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ORIGINAL RESEARCH

Comparative Study of Laparoscopic Versus Open Myomectomy in the Management of Uterine Fibroids

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ABSTRACT

Aim: To compare the intraoperative and postoperative outcomes of laparoscopic versus open myomectomy in the surgical management of symptomatic uterine fibroids. **Material and Methods:** This prospective, comparative study was conducted in the Department of Gynecologic Oncology, IGIMS, Patna, from January 2021 to December 2022. A total of 60 women aged 25–45 years with symptomatic uterine fibroids were enrolled and equally divided into two groups: Group A (n = 30) underwent laparoscopic myomectomy, and Group B (n = 30) underwent open myomectomy. Outcomes assessed included duration of surgery, intraoperative blood loss, blood transfusion requirement, postoperative pain scores, time to ambulation, hospital stay, return to normal activity, and postoperative complications. **Results:** Baseline characteristics were comparable between groups. Laparoscopic myomectomy had a longer operative time (105.40 ± 15.60 min vs. 85.20 ± 12.70 min, $p< 0.001$) but significantly less blood loss (120.50 ± 35.40 ml vs. 210.80 ± 48.30 ml, $p< 0.001$), fewer transfusions (6.67% vs. 26.67%, $p = 0.04$), and lower postoperative pain scores at 6, 24, and 48 hours ($p< 0.001$). Recovery was faster in the laparoscopic group, with shorter hospital stay (2.80 ± 0.90 vs. 5.10 ± 1.20 days, $p< 0.001$), earlier ambulation (12.30 ± 3.50 vs. 22.70 ± 4.80 hours, $p< 0.001$), and quicker return to daily activity (7.50 ± 2.10 vs. 14.20 ± 2.60 days, $p< 0.001$). Overall complications were lower in the laparoscopic group (6.67% vs. 23.33%, $p = 0.07$). **Conclusion:** Laparoscopic myomectomy, though associated with a longer operative duration, results in significantly reduced blood loss, less postoperative pain, faster recovery, and fewer complications compared to open myomectomy. It should be considered the preferred approach for suitable patients with symptomatic uterine fibroids.

Keywords: Laparoscopic myomectomy, Open myomectomy, Uterine fibroids, Minimally invasive surgery

INTRODUCTION

Uterine fibroids, also known as leiomyomas, are the most common benign tumors of the female reproductive system, predominantly affecting women during their reproductive years. These smooth muscle neoplasms of the uterus vary greatly in size, number, and location, leading to a diverse range of clinical manifestations. While many fibroids remain asymptomatic, a significant number of women experience symptoms such as menorrhagia, pelvic pain, pressure symptoms on adjacent organs, and reproductive dysfunction including infertility or recurrent pregnancy loss. With increasing awareness and access to diagnostic modalities such as ultrasound and MRI, the detection rates of fibroids have increased substantially, emphasizing the need for effective and patient-centered therapeutic options.[1,2]

The management of uterine fibroids depends on multiple factors including the severity of symptoms, fibroid characteristics (size, number, and location), patient age, reproductive desires, and overall health status. Medical therapies, including hormonal modulation using GnRH agonists, can offer temporary relief but are often insufficient for long-term management or fertility preservation. Consequently, surgical intervention remains the cornerstone of definitive fibroid treatment. Myomectomy, the surgical excision of fibroids while preserving the uterus, is considered the gold standard in women desiring future fertility or uterine conservation. Traditionally performed via laparotomy (open surgery), myomectomy has evolved with the advancement of minimally invasive surgical techniques, particularly laparoscopy.[3]

Laparoscopic myomectomy, introduced as a less invasive alternative, involves the excision of fibroids using small incisions under the guidance of a laparoscope. This approach is associated with reduced intraoperative blood loss, shorter hospital stays, faster recovery times, and improved cosmetic outcomes.

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However, its adoption is influenced by factors such as surgical expertise, the availability of laparoscopic infrastructure, and the complexity of the fibroid burden. Despite its advantages, concerns persist regarding the longer operative time, higher costs, and potential limitations in managing large, numerous, or deeply embedded fibroids.[4,5]

Comparative studies evaluating the outcomes of laparoscopic versus open myomectomy have shown varying results, making it necessary to investigate these procedures in diverse clinical contexts. While open myomectomy offers superior tactile feedback and allows for easier enucleation of large or numerous fibroids, it is often associated with longer recovery periods, increased postoperative pain, and more conspicuous scarring. In contrast, laparoscopy poses a steep learning curve and may be technically challenging in cases with extensive fibroid load, but it offers enhanced visualization and lower morbidity in experienced hands.[6]

In reproductive medicine, the impact of surgical modality on fertility and pregnancy outcomes is a subject of ongoing research. Several studies have indicated comparable or even favorable outcomes following laparoscopic myomectomy in terms of conception rates, time to pregnancy, and obstetric outcomes. Furthermore, uterine integrity and healing post-myomectomy are crucial for successful gestation, particularly concerning the risk of uterine rupture during future pregnancies. Laparoscopic suturing techniques, use of barbed sutures, and meticulous multilayer closure are essential for ensuring robust myometrial healing.[7]

The choice between laparoscopic and open myomectomy should be individualized, taking into account patient preferences, surgeon proficiency, fibroid characteristics, and institutional capabilities. It is important to consider not only the immediate surgical outcomes but also long-term factors such as recurrence risk, need for reoperation, and reproductive outcomes. Additionally, surgical innovation continues to push boundaries, with approaches like robotic-assisted myomectomy and single-port laparoscopy gaining popularity for offering greater precision, albeit with higher costs.[8,9]

The cosmetic aspect of gynecologic surgery has also garnered attention, especially in younger women. Laparoscopic procedures, including single-port surgery, have been shown to provide superior aesthetic outcomes with minimal visible scarring. These features, combined with shorter hospitalizations and quicker return to normal activity, contribute significantly to patient satisfaction and quality of life.[10]

Furthermore, the broader application of laparoscopic techniques in gynecology, such as laparoscopic hysterectomy and sling surgeries for pelvic organ prolapse or incontinence, demonstrates the versatility and effectiveness of minimally invasive approaches. As surgical experience and technology continue to evolve, the threshold for laparoscopic intervention in complex cases is expected to lower, making it a viable option even for large or multiple fibroids.

MATERIAL AND METHODS

This prospective, comparative study was conducted in the Department of Gynecologic Oncology, Indira Gandhi Institute of Medical Sciences (IGIMS), Patna, over a period of two years from January 2021 to December 2022. The objective was to compare the intraoperative and postoperative outcomes of laparoscopic myomectomy versus open myomectomy in the surgical management of uterine fibroids.A total of 60 female patients diagnosed with symptomatic uterine fibroids and planned for myomectomy were enrolled in the study after obtaining approval from the Institutional Ethics Committee and written informed consent from all participants. The patients were divided into two equal groups:

- **Group A (n = 30):** Patients who underwent laparoscopic myomectomy.
- **Group B (n = 30):** Patients who underwent open abdominal myomectomy.

Inclusion Criteria

- Women aged between 25 and 45 years.
- Symptomatic uterine fibroids confirmed by ultrasound and/or MRI.
- Fibroid size ≤10 cm in diameter or uterine size ≤16 weeks.
- Desire to retain uterus for fertility or personal preference.
- ASA (American Society of Anesthesiologists) physical status class I or II.

Exclusion Criteria

- Fibroid size >10 cm or uterus >16 weeks gestational size.
- Suspected or confirmed malignancy.
- Multiple previous pelvic surgeries or dense pelvic adhesions.
- Severe cardiopulmonary comorbidities precluding laparoscopy.
- Pregnancy.

Methodology

All enrolled patients underwent thorough preoperative evaluation, which included detailed history-taking, general and pelvic clinical examination, and imaging through either transabdominal or transvaginal ultrasonography to confirm the diagnosis and assess the size, number, and location of uterine fibroids. Additionally, routine laboratory investigations such as complete blood count with emphasis on hemoglobin levels, coagulation profile, and assessment of overall fitness for anesthesia were performed to ensure surgical eligibility.

Laparoscopic myomectomy was carried out under general anesthesia using the conventional four-port

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technique. Vasopressin was infiltrated into the myometrium to minimize intraoperative bleeding, followed by a precise uterine incision—either vertical or transverse—through which the fibroids were enucleated. Hemostasis was secured and the uterine defect was meticulously closed in multiple layers using absorbable sutures. The excised fibroids were retrieved via an electromechanical morcellator. In contrast, open myomectomy was performed through a Pfannenstiel or lower midline abdominal incision, depending on uterine size and accessibility. The fibroids were removed in a similar fashion, and the uterus was sutured in multiple layers to restore anatomical integrity.

The outcome measures assessed and compared between the two groups included duration of surgery (measured in minutes), intraoperative blood loss (estimated by quantifying suction volume and blood-soaked gauze), and the need for perioperative blood transfusion. Postoperative parameters included the intensity of pain using the Visual Analogue Scale (VAS), duration of hospital stay (in days), and the time taken for ambulation and return to normal daily activities. Additionally, both intraoperative and postoperative complications such as febrile morbidity, wound infection, or conversion to laparotomy (in the laparoscopic group) were systematically recorded and analyzed.

Statistical Analysis

All data were compiled and analyzed using SPSS software version 25.0. Continuous variables were expressed as mean ± standard deviation and compared using Student's *t*-test. Categorical variables were analyzed using Chi-square or Fisher's exact test. A *p*-value <0.05 was considered statistically significant.

RESULTS

Table 1: Baseline Characteristics

The baseline demographic and clinical characteristics of patients in both groups were statistically comparable. The mean age in the laparoscopic group (Group A) was 34.20 ± 5.10 years, while in the open group (Group B), it was 35.10 ± 4.90 years ($p = 0.42$). The mean fibroid size was slightly smaller in the laparoscopic group (6.80 ± 1.50 cm) compared to the open group (7.00 ± 1.70 cm), but this difference was not statistically significant ($p = 0.61$). Similarly, the body mass index (BMI) of the participants was also comparable between groups (24.60 ± 2.10 kg/m² vs. 25.20 ± 2.50 kg/m², $p = 0.35$). ASA classification distribution (Class I and II) was nearly equal in both groups (18:12 in Group A and 16:14 in Group B; $p = 0.59$), indicating similar preoperative health status. The proportion of nulliparous women was also similar—40.00% in the laparoscopic group and 46.67% in the open group ($p = 0.60$). These findings confirm that both groups were comparable at baseline, eliminating potential selection bias.

Table 2: Intraoperative Parameters

Intraoperative outcomes showed significant advantages for the laparoscopic group in terms of reduced blood loss but at the cost of longer operative time. The mean duration of surgery in the laparoscopic group was significantly longer at 105.40 ± 15.60 minutes, compared to 85.20 ± 12.70 minutes in the open group ($p< 0.001$), likely due to the technical complexity of laparoscopy. However, the mean intraoperative blood loss was substantially lower in Group A (120.50 ± 35.40 ml) than in Group B (210.80 ± 48.30 ml), which was statistically significant ($p< 0.001$). Blood transfusion was required in only 6.67% of laparoscopic cases, compared to 26.67% in open myomectomy cases ($p = 0.04$), indicating better hemostasis in minimally invasive surgery. One case (3.33%) in the laparoscopic group required conversion to open surgery due to intraoperative complications. These results demonstrate the hemodynamic advantages of laparoscopy, despite the longer surgical duration.

Table 3: Postoperative Pain (VAS Score)

Postoperative pain scores were consistently lower in the laparoscopic group at all measured time intervals. At 6 hours post-surgery, the mean VAS score in Group A was 4.30 ± 1.10, significantly lower than 6.80 ± 1.30 in Group B ($p< 0.001$). This difference persisted at 24 hours (2.80 ± 0.90 vs. 5.20 ± 1.10; $p< 0.001$) and 48 hours (1.50 ± 0.70 vs. 3.90 ± 0.80; $p< 0.001$), clearly indicating that patients undergoing laparoscopic myomectomy experienced less postoperative pain and thus required less analgesic support. These findings highlight a key benefit of minimally invasive approaches in improving early postoperative comfort.

Table 4: Recovery Parameters

Recovery-related parameters favored laparoscopic myomectomy with statistically significant differences across all measured outcomes. The mean hospital stay for patients in the laparoscopic group was significantly shorter at 2.80 ± 0.90 days, compared to 5.10 ± 1.20 days in the open group ($p< 0.001$). Similarly, the time to ambulation was faster in the laparoscopic group (12.30 ± 3.50 hours) than in the open group (22.70 ± 4.80 hours, $p< 0.001$), facilitating early mobilization and discharge. Return to normal activity was also significantly earlier in laparoscopic patients, averaging 7.50 ± 2.10 days versus 14.20 ± 2.60 days in open surgery patients ($p< 0.001$). These findings clearly demonstrate the accelerated postoperative recovery associated with laparoscopic surgery.

Table 5: Postoperative Complications

Although not all differences reached statistical significance, postoperative complications were generally less frequent in the laparoscopic group. Febrile morbidity occurred in 3.33% of patients in

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Group A compared to 13.33% in Group B (p = 0.16), while wound infections were observed only in the open group (10.00%) and not in any laparoscopic case (p = 0.07). Ileus or delayed bowel recovery was slightly more common in the open group (6.67%) than in the laparoscopic group (3.33%), though this difference was not significant (p = 0.55). The overall complication rate was 6.67% in Group A and 23.33% in Group B (p = 0.07), suggesting a trend toward fewer complications in laparoscopic procedures. While not statistically conclusive, these trends reinforce the safety and minimally invasive nature of laparoscopy.

Table 1: Baseline Characteristics of the Study Population (n = 60)

Characteristic	Group A (Laparoscopic)	Group B (Open)	*p*-value
Mean Age (years)	34.20 ± 5.10	35.10 ± 4.90	0.42
Mean Fibroid Size (cm)	6.80 ± 1.50	7.00 ± 1.70	0.61
Mean BMI (kg/m²)	24.60 ± 2.10	25.20 ± 2.50	0.35
ASA Class I : II (n)	18 : 12	16 : 14	0.59
Nulliparous (%)	12 (40.00%)	14 (46.67%)	0.60

Table 2: Intraoperative Parameters

Parameter	Group A (Laparoscopic)	Group B (Open)	*p*-value
Mean Duration of Surgery (min)	105.40 ± 15.60	85.20 ± 12.70	<0.001
Mean Blood Loss (ml)	120.50 ± 35.40	210.80 ± 48.30	<0.001
Blood Transfusion Required (%)	2 (6.67%)	8 (26.67%)	0.04
Conversion to Laparotomy	1 (3.33%)	—	—

Table 3: Postoperative Pain (VAS Score)

Time Point	Group A (Laparoscopic)	Group B (Open)	*p*-value
At 6 hours	4.30 ± 1.10	6.80 ± 1.30	<0.001
At 24 hours	2.80 ± 0.90	5.20 ± 1.10	<0.001
At 48 hours	1.50 ± 0.70	3.90 ± 0.80	<0.001

Table 4: Recovery Parameters

Parameter	Group A (Laparoscopic)	Group B (Open)	*p*-value
Mean Hospital Stay (days)	2.80 ± 0.90	5.10 ± 1.20	<0.001
Time to Ambulation (hours)	12.30 ± 3.50	22.70 ± 4.80	<0.001
Time to Normal Activity (days)	7.50 ± 2.10	14.20 ± 2.60	<0.001

Table 5: Postoperative Complications

Complication	Group A (n = 30)	Group B (n = 30)	*p*-value
Febrile Morbidity	1 (3.33%)	4 (13.33%)	0.16
Wound Infection	0 (0.00%)	3 (10.00%)	0.07
Ileus or Delayed Bowel Recovery	1 (3.33%)	2 (6.67%)	0.55
Overall Complication Rate	2 (6.67%)	7 (23.33%)	0.07

DISCUSSION

The baseline characteristics between the laparoscopic and open myomectomy groups in this study were well matched, showing no significant differences in age, BMI, fibroid size, ASA classification, or parity. This homogeneity ensured that intraoperative and postoperative outcomes could be reliably compared without demographic bias. Similar baseline comparability was observed in the study by Yılmaz et al., 2023, where age, fibroid characteristics, and comorbidities did not differ significantly between the laparoscopic and laparotomic cohorts. These uniformities across studies strengthen the validity of outcome-based comparisons between surgical approaches.[11]

Intraoperative parameters revealed a longer mean surgical time for the laparoscopic group (105.40 ± 15.60 min) compared to the open group (85.20 ± 12.70 min), which is consistent with earlier findings. For example, Flyckt et al., 2017 noted that laparoscopic myomectomy typically demands more time due to the technical intricacies of minimal access surgery.[12] Despite this, the laparoscopic group in our study experienced significantly less intraoperative blood loss (120.50 ± 35.40 ml vs. 210.80 ± 48.30 ml), a benefit also emphasized by Bean et al., 2017, who attributed reduced blood loss to enhanced visualization and vessel-sealing capabilities during laparoscopy.[13] Furthermore, only 6.67% of patients in the laparoscopic group required blood transfusions compared to 26.67% in the open group. This is in line with data from Morales et al., 2022, who reported a similar reduction in transfusion requirements with minimally invasive myomectomy techniques.[14] The

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need for conversion to laparotomy in 3.33% of laparoscopic cases in our study is acceptable and mirrors the conversion rates reported by Ünal and Karadeniz, 2023, especially in cases with dense adhesions or intraoperative hemorrhage.[15]

The assessment of postoperative pain showed significantly lower VAS scores in the laparoscopic group at all measured time points. At 6 hours, the score was 4.30 ± 1.10 vs. 6.80 ± 1.30 in the open group, and this pattern persisted at 24 and 48 hours. This finding reinforces evidence from Marín-Buck et al., 2021, who emphasized that reduced tissue trauma and smaller incisions in laparoscopic surgery lead to lower postoperative pain and faster weaning from analgesics.[16] Similarly, Carranza-Mamane et al., 2015 reported improved patient comfort and satisfaction following laparoscopic procedures for reproductive tract surgeries.[17]

Recovery parameters clearly favored laparoscopic myomectomy, with significantly shorter hospital stays (2.80 ± 0.90 vs. 5.10 ± 1.20 days), faster ambulation (12.30 ± 3.50 vs. 22.70 ± 4.80 hours), and earlier return to normal activity (7.50 ± 2.10 vs. 14.20 ± 2.60 days). These trends align with the conclusions of Tian et al., 2015, who found that quicker recovery times associated with laparoscopy translated into earlier resumption of work and daily responsibilities, which is especially important for women in reproductive and working age groups.[18] Valenti et al., 2019 also highlighted that minimally invasive surgery improves postoperative mobility and reduces indirect healthcare burdens by facilitating early discharge and functional recovery.[19]

Postoperative complications were lower in the laparoscopic group, with overall complications reported at 6.67% versus 23.33% in the open group. Although this difference was not statistically significant ($p = 0.07$), it is clinically meaningful and supported by prior literature. Bojahr et al., 2015 noted lower febrile morbidity and infection rates in laparoscopic gynecologic surgeries due to reduced exposure of internal organs and shorter incision lengths.[20] The absence of wound infections in the laparoscopic group in our study supports findings by Vitale et al., 2016, who emphasized the importance of precise trocar placement and minimal access strategies in reducing postoperative morbidity.[21] The trend toward fewer ileus and wound complications further corroborates the superior safety profile of laparoscopy as observed in multiple reviews including that by Flyckt et al., 2017.[12]

CONCLUSION

This comparative study demonstrated that laparoscopic myomectomy offers significant advantages over open myomectomy in terms of reduced intraoperative blood loss, lower postoperative pain scores, shorter hospital stay, quicker ambulation, and faster return to normal activities. Although laparoscopic procedures had a longer operative time, they were associated with fewer postoperative complications. These findings support the adoption of laparoscopic myomectomy as a safer and more effective surgical approach for appropriately selected patients with symptomatic uterine fibroids.

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