Review Article

Tullio Golia D'Augè, Ilaria Cuccu, Emanuele De Angelis, Giovanni Buzzaccarini, Ottavia D'Oria, Aris Raad Besharat, Donatella Caserta, Ludovico Muzii, Giorgio Bogani, Violante Di Donato* and Andrea Giannini

Robotic vs. laparoscopic approach in obese patients with endometrial cancer: which is the best? A mini-review

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Abstract: This literature review aims to analyze available data on minimally invasive surgery (MIS) for the surgical treatment of endometrial cancer (EC) in obese patients and compare the surgical outcomes of patients with EC, treated with robotic and laparoscopic hysterectomy. An extensive literature search was conducted about studies on obese EC women who underwent robotic or laparoscopic hysterectomy. MIS reduces the impact of common adverse effects in obese patients. The robotic approach can ensure many advantages: reduction in blood loss, operative time, and hospital stay; indeed, robotic surgery seems to add other benefits when lymphadenectomy is required. Robotic surgery is more expensive compared to other approaches but considering global cost, this is less expensive than abdominal hysterectomy and its cost decreases with increasing procedural volume. Intra, peri and post-operative outcomes of obese patients with endometrial carcinoma treated with mininvasive surgery have been analyzed, highlighting the advantages and disadvantages of this approach. However, the gold standard between classical laparoscopy and robotic laparoscopy has not been defined. Robotic surgery shows better surgical outcomes, but its potential is limited due to its costs and long operating times. However, oncologic outcomes remain the most important aspects and are still to be defined.

Keywords: endometrial cancer; obesity; laparoscopy; robotic surgery

***Corresponding author: Violante Di Donato**, PhD, Department of Maternal and Child Health and Urological Sciences, Sapienza University of Rome, Policlinico Umberto I, Viale del Policlinico 155, 00161 Roma, Italy, E-mail: violante.didonato@uniroma1.it

Tullio Golia D'Augè, Ilaria Cuccu, Emanuele De Angelis and Ludovico Muzii, Department of Maternal and Child Health and Urological Sciences, Sapienza University of Rome Rome, Italy

Giovanni Buzzaccarini, Department of Obstetrics and Gynaecology, IRCCS San Raffaele Scientific Institute, Vita-Salute San Raffaele University, Milan, Italy

Ottavia D'Oria, Department of Medical and Surgical Sciences and Translational Medicine, Ph.D. Course in "Translational Medicine and Oncology", Sapienza University of Rome Rome, Italy; and Obstetrics and Gynecological Unit, Department of Woman's and Child's Health, San Camillo-Forlanini Hospital Rome, Italy

Aris Raad Besharat, Department of Medical and Surgical Sciences and Translational Medicine, Ph.D. Course in "Translational Medicine and Oncology", Sapienza University of Rome Rome, Italy; and Department of Medical and Surgical Sciences and Translational Medicine, Gynecology Division, Sant'Andrea University Hospital, Sapienza University of Rome Rome, Italy

Donatella Caserta, Department of Medical and Surgical Sciences and Translational Medicine, Gynecology Division, Sant'Andrea University Hospital, Sapienza University of Rome Rome, Italy

Giorgio Bogani, Department of Gynecologic Oncology, IRCCS National Cancer Institute Milan, Italy

Andrea Giannini, Department of Maternal and Child Health and Urological Sciences, Sapienza University of Rome Rome, Italy; and Department of Medical and Surgical Sciences and Translational Medicine, Ph.D. Course in "Translational Medicine and Oncology", Sapienza University of Rome Rome, Italy

Introduction

Obesity is classified into four classes according to the World Health Organization (WHO): class I (BMI 30–34.9 kg/m^2), class II (BMI 35.00–39.9 kg/m^2), class III (BMI 40–49.9 kg/m^2) and class IV (BMI≥50 kg/m^2) [1]. Obese patients are often frail due to other comorbidities. This means that they need a personalized approach to their care, depending on their obesity class [2].

Endometrial cancer (EC) stands as the most prevalent gynecological malignancy, with an estimated 417,000 new cases diagnosed worldwide in 2020 and one of the major risk factors for EC is obesity [3–5]. Indeed, almost 65 % of patients with EC are obese [4].

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Obesity represents an important risk factor for endometrial cancer; indeed, a growing rate of women with endometrial cancer are obese [6–8] and this represents an important health problem considering that in the USA obesity occurs in 35.5 % of the female population [9–11].

The management of obese patients is arduous and represents a real challenge for surgeons and anesthesiologists, who must use dedicated and customized techniques for their intra and post-operative management. Data available in the literature have shown an increase in the incidence of female obesity, and several researchers have assessed how this condition affects the surgical approach in the gynecological field, in particular concerning endometrial cancer surgery [12–14]. Researchers focused on which is the best surgical approach in EC obese women considering: laparotomy, vaginal, "classic" laparoscopy and robotically assisted laparoscopy [11–13].

Minimally invasive surgery (MIS) demonstrates comparable effectiveness to laparotomy regarding surgical and oncological outcomes. Nevertheless, it unveils several advantages, including superior aesthetic results, reduced hospitalization duration and decreased postoperative complications [13, 15–17]. One of the most significant released articles was "Laparoscopy compared with laparotomy for comprehensive surgical staging of uterine cancer: Gynecologic Oncology Group Study LAP2", a large prospective study [18] that compared laparotomy and MIS in EC. MIS was shown to be a viable option for EC surgery, with a 25.8 % laparotomic conversion rate. Abdominal wall thickness was one of the most common causes of conversion to laparotomy in obese patients, as it can interfere with the surgeon's movements and restrict access to the peritoneal cavity. However, in this study, although a minimally invasive approach was shown to have intra and peri-operative outcomes that overlap with open surgery, no conclusive results were achieved regarding oncological outcomes [18]. Indeed, in a subsequent study conducted in 2012 on the same population analyzed, Walker et al. showed that there were no differences in Recurrence-Free Survival (RFS) after three years (10.24 vs. 11.39 % in the laparotomic arm and laparoscopic arm, respectively) and estimated overall survival (OS) after five years (89.8 vs. 89.8 % in laparotomy and laparoscopy, respectively) [19].

Many other studies explored the effectiveness of the MIS in the management of EC in patients with BMI>30 kg/m^2 [20–22]. Recently, robotic surgery has been analyzed to establish its safety and feasibility in the management of obese patients with EC [12, 23–25]. Indeed, several technical advantages of robotic surgery compared to conventional laparoscopy seem to facilitate the role of the surgeon, including better stability of the camera, three-dimensional optics, the possibility to concentrate the use of different instruments in the hands of a single operator, the use of lower intra-abdominal pressure and an easier learning curve for surgeons [26].Despite the limited number of prospective randomized trials and reports on robotic surgery for EC in obese patients, there is no gold-standard surgical approach [27].

This literature review aims to analyze available data on MIS for the treatment of obese patients with endometrial cancer and compare the surgical outcomes of patients with EC, treated with robotic and laparoscopic hysterectomy.

Materials and Methods

In May 2023, an elaborate literature search was performed by multiple authors to identify pertinent trials on several databases (Google Scholar, Cochrane, PubMed, MEDLINE and Embase). Articles were meticulously chosen based on pertinent keywords: "endometrial cancer", "endometrial carcinoma", "obesity", "robotic laparoscopy", "laparoscopy", "surgical outcomes", "personalized treatment" and "tailored treatment". No restriction in the year of publication was applied. The elected papers were rigorously assessed and evaluated to identify studies that align with the objectives of this review. We excluded letters, editorials, and case reports. The studies that satisfied the inclusion and exclusion criteria were considered, and relevant data were considered and explored. Investigators' disagreements were resolved through discussion.

Inclusion criteria were: (1) English articles, (2) novel studies focused on surgical robot-assisted hysterectomy in patients with obesity and EC, (3) original studies focused on surgical laparoscopic hysterectomy of obese patients with endometrial cancer (4) studies analyzing the outcomes of surgical robot-assisted hysterectomy in obese patients with endometrial cancer and (5) studies analyzing the effects of surgical laparoscopic hysterectomy in EC patients with BMI>30 kg/m^2. Blood loss, surgical site infection, hospital stay, operative time, and perioperative complications were considered adverse effects; additionally, conversation rate and costs were evaluated.

Results

Identifying a correct surgical approach in case of obesity is urgent considering that a high rate of women with EC are classified as obese or morbidly obese [4, 28, 29]. Different studies demonstrated that MIS could overcome anesthetic and surgical difficulties in these patients. MIS reduces the impact of common adverse effects in obese patients, such as hemodynamic instability, pneumothorax, deep vein thrombosis, surgical site infection and wound complications [2, 30]. Preoperative consultation with an experienced anesthesiologist is essential for these patients because it helps to assess potential complications connected to obesity and its frequent comorbidities, like obstructive sleep apnea,

hypertension, coronary artery disease, difficult airway, diminished respiratory function, renal impairment, diabetes mellitus, metabolic syndrome and delayed gastric emptying allowing the clinician to perform necessary adjustments of medication doses to body weight and to use dedicated medical equipment [2, 12, 31, 32].

Different studies evaluated whether laparoscopy was superior, or at least equivalent, to open surgery in patients with EC and morbid adiposity [33–36] and demonstrated that in this clinical setting, the robotic approach can ensure many advantages: reduction in blood loss, operative time, and hospital stay [37–40]. In addition, it has been demonstrated that, when lymphadenectomy is required, a higher number of lymph nodes can be removed using a robotic approach compared to the laparoscopic [2]. However, this last result was not confirmed by a recent meta-analysis that included 660 women undergoing sentinel node biopsy, in which no significant differences were found regarding sentinel lymph node (SLN) exposure, intra and post-operative complications, conversion to laparotomy, amount of dissected SLN, and SLN individuation and excision time [41].

Corrado et al. [2] in a large retrospective study on 655 obese (BMI≥30 kg/m^2) women with EC, focused on surgical and oncological outcomes comparing robotic vs. laparoscopic hysterectomy +/– pelvic and paraaortic lymphadenectomy. Among these patients, in 249 (38 %) a robotic approach was performed and a laparoscopic approach in 406 (62 %). This comparison showed that robotically treated patients had a statistically significant difference for longer operating time, but lower conversion rate and length of hospital stay (LOS). These results highlighted that robot-assisted laparoscopy in patients with BMI>35 kg/m^2 with EC is a possible, secure, and reproducible approach. Another important retrospective cohort study was performed by Johnasson et al. [38], in which 39 patients underwent robotic-assisted laparoscopic hysterectomy (RALH) and 41 patients total laparoscopic hysterectomy (TLH) for EC. RALH resulted in significantly longer operation time than TLH while estimated blood loss was higher and length of stay was longer in TLH than RALH. No differences between groups in intra- and postoperative complications and conversions to laparotomy were observed. Equally, Minna et al. [39] performed a prospective randomized controlled trial to compare traditional and robotic-assisted laparoscopic surgery for EC. In this study, 99 patients were enrolled and patients' pre-, intra- and post-operative outcomes were reported. The robotic-assisted laparoscopic surgery was faster than traditional laparoscopy and the total time spent in the operation room was shorter in the robotic surgery group. All conversions to laparotomy occurred in the traditional laparoscopy group. Finally, there were no statistically significant differences in surgical outcomes (number of lymph nodes removed, bleeding and the length of postoperative hospital stay).

El-Achi et al. [40] performed a retrospective analysis based on the comparison of the surgical outcomes of 64 severely obese patients (BMI>40 kg/m^2) who underwent LH or RH for EC. It was shown that the median length of stay was the same for the women who underwent LH and RH (1 day each). The mean duration of the operation was also similar for the two approaches. However, the non-operative time (docking) was significantly longer for RH compared to LH (61.9 min for RH vs. 45.7 min for LH, p=0.009). Neither adverse events nor conversions to laparotomy occurred in either group. Lastly, estimated blood loss was higher in LH compared to RH.

An evaluation of robotic-assisted hysterectomy as an alternative treatment modality for EC was conducted by Iavazzo et al. [12], wherein robotic-assisted hysterectomy was performed on a cohort of 2,769 obese patients. The most prevalent comorbidities reported among these patients were hypertension, diabetes mellitus, obstructive sleep apnea (OSA), chronic obstructive pulmonary disease (COPD), and venous thromboembolism (VTE). Finally, robotic surgery is more expensive compared to other approaches (laparoscopic and open hysterectomy) [42–44]. However, considering the robotic global cost, this is less expensive than abdominal hysterectomy, due to shorter recovery time and fewer post-operative complications. Indeed, the cost of robotic surgery decreases with increasing procedural volume [45, 46].

Discussions

Recently, numerous studies have analyzed the intra-, peri- and post-operative outcomes of obese patients with endometrial carcinoma treated with mininvasive surgery, emphasizing the advantages and disadvantages of this approach. However, to date, the gold standard between classical laparoscopy and robotic laparoscopy has not been defined. In fact, although robotic surgery shows better surgical outcomes, its potential is limited due to its costs and long operating times. Indeed, Cusimano et al. [4], in a recent meta-analysis, analyzed data from 10,800 patients with EC and obesity. The data collected showed that, among patients with a BMI>30 kg/m^2, the percentages of conversion rate from laparoscopy and robot-assisted hysterectomy were 6.5 and 5.5 %, correspondingly; the conversion rate in patients with a BMI>40 kg/m^2 were 7.0 and 3.8 % respectively. The most common reason for conversion in both groups was insufficient exposure due to adhesions and visceral adiposity. The 31 % of laparoscopic and 6 % of robotic conversions were

caused by the impossibility of tolerating the Trendelenburg position, however, it was not assessed an appreciable difference between the two arms for conversion rate, for the percentages of organ/vessel injury venous thromboembolism and blood transfusion. It has also been underlined that even if perioperative complications in patients with EC and obesity have similar rates in robotic and laparoscopic hysterectomy, the conversion rate may be reduced by the robotic approach thanks to avoiding positional intolerance in patients with morbid obesity.

Despite the surgical advantages, several authors have retrospectively demonstrated that the use of robotic surgery for the treatment of EC patients is correlated to worse oncological outcomes. Argenta et al. analyzed the data of over 1,000 patients and found that those treated with a robotic approach had an RFS and an OS lower than those treated with classical laparoscopy (HR: 1.41, 95 % CI: 1.12, 1.77 and HR: 1.39, 95 % CI: 1.06, 1.83, respectively) [47].

These results should be interpreted with caution given the retrospective nature of the studies; in fact, retrospective studies are also available in the literature that show worse oncological outcomes in patients treated with minimally invasive surgery than laparotomic surgery [48]. However, international guidelines agree on an MIS approach for the treatment of endometrial carcinoma [49, 50] given the results of randomized controlled trials that demonstrated the oncologic safety of this approach [19, 51].

Another disadvantage of robotic surgery is the high cost. A retrospective analysis conducted by Venkat et al. [46] analyzed the costs, reimbursements, and charges comparing robotic vs. laparoscopic surgery for EC. A comprehensive analysis of direct costs and charges revealed that robotic surgery incurred higher costs compared to laparoscopic surgery. Nevertheless, reimbursements to healthcare providers, including hospitals, surgeons, and anesthesiologists, exhibited no statistically significant difference between the two surgical approaches This means that, in an era of rising healthcare costs and limited resources, economic analyses are needed to provide both clinical and financial information about the use of novel surgical approaches. Nevertheless, the cost of new technology may be lower over time due to market rivalry, the reduced number and cost of non-reusable instruments and the prospects for the use of single-site robotic surgery. Currently, our healthcare system needs to embrace novel therapeutical options that improve the outcome and quality of life of cancer patients [46].

The goal of our review is to summarize the data currently available on robotic and laparoscopic approaches in obese patients with endometrial cancer. We think that this review adds a broad-based view on the subject, which remains an important topic.

Conclusions

If the advantages of robotic surgery have been clearly shown, few interrogatives remain to be solved: do the benefits of robotic surgery justify its costs? Is it correct to use a robotic approach when laparoscopy surgery is cheaper? Due to the exponential development of biotechnology, a personalized approach is mandatory to treat patients with endometrial cancer, particularly obese women need a tailored approach that may include robotic surgery.

In conclusion, miniinvasive surgery is burdened by few peri- and post-operative complications and its use is a milestone in the treatment of endometrial cancer. Robotic surgery is feasible, safe, and reproducible thanks to the surgical and biotechnological progress, becoming an acceptable substitute for laparoscopy in the management of EC-obese women.

Despite the high number of comparative studies, now, there are only a few randomized trials that may offer more concrete evidence on the application of robotic or laparoscopic technology on obese or morbidly obese and additional prospective trials are necessary to corroborate this scientific indication.

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