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Operative treatment for adenomyosis: update on literature review

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ABSTRACT

Adenomyosis, a condition characterized by the presence of endometrial tissue within the myometrium, poses significant challenges in diagnosis and management due to its widespread and infiltrative nature. Operative treatment remains the primary treatment of choice for patients with symptomatic adenomyosis, especially those seeking fertility preservation or uterine conservation. This review explores the latest surgical techniques, emphasizing the balance between effective lesion removal and preservation of uterine function. Techniques such as asymmetric dissection, wedge resection, and various flap methods are discussed, highlighting their role in minimizing the loss of healthy myometrium while preserving uterine integrity. The evolution of laparoscopic and robotic approaches has improved accuracy and recovery, while innovative procedures such as the PUSH operation offer improved structural healing after excision. The choice of technique is guided by preoperative imaging and intraoperative findings, tailored to the extent and location of adenomyosis involvement. This review underscores the importance of individualized surgical strategy in achieving optimal outcomes in the surgical management of adenomyosis.

Keywords: adenomyosis, abnormal uterine bleeding, conservative therapy, operative therapy.

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INTRODUCTION

Adenomyosis is a benign condition characterized by the invasion of endometrial glands and stroma into the myometrium, leading to hypertrophy and hyperplasia of myofibrillar connective tissue, which can cause both diffuse and localized uterine lesions.¹ The primary symptoms include worsening dysmenorrhea, uterine enlargement, abnormal uterine bleeding (e.g., increased menstrual flow and prolonged cycles), and infertility.² Accurate demographic data and prevalence of adenomyosis remain unclear due to underreporting and underdiagnosis.³ Accurate demographic data and prevalence estimates for adenomyosis are limited due to underreporting and underdiagnosis, with prevalence rates ranging widely from 5% to 70%, though recent studies suggest rates between 20% and 35%. Historically, adenomyosis has been considered a condition affecting premenopausal, multiparous women in their thirties and forties; however, this perception is influenced by biases associated with hysterectomy-based diagnoses.³⁻⁵ Advancements in diagnostic imaging techniques, including ultrasound and MRI, have improved

the understanding of this condition's affected population. A rare variant, juvenile cystic adenomyosis, typically occurs in women under 30 and is characterized by significant bleeding within myometrial cysts.^{1,2} This variant often fails to respond to medical therapy and frequently necessitates surgical interventions such as myomectomy or hysterectomy. Risk factors for adenomyosis include prolonged exposure to estrogen (e.g., high parity, early menarche, shorter menstrual cycles, elevated BMI, use of oral contraceptives, and tamoxifen) and prior uterine surgeries, such as dilation and curettage, cesarean section, or myomectomy. Severe cases may be associated with adverse outcomes during pregnancy and childbirth.⁶

Management strategies for adenomyosis vary and include conservative, surgical, and radiological approaches. Hormonal therapy is typically the first-line treatment, effectively alleviating symptoms and reducing uterine size. When conservative treatments are unsuccessful, radiological options such as uterine artery embolization (UAE), high-intensity focused ultrasound (HIFU), radiofrequency ablation

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(RFA), and hysteroscopic procedures may be considered.^{1,4,7} While hysterectomy remains the definitive treatment, increasing interest in uterine-sparing techniques has led to the development of conservative surgical options. These procedures effectively reduce abnormal uterine bleeding (AUB), pelvic pain, and uterine volume but carry risks, including postoperative complications and challenges during pregnancy.⁸ Given the complexity of cytoreductive surgery for adenomyosis, especially in patients with coexisting endometriosis, such procedures should be performed by experienced surgeons in specialized centers.⁷

DISCUSSION

Adenomyosis significantly affects women's quality of life due to symptoms such as abnormal uterine bleeding (AUB) and pain, often necessitating long-term medical or surgical management. Treatment choices depend on factors such as a woman's age, reproductive goals, and specific symptoms.^{1,2,5} However, there is a paucity of clinical studies on conservative and operative therapies for adenomyosis, and no drugs have been specifically approved for its treatment.^{6,8} As an increasing number of younger women with adenomyosis seek to preserve fertility, conservative treatment options are gaining prominence. While surgical management remains a subject of ongoing debate, minimally invasive procedures may be suitable for selected cases, particularly when the associated pregnancy risks are considered.^{4,5,7} Conservative surgical approaches include techniques such as endometrial ablation, hysteroscopic resection of endometrium and adenomyoma, laparoscopic resection of adenomyosis, high-intensity focused ultrasound (HIFU), and uterine artery embolization (UAE). However, robust evidence supporting the effectiveness of these conservative surgical interventions is limited.⁶⁻⁹

Conservative Therapy

Medical therapies for adenomyosis primarily aim to alleviate localized hyperestrogenism and manage severe symptoms, including heavy menstrual bleeding, dysmenorrhea, and non-

menstrual pelvic pain. Nonsteroidal anti-inflammatory drugs (NSAIDs) are the cornerstone of treatment due to their ability to inhibit cyclooxygenase, an enzyme responsible for prostaglandin production, which drives painful menstrual cramps. In addition to NSAIDs, hormonal therapies such as oral contraceptive pills (OCPs), levonorgestrel-releasing intrauterine devices (IUDs), danazol, and aromatase inhibitors are commonly used. These therapies work by suppressing estrogenic activity, thereby reducing endometrial proliferation. While large-scale randomized controlled trials (RCTs) providing strong evidence for specific therapies are lacking, the levonorgestrel IUD is generally preferred due to its favorable side effect profile and higher efficacy. Below are details of commonly used drug options for conservative therapy in adenomyosis.¹⁰

Non-steroidal anti-inflammatory Drugs (NSAIDs)

NSAIDs are widely prescribed for the management of dysmenorrhea, particularly primary dysmenorrhea. These drugs are effective in reducing pain by inhibiting cyclooxygenase, thereby lowering prostaglandin production and alleviating excessive uterine contractions. However, excessive or prolonged use of NSAIDs can lead to adverse effects.^{11,12} While NSAIDs do not address the underlying pathology of adenomyosis or endometriosis, they remain effective for symptomatic relief. In cases of heavy menstrual bleeding, systematic reviews have shown NSAIDs to be more effective than placebo but less effective than alternative therapies such as progestins.¹¹ Despite their limitations in treating the root causes of adenomyosis, NSAIDs are a valuable nonhormonal option for women with mild symptoms who are seeking to conceive.

Combined Oral Contraceptives (COCs)

Combined oral contraceptives (COCs) alleviate adenomyosis symptoms by suppressing follicle-stimulating hormone (FSH) and luteinizing hormone (LH), thereby inhibiting follicular development and limiting endometrial growth. Two studies have evaluated the efficacy of COCs

in managing adenomyosis. Shaaban et al. found that 6 months of COC treatment effectively reduced pain in patients with adenomyosis; however, the levonorgestrel-releasing intrauterine device (LNG-IUD) demonstrated greater effectiveness in reducing both pain and uterine size.¹³ Similarly, Hassanin et al. reported that while COCs relieved pain, dienogest was superior in reducing bleeding and uterine volume, albeit with more side effects.¹⁴ Prolonged COC use is associated with an increased risk of thromboembolic events, which must be considered when selecting this treatment option.¹⁵

Progestin

Progestins are widely used to treat adenomyosis and endometriosis by suppressing FSH and LH, thereby lowering estrogen levels.¹⁶ dienogest, an oral progestin, has shown significant efficacy in pain relief during clinical trials, though its impact on reducing uterine size, lesions, or junctional zone thickness is often limited.¹⁷ Metrorrhagia is a common side effect which can lead to anemia in some patients.¹⁸ The LNG-IUD has also proven effective in reducing pain and uterine volume, although the duration of its efficacy varies, with some studies reporting diminished results after two years.¹³ Up to one-third of patients may not respond to progestins due to progesterone resistance, and these treatments carry a risk of thromboembolic events. While progestins remain a mainstay of adenomyosis management, their limitations necessitate the exploration of alternative therapies.¹⁶

Ulipristal Acetate

Ulipristal acetate (UPA), a selective progesterone receptor modulator, is approved for specific uses such as emergency contraception and managing uterine fibroids.¹⁹ It delays ovulation and inhibits endometrial maturation by lowering serum estradiol levels. Although UPA has been explored for treating adenomyosis symptoms, evidence supporting its efficacy is limited.²⁰ Two studies reported reduced blood loss after 12 weeks of UPA treatment in patients with adenomyosis, but other studies documented worsening symptoms and imaging findings.²⁰ However,

three other studies reported worsening symptoms and imaging findings in adenomyosis, suggesting that UPA may not be an appropriate option.^{19,21,22} For example, Donnez and Donnez observed exacerbated symptoms and MRI features of adenomyosis after three months of UPA treatment, and Conway et al. reported enlarging intramyometrial cysts and increased vascularity in women treated with UPA. These findings underscore the importance of accurate diagnosis and highlight that UPA is not a suitable treatment option for adenomyosis.

Gonadotropin-releasing hormone (GnRH) Agonists

GnRH agonists suppress gonadotropin secretion by competitively binding to GnRH receptors, resulting in a substantial reduction in estradiol levels and antiproliferative effects on the myometrium. Studies have demonstrated their effectiveness in reducing uterine volume, inducing amenorrhea, and alleviating pain associated with adenomyosis. For instance, a six-month course of GnRH agonists has been shown to significantly decrease uterine volume and junctional zone thickness in patients with adenomyosis, including those with concurrent endometriosis.¹⁰ These treatments also help relieve chronic pelvic pain, reduce the need for analgesics, and improve productivity. However, severe hypoestrogenic side effects, such as decreased bone mineral density, limit their long-term use, with symptoms often recurring after discontinuation.²³ Experts recommend GnRH agonists as a last-resort therapy for cases unresponsive to other treatments or when surgery is contraindicated. Additionally, GnRH agonists may be beneficial as pre-treatment in infertile patients undergoing assisted reproduction.²⁴

Oral GnRH Antagonists

Although oral GnRH antagonists are not yet approved for the treatment of symptomatic adenomyosis, they are gaining attention due to promising preliminary results.²⁵ These medications function by inhibiting GnRH receptors, leading to dose-dependent suppression of follicle-stimulating hormone (FSH)

and luteinizing hormone (LH) and subsequently reducing ovarian steroid levels.¹⁶ They offer several advantages over GnRH agonists, including oral administration, rapid onset of action without an initial flare effect, and reversible modulation of the hypothalamic-pituitary-gonadal axis.¹⁶ Early studies suggest that oral GnRH antagonists effectively reduce uterine volume, adenomyosis lesions, and pain. Linzagolix, in particular, has demonstrated encouraging outcomes, with a high-dose initiation phase followed by a lower maintenance dose that effectively alleviates symptoms.²⁶ Additionally, GnRH antagonists may be more advantageous than agonists for fertility preservation, as they do not drastically suppress LH and have reversible effects.²⁷ While further research is required to confirm their efficacy in adenomyosis management, these medications have already proven effective in treating endometriosis-related pain and improving quality of life. At lower doses, additional therapy may not be necessary, and ongoing clinical trials are exploring their full potential in managing both adenomyosis and endometriosis.²⁸

Operative Therapy

The standard treatment for adenomyosis remains hysterectomy; however, with increasing recognition of patients' desires for fertility preservation or uterine conservation, alternative medical and surgical approaches are gaining traction. Management strategies must address two key considerations: (a) the patient's desire for future pregnancies and (b) the patient's wish to preserve the uterus.²⁹ For patients with no desire for future fertility or uterine preservation, hysterectomy with bilateral salpingectomy remains the gold standard for symptomatic adenomyosis. The surgical approach—whether laparoscopic, robotic, open laparotomy or vaginal—should be determined collaboratively between the surgeon and the patient, ensuring a definitive treatment outcome.³⁰

For patients with subfertility or those wishing to preserve the uterus, surgery aims to excise the majority of adenomyosis while maintaining the integrity of the endometrial cavity, restoring uterine anatomy, and preserving ovarian and, where possible, tubal function. Symptom

relief is achieved primarily through the removal of the adenomyotic tissue, and spontaneous pregnancy is more likely when the endometrial cavity remains intact post-surgery. Surgical planning should be guided by preoperative imaging and intraoperative findings.⁹ Adenomyosis often infiltrates the myometrium, necessitating the removal of some healthy tissue alongside the lesion. Surgical techniques can be categorized as complete excision, partial excision, and non-excisional methods.⁹

Complete Excision is typically used in cases of focal adenomyosis, such as adenomyomas, and involves adenomyomectomy, which resembles a leiomyomectomy. This procedure, first described by Hyams in 1952, has since evolved to minimize complications. However, in diffuse adenomyosis, complete excision is often unfeasible due to the risk of uterine wall weakening, which could compromise pregnancy outcomes.²⁹

The following surgical methods have been proposed for the management of uterus-sparing adenomyosis, namely Classical excision of adenomyosis tissue after a single incision in the uterus (longitudinal or otherwise), Wedge resection, Double- or triple-flap method, Transverse H incision, and PUSH technique.⁹

Classical Technique

The classical technique, which can be performed via open surgery, laparoscopy, or robotic-assisted surgery, involves identifying the lesion's location and boundaries through visual inspection, palpation, or intraoperative ultrasonography when feasible. A longitudinal incision is made in the uterine wall over the adenomyosis site, followed by sharp and blunt dissection of the lesion using scissors, graspers, or diathermy, similar to the procedure for leiomyoma removal. The seromuscular uterine wall is sutured in two or three layers with absorbable sutures, and the endometrial cavity is also closed. During laparoscopy, uterine reconstruction may employ U-shaped sutures, overlapping flaps, or the three-flap method.^{31,32}

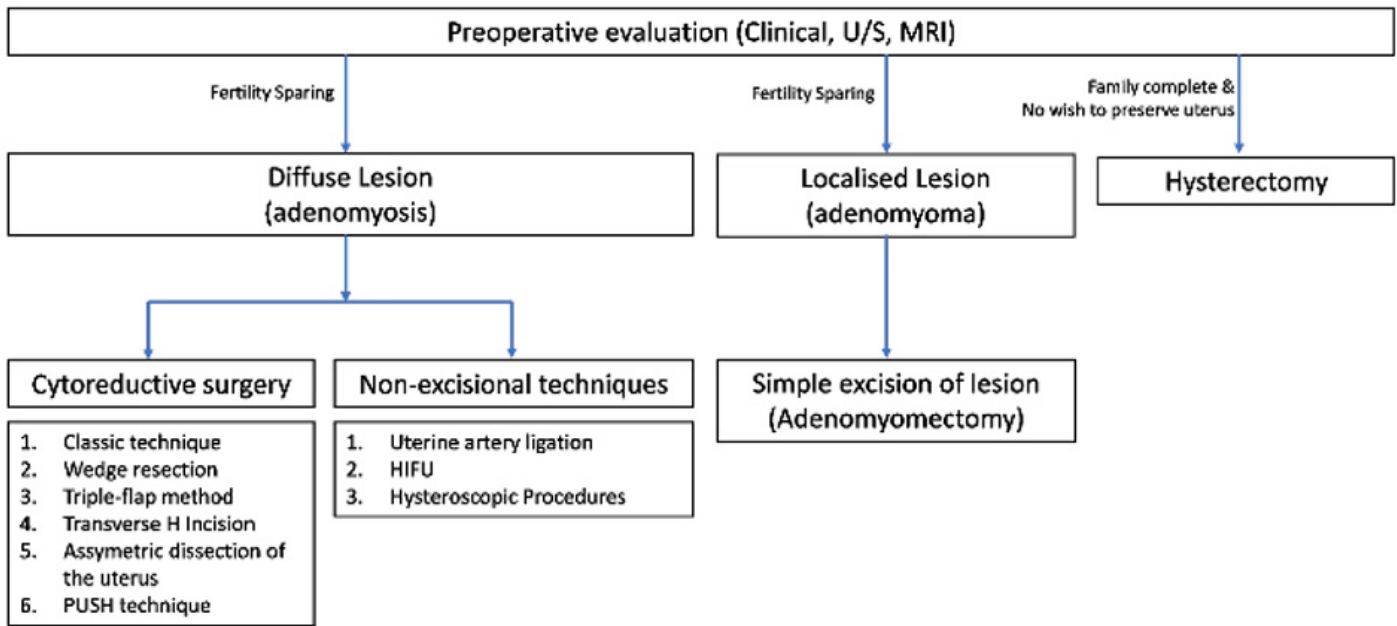


Figure 1. Surgical classification for adenomyosis⁹

Wedge Resection

Wedge resection is utilized for localized diffuse adenomyosis, particularly when confined to the anterior or posterior uterine wall. A cone-shaped excision is performed, involving the seromuscular uterine layer and the endometrial adenomyotic tissue to the extent of the lesion. The uterine wound is then reconstructed anatomically, following the classical partial adenomyomectomy technique.³³

Triple-Flap Method

Primarily used in open surgery, the triple-flap method involves midline dissection of the uterus to expose the endometrial cavity. Palpation with the surgeon's finger aids in maximizing the excision of adenomyotic tissue. The adenomyotic tissue is grasped with forceps and excised from the surrounding myometrium, leaving approximately 1 cm of healthy myometrium near the endometrial serosa. The endometrium is closed first, followed by reconstruction of the uterine wall. One side of the bisected uterine wall is brought over the other, creating an anteroposterior covering for the reconstructed uterus.³²

Transverse H-Incision Technique

This method, a laparotomy modification

for diffuse adenomyosis (often in the anterior uterine wall), starts with a vertical midline incision on the uterine wall, followed by two transverse incisions at the upper and lower uterine segments. The adenomyotic tissue beneath the flaps is removed down to a healthy myometrium while preserving the endometrial cavity, which is verified intraoperatively using chromopertubation. The uterine wall is then closed in multiple layers.³⁴

Asymmetric Dissection Technique

In this laparotomy approach, the uterus is dissected longitudinally with an electric knife in an asymmetric manner, separating the inner and outer layers while preserving the uterine cavity and arteries. The myometrium is dissected diagonally, and the uterine cavity is opened with a transverse incision. The adenomyotic lesion is removed using a loop electrode, leaving a 5 mm layer of inner and serosal myometrium. The uterine cavity and lining are then reconstructed in multiple layers.³⁵

PUSH Technique

The PUSH (Protection of Uterine Structure for Healing) method involves the excision of adenomyotic tissue via a midline incision, leaving submucosal

and subserosal muscle flaps. The flaps are overlapped and secured with full-layer vertical mattress sutures, ensuring complete reconstruction of the uterine structure without removing the outer muscle layer.³⁶

Radiofrequency Ablation

Radiofrequency Ablation (RFA) is a minimally invasive alternative for patients seeking fertility preservation and involves targeting adenomyotic lesions with ultrasound-guided radiofrequency energy.³² This approach spares healthy tissue and provides pain relief comparable to conventional uterine-sparing surgeries while being less invasive than uterine artery embolization (UAE) or high-intensity focused ultrasound (HIFU).³⁷

Office Hysteroscopy

Operative hysteroscopy is suitable for superficial adenomyosis nodules or diffuse superficial adenomyosis.³⁸ It involves resection of adenomyotic lesions under ultrasound guidance, following techniques similar to myomectomy. Xia et al.³⁹ reported successful outcomes with hysteroscopic resection, including low recurrence rates of menorrhagia and dysmenorrhea over a two-year follow-up. However, hysteroscopy is limited to the

endometrial layer and requires careful patient selection and skilled surgical execution due to the thin myometrial layer and the risk of perforation.⁴⁰

Unfortunately, hysteroscopy only provides information for the endometrial layer, and the hysteroscopy specialist faces significant limitations regarding the plane and space of division. In addition, the muscle tissue is thin and easily perforated; therefore, it is very important to select patients carefully and ensure that a skilled surgeon performs this surgical intervention.³⁹ More specifically, Xia et al.³⁹ presented the technical steps of adenomyoma removal using hysteroscopic resection. After cutting the endometrium covering the adenomyosis lesion, a pink ectopic endometrial lesion in the myometrium was seen. The ectopic endometrium and adenomyotic lesion in the myometrium were then resected in stages. During the resection of the lesion, several intramural microcysts with a broad base were seen. Opening the microcysts resulted in a thick brownish fluid flow, most of which was old blood. Then, the endometrial-like tissue and microcysts were resected using a loop. During the resection, the myometrial blood vessels were coagulated to avoid excessive fluid absorption. After drainage of the fluid, the internal view of the microcysts showed the presence of pink ectopic endometrial-like tissue. The operation was considered complete when the pink myometrial fasciculation structure appeared.³⁹ Due to the nature of this procedure, it is considered unsafe to perform with office hysteroscopic equipment.³⁹ Superficial diffuse adenomyosis can also be treated with endometrial ablation. This approach is very different from the traditional method of endometrial ablation. The resection should extend further into the myometrium, at least 10 mm, while the adenomyosis lesion should be between 3-10 cm in size. Then, the hysteroscopist should continue cutting the myometrial layer until a healthy myometrium can be recognized. The coagulation will end the procedure, which is completed using a 3 mm or 5 mm straight loop for fundus ablation and a classic cutting loop for uterine wall ablation. If symptoms persist, a second-view surgical procedure can

be performed to assess the efficacy of the hysteroscopic technique in treating adenomyosis.⁴¹

Uterine artery embolization reduces blood flow to the entire uterus, causing necrosis and resulting in a reduction in uterine size.⁴²⁻⁴⁴ Although these treatments have shown promising results, further research is needed to compare their effectiveness and assess long-term outcomes. Although these procedures aim to preserve fertility, infertility remains a known risk. For patients who do not wish to have children in the future but want a less invasive option than hysterectomy, endometrial ablation may be considered; however, its superficial nature limits its ability to treat deeper adenomyosis. More invasive procedures, such as myomectomy and partial hysterectomy, aim to preserve fertility by targeting deeper areas of adenomyosis. Still, the resulting scarring may increase the risk of disease recurrence by disrupting the endometrial-myometrial interface. Additionally, these surgeries may complicate future pregnancies by altering the anatomy of the uterus, increasing the risk of uterine rupture, premature rupture of membranes, preterm labor, and miscarriage.^{4,5} Hysterectomy remains the only definitive treatment for adenomyosis.

CONCLUSION

The evolution of laparoscopic and robotic approaches has improved accuracy and recovery, while innovative procedures such as the PUSH operation offer improved structural healing after excision. The choice of technique is guided by preoperative imaging and intraoperative findings, tailored to the extent and location of adenomyosis involvement. This review underscores the importance of individualized surgical strategy in achieving optimal outcomes in the surgical management of adenomyosis.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interests.

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