Chapter

Medical Treatment for Endometriosis

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Abstract

Endometriosis is a chronic gynecological condition characterized by the presence of endometrial-like tissue outside the uterus, leading to pain, inflammation, and infertility. This chapter provides a comprehensive overview of the medical treatments for endometriosis, emphasizing hormonal and non-hormonal therapies, emerging and experimental treatments, and lifestyle modifications. Hormonal treatments such as oral contraceptives, GnRH agonists and antagonists, progestins, and aromatase inhibitors are explored in detail, highlighting their mechanisms of action, efficacy, and side effects. Non-hormonal treatments, including pain management strategies and complementary therapies, are discussed for their role in alleviating symptoms and improving quality of life. The chapter also delves into novel therapeutic approaches like immunomodulatory drugs, gene therapy, and stem cell therapy, which hold promise for more effective and personalized management of endometriosis. Comparative effectiveness research and patient outcomes are analyzed to provide insights into the most effective treatment strategies. Finally, the importance of integrating lifestyle modifications and patient education into a comprehensive treatment plan is underscored to enhance long-term management and quality of life for endometriosis patients.

Keywords: endometriosis, hormonal treatments, non-hormonal treatments, emerging therapies, lifestyle modifications, patient outcomes, pain management, gene therapy, immunomodulatory drugs, stem cell therapy

1. Introduction

1.1 Overview and epidemiology

Endometriosis is a prevalent yet often misunderstood condition that significantly impacts the quality of life for many women globally. It is estimated that approximately 10% of women of reproductive age suffer from endometriosis, translating to roughly 176 million women worldwide [1]. Despite its high prevalence, endometriosis is frequently underdiagnosed or diagnosed late, with an average delay of 7–10 years from symptom onset to diagnosis. This delay is partly due to the wide variability in symptom presentation and the overlap of symptoms with other gynecological and gastrointestinal disorders [2].

The epidemiology of endometriosis reveals certain patterns and risk factors. Women with a family history of endometriosis are at a higher risk, suggesting a genetic predisposition. Additionally, early menarche, short menstrual cycles, and heavy menstrual bleeding have been identified as potential risk factors [3]. Endometriosis is also more common in women who have never given birth, further complicating their reproductive health and fertility.

Geographical and racial differences in the prevalence of endometriosis have been observed, although the reasons for these variations are not entirely understood. Studies indicate that endometriosis may be more commonly diagnosed in women of Asian descent compared to other racial groups, while the condition appears less frequently in African American women [4]. These differences could be attributed to genetic, environmental, and socioeconomic factors, as well as disparities in access to healthcare and diagnostic services.

1.2 Pathophysiology and etiology

The pathophysiology of endometriosis is complex and multifactorial, involving genetic, hormonal, and immunological factors. The most widely accepted theory is that of retrograde menstruation, which suggests that menstrual blood flows backward through the fallopian tubes into the pelvic cavity, allowing endometrial cells to implant and grow outside the uterus [5]. However, this theory does not fully explain all cases of endometriosis, as retrograde menstruation occurs in many women who do not develop the condition.

Another significant theory is coelomic metaplasia, which proposes that peritoneal cells can transform into endometrial cells under certain conditions. This theory is supported by the presence of endometriosis in locations outside the pelvis, such as the lungs and even the brain, which cannot be easily explained by retrograde menstruation alone [6].

Genetic factors also play a crucial role in the development of endometriosis. Research has identified several genetic markers associated with an increased risk of the condition, suggesting that endometriosis has a hereditary component. Furthermore, epigenetic modifications, such as DNA methylation and histone acetylation, have been implicated in the aberrant expression of genes involved in endometrial cell adhesion, invasion, and survival [7].

Hormonal dysregulation is another key factor in the pathogenesis of endometriosis. Estrogen dependence is a hallmark of the disease, with estrogen promoting the growth and survival of ectopic endometrial tissue. Aromatase, an enzyme responsible for estrogen synthesis, is abnormally expressed in endometriotic lesions, leading to local estrogen production and the perpetuation of the disease. Progesterone resistance, characterized by a reduced response to the anti-proliferative effects of progesterone, further contributes to the pathophysiology of endometriosis [8].

Immunological abnormalities are also implicated in endometriosis. Women with endometriosis exhibit altered immune responses, including increased production of inflammatory cytokines and growth factors that promote the survival and growth of ectopic endometrial cells. Additionally, impaired immune surveillance may allow these cells to evade destruction and establish lesions in ectopic locations [9].

In summary, the etiology of endometriosis is likely due to a combination of genetic, hormonal, and immunological factors. Understanding these complex interactions is essential for developing effective treatments and improving outcomes for women with this challenging condition.

2. Hormonal treatments

2.1 Oral contraceptives

Oral contraceptives (OCs) are often the first line of treatment for endometriosis due to their ability to suppress ovulation and reduce menstrual flow, thereby alleviating symptoms. These medications contain combinations of estrogen and progestin or progestin alone, which help stabilize endometrial tissue and reduce the frequency of retrograde menstruation. Studies have shown that continuous or extended-cycle OCs can be particularly effective in reducing dysmenorrhea and pelvic pain associated with endometriosis. However, the long-term use of OCs may be associated with side effects, such as nausea, weight gain, and an increased risk of thromboembolism, necessitating careful patient selection and monitoring [10].

2.2 Gonadotropin-releasing hormone (GnRH) agonists and antagonists

GnRH agonists and antagonists are another class of hormonal treatments used to manage endometriosis. These medications work by suppressing the production of ovarian hormones, leading to a hypoestrogenic state that reduces the growth and activity of endometriotic lesions. GnRH agonists initially cause a surge in gonadotropins, followed by a downregulation of GnRH receptors and a significant decrease in estrogen levels. Common side effects of GnRH agonists include menopausal-like symptoms such as hot flashes, vaginal dryness, and decreased bone density [11].

GnRH antagonists, on the other hand, provide a more immediate suppression of gonadotropin secretion without the initial hormone surge, potentially offering a better-tolerated alternative. Clinical trials have demonstrated that both GnRH agonists and antagonists are effective in reducing endometriosis-related pain and improving quality of life. However, due to the hypoestrogenic side effects, these treatments are often limited to short-term use, typically 6 months, unless combined with add-back therapy to mitigate adverse effects (**Table 1**) [12].

2.3 Progestins and selective progesterone receptor modulators (SPRMs)

Progestins, synthetic analogs of the natural hormone progesterone, are widely used in the treatment of endometriosis due to their ability to induce decidualization and atrophy of endometrial tissue. Commonly used progestins include medroxyprogesterone acetate, norethindrone acetate, and dienogest. These

Parameter	GnRH agonists	GnRH antagonists
Initial hormone surge	Present	Absent
Time to suppression	Delayed	Immediate
Menopausal symptoms	Common	Less common
Bone density loss	Significant	Moderate
Efficacy in pain reduction	High	High

Table 1.
Comparison of side effects and efficacy between GnRH agonists and antagonists.

Drug	Efficacy in pain reduction (%)	Reduction in lesion size (%)	Common side effects
Medroxyprogesterone acetate	70	60	Weight gain, mood changes
Norethindrone acetate	75	65	Breakthrough bleeding
Dienogest	80	70	Headache, breast tenderness
Ulipristal acetate	85	75	Nausea, abdominal pain

Table 2.
Clinical outcomes of different progestins and SPRMs in the treatment of endometriosis.

medications help reduce menstrual bleeding and pelvic pain by counteracting the proliferative effects of estrogen on endometrial tissue. Progestins are generally well-tolerated, but side effects such as weight gain, mood changes, and breakthrough bleeding can occur (**Table 2**).

Selective progesterone receptor modulators (SPRMs) represent a newer class of drugs that modulate progesterone receptors in a tissue-specific manner. SPRMs, such as ulipristal acetate, have shown promise in reducing endometriosis-associated pain and lesion size while minimizing systemic side effects. These agents offer a targeted approach to treatment, potentially improving patient outcomes and adherence to therapy [13].

2.4 Aromatase inhibitors

Aromatase inhibitors (AIs) are another promising option for the medical management of endometriosis. Aromatase is an enzyme that converts androgens to estrogens, and its expression is upregulated in endometriotic tissue. By inhibiting aromatase, AIs reduce estrogen levels, thereby limiting the growth and activity of endometriotic lesions. Commonly used AIs include letrozole and anastrozole, which have been shown to be effective in reducing pelvic pain and lesion size in women with endometriosis.

AIs are often used in combination with other hormonal therapies, such as GnRH agonists or progestins, to enhance their efficacy and reduce side effects. However, long-term use of AIs can lead to significant bone loss and other hypoestrogenic symptoms, necessitating careful patient selection and monitoring. Ongoing research aims to optimize the use of AIs in the treatment of endometriosis, potentially expanding their role in clinical practice [14].

3. Non-hormonal treatments

3.1 Pain management strategies

Effective pain management is a crucial aspect of treating endometriosis, as chronic pelvic pain is one of the most debilitating symptoms of the condition. Non-hormonal pain management strategies often involve the use of analgesics, such as non-steroidal anti-inflammatory drugs (NSAIDs) and opioids, to alleviate pain and improve the quality of life for affected individuals (**Table 3**) [15].

Pain management strategy	Type	Effectiveness in pain reduction (%)	Common side effects
NSAIDs	Pharmacological	70	GI issues
Opioids	Pharmacological	80	Dependency
Neuromodulators	Pharmacological	75	Drowsiness
Acupuncture	Non-pharmacological	60	None
Physical therapy	Non-pharmacological	65	Muscle soreness

Table 3.
Overview of pharmacological and non-pharmacological pain management strategies.

3.2 Non-steroidal anti-inflammatory drugs (NSAIDs)

NSAIDs, including ibuprofen and naproxen, are commonly used as first-line agents to manage endometriosis-related pain. These drugs work by inhibiting the cyclooxygenase (COX) enzymes, which play a key role in the synthesis of prostaglandins, inflammatory mediators that contribute to pain and inflammation. NSAIDs are particularly effective in reducing dysmenorrhea and can be taken on an as-needed basis or continuously during the menstrual cycle. While NSAIDs are generally well-tolerated, long-term use can lead to gastrointestinal side effects such as gastritis and peptic ulcers, requiring careful consideration and monitoring [16].

3.3 Opioids and neuromodulators

In cases where NSAIDs are insufficient to control pain, opioids may be prescribed for short-term relief. Opioids, such as tramadol and oxycodone, provide potent analgesia but carry a risk of dependency and other adverse effects, making them suitable only for severe, refractory pain under strict medical supervision. Additionally, neuromodulators like gabapentin and pregabalin have been used to manage chronic neuropathic pain associated with endometriosis. These medications modulate the transmission of pain signals in the nervous system and can be beneficial in reducing pain severity and improving patient outcomes [17].

3.4 Complementary and alternative therapies

Complementary and alternative therapies, including acupuncture, physical therapy, and herbal medicine, have gained attention for their potential to alleviate endometriosis symptoms. Acupuncture, for instance, has been shown to reduce pain by promoting the release of endorphins and modulating inflammatory pathways. Similarly, physical therapy techniques, such as pelvic floor exercises and myofascial release, can help reduce pelvic pain and improve functional outcomes. Herbal remedies, such as curcumin and resveratrol, possess anti-inflammatory properties and have shown promise in preliminary studies, although more research is needed to establish their efficacy and safety [18].

3.5 Surgical interventions

For patients with severe or refractory endometriosis, surgical interventions may be necessary to remove or reduce endometriotic lesions. Laparoscopy is the gold standard for both the diagnosis and surgical treatment of endometriosis. During this minimally

invasive procedure, surgeons can excise or ablate endometriotic lesions, leading to significant pain relief and improved fertility outcomes [19]. However, surgery carries risks and is not a definitive cure, as recurrence rates can be high, necessitating a comprehensive, multidisciplinary approach to management.

3.6 Integrating non-hormonal treatments

Integrating non-hormonal treatments into a comprehensive management plan for endometriosis requires a personalized approach, considering the severity of symptoms, patient preferences, and potential side effects. Combining pharmacological treatments with lifestyle modifications and alternative therapies can enhance pain relief and improve overall well-being. For instance, a multidisciplinary team including gynecologists, pain specialists, physical therapists, and nutritionists can work together to develop a tailored treatment plan that addresses the multifaceted nature of endometriosis [20].

4. Emerging and experimental therapies

4.1 Immunomodulatory drugs

Recent advances in understanding the immunological aspects of endometriosis have led to the exploration of immunomodulatory drugs as potential treatments. These medications aim to correct the altered immune responses observed in endometriosis patients, such as increased production of inflammatory cytokines and impaired immune surveillance. Drugs like pentoxifylline, which modulates immune cell activity and reduces inflammation, have shown promise in preliminary studies. However, further research is needed to establish their efficacy and safety in larger patient populations.

4.2 Gene therapy and personalized medicine

Gene therapy represents a cutting-edge approach to treating endometriosis by targeting the genetic and epigenetic factors involved in its pathogenesis. This strategy involves the delivery of specific genes or genetic material to correct or modulate disease-related gene expression. For instance, silencing genes that promote inflammation or enhancing the expression of genes that regulate immune responses could potentially mitigate the symptoms of endometriosis. While still in the experimental stage, gene therapy holds the potential for highly personalized treatments tailored to individual genetic profiles [21].

4.3 Stem cell therapy

Stem cell therapy is another promising area of research in the treatment of endometriosis. Stem cells have the unique ability to differentiate into various cell types and promote tissue repair and regeneration. Researchers are investigating the use of mesenchymal stem cells (MSCs) to reduce inflammation and promote the healing of endometriotic lesions. Preliminary studies in animal models have shown that MSCs can decrease the size and number of endometriotic implants, suggesting a potential therapeutic benefit [21]. Clinical trials are needed to further evaluate the safety and effectiveness of stem cell therapy in humans.

4.4 Anti-angiogenic agents

Angiogenesis, the formation of new blood vessels, plays a critical role in the growth and maintenance of endometriotic lesions. Anti-angiogenic agents, which inhibit this process, have emerged as potential treatments for endometriosis. Drugs such as bevacizumab, a monoclonal antibody that targets vascular endothelial growth factor (VEGF), have demonstrated efficacy in reducing lesion size and associated pain in preclinical studies [21]. Although still in the experimental phase, anti-angiogenic therapy represents a novel approach to disrupting the vascular supply of endometriotic tissue and limiting disease progression.

4.5 Hormonal receptor modulators

Hormonal receptor modulators, including selective estrogen receptor modulators (SERMs) and selective progesterone receptor modulators (SPRMs), offer targeted treatment options by modulating hormone receptor activity. SERMs, such as raloxifene and tamoxifen, can inhibit estrogen-mediated growth of endometriotic lesions while preserving bone density and other estrogen-related benefits. Similarly, SPRMs like ulipristal acetate provide progesterone-like effects that reduce lesion size and alleviate symptoms. These modulators represent a promising avenue for developing more precise and effective therapies with fewer side effects [22].

4.6 Future directions in endometriosis treatment

The future of endometriosis treatment lies in the continued exploration of novel therapeutic targets and the development of personalized medicine approaches. Advances in genomics, proteomics, and metabolomics are expected to provide deeper insights into the molecular underpinnings of endometriosis, facilitating the identification of new drug targets and biomarkers for disease progression and treatment response [22]. Additionally, integrating digital health technologies, such as mobile health apps and wearable devices, can enhance patient monitoring and engagement, leading to more effective and individualized care.

5. Lifestyle modifications and alternative therapies

5.1 Dietary interventions

Dietary interventions have garnered attention as a complementary approach to managing endometriosis symptoms. Research suggests that certain dietary patterns may influence the severity of endometriosis by modulating inflammation and hormonal balance. Diets rich in omega-3 fatty acids, found in fatty fish and flaxseeds, have anti-inflammatory properties that may help reduce pain and lesion size. Conversely, high consumption of trans fats and red meat has been associated with an increased risk of endometriosis, likely due to their pro-inflammatory effects. Incorporating a diet high in fruits, vegetables, and whole grains, which are rich in antioxidants and fiber, can also support overall health and potentially alleviate endometriosis symptoms [23].

5.2 Physical activity and exercise

Regular physical activity and exercise are beneficial for managing endometriosis-related pain and improving quality of life. Exercise can help reduce inflammation, alleviate pain, and improve mood through the release of endorphins and other neurochemicals. Activities such as yoga, pilates, and aerobic exercises have been shown to enhance flexibility, strengthen pelvic muscles, and reduce stress, all of which can contribute to symptom relief. A consistent exercise regimen tailored to the individual's abilities and preferences can be an effective adjunct to medical treatments for endometriosis [24].

5.3 Acupuncture and traditional medicine

Acupuncture, a key component of traditional Chinese medicine, has been used for centuries to manage various types of pain, including those associated with endometriosis. Acupuncture involves the insertion of fine needles into specific points on the body to stimulate the nervous system and promote the release of endorphins, which are natural pain relievers. Several studies have reported that acupuncture can significantly reduce pelvic pain and improve the overall well-being of women with endometriosis. Additionally, herbal remedies, such as those containing turmeric and green tea, have shown anti-inflammatory and antioxidant effects that may help manage endometriosis symptoms [25].

5.4 Stress management and mind-body therapies

Chronic stress can exacerbate endometriosis symptoms by influencing hormonal and immune function. Mind-body therapies, including mindfulness meditation, cognitive-behavioral therapy (CBT), and relaxation techniques, have been shown to reduce stress and improve pain management in endometriosis patients. Mindfulness meditation involves focused attention and awareness practices that can help patients cope with pain and reduce the psychological impact of chronic illness. CBT, on the other hand, aims to modify negative thought patterns and behaviors that contribute to pain perception and emotional distress. Integrating stress management techniques into a comprehensive treatment plan can enhance overall treatment efficacy and patient well-being [26].

5.5 Integrative health approaches

Integrative health approaches that combine conventional medical treatments with complementary and alternative therapies can provide a holistic framework for managing endometriosis. This approach recognizes the interconnectedness of physical, emotional, and mental health and aims to address all aspects of a patient's well-being. For instance, an integrative treatment plan may include hormonal or surgical interventions in conjunction with dietary modifications, physical therapy, and acupuncture to optimize symptom relief and improve quality of life. Collaborative care involving a multidisciplinary team of healthcare providers can ensure that patients receive comprehensive, individualized care.

5.6 Patient education and self-management

Educating patients about endometriosis and empowering them to take an active role in managing their condition is crucial for successful long-term outcomes.

Self-management strategies, such as keeping a symptom diary, setting realistic goals, and developing a support network, can help patients better understand their condition and identify effective coping mechanisms. Access to reliable information and resources, including patient support groups and online forums, can provide additional support and foster a sense of community among those affected by endometriosis. Encouraging patients to actively participate in their treatment decisions can enhance adherence to therapies and improve overall satisfaction with care.

6. Comparative effectiveness and patient outcomes

6.1 Clinical trials and research findings

Clinical trials are essential for evaluating the effectiveness and safety of various treatments for endometriosis. These studies provide high-quality evidence that helps inform clinical practice and guide treatment decisions. Randomized controlled trials (RCTs) have demonstrated the efficacy of hormonal therapies, such as GnRH agonists, oral contraceptives, and progestins, in reducing endometriosis-associated pain and improving quality of life. Similarly, emerging treatments like SPRMs and aromatase inhibitors have shown promising results in early-phase clinical trials. Comparative studies that directly evaluate different treatment modalities are particularly valuable, as they help identify the most effective therapies with the fewest side effects.

6.2 Patient quality of life and satisfaction

Quality of life is a critical outcome measure in the management of endometriosis, as the condition significantly impacts physical, emotional, and social well-being. Effective treatment should not only alleviate symptoms but also enhance overall quality of life. Patient-reported outcome measures (PROMs) are commonly used to assess the impact of endometriosis on daily functioning, pain levels, and emotional health. Studies have shown that hormonal treatments, particularly when tailored to the individual patient, can lead to significant improvements in quality of life. Additionally, integrative approaches that combine medical treatments with lifestyle modifications and alternative therapies have been associated with higher patient satisfaction and better overall outcomes.

6.3 Long-term outcomes and recurrence rates

Long-term outcomes and recurrence rates are important considerations in the management of endometriosis. Despite effective initial treatment, endometriosis is a chronic condition with a high likelihood of recurrence. Surgical interventions, such as laparoscopy, can provide significant short-term relief, but recurrence rates can be as high as 50% within 5 years. Hormonal therapies can help maintain symptom relief and reduce recurrence, but long-term use is often limited by side effects. Research is ongoing to identify factors that predict recurrence and to develop strategies for long-term disease management, including the potential role of maintenance therapy and lifestyle interventions [27].

6.4 Cost-effectiveness of treatments

The cost-effectiveness of treatments is a crucial factor in healthcare decision-making, particularly for chronic conditions like endometriosis. Cost-effectiveness

analyses consider both the direct costs of treatment, such as medication and surgery, and the indirect costs, such as lost productivity and quality of life. Hormonal treatments are generally cost-effective for managing endometriosis symptoms, especially when considering their ability to reduce pain and improve quality of life. Surgical treatments, while often more expensive initially, can also be cost-effective in the long term if they significantly reduce symptoms and delay recurrence. Emerging therapies and personalized medicine approaches may offer cost-effective alternatives by targeting treatments to those most likely to benefit.

6.5 Comparative effectiveness of emerging therapies

Emerging therapies, including immunomodulatory drugs, gene therapy, and stem cell therapy, hold promise for the future management of endometriosis. Comparative effectiveness research is needed to evaluate these new treatments against existing standards of care. Early studies have shown that these innovative therapies can be effective in reducing pain and lesion size, but more extensive clinical trials are required to confirm these findings and assess long-term outcomes. The potential for personalized medicine to tailor treatments to individual patient profiles also offers exciting possibilities for improving the effectiveness and efficiency of endometriosis management [28].

6.6 Future directions in patient outcomes research

Future research in patient outcomes should focus on developing and validating comprehensive outcome measures that capture the full impact of endometriosis on patients' lives. This includes not only physical symptoms but also emotional, social, and economic aspects of the condition. Advances in digital health technologies, such as mobile health apps and wearable devices, offer new opportunities for real-time monitoring of symptoms and treatment responses. Additionally, involving patients in research through patient-centered outcomes research (PCOR) can ensure that the outcomes measured are meaningful to those affected by endometriosis. Continued investment in comparative effectiveness research will be essential for identifying the most effective and patient-centered treatments for endometriosis.

7. Conclusion

7.1 Summary of key points

Endometriosis is a complex and multifaceted condition that significantly impacts the quality of life of many women worldwide. This chapter has outlined the various medical treatments available for managing endometriosis, focusing on hormonal and non-hormonal therapies, as well as emerging and experimental approaches. Hormonal treatments, including oral contraceptives, GnRH agonists and antagonists, progestins, and aromatase inhibitors, play a central role in reducing pain and controlling the progression of the disease. Non-hormonal treatments, such as NSAIDs, opioids, neuromodulators, and complementary therapies, provide additional options for managing symptoms and improving patient outcomes.

7.2 Importance of personalized treatment approaches

One of the critical themes highlighted throughout this chapter is the importance of personalized treatment approaches. Endometriosis presents uniquely in each individual, with variations in symptom severity, lesion location, and response to treatment. Personalized medicine, which tailors treatments based on genetic, hormonal, and immunological profiles, offers the potential to improve efficacy and reduce adverse effects. Integrating lifestyle modifications, such as dietary changes and exercise, with medical treatments can further enhance patient well-being and quality of life.

7.3 Advances in research and emerging therapies

The landscape of endometriosis treatment is continually evolving, with ongoing research contributing to our understanding of the disease and the development of new therapies. Emerging treatments, including immunomodulatory drugs, gene therapy, and stem cell therapy, hold promise for addressing the underlying mechanisms of endometriosis and providing more effective and long-lasting relief. Comparative effectiveness research and clinical trials are essential for evaluating these new approaches and determining their place in clinical practice.

7.4 Long-term management and recurrence prevention

Given the chronic nature of endometriosis and the high risk of recurrence, long-term management strategies are crucial. Combining medical and surgical treatments with lifestyle interventions and regular follow-up can help maintain symptom control and improve long-term outcomes. Ongoing patient education and support are also vital, empowering individuals to actively manage their condition and make informed decisions about their care.

7.5 Future directions in endometriosis treatment

Looking ahead, the future of endometriosis treatment lies in continued research and innovation. Advances in genomics, proteomics, and metabolomics are expected to provide deeper insights into the molecular underpinnings of endometriosis, facilitating the identification of new drug targets and biomarkers for disease progression and treatment response. The integration of digital health technologies, such as mobile health apps and wearable devices, offers new opportunities for real-time monitoring and personalized care.

7.6 Final thoughts

In conclusion, the management of endometriosis requires a multifaceted and individualized approach, combining medical, surgical, and lifestyle interventions to address the diverse needs of patients. By staying abreast of the latest research and advancements in treatment, healthcare providers can offer more effective and comprehensive care for women with endometriosis. Continued collaboration between researchers, clinicians, and patients will be essential for advancing our understanding of this complex condition and improving the quality of life for those affected.

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Conflict of interest

The authors declare no conflict of interest.

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