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Management of COMPlicAted intra-abdominal collectionS after colorectal Surgery (COMPASS): protocol for a multicentre, observational, prospective, international study of drain placement practices in colorectal surgery

EuroSurg Collaborative*

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Abstract

Aim. Postoperative drains have historically been used for the prevention and early detection of intra-abdominal collections. However, current evidence suggests no significant clinical benefit of prophylactic drain placement following colorectal surgery. This is reflected in Enhanced Recovery After Surgery (ERAS) guidelines recommending against their routine use. The Ileus Management International (IMAGINE) study found more than one third of participating centres across the world routinely used drains in the majority of colorectal resections. This study aims to audit international compliance with ERAS guidelines regarding the use of postoperative drains in colorectal surgery.

Methods. This prospective, multicentre audit will be conducted via the student- and trainee-led EuroSurg Collaborative network across Europe, South Africa and Australasia. Data will be collected on consecutive patients undergoing elective and emergency colorectal surgery with 30-day follow-up. This will include any colorectal resection, formation of colostomy/ileostomy and reversal of stoma. The primary endpoint will be adherence to ERAS guidelines for intra-abdominal drain placement. Secondary outcomes will include: time-to-diagnosis of intra-abdominal postoperative collections; output and time-to-removal of drains; and 30-day postoperative complications defined by Clavien-Dindo Classification.

Discussion. This protocol describes the methodology of the first international audit of intra-abdominal drain placement after colorectal surgery. This study will be conducted across a large collaborative network with quality assurance and data validation strategies. This will provide a clear understanding of current practice, and novel evidence regarding the efficacy and safety of intra-abdominal drain placement in colorectal surgical patients.

Introduction

Peritoneal and pelvic surgical drain placement has been a longstanding part of the postoperative management of colorectal surgical patients [1]. Drain placement is often performed under the rationale that it may prevent complicated intra-abdominal collections, reduce the incidence of anastomotic leaks, and allow early detection of haemorrhage, anastomotic leakage, or other complications [2, 3]. However, the literature on the efficacy and safety of drain placement remains conflicting, with routine placement of prophylactic drains having been associated with additional adverse events (such as increased production of serous fluid, wound infections, and poorer postoperative pain control and mobility [4, 5]). Additionally, drains can have an impact on patients' wellbeing: indwelling drains have been associated with increased discomfort and this may exacerbate postoperative anxiety [6].

Recent evidence recommends against the routine use of prophylactic drains after colorectal surgery procedures due to a lack of clinical benefit [7–9]. On this basis, Enhanced Recovery After Surgery (ERAS) guidelines strongly recommend against the routine use of pelvic and peritoneal drains due to no demonstrable effect on measured clinical outcomes [10]. Despite these recommendations, prophylactic drain use after colorectal surgery remains widespread, with 35% of participating centres in 2018 routinely using intraoperative drains for the majority of their colorectal surgical patients [3]. Further, there is no consensus on the type of surgical drain that should be used, nor criteria for safe removal [8].

COMPlicAted intra-abdominal collectionS after colorectal Surgery (COMPASS) is an international prospective cohort study that aims to audit clinical practice regarding intra-

abdominal drain placement following colorectal surgery. Key methodological features, as well as strengths and limitations of the study design, are discussed.

Methods

The content of this protocol is described according to relevant items of the SPIRIT checklist (Standard Protocol Items: Recommendations for Interventional Trials) [11].

Study objectives

The primary aim of the COMPASS study is to audit compliance to ERAS guidelines regarding the placement of intra-abdominal drains after colorectal surgery. The secondary aims are to assess whether intra-abdominal drain placement is associated with earlier detection of intra-abdominal collections and/or anastomotic leak; to examine the management and outcomes of drains placed; and to characterise the incidence of complicated postoperative collections and their clinical management in colorectal surgery within an international cohort.

Study design

A snapshot, multicentre, prospective, international cohort study will be delivered by the EuroSurg Collaborative. EuroSurg is an international student- and trainee-led collaborative group supported by national collaborative groups including the Student Audit and Research in Surgery (STARSurg, UK), Italian Surgical Research Group (ItSURG, Italy), Portuguese Surgical Research Collaborative (PTSurg, Portugal), Student-Initiated German Medical Audit (SIGMA, Germany), and Trials and Audit in Surgery by Medical students in Australia and New Zealand (TASMAN, Australia and New Zealand). This model of collaborative research has been previously described in detail [12]. This comprises ‘mini-teams’ of collaborators

across multiple hospitals collecting data over short periods of time, typically several consecutive weeks (Figure 1).

Study setting

Any centre within a member nation of the European Society of Coloproctology (ESCP), the Colorectal Surgical Society of Australia and New Zealand (CSSA) or from South Africa performing elective or emergency colorectal surgery will be eligible to participate. Each centre may contribute data in up to five predetermined data collection periods between February and March 2020, and September and November 2020. These split data collection periods were chosen in response to the onset of the ongoing COVID-19 pandemic. Future dates and sites able to participate may be adapted at the discretion of the steering committee to ensure the safety of both patients and collaborators [13]. Each period will have a duration of 14 consecutive days and will be followed by a 30-day follow-up (Box 1).

Box 1 Data collection periods

- Period 1: 3 February 2020 to 16 February 2020
- Period 2: 24 February 2020 to 8 March 2020

Periods rescheduled due to COVID-19:

- Period 3: 14 September 2020 to 27 September 2020
- Period 4: 5 October 2020 to 18 October 2020
- Period 5: 26 October 2020 to 8 November 2020

Eligibility criteria

Patients undergoing elective and emergency colorectal resection, or reversal of colostomy/ileostomy will be eligible. Each of the following criteria must be satisfied for patient inclusion in the study:

- Adult patients (18 years or above);
- Elective and emergency colorectal resection procedures (Box 2) through any approach (open, laparoscopic and robotic surgery).

Patients who fulfil any of the following criteria will be excluded:

- Appendicectomy (emergency or elective);
- Transanal surgery not involving an external skin incision (including transanal total mesorectal excision, transanal endoscopic microsurgery and transanal minimally invasive surgery);
- Procedures for primary gynaecological, hepatobiliary, urological or vascular pathologies;
- Previous inclusion in the COMPASS study (return to theatre during the same admission or follow up will be regarded as a complication);
- COVID-19 infection diagnosed within 7 days before surgery, based on positive COVID-19 lab test/computed tomography (CT) chest scan, or clinical diagnosis (no COVID-19 lab test or CT chest performed).

Box 2 Eligible colorectal procedures

All of the following colorectal procedures are eligible for inclusion:

- Ileocolic resection
- Total colectomy
- Sub-total colectomy
- Extended hemi-colectomy
- Left hemi-colectomy
- Right hemi-colectomy
- Transverse colectomy
- Sigmoid colectomy (including Hartmann's procedure)
- Anterior resection
- Pan-proctocolectomy
- Completion proctectomy
- Reversal of ileostomy or colostomy
- Formation of stoma (ileostomy or colostomy)

Outcomes

The primary outcome is adherence to selected Enhanced Recovery After Surgery (ERAS) guidelines regarding rate of routine prophylactic intra-abdominal drain insertion after colorectal surgery [10].

The secondary outcomes are:

- Rate and time-to-diagnosis (measured in whole days) of intra-abdominal postoperative collections, defined as collections which alter the normal postoperative

course (e.g. requiring either medical, radiological, endoscopic or surgical intervention) [14].

- Daily drain output and time-to-removal (measured in whole days) of intra-abdominal drains. Daily drain output will be calculated according to the volume drained in a 24h period (8am – 8am).
- Rate of 30-day intra-abdominal drain-specific complications:
    - Surgical site infection (Centers for Disease Control and Prevention (CDC) definition) [15];
    - Cutaneous irritation at the drain insertion site (defined as reversible damage of the skin associated with rash, dry skin, itchiness, erythema and/or hives);
    - Small bowel evisceration and herniation of omentum (defined as prolapse of small bowel and/or omentum through the drain site after the removal of the drain);
    - Bowel injury (defined as intraoperative identification of or CT-proven drain-related iatrogenic bowel perforation) [1, 16].
- Overall 30-day adverse event rate as defined by the Clavien-Dindo Classification of postoperative complications and length of stay (days) [17]. The highest graded complication will be recorded for each patient (minor, Grades I–II; major, Grades III–V).

Other variables

Additional variables will be collected to risk-adjust outcomes for potential confounding factors (Supplementary Table 1). These include previous abdominal surgery; cardiovascular or metabolic comorbidities (including chronic obstructive pulmonary disease, ischaemic heart disease, peripheral vascular disease and diabetes mellitus); open surgical approach;

transfusion of red blood cells; history of immunosuppression; anticoagulation therapy; operative contamination; and intraoperative complications. Furthermore, due to the evidence supporting a significant impact of COVID-19 infection on postoperative morbidity and mortality, additional data points will be collected on COVID-19 diagnosis and patients that are COVID-19 positive before surgery will be excluded from the analysis [18]. Patients that become COVID-19 positive in the postoperative period will be included in the analysis.

Data collection and management

All data will be collected prospectively and stored online through a secure server running the Research Electronic Data Capture (REDCap) web application, hosted by the Birmingham Clinical Trials Unit (BiSTC) at the University of Birmingham [19, 20]. All data uploaded and stored in REDCap is encrypted, and the data management and data security within the BiSTC REDCap will abide by the requirements of the General Data Protection Regulations (GDPR) and any subsequent amendments. No patient identifiable information will be uploaded, and anonymised data will be pooled and analysed, with no surgeon- or centre-specific comparisons performed.

Study recruitment and power calculation

Based on the previous EuroSurg IMAGINE audit, COMPASS is anticipated to include 150 centres in the UK and 150 centres in Europe, South Africa and Australasia [23]. With consideration to recent figures provided by the UK National Bowel Cancer Audit 2016 and previous EuroSurg studies, we estimate that, on average, three patients will undergo colorectal resection per week at each participating centre [21–23]. Therefore, a minimum sample size of 3000 patients is anticipated.

In the previous IMAGINE audit, 35% of centres indicated that they routinely performed abdominal cavity drainage after colorectal surgery [24]. Assuming that "routine use" implies use in >50% of cases, the lower bound for the anticipated number of patients treated with abdominal cavity drainage can be assumed to be 17.5%. Therefore, the target sample size would be sufficient to estimate the rate of abdominal cavity drainage with a 95% confidence interval of approximately ±1 percentage point.

Statistical analysis

Rate of compliance to the ERAS guidelines regarding routine placement of prophylactic drains will be calculated for the cohort. Comparisons between those patients with and without a prophylactic drain will then be performed. Statistical analysis will involve independent samples t-tests for normally distributed factors; Mann-Whitney U tests for non-normal or ordinal factors; and chi-square tests otherwise. A multivariable analysis will then be performed using binary logistic regression to identify significant independent predictors of prophylactic drain placement and independent outcome predictors by drain use.

Subgroup analyses will be performed to determine differences between emergency and elective groups in drains use and resection on colon and/or rectum.

Study delivery and quality assurance

COMPASS will be coordinated by an International Management Group with the support of an expert advisory group. National steering groups will ensure local dissemination and delivery in each participating country. The study protocol will be disseminated through the existing collaborative network and supporting national collaboratives. At each site, teams of students and trainees will be responsible for data collection with the supervision of a senior

surgeon. All collaborators will be required to complete an online e-learning package, available on EuroSurg website, to guarantee the quality of collected data. Independent collaborators not involved in data collection will perform a process of data validation, including case ascertainment and data accuracy.

Data governance and ethics

Ethical approval processes will be sought according to each participant country requirements. Evidence of ethical approval will be required from national or local collaborators prior to the commencement of data collection. In the UK, an ethical review by the South-east Scotland Research Ethics Service has confirmed that COMPASS does not require formal ethical approval and it can be submitted for consideration as clinical audit at eligible centres. Data will be stored in the secure online database REDCap provided by the Birmingham Surgical Trials Consortium (BiSTC) from Birmingham University.

Discussion

In this protocol, we present an international prospective observational student- and trainee-led study conducted across EuroSurg Collaborative network. Through a previous EuroSurg international study, IMAGINE, a survey on ERAS guidelines compliance found a systematic use of surgical drains in up to 35% of participating centres [24]. However, the use of prophylactic drains is not recommended in routine colorectal surgery [7, 25–27].

Controversy still exists regarding the management of postoperative collections, and the reasons for prophylactic drain placement after colorectal surgery [28]. Anastomotic leakage is a burden that is present in close to 10% of elective colorectal procedures, with heterogeneity

in prevalence across centres internationally [29, 30]. Postoperative collections due to anastomotic leak or other postoperative complications (such as bleeding or infection of serous collections) explains part of the morbidity and mortality seen in patients undergoing elective or emergency colorectal procedures. To date, large cohort studies exploring the international management of collections in colorectal surgery and current practices related to drains have been lacking.

Reasons for not following ERAS guidelines and variability in compliance across the globe may be due to local centre protocols, lead-consultant strategy, or case-by-case decision making. This study will help produce a profile of drain management practices following colorectal surgery across diverse international settings, evaluating the compliance to ERAS guidelines.

Some limitations and challenges have been identified for this study. Firstly, due to the study's 'snapshot' design, a pragmatic decision was made to rationalize the volume and accuracy of data points in order to maximize its feasibility across an international network of medical students and trainees. Rationalisation of data points implied using surrogates to facilitate and standardise the collection of intraoperative data points. For example, the requirement for perioperative blood transfusion will be interpreted as significant intraoperative blood loss. The observational nature of this study also limits the causal relationship between surgical drains and patient outcomes. Finally, some centres may not follow ERAS guidelines and be compliant with their local or national guidelines.

COMPASS will be delivered through the well-established collaborative research model, which has been validated across several international cohort studies [23, 24]. This model facilitates the inclusion of large numbers of patients in 'snapshot' research studies across short study periods, generating hypotheses for future interventional studies. COMPASS will extend this model across multiple countries, promoting multinational collaboration and supporting national research collaboratives. Concurrently, it will serve as an opportunity for medical students and young trainees to engage in surgical research early in their careers.

The accuracy and completeness of data collected will be ensured using the following strategies: a local senior consultant will supervise students and trainees; online tutorials will provide training in assessment of primary and secondary outcome measures, eligibility criteria and data collection (http://eurosurg.org/e-learning/); and, finally, independent collaborators at each participating centre will perform data validation.

The study is open to new registrations until the commencement of the final data collection period. International collaboration is essential to define current practices in colorectal surgery and improve patients' outcomes.

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Figures

Figure 1: Data collection mini-team structures