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NARRATIVE REVIEW

Pelvic floor dysfunction in women with deep infiltrating endometriosis: from bench to bedside

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ABSTRACT

Deep Infiltrating Endometriosis (DIE) is a severe form of endometriosis that affects the pelvic organs and often leads to pelvic floor dysfunction (PFD). This review explores the relationship between DIE and PFD, analyzing diagnostic approaches, therapeutic strategies, and novel imaging tools. A narrative review was conducted using PubMed and EMBASE with no time restrictions, following SANRA guidelines. Thirteen studies were included, comprising clinical trials, observational studies, and systematic reviews. Evidence indicates that women with DIE experience pelvic floor muscle hypertonia, impaired relaxation, and heightened pain sensitivity. Pelvic floor physiotherapy (PFP) shows benefit in reducing dyspareunia and improving muscle relaxation, though its impact on urinary, bowel, and sexual functions remains inconclusive. Surgical interventions, particularly colorectal resections, are effective in alleviating dyspareunia and fecal incontinence, yet data on urinary improvement are limited. Transperineal ultrasound and elastography emerge as promising tools for diagnosing and monitoring PFD. While surgery currently represents the most effective strategy for symptom relief, integrating non-invasive options and advanced imaging may enhance outcomes. Standardized protocols and high-quality studies are needed to refine management of PFD in DIE.

Key words

Deep infiltrating endometriosis; pelvic floor dysfunction; chronic pelvic pain; dyspareunia; pelvic floor physiotherapy; transperineal ultrasound; surgery.

Introduction

Endometriosis is a complex disease with unclear origins, affecting 10-15% of women of reproductive age, and notably, it also appears in adolescents and postmenopausal women [1-3][4,

5]. Common risk factors include early menstruation, heavy menstrual cycles, ethnicity and lifestyle factors [6, 7][8, 9].

The disease is thought to primarily develop from retrograde menstruation, where endometrial cells backflow into the pelvic cavity, potentially causing implantation and growth. [10].

Deep Infiltrating Endometriosis (DIE) is a severe subtype of endometriosis characterized by the infiltration of pelvic structures such as the rectovaginal septum, bladder, and uterosacral ligaments. It affects a subset of women with endometriosis and is frequently associated with complex symptoms, including chronic pelvic pain, dyspareunia, urinary and intestinal dysfunction, and infertility. Despite its clinical burden, the functional complications of DIE—particularly pelvic floor dysfunction (PFD)—remain underrecognized and underexplored in both diagnosis and management.

PFD in this population may result from neuromuscular impairment and hypertonia of pelvic floor muscles, contributing to worsening of urinary symptoms, sexual dysfunction, and defecatory disorders. Diagnostic tools like transvaginal ultrasound and MRI provide structural assessment of DIE lesions, while emerging modalities such as transperineal ultrasound and elastography are increasingly used to evaluate pelvic floor function. The combination of DIE and PFD poses diagnostic and therapeutic challenges, necessitating multidisciplinary and individualized management.[14-16]. Chronic pelvic pain is a hallmark symptom of endometriosis, though its severity does not consistently correlate with the disease extent [17]. This symptom is also common in other gynecological disorders like uterine fibroids [18]. There's also an observed inverse correlation between the stage of endometriosis at diagnosis and fertility outcomes [19-23].

Diagnostic procedures for endometriosis include laparoscopy, considered the definitive test, though transvaginal ultrasound is preferred initially for less invasive diagnosis, with MRI as an additional, albeit more costly, tool [11, 12]. Currently, the classification of endometriosis for surgical purposes includes several staging systems to better inform postoperative outcomes for patients [13].

This review aims to explore the intricate relationship between DIE and PFD by summarizing current diagnostic strategies, surgical and conservative treatments, and novel approaches for optimizing care in affected women.

Materials and Methods

In this literature review, an extensive search was conducted on PubMed and EMBASE using the original textwords and MeSH “Pelvic Floor Dysfunction AND Deep Infiltrating Endometriosis” from inception to December 2024. We included articles in the form of clinical trials, observational studies, meta-analyses, and reviews, without time restrictions; exclusion criteria were not pertinent medical content and non-use of the English language. Exclusion criteria included non-English language publications, studies not involving DIE or pelvic floor outcomes, irrelevant or duplicate articles.

Due to the narrative design of this review, a formal double-blinded screening procedure was applied. Discussion regarding inclusion or exclusion of articles was resolved by consensus after involving a third author. The analytical method was completed by reading the selected articles in their entirety, categorizing relevant issues, summarizing the findings, and conducting a comprehensive evaluation and review procedure to identify items related to the study objectives. For each included study, we extracted key information including study design, sample size, population characteristics, type of intervention, outcome measures, duration of follow-up, and

principal findings. Given the substantial heterogeneity in study designs, interventions, and reported endpoints, the results were synthesized descriptively rather than subjected to quantitative pooling or meta-analysis. A total number of 50 studies was included after full text evaluation. Due to the narrative nature of the review, standardized quality appraisal tool was applied, as this review aimed primarily to provide a qualitative synthesis of the existing evidence.

The selected studies were categorized based on thematic relevance. A narrative synthesis of the selected research was then finalized, adding more theoretical ideas from book chapters and articles referenced in the included studies. The review adhered to the SANRA principles for narrative reviews [24].

Results

DIE and Pelvic Floor Muscles dysfunction: prevalence and pathophysiology

In 2021, Fraga et al. [26] conducted a detailed cross-sectional study at a tertiary academic hospital's Endometriosis Outpatient Clinic, involving a total of 160 women. Among these, 80 were diagnosed with DIE affecting the bowel or septovaginal regions and were currently undergoing hormonal therapy. The other 80 women, serving as a control group, were attendees of various other outpatient services within the same hospital. Both groups were selected based on their recent history of heterosexual vaginal intercourse within the month prior to their participation in the study and underwent comprehensive physical examinations.

The study's assessments included sterile swab tests and vaginal palpation to identify conditions such as vulvodynia, vaginismus, variations in muscle tone (hyper/hypotony), trigger points, and pain along the vaginal walls. Pain intensity was quantitatively measured using the visual analogue scale (VAS), and the dynamics of pelvic floor muscle (PFM) contractions and relaxations were evaluated through the Modified Oxford scale (PERFECT). Additional diagnostic tests such as the Carnett test were employed to assess abdominal pain. Tests like the Thomas, Pace, and Ober evaluated shortening of the muscles in the lower limbs, and the Schöber test measured the mobility of the lumbosacral area.

The findings from this study revealed significant differences between the two groups. Women with DIE who were receiving hormonal therapy reported more frequent symptoms than those in the control group. Specifically, these symptoms included an increased prevalence of PFM hypertonia, trigger points, and pain during vaginal examinations. Additionally, women with DIE demonstrated weaker PFM contractions and less effective muscle relaxation compared to the control group. The assessments of pain in the abdominal area and lower limbs, particularly in aspects related to pelvic stabilization, consistently showed more pronounced issues in the group affected by DIE. The study linked the presence of pain notably to PFM hypertonia and the inability to fully relax these muscles.

The implications of these findings led the authors to advocate strongly for the inclusion of PFM assessments in the routine care protocol for patients suffering from chronic pelvic pain (CPP) associated with endometriosis. By integrating these evaluations, healthcare providers can gain better insights into the muscular dysfunctions contributing to CPP and thus tailor more effective management and treatment strategies for this patient population. This approach suggests a more nuanced understanding of the interplay between muscular and neurological factors in endometriosis-related pelvic pain, underscoring the need for a multidisciplinary approach to treatment that addresses both hormonal and musculoskeletal aspects of the disease. However, causality cannot be inferred due to the study’s observational nature, and confounding by hormonal treatment or disease severity remains unaddressed. The reliance on clinical palpation and subjective measures, while clinically relevant, limits generalizability.

Pelvic Floor Dysfunction and Surgical Treatment for DIE

In 2022, Fraga et al. carried out a comprehensive systematic review and meta-analysis [26], meticulously analyzing six randomized controlled trials selected from the PubMed database, published up to January 5, 2021. The purpose of their study was to evaluate the effectiveness of various surgical treatments on pelvic floor dysfunctions associated with DIE. These dysfunctions included urinary incontinence (UI), pelvic organ prolapse (POP), fecal incontinence (FI), constipation, and sexual dysfunction (dyspareunia).

The array of surgical interventions assessed was diverse, encompassing laparoscopic or open colorectal resections, more conservative approaches such as shaving or disc excision, as well as more radical procedures like segmental rectal resection. Additionally, techniques involving laparoscopy with electroablation or CO2 laser ablation were reviewed, along with combinations of these methods, some including presacral neurectomy. This variety in surgical techniques reflects the complexity and severity of DIE, necessitating tailored surgical responses based on individual patient conditions and the extent of endometrial infiltration.

The outcomes of the meta-analysis revealed significant improvements in dyspareunia, constipation, and FI following surgical intervention. These results highlight the potential for surgical management to alleviate some of the most debilitating symptoms of DIE. However, the meta-analysis also exposed substantial variability in the results, which was attributed to the heterogeneity of the surgical methods employed across the studies. This diversity in techniques poses a challenge to conclusively determining the superiority of one method over another.

During their discussion, Fraga et al. recognized the difficulties inherent in synthesizing a holistic data analysis due to the varied nature of the studies involved. Although subgroup analyses did show some benefits for specific symptoms, particularly dyspareunia and FI, no single surgical technique was identified as overwhelmingly superior across all outcomes. This indicates that while surgery can be beneficial, the optimal approach may vary depending on the specifics of each case.

Moreover, Fraga et al. [26] pointed out a notable deficiency in the available data concerning the effects of these surgical interventions on UI and POP. This gap in data significantly impedes a thorough methodological review and understanding of how these common aspects of pelvic floor dysfunction respond to surgical treatment in the context of DIE. However, the heterogeneity in surgical techniques (shaving, disc excision, segmental resection) and outcome measures complicates interpretation. The lack of consistent reporting on urinary and prolapse outcomes weakens the review's comprehensiveness. The evidence suggests that while surgery offers symptom relief, it is unlikely to address the full spectrum of PFD and should be integrated into broader, multimodal care.

In conclusion, while the systematic review by Fraga et al. confirmed that surgical interventions could lead to improvements in certain symptoms of DIE, such as dyspareunia and FI, the variability in surgical practices and the lack of comprehensive data on all relevant pelvic floor dysfunctions make it challenging to definitively attribute these improvements to any specific surgical technique. The findings underscore the need for further research into standardized approaches that could potentially offer consistent results across the spectrum of DIE-related pelvic floor dysfunctions.

The impact of Ultrasound Imaging on Pelvic Floor Dysfunction in DIE women

In a series of rigorous studies, researchers explored the relationship between DIE and pelvic floor muscle (PFM) dysfunction through various methodologies and patient groups, highlighting the potential of pelvic floor physiotherapy (PFP) in managing symptoms associated with DIE.

Del Forno et al. [27, 28] conducted two sequential randomized controlled trials involving nulliparous women diagnosed with DIE and experiencing superficial dyspareunia. The first study in 2021 involved initial assessments using 3D/4D transperineal ultrasound to examine the levator hiatal area (LHA) in different states, with subsequent PFP sessions for half the participants. Follow-up evaluations showed that the treatment group had improved PFM relaxation and reduced pain levels compared to the control group. The subsequent 2022 trial replicated the setup but expanded the follow-up assessments to include urinary, bowel, and sexual functions. Although PFP did not significantly alter these functions, it did show promise in improving constipation symptoms, suggesting a nuanced benefit of PFP in managing DIE-related complications.

Raimondo et al. [29], in 2017, conducted a pilot prospective study assessing PFM morphometry using the same ultrasound technology in women with DIE compared to healthy controls. Their findings indicated that women with DIE had consistently smaller LHA measurements, suggesting inherent PFM dysfunctions that could be contributing to the symptoms of DIE.

Mabrouk et al. [30], in 2018 further investigated the link between PFM hypertonic dysfunction and DIE by enrolling women with ovarian endometriosis for a prospective study. Their research confirmed that women with DIE typically had smaller LHA measurements, reinforcing the theory that PFM dysfunction is a significant factor in the pathology of DIE and related pelvic organ dysfunction [31].

In a 2022 observational prospective cohort study, Raimondo et al. [32] examined the specific association between chronic constipation and PFM dysfunction in women with endometriosis. This study revealed distinct ultrasound characteristics in women with endometriosis and constipation, particularly noting increased signs of pelvic floor muscle hypertonia in these patients.

In 2019, Mabrouk et al. [33] analyzed the relationship between voiding dysfunction and PFM morphometry in patients with posterior DIE. Their findings indicated a link between PFM dysfunction and voiding issues, as evidenced by LAM coactivation during the Valsalva maneuver being more prevalent in patients with voiding dysfunction.

Lastly, in 2022, Arena et al. [34] utilized a 4-point pelvic contraction scale in a study employing transperineal 3D/4D ultrasound to assess PFM function in nulliparous women scheduled for endometriosis surgery compared to healthy controls. The study demonstrated that this scale could effectively assess PFM function, offering a reliable method to detect dysfunctions and potentially guide targeted PFM rehabilitation therapies.

Collectively, these studies underscore the significant role of PFM dysfunctions in DIE and illustrate the potential of targeted pelvic floor interventions in alleviating some of the debilitating symptoms associated with this condition. However, inconsistent effects on urinary and bowel symptoms may reflect patient heterogeneity, variability in PFP delivery, or insufficient treatment duration. Raimondo and Mabrouk's morphometric findings confirm anatomical changes, but again, causality is uncertain. Together, these studies validate TPU for both diagnosis and therapeutic monitoring, though standardized protocols are still lacking.

In 2019, Meng Xie and colleagues [35] executed a prospective observational study that utilized transperineal elastography to assess the elasticity of PFM in various patient groups. This study encompassed 88 participants who were categorized based on their medical conditions: those with DIE formed Group I, those with ovarian endometrioid cysts constituted Group II, and those with ovarian teratomas were placed in Group III. The transperineal elastography conducted on these groups revealed that the PFMs in the DIE group exhibited both reduced elasticity and compromised coordination.

Building on this research, Meng Xie et al. [36] conducted a retrospective study in 2020 to further explore the effects of surgical treatment on PFM elasticity in DIE patients. This study involved 34

patients who had undergone laparoscopic surgery for colorectal endometriosis and were divided into two subgroups: 21 patients underwent colorectal shaving (Group I) and 13 underwent segmental colorectal resection (Group II). Transperineal elastography was utilized to measure the elasticity of the levator ani muscle before and after the surgical procedures. The findings indicated that both types of surgery—shaving and segmental resection—had a significant impact on the elasticity of the levator ani muscle in DIE patients, with the changes effectively captured by the transperineal elastography. However, small sample sizes and absence of clinical correlation with symptoms limit applicability. Larger validation studies are needed to establish its prognostic value and sensitivity to therapeutic change.

Urinary Dysfunction before and after DIE surgery

In a 2014 prospective study led by Marcos Ballester and his colleagues [37], the team investigated how surgery for DIE affects urinary function and patients' quality of life. The study included 50 patients scheduled for surgical treatment due to DIE. Researchers utilized urodynamic tests and electromyography to evaluate urinary dysfunction before and after surgery. Electromyography was particularly aimed at identifying neurogenic changes associated with sacral reflexes and the pelvic floor muscles, frequently involved in cases of colorectal endometriosis.

To further understand the impact on patients' daily lives, the study incorporated the Bristol Female Lower Urinary Tract Symptoms (BFLUTS) questionnaire, a tool designed to evaluate the severity of urinary symptoms and their effect on quality of life.

The study's results indicated a high incidence of urinary symptoms and neurogenic dysfunction in patients prior to surgery. While there was a notable improvement in BFLUTS scores shortly after surgery, suggesting some immediate relief from symptoms, these improvements did not persist long-term. Moreover, comparisons of urodynamic tests before and after surgery showed no significant changes, pointing to a static urodynamic state despite surgical intervention.

Interestingly, the development of peripheral neuropathy post-surgery was observed solely in those patients who underwent both DIE and colorectal resection, highlighting a specific risk associated with this more invasive surgical approach [38].

Overall, the research by Ballester and his team sheds light on the complex relationship between surgical treatment for DIE, urinary dysfunction, and the broader impact on quality of life. It emphasizes the importance of cautious surgical planning and raises awareness about the potential long-term challenges and neurological risks that may accompany surgery in the treatment of DIE. However, the lack of urodynamic improvement, despite early gains in quality-of-life scores, points to a mismatch between structural and neuromuscular resolution. This disconnect likely reflects irreversible nerve injury or persistent PFM hypertonia. The findings advocate for cautious surgical planning, particularly in colorectal procedures, and emphasize the need for non-surgical adjuncts to address persistent dysfunction.

Discussion

The relationship between Die and PFD is increasingly recognized as clinically significant, yet remains inadequately understood. This review identifies recurring patterns, pelvic floor hypertonia, altered levator ani anatomy, and pain sensitization, that suggest a shared neuromuscular pathophysiology, beyond mere anatomical distortion caused by DIE lesions; especially, we found that these women suffer commonly chronic pelvic pain, urinary symptoms, gastrointestinal symptoms, and sexual dysfunction as Dyspareunia.

Hormonal terapy does not seem to significantly improve chronic pelvic pain in these women [25], while the PFP seems to have a good impact on superficial dyspareunia, chronic pelvic pain and

pelvic floor muscle relaxation [27]; however, PFP appears controversial [28]. It demonstrates promise, especially for dyspareunia and PFM relaxation, but results remain inconsistent across studies. The heterogeneity in treatment regimens, therapist expertise, and outcome measures likely contributes to the variable efficacy observed in analyzed trials [26-31]. This variability highlights the urgent need for standardized PFP protocols and functional outcome endpoints.

Surgical treatment for DIE, particularly in cases with colorectal involvement, should improve dyspareunia and FI [26], but without solid evidence to support the superiority of a technique. Furthermore, DIE surgical treatment does not significantly improve long-term urinary measurement [37]. Instead, to treat pelvic floor dysfunction directly by, for example, the repair of the native vaginal tissue in symptomatic rectocele, is associated with a good risk profile and improvement of the disorders related to prolapse and dyspareunia [39].

At present, regarding urinary incontinence, one of the actual goals in urogynecology is the research of minimally invasive techniques for its treatment [40,41]. Moreover, urinary dysfunction seems to be linked with sexual function: there is strong evidence that urinary incontinence negatively affects female sexual function. Treatments aimed to cure urinary incontinence (including PFMT, medications, and surgery) seem to improve quality of life by recovering, at least for sexual function [42,43]. In this regard, pharmacotherapy with ospemifene has proven useful in treating urinary disorders in post-menopausal women with vulvovaginal atrophy [44] and a similar result was also obtained using purified bovine colostrum [45]. Both tools improved sexual function and quality of life in enrolled women. Furthermore, in women whose vulvovaginal atrophy is related to hormonal therapies for the treatment of gynecological cancer, the use of fractional CO2 laser seems to be a useful therapeutic tool [46]. It should be noted that recurrent post-coital urinary tract infections also have a very negative impact on the quality of sexual function. An oral combination of hyaluronic acid, chondroitin sulfate, curcumin and quercetin has shown to be effective in their prevention [47].

Moreover, it seems common evidence that ultrasound imaging, especially 3D/4D TPU, is a promising tool to use in the diagnosis of pelvic floor dysfunction and in the management and follow-up of all these women. Their ability to quantify muscle elasticity and hiatus dimensions may help stratify patients, predict symptom trajectories, and tailor interventions. However, the predictive value of these modalities remains unvalidated, and their integration into routine practice requires further cost-effectiveness and feasibility assessment [27-29, 48].

Conclusions

PFD is a common and often unrecognized problem in women with DIE. At present, there is still a lot of uncertainty about a noninvasive useful treatment for these women, and surgery seems to remain the only solid tool to improve some aspects of this condition. However, it is not possible to prove the superiority of a technique. Promising evidence, instead, is switching the paradigm of the issue: from a purely lesion-oriented surgical model to a multidisciplinary framework incorporating functional diagnostics, physiotherapy, and individualized care, incorporating 3D/4D TPU and various treatment pathways (surgical, physical, pharmacological, or dietary supplement-based).

Authors contribution

Conceptualization, NI, RM; Data curation, DV, MR, FMC; Formal Analysis, AC, MF; Investigation, IM; Methodology, CV Project administration, DDN, GN; Writing – original draft, PF, DDN, NI; Writing – review & editing, DV, MR, FMC, AC, MF, IM, CV, DDN, GN.

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Study registration

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Disclosure of interest

The authors declare no conflict of interest.

Ethical approval

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Data sharing statement

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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Table 1. Characteristics of key studies included

Study (Author, Year)	Population	Study Objective	Methodology	Key Results	Conclusions
Fraga et al., 2021	160 women (80 with DIE, 80 control group)	Investigate pelvic floor muscle dysfunction in women with DIE	Clinical evaluation, VAS and PERFECT scales, Carnett test	DIE patients showed increased pelvic floor muscle hypertonia and pain during vaginal palpation	Need to incorporate pelvic floor muscle assessment into DIE patient care
Del Forno et al., 2021	34 nulliparous women with DIE and superficial dyspareunia	Evaluate the effectiveness of pelvic floor physiotherapy (PFP) using transperineal ultrasound	3D/4D transperineal ultrasound, pain rating scale, physiotherapy	PFP improved superficial dyspareunia and muscle relaxation	PFP appears to improve dyspareunia and muscle relaxation
Mabrouk et al., 2018	Symptomatic women with clinical/sonographic diagnosis of endometriosis	Assess the association between hypertonic pelvic floor muscles and deep lesions in DIE women	3D/4D transperineal ultrasound to measure levator hiatus area (LHA)	DIE women showed a smaller LHA at rest, contraction, and during Valsalva	Transperineal ultrasound is useful for comprehensive functional assessment
Raimondo et al., 2017	50 nulliparous women with DIE and 35 healthy women	Evaluate static and dynamic pelvic floor muscle morphometry using 3D/4D ultrasound	3D/4D transperineal ultrasound, measurement of LHA areas	DIE women showed less marked LHA reduction during contraction and less enlargement during Valsalva	3D/4D ultrasound can detect pelvic floor muscle dysfunction in DIE women
Meng Xie et al., 2019	88 patients with DIE, endometriotic cysts, or ovarian teratoma	Assess pelvic floor muscle elasticity in DIE patients using	Pre- and post-operative transperineal elastography	DIE was associated with decreased pelvic floor	Transperineal elastography can monitor post-surgical changes in

		transperineal elastography		muscle elasticity	pelvic floor muscles
Fraga et al., 2022	6 randomized controlled trials	Assess the impact of surgery on pelvic floor disorders (urinary incontinence, prolapse, bowel dysfunction, dyspareunia)	Meta-analysis, systematic review of surgical techniques	Significant improvements in dyspareunia and fecal incontinence post-surgery	Surgery improves some aspects of pelvic floor disorders, but no technique superiority was demonstrated
Ballester et al., 2014	50 patients with DIE requiring surgery	Evaluate urinary dysfunction before and after DIE surgery	Urodynamic tests, electromyography, quality of life questionnaires	Pre-operative neurogenic dysfunctions correlated with DIE	Urinary dysfunction persists long-term despite surgery
Meng Xie et al., 2020	34 patients undergoing surgical resection for endometriosis	Assess changes in levator ani elasticity post-surgery	Pre- and post-operative transperineal elastography	Both surgical techniques altered levator ani elasticity	Elastography can monitor post-operative pelvic floor muscle changes
Arena et al., 2022	Women with OE, DIE, and healthy volunteers as controls	Evaluate pelvic floor muscle function using a quick 4-point contraction scale	3D/4D transperineal ultrasound and quick 4-point contraction scale	The quick 4-point scale can rapidly detect pelvic floor muscle dysfunction	The 4-point scale is a useful tool to detect pelvic floor muscle dysfunction
Meng Xie et al., 2019	88 patients with DIE, ovarian cysts, or teratoma	Assess pelvic floor muscle elasticity using elastography	Transperineal elastography pre- and post-operation	DIE patients showed decreased pelvic floor elasticity	Elastography can monitor changes in pelvic floor muscles
Ballester et al., 2014	50 patients with DIE who required surgery	Evaluate urinary dysfunction before and after DIE surgery	Urodynamic tests, electromyography, BFLUTS questionnaire	High incidence of urinary dysfunction before surgery; no significant	Urinary dysfunction persists long-term after DIE surgery

				post-surgical improvement	
Raimondo et al., 2022	Women with DIE and chronic constipation	Investigate trans-perineal ultrasound signs in women with DIE and constipation	Trans-perineal ultrasound at rest and during Valsalva maneuver	DIE patients with constipation had smaller LHA and higher LAM coactivation	Trans-perineal ultrasound is useful for diagnosing PFM dysfunction
Del Forno et al., 2021	34 nulliparous women with DIE and dyspareunia	Evaluate the impact of PFP on pelvic floor relaxation using ultrasound	3D/4D transperineal ultrasound, pain scale, physiotherapy	PFP improved pelvic floor muscle relaxation and reduced chronic pelvic pain	PFP appears to improve pelvic floor function in DIE patients
Arena et al., 2022	Women with ovarian endometriosis or DIE	Assess PFM function using a quick 4-point contraction scale	3D/4D transperineal ultrasound and quick contraction scale	Quick scale reliably detected PFM dysfunction in endometriosis patients	Quick scale is a practical tool for PFM assessment
Mabrouk et al., 2018	Women with or without DIE undergoing surgery	Analyze pelvic floor muscle dysfunction in DIE patients	Clinical and sonographic assessments, laparoscopic surgery	DIE patients had smaller LHA and reduced PFM contraction	Tailored therapy is necessary for DIE-related PFM dysfunction
Fraga et al., 2022	Meta-analysis of six randomized controlled trials	Evaluate the impact of surgical treatment on pelvic floor disorders	Systematic review and meta-analysis	Dyspareunia and FI improved after surgery, but no superior technique identified	Surgery can improve pelvic floor disorders, but further studies are needed

DIE: deep infiltrating endometriosis; PFM: pelvic floor muscle; PFP: pelvic floor physiotherapy; ; VAS: visual analog scale; LHA: levator hiatal area; LAM: levator ani muscle: OE: ovarian endometriosis,