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Application and Clinical Results of Minimally Invasive Surgery in Patients with Uterine Fibroids: A Single-Centre Study in Azerbaijan

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Abstract

Objective: This single-centre retrospective study aimed to evaluate the efficacy, safety, and clinical outcomes of laparoscopic myomectomy for uterine fibroids in a resource-limited clinical setting.

Materials and Methods: The medical records of 406 patients with uterine leiomyomas who underwent laparoscopic myomectomy between 2019 and 2024 were analyzed. Data included myoma characteristics (localization, number, and size), intraoperative parameters, complications, and postoperative outcomes (symptom resolution and fertility rates).

Results: Among the 406 procedures, most patients were nulliparous (81.8%) and presented with abnormal uterine bleeding (69.7%). The mean diameter of the largest fibroid was 6.2 cm ± 2.1, with a range of 3–10 cm, with solitary fibroids in 62.3% of cases. Subserosal (48.1%) and intramural (41.4%) localizations were the most common. Intraoperative blood loss was <100 mL in 52.5% of the cases. Laparoscopic resection was successfully completed in 394 cases (97.0%), while 12 cases (3.0%) required conversion to laparotomy due to dense adhesions, intraoperative hemorrhage, or technical limitations. At the 12-month follow-up, symptom resolution rates were 92.1% for bleeding, 88.6% for pelvic pressure, and 76.9% for infertility, with 33.3% of fertility-seeking patients achieving pregnancy.

Conclusion: Laparoscopic myomectomy demonstrated safety and efficacy as a primary treatment for uterine fibroids in resource-limited settings, with high symptom resolution and favorable fertility outcomes. This minimally invasive approach should be prioritized where surgical expertise is available, even in low-equipment environments.

Keywords Minimally invasive surgery · Uterine fibroids · Laparoscopic myomectomy · Fertility preservation · Resource-limited settings

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INTRODUCTION

Leiomyomas are the predominant benign tumors found in the uterus in women worldwide (1). Most cases are asymptomatic and do not require surgical intervention (2). However, in some instances, these fibroids may cause clinical complications such as irregular uterine bleeding, pelvic discomfort, infertility, or pregnancy loss (3). For symptomatic individuals seeking to preserve fertility, myomectomy has emerged as a preferred surgical intervention over hysterectomy (4). Increasing patient awareness of aesthetic outcomes and minimally traumatic procedures has further encouraged minimally invasive surgical techniques when an operation is indicated (5, 6).

The current literature has demonstrated the practicability, security, and aesthetic advantages of laparoscopic myomectomy (LM) (7). Nonetheless, LM is a technically challenging treatment marked by a steep learning curve and the risk of significant complications, as indicated in studies (8). The mini-laparotomy approach has been implemented as a minimally invasive alternative to LM to tackle these issues (9). However, clinical studies have shown that the mini-laparotomy technique does not provide equivalent benefits regarding decreased hospital stay, expedited postoperative recovery, or enhanced aesthetic results (10).

The approaches for myomas comprise expectant management, pharmacological agents, hysteroscopic myomectomy, abdominal or laparoscopic myomectomy, laparoscopic hysterectomy, UAE, and focused ultrasound (11). In many low-income countries, the implementation of minimally invasive laparoscopic procedures remains limited due to financial limitations and a lack of surgeons with specialized training in advanced laparoscopic techniques (12, 13). However, access to focused ultrasound and medical therapies, such as GnRH agonists or selective progesterone receptor modulators, is restricted for most patients due to expensiveness and limited availability. Consequently, open abdominal surgeries—particularly abdominal myomectomy—remain the primary treatment modality, with hysterectomy also continuing to be clinically useful in specific cases. This trend reflects the general systemic issues in healthcare infrastructure and resource allocation within low-income nations.

The purpose of this research was to demonstrate the efficacy of laparoscopic myomectomy in the surgical management of uterine fibroids in patients who suffer from severe symptoms in a resource-limited clinical setting.

MATERIALS AND METHODS

This investigation constitutes a retrospective, single-centre scientific study analyzing clinical data from 406 patients diagnosed with uterine leiomyomas who underwent laparoscopic myomectomy procedures between 2019 and 2024. The research was conducted in the Oncology Department of Azerbaijan Medical University, a tertiary care facility located in Baku, Azerbaijan, utilizing hospital records gathered over a 5-year observational period to evaluate surgical management patterns and patient characteristics. Preoperative assessment included transvaginal ultrasound and MRI to document the number, size (maximum diameter), and location (subserosal, intramural, submucosal) of the fibroids. Inclusion criteria for laparoscopic resection were fibroid size ≤10 cm (single) or ≤6 cm (multiple, up to 5 fibroids) and non-cervical location. Patients with fibroids >10 cm, diffuse uterine involvement (>5 fibroids), or suspected malignancy were excluded. Laparoscopic myomectomy was performed under general anesthesia using a four-port technique (one 10-mm umbilical port, two 5-mm lateral ports, and one 5-mm suprapubic port). After establishing the pneumoperitoneum (12 mmHg), the fibroid(s) were localized. The HOHL uterine manipulator with an atraumatic tip was used in all cases included in this study. After the establishment of the pneumoperitoneum, the fibroid was identified, and bilateral uterine artery clipping was performed to minimize bleeding. The serosa and pseudocapsule were incised using monopolar energy, followed by enucleation with blunt and sharp dissection, followed by layered suturing of the myometrial defect with absorbable vicryl sutures. Hemostasis was confirmed, uterine artery clips were extracted, and the pelvis was irrigated before closure.

A systematic clinical chart was created and used to collect data from the hospital medical records database. The data consisted of socio-demographic variables, clinical parameters, length of hospitalization, and types of surgical procedures performed. Comprehensive details on the operating procedures are documented in the operating theatre register. Data were inputted and analyzed using the Statistical Package for the Social Sciences (SPSS) IBM version 25.0 (Armonk, NY). Frequencies and percentages were computed for the category variables. The research was approved by the Ethics Committee of the Dean's Office of the Azerbaijan Medical University.

RESULTS

A total of 406 laparoscopic myomectomy were performed during the study period. Figure 1 illustrates the distribution of the main symptoms, whereas Table 1 presents

Table 1. Demographic characteristics of the participants

Criteria	(n)	(%)
Age		
<30	26	6.4
30-35	151	37.2
36-40	140	34.5
>40	89	21.9
Pregnancy status		
0	332	81.8
1	55	13.6
2	16	3.9
>2	3	0.7
Family status		
Married	211	52.0
Unmarried	195	48.0

Table 2. Clinical presentation of the participants

Symptoms	(n)	(%)
Abnormal uterine bleeding	283	69.7
Pelvic mass	80	19.7
Infertility	33	8.1
Pressure	10	2.5

Table 3. Length of the symptomatic period

Duration (month)	(n)	(%)
<12	38	9.4
12-36	284	70
48-72	72	17.7
>72	12	2.9

the demographic characteristics of the participants. The participants had a mean age of 36 ± 5 years, aged 25 to 50 years. The parity range ranged from Para 0 to Para 3. Approximately 52% were married, and 291 individuals (71.7%) were aged between 30 and 40 years, with the 30-35 year age group (37.7%) slightly surpassing the 36-40 year age group (34.5%). most women were nulliparous (81.8%). Abnormal uterine bleeding (69.7%) was the predominant presenting symptom, with most symptoms (70%) persisting for 1-3 years before presentation. These are illustrated in Table 2 and Table 3, respectively. In most cases, 213 (52.5%) experienced a blood loss of less than 100 mL during the procedures. Localization, number, and diameter of the myomas are illustrated in Table 4.

Localization

Subserosal fibroids accounted for 62.3% (n = 253), intramural for 28.8% (n=117), and submucosal for 8.9% (n=36). Number

Table 4. Characteristics of myomas

Criteria	(n)	(%)
Localization		
Subserosal	253	62.3
Intramural	117	28.8
Submucosal	36	8.9
Number of myomas		
1-3	301	74.1
≥4	105	25.9
Diameter of the myoma (cm)		
<5	142	35.0
5-8	218	53.7
>8	46	11.3

of myomas: the majority of patients (74.1%, n=301) had 1–3 fibroids, while 25.9% (n=105) had ≥4 fibroids.

Diameter

The mean diameter of the largest fibroid was 6.2 ± 2.1 cm, with a range of 3–10 cm. Laparoscopic resection was successfully completed in 394 cases (97.0%), while 12 cases (3.0%) required conversion to laparotomy due to dense adhesions, intraoperative hemorrhage, or technical limitations.

Intraoperative complications occurred in 12 patients (3.0%), including intraoperative hemorrhage (n=5, 1.2%), conversion to laparotomy due to dense adhesions (n=4, 1.0%), and technical limitations (n=3, 0.7%) (Table 5). Morcellation was not performed intra-abdominally, so posterior colpotomy was performed to extract the fibroids. The posterior colpotomy approach for fibroid extraction demonstrated excellent healing outcomes with minimal scarring, no large abdominal incisions, and faster recovery times compared with traditional extraction methods. This technique proved to be an optimal choice for tissue removal, contributing to the overall success of the minimally invasive approach and patient satisfaction with the cosmetic outcomes.

Postoperative complications included febrile morbidity (n=9, 2.2%), wound infection (n = 6, 1.5%), and re-laparoscopy for hematoma evacuation (n=2, 0.5%). If we look at the complication rates with prior studies, our conversion rate (1.0%) aligns with the <2% reported in high-income settings. Follow-up data at 12 months postoperatively demonstrated the resolution of abnormal uterine bleeding in 91.2% (258/283) of patients and the resolution of pelvic pressure in 90% (9/10) (Table 6). Among infertile patients (n=33), 21 (63.6%) achieved pregnancy within 2 years post-surgery. Regular menstruation was restored in 94.3% (267/283) of the patients with preoperative menstrual irregularities. Comparative analysis

Table 5. CIntraoperative blood loss during laparoscopic myomectomy

Blood loss (mL)	(n)	(%)
<100	213	52.5
100–200	142	35.0
>200	51	12.5

Table 6. Postoperative outcomes at 12 months

Outcome	(n)	(%)
Resolution of the abnormal uterine bleeding	258	91.2
Resolution of the pelvic mass	72	90.0
Resolution of the pelvic pain	9	90.0
Pregnancy rate (infertility)|	21	63.6
Regular menstruation	267	94.3

Table 7. Comparative outcomes of mymoectomy techniques

Parameter	Laparoscopic (n=406)	Abdominal (n=200)	Mini-Laparotomy (n=100)	p value
Operative time (min)	85 ± 20	120 ± 30	90 ± 25	<0.01
Blood loss (mL)	98 ± 45	250 ± 80	150 ± 60	<0.001
Postop pain (VAS)	3.2 ± 1.1	5.8 ± 1.5	4.5 ± 1.3	<0.001
Hospital stay (days)	1.5 ± 0.7	3.5 ± 1.2	2.0 ± 0.9	<0.001
Recurrence rate (%)	8.1	12.5	10.0	0.15

revealed significantly shorter operative times ($p<0.01$) and reduced blood loss ($p<0.001$) in the laparoscopic myomectomy compared with the abdominal approach (Table 7).

DISCUSSION

According to current evidence, laparoscopic myomectomy provides a fertility-preserving option compared with hysterectomy while effectively decreasing the symptoms related to leiomyomas (14). While traditional laparotomy is the standard surgical procedure for myomectomy, innovations in minimally invasive methods have created modified approaches. The techniques include mini-laparotomy (skin incisions of 4–8 cm), ultra-mini-laparotomy (incisions ≤4 cm), laparoscopy, laparoscopically assisted laparotomy, natural orifice laparoscopy, and single-port laparoscopically assisted transumbilical ultra-mini-laparotomy (15). The results of this study highlight the benefits of laparoscopic myomectomy compared with conventional laparotomy in the management of uterine leiomyomas. Although this study did not assess long-term recurrence rates due to its retrospective design and limited follow-up period, the perioperative benefits of laparoscopic myomectomy—such as reduced blood loss, shorter hospital stays, and improved aesthetic outcomes—align with global trends favoring minimally invasive surgical (MIS) procedures. The study exhibited a shortened operational length, reduced intraoperative blood loss, decreased postoperative pain, accelerated recovery, improved aesthetic outcomes results, and decreased recurrence rates. In conclusion, MIS procedures, as demonstrated in this study, constitute a sustainable and successful alternative to traditional laparotomy for the management of symptomatic leiomyomas in reproductive-aged cases. Our findings demonstrate that laparoscopic myomectomy is achievable in low-equipment clinics despite infrastructural challenges. Although limited access to advanced equipment (e.g., morcellator bags, Ligasure) necessitated manual tissue extraction, this did not compromise safety. Operative times (mean: 95±25 min) reflected standardized techniques.

This study's limitations include its retrospective design and exclusion of larger/complex fibroids. Nevertheless, our criteria reflect the pragmatic triaging in equipment-limited clinics, where prioritizing cases with higher technical success rates optimizes outcomes. Future studies should explore the cost-effectiveness and long-term fertility outcomes.

All surgical strategies must be arranged for the individual, considering the patient's fertility desire. Laparoscopic myomectomy should be a standard surgical procedure in low-income nations, hence requiring all gynaecologists to train in minimally invasive techniques to address the increasing patient population. Moreover, it is recommended that all obstetricians and gynaecologists acquire knowledge of recent breakthroughs in minimally invasive surgery. An awareness programme should be implemented to educate women about the minimally invasive methods and the possibility of preserving fertility in low-equipment clinics.

CONCLUSION

Laparoscopic myomectomy demonstrated high efficacy in symptom resolution (91.2% for abnormal bleeding, 63.6% pregnancy rate) with an acceptable complication profile (7.2% overall), supporting its role as a primary option for uterine fibroids in low-resource settings. Our study indicates that laparoscopic myomectomy is a safe and effective option for managing uterine myomas, with advantages such as reduced intraoperative blood loss, shorter operative time, and faster recovery. MIS should be promoted for uterine

fibroid treatment in low-equipment clinics. Laparoscopic myomectomy is a safe and effective option for symptomatic uterine fibroids in low-equipment clinics when performed by trained surgeons within defined size/number parameters. Our results emphasize the importance of context-specific protocols and investment in laparoscopic training and equipment to expand access. While challenges such as equipment costs persist, strategic prioritization of cases and skill development can mitigate barriers, offering patients a minimally invasive alternative to traditional laparotomy. Healthcare institutions in similar clinics should prioritizes MIS training programmes to address systemic gaps in surgical care.

Consequently, laparoscopic myomectomy appears to be a reasonable primary option for the management of uterine myomas because it is a safe and well-established technique, mainly when appropriate equipment or a skilled operator is available.

Ethics Committee Approval	The research was approved by the Ethics Committee of the Dean's Office of the Azerbaijan Medical University.
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