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Minimally invasive versus open myomectomy for uterine fibroids: A one-year prospective cohort study in reproductive-age women

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Abstract
Background: Uterine fibroids are among the most common benign tumors affecting women of reproductive age. Surgical intervention is often indicated in symptomatic cases, with myomectomy as the preferred fertility-sparing procedure. With the advancement of minimally invasive techniques, laparoscopic myomectomy has gained popularity. However, comparative outcomes between laparoscopic and open approaches remain clinically relevant, particularly in terms of intraoperative complications, postoperative recovery, and fertility outcomes.
Materials and Methods: This prospective comparative study was conducted at the Department of Gynaecology, Mayo Institute of Medical Sciences, Lucknow, from March 2019 to February 2020. A total of 120 reproductive-age women with symptomatic uterine fibroids were included, with 60 undergoing laparoscopic myomectomy and 60 undergoing open myomectomy. Intraoperative blood loss, operative time, hospital stay duration, postoperative pain scores, and complication rates were recorded. Statistical analyses included Chi-square test, unpaired t-test, and Mann-Whitney U test where appropriate.
Results: Mean operative time was longer in the laparoscopic group (108.2 ± 14.5 min) versus the open group (92.4 ± 12.3 min; $p < 0.001$), but laparoscopic surgery resulted in significantly lower blood loss (134.6 ± 24.1 mL vs 241.8 ± 30.6 mL; $p < 0.001$), shorter hospital stay (2.1 ± 0.6 days' vs 4.8 ± 1.2 days; $p < 0.001$), and reduced postoperative pain scores (3.2 ± 0.9 vs 6.1 ± 1.1; $p < 0.001$). Complication rates were lower in the laparoscopic group.
Conclusion: Laparoscopic myomectomy offers superior postoperative outcomes with reduced morbidity and faster recovery compared to the open approach, despite a longer operative duration.

Keywords: Uterine fibroids, Laparoscopic myomectomy, Open myomectomy, Surgical outcomes, Reproductive-age women, Minimally invasive surgery

Introduction
Uterine fibroids, or leiomyomas, are benign smooth muscle tumors of the uterus that affect an estimated 20-40% of women during their reproductive years [1]. While many fibroids are asymptomatic, a significant proportion of women experience symptoms such as abnormal uterine bleeding, pelvic pain, pressure symptoms, infertility, and recurrent pregnancy loss [2]. When medical management fails or fertility preservation is desired, myomectomy remains the preferred surgical treatment option [3].
Traditionally, open myomectomy via laparotomy has been the standard approach, particularly for women with large or multiple fibroids [4]. However, with advancements in surgical technology and increased expertise in minimally invasive techniques, laparoscopic myomectomy has emerged as a viable alternative. This technique offers the potential benefits of smaller incisions, reduced blood loss, shorter hospital stays, quicker recovery, and decreased postoperative pain [5]. Nonetheless, it also presents challenges such as longer operative time, the need for advanced laparoscopic skills, and concerns regarding morcellation and recurrence [6].
The choice between laparoscopic and open myomectomy often depends on a variety of factors including the size, number, and location of fibroids; the surgeon's expertise; and the patient's reproductive goals. Several studies have compared both approaches, yet discrepancies remain regarding operative time, complication rates, and long-term fertility outcomes [7]. Moreover, patient selection bias and institutional variability in surgical skill contribute to conflicting conclusions in existing literature [8].
In India, where access to minimally invasive gynecologic surgery is growing but not yet

universally standardized, the decision-making process for the appropriate surgical route is particularly nuanced [9]. Thus, it becomes essential to generate high-quality evidence from diverse clinical settings to inform practice guidelines and support evidence-based decisions in the management of uterine fibroids.

This study aims to compare the intraoperative and postoperative outcomes of laparoscopic versus open myomectomy in reproductive-age women presenting with symptomatic uterine fibroids.

Materials and Methods

Study Design and Setting

This prospective comparative study was conducted in the Department of Gynaecology at Mayo Institute of Medical Sciences, Lucknow, over a one-year period from March 2019 to February 2020. The study aimed to evaluate and compare intraoperative and postoperative outcomes between laparoscopic and open myomectomy in reproductive-age women.

Sample Size and Participants

A total of 120 women aged 20 to 45 years, diagnosed with symptomatic uterine fibroids requiring surgical intervention, were enrolled. Patients were selected based on strict inclusion and exclusion criteria. Sixty patients underwent laparoscopic myomectomy (Group A), and sixty underwent open myomectomy (Group B). Allocation into groups was based on patient preference after counseling and surgeon's discretion based on fibroid characteristics.

Inclusion Criteria

- Women aged 20-45 years.
- Presence of symptomatic fibroids (e.g., menorrhagia, dysmenorrhea, infertility).
- Fibroids sized 3-10 cm in diameter (single or multiple).
- Desire for uterine preservation.

Exclusion Criteria

- Suspicion of malignancy.
- Severe cardiopulmonary comorbidities.
- History of extensive pelvic adhesions.
- Pregnancy.

Preoperative Evaluation and Procedure

All patients underwent a thorough clinical evaluation including pelvic ultrasonography and pre-anesthetic assessment. Standard protocols for preoperative hemoglobin optimization and bowel preparation were followed.

Surgical Technique

Laparoscopic myomectomy was performed under general anesthesia using three-port or four-port technique, with uterine incision and fibroid enucleation followed by intracorporeal suturing. Open myomectomy was performed through a Pfannenstiel incision under general anesthesia, using standard layered closure after fibroid removal.

Outcome Measures

The following variables were recorded for both groups:

- Operative time (from incision to closure).
- Estimated intraoperative blood loss (based on suction and sponge count).
- Postoperative pain (measured using Visual Analogue Scale at 6 and 24 hours).
- Duration of hospital stay (in days).
- Intraoperative and postoperative complications (fever, hemorrhage, infection).

Statistical Analysis: Data were entered in Microsoft Excel and analyzed using SPSS version 22.0. Continuous variables were expressed as mean ± standard deviation and compared using unpaired t-test or Mann-Whitney U test, as appropriate. Categorical variables were analyzed using Chi-square or Fisher's exact test. A p-value < 0.05 was considered statistically significant.

Ethical Considerations

The study was approved by the Institutional Ethics Committee. Written informed consent was obtained from all participants after explaining the study objectives, procedures, risks, and benefits.

Results

Table 1: Demographic Characteristics

Parameter	Laparoscopic Group (n=60)	Open Group (n=60)	p-value
Mean Age (years)	31.8	32.5	0.428
BMI (kg/m²)	24.6	25.1	0.312
Parity (Nulliparous)	22 (36.7%)	24 (40.0%)	0.689
Previous Abdominal Surgery	10 (16.7%)	12 (20.0%)	0.648

Table 2: Intraoperative Outcomes

Parameter	Laparoscopic Group (n=60)	Open Group (n=60)	p-value
Operative Time (min)	108.2 ± 14.5	92.4 ± 12.3	<0.001
Estimated Blood Loss (mL)	134.6 ± 24.1	241.8 ± 30.6	<0.001
Need for Blood Transfusion	3 (5.0%)	10 (16.7%)	0.041

Table 3: Postoperative Recovery Parameters

Parameter	Laparoscopic Group (n=60)	Open Group (n=60)	p-value
Hospital Stay (days)	2.1 ± 0.6	4.8 ± 1.2	<0.001
Postoperative Pain Score (VAS)	3.2 ± 0.9	6.1 ± 1.1	<0.001
Return to Normal Activity (days)	7.8 ± 2.1	13.4 ± 3.2	<0.001

Table 4: Postoperative Complications

Complication Type	Laparoscopic Group (n=60)	Open Group (n=60)	p-value
Fever	2 (3.3%)	5 (8.3%)	0.241
Wound Infection	1 (1.7%)	4 (6.7%)	0.171
Hemorrhage	0 (0.0%)	2 (3.3%)	0.154
Reoperation	0 (0.0%)	1 (1.7%)	0.316

Table 5: Fertility Outcomes at 6 Months Follow-up

Parameter	Laparoscopic Group (n=60)	Open Group (n=60)	p-value
Attempted Conception	30 (50.0%)	28 (46.7%)	0.709
Successful Conception	18 (60.0%)	12 (42.9%)	0.173
Menstrual Regularity Restored	53 (88.3%)	48 (80.0%)	0.264

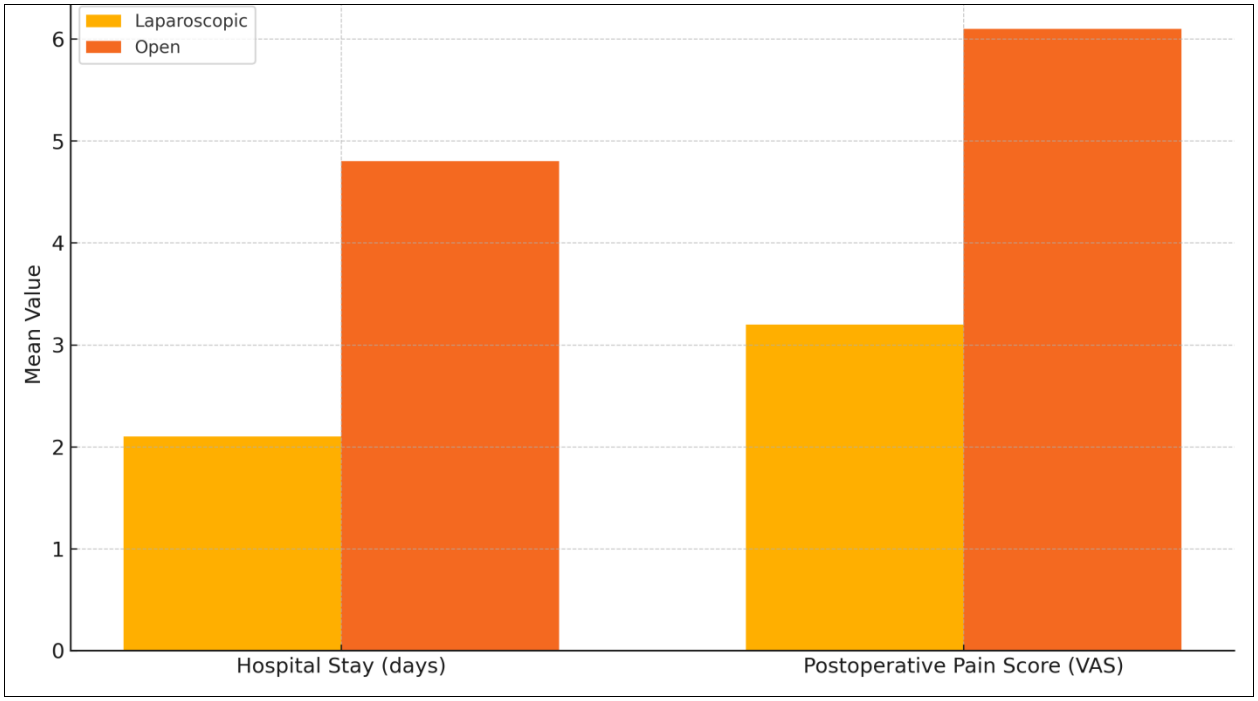

Fig 1: Comparison of recovery parameters

The comparative analysis between laparoscopic and open myomectomy in 120 reproductive-age women revealed statistically significant differences in multiple outcome parameters.

Operative Parameters

Laparoscopic myomectomy had a significantly longer mean operative time (108.2 ± 14.5 minutes) compared to open myomectomy (92.4 ± 12.3 minutes; $p < 0.001$). However, the laparoscopic group demonstrated a significantly reduced mean estimated intraoperative blood loss (134.6 ± 24.1 mL) versus the open group (241.8 ± 30.6 mL; $p < 0.001$). Blood transfusion was required in only 5.0% of laparoscopic cases compared to 16.7% in the open group ($p = 0.041$).

Postoperative Recovery

Patients undergoing laparoscopic surgery had markedly shorter hospital stays (2.1 ± 0.6 days vs 4.8 ± 1.2 days; $p < 0.001$) and reported significantly lower postoperative pain scores on the Visual Analogue Scale (3.2 ± 0.9 vs 6.1 ± 1.1; $p < 0.001$). The time to return to normal activity was also shorter in the laparoscopic group (7.8 ± 2.1 days) versus the open group (13.4 ± 3.2 days; $p < 0.001$).

Complication Rates

Although not statistically significant, the laparoscopic group showed lower frequencies of postoperative fever (3.3% vs 8.3%), wound infection (1.7% vs 6.7%), hemorrhage (0% vs 3.3%), and reoperation (0% vs 1.7%), indicating a trend toward fewer complications.

Fertility Outcomes

At 6-month follow-up, successful conception was achieved in 60.0% of laparoscopic cases versus 42.9% in the open group, though this difference was not statistically significant ($p = 0.173$). Menstrual regularity restoration was higher in the laparoscopic group (88.3% vs 80.0%; $p = 0.264$).

Discussion

The present study aimed to provide a comprehensive comparison of laparoscopic versus open myomectomy outcomes in reproductive-age women. Laparoscopic techniques have emerged as a minimally invasive alternative, demanding rigorous analysis of their efficacy and safety.

Our data revealed that laparoscopic myomectomy resulted in significantly lower mean blood loss (134.6 mL vs 241.8 mL; $p < 0.001$), shorter hospital stay (2.1 days' vs 4.8 days; $p < 0.001$), and reduced pain scores (3.2 vs 6.1 VAS; $p < 0.001$), albeit with longer operative times (108.2 min vs 92.4 min; $p < 0.001$). This aligns with outcomes reported by D'Silva et al., who also found less blood loss and quicker discharge after laparoscopic myomectomy [10]. A meta-analysis by Bhave

Chittawar et al. similarly noted minimized blood loss and hospital stay without increased complications [11]. Mohamed et al. [12] reported 2±1 days of hospitalization for laparoscopic patients versus 3±1 days for open procedures, reinforcing our findings.

In terms of fertility outcomes, although not statistically significant, our laparoscopic group showed higher conception rates (60.0% vs 42.9%; $p = 0.173$). This trend is consistent with retrospective data by Sok et al. [13], indicating comparable pregnancy outcomes between surgical approaches. Meanwhile, Coccia et al. [14] observed similar live birth rates, noting no significant fertility trade-offs with laparoscopy.

Clinical Implications

Our results reinforce laparoscopic myomectomy as a favorable option for women aiming for faster recovery and reduced morbidity. Surgeons proficient in minimally invasive techniques may justifiably prefer laparoscopy for cases involving fibroids ≤10 cm and fewer than five in number, as also suggested by Mohamed *et al*. [12]. The trend towards improved short-term fertility outcomes may further strengthen clinical decision-making in fertility-preserving fibroid surgery.

Conclusion

This prospective comparative study demonstrated that laparoscopic myomectomy offers superior short-term outcomes compared to open myomectomy in reproductive-age women with symptomatic uterine fibroids. Despite a longer operative time, laparoscopic surgery was associated with significantly reduced intraoperative blood loss, lower postoperative pain scores, shorter hospital stays, faster return to normal activity, and a trend toward fewer complications. Fertility outcomes at six-month follow-up were comparable between both groups, with a slight advantage noted in the laparoscopic cohort. These findings support the clinical preference for laparoscopy in appropriately selected patients, especially in centers equipped with skilled surgeons and advanced laparoscopic facilities. Further randomized studies with longer follow-up are necessary to validate long-term reproductive outcomes and recurrence risks.

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Conflicts of Interest

The authors declare no conflicts of interest.

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