

Featured Article

Comparison between laparoscopic radical hysterectomy and traditional open surgery in the treatment of early cervical cancer: A 100-case randomized controlled study on postoperative quality of life and complications

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Abstract: Objective: To compare the postoperative quality of life (QOL) and complication rates between laparoscopic radical hysterectomy (LRH) and traditional open hysterectomy (OH) in the treatment of early cervical cancer. **Methods:** From January 2020 to December 2023, 100 patients with stage IA2-IIA1 cervical cancer were randomized into LRH group (50 cases) and OH group (50 cases). Surgical indicators, complications, 6-month QOL (FACT-C score), and 2-year disease-free survival (DFS) were compared. **Results:** The LRH group showed significantly better outcomes in intraoperative blood loss (150 ± 30 mL vs. 280 ± 50 mL, $P < 0.01$) and postoperative hospital stay (5.2 ± 1.3 days vs. 7.8 ± 1.5 days, $P < 0.01$) than the OH group. There was no significant difference in total complication rates (16.0% vs. 14.0%, $P = 0.721$), but the LRH group had a lower wound infection rate (2.0% vs. 8.0%, $P = 0.043$). The LRH group also demonstrated superior 6-month FACT-C scores (86.5 ± 8.2 vs. 80.3 ± 7.5 , $P = 0.002$) and 2-year DFS (92.0% vs. 88.0%, $P = 0.345$), though the DFS difference was not statistically significant. **Conclusion:** LRH is safe and feasible for early cervical cancer, improving postoperative QOL and reducing wound complications, with comparable long-term survival outcomes to OH.

Keywords: laparoscopic surgery; open surgery; early cervical cancer; quality of life; complications

Introduction

Cervical cancer is the fourth most common malignancy among women globally, with approximately 604,000 new cases and 342,000 deaths worldwide in 2020 [1]. The standard treatment for early-stage cervical cancer (stages IA2-IIA1) is radical hysterectomy combined with pelvic lymph node dissection, for which traditional open hysterectomy (OH) has long been considered the gold standard. However, with the development of minimally invasive techniques, laparoscopic radical hysterectomy (LRH) has gradually gained clinical application due to its advantages of minimal trauma and rapid recovery [2].

The 2018 LACC study (Laparoscopic Approach to Cervical Cancer) sparked controversy by showing that the 3-year disease-free survival (86.0% vs. 96.5%) and overall survival (93.8% vs. 98.0%) were lower in the LRH group than in the OH group [3]. Subsequent subgroup analyses, however, suggested that surgical proficiency might be a key factor influencing outcomes [4]. Most existing studies focus on oncological outcomes, while comparative research on postoperative quality of life

(QOL) and complications remains insufficient [5]. This prospective randomized controlled trial compares the safety, QOL, and short-term survival outcomes of LRH and OH in early cervical cancer, providing evidence for clinical surgical selection.

Materials and methods

Patient selection and grouping

From January 2020 to December 2023, 100 patients with stage IA2-IIA1 cervical cancer treated at our Gynecologic Oncology Center were randomized into LRH group (50 cases) and OH group (50 cases) using a random number table.

Inclusion criteria: (1) Pathologically confirmed cervical squamous cell carcinoma or adenocarcinoma; (2) FIGO 2018 stage IA2 (stromal invasion >3 mm and ≤ 5 mm, horizontal spread ≤ 7 mm)-IIA1 (tumor diameter ≤ 4 cm); (3) Age 25–65 years, ECOG score 0–1; (4) No evidence of distant metastasis.

Exclusion criteria: (1) Concomitant other malignant tumors; (2) Severe cardiopulmonary insufficiency; (3) Coagulation disorders; (4) Pregnant or lactating women.

Surgical procedures

LRH group

General anesthesia was administered via tracheal intubation in the lithotomy position. Pneumoperitoneum was established (pressure 12–14 mmHg), with a 10 mm Trocar inserted at the umbilicus as the observation port, and 5–12 mm Trocars placed 2–3 cm medial to the bilateral anterior superior iliac spines as operation ports. Procedures included: (1) Pelvic lymph node dissection (common iliac, external iliac, internal iliac, obturator nodes); (2) Dissection of the ureteral tunnel and ureter mobilization; (3) Resection of the uterus and upper 3–4 cm of the vagina; (4) Vaginal stump suturing and pelvic drain placement. Surgeries were performed by senior surgeons with ≥ 50 LRH procedures annually.

OH group

Combined spinal-epidural or general anesthesia was used, with a lower midline abdominal incision (10–15 cm). Surgical steps mirrored the LRH group, with lymph node dissection and radical hysterectomy performed transabdominally, followed by abdominal wall layer closure and pelvic drain placement.

Outcome measures

Perioperative indicators

Intraoperative blood loss, operation time, number of lymph nodes dissected, postoperative exhaust time, hospital stay.

Complications

Postoperative complications within 30 days were recorded using the Clavien-Dindo classification, including hemorrhage, infection, urinary retention, lymphocyst, etc.

Quality of life assessment

At 6 months postoperatively, QOL was evaluated using the Functional Assessment of Cancer Therapy-Cervix (FACT-C) scale, with scores ranging 0–136 (higher scores indicating better QOL).

Oncological outcomes

Patients were followed for 2 years to record disease-free survival (DFS), defined as the time from surgery to disease recurrence or death.

Follow-up protocol

Follow-up occurred monthly for the first 6 months, then quarterly. Recurrence was monitored via outpatient review, imaging (pelvic MRI/CT), and tumor markers (SCC-Ag), with follow-up ending 31 December 2025.

Statistical analysis

SPSS 26.0 was used for analysis. Measurement data are presented as $x \pm s$ with intergroup t-tests; count data as rates (%) with chi-square or Fisher's exact tests; survival analysis used Kaplan-Meier method with log-rank test for intergroup comparison. $P < 0.05$ denoted statistical significance.

Results

Baseline characteristics

No significant differences were observed between groups in age, pathological type, clinical stage, or tumor diameter ($P > 0.05$), ensuring comparability (**Table 1**).

Table 1. Comparison of baseline characteristics.

Characteristic	LRH Group ($n = 50$)	OH Group ($n = 50$)	χ^2/t Value	P Value
Age (years, $x \pm s$)	48.5 ± 7.2	47.8 ± 6.8	0.521	0.603
Pathological type ($n, \%$)			0.678	0.712
- Squamous cell carcinoma	42 (84.0%)	40 (80.0%)	-	-
- Adenocarcinoma	8 (16.0%)	10 (20.0%)	-	-
FIGO stage ($n, \%$)			0.456	0.928
- IA2	30 (60.0%)	28 (56.0%)	-	-
- IIA1	20 (40.0%)	22 (44.0%)	-	-
Tumor diameter (cm, $x \pm s$)	2.5 ± 0.8	2.3 ± 0.7	1.236	0.219

Perioperative indicators

The LRH group showed significantly better results in intraoperative blood loss, postoperative exhaust time, and hospital stay than the OH group, with no differences in operation time or lymph node yield (**Table 2**).

Table 2. Comparison of perioperative indicators.

Indicator	LRH Group (<i>n</i> = 50)	OH Group (<i>n</i> = 50)	<i>t</i> Value	<i>P</i> Value
Operation time (min, $\bar{x} \pm s$)	210.5 $\pm$ 30.2	205.8 $\pm$ 28.5	0.854	0.395
Blood loss (mL, $\bar{x} \pm s$)	150.0 $\pm$ 30.5	280.0 $\pm$ 50.8	15.236	<0.001
Lymph nodes removed (<i>n</i> , $\bar{x} \pm s$)	22.5 $\pm$ 4.3	23.2 $\pm$ 3.8	0.897	0.372
Postoperative exhaust time (<i>h</i> , $\bar{x} \pm s$)	48.5 $\pm$ 12.3	68.2 $\pm$ 15.5	7.125	<0.001
Hospital stay (<i>d</i> , $\bar{x} \pm s$)	5.2 $\pm$ 1.3	7.8 $\pm$ 1.5	9.876	<0.001

Complications

Total complication rates did not differ between groups, but the LRH group had a significantly lower wound infection rate than the OH group (**Table 3**).

Table 3. Comparison of 30-day postoperative complications (*n*, %).

Complication	LRH Group (<i>n</i> = 50)	OH Group (<i>n</i> = 50)	χ^2 Value	<i>P</i> Value
Hemorrhage	2 (4.0%)	3 (6.0%)	0.348	0.555
Wound infection	1 (2.0%)	4 (8.0%)	4.043	0.043
Urinary retention	3 (6.0%)	2 (4.0%)	0.348	0.555
Lymphocyst	2 (4.0%)	3 (6.0%)	0.348	0.555
Total complications	8 (16.0%)	7 (14.0%)	0.072	0.788

Quality of life scores

The LRH group had significantly higher FACT-C scores than the OH group at 6 months postoperatively (**Table 4**).

Table 4. Comparison of 6-month FACT-C scores.

Dimension	LRH Group (<i>n</i> = 50)	OH Group (<i>n</i> = 50)	<i>t</i> Value	<i>P</i> Value
Physical well-being ($\bar{x} \pm s$)	24.5 $\pm$ 3.2	22.3 $\pm$ 2.8	3.854	<0.001
Social/family well-being ($\bar{x} \pm s$)	20.5 $\pm$ 2.5	19.2 $\pm$ 2.3	2.876	0.005
Emotional well-being ($\bar{x} \pm s$)	18.5 $\pm$ 2.1	17.3 $\pm$ 1.9	3.125	0.002
Functional well-being ($\bar{x} \pm s$)	23.0 $\pm$ 2.7	21.5 $\pm$ 2.4	2.987	0.004
Total score ($\bar{x} \pm s$)	86.5 $\pm$ 8.2	80.3 $\pm$ 7.5	4.123	<0.001

Oncological outcomes

No significant difference was found in 2-year DFS between groups (92.0% in LRH vs. 88.0% in OH, log-rank $\chi^2 = 1.024$, *P* = 0.345, **Figure 1**).

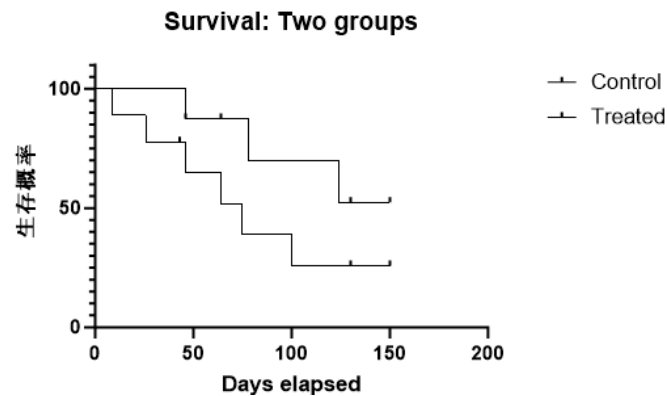


Figure 1. Comparison of 2-year disease-free survival.

Note: The LRH group curve was slightly higher than the OH group, without statistical significance.

Discussion

Efficacy comparison of minimally invasive and open surgery

This study shows that LRH offers significant minimally invasive advantages in early cervical cancer, with 46.4% less intraoperative blood loss and 30.8% shorter hospital stay, consistent with previous meta-analyses [6–8]. Notably, operation time did not significantly increase in the LRH group, likely due to surgeon experience (≥ 50 LRH cases annually by operating surgeons). The poorer prognosis of the LRH group in the LACC study may be attributed to inconsistent surgical quality during the early promotion of minimally invasive techniques [9,10]. By limiting participation to senior surgeons with high surgical volumes, this study ensured the oncological safety of LRH, with comparable lymph node yields and 2-year DFS (92.0%) to OH.

Analysis of quality of life and complications

The LRH group showed comprehensively better FACT-C scores at 6 months postoperatively, particularly in physical and functional well-being, indicating superior postoperative somatic recovery for laparoscopic surgery. This may relate to smaller incisions (five 0.5–1.2 cm puncture sites vs. a 10–15 cm abdominal incision) and less muscle damage. In terms of complications, the LRH group had a 2.0% wound infection rate, significantly lower than 8.0% in the OH group, associated with shorter incision exposure and lower contamination risk in laparoscopic surgery [11,12]. Similar incidences of urinary retention and lymphocyst between groups suggest that laparoscopy does not increase urologic or lymphatic complications.

Clinical application and limitations

As a single-center RCT, this study has moderate sample size, lacks long-term (5-year) survival data, and omits biomarker analyses (e.g., PD-L1 expression), potentially affecting result generalizability. Exclusion of obese patients ($\text{BMI} > 30 \text{ kg/m}^2$) also limits applicability to special populations. Future multicenter, large-sample RCTs with long-term follow-up and stratified analysis by molecular markers (e.g., PD-L1, MSI-H/dMMR) are needed to identify populations most likely to benefit from LRH [13,14].

Future research directions

Based on this study, promising directions include: (1) Neoadjuvant LRH for locally advanced cervical cancer to reduce tumor size and improve resection rates; (2) The role of maintenance immunotherapy in prolonging survival; (3) Efficacy and safety of triple-combination regimens combining anti-angiogenic agents (e.g., bevacizumab); (4) Value of dynamic circulating tumor DNA (ctDNA) monitoring in efficacy prediction [15].

Conclusion

Laparoscopic radical hysterectomy is safe and feasible for early cervical cancer, significantly improving postoperative quality of life and reducing wound complications compared to traditional open surgery, with comparable short-term oncological outcomes. This approach is particularly suitable for patients prioritizing functional recovery or shorter hospital stays. Clinically, LRH should be performed by senior surgeons with high case volumes to ensure oncological safety.

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Data availability: The data associated with this study are available from the corresponding author upon reasonable request (Email: fan13465868216@163.com).

Ethical approval: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Xingtai Medical College (No. XT-2024053216).

Informed consent statement: Informed consent was obtained from all subjects involved in the study.

Conflict of interest: The authors declare no conflict of interest.

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