



Review Article

Robot-assisted versus conventional laparoscopic surgery for endometrial cancer staging: A meta-analysis

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ABSTRACT

This meta-analysis broadly compared the safety and efficacy of robot-assisted laparoscopy (RAL) with that of conventional laparoscopy (CL) for endometrial cancer staging. The advantages of RAL were evaluated through the outcomes in terms of conversion rates, complications, length of operation, blood loss, number of lymph nodes harvested, and length of hospitalization. Three electronic databases (PubMed, MEDLINE, and Embase) were searched to identify eligible studies. We selected all retrospective studies documenting a comparison between RAL and CL for endometrial cancer staging between 2005 and 2015, and tallied with meta-analyses criteria. Only studies published in English were included in this analysis. The outcomes of the extracted data were pooled and estimated by the Review Manager version 5.1 software. Seventeen studies met the eligibility criteria. Among the 2105 patients reported, 912 underwent RAL and the other 1193 underwent CL for endometrial cancer staging. Compared with CL, RAL had lower conversion rates [risk ratio, 0.4; 95% confidence interval (CI), 0.25–0.64; $p = 0.0002$]. Its complications were also less than that of CL (risk ratio, 0.72; 95% CI, 0.56–0.94; $p = 0.02$). RAL was associated with significantly less intraoperative blood loss (weighted mean difference, -79.2 mL; 95% CI, from -103.43 to -54.97 ; $p < 0.00001$) and a shorter length of hospitalization (weighted mean difference, -0.37 days; 95% CI, from -0.57 to -0.17 ; $p = 0.0003$). We found no significant differences in the length of operation and number of lymph nodes harvested between the two groups. From our meta-analysis results, RAL is a safe and effective alternative to CL for endometrial cancer staging. Further studies are required to determine potential advantages or disadvantages of RAL.

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Introduction

Endometrial cancer is one of the most commonly seen gynecologic malignancies, with a highly increasing incidence in the developed world [1]. The primary treatment for endometrial cancer is total hysterectomy, bilateral salpingo-oophorectomy, and surgical staging [2]. Safe and effective surgery for endometrial cancer serves as a linchpin for both disease prognosis and improved life quality of the patients.

Over the past decade and a half, minimally invasive approaches have increasingly been adopted by gynecologic oncologists for the

treatment of endometrial cancer. Laparoscopic surgery is considered a preferred alternative to laparotomy because of less blood loss and blood transfusion, shorter hospitalization, and better cosmetic results [3,4]. However, the minimally invasive approach to treat endometrial cancer has been limited owing to two dimensioned visualization and strict requirement of skilled and experienced surgeons. In recent years, the use of a robotic surgical platform (Da Vinci Surgical System) has grown exponentially [5]. It offers numerous potential benefits, especially extensive suturing and less collateral damage, in endometrial cancer staging.

All the benefits of robot-assisted laparoscopic surgery (RAL) surmounted the limits of conventional laparoscopic surgery (CL) [6]. It was associated with a shorter hospital stay, a lower overall complication rate, and fewer blood transfusions. In addition, it has shortened the transition time of patients to normal social life and improved their quality of life as well. However, studies comparing RAL with CL in endometrial cancer staging are limited. The real

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benefits of robot-assisted laparoscopic endometrial cancer staging remained controversial.

The aim of this meta-analysis is to evaluate the efficacy and safety of RAL in endometrial cancer staging compared with CL.

Materials and methods

Search strategy

A systematic literature review was performed using electronic databases (PubMed, MEDLINE, and Embase). All English-language publications comparing RAL with CL for endometrial cancer staging from January 1, 2005 to April 25, 2015 have been identified. The following key words were used in the search: [(robot* or “robotic surgery” or “robotic staging”) and (“endometrial cancer” or “endometrial carcinoma”)]. Moreover, the “related articles” offered by databases were explored to broaden the search, and all abstracts, studies, and citations were reviewed.

Finally, a manual search for relevant studies was also carried out to identify studies for possible inclusion as a supplement.

Data extraction

The data were extracted by two researchers (Z.A. and H.R.) independently for each eligible study comparing RAL and CL. Any disagreements were resolved by a third reviewer (S.H.), until a consensus was reached.

The quality of each study was evaluated using the Newcastle–Ottawa Scale [7]. Seventeen studies were selected according to the criteria based on the following three items: patient selection, comparability of RAL and CL groups, and exposure. The quality of study grades was evaluated based on an ordinal star scoring scale. Higher scores represented higher quality of the study. One star for each numbered item within the selection and exposure categories in one study and a maximum of two stars for the comparability of the two groups have been formulated. The studies with six or more stars were considered to be of much higher quality.

Inclusion criteria

All the selected studies in the meta-analysis adhered to the following inclusion criteria: (1) comparison of outcomes of RAL with CL for endometrial cancer staging; (2) evaluation of length of operation, blood loss, operative complications, and length of hospital stay; (3) patient medical parameters (age, body mass index, history of abdominal surgery, pre-existing complication conditions, uterine weight, tumor stage, and tumor grade) in compared groups not being statistically different; and (4) patients not having received radiation therapy or chemotherapy preoperatively.

Exclusion criteria

The exclusion criteria for this meta-analysis were as follows: (1) research articles, such as letters, editorials, and expert opinions; (2) studies without original data, case reports, or studies lacking CL as a control group; (3) studies not providing clear outcomes or patient parameters; (4) studies including open hysterectomy or single-port laparoscopic surgery alone; and (5) reports only on RAL surgeries.

Statistical analysis

This meta-analysis was performed using Revman 5.3 (Review Manager version 5.3; The Nordic Cochrane Centre, Copenhagen, Denmark) for the five primary outcome parameters: length of operation, blood loss, conversion rates, number

of lymph nodes harvested, and length of hospitalization. The statistical package of the software was applied to analyze the risk ratios (RRs) for dichotomous variables and weighted mean differences (WMDs) for continuous variables. Heterogeneity was evaluated by F and I^2 . We considered heterogeneity to be present if the I^2 statistic was $> 50\%$, and the threshold of significance was considered at $p < 0.05$. The publication bias was evaluated by funnel plots.

Results

Study selection and study characteristics

The 17 studies [8–24] were selected from the search on RAL surgery for endometrial cancer staging (Figure 1). All included studies were retrospective and nonrandomized controlled comparison. The characteristics of these studies were summarized, and the quality of studies was assessed. A total of 2105 patients were identified: 912 in the RAL group and 1193 in the CL group. All studies involved RAL versus CL for endometrial cancer staging. The first author and year of publication, patient parameters (age, body mass index, tumor stage, tumor grade, and uterine weight), study design, and the quality assessment of studies are given in Table 1.

Synthesis of results

Ten studies reported the rates of conversion. The pooled estimate showed an RR of 0.4 (95% CI, 0.25–0.64) in favor of patients who received RAL. The I^2 was 0%, which suggested no heterogeneity in pooled studies (see Figure 2). The reason for conversion in RAL was exposure difficulty. However, other reasons, such as dense adhesions, vascular injury, and obscuring anatomy, induced conversion in CL to a greater extent.

Fourteen studies assessed the complications of the two surgical procedures. It showed fewer complications in the RAL group than in the CL group (RR, 0.72; 95% CI, 0.55–0.95; $p = 0.02$; see Figure 3). Even though a large number of studies reported fewer

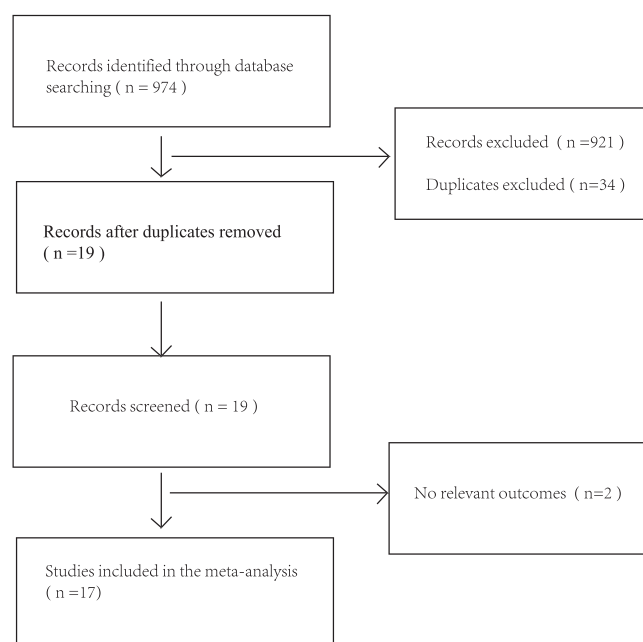


Figure 1. Flow diagram of studies identified in the meta-analysis.

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