a 60 mm linear stapler. Previously the stapler entry hole was closed using a 60 mm linear stapler with 3 stitches lifting. Now the entry hole is sutured intracorporeally using barbed suture material. LDG was accompanied by cholecystectomy in 13 patients, colorectal resection in 5 patients, jejunostomy in one patient.

**Results:** The mean operation time was 260 min (range: 92–529 min). The mean blood loss was 22.6 ml (range: 5–510 ml). The mean postoperative hospital stay was 11.8 days (range: 4–69 days). Postoperative complications related to R-Y anastomosis included 8 stenosis (4.4%), 2 stasis (1.1%), 2 bleeding (1.1%). Reoperations were required in two patients with stenosis. Three cases (4.8%) with anastomotic stenosis were found in 63 totally laparoscopic approaches. No complications were identified using barbed suture material.

**Conclusions:** In order to improve the results of R-Y reconstruction after LDG, totally laparoscopic approach and intracorporeally suturing are important.

## O055 - Gastroduodenal Diseases

### Optimal Extent of Abdominal Lymph Node Dissection for Advanced Siewert Type II and III Esophagogastric Junction Carcinoma

C.M. Huang, J.X. Lin

Fujian Medical University Union Hospital, FUZHOU, China

**Objective:** The aim of this study was to clarify the optimal abdominal lymphadenectomy for advanced in Siewert types II and III adenocarcinoma of the esophagogastric junction (AEG).

**Methodology:** From June 2007 to June 2014, the data of 573 patients who underwent radical total gastrectomy due to advanced Siewert types II and III was collected and retrospectively analyzed. The incidence of abdominal lymph node metastasis (LNM) of each station were compared between patients with Siewert type II and III AEG. And we used the therapeutic index to assess the efficacy of abdominal lymph node dissection of each station.

**Results:** Of the 573 patients, 247 (44.0%) had Siewert type II AEG and 326 (56.0%) had type III AEG. Among them, 252 patients carried out abdominal D2 lymphadenectomy and 321 patients underwent D2 lymphadenectomy without No. 10 lymphadenectomy (D2-). The mean number of dissected lymph nodes (LNs) was  $34.6 \pm 13.0$ , and the numbers of dissected lymph nodes at each lymph node station did not significantly differ between patients with type II and III AEG ( $P > 0.05$ ). The therapeutic index of No.1–3, 7, 9 and 11 LNs was over 4.0 in advanced type II AEG cases, while the index was higher than 4.0 in No.1–4 and 7–11 LNs in patients with type III AEG. The index of No.10 LNs was more than 10 in type III AEG subgroups with primary tumors invading the serosa layer (15.6), undifferentiated cancers (10.9) and tumor size  $\geq 50$  mm (10.5).

**Conclusions:** Dissection of No. 1–3, 7, 9 and 11 LNs would obtain highest survival benefits regardless of the Siewert subtype. Patients with type AEG, especially those with primary tumors invading the serosa layer, undifferentiated cancers and tumor size  $\geq 50$  mm might obtain relatively higher survival benefits from No. 10 lymphadenectomy.

## O056 - Gastroduodenal Diseases

### Randomized, Controlled Phase III Trial Comparing Three-Dimensional and Two-Dimensional Laparoscopic Gastric Cancer

C.M. Huang, J. Lu

Fujian Medical University Union Hospital, FUZHOU, China

**Objective:** To determine the safety and superiority of three-dimensional (3D) laparoscopic gastrectomy (LG) compared with two-dimensional (2D) laparoscopic in patients with gastric cancer.

**Background:** There is still a lack of randomized, controlled trial regarding the safety and efficacy of 3D vs. 2D laparoscopic surgery for gastric cancer.

**Method:** A large-scale, phase 3, prospective randomized controlled trial was conducted. The primary end point was operation time. Morbidity within 30 postoperative days and surgical outcomes were compared to evaluate the safety and efficacy of 3D LG as a secondary end point.

**Results:** A total of 438 patients were randomized (3D group 219 cases; 2D group 219 cases) between January 1, 2015 and April 1, 2016. Nineteen patients were excluded. Finally, a total of 419 patients were analyzed (3D group 211 cases, 2D group 208 cases). There were no significant differences between the two groups regarding the operation time (3D vs. 2D,  $175.52 \pm 35.53$  min vs.  $173.63 \pm 37.00$  min,  $p=0.596$ ). The operation time was further stratified analysis by BMI and operative region which showed that when body mass index (BMI) is larger than  $25 \text{ kg/m}^2$  the 3D group in the Splenic Hilar regional lymph node cleaning time was significantly lower than the 2D group ( $29.4 \pm 7.8$  min vs.  $23.3 \pm 6.4$  min,  $p=0.024$ ). The intra-operative blood loss in the 3D group was significantly lower than the 2D group ( $61.37 \pm 82.99$  ml vs.  $81.54 \pm 119.44$  ml,  $P=0.045$ ). Furthermore analysis suggested that 3D laparoscopic was a protect factor for excessive blood loss ( $\geq 200$  ml). The postoperative complication rates of the 3D and 2D groups were 17.1% (36/211) and 13.9% (29/208), respectively,  $p=0.378$ . No patients died during the postoperative hospital stay. Postoperative questionnaire survey showed that the surgeon experienced better depth perception with the 3D system and there was no significant difference in postoperative strain between the two groups.

**Conclusions:** 3D LG not only can significantly reduce the lymph node dissection time at complicated regional, but also has a benefit of less intra-operative blood loss and lower occurrence of excessive bleeding incidence compared with conventional 2D surgery. (Number NCT02327481).

## O057 - Gastroduodenal Diseases

### Trends of Incidence and Survivals for Gastric Neuroendocrine Neoplasms: An Analysis of 3523 Patients in the Seer Database

C.M. Huang, L. Cao

Fujian Medical University Union Hospital, FUZHOU, China

**Objective:** The aim of this study is to investigate trends in incidence and survivals for gastric neuroendocrine neoplasms (g-NENs).

**Methodology:** Patients diagnosed with g-NENs (n=3523) were identified from the Surveillance, Epidemiology and End Results (SEER) database. Patients diagnosed with g-NENs (n=199) in our department were assigned as validation set. Univariate and multivariate survival analysis were used to identify prognostic factors. A nomogram was adopted to predict disease special survival (DSS) and overall survival (OS).

**Results:** The incidence of g-NENs is steadily increasing over time at a rate higher than any other cancer [annual percentage change (APC)=6.3, 95% confidence interval (CI) 5.6–7.0]. The 1-, 3-, 5-years of DSS (OS) rates were 87% (84.3%), 78.6% (71.9%) and 70.6 (53.7%), respectively. The multivariate analysis identified that patient's age, sex, T stage, M stage, and histological type were the common independent prognostic factors for both DSS and OS (all  $P < 0.05$ ). The concordance index of the nomograms for DSS (OS) in the training set was superior to that of the 7th edition of AJCC staging system [0.899 (0.849) versus 0.864 (0.783)]. Calibration plots of the nomograms showed that the probability of DSS (OS) corresponded to actual observation closely in both training set and validation set.

**Conclusion:** The incidence of g-NENs has been steadily increasing at a high rate over the past four decades. The nomograms based on SEER database had a more superior ability to predict clinical outcomes for g-NENs patients than the traditional TNM staging system.

## O058 - Gastroduodenal Diseases

### Minimally Invasive Versus Open Gastrectomy, the Differences Between East and West: A Systematic Review of Literature

N. van der Wielen, J. Straatman, M.A. Cuesta, F. Daams, D.L. van der Peet

VU medical center, AMSTERDAM, The Netherlands

**Objective:** Minimally invasive surgical techniques for gastric cancer are gaining more interest worldwide. Several Asian studies have proven the benefits of minimally invasive techniques over the open techniques. However, implementation of this technique in Western countries is gradual. The aim of this systematic review is to give insight in the differences in outcomes in Asian countries in comparison to Western countries.

**Methodology:** an extensive search was conducted using the Medline, Embase and Cochrane databases. Analysis of the outcomes regarding operative results, postoperative recovery, complications, mortality, adequacy of resection and survival were made using Review Manager. Subgroup analyses were made for the Asian and Western countries. A total of twelve Asian and eight Western studies were included.

**Results:** Minimally invasive gastrectomy shows faster postoperative recovery, less complications and similar outcomes regarding oncological outcomes in comparison to the open technique in both subgroups. However, patient characteristics differ between the Eastern and Western population. Additionally, comparison of overall outcomes between East and West showed differences in complications, mortality and number of resected lymph nodes in favor of the Asian population.

**Conclusion:** The benefits of a minimally invasive technique shows similar outcomes in Western studies in comparison to Asian studies. However, due to the slow implementation of this technique, overall outcomes still seem to be in favor in the Asian population. Improvement of these results are to be expected with the growing adoption of minimally invasive techniques in the treatment of gastric cancer worldwide.

## O059 - Gastroduodenal Diseases

### Systematic Review of Exocrine Pancreatic Insufficiency After Gastrectomy for Cancer

J. Straatman, J. Wiegel, N. Wielen, van der, E.P. Jansma, M.A. Cuesta, D.L. Peet, van der

VU University Medical Center, AMSTERDAM, The Netherlands

**Background:** Survival rates following total gastrectomy with adequate lymphadenectomy are increasing, leading to a shift in outcomes of interest from survival to postoperative outcomes and symptoms. In this systematic review we investigate gastrointestinal symptoms following gastrectomy in relation to exocrine pancreatic insufficiency and the effect of pancreatic exocrine enzyme supplementation on these symptoms.

**Methods:** The online databases Pubmed, Embase and Cochrane library were systematically searched in accordance with the PRISMA guidelines. Studies that researched gastrointestinal symptoms, exocrine pancreatic function and enzyme supplementation were identified and assessed.

**Results:** The search resulted in a total of 1023 articles after exclusion of duplicates. After thorough assessment four studies were included for systematic review. Exocrine pancreatic insufficiency was investigated by two studies, the results showed a significant decrease of total exocrine pancreatic function up to 76%. The other two studies investigated the effect of pancreatic enzyme supplementation and found minor improvement in fecal consistency and a decrease in high-degree steatorrhea. No differences in individual symptom scores were reported.

**Conclusion:** Gastrointestinal symptoms such as steatorrhea, bloating and dumping syndrome may be related to exocrine pancreatic function, initiated by total gastrectomy. Treatment with pancreatic enzymes had a minor positive effect on patients. It should be noted that these studies were of small sample size and low quality. New and larger RCT's are necessary to prove or exclude the benefit of pancreatic enzyme replacement therapy in the treatment of the gastrointestinal symptoms after total gastrectomy.

## O060 - Gastroduodenal Diseases

### Laparoscopy for Gastric Cancer: Impact of Clinical Staging

R. Rosati, F. Puccetti, P. Parise, L. Minelli Grazioli, A. Cossu, O. Adamenko

San Raffaele Hospital, MILANO, Italy

**Aim:** Laparoscopy is generally considered a feasible and safe technique leading to several advantages. Among western countries, minimally invasive surgery for gastric cancer is not widely spread and is usually reserved to fit patients, without previous major abdominal surgery and with early gastric cancer. Aim of this study is to evaluate and compare the feasibility, postoperative results and oncologic outcome of laparoscopic gastrectomy (LG) performed in a western series of gastric adenocarcinoma patients at different clinical stages.

**Methods:** From March 2012 to March 2016, all patients affected by gastric adenocarcinoma were addressed to multimodal treatment. Among patients eligible for surgery, laparoscopic approach was performed whenever possible. According to cTNM, patients were divided in three groups: early gastric cancer (EARLY) group (cTis-1,N0), locally advanced N0 (LAN0) group (cT $\geq$ 2,N0) and locally advanced N+ (LAN+) group (cT $\geq$ 2,N+). Primary outcomes were postoperative morbidity, 90-days mortality, surgical clearance and lymph nodes removal while secondary endpoints were overall and disease-free survival (OS and DFS).

**Results:** Two hundred and seventeen patients were referred for gastric adenocarcinoma among which 63 were submitted to LG. 16 patients were included within EARLY group, 22 within LAN0 group and 25 within LAN+ group. Groups were homogeneous in terms of gender, age, preoperative weight loss, previous abdominal surgery and extent of resection (p n.s.). LAN+ patients received more chemotherapy and experienced higher conversion rate (<0.001). No significant differences were found among the three groups in terms of postoperative complications, length of hospital stay and readmission rate (p n.s.). 90-days mortality after surgery was null. Although lymph nodes involvement was greater in LAN+ group, median of harvested lymph nodes was homogeneously high (31 in Early and LAN0 groups; 38 in LAN+ group). Two patients within LAN+ group received a R1 resection. Median follow-up was 19 months and DFS and OS curves showed differences according to pTNM stage.

**Conclusions:** Laparoscopic approach allows an adequate surgical clearance and lymph nodes retrieval, without an increased major postoperative complications rate even in locally advanced adenocarcinoma. LG can therefore be considered as a safe and feasible procedure if performed in high-volume centers and by laparoscopy-skilled surgeons.

## O061 - Gastroduodenal Diseases

### Laparoscopic Total Gastrectomy for Locally Advanced Gastric Cancer

B. Pomortsev

Moscow Clinical Scientific Center, MOSCOW, Russia

**Introduction:** Nowadays, the proportion of patients with locally advanced gastric cancer is estimated up to 90 percent of all gastric cancer cases in Russian Federation. Surgical procedure with D2 Lymphadenectomy is the main option for treatment. Laparoscopic procedures for gastric cancer as minimally invasive surgeries, has gained popularity for the treatment of early gastric cancer in East Asia. Several studies indicated, that laparoscopic subtotal gastrectomy with D2 lymphadenectomy is a technically feasible and safe procedure, by experienced surgeons in high-volume specialized hospitals. But, lack of solid evidence on the safety and feasibility laparoscopic total gastrectomy for locally advanced cancer.

**Objectives:** To present single center experience laparoscopic total gastrectomy for locally advanced gastric cancer.

**Methods:** Retrospective review included patients with locally advanced gastric cancer, according Japanese guidelines 4th edition (2014), which were operated in Moscow Clinical Scientific Center from January 2014 to November 2016. We performed 61 total gastrectomy (29 for men and 32 for women) The mean age was 64.9 (range from 38 to 83) years. The mean BMI was 27 (range from 17 to 41).

**Results:** Laparoscopic procedures were completed in all 61 patients without conversion. Spleen preserving procedures were done in 53 cases (86.9%). The mean operation time was 441±51 min (range from 250 to 790). The mean blood loss was 136±52 ml. The mean length of hospital stay was 15 days (range from 4 to 120 days). "Major" complications of the III-V grades of Clavien Classification were diagnosed in 12 cases (19.6%). Third grade complications were in 9 cases (19%). Three patients had esophagojejunal leak and were successfully treated. Four patients had abdominal abscess and were successfully drained under US guide. Two patients had intrabdominal bleeding in early postoperative period and repeat operations were done. The mortality rate 3.2% (2 patients). All procedures were done radically without residual tumor (R0). Mean retrieved lymph nodes was 26.

**Conclusion:** Laparoscopic total gastrectomy for locally advanced gastric cancer is safe and feasible. The optimal technique for reconstruction is a keystone of this procedure.

## O062 - Gastroduodenal Diseases

### Functional Outcomes of Laparoscopy-Assisted Pylorus-Preserving Gastrectomy Compared With Laparoscopy-Assisted Distal Gastrectomy

B.W. Eom, Y.W. Kim, H.M. Yoon, K.W. Ryu

National Cancer Center, GOYANG, Republic of Korea

**Background:** There are still debate on the functional advantage of laparoscopy-assisted pylorus-preserving gastrectomy (LAPPG) The aim of this study is to evaluate the functional outcomes of LAPPG compared with laparoscopy-assisted distal gastrectomy (LADG).

**Methods:** We reviewed the clinicopathological data of 234 patients who underwent LADG and 102 patients who underwent LAPPG for cT1N0 gastric cancer located in the middle one-third of stomach between January 2012 and December 2015. Post-operative complications, long-term symptoms, and nutritional parameters were analyzed to assess functional outcomes of LAPPG.

**Results:** The operating time was longer (167 min vs. 212 min,  $p<0.001$ ) and the number of harvested lymph nodes was lesser (33.7 vs. 30.4,  $p=0.02$ ) in LAPPG compared with those in LADG. The overall incidence of postoperative complications was not significantly different between the two groups, and delayed gastric emptying was more frequent in LAPPG than in LADG (0.9% vs. 8.8%,  $p=0.001$ ). In outpatient clinic, patients complained dumping syndrome in a similar frequency, however, the LAPPG group complained reflux and gastric stasis symptom more often than the LADG group. Change of body weight, serum protein, and albumin had no significant difference between the two groups, and only serum hemoglobin level declined significantly less in the LAPPG group than in the LADG group after postoperative 3 years.

**Conclusions:** LAPPG had an advantage in hemoglobin recovery and disadvantages in delayed gastric emptying, reflux and gastric stasis symptoms. Further studies are necessary to clarify whether LAPPG is superior to LADG in functional outcomes.

## O063 - Gastroduodenal Diseases

### Three-Port Totally Laparoscopic Distal Gastrectomy (Duet TLDG): A Reliable Surgical Method for The Treatment of Gastric Cancer

H.S. Seo

Seoul St. Mary's Hospital, The Catholic University of Korea, SEOUL, Republic of Korea

**Background:** Minimally invasive surgery for gastric cancer has been widely performed. The present study aimed to identify the feasibility of three-port totally laparoscopic distal gastrectomy (TLDG) compared with four or five-port TLDG.

**Methods:** A total of 251 patients who underwent curative TLDG for gastric cancer: 72 underwent 3-port TLDG (Duet TLDG), 74 underwent 4-port TLDG, and 105 underwent 5-port TLDG in Catholic Medical Centre were enrolled. All operations were performed by two contemporary gastric cancer specialists without any special instruments. Clinicopathological characteristics, operative details, and post-operative short-term outcome were analysed retrospectively.

**Results:** Clinicopathological characteristics showed no significant difference between each groups except N2 stage was higher in 5-port group. The number of retrieved lymph nodes showed no significant difference. The operation time was longer in 4-port group, and shorter in 3-port group with statistically significance ( $144.9\pm 32.3$  vs.  $167.1\pm 30.5$  vs.  $159.9\pm 31.5$ , respectively,  $p=0.007$ ). Estimated blood loss count showed no significant difference. In the post-operative short-term outcomes, duration to flatus, soft diet, and discharge was significantly longer in 5-port group. Post-operative complication showed no significant difference between each groups.

**Conclusions:** The Duet TLDG is a reliable method as a reduced port surgery without any special instruments for the treatment of not only early gastric cancer but also advanced gastric cancer.

## O064 - Gastroduodenal Diseases

### Needlescopic Intra-gastric Surgery Facilitated By 2 mm Instruments

A. Kamei, E. Kanehira, T. Tanida, K. Takahashi

Medical Topia Soka, SAITAMA, Japan

**Aim:** Intra-gastric surgery is a percutaneous endoluminal surgery in the stomach aimed at resection of tumors located at the esophagogastric junction. To minimize the trauma of the access route, we developed needlescopic intra-gastric surgery performed via 2 mm, 2 mm and 5 mm ports (PEIGS-252).

**Methods:** To facilitate PEIGS-252, we co-developed a series of 2 mm instruments including grasping forceps, a cannula, a laparoscope, an electrocautery, scissors, and a needle holder. Two 2 mm trocars and a 5 mm one are inserted into the gastric lumen percutaneously. Intra-gastric resection of lesions are performed by the instruments brought through those three ports. The specimen is extracted via the esophageal-oral route. The defect in the gastroesophageal wall is closed by hand-suture. After the Intra-gastric procedure, the 5 mm stab wound is closed by hand-suture, while the 2 mm wounds are left untreated.

**Results:** Between March 2015 and January 2017, PEIGS-225 was performed in 20 patients. There were no perioperative complications. The mean operation time was 99 min. Pathological findings indicated that the margin was negative in all cases.

**Conclusion:** Needlescopic Intra-gastric surgery performed via the smallest access (2 mm, 2 mm, 5 mm) is enabled by the 2 mm instruments developed by us.

## O065 - Gastroduodenal Diseases

### Long-Term Prognosis and Postoperative Nutritional Status After Laparoscopic Pylorus-Preserving Gastrectomy

M. Tsujiura, N. Hiki, M. Ohashi, S. Nunobe, K. Kumagai, S. Ida, T. Sano, T. Yamaguchi

Cancer Institute Hospital, TOKYO, Japan

**Introduction:** Laparoscopic pylorus-preserving gastrectomy (LPPG) was introduced as a function-preserving operation with minimal invasion for early gastric cancer (GC). This study was aimed to investigate surgical outcomes including long-term prognosis and postoperative nutritional conditions after LPPG.

**Methods:** Between January 2006 and December 2012, 475 patients were initially scheduled to undergo LPPG for cT1 N0 GC. Among them, 10 patients were converted to other operative procedures or open surgery according to intraoperative findings. As a result, a total of 465 patients who underwent LPPG were analyzed in this study. Surgical and oncological outcomes, long-term survival rates, postoperative nutritional status including laboratory test and body weight change were retrospectively analyzed.

**Results:** Our data showed safe and acceptable surgical results regarding overall postoperative complication rate (severe complications over Grade IIIa in Clavien-Dindo classification: 14/465=3.0%) and mortality (no case of in-hospital death). The 5-year overall survival and relapse-free survival rates were 98.0% (95% confidence interval (CI); 96.1–99.0%) and 98.0% (95% CI; 96.1–99.0%), respectively. Only 2 cases of postoperative recurrence were confirmed and their recurrence sites were not in remnant stomach or regional lymph node. The post-operative nutritional status were well-maintained regarding serum total protein, albumin and hemoglobin levels and the relative body weights (post-operative/pre-operative) were  $93.24\% \pm 7.29$  (mean  $\pm$  SD) after LPPG.

**Conclusion:** LPPG is an acceptable and favorable operative method for GC clinically diagnosed at the early stage in terms long-term survival and postoperative nutrition.

## O066 - Gastroduodenal Diseases

### Quality of Life Changes After Completion of Adjuvant Chemotherapy Following Gastrectomy In Advanced Gastric Cancer

K.B. Park<sup>1</sup>, J.Y. Park<sup>1</sup>, S.S. Lee<sup>2</sup>, O.K. Kwon<sup>1</sup>, H.Y. Chung<sup>2</sup>, W.S. Yu<sup>1</sup>

<sup>1</sup>Kyungpook National University Medical Center, DAEGU, Republic of Korea; <sup>2</sup>Kyungpook National University Hospital, DAEGU, Republic of Korea

**Background:** The Quality of Life (QoL) after adjuvant chemotherapy following a gastrectomy might be affected by different types of adjuvant chemotherapy regimen, and QoL changes might deteriorate even after the completion of adjuvant chemotherapy. We evaluated QoL changes after the completion of adjuvant chemotherapy following gastrectomy in patients with advanced gastric cancer.

**Methods:** Patients were divided into two groups based on postoperative adjuvant chemotherapy regimen; 130 patients received S-1 and 56 patients received capecitabine and oxaliplatin (XELOX). QoL data from the European Organization for Research and Treatment of Cancer (EORTC), QLQ-C30, and QLQ-STO22 questionnaires were obtained from patients upon completion of adjuvant chemotherapy, and both 6 and 12 months after the completion of adjuvant chemotherapy. We compared the QoL changes at each time.

**Results:** The mean scores of physical and role functioning were significantly increased in XELOX regimen and were equal in the S-1 regimen at 6 and 12 months after the completion of adjuvant chemotherapy. The mean score of the reflux symptoms was significantly changed in the S-1 regimen and was higher in the S-1 regimen than the XELOX regimen at 12 months after the completion of adjuvant chemotherapy. The mean score for taste was significantly decreased in both regimens and was lower in the XELOX regimen than the S-1 regimen at six months after the completion of adjuvant chemotherapy.

**Conclusions:** Most QoL indicators were similar between the groups six months after the completion of adjuvant chemotherapy. However, supporting deterioration functional scales is essential in patients who receive a XELOX regimen and medical intervention to improve symptom scales is needed in patients who receive an S-1 regimen, even after the completion of adjuvant chemotherapy.

## O067 - Gastroduodenal Diseases

### Laparoscopy and Luminal Endoscopy Cooperative Surgery (LECS) Can be a Standard Treatment for Submucosal Tumors of the Stomach: A Multicenter Study

N. Hiki<sup>1</sup>, H. Kawahira<sup>2</sup>, N. Inaki<sup>3</sup>, S. Kitashiro<sup>4</sup>, N. Abe<sup>5</sup>, I. Miyashiro<sup>6</sup>, S. Nagao<sup>7</sup>, M. Nishizaki<sup>8</sup>, S. Nunobe<sup>1</sup>

<sup>1</sup>Cancer Institute Hospital, TOKYO, Japan; <sup>2</sup>Chiba University Graduate School of Medicine, CHIBA, Japan; <sup>3</sup>Ishikawa prefectural central hospital, ISHIKAWA, Japan; <sup>4</sup>Tonan Hospital, SAPPORO, Japan; <sup>5</sup>Kyurin University School of Medicine, TOKYO, Japan; <sup>6</sup>Osaka medical center for cancer and cardiovascular diseases, OSAKA, Japan; <sup>7</sup>Toho University, TOKYO, Japan; <sup>8</sup>Okayama University, OKAYAMA, Japan

**Background:** We have developed a laparoscopy and luminal endoscopy cooperative surgery (LECS) technique for gastric submucosal tumor (SMTs) resection that can be performed without excessive resection of the stomach. In the present study, we aimed to evaluate the feasibility and safety of LECS for gastric SMT resection in this multicenter retrospective study.

**Methods:** Between October 2007 and December 2011, 126 patients with gastric SMTs underwent LECS in 8 institutes. Patient demographics, tumor histopathologic characteristics, and operative and follow-up data were reviewed.

**Results:** Sixteen (12.7%) tumors were located in the upper third of the stomach, 88 (69.8%) in the middle third, 5 (4.0%) in the lower third, and 17 (13.5%) were located at the esophago-gastric junction. The average operation time for LECS was  $190.2 \pm 66.8$  min, with an average estimated blood loss of  $15.1 \pm 38.6$  mL. In 2 cases (1.6%), the procedure was converted to open surgery because of intra-abdominal adhesions and stenosis, respectively. Morbidity was found in 6 cases (4.8%); leakage was found in 2 cases, gastric stasis in 2 cases, fever in 1 case, and cystitis in 1 case. Histologically, a gastrointestinal stromal tumor (GIST) was found in 86 (68.3%) cases. The median follow-up period was 54.7 months; no local or distant tumor recurrence was observed in any of the patients and all patients were alive.

**Conclusions:** LECS proved to be a safe and feasible procedure for the resection of gastric SMTs, with reasonable operation time, less bleeding, and an acceptable complication rate in this multicenter study in Japan.

## O068 - Gastroduodenal Diseases

### Feasibility and Functional Outcomes of Laparoscopic Proximal Gastrectomy WITH Double Tract Reconstruction for Proximal Gastric Cancer

Y.K. Park, M.R. Jung, S.Y. Ryu, O. Jeong

Chonnam National University Hwasun Hospital, JEONNAM, Republic of Korea

**Introduction:** Laparoscopic proximal gastrectomy (LPG) with double tract reconstruction (DTR) is an attractive treatment option for proximal gastric cancer when considering the advantages of a function preservation, including improved nutrition and a decreased incidence of postoperative reflux esophagitis. The aim of this study was to assess the feasibility of LPG with DTR and to compare the functional outcomes of LPG with laparoscopic total gastrectomy (LTG).

**Methods:** Between November 2011 and August 2015, 158 patients with proximal gastric cancer underwent LPG (n=24) or LTG (n=134) at our institution. Patients were indicated for LPG if they were diagnosed with cT1N0M0 and LTG was indicated for the patients with cT1N0, T1N1 and T2N0 gastric cancer. We reviewed their medical records from our prospectively collected gastric cancer database. The clinicopathological characteristics and functional outcomes were compared between two groups.

**Results:** There was no significant differences in demographic and pathologic characteristics. Though the operative time was longer in LPG group ( $303 \pm 54$  vs.  $262 \pm 78$  min,  $p=0.013$ ), the postoperative 30-days complication rate was not significantly different between two groups (20.8% vs. 16.4%,  $p=0.565$ ). The incidences of endoscopic findings of reflux esophagitis (0% vs. 3.7%,  $p=1.000$ ) and reflux symptoms (4.8% vs. 10.9%,  $p=0.694$ ) were similar in both groups. LPG group had a significantly better serum Vitamine B12 levels at the first postoperative year than LTG group ( $420 \pm 289$  vs.  $253 \pm 133$ ,  $p=0.028$ ). The body weight loss during postoperative 1 year was also significantly lower in LPG group ( $6.4 \pm 3.3$  vs.  $8.7 \pm 4.5$  kg,  $p=0.023$ ).

**Conclusion:** In the study, the LPG with DTR is a technically feasible and showed comparable incidence of postoperative reflux esophagitis to the LTG. Moreover, LPG is preferred over LTG in terms of postoperative nutritional status at first year. Therefore, LPG with DTR would be a good alternative procedure for proximal gastric cancer. A large scaled randomized trial is needed to validate the functional benefits of LPG.

## O069 - Gastroduodenal Diseases

### Comparison Study of Laparoscopic and Open Gastrectomy for cT4 Gastric Cancer

Y.K. Park, M.R. Jung, O. Jeong, S.Y. Ryu

Chonnam National University Hwasun Hospital, JEONNAM, Republic of Korea

**Aim:** Laparoscopic gastrectomy (LG) for far advanced gastric cancer is still a challenging procedure because of technical difficulty and lack of evidence of oncologic safety. This study is aimed to evaluate the feasibility and safety of LG for clinical T4 gastric cancer.

**Methods:** Of 217 patients who underwent LG or open gastrectomy (OG) with D2 lymph node dissection for cT4 gastric carcinoma, 47 treated by LG and 170 treated by OG were analyzed from prospectively collected database.

**Results:** The two study groups were similar in age, sex, body mass index, comorbidity, ASA score, and tumor stage. Total gastrectomy and combined resection were the more frequently performed in OG group compared to LG group (44.7% vs. 19.1%, 37.1% vs. 17.0%). The LG group had a significantly longer mean operating time (306 vs. 234 min,  $p < 0.001$ ) but showed significantly less intraoperative blood loss (191 vs. 397 ml,  $p < 0.001$ ). Total numbers of harvested lymph nodes were similar in the two groups. Postoperatively, the incidence of postoperative fever and transfusion were significantly lower in the LG group. Hospital stay was also significantly shorter in the laparoscopy group. LG group showed significantly less postoperative complication. In the multivariate analysis adjusting age, sex, BMI, ASA score, resection type, combined organ resection and tumor stage, LG showed a significant reduction of postoperative complication (OR=0.259, 95% CI =0.092–0.729,  $p=0.011$ ). Furthermore, overall survivals were similar in stage II and III subgroups ( $p=0.399$  and  $p=0.399$ , respectively).

**Conclusion:** Laparoscopic surgery for sT4 patients is feasible and safe. It may benefit patients with lower morbidity and reduced hospital stay. Our data showed long-term outcomes are also similar between the open and laparoscopy surgery group. However, long-term oncological outcomes should be awaited.

## O070 - Gastroduodenal Diseases

### Needle-Device Assisted Single Incisional Laparoscopic Gastrectomy for Early Gastric Cancer: Propensity Score Matched Analysis

K. Doden, N. Inaki, R. Matsui, T. Tsuji, D. Yamamoto, H. Kitamura  
Ishikawa Prefectural Central Hospital, KANAZAWA, Japan

**Aim:** We have introduced needle-device assisted single incisional laparoscopic gastrectomy (NA-SILG) for early gastric cancer since 2013. We will report the procedure and evaluate its clinical results compared to conventional laparoscopic gastrectomy (CLG).

**Methods:** Operating set up is quite same as in CLG. Operator stands on the right side. We make a 2.5 cm skin incision and equipped the EZ access device™ at umbilicus. Two 12 mm trocars are inserted through the access device for the use for surgeon's right forceps and endoscope. Three 2.1-diameter BJ Needle™ forceps are inserted through its dedicated puncture port, one at right side of the abdomen for the operator's left hand and two at the left side for the assistant's both hands. Subsequent procedure is performed in the same way as CLG. We retrospectively reviewed the medical records of 171 patients who underwent NA-SILG or CLG for early gastric cancer between January 2013 and August 2016. We performed 1:1 propensity score matching (PSM) between the two groups.

**Results:** In total, 19 NA-SILG patients and 143 CLG patients were included in the analysis. At baseline, patients with NA-SILG were younger ( $53.8 \pm 13.7$  vs.  $67.2 \pm 9.73$  year-old) and had lower BMI ( $21.2 \pm 2.83$  vs.  $23.2 \pm 3.09$  kg/m<sup>2</sup>) than patients with CLG (both  $P < 0.01$ ). NA-SILG group had much more female patients ( $P < 0.01$ ). After PSM, demographic and clinical characteristics were not statistically different between the 19 NA-SILG and the 19 CLG patients. All patients were in clinical stage IA. Operative time were  $221 \pm 34.6$  min vs.  $221 \pm 43.3$  min ( $P = 1.0$ ) and the amount of intraoperative bleeding were 11 (11–13) ml vs. 11 (10–12.5) ml ( $P = 0.32$ ) for NA-SILG and CLG groups, respectively. NA-SILG patients had no postoperative complications more severe than Clavien-Dindo classification IIIb. Total hospital stay among NA-SILG patients was 11 (11–13) days and similar with that of CLG patients ( $P = 0.32$ ). The amount of dissected lymph nodes were 42 (34–65) vs 51 (37.5–60) ( $P = 0.44$ ) for NA-SILG and CLG groups. Pathologic stages (stage IA/IB/IIA/IIIB/IIIA/IIIB /IIIC/IV) were (13/5/0/0/1/0/0/0) for NA-SILG and (17/1/0/1/0/0/0) for CLG ( $P = 0.23$ ).

**Conclusions:** NA-SILG for early gastric cancer in slim figure patients has an impact on cosmetic outcome and minimally invasiveness, keeping the acceptable clinical results as a cancer surgery.

## O071 - Intestinal, Colorectal and Anal Disorders

### The Fate of Chronic Sinus After Sphincter-Saving Surgery in Rectal Cancer

I.T. Woo, H.J. Kim, G.S. Choi, J.S. Park, S.Y. Park, H.J. Lee, I.G. Park

Kyungpook National University Medical Center, DAEGU, Republic of Korea

**Background/Purpose:** Anastomotic leakage (AL) after sphincter-saving procedure may incompletely resolve, resulting in chronic anastomotic sinus. Despite increasing incidence of chronic sinus, management is still difficult and not clearly defined. This study aimed to assess whether stoma reversal can be safely performed in patients with persistent asymptomatic or symptomatic AL, and to evaluate prognostic factors that may develop pelvic sepsis after reversal of stoma in them.

**Methods:** Between 2010 and 2015, 1073 rectal cancer patients undergoing sphincter-saving surgery by minimally invasive approach were retrospectively analyzed. Asymptomatic AL was considered if an AL was not diagnosed before diverting stoma reversal, 6 ~ 8 weeks after rectal surgery, and absence of clinical symptoms. Chronic sinus was considered as AL tract persisted > 6 months after rectal resection. Patients who treated by dismantling anastomosis for AL or making palliative stoma for local recurrence were excluded in this study (N=10).

**Results:** 299 (28.1%) of 1063 patients had defunctioning stoma after rectal resection, and 105 (9.9%) developed AL; 21 were asymptomatic and 84 were symptomatic AL. In 21 patients with asymptomatic AL, five developed chronic AL without evidence of AL, after reversal of stoma. In patients with symptomatic AL, 21 had stoma during rectal resection, 39 required stoma creations for treating AL, and 14 were treated conservatively without abdominal surgery. During follow-up, 68 (79.1%) of 86 ALs with stoma healed up after a mean delay of 17.3 weeks (range, 8–46 weeks). Among them, 20 (29.4%) of 68 developed postoperative symptomatic abscess or pelvic sepsis after stoma reversal, 10 (14.7%) required stoma creation again, nine (13.2%) underwent a redo surgery, and seven (10.3%) still had a stoma at the last follow-up. The remaining 18 (20.1%) presented with persistent AL with chronic sinus after rectal surgery. Three received redo surgery first, and then stoma was reversed. Ten (66.7%) of the remaining 15 developed postoperative symptomatic abscess or pelvic sepsis after stoma reversal; eight (53.3%) underwent a redo surgery, and six (40.0%) still had a stoma at the last follow-up. Preoperative chemoradiotherapy was the only prognostic factor for pelvic sepsis after stoma reversal [ $P = 0.001$ ; Odds ratio (95% CI): 5.042 (1.895–13.416)].

**Conclusion:** In patients with chronic sinus after sphincter-saving surgery for rectal cancer, stoma reversal should be performed carefully, especially in patients who received preoperative CRT. In addition, pelvic sepsis could be controlled redo surgery in selected patients.

## O072 - Intestinal, Colorectal and Anal Disorders

### Urinary and Sexual Function Following Robotic Total Mesorectal Excision and Lateral Pelvic Lymph Node Dissection for Rectal Cancer

I.T. Woo, H.J. Kim, G.S. Choi, J.S. Park, S.Y. Park, H.J. Lee, I.G. Park

Kyungpook National University Medical Center, DAEGU, Republic of Korea

**Background/Purpose:** Lateral pelvic lymph node dissection (LPND) is a challenging procedure due to its technical difficulty and higher incidence of surgical morbidity. Despite advances in surgical technique and improvement of the robotic instrument, concerns still exist regarding poor functional outcomes following LPND. Therefore, we investigated the impact of robotic additional LPND compared to robotic total mesorectal excision (TME) on functional outcomes.

**Methods:** Between 2011 and 2015, 62 patients underwent robotic TME with LPND. Among them, patients older than 75 or with distant metastasis within 12 months after surgery were excluded (N=4). Overall, 50 patients (86.2%) responded to the questionnaires. They were matched 1:1 by age, tumor location, preoperative chemoradiotherapy, and existence of protective stoma.

**Results:** In total patients, the mean IPSS score was worse in the LPND group than the TME group ( $7.4 \pm 6.7$  vs.  $4.3 \pm 3.5$ ,  $P = 0.005$ ). In male patients, moderate to severe urinary dysfunction was significantly greater in the LPND group ( $P = 0.015$ ), whereas in female patients, it was not different between the groups ( $P = 0.212$ ). Male sexual function was available to analyze in 21 in the LPND group and 30 patients in the TME group. IIEF-5 score was also worse in the LPND group, but it did not have statistical difference ( $P = 0.260$ ). Male sex and LPN metastasis were independent factors of moderate to severe urinary dysfunction [Odds ratio (95% confidence interval) 5.41 (1.27–22.98) and 5.76 (1.48–22.38), respectively].

**Conclusion:** Patients undergoing TME with additional LPND showed worse urinary function than the TME group. Dysfunction mainly depends on male and the disease severity in pelvic side-wall. Therefore, it should be performed in selected patients who were highly suspected LPN metastasis.

## O073 - Intestinal, Colorectal and Anal Disorders

### Optimal Stump Management in Laparoscopic Appendectomy: A Network Meta-analysis

S.A. Antoniou<sup>1</sup>, D. Mavridis<sup>2</sup>, S. Hajibandeh<sup>3</sup>, S. Hajibandeh<sup>3</sup>, G.A. Antoniou<sup>4</sup>, R. Gorter<sup>5</sup>, M. Tenhagen<sup>6</sup>, C. Koutras<sup>7</sup>, R. Pointner<sup>8</sup>, G.E. Chalkiadakis<sup>1</sup>, F.A. Granderath<sup>9</sup>, G.F. Fragiadakis<sup>10</sup>, A.E. Philalithis<sup>11</sup>, H.J. Bonjer<sup>6</sup>

<sup>1</sup>University Hospital of Heraklion, HERAKLION, Greece; <sup>2</sup>School of Medicine, University of Ioannina, IOANNINA, Greece; <sup>3</sup>Royal Blackburn Hospital, BLACKBURN, United Kingdom; <sup>4</sup>The Royal Oldham Hospital, Pennine Acute Hospitals NHS Trust, MANCHESTER, United Kingdom; <sup>5</sup>Paediatric Surgical Centre of Amsterdam, Emma Children's Hospital AMC & VU Unive, AMSTERDAM, The Netherlands; <sup>6</sup>VU University Medical Center, AMSTERDAM, The Netherlands; <sup>7</sup>Clinic for Orthopedics and Rheumatology, RATINGEN, Germany; <sup>8</sup>Zell am See Hospital, ZELL AM SEE, Austria; <sup>9</sup>Neuwerk Hospital, MOENCHENGLADBACH, Germany; <sup>10</sup>General Hospital of Chania, CHANIA, Greece; <sup>11</sup>University of Crete, HERAKLION, Greece

**Aim:** To investigate the relative effectiveness and provide a treatment ranking of different options for securing the appendix stump in laparoscopic appendectomy.

**Methods:** Electronic databases were searched to identify randomized controlled trials (RCTs) comparing ligation methods of the appendix including endoloop, laparoscopic suture, endoclip or endoscopic stapler to open appendectomy, single-incision appendectomy, needlescopic appendectomy, or conservative treatment. The primary outcomes were organ/space infection and superficial surgical site infection. We performed a network meta-analysis and we estimated the pairwise relative treatment effects of the competing interventions using the odds ratio (OR) and its 95% confidence interval (CI). We report suggests inconsistency between direct and indirect comparisons. In forest plot suggests obtained a hierarchy of the competing interventions using rankograms and the surface under the cumulative ranking curve (SUCRA).

**Results:** Forty-three RCTs were eligible and provided data for more than 5000 patients. Suture ligation appeared to be the most effective treatment strategy, in terms of both organ/space infection and superficial surgical site infection, according to the estimated relative effects and SUCRA values. Statistical significance was reached for the comparisons of clip vs. endoloop (OR 0.56, 95% CI 0.32 to 0.96) for organ/space infection; and suture vs. clip (OR 0.20, 95% CI 0.08 to 0.55) and clip vs. endoloop (OR 2.22, 95% CI 1.56 to 3.13) for superficial surgical site infection. There was considerable uncertainty on these outcomes, because the rarity of events generally resulted in wide interval estimates. Furthermore, the network was informed primarily by indirect treatment comparisons. However, there was no evidence of inconsistency between direct and indirect comparisons, but this could be masked, due to the sparseness of events.

**Conclusions:** The use of suture ligation of the appendix in laparoscopic appendectomy seems to be superior to other methods for the composite parameters of organ/space and superficial surgical site infection.

## O074 - Intestinal, Colorectal and Anal Disorders

### Laparoscopic Right Colectomy with Complective Extended D3 Anterior/Posterior Mesenterectomy: A Norwegian Pilot Series

R. Gaupset<sup>1</sup>, (A) Kazaryan<sup>1</sup>, (B) Stimec<sup>2</sup>, J.M. Nesgaard<sup>3</sup>, (A) Bakka<sup>1</sup>, (B) Edwin<sup>4</sup>, D. Ignjatovic<sup>1</sup>

<sup>1</sup>Akershus University Hospital, NORDBYHAGEN, Norway; <sup>2</sup>University of Geneva, GENEVA, Switzerland; <sup>3</sup>Vestfold Hospital Trust, TONSBERG, Norway; <sup>4</sup>Oslo University Hospital-National Hospital, OSLO, Norway

**Introduction:** Extended D3 anterior and posterior mesenterectomy (ED3APM) in right colectomy has received increased attention. The aim of this study was to demonstrate feasibility of the procedure and provide short-term outcomes data.

**Methods:** From July 2013 to June 2016 sixteen patients with adenocarcinoma in the right colon underwent right colectomy with ED3APM, including lymph nodes anterior/posterior to the superior mesenteric vessels all the way to the left edge of the superior mesenteric artery. A 3D reconstructed anatomy map derived from the staging CT was used as a roadmap at surgery.

Median age, BMI and follow-up were 69 (52–74) years, 25 (19.6–46) and 9 (6–45) months, respectively.

The procedure was systematized in 8 operative steps: Step 1: Peritoneal incision over the terminal ileal vessels and securing them in vessel loops; Step 2: Isolation of the ileocolic artery and its division; Step 3: Isolation of the middle colic artery; Step 4: Isolation of the right branch of the middle colic artery and its division; Step 5: Preparation of the anterior flap of the mesentery; Step 6: Division of the ileocolic vein; Step 7: Visualization of the gastrocolic trunk; Step 8: Preparation of the posterior flap of the mesentery.

**Results:** 6 (37%) cases were converted, 2 due to bleeding and 4 due to challenging dissection. The cases for laparoscopic surgery were not selected based on anatomical disposition, but rather on availability of surgeons, and the threshold for conversion was low in this introductory stage. Median operative time and blood loss was 292 (177–439) min and 250 (0–1300) ml, respectively. Postoperative complications occurred in 6 (38%), including 2 (13%) major complication requiring reoperation. Median hospital stay was 4.5 (3–13) days. R0 resection was achieved in all cases. Median number of the lymph node harvested was 41.5 (25–86), including 11.5 (4–35) in the D3 volume. Six patients had positive nodes, 3 of them in the D3 volume, including 1 case of a skip metastasis. There was no mortality, and all patients are alive. 1 patient was assumed to develop lymph node metastases.

**Conclusion:** Laparoscopic right colectomy with ED3APM is feasible, associated with acceptable morbidity and fast recovery; now in readiness for introduction in specialized colorectal institutions.

## O075 - Intestinal, Colorectal and Anal Disorders

### Stent Bridge to Surgery for Malignant Colonic Obstruction Reduces Complications and Stoma Rate Compared to Emergency Surgery: A Meta-analysis of RCTs

A. Arezzo<sup>1</sup>, R. Passera<sup>1</sup>, G. Losecco<sup>1</sup>, M. Verra<sup>1</sup>, M.A. Bonino<sup>1</sup>, E. Targarona Soler<sup>2</sup>, M. Morino<sup>1</sup>

<sup>1</sup>University of Torino, TORINO, Italy; <sup>2</sup>Hospital de la Sta Creu i St Pau, BARCELONA, Spain

**Background:** Twenty years after the first description of the technique, the debate is still open on role of self-expandable metallic stent (SEMS) placement as a bridge to elective surgery for symptomatic left-sided malignant colonic obstruction.

**Objective:** To compare morbidity rates after colonic stenting bridge to surgery (SBTS) versus emergency surgery (ES) for left-sided malignant obstruction.

**Methods:** We performed a systematic review and meta-analysis of randomized controlled trials (RCTs) on SBTS or ES for acute symptomatic malignant left-sided large bowel obstruction. The primary outcome was overall morbidity within 60 days after surgery.

**Results:** The meta-analysis included 8 RCTs and 497 patients. Overall morbidity within 60 days after surgery was 22.3% in SBTS- and 51.2% in ES-treated patients (relative risk [RR] 0.59,  $p=0.023$ ). The temporary stoma rate was 33.9% after SBTS and 51.4% after ES (RR 0.67,  $p<0.001$ ). The permanent stoma rate was 22.2% after SBTS and 35.2% after ES (RR 0.66,  $p=0.003$ ). Primary anastomosis was successful in 70.0% of SBTS- and 54.1% of ES-treated patients (RR 1.29,  $p=0.043$ ).

**Conclusion:** SBTS was associated with lower short-term overall morbidity and lower rates of temporary and permanent stoma. These findings, together with potentially enhanced quality of life and comparable oncologic outcomes, suggest that the SBTS strategy may be preferable to ES for left-sided malignant colonic obstruction.

## O076 - Intestinal, Colorectal and Anal Disorders

### Single-Port Laparoscopic Surgery in Uncomplicated Acute Appendicitis: The Results of Randomized Controlled Trial

B.M. Kang<sup>1</sup>, S.I. Choi<sup>2</sup>, B.S. Kim<sup>3</sup>, S.H. Lee<sup>2</sup>

<sup>1</sup>Chuncheon Sacred Heart Hospital, Hallym University College of Medicine, CHUNCHEON, Republic of Korea; <sup>2</sup>Kyung Hee University Hospital at Gangdong, Kyung Hee University School of Medicine, SEOUL, Republic of Korea; <sup>3</sup>Kyung Hee Medical Center, Kyung Hee University School of Medicine, SEOUL, Republic of Korea

**Aim:** Single-port laparoscopic surgery (SPLS) for appendicitis is introduced as a new approach to maximize the cosmetic result. The aim of this randomized trial is to evaluate the safety and efficacy of SPLS in uncomplicated acute appendicitis.

**Methods:** Between December 2009 and November 2010, total 194 patients with radiologically-diagnosed acute appendicitis were randomly allocated to single-port or multiport laparoscopic surgery (MPLS). The patients with intraoperative finding of perforated appendicitis were excluded in analysis. Patient's characteristics, operative outcomes, postoperative pain score, time to functional recovery and the cost were compared. Primary end points were perioperative morbidity. All the data were analyzed by intention-to-treat principle.

**Results:** After excluding the 14 cases, total 180 patients was include in analysis. 90 patients were assigned in the SPLS and MPLS groups, respectively. Baseline characteristics were well-balanced in both groups. Rate of conversion to MPLS was 11.1% in the SPLS group. Operation time was 14.5 min longer in the SPLS group (43.8 min vs. 29.3 min,  $p=0.000$ ). There was no difference in the rate of intraoperative (4.4% in the SPLS group vs. 0% in the MPLS group,  $p=0.121$ ) and postoperative complications (4.4% vs 2.2%,  $p=0.682$ ) between groups. Postoperative pain scores were similar in both groups at 12, 24 and 36 h after surgery, but amounts of analgesia was greater in the SPLS group (73.9 mg vs. 51.7 mg,  $p=0.035$ ). Postoperative time to first passage of flatus (27.7 h vs. 20.1 h,  $p<0.001$ ) and time to resuming soft diet intake (38.5 h vs. 29.4 h) were later in the SPLS group. Also, postoperative length of hospital stay was longer (2.5 days vs. 2.1 days,  $p=0.004$ ) and the cost was higher (1826.9 USD vs. 1662.4 USD,  $p=0.001$ ) in the SPLS group.

**Conclusion:** SPLS is safe procedure in uncomplicated appendicitis. However, longer operation time, later postoperative functional recovery, longer hospital stay and higher cost are disadvantages in SPLS, even though it is a small difference (ClinicalTrials.gov Identifier: NCT01007318).

## O077 - Intestinal, Colorectal and Anal Disorders

### Transanal Total Mesorectal Excision for Rectal Cancer: Is Obesity Still Associated with Higher Morbidity?

F.B. Delacy<sup>1</sup>, J. Van Laarhoven<sup>2</sup>, R. Pena<sup>1</sup>, M.C. Arroyave<sup>3</sup>, D. Momblán<sup>1</sup>, A.M. Lacy<sup>1</sup>

<sup>1</sup>Hospital Clínic of Barcelona, BARCELONA, Spain; <sup>2</sup>Jeroen Bosch Ziekenhuis, 'S HERTOGENBOSCH, The Netherlands; <sup>3</sup>Clínica Somer, ANTIOQUIA, Colombia

**Aim:** Rectal surgery is a technically demanding procedure, especially in obese patients. High Body Mass Index (BMI) has been associated with increased morbidity. Transanal total mesorectal excision (taTME) has emerged as an alternative to laparoscopy and might be associated with improved outcomes in such difficult cases.

**Methods:** From a prospectively maintained database of patients undergoing taTME for rectal cancer, we analyzed the outcomes of patients with BMI <25 Kg/m<sup>2</sup> (non-obese group) and patients with BMI >30 Kg/m<sup>2</sup> (obese group). Patients with mid and low rectal cancer were included. Histopathological results were also studied.

**Results:** A total of 104 patients were included in the analysis, 83 patients (79.8%) in the non-obese group and 21 patients (20.2%) in the obese group. Both groups did not differ in male–female ratio (male patients: 53.0% vs. 66.7%,  $p=0.260$ ) or median age (63 vs. 66 years). There was no difference in smoking ratio (31.4% vs. 30.0%,  $p=0.903$ ). There was an expected increased risk in the ASA classification for the obese group. T3 disease was present in 62 (77.5%) vs. 13 (61.9%) patients ( $p=0.146$ ), and T4 was present in 7 (8.8%) vs. 1 (4.8%) patient ( $p=0.547$ ), with no difference in the administration of neoadjuvancy (71.0% vs. 61.9%;  $p=0.575$ ). Median operative time was 120 vs. 160 min ( $p=0.051$ ). Intraoperative complications were present in 5 (6.4%) vs. 3 (15.0%) ( $p=0.211$ ). Abdominal conversion to hand-port occurred in 1 (1.2%) vs. none ( $p=0.613$ ). The 30-days postoperative complication number was 30 (36.6%) vs. 9 (42.9%) ( $p=0.597$ ). A reintervention was warranted in 6 (7.3%) vs. 1 (4.8%) case ( $p=0.678$ ), while readmission rate was 9.9% vs. 9.5% ( $p=0.961$ ). Median length of hospital stay was 6 vs. 7 days ( $p=0.280$ ). Pathological results showed no difference concerning quality of the specimen between both groups (98.8% vs. 100.0% of completeness of mesorectum,  $p=0.611$ ) and no difference in positive CRM (8.5% vs. 4.8%,  $p=0.564$ ).

**Conclusions:** despite increased technical difficulty of resection, with taTME obesity seems to be no longer associated with higher morbidity.

## O078 - Intestinal, Colorectal and Anal Disorders

### Reoperation After Transanal Endoscopic Microsurgery (TEM) for Rectal Cancer: A 25 Years Experience of a Single Centre

M. Ortenzi, R. Ghiselli, M. Haxhiu, M. Guerrieri

Clinica Chirurgica, ANCONA, Italy

**Aim:** The success of Transanal Endoscopic Microsurgery (TEM), when applied to early rectal cancer, depends on proper indications and strict selection of patients. When unfavorable pathologic features are found after TEM operation, total mesorectal excision is recommended in order to minimize the risk of recurrence. In this study, data were collected in a retrospective series of patients to determine the indications for reoperation after TEM.

**Methods:** From 1992 to 2016, 1388 patients underwent local excision by TEM in our institution. All patients had an accurate rectal-digital examination and clinical tumour staging by transanal endosonography, CT and/or MRI. The histologic examination included an evaluation of: free margins, depth of tumour infiltration according to International Union Against Cancer (UICC) guidelines, degree of tumour differentiation, presence of lymph vascular invasion. When a high risk tumour was found reoperation was performed within 8 weeks from TEM. All patients underwent laparoscopic procedures. They were divided into two groups according to the procedure performed: anterior resection (LAR) or abdominal perineal amputation (LAPR).

**Results:** Sixty-eight patients (5.3%) underwent reoperation within 8 weeks from the transanal procedure. Thirty-eight patients underwent LAR and 30 LAPR. Mean operative time was 148.24 min (range 85–275) and did not differ significantly between the two groups ( $p=0.62$ ). The mean distance of the TEM scar from the anal verge was 8.5 cm (range 2–18) and statistically differed between the two groups ( $p=0.003$ ); distance of tumours statistically correlated with abdominal perineal amputation ( $p=0.0001$ ) in multivariate analysis. Conversion to open surgery was needed in 6 patients (15.7% of the LAR group and 3 (10%) of the LAPR group ( $p=0.38$ )). The histologic examination revealed clusters of cancer cells in the muscular layer in 3 cases (3 pT2 N0) and in the perirectal fat in 1 case (1 pT3 N0), and lymph node metastases in 4 cases. No residual neoplasm was detected in the remnant 60 cases (88.3%). At mean follow up of 108 months, the overall free survival was 98% (95%CI: 88%-99%).

**Conclusions:** In our experience the reoperation after TEM by laparoscopic approach was feasible and safe with low conversions rate and optimal oncological results.

## O079 - Intestinal, Colorectal and Anal Disorders

### The Laparoscopic Tangential Resection of Meckel Diverticulum is Safe and Effective to Remove Ectopic Mucosa

D.A. Tartaglia, M.A. Bianchini, G.I. Stefanini, B.A. Bakkar, F.R. Quilici, M.A. Castagna, S.E. Musetti, L.U. Cobuccio, A.N. Bertolucci, C.H. Galatioto, M.A. Chiarugi

Azienda Ospedaliera Universitaria Pisana, PISA, Italy

**Aim:** The laparoscopic wedge resection of Meckel Diverticulum (MD) has been reported as safe and effective. However, some authors speculate that a resection of the bowel segment is a safer therapeutic alternative, as a simple diverticulectomy could leave ectopic tissue in situ. The aim of this study was to evaluate whether the tangential resection of MD could be enough to completely remove any MD mucosal abnormalities.

**Materials and Methods:** We reviewed the clinical charts of 40 patients who underwent surgery for MD during the period 2005–2016 in our unit. We described and analyzed the following parameters: patients' general characteristic (age, F/M ratio, BMI), rate of complicated and incidental MD, percentage of tangential resections, rate of laparoscopic surgery, conversion rate, complication rate, mean length / width of MDs, and histological findings.

**Results:** In eleven years, 40 patients presented an MD. Mean age was 57.7 yrs (range 2–86), F/M ratio 1:3 and mean BMI 27.72 kg/m<sup>2</sup> (range 18.7–49). 62% MD (25/40) were incidentally identified during surgical operations done for other causes, the remaining 38% (15/40) were symptomatic. Stapled tangential resection was performed in 38/40 (95%) patients; in the remaining 5%, a segmental resection with primary side-to-side anastomosis was carried out. 21/38 (55%) were approached laparoscopically and 38% of those were converted. No postoperative complications related to the stapled resection of the diverticulum were identified. The mean diverticular length was 4.1 cm (range 2–9 cm) and the mean base diameter was 2.4 cm (range 1.2–4 cm). The mean height-to-diameter ratio (HDR) was <2. MD presented a normal mucosa in 16/40 patients (40%), flogosis and/or necrosis in 18/40 (45%), a gastric mucosa in 4/40 (10%), a pancreatic-type mucosa in 1/40 (3%) and a well differentiated neuroendocrine tumor in 3% (1/40). In all MDs with ectopic mucosa, the edge along the margin of resection was free of cellular metaplasia/dysplasia.

**Conclusion:** The diverticulectomy performed by "firing" a stapler at the base of the Meckel diverticulum is safe and effective to completely remove any eventual mucosal abnormalities.

## O080 - Intestinal, Colorectal and Anal Disorders

### Laparoscopic Surgery for Malignant Colorectal Obstruction After Sems

K. Ohta<sup>1</sup>, M. Ikenaga<sup>1</sup>, K. Konishi<sup>2</sup>, M. Ueda<sup>1</sup>, Y. Tsuda<sup>1</sup>, S. Nakashima<sup>1</sup>, S. Adachi<sup>1</sup>, S. Endo<sup>1</sup>, T. Yamada<sup>1</sup>

<sup>1</sup>Higashiosaka City Medical Center, HIGASHIOSAKA, Japan;

<sup>2</sup>Hyogo Prefectural Nishinomiya Hospital, NISHINOMIYA, Japan

**Aim:** Endoscopic self-expandable metallic stents (SEMS) focusing on bride to surgery (BTS) is an acceptable procedure for malignant colorectal obstruction. We aimed to evaluate safety and feasibility of BTS using laparoscopic surgery after SEMS (BTS-Lap) for the obstruction.

**Methods:** We examined short-term results of clinical and pathological outcomes about twenty-five cases of BTS-Lap from January 2012 to October 2016 in our department.

**Results:** Median age was 67 years old, 11 male and 14 female. Tumor locations (A/T/D/S/RS) were 3/2/3/13/4. All cases of endoscopic SEMS were successfully inserted to obstruction. Median interval day from SEMS to BTS-Lap was 15 days. The median operation time was 247 min and median bleeding was 48.5 mL. Conversion rate to open surgery was 8%, 2 cases. Twenty-four cases, 96% performed primary anastomosis and no stoma creation after surgery. There is no mortality in this study. Morbidity was 16%, 4 cases. Hospital stay after surgery was 11.5 days. Pathological finding shows that the well or moderate tubular adenocarcinoma (tub1/tub2) was 96%, 24 cases. T3 (SS) cases were 76%, 19 cases and positive lymph-node rates were 56%, 14 cases. Stage IV was 12%, 3 cases and curative surgery was 88%, 22 cases.

**Conclusion:** Clinical and pathological short-term results of BTS-Lap were acceptable. Our results showed high primary anastomosis rate, which means avoiding stoma creation. Morbidity and hospital stays were also feasible outcomes compared to laparoscopic surgery for non-obstructive colorectal cancer in our department.

## O081 - Intestinal, Colorectal and Anal Disorders

### Anastomosis Perfusion in Laparoscopic Colorectal Resection with Indocyanine Green Angiography: Preliminary Results of a Multicenter RCT

R. Rosati<sup>1</sup>, P. De Nardi<sup>1</sup>, G. Maggi<sup>1</sup>, R. Maggiore<sup>1</sup>, U. Elmore<sup>1</sup>, L. Boni<sup>2</sup>, E. Cassinotti<sup>2</sup>

<sup>1</sup>San Raffaele Hospital, MILANO, Italy; <sup>2</sup>University of Insubria, VARESE, Italy

**Aim:** Anastomotic leak is one of the most serious complication after colorectal resection, affecting postoperative function and, in case of cancer resection, oncological outcome. Insufficient vascular supply is one of the main causes of anastomotic leak. Intraoperative angiography with indocyanine green (ICG) has been successfully employed to assess bowel perfusion before performing an anastomosis, however large and randomized trials are lacking. The aim of this study was to evaluate the usefulness of intraoperative assessment of anastomotic perfusion using ICG angiography in patients undergoing resection with colorectal anastomosis.

**Methods:** This is a prospective, controlled, multicenter randomized trial. Patients undergoing laparoscopic left colectomy or anterior rectal resection for malignant or benign disease were enrolled. In the study group a bolus of 0.3 mg/Kg of ICG was injected before and after completion of the anastomosis to assess margins perfusion and the level of resection was selected based on the fluorescence result; in the control group the level of resection was selected by crude visual assessment of the bowel. The primary outcome was to verify if ICG angiography could lead to a reduction in anastomotic leak rate. Secondary outcomes were possible change in surgical strategy and postoperative morbidity.

**Results:** 132 patients were randomized, 65 in the study and 67 in the control group. No differences in age, BMI, gender, preoperative neoadjuvant therapy, ASA score and comorbidities were observed between the two groups. ICG angiography showed insufficient perfusion of the colic stump in 6 cases (4.3%). These patients had an extended resection, of 2 to 10 cm, till a viable well-perfused colon segment was obtained. An anastomotic leak developed in 7 (10.4%) patients of the control group and in 5 (7.7%) patients of the study group (p: n.s.). No difference in overall postoperative morbidity was observed in the two groups. There was no morbidity related to the ICG injection.

**Conclusions:** ICG angiography is a safe procedure that can effectively assess the vascularization of the bowel and anastomosis in patients undergoing colorectal resection. Its role in reducing anastomotic leak rate should be assessed with further enrolment.

## O082 - Intestinal, Colorectal and Anal Disorders

### Evaluation of Intestinal Perfusion by Indocyanine Green (ICG) Fluorescence Imaging During Procedures on the Rectum and Colon Sigmoidum

V. Bencurik, M. Škrovina, J. Bartoš, K. Klos, P. Andel, E. Holáškova, M. Machácková

Komplexné onkologické centrum, NOVÝ JICÍN, Czech Republic

**Aim:** The aim of the work was to evaluate utility of ICG fluorescence imaging in determining of the perfusion mapping in sigmoid colon and rectum surgery and record complications in anastomosis healing.

**Methods:** This was a prospective single-institution study of 89 patients with left-sided colon and rectal cancer or benign lesions who underwent surgery between August 2015 and December 2016. There were 56 men and 33 women with median of age 64 and median of BMI 27. To surgical treatment for cancer of the sigmoid colon or rectum were indicated 80 patients, 9 patients had a benign disease. Total mesorectal excision with coloanal mechanical or hand-sewn anastomosis underwent 51 patients and 38 had resection of the sigmoid colon or upper rectum. After distal transection of the bowel, the mesentery of the specimen was cut to the planned transection line determined by the surgeons judgement under normal quality. After ICG was injected intravenously, intestinal perfusion of the proximal colon was assessed in the fluorescent imaging mode. The quality of perfusion of the mesocolon and bowel wall and its impact on moving the resection line and complications of anastomosis healing 30 days postoperatively were all evaluated.

**Results:** Assessment of perfusion using fluorescent angiography was technically successfully performed in all patients. In 7 cases (7.9%) the resection line had to be moved for signs of poor perfusion of the bowel wall. Postoperatively, healing of the anastomosis was complicated in 7 patients (7.9%). Anastomotic leakage was recorded in 6 patients (11.8%) with total mesorectal excision and in 1 patient (2.6%) after resection of the sigmoid colon and upper rectum.

**Conclusion:** The presented results indicate that fluorescent angiography may lead to a decrease in the incidence of anastomosis dehiscence after colorectal resections by mapping the perfusion in details.



## O083 - Intestinal, Colorectal and Anal Disorders

### The Learning Curve of ESD Procedure in the European Settings. Analysis of 285 Consecutive Colorectal ESDs Performed by the Single Surgeon in Poland

M. Spychalski<sup>1</sup>, A. Dziki<sup>2</sup>

<sup>1</sup>Center of Bowel Treatment, BRZEZINY, Poland; <sup>2</sup>Medical University of Lodz, LODZ, Poland

**Background:** Endoscopic submucosal dissection (ESD) is perceived as technically difficult and carries a higher risk of complications than conventional endoscopy. The aim of the study was to analyze early results and complications of colorectal ESD procedures and defining the steps of the learning curve.

**Methods:** All ESD was performed by single surgeon only, who prior to service commencement undergone extensive training in Japan centres of excellence and numerous courses around the Europe. Between 2013 and 2016 285 cases of colorectal ESDs were performed (240 primary tumors, 45 recurrent). Retrospective analysis of ESD database was performed including size and localization of the tumor, en block resection rate, complications and recurrence during follow up endoscopy.

**Results:** The average size of the removed tumors was 40.6 mm (range 6 to 105 mm). Overall en block resection rate was 79.4%. After completing first 80 cases en block resection rate in primary tumors below 5 cm diameter was 86.4%. Perforation occurred in 18 cases (7.3%) and delayed bleeding in 10 cases (3.5%). Efficacy of ESD defined as en block resection rate, complication risk and procedure time statistically decreased in the tumors localized in proximal colon excising 5 cm of diameter.

**Conclusions:** The presented study is to our knowledge one of the largest concerning the ESD of colorectal tumors in this region of Europe. In concern to oncological results, ESD enables to safe tumor removal, regardless of size and location if the tumor is limited to submucosal layer. After 80 resections rates of en-bloc resections approach those in Asian centers. Tumors localized in proximal colon with diameter excising 5 cm are still a challenge even after first steps of the learning curve is successfully finished. Defining of learning curve steps might be helpful for one who plan to commence the dissection in colon and rectum.

## O084 - Intestinal, Colorectal and Anal Disorders

### Quality of Life in Rectal Cancer Treated by Endoluminal Loco-Regional Resection by Tem Vs Laparoscopic Total Mesorectal Excision: Long Term Results

G. d'Ambrosio, A. Picchetto, S. Campo, R. Palma, M. Agostini, A.M. Paganini, E. Lezoche

University of Rome "Sapienza,, Hospital Policlinico "Umberto I,, ROMA, Italy

**Background:** Endoluminal loco-regional resection (ELRR) by transanal endoscopic microsurgery (TEM) may be an alternative treatment option to laparoscopic total mesorectal excision (LTME), in selected patients with N0 rectal cancer. Post-operative Quality of Life (QoL) evaluation is an important parameter of outcomes related to high percentage of functional sequelae. We reported, in a previous published paper, the short and medium term results of QoL in patients underwent ELRR by TEM or LTME.

**Aim:** The aim is to evaluate the 3y QoL in patients with iT2-T3 N0/+ rectal cancer underwent ELRR by TEM or LTME after neoadjuvant radio-chemotherapy (n-RCT) in a retrospective analysis of prospectively collected data.

**Materials and Methods:** We enrolled in this study 39 patients with iT2-iT3 rectal cancer who underwent ELRR by TEM (n=19) or LTME (n=20), according to predefined criteria.

QoL was evaluated by EORTC QLQ-C30 and QLQ-CR38 questionnaires at admission, after n-RCT and 1, 6, 12 and 36 months after surgery.

**Results:** No statistically significant differences in QoL evaluation were observed between the two groups, both at admission and after n-RCT.

In short term (1–6 months) period, significantly better results were observed in ELRR group by QLQ-C30 in: Global Health Status (p=0.003), Physical Functioning (p=0.004), Role Functioning (p=0.004), Emotional Functioning (p=0.004), Cognitive Functioning, Fatigue (p=0.005), Dyspnoea (p=0.005), Insomnia (p=0.05), Appetite loss (p=0.05), Constipation (p=0.05); and by QLQ-CR38 in: Body Image (p=0.03) and Defecation (p=0.025).

At 1 year, the two groups were homogenous as assessed by QLQ-C30, whereas the QLQ-CR38 still showed better results of ELRR vs. LTME in Body Image (p=0.006), Defecation Problems (p=0.01), and Weight Loss (p=0.005).

At 3 years no statistically significant differences were observed between the two groups.

**Conclusions:** In selected patient with rectal cancer, underwent ELRR by TEM or LTME, QoL testes at 3 years don't show any statistical difference on examined items.

## O085 - Intestinal, Colorectal and Anal Disorders

### Comparison of Anastomotic Related Complications Between Intracorporeal and Extracorporeal Ileocolic Anastomosis

R. Bergamaschi<sup>1</sup>, S. Tou<sup>2</sup>, L. Martinek<sup>1</sup>, K.P. Lee<sup>1</sup>, S.B. Yelika<sup>1</sup>, S.K. Abbas<sup>1</sup>, K. You<sup>1</sup>

<sup>1</sup>State University of New York, Stony Brook, OLDFIELD, United States of America; <sup>2</sup>Derby Teaching Hospitals NHS Foundation Trust, DERBY, United Kingdom

**Aim:** Foreshortened mesentery or thick abdominal wall constitutes the rationale for laparoscopic intracorporeal ileocolic anastomosis (ICA). The aim of this study was to compare intracorporeal (IC) and extracorporeal (EC) ICA in terms of anastomotic related perioperative complications.

**Methods:** This was a prospective non-randomized surgeon's trial enrolling patients with Crohn's terminal ileitis or right colon cancer undergoing laparoscopic right colon resection with ICA by one surgeon. Propensity score matching with a 1:1 ratio for age, BMI, ASA, and previous abdominal surgery was employed to compare to diagnosis-matched patients with EC anastomosis by another surgeon. Anastomotic related perioperative complications included anastomotic leak, surgical site infections, and related reinterventions.

**Results:** Overall 453 (233 IC vs. 220 EC) patients were enrolled. Propensity score matching left 195 IC and 195 EC patients comparable for age (p=0.294), gender (p=0.683), ASA (p=0.545), BMI (p=0.079), previous abdominal surgery (p=0.348), and diagnosis (p=0.301). Operating time between IC and EC were 132±37 min and 140±36 min. Conversion rates (5.1% vs. 3.6% p=0.457), and intraoperative complications (1% vs. 2.1% p=0.45) were not related to the anastomosis. The rate of perioperative complications was higher in EC patients (5.1% vs. 12.8% p=0.008). Anastomotic leak (0.5% vs. 1.5% p=0.623), and reoperation rates (1% vs. 3.6% p=0.106) did not differ. SSI rates were higher after EC anastomosis (1% vs. 4.6%).

**Conclusions:** Patients that underwent intracorporeal ICA had fewer anastomotic related complications as compared to patients undergoing extracorporeal anastomosis.

## O086 - Intestinal, Colorectal and Anal Disorders

### A Novel Dye (IRDye® 800-Bk) for Near-Infrared Fluorescence Delineation of the Ureters During Laparoscopy: Preclinical Experience

M. al-Taher<sup>1</sup>, J. van den Bos<sup>2</sup>, R.M. Schols<sup>1</sup>, B. Kubatz<sup>2</sup>, N.D. Bouvy<sup>2</sup>, L.P.S. Stassen<sup>2</sup>

<sup>1</sup>Zuyderland Medical Center, MAASTRICHT, The Netherlands; <sup>2</sup>Maastricht University Medical Center, MAASTRICHT, The Netherlands

**Aim:** Despite advances in laparoscopic surgery, iatrogenic ureteral injuries during laparoscopy may still be encountered. Near-infrared fluorescence (NIRF) imaging is a promising new technique for intraoperative visualization of target organs and could thereby improve safety and efficiency of laparoscopic surgery. For ureteral imaging no effective dye for clinical use in the human is yet present. Previous experiments with the preclinical IRDye® 800CW resulted in a strong ureteral signal. This dye is however costly. Recently a new preclinical dye, IRDye® 800-BK, has been developed for intraoperative NIRF visualization of the ureters. Its cost are in the range of dyes that are used for other human indications. In this study we evaluated the enhancement of visualization of the ureters using IRDye® 800-BK.

**Methods:** This study consisted of three parts. In three 39 kgs landrace pigs the performance of the dye during in vivo laparoscopy was tested. Resp. 3, 6 and 12 ml of a 1 mg/ml solution were administered. Observations were performed from 10 min until 120 min after i.v. injection. Also ex-vivo, in fresh explanted porcine and in postmortem human ureters, the dye was tested, with dilutions up to 1:4096. The NIRF signal was expressed as the target-to-background ratio.

**Results:** In vivo, in the two highest doses, strong signals of peristaltic transport of urine in the ureters were observed, comparable to previous IRDye® 800CW results. In all ex vivo porcine and human ureters strong imaging was obtained up to dilutions of 1:256. Varying thickness of the ureteral wall had no influence, overlying fat however did.

**Conclusion:** This study demonstrates successful NIRF imaging of the ureter, both in vivo in the pig as ex-vivo in a porcine and human model, using the novel preclinical dye IRDye® 800-BK. Based on its performance and low cost it is a very promising dye for such imaging.

## O087 - Intestinal, Colorectal and Anal Disorders

### Long-Term Oncologic Outcomes Following Anastomotic Leak After Anterior Resection for Rectal Cancer: Less Chemotherapy, More Metastases

M.E. Allaix, F. Rebecchi, F. Famiglietti, S. Arolfo, M. Morino

University of Torino, TORINO, Italy

**Aim:** The evidence regarding the impact of anastomotic leak (AL) after anterior resection (AR) for rectal cancer on oncologic outcomes is controversial, and there are no data about the prognostic relevance of the International Study Group of Rectal Cancer (ISREC) AL classification. The aim of this study was to evaluate the oncologic outcomes in patients with AL after AR for rectal cancer. The prognostic value of the ISREC AL grading system was also investigated.

**Methods:** It is a retrospective analysis of a prospectively collected database including all patients undergoing elective AR for stage I-III rectal cancer (April 1996–September 2011). AL severity was defined according to the ISREC criteria. A multivariable analysis was performed to identify predictors of poor survival.

**Results:** A total of 532 patients underwent curative AR (69% laparoscopic) for high (36%) or mid-lower (64%) rectal cancer. AL rate was 9.8%. With a median follow-up of 68 (range, 12–242) months, 5-year overall survival (OS) rate was 67.6% in patients with AL and 86.9% in those without AL ( $P < 0.001$ ). AL was also associated with poorer 5-year disease-free survival (DFS) (48.4% vs. 81%;  $P < 0.001$ ). No significant differences were observed between ISREC grade A, B and C leaks. Local recurrence rate was 9.6% among patients with AL and 4.7% among those without AL ( $P = 0.232$ ). Distant metastases developed in 42.3% of patients with AL and in 16.6% of those without AL ( $P < 0.001$ ). AL was an independent predictor for poorer OS (HR 2.93; 95%CI 1.17–4.89) and DFS (HR 5.52; 95%CI 2.35–12.98) on multivariable analysis. Adjuvant chemotherapy was more likely not administered or delayed after AL (47.2% vs. 27.5%,  $P < 0.001$ ).

**Conclusion:** AL after curative AR for rectal cancer is associated with poor survival and a higher rate of distant metastases, regardless of severity. The reduced rate of adjuvant chemotherapy in AL patients might play a major role.

## O088 - Intestinal, Colorectal and Anal Disorders

### Section of the Mesorectum with Linear Stapler During Laparoscopic Resection for Rectal Cancer: A Technique to Avoid Coning of the Distal Margin

M. Garancini, A. Giani, A. Boscaneanu, M. Polese, A. Di Lucia, G. Bovo, V. Giardini, A. Delitala

San Gerardo Hospital, University of Milano-Bicocca, MONZA, Italy

**Aim:** Distal coning, defects in the mesorectum and completeness of the circumferential resection margin represent the crucial parameters of surgical specimens to be evaluated after rectal cancer resection to establish the quality of surgery and consequent local recurrence rate and long-term survival. In particular the mesorectum must be transected transversely to avoid coning towards the distal resection margin and possible loss of lymph nodes next to the tumor. Laparoscopy is widely used in rectal surgery, but some authors have recently reported that laparoscopic resection is inferior compared to open resection in terms of these pathologic outcomes. The aim of the present study was to report the application of a standardized surgical technique based on the section of the mesorectum with a linear stapler with the goal to avoid distal coning in a cohort of patients undergoing laparoscopic rectal resection.

**Methods:** From October 2008 up to December 2015 all consecutive patients undergoing laparoscopic rectal cancer resection in our department were enrolled in the study. Pathologic outcomes, clinical results and costs were analysed.

**Results:** 85 patients were included in the study. Post-operative morbidity and mortality rates were respectively 22.4 and 2.4%. Anastomotic leakage and post-operative bleeding occurred both in 3 patients (3.5%). Conversion rate to open surgery was 16.5%. Good plane, moderate plane and poor plane of surgery were achieved in 65.9%, 18.9% and 15.3% of patients, respectively. No patient showed distal coning. Positive circumferential and distal margins were found in respectively 11.8 and 1.2% of patients. Five-years overall survival and disease specific survival were respectively 80.7 and 85.5%. Three patients (3.6%) had local cancer recurrence during follow up; all of them had poor plane of surgery achieved but none of them had a positive margin. Cost analysis showed that section of the mesorectum required a mean of 2.2 stapler reloads, with a mean additional cost per patient of 371.8 Euro compared to section of mesorectum with other devices.

**Conclusions:** Section of the mesorectum with linear stapler may lead to no distal coning, improves the quality of surgical specimen during laparoscopic resection and is related to good short and long terms outcomes.

## O089 - Intestinal, Colorectal and Anal Disorders

### Transanal Close Rectal Dissection (TACRD) and Ileal Pouch-Anal Anastomosis: Short-Term Outcomes in Patients with Ulcerative Colitis

R. Pena<sup>1</sup>, F.B. Delacy<sup>1</sup>, A. Torroella<sup>1</sup>, (A) Otero<sup>1</sup>, (B) Martin-Perez<sup>1</sup>, M. Tasende<sup>2</sup>, R. Almenara<sup>1</sup>, A.M. Lacy<sup>1</sup>

<sup>1</sup>Hospital Clínic de Barcelona, BARCELONA, Spain; <sup>2</sup>Complejo Universitario A Coruña, A CORUÑA, Spain

**Aim:** In selected cases of ulcerative colitis (UC), restorative proctocolectomy with a J-pouch and ileal pouch-anal anastomosis (IPAA) is the treatment of choice. Total mesorectal excision has been preferred to perform the proctectomy, although a close rectal dissection (without following the holy plane) has also been described. Hybrid transanal CRD (TaCRD) appears to be the next step in the evolution of minimally invasive transanal surgery. We present the short-term outcomes and complications of our series.

**Methods:** All consecutive patients with UC treated at our hospital by TaCRD between September 2012 and November 2016 were prospectively included in a standardized database. In the majority of cases a three-stage procedure was performed.

**Results:** A total of 26 patients were analyzed. Mean age was 45.15 (SD 15.26) years with 65.4% male (n=17). Six patients (23.0%) were obese (BMI>24.9). Mean operative time for TaCRD and IPAA was 154.79 min (SD 50.1) without any conversion to pure laparoscopic or open approach. Three patients (11.5%) received a total colectomy and proctectomy with IPAA and loop ileostomy in the same intervention (as opposed to the standard two-step procedure). Stapled IPAA was performed in 22 patients (84.6%) and hand-sewn in four (15.4%). No intraoperative complications were reported. In the 30-day postoperative period, major (Clavien Dindo IIIb) complications were reported in two patients (7.69%). One presented pouch bleeding requiring blood transfusion and surgical hemostasis. The other presented early anastomotic leakage requiring a pouch redo. There was no report of pelvis sepsis or mortality. The mean follow-up time was 29.36 (SD 16.02) months. Three cases of pouchitis were reported, one of them requiring a terminal ileostomy. Functional evaluation was available for 18 (69.23%) patients, with a mean Oresland score of 4.7 and Wexner score of 1.4.

**Conclusions:** For patients with UC requiring surgery, TaCRD provided good short-term morbidity. Further investigation is justified to assess any benefit when compared to TME and abdominal CRD. Evaluation of functional results is still to be completed.

## O090 - Intestinal, Colorectal and Anal Disorders

### Assessment of Risk Factors for Anastomotic Leak After Rectal Cancer Surgery Through an Individual Participant Data Meta-analysis: The SYREAL Study

A. Arezzo<sup>1</sup>, P. Chiaro<sup>1</sup>, M. Migliore<sup>1</sup>, S. Arolfo<sup>1</sup>, C. Filippini<sup>1</sup>, D. di Cuonzo<sup>2</sup>, M. Morino<sup>1</sup>

<sup>1</sup>University of Torino, TORINO, Italy; <sup>2</sup>Città della Salute e della Scienza di Torino, TORINO, Italy

**Background:** Anastomotic leak (AL) after rectal cancer surgery constitutes a severe complication associated with poorer oncologic outcome and quality of life. Preoperative assessment of the risk for AL is a key component of surgical planning, during which the surgeon informs the patient about the individual risk and associated complications and can discuss the opportunity of creating an anastomosis with or without a defunctioning stoma. The aim of the SYREAL (SYstematic review of risk factors for REctal Anastomotic Leak) study was to increase the current knowledge base of the risk factors for AL in patients undergoing rectal cancer surgery.

**Methods:** Studies on rectal cancer surgery published between 2000 and 2015 were systematically reviewed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses of Individual Participant Data checklist (PRISMA-IPD) guidelines. Multiple imputation imputation by chained equations was used to fill missing data. A logistic regression model was fitted to determine the risk factors for AL. All significant variables ( $p < 0.05$ ) in the univariate analysis entered into the multivariable analysis. The project was registered with PROSPERO (CRD42016043053).

**Results:** The SYREAL consortium was composed of 26 centers that provided individual data on 9742 patients. Significant preoperative risk factors were: male sex (OR=1.2206, 95%CI [1.0685, 1.3944]), short-term preoperative radiotherapy (OR=1.2021, 95%CI [1.0276, 1.4063]) and Tumor distance (OR=0.9610, 95%CI [0.9420, 0.9800]). Factors not associated with increased risk of AL were obesity, diabetes, TNM, tobacco use, American Society of Anesthesiologists (ASA) grade, operative time, blood transfusion, preoperative chemotherapy, preoperative long-course radiotherapy, time between neoadjuvant therapy and surgery, manual or stapled anastomosis, pelvic drain.

**Conclusions:** Preoperative risk factor assessment for AL after rectal surgery can assist surgeons in decision making during preoperative planning. However, the potential benefits of creating a defunctioning stoma should be weighed against risk factors such as male gender, tumour distance and short-term preoperative radiotherapy.

## O091 - Intestinal, Colorectal and Anal Disorders

### Near-Infrared Fluorescence Angiography for Real-Time Intraoperative Guidance in Anastomotic Colorectal Surgery: A Systematic Review of Literature

J. van den Bos<sup>1</sup>, M. al Taher<sup>2</sup>, R.M. Schols<sup>1</sup>, N.D. Bouvy<sup>2</sup>, L.P.S. Stassen<sup>2</sup>

<sup>1</sup>Maastricht University, MAASTRICHT, The Netherlands;  
<sup>2</sup>Maastricht University Medical center, MAASTRICHT, The Netherlands

**Aim:** NIRF (Near-InfraRed Fluorescence) imaging is progressively used to enhance anatomical imaging in surgery. A promising application is NIRF angiography in anastomotic colorectal surgery. Early adopters are enthusiastic, however objective arguments are not always given. This review aims at determining the value of the technique by addressing its feasibility and effectiveness.

**Methods:** A systematic literature search of PubMed and EMBASE was conducted and reference lists were checked for additional studies. English language articles presenting original patient data were included without restriction of type of study, except for case reports, technical notes and video vignettes. The intervention consisted of NIRF angiography to assess perfusion of the colon and/or rectum. In order to determine its feasibility, information was collected on ease of use, added surgical time and complications related to the technique. Evaluation of its effectiveness was performed by studying data on improvement of the image, objective quantification of vascularisation, and aiding in decision making. Quality of manuscripts was assessed using the MINORS and Newcastle-Ottawa scales.

**Results:** 9 studies with 1284 patients were available for evaluation, of which four had a comparison group, without RCT's. Quality was variable. 720/1284 of procedures were performed laparoscopically or robotically. Overall the technique was regarded safe and feasible, with all systems easy to use, a mean of 4.5 min added surgical time and no complications directly related to the technique. Concerning the effectiveness, imaging was obtained in almost all patients. Quantification of the signal was performed in one study but without correlation to the level of perfusion. Aiding in surgical decision making is illustrated by revision of the surgical plan in 12% of all patients, and an overall decline in anastomotic leak rate from 7.4 to 4.9% although this result was not consistent between studies.

**Conclusions:** Based on reported safety and feasibility, with successful imaging in almost all patients, a change in surgical plan in 12% of patients and a suggestion of a decline in anastomotic leak rate, NIRF angiography can be considered promising. However, due to the variable quality of studies results should be interpreted with caution and further evaluation is warranted.

## O092 - Intestinal, Colorectal and Anal Disorders

### Outcomes of 58 Consecutive Transanal Total Mesorectal Excisions for Low Rectal Cancer

M. Adamina<sup>1</sup>, R. Troller<sup>2</sup>, F. Grieder<sup>2</sup>, E. Gmür<sup>2</sup>, H. Gelpke<sup>2</sup>, D. Schulthess<sup>2</sup>, S. Breitenstein<sup>2</sup>

<sup>1</sup>GERMAN EXPERT GROUP, Switzerland ; <sup>2</sup>Kantonsspital Winterthur, WINTERTHUR, Switzerland

**Aim:** Transanal total mesorectal excision (taTME) is an alternative to conventional mesorectal excision owing to its reported ability to achieve clear distal and circumferential resection margin in low rectal cancers. This study evaluates the perioperative and short-term oncologic outcomes of taTME.

**Methods:** Consecutive patients treated at a single centre by taTME were included in a prospective cohort study. Perioperative and short-term oncologic outcomes were measured along regular clinic visits and the results were reported as median and interquartile range (IQR). A prospective clinical registry was maintained and outcomes were independently assessed.

**Results:** 58 patients with a low rectal cancer (median 7 cm to anal verge, IQR 6–8) underwent a taTME between Feb 2013 and Jan 2017. Age and body mass index were 65 years (IQR 55.25–76) and 26 kg/m<sup>2</sup> (IQR 21.8–29.4). 43 (74%) patients had neoadjuvant radiochemotherapy. Median surgery time was 358 min (IQR 312–420), including an ileostomy in all patients. One hour surgery time was saved when taTME was performed by 2 teams working simultaneously (n=29, 333 min, IQR 304–409) compared to 1 team (n=29, 392 min, IQR 334–424), albeit this difference was not yet statistically significant (p=0.08). Similarly, surgical time decreased by 35 min with increasing experience e.g. 2-team first 15 patients (359 min, IQR 311–414) versus last 14 patients (325 min, IQR 263–396).

Dissection of the mesorectum was good (94% Quirke 3) and all distal and circumferential margins were clear. Median T stage was 3 (IQR 2–3). 16 patients had lymphnode metastases for a median number of retrieved nodes of 25.5 (IQR 18–34). Cumulative 30-day morbidity amounted to 32.7% major complications (Dindo Clavien III-V), including 6 anastomotic leaks (10%), of which 5 (8.6%) underwent successful drainage and endosponge therapy, and 29.3% minor complications (Dindo Clavien I-II). Median length of hospital stay was 13 days (IQR 9–16).

**Conclusion:** Transanal total mesorectal excision allows good surgical and oncologic quality to the expenses of a reasonable surgery time and morbidity.

## O093 - Intestinal, Colorectal and Anal Disorders

### Laparoscopic Resection for Primary and Recurrent Crohn's Disease: A Review of Over 100 Consecutive Cases

S. Panteleimonitis<sup>1</sup>, J. Ahmed<sup>2</sup>, T. Parker<sup>2</sup>, T. Qureshi<sup>2</sup>, A. Parvaiz<sup>3</sup>

<sup>1</sup>University of Portsmouth, PORTSMOUTH, United Kingdom;  
<sup>2</sup>Poole Hospital, POOLE, United Kingdom; <sup>3</sup>Champalimaud foundation, LISBON, Portugal

**Introduction:** Laparoscopic surgery for patients with Crohn's disease (CD) is considered challenging. The aim of this study is to evaluate the clinical outcomes of laparoscopic bowel resection in patients with CD. We also assessed the effectiveness of the laparoscopic approach in recurrent or emergency surgery due to CD.

**Methods:** All patients with CD, who underwent laparoscopic resection surgery in two units from October 2006 to February 2016, were identified through prospectively maintained databases. Their baseline characteristics and perioperative outcomes were analysed. The outcomes of patients receiving primary vs. recurrent and elective vs. emergency laparoscopic resections for CD were also examined.

**Results:** In total 106 patients underwent laparoscopic resection. Primary ileocolic resection was the most frequent procedure (62%) followed by redo-ileocolic resection (15%). Overall conversion rate was 4.7%. Median operative time was 130 (95–185) minutes and blood loss 20mls (0–50). Median length of stay was 4 days (3–6), 30-day readmission rate was 17% and 30-day re-operation rate 5.7%. There was one anastomotic leak (0.9%) and no 30-day mortality. Patients having primary resections were younger and had a longer length of stay (4 vs. 5 days; p=0.014). 96 procedures were performed electively and 10 as an emergency. 30 day re-operation rate was higher in patients having emergency surgery (3.1% vs 30%; p=0.011).

**Conclusion:** Laparoscopic resection surgery for CD is safe and feasible when operative technique and post-operative care has been standardised. Similarly, laparoscopic surgery is also a viable option for patients having recurrent resection or emergency surgery.

## O094 - Intestinal, Colorectal and Anal Disorders

### How Challenging is Higher Body Mass Index in Patients Undergoing Minimal Invasive Colorectal Surgery: Analysis from 1091 Consecutive Cases

S. Panteleimonitis<sup>1</sup>, J. Ahmed<sup>2</sup>, T. Nasir<sup>2</sup>, N. Figueiredo<sup>3</sup>, J.F. Cunha<sup>3</sup>, A. Parvaiz<sup>3</sup>

<sup>1</sup>University of Portsmouth, Portsmouth, United Kingdom; <sup>2</sup>Poole Hospital, Poole, United Kingdom; <sup>3</sup>Champalimaud foundation, Lisbon, Portugal

**Aim:** It is debatable whether obesity translates to a higher conversion rate and worse short term outcomes in laparoscopic colorectal surgery. This study examines whether body mass index (BMI) affects the short term peri- and post-operative outcomes of patients undergoing minimally invasive colorectal surgery.

**Methods:** Patients from two centres (one in Portugal, one in the UK) who received minimally invasive colorectal surgical resections between 2006 and 2016 were identified from prospectively maintained databases. The baseline characteristics and short term outcomes of obese patients (BMI ≥ 30) vs non-obese patients (BMI < 30) were analysed.

**Results:** A total of 1059 patients were identified (elective 96.3%, emergency 3.7%), 251 (24%) in the obese group (median BMI 32 (IQR 30–35)) vs 808 (76%) in the non-obese group (median BMI 25 (IQR 22.8–27)). Patient's baseline characteristics were comparable in terms of age, operating surgeon, gender and surgical approach (laparoscopic vs. robotic). ASA grade was worse in the obese group (p=0.006) and there more emergency cases in the non-obese group (4.5% vs 1.2%, p=0.13). There was no difference between the two groups in conversion rate (obese vs. non obese: 2% vs 1.1%, p=0.340), length of stay, anastomotic leak rate and 30-day readmission, reoperation and mortality rates. Operation time and blood loss were higher in the obese group (obese vs. non obese: 185 vs. 170 min, p=0.001; 10 ml vs. 0 ml, p=0.000). In patients with malignant disease lymph node yield was similar between the two groups but non-obese patients had more advanced tumours (T stage, p=0.037). Univariate and multivariate analysis showed that BMI does not affect conversion or morbidity and mortality.

**Conclusion:** The increased technical difficulty encountered in obese patients in minimally invasive colorectal surgery results in higher operative times and blood loss, although this is not clinically significant. However, conversion rate and post-operative short term outcomes are similar between obese and non-obese patients, despite obese patients having worse ASA grade.

## O095 - Intestinal, Colorectal and Anal Disorders

### Does Neoadjuvant Chemoradiotherapy Affect Clinical Outcomes in Patients with Rectal Cancer? A Propensity Score Matched Study from Two European Centres

S. Panteleimonitis<sup>1</sup>, M. Odermatt<sup>2</sup>, T. Amjad<sup>3</sup>, N. Figueiredo<sup>3</sup>, J.F. Cunha<sup>3</sup>, R.J. Heald<sup>3</sup>, A. Parvaiz<sup>3</sup>

<sup>1</sup>University of Portsmouth, Portsmouth, United Kingdom; <sup>2</sup>Poole Hospital, Poole, United Kingdom; <sup>3</sup>Champalimaud foundation, Lisbon, Portugal

**Aim:** Neoadjuvant chemoradiotherapy (RCT) is given to patients with rectal cancers who have either threatened or involve circumferential resection margin (CRM). There remains a debate that giving neoadjuvant-RCT increases the risks of worse short term outcomes. This study aims to investigate the short-term clinical outcomes of minimally invasive rectal cancer surgery patients receiving neoadjuvant-RCT vs. those that went straight to surgery.

**Methods:** A total of 390 consecutive patients that received rectal cancer surgery in two centres (one in the UK, one in Portugal) between 2006 and 2016 were identified from prospectively collated databases. Patients that received neoadjuvant-RCT vs. those that did not were 1:1 propensity score-matched for operating surgeon, tumour stage and surgical procedure. Their short- and intermediate-term outcomes were analysed.

**Results:** 94 patients that received neoadjuvant-RCT were matched with 94 patients that did not. Patients in the RCT group were slightly lower BMI (25.5 (IQR 23–29) vs 27 (IQR 25–31.2),  $p=0.003$ ). There were no differences in any other baseline characteristics (age, operating surgeon, gender, ASA grade, approach, surgical procedure, tumour stage). Lymph node yield was lower in the RCT-group (12.5 vs. 17,  $p=0.000$ ) but there were no differences between the two groups in operative time, blood loss, length of stay, conversion rate, R0 clearance, anastomotic leak rate and 30-day mortality, readmission and reoperation rates. Univariate and multivariate logistic regression analysis of all 390 patients showed that neoadjuvant-RCT does not affect morbidity and mortality.

**Conclusions:** In this two-centre study there were no differences in the intermediate- and short- term outcomes between patients that did or did not receive neoadjuvant-RCT. Patient receiving neoadjuvant-RCT had a lower lymph node yield secondary to the effect of RCT on lymph nodes. In this study population, neoadjuvant-RCT does not affect morbidity and mortality as demonstrated in logistic regression analysis.

## O096 - Intestinal, Colorectal and Anal Disorders

### Delaying Surgery After Neoadjuvant Chemoradiotherapy in Rectal Cancer: Does It Influence Surgical Approach or Short Term Clinical Outcomes?

N. Figueiredo<sup>1</sup>, S. Panteleimonitis<sup>2</sup>, S.G. Popeskou<sup>3</sup>, J.F. Cunha<sup>1</sup>, T. Qureshi<sup>3</sup>, G.L. Beets<sup>1</sup>, R.J. Heald<sup>1</sup>, A. Parvaiz<sup>1</sup>

<sup>1</sup>Champalimaud foundation, Lisbon, Portugal; <sup>2</sup>University of Portsmouth, Portsmouth, United Kingdom; <sup>3</sup>Poole Hospital, Poole, United Kingdom

**Aim:** Increasing the interval between end of neoadjuvant chemoradiotherapy (RCT) and surgery could improve the pathological complete response rate in patients with rectal cancer. However, controversy arises from waiting more than 8 to 12 weeks after RCT, as it might increase fibrosis around the total mesorectal excision (TME) plane potentially leading to technical difficulties and higher surgical morbidity. This study evaluates the type of surgical approach and short term post-operative outcomes in patients with rectal cancer that were operated before and after 12 weeks post RCT.

**Methods:** Patients from three centres (two in the UK, one in Portugal) who received rectal cancer surgery following neoadjuvant RCT between 2006 and 2016 were identified from prospectively maintained databases. Preoperative RCT was given to patients with high risk for local recurrence (threatened CRM  $\leq 2$  mm or T4 in staging MRI). The baseline characteristics and surgical outcomes of patients that were operated  $<12$  weeks and  $\geq 12$  weeks after finishing RCT were analysed.

**Results:** A total of 470 patients received rectal cancer surgery, of those 124 (26%) received neoadjuvant RCT. Seventy-six patients (61%) were operated  $\geq 12$  weeks after end of neoadjuvant-RCT and 48  $<12$  weeks. Patients in the  $\geq 12$  weeks cohort had a higher BMI (27 vs. 25,  $p=0.030$ ) and lower lymph node yield (11 vs. 14,  $p=0.001$ ). The remaining of the baseline characteristics were similar between the 2 groups (age, operating surgeon, gender, ASA grade, T stage, surgical approach, operation). Operation time, blood loss, conversion rate, length of stay, 30-day readmission rate, 30-day reoperation rate, anastomotic leak rate, 30-day mortality, CRM clearance, and ypT0 rates were similar between the 2 groups. Univariate and multivariate analysis showed that delaying surgery  $\geq 12$  weeks did not affect morbidity and mortality.

**Conclusion:** In our cohort, there was no difference in short term surgical outcomes between patients operated before or after 12 weeks following RCT. The planned surgical procedure and the proposed approach did not differ due to waiting after RCT. Delaying surgery by  $\geq 12$  weeks is safe, feasible and does not result in higher surgical morbidity.

## O097 - Intestinal, Colorectal and Anal Disorders

### Location and Histological Features of Colonic Polyps: Review of 6000 Colonoscopies and 600 Polyps

H. Qandeel, M. Alqudah, A.R. Al Manasra, R. Elayyan, S. Al-Smadi, N. Al-Zoubi, M. Obeidat

Jordan University of science and technology, Irbid, Jordan

**Aim:** The true prevalence of colonic polyp is unknown. We aim in this study to determine the prevalence location and histologic features of colonic polyps.

**Methods:** clinical data was collected for patients who underwent colonoscopies for all indications between 2009 and 2015. Information about polyps' site, size and histology were included.

**Results:** 5048 consecutive patients underwent 6098 colonoscopies between (2009–2015). The mean age was 57 (range 16–98) and 62% of them were males. At least one polyp was found in 570 colonoscopies (9.3%) in 439 patients (8.7%). Abdominal pain was the most common (28%) indication for colonoscopies, but the least common indication for cancer polyps cases. Altered bowel habits, bleeding per rectum and follow-up were the most common indications for colonoscopies in cancer cases.

Cancer was detected in 26 (4.3%) out of total 603 polyps. The rest of polyps were classical adenomas 260/603 (43.1%), serrated lesions 315/603 (52.2%) and others 2/603 (0.3%). Adenomas were subdivided into tubular 172/260 (66.15%), tubule-villous 59/260 (22.7%) and villous 29/260 (11.15%). Serrated lesions were subdivided into hyperplastic polyps 163/315 (51.7%), mixed dysplastic/hyperplastic polyps 137/315 (43.5%), and others 15/315 (4.8%).

Polyps were predominantly left-sided colorectal (66.6%): descending colon (13.9%), sigmoid colon (17.3%), recto-sigmoid (15.6%) and rectum (19.8%). 12% of the polyps were synchronous. 43/53 (81%) of the high grade dysplasia adenomatous polyps and 16/26 (65.4%) of the cancer polyps were in the left-sided colorectal area. About one-third of all polyps, two-thirds of the cancer polyps and two-thirds of the high grade dysplastic adenomas were 1 cm or greater in size. There was no association between age or gender and the grade of dysplasia or cancer.

**Conclusion:** Left sided colorectal polyps have higher risk of 'cancer' and 'high grade dysplastic adenomas'. Left-sided colorectal polyps must be treated more seriously, especially the larger ones.

## O098 - Intestinal, Colorectal and Anal Disorders

### Adoption OF Standardised Technique Fro Robotic Rectal Surgery with the da Vinci Xi System and Integrated Table Motion

S. Panteleimonitis<sup>1</sup>, S.G. Popeskou<sup>2</sup>, H. Domingos<sup>3</sup>, J. Ahmed<sup>2</sup>, N. Figueiredo<sup>3</sup>, T. Qureshi<sup>2</sup>, A. Parvaiz<sup>3</sup>

<sup>1</sup>University of Portsmouth, Portsmouth, United Kingdom; <sup>2</sup>Poole Hospital, Poole, United Kingdom; <sup>3</sup>Champalimaud foundation, Lisbon, Portugal

**Introduction:** The da Vinci Xi® is the 4th generation robotic system from Intuitive Surgical and coupled with the integrated table motion enables the surgeon to perform single docking robotic surgery without having to change the port configuration during the operation and reduces the time the patient spends in the steep Trendelenburg position. The aim of this study is to present a standardised technique for single docking robotic rectal surgery with the da Vinci Xi system and see it's impact on short term clinical outcomes in two European centres.

**Method:** Prospectively collected data from two European centres (Poole & Lisbon) for consecutive patients who underwent robotic rectal cancer surgery with the da Vinci Xi between November 2015 and December 2016 was analysed. Two consultant surgeons were taught by a single trainer using the standardised approach to procedure. Splenic flexure was mobilised for all anterior resections. The time the patients spent on the reverse Trendelenburg position during splenic flexure mobilisation was also recorded.

**Results:** 45 consecutive patients (31 male) of median age 69 years (IQR 60–77) with histological proven adenocarcinoma of rectum were operated during the study period. Median BMI was 28 (IQR 25–30). 18 (40%) of them received neoadjuvant chemoradiotherapy. 38 (85%) patients had anterior resections and 7 (15%) abdominoperineal excisions. There were no conversions to open, no anastomotic leaks and no 30-day mortality. Median operation time was 331 (249–372) minutes, blood loss 20 (20–45) mls and length of stay 5 (IQR 4–8) days. 30-day readmission rate and re-operation rates were 4% (n=2). Median reverse Trendelenburg time was 30 (IQR 21.25–35) minutes.

**Conclusion:** Our results show that adoption of the closely supervised, standardised approach to the single docking procedure with the da Vinci Xi is a valid, reproducible technique that offers good short term outcomes. The technological advances of this new robotic system coupled with the integrated table motion enables the use of the totally robotic single docking approach whilst reducing the time spend in the steep Trendelenburg position.

## O099 - Intestinal, Colorectal and Anal Disorders

### Anterior Medial-to-Lateral and Caudal-to-Cranial Approaches to D3 Lymph Node Dissection in Laparoscopic Right Hemicolectomy for Right Colon Cancer

I.A. Tulina, S.K. Efetov, L.V. Sidorova, P.V. Tsarkov

Sechenov First Moscow State Medical University, Moscow, Russia

**Aim:** To compare intraoperative characteristics of two approaches to perform D3 lymph node dissection (LND) in laparoscopic right hemicolectomy for extended right colon cancer.

**Methods:** D3 LND comprises of removal of paravesical fat with lymph nodes around the roots of ileo-colic (IC) artery, right colic (RC) artery and middle colic (MC) artery. To do that the trunk of superior mesocolic artery (SMA) should be identified. In traditional "anterior medial-to-lateral" (A-M-L) approach this is performed through visualization of superior mesocolic vein (SMV) trunk first. For that the last iliac vessels in the mesoileum are found and moving upwards the SMV trunk is met. Moving further upwards along SMV it is possible to clearly see the roots of IM, RC and MC veins and at the same place corresponding IM, RC and MC arteries. By clearing the fat off the latter D3 LND is performed. Recently a modified "caudal-to-cranial" (C-C) approach was proposed. First, the mesoileum related to the last 10–15 cm of ileum is mobilized from underneath in cranial direction up to the level of pancreas head. After this tunneling manoeuvre between mesoileal and mesocolic fascias, and underlying duodenum and pancreas together with their vessels, the same steps as described above in A-M-L approach are performed. Preliminary tunneling under colonic vessels roots facilitates their further identification, minimizes the risk of duodenum and pancreas trauma and eases entering the right mesocolic plane of medial-to-lateral dissection. Retrospective comparison of 16 A-M-L (performed in 2009–2014) and 10 C-C (2015–2016) laparoscopic right hemicolectomies was done.

**Results:** A-M-L and C-C approaches didn't differ significantly in operating time (249.0±10.8 vs. 252.9±16.2 min, p=0.27), intraoperative blood loss (147.5±40.2 vs. 185.4±24.9 ml, p=0.23) and conversion rate (12.5% and 10%, p=0.38). Postoperative complications were not associated with approach.

**Conclusions:** Both approaches appear to be safe and feasible. Instead of expected superiority modified C-C approach didn't demonstrate significant benefit in operating time, blood loss, conversion rate and complications. The major limitations (low patient number and retrospective analysis) may influence that.

## O100 - Intestinal, Colorectal and Anal Disorders

### A New Suprapubic Approach for Robotic Right Colectomy with CME

W. Petz<sup>1</sup>, D. Ribero<sup>1</sup>, E. Bertani<sup>1</sup>, M.L. Polizzi<sup>1</sup>, G. Formisano<sup>2</sup>, P.P. Bianchi<sup>2</sup>, G. Spinoglio<sup>1</sup>

<sup>1</sup>European Institute of Oncology, Milano, Italy; <sup>2</sup>Ospedale della Misericordia, Grosseto, Italy

**Aims:** Laparoscopic complete mesocolic excision (CME) for right colon cancer surgery is not widely diffused, owing to significant technical challenges. Robotic assistance may play an effective role in decreasing difficulties of laparoscopic CME in right colectomy, and may therefore contribute to expand its use, ameliorating oncologic outcomes. Aim of this paper is to present results of robotic right colectomy with CME with a new technique of posterior dissection and suprapubic trocars layout.

**Methods:** From July to December 2016, all patients candidates to robotic right colectomy with CME underwent the colonic resection with a suprapubic approach at two Institutions. Surgery was realized with the Da Vinci Xi system, and all trocars were placed along a horizontal line 3 cm above the pubis. Dissection was performed bottom-to-up, first separating Toldt's fascia of ascending mesocolon from Gerota's fascia on posterior plane; an extensive lymphadenectomy along superior mesenteric vessels axis was realized in all cases.

**Results:** Study population comprises 18 patients (8 males, 10 females) with a median age of 69 years and a median body mass index of 27 kg/m<sup>2</sup>. Median operative time was 249 min, blood losses were negligible, no conversions to open or laparoscopic surgery occurred. Median hospital stay was six days (range 4–9); no anastomotic leak occurred, the only observed complications were two anastomotic bleedings. No patient died postoperatively. Resection margins were negative in all patients; median tumour diameter was 3.6 cm (range 2.4–6), median specimen length was 40 cm (range 26–66) and median number of harvested lymph nodes was 40 (range 19–67).

**Conclusions:** Robotic right colectomy with CME using a suprapubic approach is a feasible and safe technique that allows for an extensive lymphadenectomy and provides high quality surgical specimens.

## O101 - Intestinal, Colorectal and Anal Disorders

### Conversion of Curative Laparoscopic Rectal Resection for Rectal Cancer Does not Lead to Worse Outcomes than Primary Open Rectal Surgery

M.E. Allaix, E.J. Furnée, L. Esposito, A. Arezzo, M. Morino

University of Torino, Torino, Italy

**Aim:** Laparoscopic rectal resection (LRR) for rectal cancer is a challenging procedure, with conversion to open surgery being reported in up to 30% of cases. There is limited evidence about short-term and long-term oncologic outcomes after converted LRR. Since only a few studies with short follow-up have compared converted LRR and open RR (ORR), it is unclear if the laparoscopic approach should be always attempted also in those patients with preoperatively known high risk of conversion. The aim of this study was to compare both early postoperative outcomes and long-term survival after converted LRR or ORR for non-metastatic rectal cancer.

**Methods:** A prospective database of consecutive curative LRR and ORR for rectal cancer was reviewed. Patients who required conversion (CONV group) were compared with those who had primary open rectal surgery (OPEN group). Only patients with a minimum 5-year follow-up were included in the oncologic analysis. A multivariate analysis was performed to identify predictors of poor survival.

**Results:** A total of 257 patients were included in the study: 47 had a converted LRR (CONV group) and 210 had a ORR (OPEN group). The most common reasons for conversion were a locally advanced tumor or pelvic adhesions secondary to neoadjuvant chemoradiation therapy (44.7%) and obesity (31.9%). There were no differences in perioperative morbidity, mortality and length of hospital stay between the two groups. With a median follow-up of 79 (range, 12–266) months, 5-year overall survival was 76.4% in CONV patients and 76.8% in OPEN patients ( $P=0.956$ ). Five-year disease-free survival was 61.4% and 74.5%, respectively ( $P=0.064$ ). Poor tumor differentiation, lympho-vascular invasion and a lymph node ratio of 0.25 or greater were independently associated with poorer survival.

**Conclusion:** These results suggest that even challenging cases should be approached laparoscopically. Even though disease-free survival is reduced after converted LRR, conversion *per se* does not impair the outcomes in rectal cancer patients.

## O102 - Intestinal, Colorectal and Anal Disorders

### Is Discharge Within 24 Hours from a Laparoscopic Colectomy Feasible and Safe? Experience from Two UK Centers

S.G. Popeskou, S. Panteleimonitis, E. Langford, A. Parvaiz, T. Qureshi

Poole Hospital, Poole, United Kingdom

**Introduction:** Enhanced recovery programs combined with minimally invasive surgery have significantly reduced hospital stay after elective colorectal resections. This study focuses at whether patients can be discharged safely within 24 h following a laparoscopic colectomy.

**Methods:** Prospectively collected data from two UK centers, ranging from 2006 to 2016 were analyzed. Patients with both benign and malignant pathology undergoing elective laparoscopic colonic resections were included. A standardized, modular approach to surgery in combination with ERAS were followed, with the exception of epidural analgesia being replaced with single shot spinal infiltration. To confirm safe discharge, patients were followed up by a nurse-lead telephone call system. The short-term clinical outcomes were analyzed.

**Results:** A total of 850 patients underwent elective laparoscopic colonic resections. A group of 53 (6.2%) patients were discharged within 24 h following surgery. There were no conversions or mortality associated with surgery. From them, 4 (7%) patients were readmitted within 30 days of discharge and 2 (3%) required reoperation within 30 days. (Small bowel obstruction & wound abscess drainage). Our analysis indicates that elevated BMI ( $p=0.041$ ), female sex ( $p=0.009$ ) and benign pathology ( $p=0.017$ ) were factors negatively affecting a 24h discharge.

**Conclusion:** This study demonstrates that the concept of a 24-hour discharge following elective laparoscopic colorectal resections is safe and feasible in selected patients. A standardized approach to laparoscopic surgery and adherence to an ERAS protocol helps to achieve this.

## O103 - Intestinal, Colorectal and Anal Disorders

### Clinical Effect of Indocyanine Green (ICG) Enhancement Pattern to Reduce Anastomotic Complications During Laparoscopic Colorectal Surgery

G.M. Son

Pusan National University Yangsan Hospital, Gyeongsangnam-Do, Republic of Korea

**Aim:** This study is to evaluate clinical effect of indocyanine green (ICG) enhancement pattern to reduce anastomotic complications during laparoscopic colorectal surgery.

**Methods:** Fluorescence imaging system, IMAGE1 S™ (Karl Storz, Germany) was applied to colorectal cancer patients ( $n=57$ ) from July, 2015 to December, 2016. Fixed consecutive images were obtained from operation video of colorectal cancer patients under informed consents. Fluorescence intensity of colonic flow was measured as mean value of interested area using Images J 1.49v (Wayne Rasband, National Institutes of Health, USA). Time to half of maximal intensity (T1/2max) was calculated and adjusted with latency (adjusted T1/2max). ICG enhancement patterns were categorized to fast, moderate, and slow group by adjusted T1/2max. We compared anastomotic complications between initial period ( $n=21$ ) with simple ICG perfusion test and recent period ( $n=36$ ) with ICG perfusion analysis and optimal engagement.

**Results:** Operations were intersphincteric resection (5 cases), low anterior resection (29 cases), anterior resection (14 cases), and right hemicolectomy (9 cases). Incidence of anastomotic complication was 8.8% including stricture ( $n=1$ ), leak ( $n=3$ ), and colonic necrosis ( $n=1$ ). Reoperations were needed for 3 cases (5.3%). ICG enhancement pattern of initially planned transection segments were classified as fast ( $n=46$ ), moderate ( $n=8$ ), and slow ( $n=3$ ) group. After transection lines were changed in some cases, patients were reclassified to fast ( $n=52$ ), moderate ( $n=4$ ), and slow ( $n=1$ ) group. Anastomotic complication rates were 1.9% (1 case), 75% (3 cases) and 100% (1 case), respectively ( $p<0.001$ ). According to period, incidences of poor perfusion were similar (33.3% vs. 11.1%,  $p=0.121$ ), but anastomotic complications were reduced significantly (19.0% vs. 2.8%,  $p=0.036$ ) in the period 2 with perfusion analysis and optimal engagement. Diagnostic values of perfusion analysis were 80% of sensitivity, 98.1% of specificity, 96.5% of accuracy, 80% of positive predictive value, 98.1% of negative predictive value to detect poor perfusion segment. On logistic regression model, ICG enhancement pattern was analyzed as independent factor for anastomotic complications ( $p=0.013$ ).

**Conclusion:** ICG enhancement pattern using adjusted T1/2max could be applied to detect poor perfusion segment for optimal anastomosis and to reduce anastomotic complications during laparoscopic colorectal surgery.

## O104 - Intestinal, Colorectal and Anal Disorders

### Hartmann's Pouch and Laparoscopic Cholecystectomy: The Problems and the Solutions

M. Sajid, T. Katbeh, S. Breaky, Z. Ahmed, A.H.M. Nassar

NHS, Glasgow, United Kingdom

**Background:** Hartmann's Pouch Stones (HPS) are occasionally encountered during laparoscopic cholecystectomy (LC). Difficulties can be posed in safe dissection of the pedicle due to either pathological sequelae e.g. Mirizzi's Syndrome, Mucocele and empyema or distortion of the anatomy, with possible increase in the risk of bile duct injury.

**Aim:** To identify the incidence, presentation, intraoperative findings, technical problems and solutions related to HPS encountered during laparoscopic cholecystectomy.

**Methods:** A prospectively collected computerised database of preoperative, operative and post-operative data of 4898 patients who underwent LC between 1992 and 2016 under a single surgeon was analysed. 571 (12%) patients were found to have HPS intraoperatively.

**Results:** 405 (71%) were females with a median age of 52 (14–86) years. 36% were ASA 1, 44% ASA 2, 12% ASA 3 and 0.4% ASA 4. Patients presented with one or more of the following: 49% with acute biliary pain, 25% chronic biliary pain, 28% acute cholecystitis, 4% acute pancreatitis, and 16% jaundice with or without cholangitis. In terms of US findings: 535 were positive for gallbladder stones; of which 435 showed multiple stones, 200 had gallbladder wall thickening/contraction, 5 mucocele, 85 Common Bile Duct (CBD) dilatation/stone. With regards to difficulty grading (Nassar's scale) 8 (1%) patient were graded as I, 70 (12%) grade II, 232 (41%) grade III, 237 (41%) grade IV and 20 (4%) grade V. 500 patients required adhesiolysis, 39 (8%) required fundus first dissection. 544 (95%) patients underwent Intra-operative cholangiogram (IOC). 87 patients had Common Bile Duct (CBD) stones requiring exploration. Patients had one or more of the following operative findings: 93 (16%) acute cholecystitis, 173 (30%) of empyema, 143 (25%) cases of mucocele and 12 (2%) had Mirizzi's syndrome. 3 cases were converted to open cholecystectomy. One mortality 5 weeks post op from sepsis and liver failure due to multiple liver abscesses.

**Conclusion:** HPS increases the difficulty of performing LC. Careful dissection, stone removal, fundus-first dissection and the use of routine IOC are useful measures to avoid ductal injury and reduce the conversion rate.

## O105 - Intestinal, Colorectal and Anal Disorders

### Major Vessels Sealing with Radiofrequency Device in Laparoscopic Surgery for Colorectal Cancer: A Large Single Centre Experience

M. Grieco, M. Carlini, D. Spoletini, D. Apa

Ospedale Sant'Eugenio, Roma, Italy

**Background:** Adequate haemostatic techniques in colorectal laparoscopic surgery are essential for optimal intra and postoperative results.

**Aim:** of this study was to evaluate feasibility and effectiveness of major vessels sealing with radiofrequency device in laparoscopic resections for colorectal cancer.

A variety of energy based devices are available for dissection of major vascular structures including vascular staplers, ultrasonic coagulating shears, bipolar forceps, clips and radiofrequency dissectors. Few controlled but heterogeneous studies compared these procedures.

Electrothermal bipolar vessel sealer Ligasure® applies electrical power to the tissue with high frequency and low voltage, which results in elastin and collagen denaturation and rearrangement that seal blood vessels up to 7 mm in diameter. The device provide efficient transection, minimum thermal damage, reliable vessel sealing, and low visual obstruction from mist or smoke.

**Methods:** Early outcome of 676 consecutive unselected patients who underwent elective laparoscopic resection for colorectal cancer, performed with LigaSure® in our institution over a 10 years period (2006–2016), are reported.

In all cases only the electrothermal bipolar vessel sealing device was used for dissection and ligation of all the major vessels, included the mesenteric vessels.

**Results:** 642 procedures were completed in laparoscopy. Vessel sealing was achieved in 100% of cases without any intraoperative or postoperative major bleeding. No secondary surgical procedure for bleeding was required for bleeding from major vessels for a for any of the patients. 1 surgical procedure was required, 3 h after a right hemicolectomy, due to venous bleeding from the omentum, probably for surgical manipulation.

Overall satisfaction with the 5 mm LigaSure® was higher than 10 mm instrument, with advantages in terms of accuracy of dissection, speed, handling and safety .

**Conclusions:** The radiofrequency device was completely safe and effective to seal and divide the major mesenteric vessels during laparoscopic colorectal resection with a very high success rate. Furthermore this device reduces the operative time, blood loss and costs.

## O106 - Intestinal, Colorectal and Anal Disorders

### Laparoscopic Surgery of Benign Entero-Vesical or Entero-Vaginal Fistulae

C.N. Keller, M.J. Kraemer

St. Barbara-Klinik, Hamm, Germany

**Aim:** Entero-vesical/vaginal fistulae (EVF) are an uncommon septic complication mainly of diverticular disease. They are usually situated within extensive and dense inflammatory masses occluding the entrance of the pelvis. There are still some controversies regarding laparoscopic feasibility and treatment modalities of EVF.

**Methods:** Retrospective chart review of EVF-patients operated at our department since 2008. Patients were identified by use of the computerized hospital information system.

**Results:** 19 patients (10 males), median age (68y), 13 entero-vesical, six entero-vaginal fistulae. The fistulae were caused by complicated diverticular disease in 16 patients (84%), Crohn's disease (two patients), ulcerative colitis (one patient). All cases were attempted laparoscopically. Operative treatment involved separation of the inflammatory mass and resection of the affected colorectal segment. There were three conversions (16%), all three requiring bladder repair considered too extensive for laparoscopic means. Small bladder defects were sutured laparoscopically in two further patients, the remaining patients requiring no bladder repair. The inferior mesenteric artery was preserved in all cases. Median operative time was 180 min. Two patients received a protective ileostomy: one converted patient and one cachectic patient with Crohn's disease under immune-modulating therapy. Both ileostomies were closed. Altogether, there were five complications in five patients (26%), four of them were minor (Clavien grade I&II). The cachectic patient with Crohn's disease suffered a major (Clavien grade IIIb) complication (stoma prolapse, treated by early closure of the ileostomy). There was no anastomotic leakage, and no mortality. Median hospital stay was 12 days.

**Conclusions:** The laparoscopic approach is a safe option for the treatment of EVF of benign inflammatory origin. In most cases it offers all the advantages pertaining to minimally invasive surgery. For a definite and causal approach the disorder belongs primarily within the therapeutic domain of the visceral surgeon. Following the separation of the inflammatory colon most of the bladder lesions caused by EVF will heal without further surgical measures.

## O107 - Intestinal, Colorectal and Anal Disorders

### The Dominance of Artery in Hemorrhoids: Targeting the Specific for Disease Rectification

Q. Ul Ain, Y. Bashir, E. Eguare

Naas General Hospital, Naas Co. Kildare, Ireland

**Introduction:** Internal hemorrhoids have 3 main cushions, which are located at left lateral, right posterior and right anterior areas of the anal canal. However, this combination is found in only 19% of patients; hemorrhoids can be found at any position within the rectum. While it is known that hyper vascularity and increased flow is present in hemorrhoidal disease, the dominant artery leading to symptoms is not known. With high recurrences from most treatment modalities, our study aims at identification of the dominant vessel and ligation of which will ensure reduced recurrence.

**Methods:** It is a prospective study conducted on patients who underwent THD from July 2015–September 2016. Each patient subjected to THD-M (Transanal hemorrhoidal artery dearterialization–mucopexy), had all the arteries evaluated using Doppler ultrasound and recorded on designed Performa. The arteries were assessed at 1,3,5,7,9 and 11 O'clock in lithotomy position. The artery with highest Doppler signals was considered as the dominant artery. All the Doppler ultrasound measurements were performed by the same individual (The operating surgeon), to avoid operator-related errors. Statistical analysis was conducted by SPSS v23.0.

**Results:** 40 (Male n=19, Female n=21) patients were included in the study that underwent THD. The dominant artery with highest available signals was located at 10 O'clock (n=13). There is no statistical significance of dominant artery to age or gender (p=0.335).

**Conclusion:** Our pilot study shows that every individual has a dominant artery in hemorrhoidal plexus, and its identification and subsequent ligation should be mandatory, during THD. This in turn will ensure fewer recurrences with better outcomes. A larger cohort study will be needed to further validate this study.

## O108 - Liver and Biliary Tract Surgery

### Management of Patients with Mechanical Icterus, Cholangitis and Biliary Sepsis in the Presence of Cholecystocholedocholithiasis

D. Popov, A.Y. Korolkov, A.O. Tantsev

Pavlov First Saint Petersburg State Medical University, Saint Petersburg, Russia

**Aim:** To improve the results of treatment of patients with mechanical icterus, acute cholangitis and biliary sepsis in the presence of cholecystocholedocholithiasis.

**Materials:** In the period from 2014 to 2016 in surgical clinic of Pavlov Saint-Petersburg State Medical University 57 patients with cholecystocholedocholithiasis were treated.

**Methods:** In each group of patients the following parameters were estimated: rate and severity of postoperative complications, general time of operation, totality of a lithoextraction, rate of conversions, lethality, mean duration of hospital stay.

**Results:** 18 patients had an acute cholecystitis (31,6%), 39 (68,4%)—the chronic one. 31 patients (54,4%) had a mechanical icterus, 23 (40,4%)—cholangitis, 3 patients (5,2%) had a biliary sepsis. To all patients with a mechanical icterus and cholangitis, despite the presence of inflammation of the gallbladder, the single-step operations was performed: in 21 (38,6%) cases—a single-step laparoscopic cholecystectomy (LC) with laparoscopic choledocholithotomy (LCLT), 30 (54,8%)—single-step LC with intraoperative endoscopic papillosphincterotomy (IOES). In 3 (5,6%) cases, in view of the existence of contraindications, traditional cholecystectomy with a choledocholithotomy was performed and in 1 case (1,9%) we had a conversion. To the patients with a biliary sepsis with an uninfamed gallbladder low-invasive procedures were performed (percutaneous cholecystostomy, IOES) and then after patients stabilization LC was carried out; in the case of a biliary sepsis in the presence of an acute cholecystitis single-step LCE+LCLT was performed.

**Conclusions:** In cases of mechanical icterus and cholangitis proceeding in the presence of cholecystocholedocholithiasis, despite the presence of inflammation of the gallbladder, the single-step combined treatment is shown. Advantage among single-step procedures is necessary to give to LCE+LCLT, because in comparing with LC+IOES it has a less postoperative lethality (4,7% vs 10,0%), and also less rate (6,2% vs 17,4%) and severity of postoperative complications. In case of a biliary sepsis, with no inflammation of gallbladder, performance of low-invasive procedures, referred on decompression of biliary ducts, is shown and after stabilization of patient's condition LC performing is necessary. In case of biliary sepsis, proceeding in the presence of an acute cholecystitis, the operation of choice is LCE+LCLT.

## O109 - Liver and Biliary Tract Surgery

### Single Port Versus two-Port Laparoscopic Cholecystectomy: A Prospective Randomized Study

E.G. Shahin

Private clinic, Alexandria, Egypt

**Aim:** Laparoscopic cholecystectomy (LC) is the gold standard for gall bladder removal. The aim of this prospective randomized study was to compare between the surgical outcomes single-port laparoscopic cholecystectomy (SPLC) and the two-port laparoscopic cholecystectomy (TPLC).

**Methods:** Fifty patients with uncomplicated gall stone disease were randomly allocated to either SPLC group or TPLC group. Data regarding patients demographics, operative time, intraoperative and postoperative complications, postoperative pain scores and patient satisfaction with the final outcome were recorded.

**Results:** All procedures were completed laparoscopically and there were no conversions to either conventional LC or open cholecystectomy. The median *total operative time* was statistically significantly shorter in the TPLC group compared to the SPLC group (60 vs. 71 min;  $p=0.028$ ). The difference in the overall 24-hour postoperative median pain score between both study groups was statistically insignificant. The median patient satisfaction score was statistically significantly higher in the SPLC group.

**Conclusion:** Both techniques are feasible, safe and can be performed with comparable surgical outcomes. However, Single-port LC is associated with a higher patient satisfaction score.

## O110 - Liver and Biliary Tract Surgery

### Grade II Acute Cholecystitis: Laparoscopy or Laparotomy? A Retrospective Cohort Study Using Propensity Score Adjustment Analysis

S. Zribi, M. Bouassida, M.F. Chtourou, S. Sassi, B. Mroua, M.M. Mighri, H. Touinsi

Mohamed Taher Maamouri, Sfax, Tunisia

**Aim:** According to the Tokyo Guidelines 2013 (TG13), the management of Grade II acute cholecystitis (AC) is not consensual. Our aim was to compare laparotomy to laparoscopy for grade II AC using Propensity score adjustment analysis.

**Methods:** Our study is retrospective, including 448 patients operated for grade II AC according to Tokyo Guidelines 2013. Patients were divided into two groups: 231 patients operated by laparoscopy (group A) and 217 patients operated by laparotomy (group B). Both of these groups were compared before and after adjustment using the Propensity score. The ability of the propensity model to balance the two groups was assessed in two ways. First, a ROC curve analysis and a probability density function were computed. Second, we compared the distribution of baseline characteristics across the two groups before and after propensity adjustment, to ensure that the adjusted differences were small and not significant.

**Results:** Before adjustment patients in group B were older than patients in group A, with a higher rate of patients suffering from heart disease; white blood cell count and total bilirubin were higher in group B; there were more thickening of the gallbladder wall at ultrasonography in group B and the rate of gangrenous cholecystitis was higher in group B. All these factors were considered as confounding and were used in adjustment. After computation of this PS, area under the ROC curve of the model was  $80.9\% \pm 0.033$ , suggesting its good performance. After the adjustment, there were no significant differences between the two groups for the confounding factors. The morbidity, the mortality and the reoperation rate were similar in the two groups. The duration of hospital stay and the direct medical costs were significantly higher in group B.

**Conclusion:** Patients with grade II AC should be operated using laparoscopic approach since their hospitalisation is shorter and without significant complications.

## O111 - Liver and Biliary Tract Surgery

### Laparoscopic Management of Acute Empyema of Gallbladder

V.V. Grubnik, V.V. Ilyashenko, O.I. Tkachenko, V.V. Mishenko

Odessa national medical university, Odessa, Ukraine

**Aim:** Acute cholecystitis (AC) is a common indication for surgery. Surgical management of AC might be associated with high rates morbidity and mortality. Empyematous cholecystitis (EC) is one of the most severe forms of AC. The aim of the study was to investigate the outcomes of patients undergoing laparoscopic surgery of EC.

**Methods:** We performed retrospective analysis of results of laparoscopic cholecystectomies. Cases with EC were compared to cases without gallbladder empyema with regard to baseline features, clinical parameters and surgical outcomes.

**Results:** From 1996 to 2016, laparoscopic procedures were performed in 5620 patients with AC, 1780 of them had EC. The male gender, advanced age, ASA score  $>2$ , elevated white blood count and fever were confirmed as risk factors for EC. Surgery lasted significantly longer in the EC group ( $92.0 \pm 25.6$  min vs.  $76.4 \pm 28.3$  min,  $p < 0.01$ ). The rates of conversion (10.4 vs. 3.2%), reintervention (3.8 vs. 1.5%), bile duct injury (0.6 vs. 0.3%) were significantly higher in the EC group. Since 2006 we introduced laparoscopic subtotal cholecystectomy (LSC) for very complicated cases. LSC was done in 72 patients with EC: rate of conversion was reduced to 3.6%, reintervention—to 1.5%, bile duct injury rate was zero.

**Conclusions:** Empyematous cholecystitis is a severe form of acute cholecystitis with high rates of morbidity and mortality. Laparoscopic subtotal cholecystectomy can reduce rate of conversion and bile duct injury in the patients with EC.

## O112 - Liver and Biliary Tract Surgery

### Laparoscopic Common Bile Duct Exploration in Ukraine

V.V. Grubnik, O.I. Tkachenko, V.V. Ilyashenko, B.V. Evsikov

Odessa national medical university, Odessa, Ukraine

**Aim:** The treatment of concomitant gallbladder (GB) and common bile duct (CBD) stones is still variable without a standard treatment protocol. A recent meta-analysis has shown no significant difference between two-stage endoscopic and laparoscopic procedures and single-stage laparoscopic CBD exploration. We report our experience over a 15 years period.

**Methods:** All cases of CBD exploration were identified from 2000 to 2016 and analysed retrospectively. There were no exclusions. The mean clinical follow-up was 18 months (range, 3–60 months).

**Results:** A total of 396 patients were included who underwent laparoscopic CBD exploration. The mean age was 58 years (range, 16–81 years). There were 268 (67.7%) female and 128 (32.3%) male. A total of 256 procedures (64.6%) were performed electively and 140 as an emergency. Twenty-two procedures (5.6%) were converted to open due to adhesions and impacted stones. One hundred fifty-one (38.1%) procedures were performed with a transcystic approach with a mean postoperative stay of 3.5 days. A total of 223 procedures were performed with a choledochotomy with a mean post-op stay of 5.5 days (range, 3–14 days). After laparoscopic choledochotomy, external drainage was used in 96 (43%) patients. In 127 patients we performed primary closure of the CBD with insertion of endobiliary stents in 102 patients. Five patients (2.2%) had persistent bile leaks following choledochotomy. One patient died over the study period for abdominal sepsis (0.25%). Three patients were re-operated for bile leakage and peritonitis. Fifty patients (3.8%) had retained stones, 12 of them had a successful ERCP, three were re-operated: one laparoscopically and two by open approach.

**Conclusions:** Laparoscopic bile duct exploration can be performed successfully in both the emergency and elective setting. A transcystic approach should be favoured where possible. Primary closure of the CBD after laparoscopic choledochotomy can be done safely after insertion of endobiliary stent.



## O113 - Liver and Biliary Tract Surgery

### Laparoscopic Liver Resection vs Radiofrequency Ablation in Cirrhotic Patients with Hepatocellular Carcinoma: Towards the 'Gold Standard'

N.M. Mariani, R. Santambrogio, M. Barabino, G. Scifo, M. Giovenzana, E. Opocher

Ospedale Santi Paolo e Carlo, Milano, Italy

**Background:** There is currently no clear consensus on the relative suitability of laparoscopic liver resection (LLR) and radiofrequency ablation (RFA) as minimally invasive treatment for small hepatocellular carcinoma (HCC). The aim of this study was to compare the outcome of these laparoscopic therapies.

**Methods:** Between 2001 and 2016, among 858 patients surgically treated for HCC, 55 and 199 patients underwent LLR and RFA for single HCC ( $\leq 3$  cm). The groups were selected according to predefined criteria.

**Results:** There were not differences regarding BCLC staging, tumor size, etiology of cirrhosis and liver function. However, patients with HCC in segments 2–6 were more often treated by LLR. Although operation duration, blood transfusion, and length of postoperative stay were significantly better in the RFA group, severe postoperative complications (Dindo-Clavien  $> 2$ ) were similar (6% for RFA vs. 11% for LLR). During a median follow-up of 34 months, the 5-year survival rate in the LLR group was 61%, compared with 40% in the RFA group ( $p=0.015$ ). Intra-hepatic recurrence rates at 5 years were statistically higher in the RFA group (79% vs. 54%;  $p=0.0001$ ). Local tumor progression was significantly higher in the RFA vs. LLR group (15% vs. 5%, respectively,  $p=0.045$ ).

**Conclusions:** the results of this study showed that LLR as well as RFA are safe treatments, although RFA is less invasive. Moreover, LLR was superior to RFA with regard to HCC recurrences and overall survival rates. However, a large-scale study or randomized controlled trial is necessary to obtain a definite conclusion.

## O114 - Liver and Biliary Tract Surgery

### Efficiency of Fluorescent Cholangiography During Laparoscopic Cholecystectomy in Comparison to Conventional Cholangiogram

V. Eisner, S. Schneider-Koriath, K. Ludwig

Klinikum Süd Rostock, Rostock, Germany

**Aim:** Bile duct injury (BDI) as a severe complication within a laparoscopic cholecystectomy (LC) still has an incidence rate up to 0.3% despite a strictly standardized surgical procedure. Intraoperative misidentification of the extrahepatic biliary anatomy appears to be the commonest cause of BDI. Nevertheless the routine use of intraoperative cholangiography (IOC) remains controversial due to added cost, radiation exposure and a lack of evidence. Whereas fluorescent cholangiography (FC) is reported as a novel economical and effective method for non-invasive visualization of the biliary duct structures. The aim of this study was to verify the utility of FC in comparison to IOC concerning the identification of biliary duct anatomy during LC.

**Materials and Methods:** The intraoperative examination followed a standardized protocol including FC both before and during the dissection of Calot's triangle, as well as a final IOC. Afterwards the data were analyzed regarding the intraoperative time and identification of predefined anatomical structures.

**Results:** Within the study period a total of 200 patients underwent a laparoscopic cholecystectomy. Mean age and body mass index were 54.0 years (range 19–85) and 27.9 kg/m (range 14–45), operative time averaged 67.7 min (range 25–155). FC was performed faster than IOC ( $2.1 \pm 2.0$  vs.  $7.1 \pm 4.8$  min) visualizing the cystic duct (CD) and common bile duct (CBD) in 67.0% and 65.4% before dissection of Calot's triangle, and in 94.5% and 72.0% afterwards. Furthermore, bile leakage from the liver bed after cholecystectomy being non-delineable by IOC was found in 5 cases (2.5%) via FC. Whereas asymptomatic intraductal concretions were detected in 10 patients (5.0%) utilizing IOC compared to 1 patient (0.5%) for FC. In addition, BMI  $> 30$  kg/m reduced the identification rate of CD before dissection of Calot's triangle (71.5% vs. 55.8%,  $p=0.041$ ).

**Conclusion:** FC is a feasible and effective procedure for real-time visualization of bile duct anatomy within LC and enables the immediate care of bile leakage from the liver bed being non-delineable by IOC. FC may be used regularly to avoid BDI during LC.

## O115 - Liver and Biliary Tract Surgery

### Outcomes of Laparoscopic Major Liver Resection for Hepatocellular Carcinoma

J.Y. Cho<sup>1</sup>, H. Guro<sup>2</sup>, H.S. Han<sup>1</sup>, Y.S. Yoon<sup>1</sup>, Y.R. Choi<sup>1</sup>, J.S. Jang<sup>1</sup>, S.U. Kwon<sup>1</sup>, S. Kim<sup>1</sup>, J.K. Choi<sup>1</sup>

<sup>1</sup>Seoul National University Bundang Hospital, Seongnam, Republic of Korea; <sup>2</sup>Amai Pakpak Medical Center, Mirawi, Philippines

**Aim:** To compare the surgical outcomes of laparoscopic and open major liver resection (LR) for hepatocellular carcinoma (HCC).

**Methods:** We retrospectively reviewed 165 patients who underwent major LR for HCC between January 2004 to June 2015. We divided the patients into two groups as to the type of procedure, laparoscopic major LR (group L;  $n=62$ ) and open major LR (group O;  $n=90$ ).

**Results:** Open conversion occurred in 13 patients and these were excluded. In group L, there were 30 right hepatectomy, 28 right posterior sectionectomy, 11 left hepatectomy, 6 right anterior sectionectomy, 6 extended right hepatectomy, and 2 central bisectionectomy. Tumor size was greater in Group O ( $6.3 \pm 3.8$  cm) than in group L ( $4.1 \pm 2.4$  cm;  $P=0.016$ ). There were no differences in the mean ICG-R15% ( $P=0.698$ ) and presence of histologic cirrhosis ( $P=0.295$ ). The mean operation time was longer in group L ( $416.6 \pm 166.9$  min) than group O ( $332.5 \pm 105.4$  min;  $P=0.002$ ), but there were no differences in blood loss ( $P=0.319$ ), transfusion rate ( $P=0.260$ ), and R0 rate ( $P=0.255$ ) between two groups. However, hospital stay was shorter ( $11.3 \pm 8.3$  vs.  $18 \pm 21.4$ ;  $P=0.007$ ) and complication rate was lower (20.5% vs. 38.7%;  $P=0.005$ ) in group L than group O. There was no statistical difference in 5-year overall patient survival rate (77.3% vs 60.2%;  $P=0.087$ ) and the 5-year disease-free survival rate (50.8% vs 40.1%;  $P=0.139$ ) between the two groups.

**Conclusion:** Laparoscopic major LR for hepatocellular carcinoma is feasible and oncologically safe when performed by experienced surgeons, but further refinements of the surgical technique are needed to reduce operation time.

## O116 - Liver and Biliary Tract Surgery

### Laparoscopic Liver Resections for Hepatocellular Carcinoma. Can We Extend the Surgical Indication in Cirrhotic Patients?

F. Cipriani<sup>1</sup>, C. Fantini<sup>2</sup>, F. Ratti<sup>1</sup>, R. Lauro<sup>3</sup>, H. Tranchart<sup>4</sup>, M. Halls<sup>5</sup>, V. Scuderi<sup>6</sup>, L. Barkhatov<sup>7</sup>, B. Edwin<sup>7</sup>, R.I. Troisi<sup>6</sup>, I. Dagher<sup>4</sup>, P. Reggiani<sup>3</sup>, G. Belli<sup>2</sup>, L. Aldrighetti<sup>1</sup>, M. Abu Hilal<sup>5</sup>

<sup>1</sup>San Raffaele Hospital, Milan, Italy; <sup>2</sup>Loreto Nuovo Hospital, Naples, Italy; <sup>3</sup>Policlinico Major Hospital, Milan, Italy; <sup>4</sup>Antoine-Beciere Hospital, Paris, France; <sup>5</sup>University Hospital Southampton, Southampton, United Kingdom; <sup>6</sup>Ghent University Hospital Medical School, Ghent, Belgium; <sup>7</sup>Oslo University Hospital, Oslo, Norway

**Aim:** Evidence on the value of laparoscopic liver resections (LLR) for hepatocellular carcinoma (HCC) and severe cirrhosis still lacks. Aim of this study is to assess surgical and oncological outcomes of LLR in cirrhotic HCC patients.

**Methods:** The analysis included 403 LLR for HCC from 7 European centres. 333 cirrhotic and 70 non-cirrhotic patients were compared. A matched comparison was performed between 100 Child-Pugh A and 25 Child-Pugh B patients.

**Results:** There was no difference in blood loss (250 vs. 250 mL,  $p=0.465$ ) and morbidity (28.6% vs. 26.4%,  $p=0.473$ ) between cirrhotics and non-cirrhotics, and liver-specific complications were similar (12.8% vs. 12%,  $p=0.924$ ).

The sub-analysis revealed similar peri-operative outcomes in either Child-Pugh A or B patients. Noteworthy, ascites (11% vs. 12%,  $p=0.562$ ) and liver failure (3% vs. 4%,  $p=0.595$ ) were not different.

ASA score (OR 1.76,  $p=0.034$ ) and conversion (OR 2.99,  $p=0.019$ ) resulted risk factors for major morbidity. Despite lower recurrence-free survival in cirrhotics (43 vs. 55 months,  $p=0.034$ ), overall survival was similar to non-cirrhotic patients (84 vs. 76.5,  $p=0.598$ ).

**Conclusions:** LLR for HCC appear equally safe in cirrhotic and non-cirrhotic patients, and the advantages can be witnessed in those with advanced cirrhosis. Severe co-morbidities and conversion should be considered risk factors for complications—rather than the severity of cirrhosis and portal hypertension—when liver resection is performed laparoscopically. Such results may be of great interest to liver surgeons and hepatologists when deciding on the management of HCC within cirrhosis.

## O117 - Liver and Biliary Tract Surgery

### Impact of the Implementation of Eras in Complex Liver Resections: A Propensity Score-Based Analysis Between Open and Laparoscopic Approach

F. Ratti, F. Cipriani, G. Fiorentini, A. Cardella, D. Palombo, M. Paganelli, M. Catena, L. Aldrighetti

IRCCS San Raffaele Hospital, Milano, Italy

**Background:** Modern laparoscopic liver surgery has evolved to encompassing complex procedures. Accordingly, even patients management has improved, within fast-track programs. Aim of the present study was to evaluate the impact of fast-track approach in patients undergoing complex laparoscopic procedures and to analyse factors with influence on morbidity and functional recovery.

**Methods:** Resections (September 2014–September 2016) were stratified according to difficulty score: a group of 215 complex resections was obtained (102 laparoscopic and 163 open). The laparoscopic group was matched (1:1 ratio) with open patients to obtain the Lap-group (n=102) and the Open-group, (n=102). Propensity scores were used to achieve the matching using covariates that were representative of patients and disease characteristics.

**Results:** Groups were homogeneous in terms of patients and disease characteristics. Postoperative morbidity was 31.4% in the LPS and 38.2% in the Open group (p=0.05) and functional recovery was shorter in the LPS (respectively 4 vs. 6 days, p=0.041). Adherence to fast-track protocol was high in both groups, with several items with a higher penetrance in the LPS group. Among factors associated with morbidity and functional recovery, laparoscopic approach and strict adherence to fast-track protocol resulted protective factors.

**Conclusion:** The combination of minimally invasive approaches and fast-track protocols allows to obtain reduced rate of postoperative morbidity and satisfactory functional recovery even in the setting of complex liver resections. The effort of the multidisciplinary hepatobiliary team should be to consider laparoscopy whenever possible: when unfeasible, the strict adherence to fast-track programs is associated with the achievement of adequate results and should be implemented.

## O118 - Liver and Biliary Tract Surgery

### Influence on I Go Mils (Italian Group of Minimally Invasive Liver Surgery) Registry on Implementation of Mils Program in a Tertiary Referral Center

F. Ratti, F. Cipriani, G. Fiorentini, A. Cardella, D. Palombo, M. Paganelli, M. Catena, L. Aldrighetti

IRCCS San Raffaele Hospital, Milano, Italy

**Background:** In 2014 the I Go MILS registry was established with the aim to collect MILS experience and to promote it in Italy. Evidence indeed suggests that outcomes measurement and monitoring, if associated with auditing, feedback and public disclosure of data, lead to an improvement of the quality of care and to implementation of new technologies. The primary endpoint of the present study was to evaluate the recent trends in MILS diffusion and to analyze its correlation with the registry establishment in a single, tertiary referral center with specific commitment in laparoscopic liver surgery.

**Methods:** 2230 liver laparoscopic resections were performed at the Hepatobiliary Surgery Division of San Raffaele Hospital between 2004 and 2016: 506 of them were performed laparoscopically (from 2005 on). The MILS/Total Series (TS) ratio was evaluated to analyse the correlation between laparoscopic activity and registry establishment.

**Results:** The overall MILS/TS ratio was 22.7% in the study period, ranging from 5.8% in 2005, to 16.3% in 2010 to 56% in 2016. The skewness of the MILS/TS ratio was calculated in different periods of the series and the cut-off point for spread of MILS activity (>30%) was determined after 2014 (Registry). The median number of laparoscopic procedures before and after 2014 was 35 and 81 respectively (p<0.05). At the uni- and multivariate analysis Registry establishment resulted among factors significantly associated with MILS approach. After 2014, the median number of major hepatectomies and complex liver resections per year significantly increased (respectively 6 and 11 before 2014 and 25 and 38 after 2014, p<0.05). After 2014, outcomes in terms of blood loss, morbidity, mortality and length of stay did not significantly differ from the previous period. Conversion rate was 11.8% before and 15.7% after 2014.

**Conclusion:** High-volume centers progressively increased the profile of complexity of their laparoscopic series, along with expertise acquisition. The birth of I Go MILS registry promoted the diffusion and implementation of MILS programs, leading to an improvement of this approach and witnessing the role of MILS as mandatory in a liver surgery program.

## O119 - Liver and Biliary Tract Surgery

### Surgical Complexity of Laparoscopic Liver Resection: Proposal for a New Classification

Y. Kawaguchi<sup>1</sup>, F. Fuks<sup>2</sup>, K. Kokudo<sup>1</sup>, G. Gayet<sup>2</sup>

<sup>1</sup>The University of Tokyo, Tokyo, Japan; <sup>2</sup>Institut Mutualiste Montsouris, Paris, France

**Aim:** The indications for laparoscopic liver resection (LLR) are gradually expanding. For a safe dissemination of LLR, a clear training pathway is needed to gradually increase skills of LLR according to the experience level before performing technically-demanding procedures. However, the difficulty of a surgical procedure can be hardly assessed, because its definition is subjective. Therefore, the aim of the present report was to devise a classification system for LLRs in terms of the surgical complexity of each LLR procedure based on intraoperative characteristics.

**Methods:** Between 1995 and 2015, consecutive 627 patients underwent LLR. Of these, patients who underwent repeat LLR (except wedge resection), multiple liver resections (>4), vascular/biliary reconstruction, concomitant extra-hepatic procedures (except cholecystectomy) were excluded from the present report. LLR procedures were divided into 3 groups according to scores based on median values of operative time (<or ≥190 min), blood loss (<or ≥100 ml), and conversion rate (<or ≥4.2%).

**Results:** Of the 627 LLRs, 452 were selected and divided into three groups based on their scores. Group I (0 point) included wedge resection and left lateral sectionectomy. Group II (2 points) included anterolateral segmentectomy and left hepatectomy. Group III (3 points) included posterosuperior segmentectomy, right posterior sectionectomy, right hepatectomy, central hepatectomy, and extended left/right hepatectomy. The mortality rates were significantly different among the groups (P=0.027): Group I, 0%; Group II, 0%; Group III, 2.7%. The rates of overall morbidity (Groups I, II, and III: 8.4%, 17.3% and 45.7%, respectively, P<0.001) and major complications (1.1%, 4.0%, and 20.4% respectively, P<0.001) increased significantly with a stepwise increase of Groups from I to III (P<0.001, Cochran-Armitage trend test).

**Conclusions:** This objective and practical classification system provides three levels of LLRs difficulty: grade I (the beginning and least complex level, Group I), grade II (the intermediate level, Group II), and grade III (the advanced level, Group III). The classification can be helpful for liver surgeons at each level of laparoscopic approach, indicating the appropriate LLR for the treatment of liver lesions and ensuring the safety of patients who undergo LLR.

## O120 - Liver and Biliary Tract Surgery

### Factors that Influence the Intensity of the Signal of Fluorescence Cholangiography Using Indocyanine Green

J. van den Bos<sup>1</sup>, I. Jacobs<sup>1</sup>, N.D. Bouvy<sup>2</sup>, L.P.S. Stassen<sup>2</sup>

<sup>1</sup>Maastricht University, Maastricht, The Netherlands; <sup>2</sup>Maastricht University Medical center, Maastricht, The Netherlands

**Aim:** to provide an overview of the factors influencing the intensity of the signal during NIRF (Near-IntraRed Fluorescence) imaging with Indocyanine green, primarily focussed on NIRF cholangiography during laparoscopic cholecystectomy.

**Methods:** database search was performed using relevant key terms, with selection of reports in the English language with original data of human studies on NIRF during laparoscopic cholecystectomy. A systematic search was performed and references were checked for additional reports. All literature was studied by two researchers. Factors of influence were classified as non-patient related (dose and concentration, timing, route of administration, distance and angle of imaging, systems used) and patient related (cholecystitis, obesity). Also, the method of interpretation of the signal was studied.

**Results:** Dose and concentration of the dye have a positive correlation with the signal. In practice however, the dose is not always corrected for weight. Intravenously given, 24 h before surgery, gives the least hindering background illumination, but this timing is impractical. Rectangular and close approach of the target with the laparoscope gives best result. A difference in signal is observed between different manufacturers. Considering the patient, a thickening gallbladder wall and inflammation as in cholecystitis decreases the signal, as does overlying fat in obesity; which conflicts with the fact that in such difficult circumstances additional imaging is especially of value. In practice, the subjective signal is important, but for comparison objective quantification is mandatory. Methods to do this differ however, hindering such comparison. New experimental dyes are promising, but are not yet approved for clinical use.

**Conclusion:** several factors have been identified that are of influence on the intensity of the fluorescence signal. These results have implications for the practice of NIRF and the use of ICG. Also, inconsistencies and lack of data have been identified that can direct future research.

## O121 - Liver and Biliary Tract Surgery

### Robot-Assisted and Laparoscopic Postero-Superior Liver Segments Resection. Single Center Experience

M. Efanov<sup>1</sup>, R. Alikhanov<sup>1</sup>, V. Tsvircun<sup>1</sup>, I. Kazakov<sup>1</sup>, P. Kim<sup>1</sup>, A. Vankovich<sup>1</sup>, K. Greandal<sup>1</sup>, S. Berelavichus<sup>2</sup>, D. Akhaladze<sup>1</sup>

<sup>1</sup>Moscow Clinical Research Center, Moscow, Russia;  
<sup>2</sup>A.V.Vishnevsky Institute of Surgery, Moscow, Russia

**Background:** To date there are few papers analyzed results of minimally invasive difficult to reach segments liver resection. We aimed to compare results of robotic and conventional laparoscopic resections of postero-superior liver segments (1, 4a, 7, 8) with regards to estimation of learning curve.

**Methods:** The results of 160 consecutive liver resections were analyzed. Two groups of robotic liver resection (16 vs. 27) and two groups of conventional laparoscopic (29 vs. 88) were compared. Calculation of case number in groups was based on significant change of the difficulty index (Iwate criteria) or the rate of posterosuperior segments resection.

**Results:** The number of patients underwent resection of postero-superior liver segments enlarged from 0 to 12 (44%) in two groups of robotic liver resection ( $p < 0.05$ ) and from 3 (10%) to 38 (43%) in groups of conventional liver resection ( $p < 0.05$ ). Difficulty index enlarged significantly only in patients underwent robotic resection ( $5.0 \pm 1.6$  vs.  $7.3 \pm 1.7$ ), while groups of laparoscopic resection it was not change ( $5.8 \pm 1.4$  vs.  $5.8 \pm 1.9$ ). The number of patients underwent liver resection for lesions with major vascular involvement enlarged in groups of robotic liver resection (from 25 to 52%) and in groups of conventional liver resection (from 7 to 28%). There were no differences in morbidity between groups, 13% vs 26% robotic liver resection and 14% vs 17% for laparoscopic liver resection. The implementation of minimally invasive posterosuperior segment resection started with the robotic approach.

**Conclusion:** Robotic and conventional laparoscopic approaches demonstrate the equal results in resection of difficult-to-reach segments. The inclusion of robot-assisted resections in a minimally invasive liver surgery program may be useful to rapidly increase the complexity of laparoscopic liver resections.

## O122 - Liver and Biliary Tract Surgery

### Laparoscopic Central Hepatectomy: A Parenchyma Sparing Alternative

K.H. Chen, T.F. Siow, U.C. Chio, Y.D. Chen, Y.J. Chang, T.C. Lin, S.Y. Huang, C.W. Lei, C.H. Hsu, J.M. Wu, K.S. Jeng

Far-Eastern Memorial Hospital, New Taipei City, Taiwan

**Introduction:** For tumors in S 8 and S4a, laparoscopic hepatectomy has been considered relatively contraindicated. Extended right or left hepatectomy may be an option but at the cost of increased risk of postoperative liver failure. Despite surgical complexity, central hepatectomy preserves liver parenchyma and therefore decreases the risk of liver failure. However, laparoscopic central hepatectomy had been reported only uncommonly for the high technique demanding and long operation time.

**Aim:** to evaluate feasibility and safety of laparoscopic central hepatectomy for tumors in S4a and S8.

**Methods:** Patients receiving laparoscopic and robotic central hepatectomy, including central bisectionectomy S458, anterior sectionectomy S58, S4 segmentectomy and S4 & ventral S58 had been collected from a prospectively established database of 694 laparoscopic liver resections. Perioperative outcome and follow-up data were analyzed.

**Results:** From May 2008 to Nov 2016, total 47 patients have been collected. Surgical approaches included laparoscopic assisted in 7, robotic approach in 8 and pure laparoscopic approach in 32 patients. Extent of resection included isolated S4 in 4, S58 in 8, S4 and ventral S8 in 14, S458 in 6 patients. Pathology revealed HCC in 39, metastatic colorectal cancer (CRLM) in 5, other metastasis in 1 and benign in 1. Tumor size ranged from 1 cm to 16.5 cm (mean 4.6 cm) Mean blood loss was 527 c.c. (100 ~ 1800). 11% of the patients in this group received blood transfusion. R0 resection had been achieved in all patients with mean 0.6 cm resection margin (0.1 ~ 2 cm). Mean hospital stay after surgery was 7.7 days (4 ~ 27). One patient needed open conversion. Postoperative complications included 1 wound infection, 3 lung atelectasis, 6 bile leakage and 4 pleural effusion. There was no perioperative mortality or liver failure.

**Conclusion:** (s): With the growing knowledge, experience accumulation and advance of surgical instruments of laparoscopic liver resection, central resection is feasible and safe despite the higher incidence of bile leak. It can serve as a reasonable alternative to preserve liver parenchyma especially in patients with chronic liver disease.

## O123 - Liver and Biliary Tract Surgery

### Laparoscopic Resection of Liver Tumors Located in the Postero-Superior Segments: Is Robotic Assistance an Additional Value?

S. Ferretti, F. Caniglia, V. Perrone, N. De Lio, F. Costa, E. Kaufaman, N. Napoli, F. Vistoli, U. Boggi

Azienda Ospedaliero Universitaria Pisana, Pisa, Italy

**Introduction, Materials and Methods:** We present our experience with robotic resection of 24 tumors located in postero-superior liver segments (i.e., IVa; VII; VIII) (P-SLS) along with a video on segment VIII resection and a review of the literature. Data were collected prospectively and analyzed retrospectively.

**Results:** Surgery required a mean of 252 min (115–430) and was completed laparoscopically in all but one patient (4.2%). Mean estimated blood loss was 150 ml (100–350). Postoperative complications occurred in 5 patients (20.8%). Median length of hospital stay was 12.7 days (5–96). All patients had a margin negative resection. Mean follow-up period of 21.4 months ( $\pm 24.4$ ).

**Conclusion:** Our initial experience confirms that laparoscopic robot-assisted resection of tumors located in P-SLS is feasible and safe. Although it is known that tumors in the P-SLS can be resected by conventional laparoscopic techniques, it may be interesting to note that our experience reflects the prospective application of robotics to “all comers” with resectable tumors located in these segments and results refer to an “intention-to-treat” policy. Despite the lack of specific selection criteria, other than general suitability for laparoscopy, we were able to resect all tumors with negative margins and reasonable morbidity. If these results were duplicated on a larger scale, robotics could become a valid alternative to standard laparoscopy as it could allow more surgeons to resect tumors located in the P-SLS laparoscopically and/or remove some of the current anatomic selection criteria imposed by the intrinsic technical limitations of laparoscopy.

## O125 - Liver and Biliary Tract Surgery

### Long Term Follow-Up for 1000 Laparoscopic Common Bile Duct Explorations

M. Flynn<sup>1</sup>, T. Kabeth<sup>2</sup>, E. Donnelly<sup>2</sup>, A. Nassar<sup>2</sup>

<sup>1</sup>Belfast City Hospital, Londonderry, United Kingdom; <sup>2</sup>Monklands Hospital, Lanarkshire, United Kingdom

**Aim:** To evaluate The efficacy of Common Bile Duct Exploration (CBDE) on a unit adopting a single session Laparoscopic Cholecystectomy (LC) and CBDE for suspected CBD stone patients.

**Methods:** Clinical notes review of a 25 year prospective database, and in some cases telephone followup during 2016 of a series of CBDE's performed by a single surgeon. Up to date electronic care records for each patient were used, from the same surgical firm and other well documented appointments.

**Results:** Follow-up was undertaken for 1086 patients, 748 (69%) were females, median age 60 (8–91) years. 26% were ASA 1, 47% ASA 2, and 21% ASA 3. There were between 1 and 5 episodes per patient with 733 (67.5%) having 1 episode, and a mean of 1.3. Total days in hospital ranged from 1 to 160 days, mean (interquartile range) of 9.4 (8) days. 86 Patients (0.91%) were readmitted due to complications.

387 underwent CBDE with a choledochotomy (36%), and the remaining 699 (64%) had Trans-cystic exploration. 208 patients had a T-tube placed, and 262 a Trans-cystic tube (24.1%) for biliary drainage.

39 (3.6%) were readmitted with abdominal pain: 14 (36%) after removal of T-tube, and 16 (41%) unexplained episodes with normal Imaging. 12 patients were readmitted with dehydration or renal failure. There were 6 patients (0.5%) overall who developed Cholangitis and 2 (0.2%) with unexplained pyrexia. 41 (3.8%) underwent subsequent ERCP, with 12 (1.1%) documented incidences of recurrent stones and 17 (1.6%) cases of retained. Furthermore, 5 readmissions (0.5%) had deranged LFT's without further biliary findings, four had clinical suspicion of a passed stone (0.4%) and a further 8 similar patients readmitted with unexplained derangement of LFT's or jaundice (0.007%), all had normal imaging. 2 (0.2%) patients had documented CBD stenosis as the reason for readmission. Furthermore there were 5 bile leaks and 5 postoperative collections (0.5%) postoperatively.

Long-term, 5 patients reported incisional hernias (0.5%), and 23 ongoing dyspepsia (2%). 27 (2%) had Oesophagegastroduodenoscopy for persisting symptoms.

**Conclusion:** Laparoscopic CBDE is safe and effective approach for managing choledocholithiasis, it associated with low complication and mortality rate, high clearance and low recurrent rate.

## O126 - Liver and Biliary Tract Surgery

### Laparoscopic Versus Open Major Hepatectomies: Analysis of Surgical Outcomes and Cost Effectiveness in a High-Volume Centre

F. Cipriani, A. Cardella, F. Ratti, G. Fiorentini, M. Catena, M. Paganelli, L. Aldrighetti

San Raffaele Hospital, Milan, Italy

**Aim:** Considering the limited evidence on the clinical efficacy and cost effectiveness of laparoscopic major hepatectomies (LMH), additional studies are desirable. We aimed evaluate both clinical outcomes and financial costs of LMH performed in a high-volume centre through a case-control analysis with open procedures (OMH).

**Methods:** The financial analyses compared a variety of technical and medical aspects including intra, post and total hospital expenses (Euros). Both intention-to-treat (ITT) and per-protocol (PP) analysis were undertaken, considering patients undergoing conversion either in the laparoscopic or open group, respectively.

**Results:** Patients receiving major hepatectomy between May 2014 and Dec 2016 were identified (n=132, 80 LMH vs. 52 OMH). 21 LMH were converted (26.2%), and the commonest reason were concerns on oncologic adequacy (n=9, 42.8%).

The ITT analysis LMH showed longer operative time (300 vs. 270 min, p=0.039), but lower blood loss (400 vs. 900 mL, p<0.001), lower transfusions (10 vs. 48%, p=0.013) and shorter hospital stay (5 vs. 7 days, p=0.006). Morbidity was also significantly lower for LMH (31 vs. 53%, p=0.037), and patients required less postoperative investigations (21 vs. 46%, p=0.004) and interventional treatments (10 vs. 17%, p=0.037). The higher intraoperative costs of LMH (3712 vs. 2490, p<0.001) were balanced by lower postoperative expenses (7423 vs. 9527, p=0.032), thus resulting in a total cost neutrality when compared to open (11135 vs. 12017, p=0.606). The PP analysis did not confirm longer operative time for LMH (300 vs. 300 min, p=0.445), while blood loss/transfusion (300 vs. 850, p<0.001, 12 vs. 35%, p=0.002), postoperative morbidity/investigations (24 vs. 51%, p=0.015, 3 vs. 19%, p=0.001) and length of stay (5 vs. 7 days, p=0.002) were still lower and with increased significance. Higher intraoperative costs for LMH were confirmed (3766 vs. 2767, p<0.001), but lower postoperative expenses were exacerbated (5561 vs. 10010, p=0.004), now resulting in significantly inferior global costs (9327 vs. 12777, p=0.027).

**Conclusions:** Completed LMH provide significant clinical advantages compared to OMH, and are associated to cost savings. Despite some of these benefits may be jeopardized by conversion, a program of LMH appears worth in a high-volume centre. Studies on the clinical and financial impact of conversion are warranted.

## O127 - Morbid Obesity

### Surgical Revision in 1000 Consecutive Patients Who Had Sleeve Gastrectomy for Morbid Obesity in a Single Center

A. d'Alessandro, E. Chahine, M. Nunziante, E. Chouillard

CHIPS - Centre hospitalier Poissy Saint-Germain-enLaye, Poissy, France

**Aim:** Bariatric surgery is the best available, long-term treatment for morbid obesity. Currently, laparoscopic sleeve gastrectomy (LSG) is the most commonly performed bariatric procedure in France. Despite its safety and efficacy, long-term complications of LSG are not rare including weight regain, insufficient weight loss, gastroesophageal reflux disease (GERD), and twisting or stenosis. The goal of this study was to analyze the pattern and short-term results of surgical revision in patients with LSG.

**Methods:** Revisional surgery, regardless of its motivation, was always a multidisciplinary decision after thorough clinical, biological, endoscopic, and radiological assessment. Patients who had revisional surgery were retrospectively identified and subsequently divided in 4 subgroups according to preoperative body mass index (BMI) (<or >50 kg/m<sup>2</sup>) and the presence or not of GERD. The minimal follow up period was 12 months.

**Results:** Between December 2004 and September 2015, 1000 patients had LSG. 114 patients were lost to follow-up (11.4%). The rate of excess weight loss (EWL)>50% was 68%. Out of 886 patients, 47 had a revisional surgery (5.3%) for inadequate weight loss, GERD, or stenosis, respectively. The performed procedures included Roux en Y Gastric Bypass (60%), re-Sleeve (18%), Duodenal Switch (DS) (12%), Single Anastomosis Duodeno-Ileal Shunt (6%), and Sero-myotomy (4%). Median interval from the initial surgery to conversion was 27 months (18–41). Median operating room time was 170 min (range, 100–290). Median length of stay was 72 h (range, 48–120). Mortality was nil. Overall complication rate was 8% (4/47). The follow-up rate at 12 months was at 96%. Satisfaction index at 12 month was 88%.

**Conclusions:** Revisional options after LSG are safe and lead rarely to complications. Nowadays, LSG could be considered as the first step of a potentially multi-step bariatric pathway. Longer follow-up will be needed to establish the correct algorithm of choice of the surgical option for post LSG revision.

## O128 - Morbid Obesity

### Effectivity of OS-MRS in Laparoscopic Sleeve Gastrectomy

H. Seyit, K. Tulubas, Y.T. Seker, Z. Cukurova, G. Demir, H. Alis

Bakirkoy Dr.Sadi Konuk Training and Research Hospital, Istanbul, Turkey

**Introduction:** OS-MRS is the first scoring system in bariatric surgery for risk classification and assessment, and has been using by many centers for its ease of implementation. For this reason, this is the only most accurate scoring system. In this study, we aimed to investigate the efficacy of OS-MRS in laparoscopic sleeve gastrectomy (LSG) performed in one center.

**Material—Method:** Pre-operative OS-MRS scores of patients undergoing LSG for morbid obesity, between January 2014 and August 2016 were calculated. One point was given for each parameter, and 0–1 points were classified as group A, 2–3 points were classified group B and 4–5 points were classified as group C. The results were retrospectively analyzed with patient datas and postoperative complications and mortality. After discharge, all patients were followed up routinely on 1. week, 1-3-6- and 12. months. Surgical mortality and morbidity were evaluated on 90 days.

**Results:** A total of 779 patients (566 of them were female) were included in the study. The mean age was 38.0 (13–68). OS-MRS scores of 213 male patients (27.3%), 208 patients with hypertension (26.7%), 25 patients with an embolic risk (3.2%), 230 patients with age≥45 (29.4%) and patients with BMI≥50 kg/m<sup>2</sup> were determined. Group A, group B and group C were 510 (65.5%), 251 (32.2%) and 18 (2.3%) respectively. When the groups are evaluated in terms of mortality; It was found that group C had a higher statistically significant difference than the other groups (p=0,010).

**Conclusion:** We assume that LSG shouldn't be an alternative to the roux-NY gastric bypass (RNYB) technique. A better evaluation of comorbidities in preoperative period and preoperative maintaining the weight control without surgery; than making surgery decision; will be the effective methods to reduce mortality rates.

## O129 - Morbid Obesity

### Absorbable Mesh Crura Buttressing vs Hiatoptasty Alone for Gastroesophageal Reflux Management in Obese Patients During Laparoscopic Sleeve Gastrectomy

A. Balla, S. Quaresima, A. Seitaj, A. Paganini

Sapienza University of Rome, Rome, Italy

**Aim:** Gastroesophageal reflux disease (GERD), with or without hiatal hernia, is present in 50–70% of patients with morbid obesity candidate to bariatric surgery. GERD is a relative contraindication to Laparoscopic Sleeve Gastrectomy (LSG) except in case of small type I hiatal hernia, when LSG with hiatal hernia repair (HHR) and hiatoptasty may be performed. This may be simple or reinforced by absorbable mesh applied on the diaphragmatic crura. Aim of this retrospective case-control study is to compare the results of the two techniques in terms of postoperative symptoms in patients who underwent LSG with an esophageal hiatus measuring up to 4 cm in diameter.

**Methods:** GERD symptoms were assessed by a Health Related Quality of Life (HRQL) questionnaire before and six months after surgery. Patients were divided in two groups according to the HHR type: Group A, LSG and simple hiatoptasty; Group B, LSG and crura buttressed with absorbable mesh (Bio-A®, Gore & Associates, Inc., Newark, Delaware, USA) hiatoptasty. Patients were selected according to the anthropometric characteristics and the intraoperatively measured esophageal hiatus size.

**Results:** Twelve patients each were included in Group A (10 females, 2 males, mean age 46.4 years) and in Group B (8 females, 4 males, mean age 48 years). Mean preoperative Body Mass Index (BMI) was 42.1 kg/m<sup>2</sup> in Group A and 44.3 kg/m<sup>2</sup> in Group B (p=0.415). Six months after surgery, mean BMI was 31.5 kg/m<sup>2</sup> in Group A and 32.9 kg/m<sup>2</sup> in Group B (p=0.468). Mean % Excess BMI Loss was 64.8 and 58.3 for Groups A and B, respectively (p=0.512). Mean preoperative GERD-HRQL questionnaire scores were 16.5 and 13.9 in Groups A and B, respectively (p=0.659), while postoperatively they were 9.5 in Group A and 2.0 in Group B (p=0.1002). There was no statistically significant difference between the pre- and postoperative scores in Group A (p=0.2793), while in Group B a statistically significant difference (p=0.004) was observed.

**Conclusion:** Crura buttressed hiatoptasty during LSG was associated with significantly improved GERD symptoms as compared to the preoperative evaluation. A larger sample size and longer duration of follow up are needed to confirm this finding.

## O130 - Morbid Obesity

### One vs Two Stage Gastric Band Conversion to Sleeve Gastrectomy: A Comparison OF Weight Loss

B.F. Schwack, M.S. Kurian, G.A. Fielding, H. Youn, C.J. Ren Fielding

New York University School of Medicine, New York, NY, United States of America

**Aim:** The literature supports comparable safety profiles in regard to performing one vs. two stage revisional conversions of laparoscopic adjustable gastric bands to sleeve gastrectomies. In this discussion, we compare weight loss differences between one and two stage gastric band removal to sleeve gastrectomy procedures. The reasoning behind this discussion is the question: can an appropriately sized sleeve be created at the same time as gastric band removal (assuming scar tissue and tissue swelling), and can that sleeve permit adequate weight loss?

**Methods:** This is a retrospective review of patients who underwent gastric band removal and revisional sleeve gastrectomies between 2008 and 2016. We reviewed each patient's BMI at the time of the revisional sleeve gastrectomy and compared the BMI reduction (BMIR) and percentage total body weight loss (%BWL) after one year between patients undergoing a concurrent gastric band removal and sleeve gastrectomy vs. those undergoing a gastric band removal with an interval sleeve gastrectomy (3 or more months after band removal).

**Results:** Between 2008 and 2016 there were 259 patients who underwent surgery converting a gastric band to a sleeve gastrectomy (191 one stage, 68 two stage). We compared the weight loss parameters for those following up at one year for both one stage and two stage conversions (104 one stage, 38 two stage). One stage conversions exhibited a 16.95% total body weight loss while two stage conversions exhibited a 17.95% total body weight loss ( $p=0.08$ ). BMI reduction was also reviewed at one year showing 7.49 for one stage and 7.95 for two stage procedures ( $p=0.81$ ).

**Conclusions:** The safety of one vs. two stage laparoscopic adjustable gastric band conversion to sleeve gastrectomy has been supported in the literature. We demonstrate that there is no statistical difference in weight loss, after one year, between patients having their conversion at the same time (one stage) or in an interval manner (two stage). Therefore, there appears to be no weight loss benefit favoring a one vs. two stage procedure—thus leaving the choice up to surgeon's level of operative comfort and preference.

## O131 - Morbid Obesity

### Single-Incision Sleeve Gastrectomy Versus Laparoscopic Sleeve Gastrectomy: A Case-Control Study

E. Chahine, M. Dirani, M. Hayek, A. D'Alessandro, E. Chouillard

Poissy-Saint-Germain-en-Laye Medical Center, Poissy, France

**Introduction:** Single incision laparoscopic approach to the abdominal cavity is, nowadays, gaining popularity. Obese patients may theoretically benefit most from single incision techniques due to a would-be lower abdominal wall-related morbidity. We undertook a retrospective case-control study evaluating the Single Incision Sleeve Gastrectomy (SSG) as compared to the multiple incision laparoscopic Sleeve Gastrectomy (LSG).

**Methods and Procedures:** Between January 2008 and September 2016, our group performed sleeve gastrectomy in 1350 patients with morbid obesity. Of these, 400 patients who had SSG (Group A) were retrospectively matched for age, sex, and body mass index (BMI), respectively, to 400 patients who had LSG (Group B).

The two groups were compared regarding operative parameters, post-operative pain management, fistula occurrence, and mid-term outcome at 2 years follow-up.

**Results:** The conversion rate (any additional port insertion or laparotomy) was 5.6% in Group A and 0.9% in Group B ( $p<0.05$ ). Average operative duration was 102 min in Group A (50–288 min) and 69 min in Group B (42–181) ( $p<0.05$ ). The postoperative morbidity rate was 4.6% in Group A and 7.4% in Group B ( $p>0.05$ ). Cumulative postoperative Morphine doses were significantly lower in Group A patients ( $p<0.05$ ). Two leaks were observed in Group A patients (0.5%) and 4 leaks in Group B patients (1%) ( $p>0.05$ ). The median duration of hospital stay was 2 days (0–7) in Group A and 2.4 days (2–12) in Group B ( $p>0.05$ ).

The quality of life (QoL) score and the cosmetic perception at both 1 and 12 months, respectively favored significantly Group A patients ( $p<0.05$ ).

Mean follow-up was 16 months in Group A (11–56) and 19 months in Group B (12–66). Weight loss patterns were comparable in both groups ( $p>0.05$ ). Two patients in each group had an incisional hernia.

**Conclusions:** SSG has longer operative duration as compared to LSG. SG seems to be associated to lower post-operative pain and shorter hospital stay. Leak rate, short-term weight loss and 2-year incisional hernia rate are comparable.

Finally, as compared to LSG, SSG is associated to better cosmetic benefits and QoL scores at both 1 and 12 months postoperatively, respectively.

## O132 - Morbid Obesity

### Weight Regain After Vertical Gastric Plication: Sleeve or Roux en Y Gastric Bypass as a Salvage Procedure? Analysis of the First 100 Consecutives

E. Chahine, M. Hayek, M. Dirani, A. D'Alessandro, E. Chouillard

Poissy-Saint-Germain-en-Laye Medical Center, Poissy, France

**Introduction:** Bariatric surgery is the best available long-term treatment in patients with morbid obesity. Vertical Gastric Plication (GP) has been recently performed as a weight loss procedure in France. Despite its relative, short-term safety and efficacy, long-term results of GP are still controversial. The goal of this study was to assess the indications and outcome of revision for weight regain in patients with GP.

**Methods:** Patients were prospectively included in a database, with regular assessment of both results, and complications, respectively. Weight regain or insufficient weight loss were initially treated conservatively in all patients after a thorough clinical, biological, endoscopic and radiologic assessment. If conservative treatment was unsuccessful or in case of anatomical anomaly, surgical revision was indicated.

**Results:** Between February 2010 and September 2015, 100 patients had GP. Of these, 20 were lost to follow-up. The rate of patients with excess weight loss (EWL) $>50\%$  was only 50%. The remaining 40 patients had either inadequate weight loss (22 patients) or weight regain (18 patients) and eventually required revisional surgery. Roux en Y Gastric Bypass (RYGB) was performed in 24 patients (60%). Sleeve Gastrectomy (SG) was performed in 16 patients (40%). Median interval from GP to revision was 29 months (range, 18–41). Mean operative time was 168 min (range, 100–228). Median length of stay was 3 days (range, 2–5). Major complications occurred in 2 patients (5%) including one fistula and one intra-abdominal abscess, both after SG.

**Conclusions:** Vertical Gastric Plication is associated to high rates of weight regain or inadequate weight loss. As compared to SG, RYGB seems to be a safer revisional procedure after GP.

## O133 - Morbid Obesity

### Revisional Bariatric Surgery in Failed Laparoscopic Adjustable Banding: Eight-Year Experience of Our Institution

L. Grasso, A. Genzone, S. Arolo, A. Ferguglia, M. Toppino, M. Morino

University of Turin, Turin, Italy

**Aim:** Laparoscopic adjustable gastric banding (LAGB) requires revisional surgery for failures or late complications or failures in 20–60% of cases. Laparoscopic Roux-en-Y gastric bypass (LRYGB) and laparoscopic sleeve gastrectomy (LSG) have been reported to be safe and effective in selected patients. This study analyzes long term-outcomes of LAGB and complications that led to band removal; indications, options and effects of revisional surgery have also been evaluated.

**Methods:** A prospectively collected database was queried for patients who underwent LAGB removal from February 2008 to December 2016 at our Institution, and considered those who required a subsequent revisional procedure.

**Results:** From February 2008 to December 2016 were removed 155 LAGB (16 males, 139 females, mean age: 43.8 years). Mean body mass index (BMI) at the moment of removal was 37.9 ( $\pm 7.4$ ). Mean percentage of excess weight loss (EBWL) was  $<20\%$ . The average length of time between the placement of the device and its failure was of 6.5 years. The main indications for removal were weight regain (52%), inadequate weight loss (19%) and mechanical complication (22%).

Of these patients, 52 patients were converted to LSG (26 one-step, 26 two-steps procedures), and 21 were converted to LRYGB (10 one-step and 11 two-steps procedures). 82 patients didn't undergo revisional surgery and continued dietetic follow up. Mean EBWL was 31% for LSG and 46% for LRYGB. There was one anastomotic leak in LSG, whereas there were no significant perioperative complications in LRYGB. Hypoglycemia symptoms and dumping syndrome only occurred in LRYGB patients in 20% of patients. There were no significant differences in perioperative complications between patients who underwent one-step or two-steps procedure.

**Conclusion:** LAGB is associated with a high rate of reoperation for inadequate weight loss and intolerance. Both LSG and LRYGB are effective surgical options, leading to appropriate weight loss. While LRYGB seems to ensure greater weight loss at 24 months follow-up, LSG is associated with a lower postoperative morbidity.

## O134 - Morbid Obesity

### C-Reactive Protein Levels Variations as an Early Indicator of Leaks After Sleeve Gastrectomy

L. Grasso, A. Genzone, R. Passera, T. Romeo, M. Toppino, M. Morino

University of Turin, Turin, Italy

**Aim:** Laparoscopic sleeve gastrectomy (LSG) has a firm position as a stand-alone procedure to effectively treat morbid obesity. Low morbidity and mortality have been advocated as advantages over more complex procedures. One of the most feared complications are leaks, due to perforation along the stapled line that occurs in the early postoperative period. The incidence of leaks after sleeve gastrectomy ranges between 1.1 and 5.3%. Diagnosis of leaks can be particularly difficult in the morbidly obese. A high index of suspicion is crucial in order to recognize and treat these patients. The goal was to investigate the possible correlation between inflammatory markers and fistula occurrence, in order to identify a parameter that could be used as an early indicator of the presence of the leak.

**Methods:** A prospectively collected database was queried for patients who underwent LSG at our Institution between October 2008 and May 2016. Data about C-reactive protein (CRP) and white blood cells (WBC) levels during the first four p.o. days were collected. A possible correlation between increased serum inflammatory markers levels and leak occurrence was investigated by means of Friedman test and Wilcoxon test for non-parametric variance analysis.

**Results:** Between October 2008 and May 2016, 665 patients underwent LSG. Leak of the stapled line occurred in 13 patients (1.95%). In these patients CRP levels significantly increased compared to patients without fistula since the first p.o. day, although the difference becomes significant at day 3 ( $p < 0.0001$ ). WBC levels didn't significantly differ between patients with or without leaks, but a slight increase was registered in p.o. days 3 and 4.

**Conclusion:** Results showed that CRP levels were highly predictive of stapled line leak in patients who underwent LSG. It is a reliable and cost effective method able to suggest the presence of a leak and to allow early diagnosis and treatment.

## O135 - Morbid Obesity

### Conversion of Gastric Banding to Laparoscopic Roux-en-Y Gastric Bypass: A Single-Center Experience of 1290 Patients

I.M.C. Debergh, S. Vandenhaute, B.S. Dillemans

AZ Sint-Jan Bruges, Brugge, Belgium

**Aim:** The Roux-en-Y gastric bypass (RYGB) remains the preferred surgical conversional procedure for failed purely restrictive procedure as the laparoscopic adjustable gastric band (LAGB). However, since morbidity and early complication rates are reported to be higher than in primary RYGB, some surgeons prefer to perform this conversion in two stages instead of in one stage. We assessed the efficacy and the safety of this revisional approach in a large cohort of patients operated in a high volume bariatric institution.

**Methods:** Between October 2004 and December 2016, we identified from our prospectively collected database a total of 1290 patients in which a secondary bypass was performed after a previous band placement. In 976 cases the band was still in place and a single-stage conversion procedure was planned. In the other 314 the LAGB was already removed prior to the RYGB. The feasibility of this approach and perioperative outcomes of these patients were evaluated and analyzed.

**Results:** A single-step approach was successfully achieved in 834 (85.5%) of the 976 patients. During the study period, there was a significant increase in performing the conversion from LAGB to RYGB single-staged. No mortality or anastomotic leakage was observed in all groups. Only 60 patients (4.6%) of the study group of 1290 patients had a 30-day complication (Clavien-Dindo Classification I-IIIb): most commonly hemorrhage ( $N=29/60$ ). The total reintervention rate was 0.8% (Clavien-Dindo Classification IIIb). No differences were seen between the one staged, the two staged and the secondary bypasses in which the band was already removed prior to the RYGB.

**Conclusion:** Performing a conversion of a LAGB to RYGB can be performed with a very low morbidity and zero-mortality in a high-volume revisional bariatric center. With increasing experience and full standardization of the conversion, the vast majority of operations can be performed as a single-stage procedure. Only a migrated band remains a formal contraindication for a one-step approach.

## O136 - Morbid Obesity

### Utility of Transient Elastography in Assessment of Non-alcoholic Fatty Liver Disease in Morbidly Obese Patients Undergoing Bariatric Surgery

H. Garg, H. Bhattacharjee, S. Aggarwal, L. Agarwal, Dr. Shalimar, S. Dattagupta

All India Institute of Medical Sciences, New Delhi, India

**Aim:** Non Alcoholic Fatty Liver Disease (NAFLD) is a serious concern and Transient Elastography (TE/Fibroscan) is an upcoming modality to assess NAFLD non-invasively. Liver Stiffness Measurement (LSM) and Controlled Attenuation Parameter (CAP) are indicators of hepatic fibrosis and steatosis respectively. CAP protocol for Extra Large (XL) probe required in morbid obese population has been developed recently. This study aims to assess the role of TE in morbidly obese patients undergoing bariatric surgery.

**Methods:** 124 morbidly obese patients undergoing bariatric surgery underwent assessment for NAFLD including TE and intraoperative liver biopsy.

**Results:** Of 124 patients, 95 (76.7%) were females and mean BMI ( $\pm$ SD) was  $46.2 \pm 11.5$  kg/m<sup>2</sup>. TE did not give valid measurements in 15 patients (12.1%). Intraoperative liver biopsy was done in 87 (70.1%) patients. 76 of these patients undergoing liver biopsies had valid TE and these were used to determine diagnostic accuracy of TE. The median LSM (IQR) and CAP (IQR) were 7.1 (5.4–9.5) kPa and 322 (291–365.1) dB/m respectively. On histopathology, 24 (27.6%) patients had significant steatosis (>33%), and 32 (36.8%) patients had  $\geq$ F2 (Stage 2) fibrosis. The LSM and CAP correlated significantly with stage of fibrosis ( $p=0.013$ ) and grade of steatosis ( $p=0.002$ ) respectively. Area under ROC curve (AUROC) for prediction of significant fibrosis (F0-1 vs. F2-4) and advanced fibrosis (F0-2 vs. F3-4) was 0.64 (95% CI: 0.52–0.77) and 0.82 (95% CI: 0.69–0.94) respectively. The best LSM cut-off for significant fibrosis was 6.0 kPa with 90% sensitivity and 86.1% negative predictive value (NPV). Similarly, AUROC of CAP for differentiating moderate steatosis (S0-1 vs. S2-3) and severe steatosis (S0-2 vs S3) was 0.73 (95% CI: 0.60–0.85) and 0.81 (95% CI: 0.72–0.91) respectively. The best CAP cut-off for  $\geq$ S2 disease was 315dB/m with sensitivity of 90.9% and NPV of 92.8%. Using multivariate regression analysis, age, BMI, LDL/HDL ratio and Homeostasis Model for Assessment of Insulin resistance (HOMA-IR) index were found to be independent predictors of LSM while age and weight were independent predictors of CAP.

**Conclusion:** TE parameters correlated significantly with steatosis and fibrosis on liver biopsy and have good diagnostic accuracy to differentiate advanced stage and grade of NAFLD non-invasively.

## O137 - Morbid Obesity

### Perioperative Hemorrhagic Complications After Laparoscopic Sleeve Gastrectomy: Four-Year Experience of a Bariatric Center of Excellence

F. de Angelis<sup>1</sup>, M. Abdelgawad<sup>2</sup>, M. Rizzello<sup>1</sup>, A. Iossa<sup>1</sup>, M. Avallone<sup>2</sup>, A. Guida<sup>1</sup>, C. Ciccioriccio<sup>1</sup>, P. Termine<sup>1</sup>, G. Silecchia<sup>1</sup>

<sup>1</sup>Sapienza University of Rome - Polo Pontino, Latina, Italy; <sup>2</sup>Faculty of Medicine, Mansoura University, Mansoura, Egypt

**Background:** Bleeding and gastric fistula are the most common post-operative complications after laparoscopic sleeve gastrectomy (LSG). The long stapler line represents the most frequent source of bleeding, which ranges between 0–20%. The aim of this retrospective study was to analyze the 4-year experience of a high-volume center with respect to the prevention and management of perioperative LSG bleeding.

**Methods:** The prospectively maintained database from June 2012 to June 2016 was reviewed. Outcomes, especially perioperative bleeding (until patient discharge), its management and follow-ups, were analyzed.

**Results:** Out of 870 LSG (603 females; 267 males), 31 cases (3.5%) of post-operative complications were registered: bleeding was the most frequent complication (1.9%). Hemoperitoneum was managed laparoscopically in 9/17 patients (52.9%) with only one conversion to laparotomy (11.1%). Conservative treatment successfully controlled bleeding in 8/17 patients (47.1%). However, four patients (50%) developed an infected hematoma; two of them were treated conservatively with a CT-guided drainage, and the other two were complicated by late gastric leak treated laparoscopically. No mortalities occurred in the investigated cases.

**Conclusions:** In a high-volume center, the expected incidence of bleeding after LSG is 1.7% even after the adoption of all preventive strategies. The intra-operative protocol for detecting silent bleeding was effective, and no cases of bleeding were observed since its application. Our findings showed that the conservative management of postoperative bleeding should be considered as a high-risk condition for late leakage.

## O138 - Morbid Obesity

### Laparoscopic Sleeve Gastrectomy Combined with Rossetti-Hell Fundoplication (R-Sleeve) for Treatment of Morbid Obesity and Gastroesophageal Reflux

F. Caruso, S. Olmi, G. Cesana, S. Cioffi, M. Uccelli, F. Ciccarese, G. Castello, R. Giorgi, R. Villa, B. Scotto

Policlinico San Marco, Osio Sotto, Italy

**Aim:** Obesity is a widespread problem in the Western Countries. Gastroesophageal Reflux (GERD) can be considered an obesity-related disease. Primary aim of this retrospective study is to assess the effectiveness of Laparoscopic Sleeve Gastrectomy (LSG) and Rossetti anti-reflux fundoplication, combined in a one-step procedure (R-Sleeve), for the treatment of morbid obese patients suffering from GERD. Secondary aim is to evaluate postoperative incidence of gastric fistulas.

**Methods:** We analysed data from patients who underwent R-Sleeve from January 1st to October 31 2015 at Bariatric Surgery Centre, Policlinico San Marco di Zingonia, Osio Sotto (Bergamo), Italy. 40 patients suffering from obesity and GERD accepted to undergo the one-step combined surgery. A specific informed consent was signed from each patient. Follow-up was 12 months.

**Results:** Mean BMI was  $44.45 \pm 4.75$  (range 37.8–56.3); all patient were suffering from GERD. Mean operative time was  $38 \pm 6$  (range 33–48) minutes. 4 trocars were used for all the procedures. Mean number of staple loads used was  $5 \pm 1$  (range 4–6). No intraoperative complication or conversion to open technique were reported. Perioperative and postoperative mortality rate was 0%. Mean length of hospital stay was  $4 \pm 1$  (range 4–5) days. Gastric fistula rate was 0%. We had 1 case of food bolus, due to poor compliance of the patient to dietary regimen, treated with non-operative management. Excess Weight Loss percent (EWL%) at 1, 3, 6, 12 months was  $25.65 \pm 6.06$ ,  $41.87 \pm 12.46$ ,  $56.73 \pm 13.01$ ,  $61.68 \pm 13.57$ . Excess BMI loss percent (EBMIL%) at 1, 3, 6, 12 months was  $29.31 \pm 3.44$ ,  $47.20 \pm 5.19$ ,  $64.04 \pm 8.56$ ,  $73.29 \pm 9.98$ . At 12 months follow up 95% of patients reported a good sense of repletion without episodes of vomiting, nausea or dysphagia. PPI therapy was unnecessary for all patients 12 months after surgery.

**Conclusions:** The combination between LSG and Rossetti fundoplication is well tolerated, feasible and safe in selected patients, with good functional and weight loss results.

## O139 - Morbid Obesity

### Utility of Clinical Tests of Gastroesophageal Reflux in a Bariatric Population

I. Alarcón, E. Perea, L. Navarro, T. Yang, A. Barranco, M. Socas, F. Lopez-Bernal, S. Morales-Conde

University Hospital Virgen del Rocío, Seville, Spain

**Background:** Differents questionnaire has been proven as useful tools in the diagnosis of Gastro-esophageal reflux disease (GORD). Reflux Disease Questionnaire (RDQ) and Gastroesophageal-Reflux Impact Scale (GIS) are two validated questionnaires for GORD diagnosis in primary care. We decided to perform this study in order to evaluate the correlation between the results of the GIS and RDQ questionnaire, and the manometric characteristics and presence of pathological reflux by means of 24-h pHmetry in a group of patients with obesity.

**Methods:** Analysis of 151 consecutive patients, 102 being studied for bariatric surgery with symptoms suggestive of reflux disease and 49 being studied for GORD. All patients completed the Spanish validated versions of RDQ and GIS. These data were compared with those obtained in the pH / manometry performed in all patients.

**Results:** Means of RDQ, GIS and DeMeester was 1.9, 1.2 and 45.3 respectively in the Bariatric group, compared to 3, 2.29 and 57.8 in the GORD group with  $p < 0.05$ . The Correlation Coefficient between DeMeester and Ph / Manometry values and the GIS and RDQ tests (divided according to Heartburn, Regurgitation and Dyspepsia) were not statistically significant. The highest correlation was obtained between RDQ-A (Heartburn) and GIS and RDQ values. No correlation was observed between BMI and RDQ, GIS or PhMetry values.

**Conclusions:** Diagnosis of GER by RDQ / GIS does not show validity when applied to bariatric population in comparison with objective diagnostic tests.

## O140 - Morbid Obesity

### Impact of Bariatric Surgery on Clinical, Hormonal and Radiological Parameters of Polycystic Ovary Syndrome

K. Arumalla, H. Bhattacharjee, S. Agarwal, A. Ganie, N. Malhotra, N. Vikram

All India Institute of Medical Sciences, New Delhi, India

**Introduction:** Polycystic ovary syndrome (PCOS) is the commonest endocrinopathy in women of reproductive age. Obese females are more prone to it. Although role of bariatric surgery (BS) on PCOS is very promising, its impact on various clinical, hormonal and radiological aspects of PCOS is not well elucidated.

**Methods:** It is a prospective study of obese females with PCOS undergoing BS from January 2015 till October 2016. Rotterdam criteria was used to diagnose PCOS and Ferriman Galloway Scoring (FGS) system for hirsutism. Serum Testosterone, Follicular Stimulating hormone (FSH), Lutenising hormone (LH) estimation and ovarian morphology by transabdominal/transvaginal sonography were done. Primary end points were impact of BS on symptoms, hormonal and radiological profile of PCOS. Secondary end points were weight loss, resolution of comorbidities and metabolic syndrome. Patients were followed at 3, 6, 12 months. SPSS 20.0 statistical software was used for analysis. McNemar, Wilcoxon Signed Rank, paired t tests and Pearson correlation coefficient was used with  $p < 0.05$  as significant.

**Results:** Fifty women of reproductive age underwent BS and 18 (36%) had PCOS. All had irregular cycles; 16 (88%) had hirsutism (median FGS 11). At one-year post BS, the mean excess weight loss was 63%. All regained their normal menstrual cycle. The median FGS score reduced from 11 to 8.50 at 6 months ( $p < 0.04$ ) and maintained at 1 year. There was significant decrease in the mean serum testosterone from  $0.83 \pm 0.38$  ng/ml preoperatively to  $0.421 \pm 0.25$  ng/ml at 1 year ( $p < 0.01$ ). Although the mean LH/FSH ratio decreased from  $1.61 \pm 0.55$  pre surgery to  $1.26 \pm 0.63$  at 1 year but was not significant ( $p = 1$ ). A significant correlation was noted between weight loss at 6 months and fall in the serum testosterone levels at 1 year post-surgery ( $p < 0.023$ ). 14 PCOS women had polycystic ovaries. Complete resolution on sonographic features noted in 55% at the end of 1 year. Diabetes and hypertension were resolved at one year.

**Conclusion:** Bariatric Surgery improves the clinical, hormonal and radiological parameters associated with PCOS. Further studies have to be conducted to identify if bariatric surgery could be offered to class one obese premenopausal woman with PCOS.

## O141 - Morbid Obesity

### Diagnostic Value of Computed Tomography for Detecting Anastomotic or Staple Line Leakage After Bariatric Surgery

M.C. Kalff

Olv, Amsterdam, The Netherlands

**Background:** The use of bariatric surgery as a treatment for patients with morbid obesity is steeply increasing and is stated to be more effective than conservative alternatives. Anastomotic or staple line leakage (ASLL) is a feared complication with an incidence up to 5.6% and a leak-associated mortality of 5.0-16.7%. Despite the fact that there is only limited data available about the reliability of abdominal computed tomography (CT) in the detection of ASLL after bariatric surgery, it remains frequently used in case of suspected ASLL. Feared low sensitivity of abdominal CT causes surgeons to omit CT and directly perform diagnostic laparoscopy in case of suspected ASLL.

**Objectives:** The primary aim is to evaluate the diagnostic value of abdominal CT in case of clinically suspected ASLL after bariatric procedures. Additional aim is to identify reliable clinical parameters predicting the presence of ASLL.

**Methods:** All consecutive patients who underwent a bariatric procedure susceptible for leakage at the OLVG in the period November 2007 until August 2016 were included. CT scans of patients with suspected ASLL were independently re-evaluated by two experienced abdominal radiologists and one fellow abdominal radiology using a predefined checklist concerning ASLL followed by a dichotomous conclusion.

The diagnostic value of abdominal CT by means of sensitivity and specificity and the inter-observer variability were analyzed using findings during diagnostic laparoscopy or clinical recovery as the standard of reference.

**Results:** A total of 2410 patients were retrospectively reviewed. ASLL was clinically suspected in 121 (5.0%) patients. Using CT and/or diagnostic laparoscopy, ASLL was ultimately diagnosed in 28 (1.2%) patients at a median of 3 (IQR 2–8) days after surgery. Three (0.1%) patients died within 47 days after surgery due to complications following ASLL (leak-associated mortality 10.7%).

Multivariate logistic regression of the presence of clinical parameters at the time of suspected leakage showed no independent predictors for the presence of ASLL. Re-evaluation of selected CT scans revealed a sensitivity of 77–92% and a specificity of 65–75% of abdominal CT for the detection of ASLL after bariatric surgery.

**Conclusions:** Abdominal CT has a reasonable ability of ruling out ASLL after bariatric surgery (sensitivity 77–92%).

## O142 - Morbid Obesity

### Cost of Complications After Bariatric Surgery

M.E. Hagen, M.K. Jung, P. Rohner, N. Niclauss, N.C. Buchs, P. Morel

University Hospital Geneva, Geneva, Switzerland

**Aim:** Overall treatment costs and particularly those of cases with complications are integral parameters of surgical cost analyses. However, detailed real-world data regarding the costs of complications after bariatric surgery are rare at this point. Therefore, the aim of this study was to analyze the detailed costs of complications after bariatric surgery and to lay grounds for economic models for bariatric surgery.

**Methods:** Patients who underwent bariatric surgery at the University Hospital Geneva between January 2014 and December 2015 were included in this analysis. Patients who underwent unplanned diagnostic evaluations and/or complications were identified. Complications were grouped according to the Clavien-Dindo classification. Patients with several complications were assigned to the group of their most severe complication. Overall as well as itemized cost data were derived from the hospital's medical controlling database and matched to the clinical outcomes.

**Results:** A total of 195 patients were identified for this analysis. 134 (68.7%) of those had a completely uneventful postoperative course, 42 (21.5%) had an unscheduled diagnostic evaluation or a Clavien I complication; 6 (3.1%) patients were noted to have a Clavien II complication and 13 (6.7%) suffered from a Clavien III or higher complication. Overall perioperative costs were USD 19 857 for patients with no complications, USD 20 575 for patients with unplanned diagnostic evaluation or Clavien I complications ( $p=0.6601$ ), USD 29 069 for patients with Clavien II complications ( $p=0.0252$ ) and CHF 52 473 for patients with Clavien III or higher complications ( $P<0.0001$ ). While most significant cost increase were noted for nursing and drugs for the minor complications (Clavien I and II), major complications (Clavien III and higher) triggered—in addition to the previous posts—also a step increase in costs for operating room, medical personnel, drugs and intensive care unit.

**Conclusion:** While unscheduled diagnostic interventions and Clavien I complications only cause a mild increase in costs, Clavien II complications result in a significant economic impact. Major complications cause an exponential multiplication of overall treatment costs resulting in a relevant financial burden. This real world data provides useful guidance for economic models of bariatric surgery.

## O143 - Morbid Obesity

### Single Anastomosis Duodenal Switch: Proximal Approach

M.M. Ozmen<sup>1</sup>, T.T. Sahin<sup>2</sup>, E. Gündođdu<sup>1</sup>, C.E. Güldođan<sup>1</sup>

<sup>1</sup>Bahçesehir University, Ankara, Turkey; <sup>2</sup>Numune Teaching and Research Hospital, Adana, Turkey

**Introduction:** Although standard BPD-DS is an effective operation, it did not gain world-wide acceptance as it is technically difficult and has more complications. We aimed to present our experience in the first 50 cases with single anastomosis duodenal switch- proximal approach (SADS-p) and analyze the metabolic effects of this procedure.

**Patient and Methods:** We performed SADS in 59 (10 female) patients. Nine (9) out of these 59 patients received duodeno-ileostomy (SADI). In remaining 50 patients anastomosis were performed 300 cm distal to the ligament of Treitz as duodeno-jejunosomy (proximal approach), who were included in the study for evaluation. The patients BMI, body weight, EBWL(%) and metabolic parameters were analyzed. Distal and proximal approach were also compared.

**Results:** The mean (range) age of the patients were 37 (22–59) years, BMI were 49 (41–59) kg/m<sup>2</sup>. The mean operative time was 82 (50–110) minutes. 46 patients had T2DM. Mean (range) duration of T2DM was 45 (3–100) months. Hospital stay were 4.7 (4–5) days. There was no complications. The preoperative mean (range) weight was 132 (103–192) kg and decreased to 90 (75–118) kg at 9th months and EBWL(%) was 55 (43–66)%. Fasting blood glucose/HbA1c levels were decreased from 122.5 (78–284)mg/dL/6.5% (4.9–9.6) to 81.4 (74–101)/5.1% (4.8–5.6) in the postoperative 9th months. Diabetes remission rate was 100%. Cholesterol levels also decreased from 197 (103–289) to 138 (98–177) mg/dl. When the anemia parameters were analyzed it was observed that although there were no significant changes in hemoglobin, MCV and RDW, there was a slight decrease in serum iron levels [63.6 (28–103) vs. 44.5 (25–64) pg/mL] that did not reach a statistical significance. There were no statistically significant difference between proximal and distal approach in terms of evaluated blood parameters.

**Conclusions:** Single anastomosis duodeno-intestinal by-pass procedures (SADI or SADS-p) are effective methods. As the present study shows excellent results after SADS-p, we conclude that modified DS with proximal approach might be the procedure of choice for the future.

## O144 - Morbid Obesity

### Endoscopic Treatment of Sleeve Gastrectomy Symptomatic Obstructive Complications

F. Turcu, C. Balahura, C. Copăescu

Ponderas Academic Hospital, Bucharest, Romania

**Objective:** This study aimed to determine the incidence and management options for symptomatic obstructive complications (SOC) after laparoscopic sleeve gastrectomy (LSG).

**Methods:** A retrospective study reviewed the morbidly obese patients who underwent LSG between May 2011 and December 2016 in our Bariatric Center of Excellence (CoE), to identify the patients treated for SOC. The LSG standard technique involved the 32 Fr boogie calibration for all the patients, the systematic posterior fixation of the gastric pouch since 2013 and, systematic stapled line over sewn reinforcement, since 2014.

**Results:** 2801 patients (71.5% female and 28.5% male) with a mean age: 42±12 years and a mean BMI:38±11 Kg/m<sup>2</sup> underwent LSG. In 35 (1.2%) of these patients SOC were demonstrated, all the cases after 2013. Contrast radiological study and endoscopy confirmed short segment stenosis: twenty located at gastric mid-body and nine located near the gastro esophageal junction and in 4 cases the stenosis where double. Endoscopic management was 100% successful. The mean number of dilations was 1.7±1.2 (range 1–6), and the median balloon size was 20 mm (range 10–40 mm). The mean time from surgery to the first endoscopic attempt was 136±211 days.

**Conclusion:** SOC after LSG performed in a large volume CoE are rare but they require early diagnosis and consecutive treatment. SOC may be successfully treated with endoscopic balloon dilation. Expertise in bariatric endoscopy is required.

## O145 - Morbid Obesity

### Feasibility and Long-Term Metabolic Effects of Eus-Guided Gastrojejunostomy for Obesity: An Animal Study

S. Patrascu<sup>1</sup>, (A) Saftoiu<sup>2</sup>, S. Ramboiu<sup>3</sup>, (B) Ungureanu<sup>2</sup>, A. Dragoescu<sup>3</sup>, E.D. Burtea<sup>2</sup>, F. Nechita<sup>3</sup>, E. Georgescu<sup>3</sup>, L. Gruionu<sup>4</sup>, C.D. Nicolau<sup>5</sup>, F. Turcu<sup>6</sup>, (C) Copăescu<sup>6</sup>, V. Surlin<sup>3</sup>

<sup>1</sup>UMF Craiova, Craiova, Romania; <sup>2</sup>Research Center of Gastroenterology and Hepatology of Craiova, Craiova, Romania; <sup>3</sup>University of Medicine and Pharmacy of Craiova, Craiova, Romania; <sup>4</sup>University of Craiova, Craiova, Romania; <sup>5</sup>Center for Integrative Medicine "Lotus Life", Gastroenterology Private Hospital, Targu Mures, Romania; <sup>6</sup>Ponderas Private Hospital, Bucharest, Romania

**Aim:** Although laparoscopic gastric bypass has become the golden standard in treating morbid obesity, new alternative endoscopic procedures are emerging, with the ultimate goal to develop a therapeutic method with less physical discomfort and faster recovery for patients. The aim of this study was to compare Natural Orifice Transluminal Endoscopic Surgery (NOTES) versus Endoscopic Ultrasound (EUS)-Guided Gastrojejunal Bypass (EUS-GJJ) in experimental pig models.

**Materials and Methods:** Under general anesthesia, 4 pigs were subjected to a gastrojejunal bypass (GJJ), being divided in two groups. NOTES interventions were performed with an endoscope which allowed gastric incision and peritoneal visualization. Consecutively, laparoscopic access was realized and a jejunal loop was placed near the gastric wall incision and sutured. EUS-guided procedure consisted of an enteric balloon inflated away from the duodenum and visualized under EUS-imaging. The next step was to deploy a lumen apposing hot metal stent (Xlumena, Mountain View, USA) near to the balloon on EUS-guidance. All pigs were clinically followed for the next two weeks concerning food intake, weight and behavior, and necropsy was subsequently performed.

**Results:** Technical success was observed in both experiments. The mean time for EUS-GJJ was shorter than NOTES-GJJ with almost 20 min. All animals showed normal eating behavior without any sign of infection within the follow up. No stent migration and no suturing complications were observed. Necropsy showed complete adhesion between the stomach and the jejunum wall, with normal healing of the anastomosis in all cases.

**Conclusion:** Both procedures prove to be technically safe, with no side effects on follow-up. EUS-GJJ seems to be more accurate for choosing the specific length of the jejunum when using an enteric balloon, and much faster as compared to a NOTES technique.

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## O146 - Morbid Obesity

### Prevalence and Patterns of Non-alcoholic Fatty Liver Disease Among Morbidly Obese Patients Undergoing Sleeve Gastrectomy

A. al Manasra, H. Qandeel, M. Alqudah, M. Bani Hani, A. Al-Rhamani, K. Al-Sawalmeh

Jordan University of science and technology, Irbid, Jordan

**Background:** Obesity related non-alcoholic fatty liver disease (NAFLD) is increasingly recognized worldwide. Multiple predictive and risk factors have been proposed for NAFLD. We aim to describe prevalence, histologic patterns, and risk factors for this disease in morbidly obese patients undergoing sleeve gastrectomy.

**Methods:** This is a prospective study, which included a cohort of 49 obese patients undergoing sleeve gastrectomy with concomitant true cut liver biopsy. Patients were excluded when they have history of alcohol intake, liver disease, or hepatotoxic agents intake. Clinical, biochemical, and histological features were evaluated. Histological patterns were classified based on the NIH-sponsored NASH Clinical Research Network NAFLD Activity Score (NAS).

**Results:** Most patients were females (73%), with mean age of 34 (range 17–58). Mean BMI was 43 (35–52). Forty-five patients (91.8%) showed NAFLD. Nineteen (39%) showed non-alcoholic steatohepatitis (NASH) and 5 (10%) showed fibrosis. Only 4 biopsies (8%) were reported as normal. Significant correlation was found between low-density lipoprotein (LDL) vs. NASH ( $P=0.005$ ), LDL vs. steatosis grade ( $P=0.023$ ), aspartate aminotransferase (AST) vs. NAS ( $P=0.005$ ), AST vs. steatosis grade ( $P=0.009$ ), glucose vs. steatosis ( $P=0.006$ ), sex vs. NAFLD ( $P=0.02$ ), and sex vs. hepatocyte ballooning ( $P=0.005$ ). There was no morbidity or mortality in this study.

**Conclusion:** NAFLD has a very high prevalence among morbidly obese patients. Significant correlation is evident between biochemical markers and histological components of liver assessment. Intraoperative liver biopsy is safe in morbidly obese patients undergoing sleeve gastrectomy for the diagnosis of NAFLD.

## O147 - Morbid Obesity

### From Diabetes Care to Diabetes Cure; Could Single-Anastomosis Gastric Bypass be a Safe Bridge to Reach this Target in Non-Obese Diabetic Patients?

T. Abouzeid, K. Sabry

Ain-shams university, Portsaid, Egypt

**Aim:** was to determine the short-term anthropometric and glycemic outcomes of single-anastomosis gastric bypass (SAGB) as a proposed line of treatment for type II diabetes mellitus (T2DM) patients with body mass index (BMI) 25–30 kg/m<sup>2</sup>.

**Methods:** From November 2013 to March 2016, a prospective study has been conducted at our university hospitals on 17 consecutive patients undergone SAGB. The mean age is 42.6±13.8 years, mean BMI is 26.7±2.3 kg/m<sup>2</sup> and mean Duration of DM is 6.3±2.7 years. The mean baseline values of glycosylated hemoglobin (HbA1c), fasting plasma glucose (FPG), and 2-h postprandial glucose (2-h PPG) are 9.9%, 176.3 mg/dl and 310.3 mg/dl respectively. Other data including anti-diabetic medications, co-morbid metabolic diseases are also assessed. All patients have been scheduled to come in regular follow up dates at 1, 3, 6, 12 and 18 months postoperatively. T2DM Remission is considered if HbA1c<6.5% and FPG<126 mg/dl for at least 1 year without medication.

**Results:** The mean baseline values of HbA1c, FPG, 2-h PPG are 9.9%, 176.3 mg/dl and 310.3 mg/dl respectively. These values significantly dropped at the 18th month to reach 5.8%, 93.4 mg/dl, and 156.2 mg/dl, with 13/17 patients became off treatment (remission rate 76.4%).

**Conclusion:** However, T2DM patients with BMI 25–30 kg/m<sup>2</sup> are considered the most controversial group as regard etiology, pathophysiology, and pharmacotherapy. SAGB could be integrated in its treatment algorithm. It opens new horizons to change the concept of treatment from strict diabetes care to complete diabetes cure.

**Key Words:** Type II diabetes mellitus; Type II diabetes remission; single anastomosis gastric bypass; SAGB; Bariatric/ metabolic surgery; BMI 25–30 kg/m<sup>2</sup>.

## O148 - Morbid Obesity

### Short Term Outcome of Laparoscopic Sleeve Gastrectomy Versus Laparoscopic Gastric Bypass. Prospective Randomized Trial

M.R. Elkeleny<sup>1</sup>, M. Kassem<sup>1</sup>, M.R. Elrewani<sup>1</sup>, A. Abo Nasr<sup>1</sup>, A. Sabery<sup>1</sup>, M. Morino<sup>2</sup>

<sup>1</sup>Alexandria University, Faculty of medicine, Alexandria, Egypt;

<sup>2</sup>Torino university, Torino, Italy

Laparoscopic Roux-en-Y gastric bypass (LRYGB) considered the gold standard in bariatric surgery and other bariatric procedures should be compared with RYGB. The promising results of SG have made SG to be increasingly evaluated as the final treatment for morbid obesity. These challenges have stimulated the search for an ideal surgery. The aim of this study was to compare LSG vs. LRYGB in management of morbidly obese patients regarding; mean operative and postoperative parameter, amelioration of comorbidities, weight loss post-operative and Glucagon like peptide-1 (GLP-1) during follow up period.

**Methods:** Prospective randomized study was carried out on forty morbid obese patients in the centre of Minimally Invasive Surgery at Torino University. All patients were followed up for 6 months. They were being divided randomly into 2 groups: Group A & B; managed by LSG and LRYGB respectively. Postoperative Post-prandial GLP-1 was measured and compared to preoperative GLP-1.

**Results:** The operative time and hospital stay were shorter in Group A Then Group B. As regard, Intraoperative mishaps and postoperative complications there was no significant difference between both group. The patients' weights and patients' BMI throughout the follow-up period were significantly decreased in both groups with no significant difference between both groups. LRYGB had a more pronounced effect on overall resolution of comorbidities with statistically significant different then LSG. Hypertension: Analysis of the reduction of hypertension showed that there was no significant difference between the two groups. Obstructive sleep apnea syndrome: there was no statistical significant difference in the improvement of sleep apnea between two groups. Type 2 diabetes: There was no significant difference in the resolution of diabetes between the two groups. GERD: GERD in the LSG group improvement not reach the statistical significance at 6months. GLP-1: increase in postprandial GLP-1 significantly higher in Group B (LRYGB) than Group A (LSG).

**Conclusions:** LSG and LRYGB have comparable results as regard weight loss, postoperative complication. LSG have significant shorter operative time and less postoperative hospital stay. LRYGB had a statistically significant effect on overall resolution of comorbidities compared to LSG; Postprandial GLP-1 was found to be significantly higher after LRYGB than LSG.

## O149 - Morbid Obesity

### Prospective Randomized Trial Comparing Laparoscopic Roux-en-Y vs. Mini-Gastric Bypass for the Treatment of Morbid Obesity: Short Term Outcomes

M.R. Elkeleny, M. Mosaad

Alexandria University, Faculty of medicine, Alexandria, Egypt

Laparoscopic Roux-en-Y gastric bypass (LRYGB) considered the gold standard in bariatric surgery and other bariatric procedures should be compared with RYGB. While laparoscopic mini-gastric bypass (LMGB) has been reported to be a simple and effective treatment for morbid obesity, these challenges have stimulated the search for an ideal surgery. The aim of this study was to compare LRYGB vs. LMGB in management of morbidly obese patients regarding; mean operative and postoperative parameter, amelioration of comorbidities, weight loss post-operative and Glucagon like peptide-1 (GLP-1) during follow up period.

**Methods:** Prospective randomized study was carried out on fifty morbid obese patients in the Gastrointestinal Surgery unit at Alexandria University. All patients were followed up for one year. They were being divided randomly into 2 groups: Group A & B; managed by LRYGB and LMGB respectively. Data concerning weight loss, metabolic outcomes, and complications were collected prospectively. Postoperative Post-prandial GLP-1 was measured and compared to preoperative GLP-1.

**Result:** The operative time and hospital stay were significantly shorter in Group B Then Group A. Intraoperative mishaps and postoperative complications there was no significant difference between both group. The patients' weights and patients' BMI throughout the follow-up period were significantly decreased in both groups with significantly higher Mean excess BMI loss percent in LMGB group. Both operations showed significant resolution of preoperative comorbidities with no significant difference between both groups. GLP-1: Postoperative both group show significant increase in postprandial GLP-1 in both groups.

**Conclusions:** we observed a greater weight loss with MGB and similar efficiency on metabolic control compared to RYGBP.

## O150 - Morbid Obesity

### Acute Hospital Admission After Roux-en-Y Gastric Bypass: A Prospective Observational Study

G. Philouze, H.A. Mercoli, M. Vix, D. Mutter, S. Perretta

Nouvel Hopital Civil - IHU, Strasbourg, France

**Aim:** Roux-en-Y Gastric Bypass (RYGBP) is one of the most common surgical techniques in bariatric surgery with Sleeve Gastrectomy (SG). Many studies have already well established its benefit on weight loss, but also resolution of metabolic disorders and comorbidities linked to obesity. However, little is known about admission rates and causes after RYGBP. The aim of the present study was to determine the rate, the causes and the treatments for patients who previously underwent RYGBP for obesity.

**Methods:** This study included all consecutive patients who underwent RYGBP and needed acute hospital admission after surgery between July 1, 2014 and January 31, 2016. Demographic data (age and gender), together with clinical symptoms, and laboratory results, as well as diagnosis and treatment were prospectively collected.

**Results:** Between July 1, 2014 and January 31, 2016, 302 RYGBP were performed in our department with 51 patients needing emergency hospital admission (16.9%). Mean age was 39.7 years old ( $\pm 9.3$ ) and most of them were women (female 84%; male 16%). Mean number of comorbidities was 1.4 ( $\pm 1.1$ ) and Body Mass Index (BMI) before bariatric surgery was 44.2 kg/m<sup>2</sup> ( $\pm 5.9$ ). Time duration between RYGBP and readmission was 63.4 months ( $\pm 83.9$ ); 12 patients (23.5%) had short-term complication (<30 days after discharge). A CT-scan was performed in 40 cases (78%). The most common diagnosis was abdominal pain (29.4%), biliary colic (9.8%), diet-related problems (7.8%), perforated anastomotic ulcer (7.8%), constipation (5.9%), abscess (5.9%) and bowel occlusion (3.9%). Other rare causes such as appendicitis or gastro-gastric fistula were found in 2.0%. 34 patients needed medical treatment (66.7%), 11 underwent emergency surgery (21.6%), 4 had endoscopic treatment (7.8%) and 2 needed radiological procedure (3.9%).

**Conclusions:** Emergency hospital admission is probably underestimated after RYGBP. Although the majority of patients were treated medically, other serious causes of abdominal pain requiring surgical treatment such as anastomotic perforation are common and should be ruled out. Larger prospective studies with a larger number of patients are needed to further investigate risk factors of acute admission after RYGBP.

## O151 - Morbid Obesity

### The Impact of the Bariatric Surgery in Pancreatic Beta Cell Population in Wistar Rat Models

J.E. Falckenheiner<sup>1</sup>, A. Camacho<sup>2</sup>, A. Moreno<sup>2</sup>, G. Perez Arana<sup>3</sup>, A. Prada<sup>3</sup>

<sup>1</sup>Virgen de las Montañas Hospital, Cadiz, Spain; <sup>2</sup>Puerto Real Hospital, Cadiz, Spain; <sup>3</sup>University of Cadiz, Cadiz, Spain

**Aim:** Search the impact of different bariatric surgeries techniques in pancreatic beta cell population and carbohydrate metabolism of non-obese adult Wistar rats.

**Methods:** We used twenty healthy non-obese adult Wistar rats divided in five groups. Each with n=4. Fifty % of small bowel resection as a malabsorptive surgical model (IR50). Vertical gastrectomy (SG) as a restrictive model. Gastric bypass (RYGB) as a mixed surgical model. SHAM as a surgical control group and a fasting control group (CA). In each group was assessment: beta cell mass modifications, pancreatic islets histomorphometry, proliferation, apoptosis and neogenesis in beta-cell pancreatic population; intraperitoneal glucose test tolerance, body weight and food intake. Statistical analysis as evaluated using Mann-Whitney test.

**Results:** The malabsorptive and restrictive group have a significantly smaller increase in weight than the control groups. The intraperitoneal tolerance glucose test reports incremental glucose area under curve (AUC) was significantly higher in the malabsorptive group and lower in the restrictive group compared to the control groups during the second ( $p < 0.01$ ) and third ( $p < 0.05$ ) month of the study. The beta-cell mass was significantly higher in the IR50 group compared with control groups respectively. There was a significantly increased number of beta-cell per pancreatic insulin positive area in SG and BGYR. Proliferation was significantly increased in IR50 and RYGB group and significantly decreased in SG compared. There was no significant difference during apoptosis assessment among surgical and control groups. In neogenesis differences between groups were assessed qualitatively by the presence PDX-1 expression, being higher in RYGB.

**Conclusions:** The endocrine pancreas in our model is altered by the anatomical and functional conditions arising from surgical techniques. Carbohydrate metabolism conditions are affected by temporary adaptive processes due to surgical alternatives. Stimulation mechanisms acting on the pancreas, in the case of RYGB and IR50 are mediated by transient side phenomena glucose intolerance. Not so in the case of SG. Facing with theories that focus on proximal portions of the intestine (Foregut) and/or distal (hindgut), our results indicate the importance of the jejunal segment responsible for changes in the entero-insular axis.

## O152 - Morbid Obesity

### Laparoscopic Roux-Y Gastric Bypass as the Gold-Standard for The Obesity Treatment in Adolescents

D. Simeckova, M. Vraný, B. Manová, M. Man

Hospital in Jablonec nad Nisou, Jablonec nad Nisou, Czech Republic

**Aim:** Obesity is now a pandemic affecting people of all ages. While most of the focus has been on therapy for middle-age patients, there is a lack of information for the adolescent. Laparoscopic Roux-Y gastric bypass is the gold-standard procedure for the treatment of morbid obesity. It has been reported to be somewhat more efficient and durable than laparoscopic sleeve gastrectomy. Gastric bypass restricts food intake, with a limited component of malabsorption. However, it is considered more invasive and, therefore, more hazardous. The objectives of this report are to demonstrate the safety of this method for adolescents. There is about 30% of overweight or obese adolescents in Czech Republic and more than 4% are morbidly obese. Czech Republic is one of the countries with the growing number of the adolescent obesity. Unfortunately, the surgical treatment of the morbid obesity and metabolic syndrome is not common yet.

**Methods:** Seven patients who underwent laparoscopic Roux-Y gastric bypass were followed up for a 2-year period. Weight loss and status of several comorbidities were assessed at the 1st, 3rd, 6th, 12th, 18th, 24th postoperative months. Previously validated factors were selectively analyzed, including age, gender, preoperative BMI, diagnosis of hypertension, diabetes mellitus and depression or anxiety disorders, hyperlipidemia, complications, satisfaction level and laboratory results (C-peptide, HbA<sub>1c</sub>, Glycemia, Vitamin D, LDLC, HDLC, Cholesterol, Triglycerides, B 12, ac. Folicum, Ferritin, TRF, Proteins, Albumin).

**Results:** The range of the age of the patients was 15–18 years at the time of the operation. The weight range was 162–181 kg. Operation was preceded by psychological, endocrinological, internal, nutritional examinations. Postoperative course was uneventful. All patients experienced significant weight loss at 1st, 3rd, 6th, 12th months after the surgery and improvement of the physical and even the mental condition, laboratory results etc. No chronic medication was needed after the operation.

**Conclusions:** Two years of close follow-up of patients who underwent laparoscopic Roux-Y gastric bypass demonstrated satisfactory weight loss results. Promising results were also obtained regarding various comorbidities of obese adolescents. Roux-Y gastric bypass can be safely performed with good outcome for treating morbid obesity and metabolic disorders in adolescents.

## O153 - Morbid Obesity

### Laparoscopic Fistula-Jejunostomy for Chronic Leaks After Lsg: Video Presentation of the Operative Technique

S.C. Velici

Ponderas Academic Hospital Bucharest, Bucharest, Romania

Laparoscopic sleeve gastrectomy (LSG) is widely accepted as a bariatric surgical procedure being very well standardized, with low complication rate and insignificant long-term nutritional deficiencies. Its main complications are staple-line bleeding, strictures and staple-line leaks. Leaks after LSG (1.5 to 5%) are the most feared and difficult complications to deal with. There is currently no universal protocol showing how to manage and treat a gastric leak. However, timing of diagnosis plays an important role in deciding the invasiveness of treatment. Endoscopic approaches (endoprosthesis, endoscopic clips, endoscopic sealing glue or balloon dilation), washout, drainage placement and re-suturing the leak if tissue is still in early stages of inflammation are options for early leaks. For chronic leaks a definitive surgical approach can be fistulo-jejuno anastomosis with Roux en Y or even total gastrectomy.

**Aim:** To present the surgical technique of laparoscopic fistulo-jejuno anastomosis with Roux en Y for chronic leaks after LSG.

**Method:** Preoperative work-up (EDS, Upper GI fluoroscopy, CT) and assuring a good nutrition status (TPN or NG tubes) are very important for the success of the operation. Also, if possible/necessary all collections need to be drained, either surgical or CT guided, if possible, prior to the operation.

**Results:** This video presentation highlights the main steps of the fistulo-jejuno anastomosis technique that we applied for chronic leaks after LSG: access to the abdomen, thorough adhesiolysis, difficult approach to the hiatus, minding the spleen and its vessels, re-establishing the anatomy, identifying the fistula, preparing the jejunum, performing the Roux en Y hand-sew fistulo-jejuno anastomosis.

**Conclusions:** Leaks most often occur early after surgery and there are various conservative means to treat them, but in case of chronic fistulas a more aggressive approach is needed. In our experience, Roux en Y fistulo-jejunostomy successfully resolved all the situations of chronic fistulas after LSG.

## O154 - Morbid Obesity

### 26 Years of Experience at Texas Endosurgery Institute in Laparoscopic Colorectal Surgery in Obese Patients

M. Hernández, M.E. Franklin jr., J. Glass, (A) Garza, (B) Serrano, M. Brown

Texas Endosurgery Institute, San Antonio, United States of America

**Introduction:** Obesity is a worldwide epidemic. It was predicted that by the year of 2025, 40% of the American population would be obese. This topic is well known that predisposes to numerous diseases, and increases postoperative morbidity and mortality.

The aim of this study was to demonstrate that the laparoscopic approach was, is, and will be considered the gold standard for abdominal procedures in obese patients. Show its feasibility and outcomes, focused in efficacy and benefits of intracorporeal anastomosis.

**Material and Methods:** We retrospectively reviewed 1174 patients who underwent to a colorectal surgery from January 1991 to January 2017 at Texas Endosurgery Institute in San Antonio, Texas.

**Results:** We found that 502 patients were overweight, 260 patients were obese class I, 233 class II, and 178 class III. 624 patients were males, and 550 were females. With a mean age of 53.5, and 52.5 years old respectively. The main diagnosis was cancer in 700 (59.5%) patients, followed by diverticulitis in 434 (37%) patients, then Crohn's disease, dysmotility, ulcerative colitis, and intussusception. Only 344 (27.6%) of surgeries were performed emergently, 850 (72.4%) were elective surgeries. Independently of the type of surgery, intracorporeal anastomosis was performed in 507 (43.1%) of the patients, while laparoscopic assisted anastomosis was done in 298 (25.4%). In 253 (21.6%) patients, anastomosis was contraindicated due to the severity of illness. The intraoperative rate of complications was 1.4% and 4.8% in the postoperative period. Estimated blood loss was 352 ml., (ranged from 20 ml to 1200 ml). The length of surgery was a mean time of 156.6 min (ranged from 33 to 300 min). Mean length of hospital stay was 5.5 days (ranged from 4 to 9 days).

**Conclusions:** We demonstrated that laparoscopic approach in colorectal surgery in obese patients is an invaluable approach, due to all the benefits that it brings to these patients such as, less immunological impact, quicker recovery and lower intra and postoperative complications.

## O155 - Oesophageal and Oesophagogastric Junction Disorder

### Laparoscopic Management of Large Hiatal Hernia with Self-Fixation ProGrip Mesh

V.V. Grubnik, V.V. Ilyashenko

Odessa national medical university, Odessa, Ukraine

**Aim:** Laparoscopic fundoplication with cruroplasty in the patients with a large hiatal hernia is often associated with high anatomical recurrent rate. We conduct prospective study to evaluate objective and subjective outcomes of the patients undergoing laparoscopic repair of the large hiatal hernia, either with self-fixation ProGrip mesh or without mesh. The primary outcome measure of the study was anatomical recurrent rate which was measured by endoscopy or barium swallow. The secondary outcome measures were safety and quality of life.

**Methods:** Ninety-eight patients who underwent laparoscopic repair of the large (hiatal surface area of 10–20 cm<sup>2</sup>) type III hiatal hernia were included. Criteria of exclusion were previously failed hernia repair and emergency procedures. Patients were stratified into mesh (I) and non-mesh (II) group. I group had 50 patients, II group had 48 patients. Preoperative and postoperative symptoms were assessed using the GERD-HRQL questionnaire. Upper gastrointestinal endoscopy and barium swallow examination were routinely performed after 6, 12 and 24 month.

**Results:** All surgical procedures were completed laparoscopically without serious complications. Operative time was the same in the both groups: 94±12 min in the I group, and 92±15 min in the II group. The fixation of ProGrip mesh takes only 5–10 min. The median follow-up was 26 months. There were 11 anatomical recurrences: 10 in non-mesh group and only 1 in mesh-group. Five of the 11 patients with anatomical recurrences were symptomatic, 2 were reoperated, 3 did not require a reoperation. No mesh-related complication occurred. Quality of life was better in the mesh-group.

**Conclusions:** Laparoscopic repair of the large hiatal hernia is effective and durable. Crural reinforcement with self-fixating mesh ProGrip is safe and decreases an operative time.

## O156 - Oesophageal and Oesophagogastric Junction Disorder

### Nitinol-Framed Lightweight PTFE Mesh Versus Partially Absorbable Mesh for Laparoscopic Repair of Giant Hiatal Hernias: Prospective Randomized Study

A.V. Malynovskiy, V.V. Grubnik

Odessa national medical university, Odessa, Ukraine

**Aim:** Current techniques of laparoscopic mesh repair of giant hiatal hernias produce high recurrence rate (up to 40%, mean 25%). We define giant hiatal hernias as those with hiatal surface area (HSA) exceeding 20 cm<sup>2</sup>. A new method of repair using heart-shaped lightweight polytetrafluoroethylene (FTFE) mesh with peripheral nitinol frame (Rebound-Hiatal, MMD) has an advantage of tension-free repair with perfect mechanical support of hiatal opening. The aim of this study is to assess long-term results of prospective randomized trial ("GIANT" trial, № NCT01780285) evaluating this method.

**Methods:** Forty seven patients were allocated to 2 arms: arm I—nitinol-framed lightweight PTFE mesh repair (23 patients); arm II—lightweight partially absorbable mesh repair (Ultrapro, Ethicon) (24 patients). Nissen fundoplication was used in both arms. Main inclusion criteria: types II and III hiatal hernias; HSA exceeding 20 cm<sup>2</sup>. Main exclusion criteria: ASA>II, age<20 and >80 years, BMI<16 и > 39 kg/m<sup>2</sup>, oesophageal motility disorders, oesophageal peptic strictures, shortened oesophagus. Primary outcome measures: rates of anatomic recurrences and repair-related complications. Methods of assessment: symptom and quality of life (GERD-HRQL) questionnaires, barium study, endoscopy, and 24h pH study. Forty five patients were assessed with a time frame of 2 years.

**Results:** Patients demographics (age, gender, ASA, BMI, hernia types) and preoperative data (HSA, symptom scores, quality of life score, grades of oesophagitis, DeMeester score) didn't differ between arms. Anatomical recurrences were absent in arm I, whereas there were 5 patients with recurrence (22.7%) in arm II (4 symptomatic, 1 asymptomatic) (p=0,0216). There were no dysphagia, strictures or erosions in both arms. Other subjective and objective data also favored arm I.

**Conclusions:** Long-term results of prospective randomized trial showed superiority of nitinol-framed lightweight PTFE mesh repair over lightweight partially absorbable mesh repair in prevention of recurrence of giant hiatal hernias, without any complications. We advice to consider this new method and the principle of framed mesh for repair of giant hiatal hernias.

## O157 - Oesophageal and Oesophagogastric Junction Disorder

### Tailored Approach to Use of Dor Fundoplication in Laparoscopic Heller Cardiomyotomy for Esophageal Achalasia: Long-Term Results of Prospective Study

A.V. Malynovskiy, V.V. Grubnik

Odessa national medical university, Odessa, Ukraine

**Aim:** Standard procedure for esophageal achalasia is Heller cardiomyotomy (HC) with Dor fundoplication (DF). But DF can increase recurrence rate because of deformation of esophagus by the wrap. Literature shows that reflux rate in lower than 20% if DF is not used. The aim of study was to analyze long-term outcomes of tailored approach to use of DF in HC.

**Methods:** From 2007 to 2012, tailored approach was used in 52 patients, prospectively divided to 2 groups. I group included 21 patients with past history of GERD, younger than 50, initial stage (spindle type), enlargement of hiatal opening, whom HC with DF was performed. II group included 31 patients without past history of GERD, older than 50, advanced stages (flask and sigmoid types) and normal size of hiatal opening, whom HC without DF was performed. For recurrence assessment, Mellow and Pinkas dysphagia score (from 0 to 4) and barium esophagography were used. For reflux assessment, 1st question (intensity of heartburn) of GERD-HRQL score (from 0 to 5), and ambulatory pH monitoring with calculation of DeMeester score were used. Mean follow-up period was 4.5 years (range, 3–8).

**Results:** Patients were comparable by demographics and preoperative data. Dysphagia score and radiological recurrence were significantly lower in II group (2.9±1.8 vs. 1.3±1.1, p<0.05; 7 patients, 33.3%, versus 2 patients, 6.4%, p<0.05, respectively). Heartburn and DeMeester scores were higher in II group, but the difference didn't reach statistical significance (1.1±1.9 vs. 1.7±2.3, p>0.05; 18.2±5.6 vs. 28.3±8.4, p>0.05, respectively). The same results were achieved by number of patients with clinically relevant reflux (1 patient, 4.7% versus 3 patients, 9.6%, p>0.05). Subgroup analysis showed that this difference signifies more in advanced stages of achalasia and older age of patients.

**Conclusions:** Long-term results of tailored approach to use of DF in HC showed its feasibility. To decrease recurrence rate of achalasia, DF should be used by distinct indications. Prospective randomized studies are needed to prove this issue.

## O158 - Oesophageal and Oesophagogastric Junction Disorder

### Laparoscopic Nissen Fundoplication in Obese Patients: Short- and Long-Term Follow-Up

S. Colozzi, M. Schietroma, M. Clementi, F. Piccione, E.M. Cecilia, F. Carlei, G. Amicucci

Ospedale civile san salvatore, L'aquila, Italy

**Background:** Some studies suggest that obesity is associated with a poor outcome after Laparoscopic Nissen Fundoplication (LNF), whereas other have not replicated these findings. The effect of body mass index (BMI) on the short and long term results of LNF are investigated.

**Methods:** Patients were divided in three group based on their BMI, normal weight (BMI < 25), overweight (BMI 25–29.9) and obese (BMI > 30). The database (recorded prospectively) included operating duration, conversion, intra and early postoperative complications, late outcomes. Mean follow-up was 16.5 years (range 11–22 years). In symptomatic and asymptomatic patients were performed gastroscopy and pH metry.

**Results:** 201 patients met the inclusion criteria: 43 (21.4%) had a normal BMI, 89 (44.2%) overweight, and 69 (34.4%) obese. Hiatal hernia was significantly less frequent in the normal BMI group ( $p < 0.001$ ) The operation was significantly longer in obese patients; the use of drains and graft for hiatal hernia repair was less in the normal BMI group ( $p < 0.0001$ ). The hospital stay, conversion (6.4%), intraoperative and early postoperative complications was not influenced by BMI. Dysphagia was evenly distributed among the groups. 27 (13.4%) patients had recurrences: one in the normal BMI group (2.3%), 7 in the overweight group (7.8%;  $p < 0.001$  vs. normal) and 19 in the obese group (27.5%;  $p < 0.0001$  vs. normal;  $p < 0.001$  vs. overweight).

**Conclusions:** BMI does not influence short-term outcomes following LNF, but long-term control of reflux in obese patients is worse than in normal-weight subjects. Therefore the LNF should be thoroughly evaluated for the treatment of GERD in obese patients.

## O159 - Oesophageal and Oesophagogastric Junction Disorder

### The Impact on Quality of Life Following Different Therapeutic Approaches in Achalasia

B. Babic, W. Breithaupt, T. Schulz, G. Varga, K.H. Fuchs

Agaplesion Markus Krankenhaus, Frankfurt am Main, Germany

**Aim:** The aim of this study is to compare the development of quality of life (QL), measured with the Gastrointestinal Quality of Life Index (GIQLI), in different groups of patients, in whom:

laparoscopic Heller myotomy (LHM) was performed (Group 1).

peroral endoscopic myotomy (POEM) was performed (Group 2).

**Methods:** QL was measured prior (pre) to therapy in 99 patients. After 5 years of follow-up QL from all patients in both groups after the different therapeutic approaches was re-evaluated (post).

**Results:** Follow-up: 60 months (36–96).

Group 1:  $n = 68$ ; QL pre/post 98/119 ( $p < 0.000002507$ ).

Group 2:  $n = 31$ ; QL pre/post 100/123 ( $p < 0.0004804$ ).

After LHM and POEM a significant difference and improvement in QL could be reached.

**Conclusion:** The study clearly shows the significant benefit in QL of Achalasia patients after LHM and POEM after 5 years. Both therapeutic approaches are save and feasible.

## O160 - Oesophageal and Oesophagogastric Junction Disorder

### Needlescopic Nissen Fundoplication, Experience in 85 Patients

A. Quinones

Tec 100, Queretaro, Mexico

**Introduction and Objectives:** Minimally invasive surgery continues to evolve, with an emphasis on developing new techniques, and applying new technology to surgical procedures. The aim of this study is to describe our experience with Needlescopic Nissen Fundoplication (CL1P) performed in 85 patients, in a 3 year follow up.

**Methods:** This study is original, prospective and descriptive. We included 85 patients, 30 males and 55 females, average age of 27, all with the diagnose of reflux disease, diagnosed with endoscopy, manometry and pHmetry. We measured surgical time, inpatient time, postoperative visual analogue scale pain measure (VAS), use of extra painkillers, return to work, complications, conversion to traditional laparoscopic surgery, and finally costs.

**Results:** The average surgical time was 47.1 min (max 128 min and min 27 min). In 9 patient we had to give them 2 doses of parecoxiv 40 mg IV. The average VAS at 4 h postop was 3.1, and at 8 h 2.01. All the patients stayed in the hospital for 2 days. No complications and no conversions to traditional laparoscopy were seen in any patient. 100% of the patients return to work at day 4.

**Conclusions:** It can be concluded that Needlescopic fundoplication is a safe, less invasive, painless, therefore, less painkillers and a quick return to work, being this last, an excellent marker for general patient health. Needlescopic Fundoplication is a great option. Discussion. As any new technique, the surgeon needs to have the appropriate training, and appropriate equipment.

## O161 - Oesophageal and Oesophagogastric Junction Disorder

### Preoperative Hiatal Surface Area Measurement by CT Scan: Is There Any Help for Preoperative Decision Making in the Treatment of Hiatal Defects?

C.E. Boru, A. Iossa, M. Rengo, A. Guida, P. Termine, G. Silecchia

University La Sapienza, Rome, Italy

**Introduction:** Ouyang has recently proposed hiatal surface area (HSA) calculation by multiplanar multislice computer tomography (MDCT) scan as a useful tool for planning treatment of hiatus defects with hiatal hernia (HH), with or without gastroesophageal reflux (MRGE). Preoperative upper endoscopy or barium swallow cannot predict the HSA and pillars conditions. Aim to asses the efficacy of MDCT's calculation of HSA for planning the best approach for the hiatal defects treatment.

**Methods:** We retrospectively analyzed 25 patients, candidates to laparoscopic antireflux surgery as primary surgery or hiatus repair concomitant with or after bariatric surgery. Patients were analyzed preoperatively and after one-year follow-up by MDCT scan measurement of esophageal hiatus surface. Five normal patients were enrolled as control group. The HSA's intraoperative calculation was performed after complete dissection of the area considered a triangle. Postoperative CT-scan was done after 12 months or any time reflux symptoms appeared.

**Results:** (1) Mean HSA in control patients with no HH, no MRGE was  $< 5 \text{ cm}^2$  and similar in non-complicated patients with previous LSG and cruroplasty. (2) Mean HSA in patients candidates to cruroplasty was  $7.40 \text{ cm}^2$ . (3) Mean HSA in patients candidates to redo cruroplasty for recurrence was  $10.11 \text{ cm}^2$ . Discussion. MDCT scan offer the possibility to obtain an objective measurement of the HSA and the correlation with endoscopic findings and symptoms. The preoperative information allow to discuss with patients the proper technique when a  $\text{HSA} > 5 \text{ cm}^2$  is detected. During the follow-up a correlation between symptoms and failure of cruroplasty can be assessed.

**Conclusions:** MDCT scan seems to be an effective non-invasive method to plan hiatal defect treatment and to check during the follow-up the potential recurrence. Future research should correlate in larger series imaging data with intraoperative findings.

## O162 - Oesophageal and Oesophagogastric Junction Disorder

### Electron Microscopy Evaluation of Neosquamous Epithelium After Radiofrequency Ablation of Barrett's Esophagus

O. Skrobic<sup>1</sup>, A.P. Simic<sup>2</sup>, N. Ivanovic<sup>2</sup>, T. Kravic<sup>3</sup>, V. Bubmasirevic<sup>3</sup>, P. Pesko<sup>1</sup>

<sup>1</sup>First Surgical University Hospital, Belgrade, Serbia; <sup>2</sup>First Surgical University Hospital, Clinical Center of Serbia, Belgrade, Serbia; <sup>3</sup>Institute for Histology, Belgrade School of Medicine, Belgrade, Serbia

**Aim:** Radiofrequency ablation (RFA) is a safe and effective treatment for Barrett's esophagus (BE). Ablated BE is being replaced with neosquamous epithelium (NSE). In approximately 15% patients after BE complete eradication (CE) recurrence occurs. Dilated intercellular spaces (IS) represent the key microscopic feature of the esophageal epithelium reflux induced injury. The aim of this study was to analyze the ultrastructure of NSE by transmission electron microscopy (TEM), and to sought out the impact of post RFA treatment modalities on NSE.

**Methods:** Prospective clinical study, initiated in 2014 based on TEM analysis of biopsy specimens obtained from patients in whom CE of BE was achieved minimum 6 months after the last RFA session. In each patient biopsies were taken from NSE and proximal esophagus. Two groups of patients were defined according to the post RFA treatment: proton pump inhibitors (PPI's) or laparoscopic Nissen fundoplication (LNF). Comparative analysis of IS length was made between two groups.

**Results:** Overall 22 patients with CE of BE after RFA underwent complete study protocol, out of whom in 10 LNF was performed, while 12 were treated with PPI's. The mean value of IS length in the proximal esophagus and NSE in LNF group were  $0.311 \pm 0.173 \mu\text{m}$  and  $0.773 \pm 0.358 \mu\text{m}$ , while in PPI's group  $0.859 \mu\text{m} \pm 0.377$  and  $1.363 \pm 0.213 \mu\text{m}$ , respectively. Mean values of IS were statistically significantly higher in PPI's group both in NSE ( $p=0.04$ ) and proximal esophagus ( $p=0.002$ ).

**Conclusion:** Dilated IS are commonly presented in NSE of patients with CE of BE with RFA who are treated with PPI's, indicating early reflux damage. A proper LNF provides better protection of NSE than PPI's and may reduce the rates of recurrence after successful RFA treatment.

## O163 - Oesophageal and Oesophagogastric Junction Disorder

### Relevance of Bidirectional Hiatal Reconstruction Without Prosthetic Reinforcement in Giant Hiatal Hernia Repair

A.P. Simic, O. Skrobic, N. Ivanovic, D. Velickovic, V. Sljukic, E. Keramatollah, P. Pesko

First University Surgical Hospital, Clinical Center of Serbia, Belgrade, Serbia

**Aim:** Available evidence today indicate that there is no clear acceptance of mesh usage in giant hiatal hernia (GHH) repair, and that the risk of recurrence has to be weighed against the risk for consequent major mesh induced complications. The aim of the study was to determine the incidence of symptomatic and anatomical recurrence after laparoscopic bidirectional hiatal cruroplasty (posterior and left), combined with antireflux surgery in patients with GHH.

**Methods:** Prospective follow-up of 112 patients with GHH in whom laparoscopic bidirectional hiatal reconstruction and antireflux procedure (90 Nissen and 22 Toupet fundoplication) was performed from 2010 till 2016. Upside-down stomach was present in 40 pts, while the remaining had > 30% of the stomach positioned intrathoracally. Regular follow-up included barium esophagogram, upper GI endoscopy, and symptom severity questionnaire, one and 2 years after surgery.

**Results:** Complete follow-up was obtained in 80.35% of patients. Two patients were excluded from the study due to disrupted and slipped fundoplication respectively. Radiographic hernia recurrence (> 2 cm) was documented in 11 patients (12.22%) at 2 years, out of which five were symptom free. Endoscopy confirmed recurrence in all of those, while two additional patients were considered to have recurrence by the endoscopic criteria alone. Median recurrence time was 1.2 years. There were no short or long term complications regarding the bidirectional hiatal reconstruction.

**Conclusions:** Laparoscopic bidirectional hiatal reconstruction for GHH presents valuable solution, with literature incidence of recurrence similar to those with prosthetic materials but without side effects or complications.

## O164 - Oesophageal and Oesophagogastric Junction Disorder

### Laparoscopic Transgastric Circumferential Stapler-Assisted Versus Endoscopic Esophageal Mucosectomy in a Porcine Model

P.C. Müller<sup>1</sup>, D.C. Steinemann<sup>1</sup>, A. Zerz<sup>2</sup>, P. Sauer<sup>1</sup>, A. Schaible<sup>1</sup>, A.C. Schwarz<sup>1</sup>, B.P. Müller-Stich<sup>1</sup>, G.R. Linke<sup>3</sup>

<sup>1</sup>University Clinic of Heidelberg, Heidelberg, Germany; <sup>2</sup>Klinik Stephanshorn, St. Gallen, Switzerland; <sup>3</sup>Hospital STS Thun AG, Thun, Switzerland

**Background and study Aim:** Extensive endoscopic mucosal resection (EMR) for Barrett's esophagus (BE) may lead to stenosis. Laparoscopic, transgastric, stapler-assisted mucosectomy (SAM) retrieving circumferential specimens is proposed.

**Methods:** SAM was evaluated in two phases. The feasibility of SAM and the quality of specimens was assessed in eight animals. The mucosal healing was evaluated in a 6-weeks survival experiment comparing SAM (n=6) and EMR (n=6). The ratio of the esophageal lumen width (REL) at the resection level measured in fluoroscopy after 6-weeks divided by the width immediately after resection was compared.

**Results:** In all animals successfully a circular mucosectomy specimen was successfully obtained with an area of  $492 (426-573) \text{ mm}^2$  and  $941 (813-1209) \text{ mm}^2$  using a 21-mm and 25-mm stapler, respectively. In the survival experiments two animals developed symptomatic stenosis after EMR and none after SAM. The REL was  $0.96 [0.9-1.04]$  and  $0.27 [0.18-0.39]$  ( $p < 0.0001$ ) for SAM and EMR, respectively.

**Conclusions:** SAM provides a novel technique for en-bloc mucosectomy in BE. In contrast to EMR mucosal healing in SAM was not associated with stenosis up to six weeks after intervention.

## O165 - Oesophageal and Oesophagogastric Junction Disorder

### Reflux Control by Fundoplication After Laparoscopic Transgastric Stapler Assisted Circumferential Esophageal Mucosectomy in a Pig Model

P.C. Müller<sup>1</sup>, D.C. Steinemann<sup>1</sup>, A.C. Schwarz<sup>1</sup>, A. Zerz<sup>2</sup>, G.R. Linke<sup>3</sup>, B.P. Müller-Stich<sup>1</sup>

<sup>1</sup>University Clinic of Heidelberg, Heidelberg, Germany; <sup>2</sup>Klinik Stephanshorn, St. Gallen, Switzerland; <sup>3</sup>Hospital STS Thun AG, Thun, Switzerland

**Aim:** Laparoscopic transgastric stapler assisted mucosectomy (SAM) has been described for circumferential en-bloc resection of Barrett's epithelium (BE). The aim of this study was to assess the feasibility of combined SAM and 360° Nissen-fundoplication in a porcine model. The influence of SAM and of subsequent fundoplication on the competence of the gastroesophageal junction (GEJ) as a reflux barrier was evaluated.

**Methods:** The feasibility of fundoplication after SAM was assessed in 6 pigs. Competence of the GEJ was assessed intraoperative at baseline, after SAM, and after subsequent laparoscopic fundoplication. Blue-colored water was infused into the stomach for provocation of reflux. Time to reflux was detected by drainage of blue solution (DBS) over an esophageal tube and by multi-channel intraluminal impedance (MII). Intra-gastric yield volume and yield pressure until DBS occurred were recorded.

**Results:** Laparoscopic fundoplication after SAM was feasible in all animals. Time to DBS and MII, yield volume, and yield pressure decreased after SAM ( $p=0.008$ ,  $p < 0.001$ ,  $p < 0.001$  and  $p=0.007$ ). After adding a Nissen-fundoplication the GEJ was completely patent in 19 out of 36 measurements. For the remaining measurements time to DBS, to MII, and yield volume returned to baseline values ( $p=0.15$ ,  $p=0.84$  and  $p=0.11$ ). The yield pressure at baseline was  $11.5 \text{ mmHg}$  and after SAM and fundoplication  $19.7 \text{ mmHg}$  ( $p < 0.001$ ).

**Conclusions:** Laparoscopic fundoplication after SAM is feasible and ensures an effective reflux barrier. The combination of laparoscopic fundoplication and SAM may effectively control BE in long-term. However, a controlled clinical pilot study is indispensable for further evaluation of the method.

## O166 - Oesophageal and Oesophagogastric Junction Disorder

### Hiatal Size on Pre-operative Computed Tomography Predicts the Need for Mesh Cruroplasty in Hiatal Hernia Repair: Defining the Grey Area

L. Navaratne, J. Al-Musawi, P. Lung, A. Isla

Northwick Park Hospital, London, United Kingdom

**Aim:** The use of mesh cruroplasty for hiatal hernia repair cannot be endorsed routinely and the decision for the placement of mesh needs to be individualised based on operative findings and the surgeon's recommendation. Smaller defects will likely close with suture cruroplasty whereas very large defects will require mesh. The aim of this study was to define these cut-offs, which can be measured pre-operatively, and therefore predict the need for mesh.

**Methods:** 120 patients underwent laparoscopic anti-reflux surgery and/or laparoscopic hiatal hernia repair by a single surgeon from September 2014 to December 2016. Patients with a pre-operative computed tomography (CT) scan within 12 months of surgery were included. Size of hiatal defect was measured in axial plane. Outcomes measures included suture (S) versus mesh (M) cruroplasty and post-operative complications including recurrence.

**Results:** 31 patients met the inclusion criteria during the study period. 'S' group comprised of twenty-four (77.4%) patients with a mean hiatal defect size of 21.8 mm. 'M' group comprised of seven (22.6%) patients with a mean hiatal defect size of 44.9 mm. The difference between means ( $\pm$ SEM) was  $23.1 \pm 3.5$  (95% CI 15.9 to 30.2,  $p < 0.0001$ ). Seventeen (54.8%) patients had hiatal defect size  $\leq 25$  mm and all patients received suture cruroplasty. Nine (29.0%) patients had hiatal defect size 26–40 mm, of these two (22.2%) required mesh cruroplasty. Five (16.1%) patients had hiatal defect  $> 40$  mm, all of whom required mesh cruroplasty. If pre-operative CT was used as a screening test for mesh requirement with a cut-off of 38 mm it would yield a sensitivity of 85.7%, specificity 100%, accuracy 96.8% and area under the ROC curve 0.9613. There were no short or long-term complications in either groups including recurrence of hiatal hernia and intrathoracic wrap migration.

**Conclusion:** These results confirm that the larger the hiatal defect the more likely a mesh is required. It appears that defect sizes greater than 40 mm will require a mesh and those smaller than 25 mm will close with sutures alone. Although the numbers are small, our results suggest that there is an intermediate group ('grey' area) where the need for mesh can only be realised intra-operatively.

## O167 - Oesophageal and Oesophagogastric Junction Disorder

### Rise Stratifikation of Extended and Recurrent Hiatal Hernias Considering Sages Subtypes

C. Reincke, M. Niedergethmann

Alfried Krupp Hospital, Essen, Germany

**Aim:** Laparoscopic fundoplication and hiatal hernia repair as a primary surgery in case of Type I and II hernias (SAGES classification—Society of American Gastrointestinal and Endoscopic Surgeons) represents the routine elective procedure. In case of hernias of Type III and IV or recurrent hiatal hernia the rate of complications is increased. The aim of the study was to classify advanced and recurrent hernias, and to establish risk factors for complications in advanced hernia types.

**Methods:** 64 patients underwent surgery of hiatal hernia repair between 2013 and 2016 and were documented in a departmental prospective data base. 20/64 patients had Hernias Type I and II. 44/64 patients (68.75%) had advanced hernias: Type III 35/64, Type IV 6/64 or a recurrent hiatal hernia (16/64). 2/64 patients were emergency cases with haemodynamically relevant bleeding or incarceration with sepsis. These were excluded in the following analysis.

**Results:** No complications were found in Type I and II hiatal hernias, whereas in advanced hernias (Type III/IV) there was one case (1.6%) of postoperative haemorrhage and 3 cases of pleural effusion or pneumothorax (4.8%). Esophageal or gastric leakage occurred in 3/62 cases (4.8%) undergoing subsequent revision and pleural drainage. Mortality rate was 3.2% (2/62). The average hospital stay of the latter patients was 11.7 days, whereas in hernias Type I/II hospital stay was 6.6 days. Risk factors for complications were advanced hernias Type III and IV or recurrent hernias (odds ratio: 4.78) and pre-existing cardiological, malignant, neurological, nephrological conditions (odds ratio: 2.33).

**Conclusion:** Patients with SAGES hernias Types III/IV and recurrent hiatal hernias have an increased risk of complications compared to Types I and II. Risk factors for complications are in addition recurrent hernias and pre-existing conditions. Owing to the rate of leakage of 4.8% indicator drainage is advisable. In individual cases, especially when pleura is involved a pleura drainage should be placed. If pleura or oesophagus is injured an intensive postoperative management is indicated.

## O168 - Oesophageal Malignancies

### The Influence of the Different Forms of Appendix Base Closure on Patient Outcome in Laparoscopic Appendectomy. A Randomized Trial

S. Delibegovic, Z. Mehmedovic

University Clinical Center, Tuzla, Bosnia-Herzegovina

**Aim:** During laparoscopic appendectomy, the base of the appendix is usually secured by an Endoloop ligature or stapler. A plastic Hem-o-lok clip has been shown as an alternative technique. Titanium DS clips are a safe and effective option. The aim of this study was to compare the clinical outcomes of various forms of securing the base of the appendix, in order to find the best method.

**Patients and Methods:** Patients with acute appendicitis were randomly divided into four groups by 30 patients: in the first group, the base of the appendix was secured using an Endoloop ligature, in the second group using a 45-mm Stapler, in the third group using only one non-absorbable Hem-o-lok clip and in the fourth group using a titanium DS clip. The primary outcome was taken to be overall morbidity. Secondary outcomes were time of application, time of operative procedure, total length of stay and surgical outcome.

**Results:** The time of application was statistically significantly greater in the Endoloop group than in the Stapler ( $P < 0.0001$ ), Hem-o-lok ( $P < 0.0001$ ) and DS clips ( $P < 0.0001$ ) groups. The time of application in the Stapler group was statistically significantly shorter than in the Hem-o-lok ( $P < 0.0001$ ) and the DS clips ( $P < 0.0001$ ) groups. The time of application in the Hem-o-lok group did not differ statistically significantly from the time of application in the DS clips group ( $P = 1.00$ ). The duration of the surgical procedure was statistically significantly longer in the Endoloop than in the Stapler group ( $P < 0.0001$ ). No statistically significant difference was established between the Endoloop and the Hem-o-lok and the DS clips group. The duration of the surgical procedure in the Stapler group was statistically significantly shorter than in the DS clips group ( $P < 0.0001$ ) but did not differ statistically significantly from the Hem-o-lok group ( $P = 0.199$ ). The duration of the surgical procedure in the Hem-o-lok group was statistically significantly shorter than in the DS clips group ( $P = 0.044$ ).

**Conclusion:** All forms of closure of the appendix base are acceptable, but plastic and titanium clips have the best potential for further development, and will probably become the method of choice in securing the base of the appendix.

## O169 - Oesophageal Malignancies

### Minimally Invasive Versus Open Esophagectomy for Advanced Esophageal Cancer

M. Bjelovic, D. Gunjic, M. Veselinovic, T. Babic

University Hospital for Digestive Surgery, Clinical Center of Serbia, Belgrade, Serbia

**Aim:** To assess the effectiveness of minimally invasive esophagectomy (MIE) in comparison with open esophagectomy (OE) in advanced esophageal cancer treatment.

**Methods:** The single center prospective nonrandom cohort study included a total of 111 patients in convenience sample, who underwent the Ivor-Lewis procedure with a curative intention for the middle- and lower-third esophageal cancer between January 2009 and December 2016. All patients were operated by the one surgical team. Out of 111 patients, 44 underwent OE and 67 MIE (44 hMIE laparoscopic approach (laparoscopy, open thoracic surgery, chest anastomosis) and 23 tMIE (laparoscopy, videothoracoscopic surgery, chest anastomosis)). Patients were stratified by surgical approach and perioperative and oncologic outcomes analyzed. The primary endpoint studied was 30-day mortality. Secondary endpoints studied were perioperative characteristics, significant early postoperative complications, including major postoperative pulmonary complications (MPPCs) and oncological outcomes.

**Results:** Overall mortality rate was 1.8%. There was no statistically significant difference regarding 30-day mortality between the groups. Mean intensive care unit (ICU) stay was 3.6 (1–21) days, with a statistically significant difference in favor of the MIE group. The total number of patients with postoperative complications with Dindo-Clavien grade II or higher was 30.6%, with a higher prevalence in the OE group but without statistically significant difference ( $p > 0.05$ ). Higher prevalence of major postoperative pulmonary complications (MPPCs) was observed in the OE group compared to the MIE group. Mean number of harvested lymph nodes was 26.3 in the OE group compared to 31.7 in the MIE group ( $p < 0.05$ ). Positive resection margin (R1) i.e. tumor tissue at or  $< 1$  mm from the radial (deep), proximal, or distal margins was observed in 25.0% patients in OE group and 26.9% patients in MIE group ( $p > 0.05$ ).

**Conclusion:** Perioperative and oncologic results after MIE are not inferior but are even better in some aspects of treatment when compared to OE.

## O170 - Oesophageal Malignancies

### Techniques and Short-Term Outcomes for Minimally Invasive Ivor Lewis Esophageal Resection in Distal Esophageal and Gastro-Esophageal Junction Cancers

J. Straatman<sup>1</sup>, N. Wielen, van der<sup>1</sup>, G.A.P. Nieuwenhuijzen<sup>2</sup>, C. Rosman<sup>3</sup>, J. Roig Garcia<sup>4</sup>, J.J.G. Scheepers<sup>5</sup>, M.A. Cuesta<sup>1</sup>, M.A. Luyer<sup>2</sup>, M.I. van Berge Henegouwen<sup>6</sup>, F. van Workum<sup>7</sup>, S.S. Gisbertz<sup>6</sup>, D.L. Peet, van der<sup>1</sup>

<sup>1</sup>VU University Medical Center, Amsterdam, The Netherlands; <sup>2</sup>Catharina Ziekenhuis, Eindhoven, The Netherlands; <sup>3</sup>Radboud UMC, Nijmegen, The Netherlands; <sup>4</sup>Hospital Universitario de Josep Trueta, Girona, Spain; <sup>5</sup>Reinier de Graaf Ziekenhuis, Delft, The Netherlands; <sup>6</sup>Academic Medical Centre, Amsterdam, The Netherlands; <sup>7</sup>Canisius Wilhelmina Ziekenhuis, Nijmegen, The Netherlands

**Introduction:** Esophagectomy for cancer can be performed in a two-stage procedure with an intrathoracic anastomosis: the Ivor Lewis esophagectomy. A growing incidence of distal and gastro-esophageal junction adenocarcinomas and increasing use of minimally invasive techniques has prompted interest in this procedure. The aim of this study was to assess short-term results of minimally invasive Ivor Lewis esophagectomy (MIE-IL).

**Methods:** A retrospective cohort study was performed from June 2007 until September 2014. Including patients that underwent MIE-IL for distal esophageal and gastro-esophageal junction cancer in six different hospitals in the Netherlands and Spain. Data was collected with regards to operative techniques, pathology and postoperative complications.

**Results:** 282 patients underwent MIE-IL, of which 90.2% received neoadjuvant therapy. Anastomotic leakage was observed in 43 patients (15.2%), of whom 13 patients (4.6%) had empyema, necessitating thoracotomy for decortication. With an aggressive treatment of complications, the 30-day and in-hospital mortality rate was 2.1%. An R0-resection was obtained in 92.5% of the patients. 20.1% of patients had a complete response after neoadjuvant therapy.

**Conclusions:** Minimally invasive Ivor Lewis esophagectomy for distal esophageal and gastro-esophageal junction adenocarcinomas is an upcoming approach for reducing morbidity caused by laparotomy and thoracotomy. Anastomotic leakage rate is still high probably due to learning curve, technical diversity of anastomotic techniques, and a high percentage of patients treated by neoadjuvant chemoradiotherapy. An aggressive approach to complications leads to a low mortality of 2.1%. Further improvement and standardization in the anastomotic technique is needed in order to perform a safe intrathoracic anastomosis.

## O171 - Oesophageal Malignancies

### Audit of Totally Minimal Invasive Esophagectomy: Is It a Safe and Oncological Adequate Alternative to Open Resection?

R. Hummel, M. Thomaschewski, F. Zambrana, M. Hoffmann, D. Bausch, T. Keck

University of Lübeck, Lübeck, Germany

**Aim:** Minimal invasive approaches gained increasingly in importance in the curative treatment of adenocarcinomas of the esophago-gastric junction (AEG tumors). This study aimed to audit our results of totally minimal invasive esophagectomy (MIE) in comparison to open (cervico-) thoraco-abdominal esophagectomy (OE) for AEG tumors with regards to radicalness of resection and perioperative mortality.

**Methods:** Patients undergoing either MIE or OE for AEG tumors in curative intent between 2006 and 2014 were identified. Demographics, preoperative staging, treatment details, postoperative staging, lymph node yield, R0 rates and mortality were assessed retrospectively.

**Results:** A total of 142 patients underwent surgical treatment for AEG tumors during the study period in our unit. Of these, 52 patients underwent MIE, and 29 patients underwent OE. Groups did not differ with regards to age, sex, Siewert classification or preoperative staging. Looking at treatment details, use of neoadjuvant treatment was similar, whereas cervical anastomoses were used more frequently in MIE ( $p < 0.001$ ). There were no significant differences between groups regarding postoperative TNM stages, grading, haem-/lymphangiogenesis or Lauren classification. R0 rates in OE vs. MIE were 85.7 vs. 88.2% (ns), and median lymph node yield was 15 (range 8–38) versus 19 (range 6–47; ns). 30-day (OE vs. MIE: 0 vs. 3.8%; ns) and in-hospital mortality (OE vs. MIE: 6.9 vs. 3.8%; ns) did not differ between groups.

**Discussion:** In our audit, radicalness of MIE as assessed via R0 resection rates and lymph node yield, as well as postoperative mortality were comparable to OE. These data support that MIE is a safe and oncological adequate alternative to open resection.

## O172 - Pancreas

### Impact of Laparoscopy in Elderly Patients Requiring Distal Pancreatectomy: A Multicentric Comparative Study

R. Souche<sup>1</sup>, D. Fuks<sup>2</sup>, J. Chauvat<sup>1</sup>, (A) Herrero<sup>1</sup>, I. Pirllet<sup>1</sup>, F. Guillon<sup>1</sup>, T. Perniceni<sup>2</sup>, C. Denet<sup>2</sup>, F. Borie<sup>1</sup>, (B) Gayet<sup>2</sup>, J.M. Fabre<sup>1</sup>

<sup>1</sup>CHU Montpellier, Montpellier, France; <sup>2</sup>Institut mutualiste Montsouris, Paris, France

**Aim:** Few data are available concerning short-term results of minimally invasive surgery in patients >70 years old requiring distal pancreatectomy. The aim of this study was to compare short term results after laparoscopic (LDP) versus open distal pancreatectomy (ODP) in this sub group of patients.

**Methods:** All patients >70 years old requiring distal pancreatectomy in two expert centers between 1995 and 2016 were included and data were retrospectively collected. Demographic, intra- and postoperative data in LDP and ODP groups were compared.

**Results:** A distal pancreatectomy was performed in 100 patients >70 y.o with 47 LDP (conversion in 8 patients (17%)) and 61 ODP. Among them, 53 were between 70 and 75 y.o, 29 between 75 and 80 and 18 were >80 y.o. Spleen preservation was performed in 40 patients (40%) and was associated with splenic vessels resection in 16 patients (40%). Duration of surgery and blood loss were respectively 207 min (90–360 min) and 305 ml (20–1500 ml). Median hospital stay was 16 days (6–57 days). A 90-days complication occurred in 49 patients (49%) and was Dindo-Clavien ≥3 in 17 patients (17%). The pancreatic fistula (PF) rate was 22% (grade A: 68%, B: 22% and C: 10%). Splenic ischemia after Warshaw procedure occurred in 2 patients who required a secondary splenectomy. The 90-days mortality rate was 3%. After exclusion of patients with open conversion during LDP, the duration of surgery, hospital stay, complication rates and PF rate were not significantly different between LDP and ODP groups. Blood loss (182 ml vs. 384 ml,  $p=0.04$ ) and intraoperative transfusion rate (5% vs. 14%,  $p=0.029$ ) were lower in LDP group. In DP for malignant lesions, R0 rates (LDP: 93.4% vs. ODP: 89%,  $p=0.057$ ) and median number of resected lymph nodes (LDP: 11 (2–51) vs. ODP: 9 (8–48),  $p=0.1$ ) were not significantly different between 2 groups.

**Conclusions:** Short-term results of LDP in patients >70 y.o were similar to the results described in general population. Minimally invasive approach permitted to reduce blood loss and intraoperative transfusion without significant effect on hospital stay in this particular subgroup of patients.

## O173 - Pancreas

### The Management of Fluid Collection After Laparoscopic Distal Pancreatectomy

J.W. Kwon, S.C. Kim, D.W. Hwang, K.B. Song, J.H. Lee, S.H. Shin, K.M. Park, Y.J. Lee

Seoul Asan Medical Center, Seoul, Republic of Korea

**Background:** Recently, laparoscopic distal pancreatectomy (LDP) became the standard procedure for resection of left sided pancreatic mass. Fluid collections (FC) at the resection margin of the pancreatic stump after LDP are the frequent radiological finding. However, no recommendations exist regarding its management. The aim for this study is to define FC incidence and suggest efficient treatment of FC after LDP.

**Method:** Data of 1227 patients who underwent LDP between March, 2005 and December, 2015 were collected. This data was analyzed, regarding follow-up CT scan findings of FC at the resection margin. FC was defined when the longest diameter on CT scan was >3 cm. We compared demographic data between FC positive and negative group. Within the positive group, we also compared its intervention and observation group. The basic characteristics of this intervention group consist of symptoms, laboratory findings, CT scan.

**Results:** A follow-up with at least one CT image was available for 1217 patients. 812 patients showed FC (66.7%) in immediate postoperative CT or outpatient CT image. FC positive was more common in male patients and FC positive group show longer operative time, post operative hospital stay than FC negative group. 736 FC patients (90.6%) were observed without specific treatment. 76 FC patients (9.3%) need intervention treatment, almost of them complain nausea, vomiting or pain (67 patients / 88%). 61 patients of intervention group (80.3%) show the size of FC increase at follow up CT image. EUS guided stent insertion for gastrocystostomy was performed in 54 patients (71.1%) of intervention group.

**Conclusions:** It was found that not all FC after LDP need the additional treatment despite the fact that is frequently found. Almost patients who treated with intervention have some symptom with FC increase at follow up CT image. We noticed that out of all drainage procedures, EUS guided gastrocystostomy was most useful for our experiment.

## O174 - Pancreas

### Is There a Role for Near-Infrared Technology in Laparoscopic Pancreatic Resection of Pancreatic Neuroendocrine Tumors? Results of the Colpan Study

M. de Pastena, S. Paiella, L. Landoni, A. Esposito, L. Casetti, M. Miotto, M. Ramera, E. Secchettin, D. Bonamini, G. Marchegiani, R. Salvia, C. Bassi

AOUI Verona, Verona, Italy

**Background:** The intraoperative identification of pancreatic neuroendocrine tumors (PanNETs) is of utmost importance to drive their laparoscopic resection. Near-infrared (NIR) surgery has emerged as a new technique for localizing tumors or neoplastic tissue. This study aimed to explore the results of the application of NIR in the laparoscopic resection of PanNETs.

**Methods:** Per protocol we enrolled 10 subjects undergoing laparoscopic pancreatic surgery for PanNET from March 2016 to October 2016. During surgery, the patients were injected with indocyanine green dye (ICG, 25 mg given in 5 boli of 5 mg each). The switch-activation of NIR was performed to identify PanNETs. An ex-post analysis of the images was realized using ImageJ Software to calculate the fluorescence signal.

**Results:** NIR imaging identified all 10 PanNETs. 9 (90%) laparoscopic distal pancreatectomy with splenectomy and 1 (10%) laparoscopic enucleation were performed. The mean maximum tumor dimension was 2.4 cm (range 1–4 cm). 8 non-functioning PanNETs (80%) and 2 insulinomas (20%) were found at the final pathology. Nine out of 10 (90%) PanNETs were detected after the second ICG bolus. The mean latency time was 80 s and the mean visibility time was 220 s. The peak of tumor visualization was reached 20 min after the last bolus. This finding was confirmed by the ex-post analysis of the fluorescence signal (mean signal-to-background ratio of 7.7,  $p=0.001$ ). NIR identified 2 additional lesions, turned out to be normal lymph nodes at final pathology. A fluorescent signal was identified at the bed of the enucleation, thus a further exeresis was performed and final pathology revealed that it is residual neoplastic tissue.

**Conclusions:** This explorative study shows that NIR with ICG can have a role in laparoscopic pancreatic resection of PanNETs. Further studies are needed to assess the proper setting and role of this new and promising technology.

## O175 - Pancreas

### Multivisceral Laparoscopic Distal Pancreatectomy for Adenocarcinoma in the Body and Tail of the Pancreas

M. Sahakyan<sup>1</sup>, B. Røsok<sup>2</sup>, A. Kazaryan<sup>3</sup>, A. Fretland<sup>2</sup>, D. Ignjatovic<sup>3</sup>, K.J. Labori<sup>2</sup>, B.I. Edwin<sup>2</sup>

<sup>1</sup>The Intervention Centre, Oslo University Hospital - Rikshospitalet, Oslo, Norway; <sup>2</sup>Oslo University Hospital - Rikshospitalet, Oslo, Norway; <sup>3</sup>Akershus University Hospital, Oslo, Norway

**Aim:** Multivisceral resection is often required in patients with adenocarcinoma in the body and tail of the pancreas. However, the results following multivisceral laparoscopic distal pancreatectomy (M-LDP) are scarcely reported in the literature. We aimed to examine the outcomes of M-LDP in patients with pancreatic adenocarcinoma.

**Methods:** The perioperative and oncologic data were reviewed in patients undergoing laparoscopic distal pancreatectomy (LDP) for adenocarcinoma at Oslo University Hospital—Rikshospitalet. M-LDP included extended LDP (defined by the International Study Group for Pancreatic Surgery) and LDP combined with the concomitant resection of distant organ (synchronous distant metastases, second primary tumor). Surgical outcomes of M-LDP were compared with those following standard LDP (S-LDP). Furthermore, the oncologic results of an extended LDP were examined in patients with pancreatic ductal adenocarcinoma (PDAC).

**Results:** From April 1997 to June 2016, 469 consecutive patients underwent LDP for pancreatic neoplasms, including 116 (24.7%) for adenocarcinoma (78 S-LDP and 38 M-LDP). Adrenal gland, colon and kidney were resected en-bloc with the distal pancreas in 29.8%, 17.5% and 14.1% of cases, respectively. M-LDP was associated with larger tumor size (5 vs. 4 cm,  $p=0.03$ ), longer operative time (237 vs. 176 min,  $p=0.001$ ), higher conversion and reoperation rates (15.8 vs. 2.6%,  $p=0.02$  and 18.4 vs. 2.6%,  $p=0.005$ ) compared with S-LDP. Morbidity, severe morbidity, 90-day mortality and hospital stay were comparable in the two groups. Patients with PDAC undergoing extended LDP had a significantly shorter median and 3-year survival compared to those undergoing S-LDP (12.9 vs. 27 months and 6.2 vs. 39.4%, respectively,  $p=0.001$ ).

**Conclusions:** M-LDP is feasible and safe in patients with adenocarcinoma. Extended LDP is associated with shorter survival compared with the standard resection, but may help to achieve short-term benefits and ameliorate the quality of life in patients with locally advanced PDAC.

## O176 - Pancreas

### Morphological and Functional Changes in Pancreatic Remnant Following Pancreaticogastrostomy: Long Term Follow-Up

M. Kassem, M. Elrefaie, D. Hashad, M. El-Sirafy

Faculty of Medicine, Alexandria University, Alexandria, Egypt

Pancreatoduodenectomy (PD) is the procedure with long history and is accepted as treatment of choice in pancreato-biliary area malignancies. After a PD procedure the patient has an altered upper gastrointestinal and pancreatic anatomy with potential pancreatic exocrine and endocrine insufficiency. Pancreatic exocrine insufficiency has been reported to be more common in pancreaticogastrostomy (PG) than in pancreaticojejunostomy (PJ) after pancreaticoduodenectomy (PD). Pancreaticogastrostomy (PG) was introduced to reduce pancreatic leakage. Waugh and Clagett at the Mayo Clinic were the first to use this anastomosis in the clinical setting.

The aim of this study was to evaluate the long-term outcome of PG after PD as regard: pancreatic remnant condition (parenchyma texture, pancreatic duct size), pancreatic function preservation, imaging criteria, and patient comorbidity.

**Methods:** a retrospective study was carried out on 120 surviving patients admitted to the Gastrointestinal Surgery Department, The Main Alexandria University Hospital, Egypt; over the last 10 years: diagnosed with periampullary lesions who underwent PG after PD and followed up from 1 to 10 years. We analyzed the (1) pancreatic exocrine insufficiency [presence of steatorrhea], (2) pancreatic endocrine function [measuring of HbA1c, FBS], (3) changes of pancreatic duct diameter by computed tomography, (4) nutritional status [measuring serum total protein, albumin, and triglyceride].

**Results:** The mean follow-up period for PG after PD was  $4\pm 2$  years. A total of 55.4% patients developed pancreatic exocrine insufficiency, and 12% had new-onset diabetes. A significantly improved postoperative nutritional state was noticed in PG patients after PD. Changes in pancreatic texture and duct diameter on long term follow-up. The pancreatic remnant-related relaparotomy rate was lower in the PG patients.

**Conclusion:** There was significant pancreatic exocrine insufficiency without affection of endocrine function. PG was associated with the reduction of glandular tissue and pancreatic remnant duct patency on long-term follow-up.

## O177 - Pancreas

### A Propensity Score-Matched Analysis of Early Outcomes After Laparoscopic-Assisted Versus Open Pancreaticoduodenectomy

M. Yeo<sup>1</sup>, J.J. Ng<sup>2</sup>, F.K. Koh<sup>2</sup>, A. Kow<sup>2</sup>

<sup>1</sup>Yong Loo Lin School of Medicine, National University of Singapore, Singapore, Singapore; <sup>2</sup>University Surgical Cluster, National University Health System, Singapore, Singapore

**Aim:** Increasing numbers of complex oncological surgery are accomplished in a minimally invasive fashion due to improvement in laparoscopic surgical skills and technology. Laparoscopic-assisted pancreaticoduodenectomy (LAPD) is a minimally invasive alternative to conventional open pancreaticoduodenectomy (OPD) performed to treat periampullary tumours. Despite the increasing popularity of LAPD, few studies have compared LAPD with OPD. In this study, we aim to compare the short-term clinical outcomes of LAPD with those of OPD.

**Methods:** Between January 2014 and December 2016, a total of 52 patients underwent OPD and 20 patients underwent LAPD after being diagnosed with periampullary tumours. A retrospective study was conducted to evaluate early outcomes in LAPD vs. OPD. To minimize bias due to a lack of randomization, 20 patients who underwent LAPD were matched by age, gender, comorbidities, tumour size, pre-operative haemoglobin, albumin, bilirubin and prothrombin time, to 20 patients who underwent OPD using propensity score matching.

**Results:** The operative duration of LAPD was significant longer than OPD (380.0 vs. 431.3 min,  $p=0.05$ ), although there were no differences in operative blood loss ( $p=0.60$ ) or length of hospitalization ( $p=0.38$ ). The surgical resection margins ( $p=0.15$ ) and total number of lymph nodes harvested ( $p=0.63$ ) were similar between LAPD and OPD. There were no differences in the incidence of post-operative pancreatic fistula ( $p=0.2$ ), post pancreatectomy haemorrhage ( $p=0.55$ ), delayed gastric emptying ( $p=0.36$ ), anastomotic leaks ( $p=0.31$ ) or pulmonary complications ( $p=0.31$ ). None of the patients required a re-operation and there were no differences in the need for percutaneous ( $p=0.29$ ) or endoscopic intervention ( $p=0.31$ ) after surgery. There was also no difference in 30 day mortality ( $p=0.31$ ).

**Conclusion:** Although operative duration in LAPD is longer, there were no significant differences in early post-operative outcomes. LAPD is a safe and feasible operation for patients with periampullary tumours.



## O178 - Pancreas

### Efficacy of Blunt Dissection Technique Using an Advanced Bipolar System During Laparoscopic Spleen and Splenic Vessel-Preserving Distal Pancreatectomy

Y.S. Yoon, H.S. Han, S.H. Kim, J.Y. Cho, Y.R. Choi

Seoul National University Bundang Hospital, Seongnam-SI, Republic of Korea

**Aim:** We have recently employed blunt dissection technique using an advanced bipolar system (ABS) during laparoscopic spleen and splenic vessel-preserving distal pancreatectomy (LSSVpDP) to reduce the risk of bleeding during dissection of the splenic vessels. In this technique, small branches of the splenic vessels are clamped without prerequisite dissection, sometimes along with the surrounding pancreatic parenchyma. The aim of this study was to evaluate the utility of blunt dissection technique in comparison with conventional dissection technique during LSSVpDP.

**Methods:** Sixty-nine patients who underwent LSSVpDP from March 2003 to December 2015 were enrolled in this single-center retrospective study. The patients were divided into two groups: blunt dissection group (n=36) and conventional dissection group (n=33). Clinical parameters were compared between the two groups.

**Results:** There were no significant differences between the two groups in terms of the patient and tumor characteristics, including age, gender, body mass index, co-morbidity, tumor pathology, tumor size, and length of the resected pancreas. The incidence of postoperative complications was similar between the two groups. However, the mean operative time (185.5 vs. 221.9 min,  $p=0.023$ ), intraoperative blood loss (151.9 vs. 338.1 ml,  $p=0.001$ ) and postoperative hospital stay (9.4 vs. 11.3 days,  $p=0.001$ ) was significantly decreased in blunt dissection group than in conventional dissection group.

**Conclusion:** The results of this study suggest that blunt dissection technique using an ABS is beneficial in reducing the operating time and intraoperative blood loss during LSSVpDP.

## O179 - Pancreas

### The Laparoscopic Approach Should Be the Standard for Central Pancreatectomy: Analysis IN 52 Patients

S. Dokmak, B. Aussilhou, F.S. Fteriche, F. Cauchy, E. Ragot, P. Levy, O. Soubrane, A. Sauvanet

Beaujon Hospital, Clichy, France

**Aim:** Central pancreatectomy (CP) is an excellent indication to the laparoscopic approach because theoretically is performed for low potential malignant diseases and therefore there is no technical or oncological contraindication. However larges series are still lacking. Our aim was to report our large single center experience.

**Methods:** Laparoscopic approach was decided according to the surgeon expertise in laparoscopic surgery and the only relative contraindication was the necessity to do CP extended to the pancreatic head. Pure laparoscopic approach was performed with one layer pancreatico-gastric anastomosis, nasogastric aspiration for one week and parenteral nutrition. Demographics, operative and postoperative data were studied. Pancreatic fistula was classified according to ISGPF.

**Results:** Between July 2011 and December 2016, 52 patients underwent laparoscopic CP for NET (14), IPMN (12), SCPP (8), Mucinous cyst (5), disconnected duct syndrome (5) and other (8). Mean age was 56 year (17–77), 33 were females (64%), and the mean BMI was 25 (18–34) kg/m<sup>2</sup>. The mean operative duration was 193 mn (120–285), mean blood loss was 106 ml (0–800) with only one conversion in the early experience (2%). No mortality and overall morbidity (37; 71%), represented mainly by pancreatic fistula (29; 56%) including 12 (23%) of grades B+C, drained collections (2; 4%), bleeding (6; 11%), re-intervention (4; 8%), mean hospital stay of 22 days (13–54) and readmission (2; 4%). On histology, the mean size of the resected lesion was 2 cm (0.5–5), the mean length of the resected pancreas was 5.1 cm (1–8.50), the mean number of harvested lymph node was 3 (0.10) and invaded was 0.11 (0–3).

**Conclusion:** With these favorable results, the laparoscopic approach should be the gold standard for CP because high applicability rate, preservation of the pancreatic function and parietal advantages because these procedures are performed in young with excellent long-term prognosis.

## O180 - Pancreas

### 150 Total Laparoscopic Pancreatoduodenectomy for Patients with Tumors of the Head of the Pancreas and the Periapallare Area

P. Tyutyunnik

MCSC, Moscow, Russia

**Objectives:** To show our experience in treatment of 150 patients with tumors of the head of the pancreas and the periapallare area by using a total laparoscopic approach.

**Methods:** From January 2007 to May 2016 150 patients were taken for laparoscopic pancreaticoduodenectomy at the single center. There were 86 females and 64 males. The median age 62 (range 34–82) years. In a retrospective study we analyzed the main outcome measures: blood loss, operative time, length of hospital stay, postoperative complication according to Clavien-Dindo.

**Results:** Median operative time was 415 (range 240–875) min and median blood loss was 200 (range 10–2100) ml. Diagnosis: pancreatic adenocarcinoma (n-81), ampulloma (n-34), low bile duct carcinoma (n-14), duodenal adenocarcinoma (n-14), synchronous neuroendocrine tumor of the duodenum and multiple gastrointestinal stromal tumors (n-1), chronic pancreatitis (n-6). Complications: Clavien—Dindo: IIIa—n27, IIIb—n11, IV—n1, V—n7.

**Conclusion:** Totally laparoscopic pancreaticoduodenectomy is safe and effective procedure for patients with cancer of the biliopancreatoduodenal area. The results are comparable with results after open pancreatoduodenectomy. In spite of this, controlled multi-centric trials are needed.

## O181 - Pancreas

### The Role of Minimally Invasive Surgery in the Treatment of Pancreatic Neuroendocrine Tumors Focusing on Safety and Clinical Outcome: Systematic Review

E. Yiannakopoulou

Highest Technological Educational Institute of Athens, Athens, Greece

Pancreatic neuroendocrine tumors (pNETs) are rare with an incidence of one per 100,000 population. The majority of pNETs arise sporadically, but approximately 10% are associated with an underlying genetic syndrome such as multiple endocrine neoplasia type I and type IV, von Hippel-Lindau disease, neurofibromatosis type I, or tuberous sclerosis complex.

**Aim:** This systematic review aimed to investigate the role of minimally invasive surgery in the treatment of pNETs focusing on the safety and oncological outcome.

**Methods:** Electronic databases were searched with the appropriate search terms for the time period up to and including December 2016. Full publications, including clinical trials randomized or not, retrospective studies, case series, case reports that provided relevant data met inclusion criteria.

**Results:** Four hundred possibly relevant studies were identified. Abstracts were reviewed and finally one hundred studies were retrieved in full text and included in the systematic review. The majority of the data came from retrospective studies, small case series and case reports. A few studies have focused on the surgical outcomes of laparoscopic vs. open distal pancreatectomy in patients with pNETs. Minimally invasive simple enucleation, distal pancreatectomy with splenectomy, spleen-preserving distal pancreatectomy, central pancreatectomy, pancreaticoduodenectomy, and total pancreatectomy have been reported in the treatment of pNETs. Laparoscopic pancreatic enucleation is appropriate for benign tumors. Laparoscopic distal pancreatectomy is well suited for complete radical resection of pNETs located in the pancreatic body or tail, at least for tumors that are relatively small and solitary and not suitable for laparoscopic enucleation. Most of the studies investigate short term outcomes. There are few data on safety issues and on oncological outcome. Relevant data on the role of minimally invasive surgery on the treatment of syndromic pNETs are limited.

**Conclusion:** Minimally invasive pancreatic surgery is feasible in the treatment of pNETs. Further research in needed on the safety and oncological outcome in comparison with open surgery.

## O182 - Pancreas

### Introducing Complete Laparoscopic Whipple Procedures in Clinical Practice: Results in 29 Patients

C. Wullstein, A. Dimitriou-Zarra, C. Klingebiel

HELIOS Hospital Krefeld, Krefeld, Germany

While laparoscopic resections of the pancreatic tail are widely accepted, laparoscopic resections of the pancreatic head still remain controversial. Reasons for that may be the complexity of the resection itself and the extensive reconstruction phase.

**Methods:** Before introducing laparoscopic Whipple procedures in clinical practice this operation was trained in an animal model. Furthermore an institution performing laparoscopic Whipple procedures in their clinical routine was visited to adopt the technique. Laparoscopic resections of the pancreatic head were then introduced in summer 2012 for selected cases and data were collected prospectively.

**Results:** 29 laparoscopic resections of pancreatic head were performed (including 1 complete pancreatectomy). Indication for surgery was cancer in 21, benign disease in 5 and IPMN in 3 patients. 2 procedures were converted to open surgery (6.9%) due to intraoperative bleeding out of the mesopancreas. Reconstruction included pancreateojejunostomy in 8 and pancreatogastrostomy in 20 patients. Mean duration of the operation was 415 min (range: 360–580 min), mean blood loss was 165 ml (20–560 ml). In total 6 patients received blood transfusions during hospital stay (20.7%). A R-0 resection was accomplished in 80.1%. Mean number of lymph nodes was 18.5, ranging from 9 to 30. Postoperatively 2 patients died (6.9%), one due to sepsis of unknown origin and one due to late postoperative bleeding. 5 patients underwent re-operation (17.2%), 2 open (1 hematoma in the rectus muscle, 1 exclusion of an intraabdominal focus); 2 leakages of the biliodigestive anastomosis underwent re-laparoscopy and suturing, one intraabdominal abscess underwent re-laparoscopy, lavage and drainage. Mean length of hospital stay was 20.3 days (11–50 days).

**Conclusion:** Laparoscopic resections of the pancreatic head can be safely introduced in clinical practice. The results at the beginning of our learning curve are similar to results of open surgery. We expect improving our results with gaining experience.

## O183 - Radiology / Imaging

### Magnetic Resonance Texture Analysis as a Biomarker in Identifying Complete Response After Chemo-Radiotherapy in Locally Advanced Rectal Cancer

M. Aker<sup>1</sup>, B. Ganeshan<sup>2</sup>, D. Boone<sup>1</sup>, B. Sizer<sup>1</sup>, R. Motson<sup>1</sup>, T. Arulampalam<sup>1</sup>

<sup>1</sup>Colchester General Hospital, Colchester, United Kingdom;

<sup>2</sup>University College Hospital London, London, United Kingdom

**Background:** The management of locally advanced rectal cancer (LARC) has recently adopted a multidisciplinary approach, combining neoadjuvant chemo-radiotherapy (NCRT), surgery and adjuvant chemotherapy. After patients undergo NCRT, a certain proportion of patients respond completely to the treatment, with no cancer cells remaining in the resected specimens. There is yet no accurate and reliable way in identifying those patients who might have not needed surgery altogether. Texture analysis is a computer-aided imaging biomarker that measures heterogeneity in a region of interest on a sub-visual level.

**Purpose:** The aim of this study is to determine whether texture analysis by Laplacian of Gaussian method applied on pre and post treatment Magnetic Resonance Images (MRI) of the irradiated rectum has the ability to identify patients with complete response (CR).

**Methods:** This is a retrospective analysis of all patients diagnosed with LARC in Colchester General Hospital between January 2003 and July 2014 who received NCRT and who have had MRI scans before and after neoadjuvant therapy. Textural parameters were systematically extracted from pre and post treatment scans. Mann–Whitney U test was used to determine whether correlations exist between textural parameters and tumour regression. Receiver operator characteristics (ROC) curve and area under the curve (AUC) were used to measure the accuracy of textural analysis in identifying complete responders. Youden's index was used to identify the optimal cut off value of the parameters.

**Results:** 114 patients were included. 21% of patients experienced complete pathological response. Magnetic Resonance Texture-parameters—namely mean, standard deviation, entropy, and mean of positive pixels, with and without filtration—are all higher in patients with unfavourable response compared to favourable response ( $p < 0.05$ ). ROC analysis showed an accuracy of up to 91% with at least one texture parameter, mean of positive pixels, with a cut off value of 109.61.

**Conclusion:** Texture parameters extracted from T2-weighted MRI images exhibit a potentially significant imaging biomarker in assessing response to NCRT, which can aid decision making in identifying patients who might benefit from deferral of surgery. When personalising treatment, TA on MRI scans can also predict patients who might exhibit a favourable response.

## O184 - Robotics, Telesurgery and Virtual Reality

### Roux-en-Y Gastric Bypass As a Revisional Bariatric Procedure: Does the Robot Make a Difference?

F. Rebecchi, M. Allaix, E. Ugliono, A. Genzone, M. Toppino, M. Morino

University of Torino, Torino, Italy

**Aim:** The frequency of revisional procedures to manage the failure of primary bariatric surgery is increasing. Laparoscopic revisional Roux en-Y-Gastric Bypass (L-rRYGB) is the most commonly performed revisional bariatric procedure. The robotic technology (DaVinci, Intuitive Surg, Ca.Usa) might improve the outcomes of L-rRYGB, decreasing complications and conversion rates. However, the current evidence is very limited. The aim of this study was to compare the outcomes of rRYGB with robotic (R-rRYGB) or laparoscopic (L-rRYGB) approach after failed primary bariatric surgery.

**Methods:** Consecutive patients undergoing R-rRYGB or L-rRYGB were included in a prospective study. Intraoperative findings, early postoperative outcomes and 1-year follow-up results were compared. Economic analysis included the costs of surgery, the costs of in-hospital routine patient's care and the costs of management of postoperative complications.

**Results:** From May 2008 to September 2015, 81 patients underwent rRYGB: 45 (56%) R-rRYGB and 36 (44%) L-rRYGB. Primary procedures were adjustable gastric banding (n=21), vertical banded gastroplasty (n=48) and sleeve gastrectomy (n=12). Mean operative time was longer in the R-rRYGB group (250.9 ± 57.6 vs. 207.3 ± 45.5 min;  $p < 0.001$ ), but conversion rate to open surgery was lower (4.4% vs. 44.4%  $p < 0.001$ ). Postoperative morbidity rate was 6.7% after R-rRYGB and 22% after L-rRYGB ( $p = 0.054$ ). Length of postoperative hospital stay was shorter after R-rRYGB (4.9 ± 1.5 vs. 6.8 ± 2.8 days;  $p < 0.001$ ). The rate of anastomotic stricture requiring endoscopic dilatation was 2% vs. 11% ( $p = 0.166$ ) respectively. Four patients (11%) in the L-rRYGB were reoperated during the follow-up (1 anastomotic leak, 3 small bowel obstruction). The overall costs analysis performed at 1-year follow-up showed no significant differences between R-rRYGB and L-rRYGB.

**Conclusions:** This is the first prospective study that analyzes both clinical and economical impact of the robotic technology in patients undergoing rRYGB, showing better outcomes than L-rRYGB with overall similar costs. The robotic approach should be implemented in the treatment of patients with failed primary bariatric surgery.

## O185 - Robotics, Telesurgery and Virtual Reality

### Telemedicine Consultations in Surgery. Analysis of the Results and Perspectives of Development

S.V. Mosin, A.V. Sazhin, L.S. Kurashinova, O.K. Makarova

Russian National Research Medical University, Moscow, Russia

**Objective:** to study the reason of treatment and possibility for doctor to perform telemedicine consultations type “doctor-patient” on a profile “surgery”, also the results of their application.

**Methods:** As the object of study were taken the data of consultations “doctor-patient”, implemented by co-author of article, on a project of telemedicine consultations. There were completed 1312 telemedicine consultations from 09.2011 to 12.2015. The consultant meets all requirements to perform a standard medical practice.

The main part of the research is devoted to studying the results of telemedicine consultations and it was retrospective cohort research. The efficiency of consultations was assessed using questionnaire.

Patients were required to get qualified “second opinion” (63.5%), to determine the need to consult a doctor or a surgeon with any complaints (57.7–55.8%), to determine the plan for further surgery or treatment when the disease has been identified (57.7%), and for clarification/correction of treatment (51.9%). 36.5% of patients used consultation for self-treatment.

More than 80% of respondents, said that counseling was effective in the case of any complications during hospital treatment or after discharge. High informational content as found in case of a “second opinion” or search for “best doctor” or clinic, preliminary consultations before visit doctor (75% satisfactory answers). If patients appraised their state as urgent, 73.7% of respondents were satisfied by the consultation. In urgent cases, telemedicine consultation was effective in over 70% of patients, and lead to the call “ambulance” in 33.3%.

**Results:** with the “negative efficiency” were not fixed. “The averaged efficiency” of telemedicine consultations was 65.1%.

The most of respondents were satisfied with the speed of answer, and 74.0% estimated it to 4–5 days. 70.6% of respondents planning to use the services of telemedicine consultations in future.

**Conclusions:** Conducted telemedicine consultations are characterized by high efficiency, in most cases, reaching to 81.2% “effective consultations”. Telemedicine consultations may be carried out for suspected urgent surgical condition. When the urgent surgical condition was expect, telemedicine consultation was effective in over 70% and led to the reasonable call “ambulance” in every third case (33.3%).

## O186 - Robotics, Telesurgery and Virtual Reality

### Comparison of Short Term Surgical and Functional Outcomes of Robot-Assisted Total Mesorectal Excision for Rectal Cancer with the da Vinci Xi vs Si

G. di Franco, S. Guadagni, L. Rossi, M. Palmeri, D. Gianardi, N. Furbetta, M. Bianchini, C. Livide, G. Stefanini, F. Mosca, L. Morelli

University of Pisa, Pisa, Italy

**Background:** The new Da Vinci Xi has been specifically designed to overcome some of the main drawbacks of the Si like the fixed position of the patient after docking and instrument collisions. The aim of this study is to compare surgical and functional outcomes of robotic rectal resection with Total Mesorectal Excision (TME) for cancer, between the da Vinci Xi (Xi-RobTME group) and the da Vinci Si (Si-RobTME group).

**Materials and Methods:** The study group included the first consecutive 30 Xi-RobTME compared with a case-matched Si-RobTME group, performed between April 2010 and September 2016 by a single surgeon. Perioperative outcomes, autonomic function and quality of life, were compared. We used ICIQ-FLUTS and ICIQ-MLUTS (International Consultation on Incontinence–Female/Male Lower Urinary Tract Symptoms) and IIEF (International Index of Erectile Function)/FSFI (Female Sexual Function Index) questionnaires.

**Results:** The docking and overall operative time were significantly shorter in the Xi-RobTME group (23.5 min vs. 17.5 min,  $p < 0.001$  and 285 min vs. 318 min,  $p < 0.05$ ). In the Si-RobTME group, a hybrid approach with complete splenic flexure mobilization (SFM) was used in 12/30 cases (40%), while a fully-robotic approach was used in 18/30 cases (60%), of which 11 with partial SFM. In 30/30 (100%) of the cases in the Xi-RobTME group and 7/30 (23%) of the Si-RobTME group were performed with a fully robotic approach with complete SFM ( $p < 0.001$ ). 10/12 cases (83%) of Si-RobTME hybrid subgroup were males and the mean BMI was 25.1. The hybrid approach in males and patients with BMI > 25 was necessary in 10 patients (45% vs 0%,  $p < 0.001$ ) and in 6 patients (37% vs 0%,  $p < 0.05$ ), respectively between Si-RobTME and Xi-RobTME groups. No differences in conversion rate, mean hospital stay, pathological results and in autonomic function before and at 1 year after surgery.

**Conclusion:** The new Da Vinci Xi seem to offer technical advantages that could result in a shorter docking and operative time and with superior ability to perform a fully robotic approach, even in difficult patients such as male and obese. Conversion rate, pathologic and functional outcomes seems not to have improved, with the new Xi platform.

## O187 - Robotics, Telesurgery and Virtual Reality

### The Role of Integrated Table Motion for da Vinci Xi in Robotic Colo-Rectal Resections: A Comparative Study

M. Palmeri<sup>1</sup>, D. Gianardi<sup>1</sup>, S. Guadagni<sup>1</sup>, G. di Franco<sup>1</sup>, N. Furbetta<sup>1</sup>, M. Bianchini<sup>1</sup>, C. Cremonini<sup>1</sup>, L. Bastiani<sup>2</sup>, P. Bucciatti<sup>3</sup>, F. Mosca<sup>1</sup>, L. Morelli<sup>1</sup>

<sup>1</sup>University of Pisa, Pisa, Italy, Pisa, Italy; <sup>2</sup>National Council of Research, Pisa, Italy; <sup>3</sup>Azienda Ospedaliero-Universitaria Pisana, Pisa, Italy

**Background:** The Integrated Table Motion (ITM, Trumpf Medical, Ditzingen, Germany) is an advanced operating table wirelessly communicating with the da Vinci Xi surgical system, which allows to reposition the patients with instruments inside the abdomen without undocking the robot. The aim of our study is to compare operative and short-term outcomes of patients who underwent colorectal surgery for cancer with the da Vinci Xi system using the ITM, versus a control group of patients undergoing the same procedures without the use of the ITM.

**Materials and Methods:** Ten patients underwent robotic colo-rectal resection for cancer (6 anterior rectal resection ARR, 1 intersphincteric rectal resection IRS, 2 right colectomy RC, 1 sigmoid resection SIG) with the use of ITM (Xi-ITM group) at our center, between December 2015 and October 2016. The intraoperative and short-term results were compared, using case-control methodology. A propensity scores approach was performed to create 1:2 matched pairs (matching the Xi-ITM subjects to Xi-No-ITM subjects according to BMI, age, gender, ASA score and intervention type), using a caliper method algorithm. Independent t tests and  $\chi^2$  test (or Fisher's exact test) were performed to compare different variables.

**Results:** Mean overall robotic operative time was significantly shorter in the Xi-ITM group (227 min vs. 297 min,  $p = 0.04$ ). All Xi-ITM cases were fully robotic, while conversion was needed in two Xi-No-ITM cases, due to bulky tumors and difficult exposure (0 vs. 2,  $p = \text{NS}$ ). Postoperative medical complications, all of grade I or II, were higher in Xi-No-ITM group (1 vs. 11,  $p = 0.024$ ).

**Conclusions:** In our early experience the use of new Integrated Table Motion for da Vinci Xi resulted in a simplification of workflow. The possibility to change the patients position, without undocking the patient side cart or removing instruments, improves the exposure of operative fields, resulting in a reduced overall robotic operative time and could result in a lower conversion rate as well. The reduced use of extreme positions to gain optimal exposure of operative field could contribute to decrease the rate of postoperative medical complications due to a lesser hemodynamic and respiratory changes, or soft tissue injuries.

## O188 - Robotics, Telesurgery and Virtual Reality

### Robot Assisted Laparoscopic Resection of T4 Tumours of the Sigmoid and Rectum, Initial Results

J. Tersteeg, R.M.P.H. Crolla, J.M.J. Schreinemakers, G.P. van der Schelling, J. Wijsman

Amphia Ziekenhuis, Breda, The Netherlands

**Aim:** A radical resection (R0-resection) of T4 rectal carcinomas is important to prevent recurrence. It is also an important predictor of survival. The oncological safety of laparoscopic resection of T4 tumours remains controversial. Robot-assisted laparoscopy overcomes some limitations of laparoscopy (excellent 3D-view, articulating instruments). There is limited experience with the robot-assisted laparoscopy for rectal cancer. The aim of our study was to evaluate our initial results.

**Methods:** Between 2012 and 2016 sigmoid and rectal cancers are routinely operated with the DaVinci robot. In case of a MRI indication for intraoperative radiotherapy, we don't schedule a robot-assisted procedure. Short term results were studied retrospectively based on a prospective database of all patients who, during robot-assisted laparoscopic surgery, were considered to have a cT4 carcinoma of sigmoid or rectum between 2012 and 2016.

**Results:** Eighteen patients with 19 tumours were identified: 4 sigmoidal(21%) and 15 rectal(79%). The necessity for neo-adjuvant treatment was decided according to Dutch guidelines on pre-operative MRI. Twelve tumours(63%) had been treated with chemoradiation(n=9), short course radiotherapy with 12 weeks waiting time(n=2) or chemotherapy(n=1). During surgery there was invasion of the prostate(n=3), bladder(n=3), vesicles(n=3), uterus(n=3), adnex(n=2), vagina(n=2), sigmoid(n=1), abdominal wall(n=2) and lateral peritoneum(n=2). In four patients(22%) an anterior resection was performed, in eight(44%) a low anterior resection and in six(33%) an abdominoperineal resection, all with en-block resections of a part or the whole invaded organ. Pre-emptive conversion to open surgery was performed twice, both in an early phase(11%).

Histology showed ypT4 in four tumours(21%), pT4 in five(26%), ypT3 in five(26%), pT3 in two(11%), ypT2 in one(5%), ypT1 in one(5%) and ypT0 in one(5%). In two tumours(11%) the resection margin was inconclusive. A R0-resection was achieved in 16 tumours(84%) and R1-resection in one(5%) because of a large abscess with vital tumour cells.

Mean operative time was 280 min(148–519). Mean postoperative stay was 7.7 days(3–20). Ten patients had complications: 7 patients(39%) Clavien-Dindo grade II, 3 patients(17%) grade III-IV. There was no postoperative mortality.

**Conclusion:** Robot-assisted laparoscopy seems to be a feasible option for the resection of T4-carcinomas of sigmoid and rectum. Radical resections can be achieved in the majority of cases.

## O189 - Robotics, Telesurgery and Virtual Reality

### Robotic Assistance in Transanal Total Mesorectal Excision for Rectal Cancer: A Systematic Review

J.W. Butterworth<sup>1</sup>, S. Parker<sup>2</sup>, S. Scarpinata<sup>3</sup>

<sup>1</sup>Imperial College London, London, United Kingdom; <sup>2</sup>University College London, London, United Kingdom; <sup>3</sup>Kings, Princess Royal University Hospital, London, United Kingdom

**Aim:** Low-anterior resection can be a challenging operation, especially in obese male patients and in particular following radiotherapy. Transanal total mesorectal excision (TaTME) brought technical advantages over laparoscopic TME particularly for tumors in the distal third of the rectum. Robotic assisted TaTME (RaTaTME) has been introduced in effort to improve precision, visibility and ergonomics within the narrow pelvis, however no studies have comprehensively assessed whether this approach improves outcome. **Methods:** A systematic review of Pubmed was conducted utilizing key words: Transanal Total Mesorectal excision, robotics, rectal cancer, TaTME, Transanal Abdominal Transanal (TATA), Endoscopic Transanal TME. 100 articles were identified and 38 relevant, English language, full-text papers with quantitative data were procured for analysis. Review articles, case reports, animal and cadaveric studies were excluded.

**Results:** TaTME and RaTaTME result in similar hospital stay at 7.5 days and 8.4 days respectively. Mean operative duration is shorter for TaTME at 260.5 compared to 304.4 min for cases utilizing the robot. This may be due to increased set-up and docking time. Bloods loss in RaTaTME was 162 mls and 134 mls in TaTME studies. Overall morbidity rates between RaTaTME and TaTME studies are similar at 26.2% and 26.6% respectively. However uro-gynaecological complications were more prevalent in TaTME studies with 9% (n=1/11) developing rectovaginal fistula in one study and 1.3% (n=2/156) sustaining urethral injury in another. No uro-gynaecological complications were reported in RaTaTME. Mean anastomotic leak rates are lower at 6.43% in TaTME studies compared to 11.75% for RaTaTME. Conversion rate was lower in RaTaTME at 0.64% compared to 13.51% for TaTME. Mean CRM positivity was 3.23% in RaTaTME and 3.51% in the TaTME group. Mean 30-day mortality in the TaTME studies was 0.24% compared to a mean 0.96% in RaTaTME.

**Conclusion:** : Level 3 and 4 evidence demonstrates TaTME and robotic-assisted TaTME can be performed safely with minimal blood loss and similar short-term outcomes, morbidity rates and acceptable histological and clinical outcomes. High quality prospective controlled studies comparing robotic-assisted and pure transanal TME with careful short and long term follow-up to further assess differences in uro-gynaecological morbidity, anastomotic leak rates and long term outcomes.

## O190 - Robotics, Telesurgery and Virtual Reality

### A Single Surgeon's Learning Curve of Robot-Assisted Colorectal Surgery

K. Dogan, F. van Workum, F. Polat

Canisius-Wilhelmina Ziekenhuis, Nijmegen, The Netherlands

**Aim:** To investigate the learning curve of Robot-Assisted Colorectal Surgery (RACS).

**Methods:** RACS was implemented in December 2014 and all data was registered in a prospective outcome database. Consecutive patients operated by an experienced laparoscopic colorectal surgeon from the first patient until December 2016 were included. Casemix parameters included age, sex, BMI, ASA classification, type of resection performed and type of pathology (benign vs. malign). The primary outcome parameter was total operative time and other outcome parameters were surgical operative time, non-surgical operative time, conversion rate, severe complications (Clavien-Dindo grade  $\geq 3$ ), reoperation rate, hospital length of stay and mortality. Centered exponentially weighted moving average analysis was used to create graphical learning curves and CUSUM analysis was used to calculate when the plateau was reached if a learning curve was found.

**Results:** One hundred and six patients were included. Sixty-two percent was male, mean age was 69 years, mean BMI was 26 and patients were classified as ASA 1 (24%), ASA 2 (57%) or ASA 3 (19%). Patients underwent right hemicolectomy (27.4%), left hemicolectomy (1%), sigmoid resection (34.9%), low-anterior resection (29.2%) or abdominoperineal resection (7.5%). Total operative time decreased from 190 min to 169 min at the plateau, which occurred after 28 cases. In regression analysis, this could be explained by casemix or type of resection. Surgical operative time decreased from 139 to 124 min and non-surgical operative time decreased from 51 min to 46 min. No learning curve effects were found regarding other, clinical outcome parameters. The conversion rate was 2.8%, severe complications occurred in 18.9% and the reoperation rate was 12.3%. Median hospital length of stay was 5.5 days and 30-day mortality was 0.9%.

**Conclusion:** Implementation of RACS is associated with a learning curve of approximately 30 cases for operative time. No learning curve was found regarding clinical outcome parameters and we conclude that RACS was successfully implemented without causing learning associated morbidity to patients.

## O191 - Technology

### Usefulness of Mems-Based Optical Coherence Tomography in Intraoperative Evaluation of Lymph Node Status of Laparoscopic Gastrectomy in Gastric Cancer

H. Liu<sup>1</sup>, L. Lin<sup>2</sup>, D. Wang<sup>2</sup>, S. Luo<sup>3</sup>, L. Wang<sup>4</sup>, G. Li<sup>1</sup>

<sup>1</sup>Nanfeng Hospital, Southern Medical University, Guangzhou, China;

<sup>2</sup>Wuxi WiO Technologies Co., Ltd., Wuxi, China, Wuxi, China;

<sup>3</sup>State Key Laboratory of Intergrated Optoelectronics, Beijing, China;

<sup>4</sup>School for Radiological and interdisciplinary Sciences (RAD-X), Suzhou, China

**Background:** Evaluation of lymph node (LN) status is an important factor for detecting metastasis and thereby staging gastric cancer. Currently utilized clinical techniques involve the surgical disruption and resection of lymphatic structure for histological examination. While these techniques are reasonably effective at detection of macrometastasis, the majority of the resected lymph nodes are histologically negative. Improvements need to be made to better assess the micro-architecture of lymph nodes, minimize or eliminate lymphatic disruption complications, and provide immediate and accurate intraoperative feedback for in vivo cancer staging to better guide surgery. In contrast to all other imaging techniques that either require resection, bisection, and disruption of lymph nodes, or offer insufficient resolution to visualize morphology in situ, micro-electro-mechanical system (MEMS)-based three-dimensional optical coherence tomography (3-D MEMS OCT) imaging can be performed through the intact capsule of surgically-exposed lymph nodes that can remain in situ.

**Methods:** A unique MEMS optical scanning technique was used to make miniature OCT probes that can directly fit into the biopsy channel of laparoscopes. We evaluated the use of 3-D MEMS OCT, a high-resolution, noninvasive, label-free imaging modality for the intraoperative assessment of human LNs for advanced gastric cancer. The ROC curve was used to analyze intraoperative OCT LN images for presence of metastasis, using co-registered postoperative pathologic result as the gold standard.

**Results:** Our preliminary findings suggest that intraoperative OCT imaging of LNs using the MEMS OCT probe is an appropriate, label-free, non-invasive alternative to frozen-section analysis, potentially offering faster interpretation and results to empower superior intraoperative decision-making.

**Conclusions:** Intraoperative OCT enabled by MEMS technology has strong potential to supplement current post-operative histopathology with real-time in situ assessment of LNs to preserve both non-cancerous nodes and their lymphatic vessels, and thus reduce the associated risks and complications from surgical disruption of lymphoid structures following biopsy.

## O192 - Technology

### From 'Big Data' Meaningful Use of Real Time Data on Smart Visors in the OR

M. Jansen, M.P. Schijven

Academic Medical Center Amsterdam, Amsterdam, The Netherlands

**Background:** In the Academic Medical Center (AMC) Amsterdam, the Netherlands, a Surgical Black Box®, developed in St. Michael's hospital Toronto (Canada) in collaboration with Air Canada, was installed in one of the endoscopic Operating Rooms (OR's). This medical data recorder analyzes perfectly synchronized data. The data is being generated from the actual use of the Olympus Endosuite, and is stripped from personal identifiers. Data includes laparoscopic videostream, videostreams from OR ceiling cameras, OR sounds, door movements, OR temperature and patient biometrics during operation. Aforementioned data is used to create a performance report for postoperative debriefing of the OR team. Ideally, feedback is not provided solely post-operative, but also intra-operatively when considered to be relevant. Adverse events or errors in the OR are usually not an isolated incident, but part of a cascade. By providing relevant real time feedback on a head-mounted display, relevant information is 'in focus'; making such information hard to ignore instead of easy to miss. It is interesting to explore and investigate action and reaction on such real time cues. Resulting actions are recorded in the Black Box® OR, so information can be used in root-cause analysis of accidents.

**Aim:** First, to identify which data are considered to be suitable and considered relevant for real time feedback in laparoscopic surgery. Second, to identify the optimal routing for such feedback and third, to decide on optimal timing for data to alarm users during surgery. For this purpose, surgeons with expertise in laparoscopic intra-abdominal surgery were surveyed.

**Methods:** A Delphi study was conducted within the AMC Amsterdam. A total of 33 experts in laparoscopic intra-abdominal surgery was approached. This Delphi study consists of three iterations, in the first rounds the panel is asked to generate ideas, in the second round expert panelists will prioritize their ideas and in the final iteration agreement amongst panelists is measured.

**Results:** During this presentation the results of this Delphi analysis will be presented, recommendations stated and future initiatives explained.

## O193 - Technology

### Smart Use of Wearables in Reducing Intraoperative Muscular Stress During Laparoscopy

M. Jansen, M.P. Schijven

Academic Medical Center Amsterdam, Amsterdam, The Netherlands

**Background:** Performing laparoscopic surgery can be physically challenging. Prolonged duration of high levels of muscular stress may cause ergonomic problems and physical discomfort. This phenomenon is known in literature as "minimal access surgery (MAS)-related surgeon morbidity syndrome". A common complaint is having physical strain of the upper extremity, most often reported in the dominant forearm and by beginning laparoscopic surgeons. This can be explained by the fact that less experienced surgeons have less laparoscopic skills and, as a consequence, tend to have higher muscle tension when operating. As for patient safety, the risk of operating with high muscle tension is that movements tend to grow rougher and be less precise. The Myo armband by Thalmic Labs, is an armband capable of capturing real-time surface electromyography (sEMG) measurements that can be worn under the sterile overcoat on the forearm. Myo can be calibrated to the users normal muscular tension. When tension is out-of-normal boundary, the laparoscopic surgeon can be provided with real time haptic external biofeedback during surgery that cannot be ignored. As a result, sEMG biofeedback may reduce (MAS)-related surgeon morbidity syndromes.

**Aim:** Before real time feedback can be provided, an individual's normal muscle tension patterns when performing laparoscopic tasks must be determined. This study aims to identify individuals normal muscle tension patterns in the non-dominant as well as the dominant forearm, and second to define thresholds for exceeding normal tension profiles for providing a biofeedback signal to the user. Together with TedCas a personalized biofeedback signal is developed for prevention of the minimal access surgery syndrome.

**Methods:** Laparoscopic surgeons from the department of urology, gynecology and surgery with different levels of experience are included in the study. Of participants, a baseline sEMG of the forearm is established and an optimal tension profile created. Participants perform predefined laparoscopic tasks in a calibrated simulation setting, while sEMG values will be continuously measured with the Myo armband; one group receiving biofeedback of Myo when muscular thresholds are surpassed and one group without biofeedback.

**Results:** During this presentation the study protocol is discussed and results will be presented.

## O194 - Technology

### Happymed; Going to the Movies Whilst Undergoing Endoscopic Surgery

E.Z. Barsom, G.M.M.J. Kerkhoffs, M.P. Schijven

Academic Medical Center, Amsterdam, The Netherlands

**Aim:** Patients may experience different levels of anxiety before, during and after surgery. Studies show that anxiety during the perioperative period is highly correlated with the perception of pain. The effect of anxiety on pain perception may result in an increased use of postoperative analgesic. Non-pharmacological therapy to treat perioperative anxiety has gained popularity. Literature illustrates that listening to music preoperatively lowers levels of anxiety. There are indications that visual distraction in addition to audio might lead to an improved anxiolytic effect, and may support patients' feelings of comfort and well-being after surgery.

**Methods:** In this METC approved, currently running prospective randomized control study, 50 patients undergoing orthopedic laparoscopic procedures under loco-regional anesthesia are randomly assigned to an intervention group (audiovisual) or a control group (audio only). The intervention group uses videoglasses, presenting a relaxing type of scenic wildlife film while the control group listens to preferred music during surgery.

**Results:** Data on blood pressure, pulse, Visual Analogue Scale to assess pain, administered pain medication and patient satisfaction are retrieved. The level of anxiety is measured through the use of a validated questionnaire.

**Conclusion:** Use of private cinema screening during surgery is a novel concept, gaining much public and press attention. Indeed, it is anticipated that the use of audiovisual distraction will lead to a stronger reduction in anxiety and stress through the use of video glasses in comparison with audio only. Our study assesses the anticipated reduction in the administration of medication (anxiolytics and analgesics). If so, the use of videoglasses during surgery can be considered as a valuable non-pharmacological intervention that may lead to a preference shift both in patients and anesthesiologist towards the selection of loco-regional above general anesthesia. At this time, it is known that patients often prefer general anesthesia over loco-regional anesthesia even though evidence shows loco-regional anesthesia has better short term outcomes. Watching a movie during surgery allows optimal distraction. Offering videoglasses during surgery ultimately leads to a change in attitude towards loco-regional anesthesia, however future studies are necessary to support this line of reasoning. During presentation, setup is shared and preliminary results are presented.

## O195 - Technology

### A Randomized Comparison of a New Haptic Feedback Laparoscopic Grasper Versus a Conventional Laparoscopic Grasper in a Live Porcine Model

C.C.J. Alleblas<sup>1</sup>, M.P.H. Vleugels<sup>2</sup>, T.E. Nieboer<sup>1</sup>

<sup>1</sup>Radboud university medical center, Nijmegen, The Netherlands;

<sup>2</sup>Riverland Hospital, Tiel, The Netherlands

**Aim:** The Force Reflecting Operation Instrument (FROI) is a new laparoscopic grasper, designed to provide haptic feedback in minimally invasive surgery. After pre-clinical simulation studies for optimizing its features, the aim of this study was to assess functionality and potential benefits as well as to compare its usability to a conventional grasper in an in vivo setting.

**Methods:** This study was approved by the Dutch Central Authority for Scientific Procedures on Animals and took place in the Central Animal Laboratory of Nijmegen. A standard laparoscopic surgical setup was used to perform laparoscopic surgery on pigs. Eleven international laparoscopic experts including general surgeons, gynecologists and urologists participated in this study. They performed colorectal, gynecological or urological procedures bilaterally. In a randomized order, each surgeon once used the FROI and once used the conventional grasper. Participants were asked to complete a quantitative questionnaire for assessing five specific features of the laparoscopic graspers on a six-point Likert scale ranging from zero to five. Additionally, to capture opinions regarding the overall experience with the FROI compared to a conventional grasper, participants were requested to complete a qualitative questionnaire consisting of eight open questions.

**Results:** The surgeons rated the features 'tissue consistency sensation' (4.0 vs. 1.9), 'arterial pulse detection' (4.3 vs. 0.5) and 'force control' (3.9 vs. 1.6) significantly better for the FROI compared to the conventional grasper ( $p < 0.001$ ). No significant differences were found for 'time control' (2.5 vs. 2.6) and 'muscular demand' (2.9 vs. 2.2). The most underlined points from the qualitative assessment were improved soft tissue handling and the clinical relevance of the haptic feedback technology for complex procedures. Moreover, ten participants reported the value of the FROI in minimizing tissue damage. No safety issues were reported.

**Conclusion:** Through this study, the FROI features including tissue consistency sensation, arterial pulse detection and force control were validated in an in vivo setting. Moreover, the added value of haptic feedback technology in a live surgical setting has been approved by a multispecialty group of expert laparoscopic surgeons.

## O196 - Technology

### Indocyanine Green in Laparoscopic Surgery: Cholecystectomy, colon Resection, Liver Resection the St. Luke's Medical Center (philippines) Experience

K. Panganiban, J.J. Domino, H. Monroy, C. Teh

St. Luke's Medical Center (Institute of Surgery), Quezon City, Philippines

Identification of biliary anatomy, adequate colonic perfusion prior to colonic anastomosis and adequate margins of resection are very significant in laparoscopic cholecystectomy, colon and liver resection respectively.

This paper aims to present Indocyanine Green (ICG) as one innovation attempting to decrease the associated morbidities in the aforementioned laparoscopic procedures. In this presentation, indocyanine green was used in 12 cases of laparoscopic cholecystectomy, 2 cases of laparoscopic colon surgery and 1 case of laparoscopic liver resection. Equipment used if KARL STORZ Image 1 SPIES, full HD camera system with 30-degree 10 mm laparoscope with filter capable of detecting Near Infrared (NIR) fluorescence. For laparoscopic cholecystectomy: pre-operative administration of ICG was given 1–24 hours at 0.25–0.33 mg/kg. Intraoperative IV administration of ICG was given at 0.11–0.33 mg/kg. For laparoscopic colon surgery: intraoperative administration of ICG prior to anastomosis was given at 0.33 mg/kg. For laparoscopic liver surgery: pre-operative administration of ICG was given 2 h prior to surgery at 0.50 mg/kg.

For the results in laparoscopic cholecystectomy: after some initial dissection, the cystic duct, common bile duct and cystic duct—common hepatic duct junction were all identified. Vascular anatomy delineated in 75% of the patients. No ductal leaks noted post-dissection. No common bile duct stones identified. Mean operative time was around 1.5 h. No intraoperative complications were noted. Length of hospital stay was 1–2 days. There were no morbidities or mortalities observed. In laparoscopic colon surgery: Adequacy of vascular perfusion prior to anastomosis of resected bowel segments were assessed by the surgical team thru fluorescence angiography. No morbidities and evident anastomotic leakage noted post-operatively. Length of stay was 4–5 days. In laparoscopic liver resection: ICG was administered intravenously preoperatively to identify/localize the tumor. Uptake of ICG was inspected during the surgery. It was used as a guide prior to liver resection, alongside with intraoperative ultrasound, for adequacy of margins. No morbidities observed intra and post-operatively. Length of hospital stay was 4 days.

ICG fluorescence imaging is a simple, safe and significant technique that enables highly sensitive identification of biliary anatomy, vascular perfusion in colon surgery and tumor localization in real time laparoscopic liver surgery.

## O197 - Technology

### Does a 3D Laparoscope Reduce the Time to Perform Cholecystectomy When Compared to a 4 K Laparoscope? A Randomised Controlled Trial

M. Dunstan<sup>1</sup>, R. Smith<sup>1</sup>, K. Schwab<sup>1</sup>, M. Whyte<sup>2</sup>, T. Rockall<sup>1</sup>, I. Jourdan<sup>1</sup>

<sup>1</sup>Royal Surrey County Hospital, Guildford, United Kingdom;

<sup>2</sup>University of Surrey, Guildford, United Kingdom

**Aims:** Laboratory-based studies have proven the performance advantages of 3D laparoscopes over 2D laparoscopes, owing to binocular depth perception. However, the associated cost, extra equipment and side effects of 3D systems limit their use. The increased resolution associated with new 4 K imaging systems may provide better depth perception than current 2D systems. This randomised controlled trial aims to determine whether 3D systems provide performance benefits over 4 K systems.

**Methods:** One-hundred and twenty patients undergoing elective laparoscopic cholecystectomy are being randomised to 3D or 4 K laparoscopy under 3 Consultant surgeons. Operations are being recorded in 2D high definition. Operations are graded (1–3) for difficulty for analysis. The primary outcome is time to complete the procedure (from exposure of the gallbladder to complete separation from the liver). An interim analysis is presented here.

**Results:** Thirty-seven patients have been recruited to the trial. Thirty-three completed the trial, whilst 4 were excluded (3 due to incomplete videos and 1 was cancelled due to medical reasons). Seventeen patients were randomised to the 3D arm and 16 to the 4 K arm. Twenty-four (73%) were female. Median age was 52 (27–85). Indications were: biliary colic (13 patients), cholecystitis (11), obstructive jaundice (6), cholangitis (1), gallstone pancreatitis (1) and gallbladder polyp (1). Three operations were graded as grade 1 (9%), 16 as grade 2 (48%) and 14 as grade 3 (42%). Overall, there was no significant difference between the median time to complete the procedure in the 3D group (19 [11–78] minutes) and 4 K group (25 [7–56] minutes;  $p=0.82$ ). The median time to complete grade 1 gallbladders was 17 [11–19] minutes. There were no grade 1 gallbladders in the 4 K group. There were no significant differences between laparoscopic systems for the median time to complete grade 2 (3D: 18 [12–40] minutes vs. 4K: 18 [7–56] minutes;  $p=0.79$ ) or grade 3 gallbladders (3D: 45 [19–78] minutes vs. 4K: 34 [19–53] minutes;  $p=0.35$ ).

**Conclusion:** This trial is the first to compare 3D and 4 K laparoscopic systems in the clinical setting. Further participants will be recruited to determine whether 3D provides performance benefits over 4 K.

## O198 - Technology

### Big Data in Surgery: The First Realisation of a Sensor-OR

H. Kenngott<sup>1</sup>, M. Wagner<sup>1</sup>, P. Mietkowski<sup>1</sup>, G. Schneider<sup>1</sup>, R. Dees<sup>1</sup>, M. Apitz<sup>1</sup>, S. Bodenstedt<sup>2</sup>, S. Speidel<sup>2</sup>, B. Bergh<sup>1</sup>, B.P. Müller-Stich<sup>1</sup>

<sup>1</sup>University of Heidelberg, Heidelberg, Germany; <sup>2</sup>Karlsruhe Institute of Technology, Karlsruhe, Germany

**Introduction:** In oncology big data from next generation sequencing fosters a novel way to understand cancer and develop personalized treatments, up until now there is not much use of big data in surgery. Modern operating rooms (OR) where many devices support surgical treatment can be used for big data analysis that can benefit research and clinical practice alike.

**Methods:** For data collection we installed an extended data logger in a clinically used operating room. This data logger was able to collect all data generated by devices connected to the integrated OR. Exemplarily video data from the endoscope, as well as sensor data from medical devices were recorded. This data was annotated as to when which phase of the surgical operation took place. Then open-source software frameworks were used to build an analysis pipeline. Finally, training data was fed into the analysis pipeline to recover insights from the sensor data that comes from the connected medical devices.

**Results:** Until now 58 datasets were recorded in the sensor-OR. This included less difficult surgeries such as appendectomies and cholecystectomies, as well as different colorectal, gastric or pancreatic procedures. The duration of the datasets in mean was 4:28 h. Data from 8,59 devices (range 6 to 10) was recorded with a mean of 661.889 data points per dataset (range from 56,770 to 2.242.971). In total 38.389.596 data points were recorded during 259:07 h of surgery, resulting 41.6 data points per second. The recorded data was fed into the analysis pipeline. This allowed for the virtual simulation of several surgeries taking place at the same time simulating a whole OR wing.

**Discussion:** We enhanced an operating room to be able to collect data in an unknown depth in a clinical setting. We collected valuable data that can be used to recover in-depth insights into surgical procedures. In order to identify the most important data points for different applications, further research is necessary. By simulating several surgeries in parallel we lay the foundation for building an interconnected OR wing that can be used for optimal scheduling, automatic documentation and context-aware assistance systems based on big data analysis.

## O199 - Thoracoscopic Surgery

### Three-Dimensional Navigation Surgery via Radiofrequency Identification Technology in Video-Assisted Thoracoscopic Subsegmentectomy in a Canine Model

Y. Yojiro<sup>1</sup>, S. Toshihiko<sup>1</sup>, M. Yusuke<sup>1</sup>, S. Yasuto<sup>1</sup>, K. Teruya<sup>1</sup>, A. Hiroyuki<sup>2</sup>, M. Koichi<sup>3</sup>, M. Toshi<sup>1</sup>, A. Akihiro<sup>1</sup>, C.Y. Toyofumi F<sup>1</sup>, S. Makoto<sup>1</sup>, N. Tatsuo<sup>4</sup>, D. Hiroshi<sup>1</sup>

<sup>1</sup>Kyoto University, Kyoto, Japan; <sup>2</sup>Asahi Intecc Co. Ltd., Nagoya, Japan; <sup>3</sup>Hogy Medical Co., Ltd., Tokyo, Japan; <sup>4</sup>Institute for Frontier Medical Sciences, Kyoto, Japan

**Objectives:** In segmentectomy for the resection of ground glass opacities locating near the intersegmental plane, it is sometimes hard to ensure adequate surgical margin. To grasp accurate tumor location and its extension in lung parenchyma, we proposed a novel 3D surgical navigation system using radiofrequency identification (RFID) technology. To evaluate our system accuracy and validity, we performed subsegmentectomy in a canine model with occult small lung lesions.

**Methods:** RFID system Three components of our 3D navigation system. (1) a delivery device for loading micro-RFID tags with NiTi-coil anchors which can go through the 2-mm working channel of a bronchoscope, (2) a wand-shaped probe (10-mm diameter, and 30-mm effective range), (3) a signal processing unit with 3D lung imagery software on which tags' anatomical positions are registered. *Animal Model* Subcentimeter pseudo-tumors consisting of a mixture with 3% collagen and lipiodol were created by transbronchial injection in the peripheral lung parenchyma.

**Procedure:** (1) To resect one lesion, one surgical marker was placed in subsegmental bronchi as a central marker, and two markers on the boundary of the neighboring regions to the subsegment of the tumor location, which would sterically surround the lesion to ensure appropriate surgical margins. (2) The anatomical positions of the delivered tags with their own identification numbers were registered on the 3D lung image. (3) Subsegmentectomy was performed in which the central margin, i.e. the subsegmental bronchi, was accessed via the transparenchymal approach to test the positional accuracy in the navigation system. Surgeons grasped 3D anatomical position in lung parenchyma by locating each tag position using a probe. Following this surgical navigation, the outlined tumor was resected with appropriate surgical margins. Surgical margin status and tag recovery rate were evaluated.

**Results:** Ten lesions were marked preoperatively by 33 tags, with eleven central markings made at a mean depth of 20.5 mm from visceral pleura (range, 15.0–26.6 mm) in bronchi with mean diameter of 2.89 mm (range, 2.4–3.9 mm). Surgical margin status was secured, and the tag recovery rate was 97.0%.

**Conclusions:** RFID surgical navigation system provided precise orientation in lung parenchyma where there are no anatomical landmarks.

## O200 - Training

### The Benefits of Being a Video Gamer in Laparoscopic Surgery

M. Sammut, P. Andrejevic

Mater Dei Hospital Malta, Msida, Malta

**Introduction:** Video games are mainly considered to be of entertainment value in society. Video games, similarly to laparoscopic surgery require skills, which include visual-spatial and hand-eye coordination skills. Several studies have assessed whether video gaming experience is of benefit in laparoscopic surgery with the results being conflicting in nature.

**Aim:** The aim of the study was to investigate whether previous video gaming experience affects the performance on a laparoscopic simulator trainer.

**Methods:** Newly qualified medical officers with minimal experience in laparoscopic surgery were invited to participate in the study and assigned to the following groups: gamers (n=20) and non-gamers (n=20). Analysis included participants' demographic data and baseline video gaming experience. Laparoscopic skills were assessed using a laparoscopic simulator trainer.

**Results:** There were no statistical demographic differences between the two groups. Each participant performed three laparoscopic tasks and average scores between the two groups were compared. The gamer group had statistically significant better results in maintaining the laparoscopic camera horizon +/- 15 degrees (p=0.009), in the complex ball manipulation accuracy rates (p=0.024) and completed the complex laparoscopic simulator task in a significantly shorter time period (p=0.001). Prior video gaming experience correlated with better results, however there was no significant differences for camera accuracy rates (p=0.07) and in a two-handed laparoscopic exercise task accuracy rates (p=0.092).

**Conclusion:** The results show that previous video gaming experience improved the baseline performance in laparoscopic simulator skills.

**Keywords:** surgical training, laparoscopy, video games.

## O201 - Training

### A New Standardized Training Program for MIS Basic Skills: Definition of an Expert-Level and Transferability of the Lübeck Toolbox-Curriculum

T. Laubert<sup>1</sup>, H. Esnaashari<sup>2</sup>, P. Auerswald<sup>1</sup>, A. Höfer<sup>1</sup>, T. Keck<sup>1</sup>, C. Benecke<sup>1</sup>

<sup>1</sup>University Medical Center Schleswig-Holstein Campus Lübeck, Lübeck, Germany; <sup>2</sup>LTB Ltd., Lübeck, Germany

**Aim:** The beginning of the learning curve in MIS is characterized by difficulties which can well be acquired outside the operating room. Currently, a standardized, structured and reproducible training curriculum for MIS skills inside surgical departments does not exist in Europe.

**Methods:** The Lübeck Toolbox (LTB)-curriculum encompasses a newly devised video trainer, six training modules, training goals for each task, recommendations for an effective timing of training and online video tutorials. The conception of the video trainer and the training tasks is based on standardized prospective evaluations. Definition of training goals was based on multicenter performance analysis of n=15 experienced MIS surgeons ("expert level"). Mean values were set as benchmarks for a prospective validation study with n=30 MIS novices. For transferability of the training skills, all study participants performed a MIS cholecystectomy on a pig organ model before and after the curriculum which was video documented and analyzed by two blinded surgeons using the GOALS-score.

**Results:** All study participants successfully finished the curriculum. Mean durations of the best repetitions performed by the experienced were 72 s (±8), 49sec (±9), 66sec (±10), 89sec (±28), and 138sec (±44). The number of required repetitions by the novices for reaching the pre-defined goals for the tasks 1–6 in median were n=42 (7–80), n=26 (9–55), n=32 (14–77), n=44 (15–59), n=19 (6–68), and n=26 (15–60). As intended, these values were all located at the beginning of the plateau-phase of the learning curves. Training sessions lasted 30 min and were absolved 5–7 times/week. In consequence, the median number of training sessions required (including watching the video tutorials) was n=37 (23–49) which was equivalent to 4–6 weeks of training. With 18.0 (±2.6) vs. 10.9 (±1.6) the GOALS-score was significantly better after in comparison to before the curriculum.

**Conclusion:** With the Lübeck Toolbox-curriculum we were able to devise a highly standardized training program for basic skills in MIS. The pre-determined expert level could be validated as a realistic and reproducible training goal for MIS novices. Also, the transferability of the task content to a (sub-)realistic environment could be demonstrated. The LTB curriculum may contribute to an improved education in MIS.

## O202 - Training

### Validation of the Mobile Serious Game Application Touch Surgery for Cognitive Training and Assessment of Laparoscopic Cholecystectomy

K.F. Kowalewski<sup>1</sup>, J.D. Hendrie<sup>1</sup>, M.W. Schmidt<sup>1</sup>, T. Proctor<sup>2</sup>, S. Paul<sup>1</sup>, C.R. Garrow<sup>1</sup>, H.G. Kenngott<sup>1</sup>, B.P. Müller-Stich<sup>1</sup>, F. Nickel<sup>1</sup>

<sup>1</sup>University Hospital of Heidelberg, Heidelberg, Germany;

<sup>2</sup>University of Heidelberg, Heidelberg, Germany

**Background:** Touch Surgery™(TS) is a serious gaming application for cognitive task simulation and rehearsal of key steps in surgical procedures. The aim was to establish face, content and construct validity of TS for laparoscopic cholecystectomy(LC). Furthermore, learning curves with TS and a virtual reality(VR) trainer were compared in a randomized trial.

**Methods:** The performance of medical students and general surgeons was compared for all three modules of LC in TS to establish construct validity. Questionnaires assessed face and content validity. For analysis of learning curves, students were randomized to train on VR or TS first, and then switched to the other training modality. Performance data was recorded.

**Results:** 54 Surgeons and 51 medical students completed the validation study. Surgeons outperformed students with TS: patient preparation (students=45.0±19.1%; surgeons=57.3±15.2%; p<0.001), access and laparoscopy (students=70.2±10.9%; surgeons=75.9±9.7%; p=0.008) and LC (students=69.8±12.4%; surgeons=77.7±9.6%; p<0.001). Both groups agreed that TS was a highly useful and realistic application. 46 students were randomized for learning curve analysis. It took them 2 to 4 attempts to reach a 100% score with TS. Training with TS first did not improve students' performance on the VR trainer, however students who trained with VR first scored significantly higher in module 3 of TS.

**Conclusion:** TS is an accepted serious gaming application for learning cognitive aspects of LC with established construct, face and content validity. There appeared to be a synergy between TS and the VR trainer. Therefore, the two training modalities should accompany one another in a multimodal training approach to laparoscopy.

## O203 - Training

### Video and Medical Data Recording in the Operating Room; the Current Legal Framework Outlined

A.S.H.M. van Dalen, J. Legemaate, M.P. Schijven

Academic Medical Center, Amsterdam, The Netherlands

**Aim:** Adaption of audio-, video- and/or complete data recorders in the operating room (OR), also referred to as a Medical Data Recorder (MDR) or 'Black Box'-es, within healthcare is growing. Although MDR's may have tremendous potential to improve patient care, concerns on implementation are gaining incremental attention. Healthcare professionals might fear that data resulting from use of MDR's is (mis)used for punitive purposes, or may compromise staff or patient privacy. Proper consensus on guidelines is lacking. This presentation aims to provide an update on the current legal framework and concerns regarding the use of MDR's in the OR.

**Methods:** Literature, existing legal rules and frameworks regarding video recording regulations, applications and recommendations in OR was studied and contrasted against the use of data recorders in other high-risk industries.

**Results:** MDR data is collected with the predefined purpose of quality improvement. Therefore it is not to be linked directly to the patient treatment. Resulting data are not required to be included in the medical record as the data are not collected with the intention to "blame and shame", but purely to learn from near miss or adverse events. This parallels the "blame free reporting" principle, a well-known critical ingredient of *safety cultures*. Further, aviation has yet long successfully incorporated this *just culture* approach, in which they deal with errors proactively by adapting systems to recognize, analyse and above all prevent errors from happening again.

**Conclusions:** MDR derived data and subsequent analyses may be a powerful tool to break the error cycle. To accomplish higher safety levels, the *just culture* ought to be adapted to the OR, because surgeons and OR team members are human, humans err, and a system that does not adjust for these realities might miss the opportunity to improve the quality of care. Fear of medicolegal issues can only be abolished if legislation to protect privacy is in place. To deliver full benefits of MDR's in the OR, international and/or federal guidelines are much needed. In this presentation, a concrete outline and complete overview on the use of MDR's and state of legislation to date is given.

## O204 - Training

### Multi-Modality Training Curriculum for Laparoscopic Cholecystectomy: Results of a Randomized Controlled Trial

K.F. Kowalewski<sup>1</sup>, C.R. Garrow<sup>1</sup>, T. Proctor<sup>2</sup>, A.A. Preukschas<sup>1</sup>, M. Friedrich<sup>1</sup>, M. Wagner<sup>1</sup>, P.C. Müller<sup>1</sup>, H.G. Kenngott<sup>1</sup>, B.P. Müller-Stich<sup>1</sup>, F. Nickel<sup>1</sup>

<sup>1</sup>University Hospital of Heidelberg, Heidelberg, Germany;

<sup>2</sup>University of Heidelberg, Heidelberg, Germany

**Introduction:** Multiple training methods improve a trainee's minimally invasive surgical skills outside of the operating room. There is yet no evidence of superiority of one single training method over the other existing methods. This study aimed to evaluate the benefit of a structured multi-modality training program for surgical residents.

**Method:** Participants were randomized to either a multi-modality training group or to a control group without training and were stratified for laparoscopic experience. The multi-modality training group completed 12 h of training comprised of virtual reality and box trainer exercises. A laparoscopic cholecystectomy (LC) on a porcine liver was used as pre- and post-test. Performance was measured with Global Operative Assessment of Laparoscopic Skills (GOALS) by blinded raters.

**Results:** The Training and Control groups achieved comparable GOALS scores (13.7±3.4 vs. 14.7±2.6 points; p=0.204) and completion time (57.0±18.1 vs. 63.4±17.5 min; p=0.191) on the pretest. In the post-test the Training group improved their GOALS score (by 2.84±2.85 points, p<0.001), while the Control group did not (0.55±2.34 points, p=0.154). The average operation time was significantly shorter in the Training group compared to the Control group on the post-test (40.0). Junior residents, regardless of group assignment, showed a significant improvement in GOALS score (by 1.84±2.71 points, p<0.001) whereas senior residents did not (-0.6±3.13 points, p=0.690). After training there was no significant difference between junior and senior residents for the GOALS score anymore (18.8±3.8 vs. 15.5±3.4; p=0.120) but senior residents were still significantly faster (25.0±1.9 min vs. 50.1±20.6 min; p<0.001). Both, junior and senior residents improved their operation time (by 11.2±16.6 min, p<0.001 and 16.0±11.5 min, p=0.036, respectively).

**Conclusion:** A multi-modality training program such as the one in the present study is useful to bring junior residents to the same skill level as senior residents with regard to basic laparoscopic skills and performance of laparoscopic cholecystectomy. Senior residents have already reached proficiency and aim for mastery which includes management of more complex cases, complications and distraction without loss of performance quality. As a next step, more advanced curricula tailored to their needs should also be developed.

## O205 - Training

### Mathematic Model Can Determine Number of Trainings to Achieve Adequate Proficiency. Learning Curve Model Based on Exercise on Laparotrainer

W.D. Majewski, P. Kowalski, S. Korecki, B. Belda

Pomeranian Medical University in Szczecin, Szczecin, Poland

**Aim:** Thanks to laparoscopic simulators the learning curve can be kept apart of the patient, towards surgical laboratory. Simulation provides area for making mistakes and gives the trainee opportunity to repeat the task till success, to control the movements to be automatic and intuitive. Aim of the study was to know the learning curve for students performing basic exercise on laparotrainer and predict the number of trainings to obtain proficiency.

**Material and Methods:** In 7 weeks 31 Medical Faculty students (12 M, 19F), who previously had no contact with laparoscopic simulator took part in two training sessions with 7 days interval. Every session contained 10 attempts to pull thick thread suture through eight metallic "O" shaped hooks fixed on plastic plate, under laparoscopic control. The same enhanced I-sim laparotainers, same tools, threads, light, table level were applied. The time of performance of every attempt was measured, and demographic data were taken. Fourteen students declared manual experience (3D games, drawing, music instrument, sewing, crocheting) An attempt to find the appropriate formula and establish a function to describe the process of learning was done .

**Results:** The average time of first session was 26 min longer than the second one, mean time of attempt in the first session was 6 min39sec in second one 4 m02sec (difference 2 m37sec). Coefficient of variation of mean times of attempts dropped from 38.3 to 17.7%. In second session women performed attempts 17sec faster than men. Students with manual experience were initially 11sec faster than those without it, but in second session the difference dropped into 6 s and was insignificant. Mathematical model of function curve sent separately.

**Conclusions:** The shorter time of attempts testifies the acquiring of coordination eye-movement by trainees, after 7 days interval the trainees were twice shorter in their tasks. To define the number of repetitions when the curve is on the stable level the investigation should be prolonged. However according to the curve the plateau achieved suggest that further number of trainings will only minimally increase experience of trainees hence it may be postponed. Present measurements can help in organization of didactics on laparotainers.



## O206 - Training

### Should You and Your Surgical Team Be Taking Intraoperative Microbreaks with Stretches?

M.S. Hallbeck, B.R. Lowndes, A.M. Abdelrahman, J. Bingener

Mayo Clinic, Rochester. MN, United States of America

**Aim:** Surgeon and surgical team members' health is heavily impacted by work-related pain, fatigue, and musculoskeletal disorders. Therefore, a study to evaluate the impact of periodic intraoperative microbreak exercises performed within the sterile field on the surgical team's pain, performance and workflow was performed.

**Methods:** Attending surgeons and their surgical team members across surgical specialties at a U.S. tertiary medical center participated in an intraoperative intervention as part of a larger multi-center study. The intervention targeted the neck, shoulders and back of the participant who performed stretches in the sterile field at surgically appropriate intraoperative microbreaks throughout the surgical day. Participants completed self-reported questionnaires at the end of each surgical procedure. The primary outcome was whether the microbreak intervention with stretches increased, did not change or diminished physical performance or mental focus (3-point scale). The secondary outcomes of distraction and workflow disruption were self-rated rated from 0 (none) to 10 (maximum disruption/distraction). Participants were asked a yes/no question about the likelihood of microbreak incorporation into their operating room routine. Descriptive statistics were calculated for the primary and secondary outcomes. The surgical duration with and without microbreaks was compared using a Z-test with  $\alpha=0.05$ .

**Results:** Thirty-three surgeons and their surgical teams participated in 149 surgical procedures, 70 operations with the microbreak intervention and 79 without. The microbreak intervention did not statistically significantly lengthen the surgical duration.

Overall, 2% of the participants reported that the microbreak intervention diminished their physical performance and 3.5% felt the microbreaks with stretches diminished their mental performance.

Across the team members, 73% reported a non-zero (median 1/10) distraction level and 73% reported a non-zero workflow impact (median 2/10) across days when the surgery included microbreaks.

Eighty-three percent of the surgeons and 77% of surgical team members wanted to incorporate intraoperative microbreak exercises into their OR routine.

**Conclusions:** Many surgeons are concerned about career limiting musculoskeletal pain. Most surgical team members reported that the intraoperative microbreak intervention improved their physical performance and mental focus with minimal impact on workflow or distraction, including no increase in operative duration, and would like to incorporate microbreaks into their OR routine.

## O207 - Training

### Consensus on Structured Training Curriculum for Transanal Total Mesorectal Excision (TaTME)

N. Francis<sup>1</sup>, M. Penna<sup>2</sup>, H. Mackenzie<sup>3</sup>, F. Carter<sup>4</sup>, R.H. Hompes<sup>2</sup>

<sup>1</sup>Yeovil District Hospital NHS Foundation Trust, Somerset, United Kingdom; <sup>2</sup>University Hospitals of Oxford, Oxford, United Kingdom; <sup>3</sup>Department of Surgery and Cancer, Imperial College, London, United Kingdom; <sup>4</sup>South West Surgical Training Network, Yeovil, United Kingdom

**Background:** The interest and adoption of transanal total mesorectal excision (taTME) is growing amongst the colorectal surgical community but there is no clear guidance on the optimum training framework to ensure safe practice for this novel operation. The aim of this study was to establish a consensus on a detailed structure of the training curriculum for taTME.

**Methods:** A consensus process to agree on the framework of the taTME training curriculum was conducted, seeking the views of 207 surgeons across 17 different countries worldwide including 52 international experts in the field of taTME. The process consisted of surveying potential learners of this technique, an international experts workshop and a final expert consensus to draw an agreement on the essential elements of the curriculum.

**Results:** Appropriate case selection was strongly recommended and taTME should be offered to patients with mid and low rectal cancers. Pre-requisites to learn taTME should include completion of training and accreditation in laparoscopic colorectal surgery, with prior experience in transanal surgery. Two surgeons are required to undergo training in centers with high volume for rectal cancer surgery. Mentorship and Multi-disciplinary training were the two most important aspects of the curriculum, which should also include online modules and simulated training for pursestring suturing. Mentors should have performed at least 20 taTME cases and experienced in laparoscopic training. Review of the specimens' quality, clinical outcome data and entering data into a registry were recommended. Assessment should be an integral part of the curriculum using Global Assessment Scales, as formative assessment to promote learning and competency assessment tool as summative assessment.

**Conclusions:** A detailed framework for a structured taTME training curriculum has been proposed. It encompasses various training modalities and assessment, as well as having the potential to provide quality control and future research initiatives for this novel technique.

## O208 - Training

### The Impact of the Learning Curve on Robotic Rectal Cancer Surgery on Outcomes

R. Bergamaschi<sup>1</sup>, S. Tou<sup>2</sup>, S.K. Abbas<sup>1</sup>, S.B. Yelika<sup>1</sup>, N.Y. Kim<sup>3</sup>, J.L. Kuo<sup>4</sup>, T. Yamaguchi<sup>5</sup>, R.M.J. Rodriguez<sup>6</sup>, K.P. Lee<sup>1</sup>, F. Cianchi<sup>7</sup>

<sup>1</sup>State University of New York, Stony Brook, Oldfield, United States of America; <sup>2</sup>Derby Teaching Hospitals NHS Foundation Trust, Derby, United Kingdom; <sup>3</sup>Yonsei University College of Medicine, Yonsei, Republic of Korea; <sup>4</sup>Taipei Medical University, Taipei, Taiwan; <sup>5</sup>Shizuoka Cancer Center Hospital, Shizuoka, Japan; <sup>6</sup>Hospital Universitario Virgen del Rocío, Sevilla, Spain; <sup>7</sup>University of Florence, Florence, Italy

**Aim:** To provide an analysis of the learning curve in robotic rectal surgery. This study aims to evaluate the impact of learning curve for robotic surgery for rectal cancer on outcomes.

**Methods:** This is a multicenter retrospective study of patients undergoing robotic rectal cancer surgery, by 5 surgeons, between November 2004 and August 2013. Binary logistic regression analysis was performed to evaluate predictor factors associated with conversion rate, intraoperative and postoperative complications, and circumferential resection margin (CRM) involvement at 1 mm. A risk-adjusted Cumulative Sum (CUSUM) model was used.

**Results:** There were 639 subjects (65.6% male) with a median age of 60 years (IQR: 51–68), BMI of 23.9 (IQR: 21.5–26.2), ASA of 2 (IQR: 1–2), and distance of tumor from the anal verge at 5 cm (IQR: 3.5–8). 6.4% had previous abdominal surgery and 32.8% had preexisting comorbidities. Conversion rate was 1.1% with an operating time of 278 min (IQR: 225–370). There were 6 intraoperative complications, 205 postoperative complications, 29 reoperations, and 3 deaths at 30 days. 6% of the subjects had CRM involvement. Gender was not significant as predictor for CRM involvement ( $p=0.113$ ), but distance from the anus was a predictors for CRM involvement ( $p=0.05$ ). BMI was not a significant predictor for intraoperative complications ( $p=0.924$ ) whereas comorbidities and OR time were not significant predictors for postoperative complications ( $p=0.697$ ,  $p=0.153$ ). BMI was significant as a predictor for conversion rate ( $p<0.0001$ , odds ratio: 1.258).

**Conclusions:** Distance from anal verge was a predictor for CRM involvement and BMI was a predictor for conversion.

## O209 - Training

### Maximizing the Efficiency of Training Center Workplace Usage for Multimodality Laparoscopic Training Courses: A Randomized Controlled Trial

F. Nickel<sup>1</sup>, K.F. Kowalewski<sup>1</sup>, (A) Minassian<sup>1</sup>, J.D. Hendrie<sup>1</sup>, M. Gondan<sup>2</sup>, A.A. Preukschas<sup>1</sup>, H. Kenngott<sup>1</sup>, L. Fischer<sup>1</sup>, (B) Müller-Stich<sup>1</sup>

<sup>1</sup>University of Heidelberg, Heidelberg, Germany; <sup>2</sup>University of Copenhagen, Copenhagen, Denmark

**Background:** Laparoscopic training programs are increasingly implemented. However, no standards exist for an optimal utilization of workplaces, concretely whether trainees should train alone or in pairs per workplace in training centers.

**Methods:** This was a three-arm randomized controlled trial with laparoscopically naive medical students from Heidelberg University ( $n=100$ ). The intervention groups participated Alone ( $n=40$ ) or in Pairs ( $n=40$ ) in a multimodality training curriculum which incorporated e-learning and basic skills training (on box and VR trainers) in a standardized and structured way. The Control group ( $n=20$ ) had no training. The performance of a cadaveric porcine laparoscopic cholecystectomy (LC) was measured as primary outcome rated by blinded raters with the Objective Structured Assessment of Technical Skills (OSATS). Global Operative Assessment of Laparoscopic Skills (GOALS) score, time taken for completion of LC and VR performances were used as secondary outcome measures.

**Results:** There were no significant differences between the three groups with regard to the performance scores (OSATS: Alone= $40.2 \pm 9.8$ ; Pairs= $39.8 \pm 8.6$ ; Control= $37.1 \pm 7.4$ ; GOALS: Alone= $10.6 \pm 3.0$ , Pairs= $10.0 \pm 2.7$ , Control= $10.1 \pm 3.0$ ; all  $p$ -values  $>0.05$ ). The Pairs group finished the LC significantly faster than the Control group (median= $62.5$  min (CI= $58.0$ – $73.0$ ) vs.  $76.5$  min (CI= $72.0$ – $80$ );  $p=0.042$ ) whilst there were no inter-group differences between Alone vs. Control (Alone: median= $69.0$  min (CI= $62.0$ – $76.0$ ) vs. Control:  $p=0.099$ ) or alone vs. pairs ( $p=0.840$ ). On the VR trainer the Pairs and Alone group showed a superior performance operation time, number of movements, and path length but not for complications and application of cautery.

**Discussion:** A higher amount of trainees per workplace does not negatively influence the performance. It seems that training in pairs reduces the operation time if the learned skills are transferred to a real operation. Therefore, both, training alone or in pairs improves basic laparoscopic skills and workplaces should be used in pairs to maximize efficiency.

## O210 - Training

### A Novel Simulation System for Thoracoscopic Congenital Diaphragmatic Hernia Correction

F.M. Sanchez Margallo<sup>1</sup>, R. Rivera Barreno<sup>2</sup>, H. Staines-Orozco<sup>2</sup>, C. Rodríguez Alarcón<sup>2</sup>, E. Pérez Merino<sup>3</sup>, J. Usón Casás<sup>3</sup>

<sup>1</sup>Centro de Cirugía de Mínima Invasión Jesús Usón, Cáceres, Spain;

<sup>2</sup>Universidad de Juárez, Ciudad Juárez, Mexico; <sup>3</sup>University of Extremadura, Cáceres, Spain

Different training models in minimally invasive surgery develops skills for most surgical procedures, however there are surgical procedures due to their difficulty require in addition to conventional training specific skills development. As an example, neonatal thoracoscopic congenital diaphragmatic hernia repair represents an additional obstacle to overcome due to the reduced size of the intrathoracic space. Rabbit cadaver model proposed because of the similar size with neonatal thorax. The aim of this work was to reproduce a surgical simulator to perform the intrathoracic movements for diaphragmatic suture under a similar intrathoracic scenario.

**Method:** Correct location to place the camera and the two working ports sites were identify on 2 rabbit cadavers. In order to place 5 stitches, 3 cm incision made in left diaphragm. Correct square knots placement, distance between knots and diaphragm tears evaluated in a 5-surgeon group until the 5-intra corporeal knots were correct placed in each rabbit's cadaver model.

**Results:** It was necessary 32 rabbit cadavers to achieve correct diaphragm closure for entire group. A mean of 6.4 procedures per surgeon established to achieve acquiring surgical skills in this training model.

**Conclusion:** This model allows the initial development of specific skills for thoracoscopic congenital diaphragmatic hernia correction, and reduces the number of live animals used for it as well. Besides being a reproducible and economic model, it is essential for further use of this model in live animals.

## O211 - Training

### Exploring the Benefits of Training In Laparoscopic Liver and Rectal Resections on Swine Experimental Model: Resident vs Senior Surgeons

C. Popa

Regional Institute of Gastroenterology and Hepatology, Cluj-Napoca, Romania

**Aim:** To evaluate the role of training in synchronous rectal and liver laparoscopic resections using *in vivo* swine experimental model. To determine if a previously trained resident is able to be a partner in real scenario laparoscopic rectal and liver resections.

**Methods:** Twelve surgeons were grouped in 4 teams: two formed by general surgery residents, with previous training in laparoscopic rectal and liver resections, and two with seniors trained in laparoscopic colorectal surgery, without experience in laparoscopic liver resections. Before laparoscopic approach all participants attended a theoretical course and performed open rectal resection with anastomosis and diverse liver resections on a live pig per each group. Afterwards, laparoscopic procedures were performed on two swine by each team. A total of six laparoscopic liver resections and one double stapling rectal resection were made for each anesthetized domestic pig.

**Results:** Open approach procedure did not show any significant differences between groups. All steps of the laparoscopic colorectal resection progressed similarly for all groups, the only difference being that the senior surgeons needed less time for the anastomosis. During laparoscopic liver resections the two groups formed by resident surgeons obtained better results regarding the time needed for completion, blood loss and conversion rates.

**Conclusion:** (s): Training in rectal resection for residents can improve their skills to a level comparable to those of a senior surgeon, in swine experimental model. Efficiency in laparoscopic liver resection can be achieved by residents if they are involved in appropriate step by step and continuous training programs. Senior surgeons could also benefit from dedicated training in laparoscopic liver resections.

## O212 - Training

### Influence of Feedback of Motion Parameters on Laparoscopic Simulation Training: A Randomized Trial on Basic Surgical Skill Acquisition and Retention

E. Rijcken, J.F. Buescher, A.S. Mehdorn, P.A. Neumann, D.A. Foell, F. Becker, A.K. Mueller, U. Pankratius, R. Bahde, N. Senninger

Muenster University Hospital, Muenster, Germany

**Introduction:** Simulation training on box- and virtual-reality (VR) trainers is an established method to convey laparoscopic skills to surgical trainees. Both types of trainers have specific advantages and disadvantages. After specific adaptations, the LapX-hybrid simulator (Medical-X, Netherlands), as a combination of both approaches, provides visualized feedback of motion parameters (path length, number of movements, velocity, idle time) during laparoscopic box-training with real, non-simulated items, allowing an objective observation of skill progress and motion economy as known from VR-trainers.

**Aim:** The aim of this prospective randomized controlled trial was to investigate the impact of *motion parameter* feedback on laparoscopic basic skill acquisition and retention during a standardized laparoscopic box-training curriculum performed by surgical novices.

**Methods:** 24 medical students were randomized into two groups (box-group, n=12, and hybrid-group, n=12) to undergo an identical five-day laparoscopic training program. Seven tasks on laparoscopic basic skills, such as peg transfer, pattern cutting, clipping, and intracorporeal knot tying, were completed twice a day on four consecutive days in stable pairs. The hybrid-group was provided with continuous visual feedback of individual *motion parameters* for each task. Additionally, each participant performed a simulated cholecystectomy before and after training on day 1 and day 5 on a Symbionix LapMentor II VR-Trainer (3D-Systems, Israel), allowing an independent control of training progress in both groups. A follow-up control on skill retention was performed after six weeks with repetition of both the box-tasks and VR-cholecystectomy.

**Results:** Both groups improved significantly during the training, measured by the task performance time. The follow-up showed equal skill retention in both groups. Evaluation of the VR-cholecystectomies showed significant reduction of operation time ( $p<0.001$ ), path length of left ( $p<0.01$ ) and right ( $p<0.001$ ) instrument and the number of movements left ( $p<0.05$ ) and right ( $p<0.001$ ) for the hybrid-group, compared to the box-group. Similar results were found at the follow-up assessment.

**Conclusions:** Simulation training on both box- and hybrid-trainers leads to acquisition of laparoscopic basic skills. However, personal motion feedback improves laparoscopic basic skills significantly in several aspects. Thus, training systems with feedback of motion parameters should be preferred for long-term improvement of motion economy for surgical novices.