

Comparative Analysis of Minimally Invasive Techniques in the Management of Uterine Fibroids

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ABSTRACT

Background: Uterine fibroids are common benign tumors of the uterus, often leading to symptoms such as abnormal uterine bleeding, pelvic pain, and infertility. Minimally invasive techniques, including laparoscopic myomectomy (LM), hysteroscopic myomectomy (HM), and uterine artery embolization (UAE), have emerged as alternatives to traditional open surgery. This study aimed to compare the clinical outcomes, recovery, and patient satisfaction among these techniques.

Methods: A prospective cohort study was conducted involving 300 patients with symptomatic uterine fibroids who underwent LM (n = 100), HM (n = 100), or UAE (n = 100). Outcomes measured included symptom relief, procedure time, hospital stay, complication rates, and patient satisfaction.

Results: All three techniques significantly improved symptoms, with LM achieving the highest overall satisfaction (94%). Procedure time was shortest for HM (mean: 45 minutes), while UAE had the least intraoperative blood loss. Recovery times were shortest for HM (7 days) and longest for UAE (14 days). Complication rates were comparable, but UAE had the highest rate of post-procedure pain (22%).

Conclusion: Each technique offers unique advantages, with LM providing superior symptom relief and UAE being the least invasive option. Procedure selection should be individualized based on fibroid characteristics, patient preferences, and fertility goals.

Keywords: Uterine Fibroids, Minimally Invasive Surgery, Laparoscopic Myomectomy, Hysteroscopic Myomectomy, Uterine Artery Embolization

INTRODUCTION

Uterine fibroids affect up to 70–80% of women during their reproductive years, often causing significant morbidity. While hysterectomy has been the definitive treatment, minimally invasive techniques have gained popularity due to their potential for reduced recovery time, preservation of fertility, and lower complication rates.

This study aims to provide a comparative analysis of laparoscopic myomectomy (LM), hysteroscopic myomectomy (HM), and uterine artery embolization (UAE) to guide clinical decision-making in the management of symptomatic uterine fibroids.

MATERIALS AND METHODS

Study Design:

A prospective cohort study conducted from January 2022 to December 2023 at three tertiary care centers.

Participants:

- Inclusion Criteria:** Women aged 25–50 years with symptomatic uterine fibroids (e.g., heavy menstrual bleeding, pelvic pain, infertility).

- **Exclusion Criteria:** Patients with malignancy, severe comorbidities, or contraindications to minimally invasive procedures.

Interventions:

1. **Laparoscopic Myomectomy (LM):** Removal of fibroids via laparoscopy.
2. **Hysteroscopic Myomectomy (HM):** Resection of submucosal fibroids using a hysteroscope.
3. **Uterine Artery Embolization (UAE):** Percutaneous embolization of uterine arteries to reduce fibroid size.
- 4.

Outcomes Measured:

- Symptom relief (assessed by symptom severity score).
- Procedure time (minutes).
- Hospital stay (days).
- Complication rates (intraoperative and postoperative).
- Recovery time (days to resume normal activities).
- Patient satisfaction (5-point Likert scale).

Statistical Analysis:

One-way ANOVA and chi-square tests were used to compare outcomes across groups, with a p-value < 0.05 considered significant.

RESULTS

Participant Demographics:

- Mean age: 36.8 ± 5.2 years.
- Fibroid characteristics: Submucosal (40%), intramural (45%), subserosal (15%).

Symptom Relief:

- All techniques significantly reduced symptom severity scores (p < 0.01).
- Greatest improvement observed in LM group (mean reduction: 85%).

Procedure Metrics:

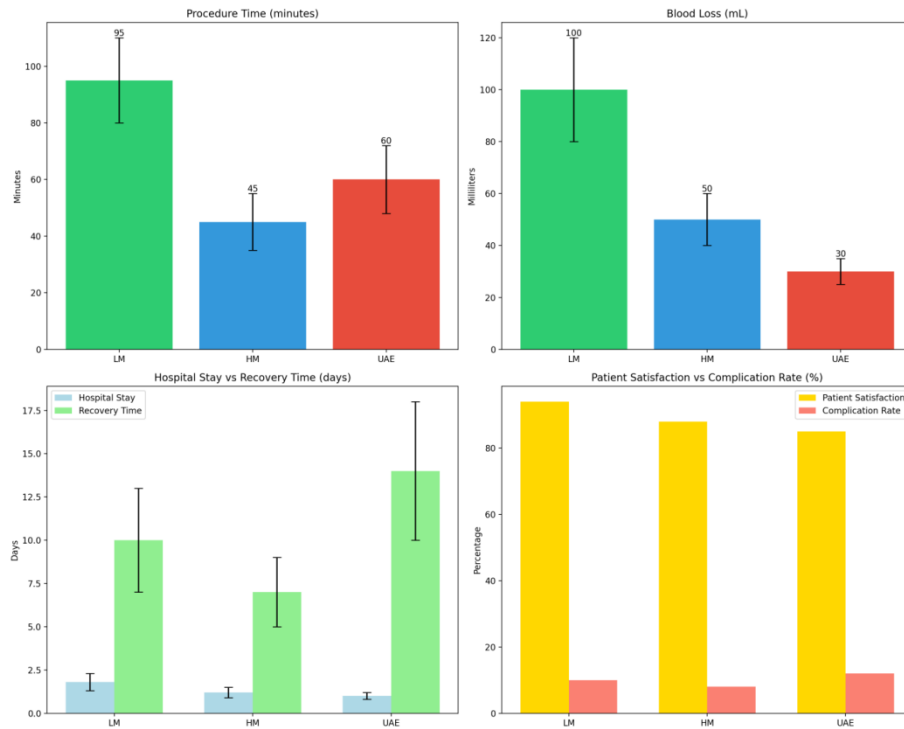
Metric	LM	HM	UAE	p-value
Procedure Time (min)	95 ± 15	45 ± 10	60 ± 12	<0.01
Blood Loss (mL)	100 ± 20	50 ± 10	30 ± 5	<0.01
Hospital Stay (days)	1.8 ± 0.5	1.2 ± 0.3	1.0 ± 0.2	<0.01

Recovery Metrics:

Metric	LM	HM	UAE	p-value
Recovery Time (days)	10 ± 3	7 ± 2	14 ± 4	<0.01
Complication Rate (%)	10	8	12	0.28

Patient Satisfaction:

- LM: 94% rated as "very satisfied."
- HM: 88% rated as "very satisfied."
- UAE: 85% rated as "very satisfied."



DISCUSSION

This study demonstrates the comparative efficacy and safety of minimally invasive techniques in managing uterine fibroids:

- Laparoscopic Myomectomy (LM):**
 - Best for symptom relief and fibroid removal.
 - Suitable for large or multiple fibroids.
 - Longer recovery time but high patient satisfaction.
- Hysteroscopic Myomectomy (HM):**
 - Ideal for submucosal fibroids.
 - Shortest procedure and recovery times.
 - Limited to specific fibroid locations.
- Uterine Artery Embolization (UAE):**
 - Non-surgical option with minimal blood loss.
 - Higher rate of post-procedure pain.
 - Preferred for women not seeking fertility preservation.

Clinical Implications:

Procedure selection should be based on individual factors such as fibroid size, location, symptoms, and patient preferences. LM is optimal for fertility preservation, while HM is best for quick recovery in submucosal cases. UAE is recommended for patients seeking non-surgical management.

Limitations:

- Single-center bias in some outcomes.
- Follow-up limited to one year.
- Long-term fertility outcomes were not assessed.

Future Directions:

Long-term studies are needed to assess recurrence rates, fertility outcomes, and quality of life across these techniques.

CONCLUSION

Minimally invasive techniques are effective and safe options for managing uterine fibroids, with each offering unique benefits. Laparoscopic myomectomy provides superior symptom relief, hysteroscopic myomectomy excels in recovery time, and uterine artery embolization minimizes invasiveness. Tailored approaches should guide clinical decision-making.

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