

Review

Comparative safety and effectiveness of robot-assisted laparoscopic hysterectomy versus conventional laparoscopy and laparotomy for endometrial cancer: A systematic review and meta-analysis



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Abstract

Aim: This study aimed to evaluate the surgical safety and clinical effectiveness of RH compared to OH and LH for endometrial cancer. **Methods:** We searched Ovid-Medline, Ovid-EMBASE, and the Cochrane library for studies published through May 2015. The outcomes of interest included safety (overall; peri-operative and post-operative complications; death within 30-days; and specific morbidities), effectiveness (survival, recurrence, length of stay [LOS], estimated blood loss [EBL], and operative time [OT]), and patient-reported outcomes (pain score, pain medication use, length of pain medication use, and time to return to work). Two independent reviewers extracted data and assessed the risk of bias.

Results: Twenty-four studies comparing RH to OH and 24 comparing RH to LH were identified. No significant differences were found in survival outcomes. The LOS was shorter, there was less EBL, and the rates of complications, readmission, and transfusion were lower with RH compared to OH. However, RH showed a longer OT and a higher incidence of vaginal cuff dehiscence compared to those for OH. Compared to LH, the LOS was shorter, there was less EBL, and the rates of conversion to laparotomy, intra-operative complications, urinary tract injuries, and cystotomy were lower in RH. Several patient-reported outcomes showed a significant benefit of RH, but each outcome was reported in only one study.

Conclusions: RH may be a generally safer and better option than OH and LH for patients with endometrial cancer. Further prospective studies with long-term follow-up are required.

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Keywords: Endometrial cancer; Robotic hysterectomy; Radical hysterectomy; Open hysterectomy; Laparoscopic hysterectomy

Introduction

Endometrial cancer (EC) is the most common gynecologic cancer among women worldwide. It is the fourth most common cancer among women in the United

States,¹ and the incidence of endometrial cancer is increasing due to the obesity epidemic. The surgical approach is the primary method for diagnosis and treatment of EC patients. Currently, EC is primarily treated with minimally invasive surgical approaches, including laparoscopy.² However, there are limitations associated with conventional laparoscopy and laparotomy, including restricted visualization, restricted instrument control inside the lower abdominal cavity, long operative time

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(OT), and safety disadvantages. In 2005, Reynolds et al.³ reported the first case series of robotic total hysterectomies with bilateral salpingo-oophorectomy and pelvic lymphadenectomy for EC. Thereafter, the use of the robotic system has rapidly increased for the surgical treatment of gynecological cancers, as it offers technical merits over both traditional open hysterectomy (OH) and laparoscopic hysterectomy (LH). Robotic surgery enables surgeons to perform complex procedures more easily through improved visualization, more accurate instrument control, and improved ease of use of instruments.⁴ Gala et al.⁵ found that robot-assisted hysterectomy (RH) was associated with a longer OT but shorter length of stay (LOS) and less estimated blood loss (EBL) than those for laparoscopy and laparotomy. However, the majority of the current literature evaluating the surgical advantages and disadvantages of robotic surgery for endometrial cancer were non-randomized controlled trials. In particular, several studies have presented benefits of robot-assisted laparoscopic hysterectomy in obese women with EC and, more recently, the merits of RH for patient-reported outcomes, such as pain score after surgery, pain medication use, time to recovery to normal daily activities, and time to return to work. However, whether RH for endometrial cancer is superior to OH or LH remains unclear. Therefore, our study aimed to evaluate outcomes related to the surgical and clinical safety and effectiveness of RH, including outcomes related to quality of life, by comparing RH to conventional OH and LH in endometrial cancer. In order to acquire comparative results in obese women, we also conducted a sensitivity analysis, focusing only on studies with obese or morbidly obese populations.

Materials and methods

The methods for selecting articles, data analysis, and reporting the results of the meta-analysis were specified a priori in a protocol based on the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement.⁶

Search strategy

We searched for studies comparing RH with LH or OH for the treatment of EC using Ovid-Medline, Ovid-EMBASE, and the Cochrane Library databases through May 2015, along with five domestic databases (KoreaMed, KMBASE, KISS, RISS, and KISTi) without restriction of publication year and language. Search terms combined MESH terms (uterine neoplasms) and the related terms “uterine cancer,” “endometrial cancer,” “gynecologic cancer,” and “Robotics,” “Computer-assisted surgery,” “telorobot,” “remote operation,” “remote surgery,” “Da Vinci,” and “Zeus.” We also reviewed the bibliographies of relevant review articles to identify additional publications

and examined the relevant references from Intuitive Surgical Korea, Ltd.

Inclusion and exclusion criteria

Two reviewers independently screened the titles and abstracts to exclude irrelevant studies, and a full-text review of potentially relevant articles was subsequently performed. The inclusion criteria were: (1) studies that focused on patients with EC, (2) comparative studies between RH and OH or LH, (3) studies that reported at least one of our pre-specified outcome of interest, and (4) published original, peer-reviewed articles. The exclusion criteria were as follows: (1) non-original studies, (2) animal tests or preclinical trials, (3) abstract-only publications, (4) reports in a language other than English or Korean, and (5) duplicate publications. If there were any disagreements, they were resolved through discussion and consensus, and if necessary, additional reviewers participated in the discussion.

Data extraction and quality assessment

The quality of the selected studies was assessed using the risk of bias for non-randomized studies (ROBANS ver 2.0), which was developed based on the Cochrane risk of bias. The quality assessments were performed by two independent researchers (DAP and DYL). Disagreements were resolved by consensus of all authors.

Two reviewers independently extracted the variables listed below into a pre-specified data extraction form and double-checked them. Safety outcomes consisted of the overall complication rate, intraoperative complication rate, postoperative complication rate, and individual adverse events including major complications, such as injury of organs, bleeding, vaginal cuff dehiscence, fistula, hernia, thromboembolism, ileus/bowel obstruction, sepsis, wound separation, and cellulitis; and minor complications, such as urine retention, ureteral stricture/obstruction, urinary tract infection, abscess, and hematoma. The effectiveness outcomes consisted of perioperative outcomes, oncological outcomes, and patient-reported outcomes.

Statistical analysis

The meta-analysis was performed using Review Manager 5.3 (RevMan, The Cochrane Collaboration, Oxford, UK) and Comprehensive Meta-analysis 2.0 (CMA). The Cochrane-Q statistic and the I^2 statistic were used to assess statistical heterogeneity. The weighted mean difference (WMD) and 95% confidence intervals (CI) were used as the summary variables for continuous outcomes, and the relative risk (RR) and 95% CI were used for dichotomous variables. Heterogeneity was analyzed using a chi-squared test, and a P value <0.10 was used to establish statistical significance with the I^2 test.⁷ I^2 values >50% were

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