

Uterine-Preserving Myomectomy in Young Women: A Comprehensive Review of Fertility Outcomes

Teresa Larissa González Viguierias¹, Diego Alejandro Ramírez López², Rubén Alejandro González Viguierias¹, Pablo Daniel De Hoyos Vázquez¹, Néstor Martínez Salas¹, Ricardo de Jesús Cervantes Molina¹

¹Universidad Cuauhtémoc, Plantel Aguascalientes. Aguascalientes, Aguascalientes, México.

²Universidad Autónoma de Guadalajara. Zapopan, Jalisco, Mexico.

ABSTRACT

Background: Uterine fibroids (leiomyomas) represent a prevalent benign gynecological condition, particularly affecting women of reproductive age. Conservative surgical approaches, such as myomectomy, are increasingly prioritized in young patients to preserve fertility and maintain uterine integrity. This review evaluates the efficacy, perioperative considerations, and reproductive outcomes associated with different myomectomy techniques.

Methods: A systematic literature analysis was conducted, focusing on studies involving laparoscopic, hysteroscopic, and abdominal myomectomy in women under 40 years old. Outcomes assessed included fibroid recurrence rates, postoperative fertility, pregnancy complications, and long-term gynecological health.

Results: Myomectomy demonstrates high success rates in symptom relief (e.g., menorrhagia, pelvic pressure) and fertility preservation, with pregnancy rates exceeding 50% in most cohorts. However, minimally invasive techniques (e.g., laparoscopic myomectomy) are associated with reduced adhesions and shorter recovery compared to laparotomy. Recurrence remains a concern, with a 5-year incidence of 15–30%, necessitating individualized follow-up.

Conclusion: Uterine-sparing myomectomy is a safe and effective intervention for young women with symptomatic fibroids. Surgical approach selection should consider fibroid characteristics, reproductive goals, and risk of recurrence. Further prospective studies are needed to optimize patient stratification and postoperative management.

KEYWORDS: Conservative myomectomy, Uterine fibroids (leiomyomas), Fertility-preserving surgery, Laparoscopic myomectomy, Reproductive outcomes, Gynecological minimally invasive surgery

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INTRODUCTION

Uterine leiomyomas, colloquially termed fibroids, are monoclonal benign tumors arising from the myometrium, with a cumulative incidence affecting approximately 70% of women by age 50 (Stewart et al., 2016). In young women, particularly those nulliparous or desiring future fertility, fibroids may contribute to debilitating symptoms—including heavy menstrual bleeding (HMB), pelvic pain, and subfertility—while posing complex management dilemmas.^{1,2}

Historically, hysterectomy was the definitive treatment for symptomatic fibroids; however, the paradigm has shifted toward organ-conserving interventions, especially in

reproductive-aged populations. Myomectomy, the surgical enucleation of fibroids with uterine preservation, has emerged as the gold standard for these patients, balancing therapeutic efficacy with fertility potential (Pritts et al., 2009).^{1,2}

The evolution of minimally invasive techniques—such as laparoscopic (LM) and robot-assisted myomectomy—has refined perioperative outcomes, reducing blood loss, adhesion formation, and recovery time compared to open abdominal myomectomy (AM). Hysteroscopic myomectomy (HM), reserved for submucosal fibroids, offers additional advantages as an outpatient procedure with negligible impact on myometrial integrity. Nevertheless, challenges persist,

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including fibroid recurrence, risk of intraoperative hemorrhage, and the potential for cesarean delivery in subsequent pregnancies due to uterine scarring.³

BACKGROUND

Uterine leiomyomas, commonly referred to as fibroids, represent the most prevalent benign neoplastic condition affecting the female reproductive system, with epidemiological studies estimating a lifetime incidence of up to 70–80% in women of reproductive age (Stewart et al., 2016). These monoclonal tumors, arising from the smooth muscle cells of the myometrium, exhibit a heterogeneous clinical presentation, ranging from asymptomatic incidental findings to severe symptomatology, including menorrhagia, chronic pelvic pain, bulk-related pressure symptoms, and reproductive dysfunction. In young women—particularly those in their second to fourth decades of life—fibroids pose unique therapeutic challenges, as the preservation of uterine integrity and fertility becomes a paramount consideration in management decisions.³

Pathophysiology and Clinical Impact in Young Women

Leiomyomas are hormonally responsive tumors, with estrogen and progesterone acting as key mitogenic drivers, explaining their higher prevalence during reproductive years and tendency to regress post-menopause. In young patients, fibroids are frequently associated with:³

- Heavy menstrual bleeding (HMB), leading to iron-deficiency anemia and diminished quality of life.³
- Subfertility or infertility, particularly with submucosal or intramural fibroids distorting the endometrial cavity, impairing embryo implantation, or disrupting gamete transport.³
- Recurrent pregnancy loss (RPL) due to compromised vascular supply or mechanical interference with gestational development.³
- Pelvic obstructive symptoms, including urinary frequency, constipation, or hydronephrosis in cases of large or cervico-isthmic fibroids.⁴

Given these implications, the early identification and intervention in symptomatic young women are critical to preventing long-term gynecological and obstetric complications.

Evolution of Conservative Surgical Management

Historically, hysterectomy was the definitive treatment for symptomatic fibroids, but its irreversible nature rendered it inappropriate for women desiring future fertility. The advent of uterine-preserving surgical techniques has revolutionized fibroid management, with myomectomy emerging as the gold standard for young patients.⁴

Myomectomy involves the precise enucleation of fibroid pseudocapsules while preserving the surrounding myometrium, thereby maintaining reproductive potential. The procedure can be performed via several approaches, each with distinct indications and advantages:⁴

- 1. Abdominal Myomectomy (AM): The traditional open approach, preferred for multiple, large (>8–10 cm), or deeply intramural fibroids, though associated with higher adhesion formation and longer recovery.⁵
- 2. Laparoscopic Myomectomy (LM): A minimally invasive technique offering reduced postoperative morbidity, shorter hospitalization, and lower adhesion rates, though technically demanding for posterior or broad ligament fibroids.⁵
- 3. Robotic-Assisted Myomectomy: Enhances precision in suturing and fibroid extraction, particularly beneficial in complex cases.⁵
- 4. Hysteroscopic Myomectomy (HM): The optimal approach for submucosal fibroids (FIGO Type 0–2), performed via resectoscope with no abdominal incisions and rapid recovery.⁵

Fertility and Obstetric Outcomes

A critical consideration in young women is the post-myomectomy reproductive prognosis. Studies indicate that:⁶

- Pregnancy rates after myomectomy range from 50–60%, depending on preoperative fertility status and fibroid location (Metwally et al., 2020).
- Obstetric risks, such as uterine rupture (0.5–1% with LM/AM) or placenta accreta spectrum (PAS), necessitate careful myometrial closure techniques and individualized delivery planning, often via cesarean section.⁶
- Adhesion prevention strategies (e.g., anti-adhesion barriers, minimally invasive approaches) are crucial to reducing secondary tubal infertility.⁶

Persistent Challenges and Recurrence

Despite surgical success, fibroid recurrence remains a significant concern, with 5-year recurrence rates of 15–30%, particularly in women under 35 or those with multiple fibroids (Guo et al., 2022). Emerging adjuvant therapies, such as GnRH agonists (preoperative shrinkage) or selective progesterone receptor modulators (SPRMs; ulipristal acetate), are being explored to mitigate recurrence risk.⁷

Conservative myomectomy stands as a cornerstone intervention for young women with symptomatic fibroids, harmonizing therapeutic efficacy with fertility preservation. However, patient selection, surgical expertise, and long-term surveillance are critical to optimizing outcomes. Future research must focus on biomarker-based recurrence prediction, refined minimally invasive techniques, and personalized postoperative care protocols.⁷

Indications

The decision to pursue conservative myomectomy in young women must be guided by a careful evaluation of clinical indications, with particular attention to symptom severity, reproductive goals, and anatomical considerations. The primary indication for uterine-preserving surgery is the presence of symptomatic uterine fibroids that significantly

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impair quality of life or reproductive potential, particularly in patients who have not achieved satisfactory relief through medical management. Medical therapies, including combined oral contraceptives, gonadotropin-releasing hormone (GnRH) agonists, or selective progesterone receptor modulators (SPRMs), may provide temporary alleviation of menorrhagia or bulk-related symptoms; however, their efficacy is often limited in cases of large or multiple fibroids, necessitating surgical intervention.

Young women presenting with fibroid-related infertility constitute a particularly critical subgroup for whom myomectomy is frequently indicated. Submucosal fibroids (FIGO types 0-2) and intramural fibroids with intracavitary distortion have been consistently associated with reduced fertility outcomes, likely due to mechanical disruption of endometrial receptivity, impaired embryo implantation, or altered uterine contractility. In such cases, myomectomy has been shown to improve spontaneous conception rates as well as outcomes in assisted reproductive technologies (ART), making it a cornerstone of fertility-preserving management. Additionally, patients with recurrent pregnancy loss attributed to fibroid-related cavity distortion may benefit from surgical correction prior to subsequent conception attempts.^{8,9}

The presence of significant bulk symptoms, including pelvic pressure, urinary frequency, or obstructive bowel dysfunction, further supports the consideration of myomectomy in young women who wish to avoid hysterectomy. While smaller fibroids may be managed expectantly in asymptomatic patients, larger leiomyomas (typically >5 cm) or rapidly growing tumors warrant surgical evaluation, particularly if associated with compressive morbidity. Furthermore, the psychological impact of fibroid-related symptoms—including chronic pain, sexual dysfunction, or anxiety regarding future fertility—should not be underestimated in this demographic and may justify surgical intervention even in cases where absolute clinical thresholds have not been met.^{10,11}

Emerging evidence also suggests a role for prophylactic myomectomy in select asymptomatic young women with fibroids that demonstrate concerning growth patterns or are positioned in anatomically critical locations (e.g., near the tubal ostia or cervical canal), where future expansion could compromise reproductive anatomy. This individualized approach requires thorough counseling regarding the balance between potential surgical risks and the anticipated benefits of preemptive intervention. Ultimately, the indications for conservative myomectomy must be tailored to each patient's unique clinical scenario, with multidisciplinary input from gynecologic surgeons, reproductive endocrinologists, and fertility specialists when appropriate.¹¹

Contraindications

While conservative myomectomy represents a cornerstone in the management of symptomatic uterine fibroids for women desiring uterine preservation, there exist several absolute and

relative contraindications that must be carefully considered in preoperative evaluation. These contraindications stem from technical limitations of the procedure, oncological concerns, and specific clinical scenarios where alternative therapeutic approaches may prove more beneficial.¹¹

Absolute contraindications primarily include situations where malignant transformation is suspected or confirmed. Uterine sarcomas, though rare with an estimated incidence of 0.5-1.0 cases per 100,000 women, represent an absolute contraindication to conservative myomectomy due to the potential for tumor dissemination and compromised oncological outcomes. The preoperative differentiation between benign leiomyomas and uterine sarcomas remains challenging, though rapid growth (particularly in postmenopausal women), imaging characteristics such as irregular margins and necrotic centers on MRI, and Doppler findings of central vascularity should raise suspicion and warrant consideration of alternative surgical approaches.¹¹

From a technical standpoint, diffuse uterine leiomyomatosis - characterized by the presence of innumerable fibroids replacing normal myometrial architecture - often presents an insurmountable challenge for conservative surgical approaches. In such cases, the extensive nature of disease frequently precludes meaningful uterine reconstruction while maintaining adequate myometrial integrity for future pregnancy, making hysterectomy the more appropriate surgical option despite the patient's desire for fertility preservation. Similarly, the presence of extensive adenomyosis coexisting with fibroids may contraindicate myomectomy alone, as the adenomyotic component frequently contributes significantly to symptom burden and may persist postoperatively without concomitant medical therapy or more extensive surgical intervention.¹²

Patient-related factors may also contraindicate conservative approaches. Women with severe medical comorbidities that significantly increase perioperative risk, such as uncorrectable coagulopathies, severe cardiopulmonary disease, or other conditions precluding safe general anesthesia, may not be suitable candidates for myomectomy. In these cases, minimally invasive alternatives such as uterine artery embolization or magnetic resonance-guided focused ultrasound surgery may offer safer options for symptom management. Additionally, the presence of active pelvic inflammatory disease or untreated genital tract infections represents a temporary contraindication due to the substantially increased risk of postoperative infectious complications and adhesion formation.¹²

From a reproductive standpoint, while myomectomy is generally considered fertility-preserving, certain clinical scenarios may paradoxically make the procedure relatively contraindicated. Women with severely diminished ovarian reserve or other significant fertility factors (e.g., severe male factor infertility requiring immediate ART) may derive greater benefit from proceeding directly to assisted reproductive technologies rather than delaying treatment for

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surgical intervention, particularly when fibroid-related symptoms are mild. The decision-making process in these cases requires careful multidisciplinary consultation between reproductive surgeons and fertility specialists to optimize outcomes.¹³

Finally, psychological factors must be considered; patients with unrealistic expectations regarding surgical outcomes or those unable to comply with necessary postoperative care and follow-up may not be ideal candidates for conservative approaches that often require long-term monitoring for fibroid recurrence. The presence of untreated psychiatric conditions that could impair postoperative recovery or adherence to medical recommendations should be addressed prior to considering myomectomy.¹⁴

Fertility Outcomes

The impact of conservative myomectomy on fertility preservation and reproductive outcomes represents a critical consideration in the surgical management of uterine fibroids among young women. Extensive clinical evidence demonstrates that uterine-preserving fibroid excision can significantly improve reproductive potential while effectively addressing fibroid-related symptomatology. The procedure's fertility-enhancing effects operate through multiple mechanisms, including restoration of normal uterine cavity architecture, improvement in endometrial receptivity, and normalization of uterine contractility patterns that may have been disrupted by leiomyomatous growth.¹⁵

Post-myomectomy pregnancy rates vary according to preoperative fertility status, with spontaneous conception occurring in approximately 50-60% of previously infertile women who had no other identifiable causes of subfertility. Among patients undergoing assisted reproductive technologies following myomectomy, clinical pregnancy rates show improvement ranging from 25-35% compared to untreated fibroid cases, particularly when the procedure addresses submucosal or cavity-distorting intramural fibroids. These outcomes highlight the importance of careful preoperative assessment using sonohysterography or hysteroscopy to evaluate endometrial cavity involvement, as this parameter significantly influences both surgical planning and subsequent fertility prognosis.¹⁵

The interval between myomectomy and conception represents another crucial factor in reproductive outcomes. Current evidence suggests optimal fertility results when conception occurs between 6-18 months postoperatively, allowing adequate time for complete uterine healing while minimizing the risk of fibroid recurrence. This window balances the competing priorities of sufficient myometrial recovery (particularly important for women who underwent extensive resection or multilayer uterine closure) against the biological reality of potential recurrent disease. The concept of "individualized waiting periods" has gained traction, with recommendations varying based on surgical approach (shorter for hysteroscopic procedures, longer for abdominal

cases) and the depth of myometrial penetration during fibroid excision.

Obstetric outcomes following conservative myomectomy warrant careful consideration, as these procedures inherently modify uterine integrity. While the overall risk of uterine rupture remains relatively low (0.5-1.0%), certain high-risk scenarios demand particular vigilance, including cases involving multiple fibroid excisions, deep intramural penetration, or use of electrosurgical energy near the endometrial cavity. The incidence of other pregnancy complications such as placenta previa (1.5-2% versus 0.5% in general population) and placental abruption (1.2% versus 0.7% baseline) shows modest elevation compared to unaffected pregnancies, reinforcing the need for specialized antenatal surveillance in this population.¹⁶

Comparative analyses of different surgical approaches reveal important nuances in fertility outcomes. Laparoscopic myomectomy demonstrates particular advantages in fertility preservation, associated with lower postoperative adhesion rates (15-20% versus 40-50% for laparotomy) and consequently reduced risk of secondary tubal factor infertility. Robotic-assisted techniques show comparable reproductive outcomes to conventional laparoscopy while potentially offering technical advantages in complex cases requiring intricate uterine reconstruction. Hysteroscopic myomectomy for submucosal lesions maintains outstanding fertility results, with pregnancy rates exceeding 70% in some series and minimal impact on subsequent pregnancy management.¹⁶

Long-term fertility preservation represents another critical outcome measure, with studies demonstrating durable reproductive capacity following myomectomy. Cumulative pregnancy rates remain stable across multiple cycles, and successful pregnancies have been documented up to 5-7 years post-procedure in women who delayed childbearing. However, the specter of fibroid recurrence - particularly in younger patients (under 35 years) and those with multiple initial fibroids - necessitates ongoing gynecologic surveillance and may prompt consideration of accelerated family planning in certain cases.¹⁶

The psychological dimension of fertility outcomes should not be underestimated, as the reassurance of uterine preservation and documented reproductive success contributes significantly to quality of life improvements. Patient-reported outcome measures consistently show reduced anxiety regarding fertility potential following conservative myomectomy, particularly when accompanied by thorough preoperative counseling regarding individualized success probabilities based on fibroid characteristics and surgical findings.¹⁶

Conservative myomectomy offers young women with symptomatic fibroids an effective pathway to preserve and often enhance reproductive potential. The procedure's fertility benefits extend beyond simple anatomy correction to encompass functional improvements in uterine physiology

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and endometrial receptivity. While certain risks persist regarding pregnancy management post-myomectomy, these are substantially outweighed by the benefits of uterine preservation in appropriately selected patients. Future research directions should focus on optimizing surgical techniques to further minimize myometrial trauma, developing standardized protocols for postoperative fertility management, and refining patient selection criteria to maximize reproductive outcomes while minimizing unnecessary intervention.¹⁶

CONCLUSIONS

Conservative myomectomy remains a pivotal intervention in the therapeutic armamentarium for managing symptomatic uterine fibroids in young women who desire uterine preservation and fertility maintenance. The procedure has evolved significantly with advancements in minimally invasive surgical techniques, including laparoscopic, robotic-assisted, and hysteroscopic approaches, each offering distinct advantages in terms of postoperative recovery, adhesion prevention, and fertility outcomes. However, the surgical approach must be carefully individualized based on fibroid characteristics, patient anatomy, and surgeon expertise to optimize therapeutic efficacy while minimizing complications.

The long-term success of conservative myomectomy extends beyond technical execution to encompass comprehensive preoperative evaluation and postoperative management. Preoperative imaging, particularly high-resolution pelvic ultrasound and magnetic resonance imaging, plays an indispensable role in surgical planning by precisely mapping fibroid number, size, location, and vascularity. Furthermore, the integration of medical therapy in the perioperative period, including gonadotropin-releasing hormone agonists for fibroid shrinkage or adjunctive hormonal treatments to reduce intraoperative blood loss, has enhanced surgical feasibility and outcomes. Postoperatively, patients require diligent surveillance for fibroid recurrence, which remains a persistent challenge with reported rates up to 30% within five years, particularly in younger patients and those with multiple fibroids.

From a reproductive perspective, conservative myomectomy demonstrates generally favorable outcomes, with pregnancy rates exceeding 50% in appropriately selected patients. However, obstetric considerations remain paramount, as the procedure inherently alters uterine integrity, necessitating careful counseling regarding optimal conception timing—typically recommended no sooner than 6-12 months postoperatively—and delivery planning, with cesarean section often advised for women who underwent extensive myometrial reconstruction. The risk of uterine rupture, though low (approximately 0.5-1%), underscores the importance of meticulous surgical technique, particularly regarding myometrial closure and adhesion prevention strategies.

The psychological dimension of fibroid management in young women warrants particular emphasis. The condition frequently impacts quality of life through menorrhagia-induced anemia, pelvic discomfort, and fertility concerns, while the surgical experience itself may generate anxiety regarding reproductive prognosis. A patient-centered approach that addresses these multifaceted concerns through clear communication, realistic expectation-setting, and when appropriate, psychological support, significantly enhances overall treatment outcomes and patient satisfaction.

In conclusion, conservative myomectomy represents an effective balance between therapeutic efficacy and fertility preservation for young women with symptomatic uterine fibroids. The procedure's success hinges on meticulous patient selection, surgical expertise, and comprehensive perioperative care. Future directions should focus on refining minimally invasive techniques, developing standardized protocols for adhesion prevention, and establishing evidence-based guidelines for postoperative fertility management. Additionally, research into molecular predictors of fibroid recurrence may enable more personalized approaches to long-term follow-up and adjuvant therapy. As reproductive medicine advances, conservative myomectomy will undoubtedly maintain its status as a cornerstone treatment, continually adapting to incorporate technological innovations while remaining grounded in its fundamental goal: preserving both health and hope for future motherhood.

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