Rivista Italiana di Colon-Proctologia Founded in 1982

PELVIPERINEOLOGY

CONTENTS

2026
Volume: 45
Issue: 2
August

www.pelviperineology.org

ISSN: 1973-4905 E-ISSN: 1973-4913

galenos Publishing House

PELVIPERINEOLOGY
Rivista Italiana di Colon-Proctologia Founded in 1982

EDITORIAL BOARD

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The journal is published online.

Owner: The International Society for Pelviperineology

Responsible Manager: Ahmet Akın Sivaslıoğlu

Editorial Office: International Society for Pelviperineology
e-mail: editorinchief@pelviperineology.org
Quarterly journal of scientific information registered at the Tribunale di Padova, Italy n. 741 dated 23-10-1982 and 26-05-2004
The journal is property of the International Society for Pelviperineology

Publisher Contact
Address: Molla Gürani Mah. Kaçamak Sk. No: 21/1 34093 İstanbul, Türkiye
Phone: +90 (212) 621 99 25
Fax: +90 (212) 621 99 27
E-mail: info@galenos.com.tr/ yayin@galenos.com.tr
Web: www.galenos.com.tr
Publisher Certificate Number: 14521

Printer: La Grafica Faggian, Via F. Severi 2/4 Campodarsego (Padova) IT
E-mail: comm@lagraficafaggian.it
Printing Date: August 2026
ISSN: 1973-4905 E-ISSN: 1973-4913

International scientific journal published quarterly.

Official Journal of the: International Society for Pelviperineology (www.pelviperineology.com)
Associaciòn LatinoAmericana de Piso Pelvico
Perhimpunan Disfungsi Dasar Panggul Wanita Indonesia
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Editorial: Safeguarding Patient Confidentiality in Medical Publishing

Protecting patient confidentiality is one of the fundamental ethical responsibilities of authors, reviewers, editors, and publishers. Respect for patient privacy is an essential principle of medical publishing and is reflected in the recommendations of international publication ethics organizations. Every effort must be made to ensure that no information capable of identifying a patient appears in a published article without explicit and appropriate authorization.

In a previous issue of our journal, we unfortunately failed to identify that a patient's name was visible on an ultrasonography report included in a published figure. As a result, a breach of patient anonymity occurred. We sincerely regret this oversight and acknowledge our responsibility in ensuring that all published material is carefully reviewed to protect patient confidentiality.

Upon recognition of this error, the identifying information was removed, and an Erratum has been published to correct the scientific record. In addition, we have reviewed our editorial procedures and reinforced our pre-publication quality control measures to minimize the risk of similar incidents in the future. Particular attention will be given to the careful inspection of all clinical images, radiological studies, pathology reports, and supplementary materials for any inadvertently disclosed patient identifiers.

Although this error does not affect the scientific content or conclusions of the article, it highlights the importance of maintaining vigilance throughout every stage of the editorial and publication process. Patient privacy is a core ethical obligation that must never be compromised.

On behalf of the Editorial Board, I extend our sincere apologies to the patient, the authors, and our readers for this regrettable oversight. We remain firmly committed to upholding the highest standards of publication ethics, editorial responsibility, and respect for patient confidentiality.

We are publishing the August 2026 issue of our journal, featuring publications of undeniable scientific quality that will undoubtedly contribute to the medical literature. This issue includes highly important research, case reports, brief reports, and reviews focusing on gynecology, pelviperineology, functional female genital aesthetics, female sexual function, infertility, laparoscopy, and V-notes. I would like to thank the researchers from diverse geographical regions for these articles and our reviewers who evaluated them without expecting any compensation. We are extremely pleased to see that the Article Processing Charge (APC), which we implemented to ensure the independent existence of our journal and the publication of high-quality scientific content, is largely supported by the authors.

Your support for our journal is our most important motivation.

Stay healthy,

Prof. Dr. Ahmet Akın SIVASLIOĞLU

Editor-in-chief

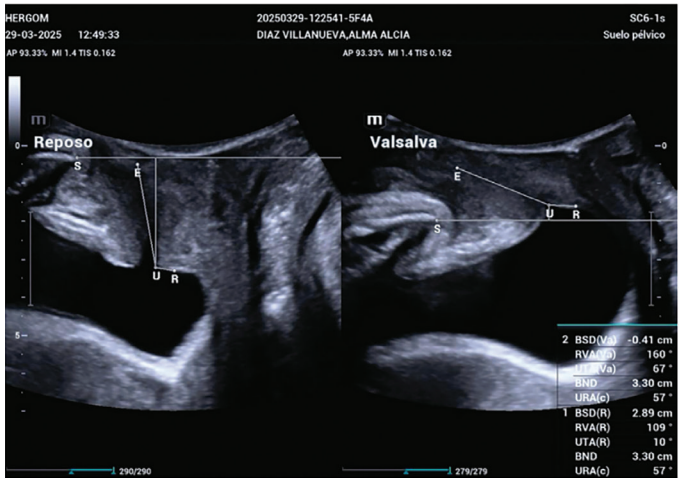
DOI: 10.34057/PPj.10.34057/PPj.2026.45.02.e001
Pelviperineology 2026;45(2):52

DOI: 10.34057/PPj.2026.45.01.76486

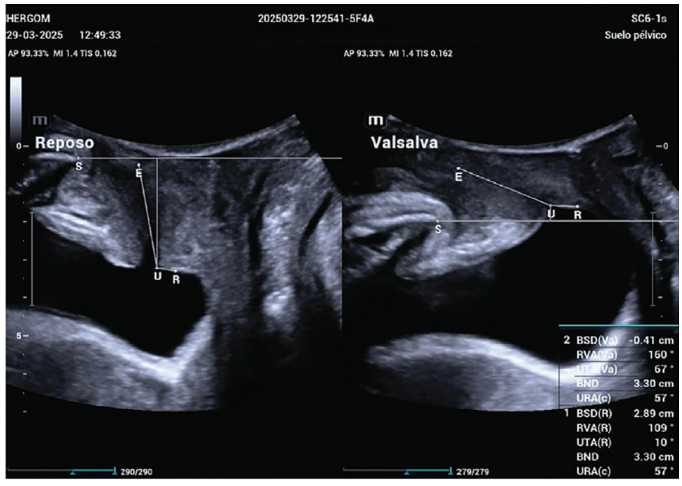
Maiti S, Aguilar DLL, Apodaca FJC. Intraoperative evaluation of the effectiveness of sling positioning. Pelviperineology. 2026;45(1):47-51

The author omitted the patient's name on Figure 3; Figure 3 has been revised.

The uncorrected version is as follows:



The corrected version is as follows:



It was stated that patient consent was not obtained, but the author forgot that a form was collected and stated that no information was received; however, it has been revised as follows:

The uncorrected version is as follows:

Informed Consent: The authors state that no patient data appear in this article.

The corrected version is as follows:

Informed Consent: Written informed consent was obtained from the patient prior to submission and publication of this case report.

BRIEF REPORT

DOI: 10.34057/PPj.2026.45.02.2025-2-1
Pelviperineology 2026;45(2):53-57

Pessary self-management: A national survey of urogynaecologists in the United Kingdom

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Citation: Yoong CY, Dembinsky M, Kearney R, Hagen S, Bugge C, Khunda A. Pessary self-management: a national survey of urogynaecologists in the United Kingdom. Pelviperineology. 2026;45(2):53-57

ABSTRACT

This project aims to evaluate the obstacles, as viewed by specialists affiliated to the British Society of Urogynaecology (BSUG), in implementing pessary self-management for women with pelvic organ prolapse. A 7-item survey was sent to 466 members of BSUG by e-mail. Data were collected on unit demographics and obstacles to the wider adoption of self-management of pessaries. We received 88 responses. Of those, 15/88 respondents (16.9%) did not have an urogynaecology nurse and 13/88 (14.8%) had no regular nurse-led pessary clinic. However, 47/88 (53%) stated that they see at least 3 patients who are suitable for pessary self-management per week, but only 39/88 (44%) offer self-management tuition for more than half of their suitable patients. Pessary self-management was more likely to be offered to at least 20% of eligible patients in units with 3 or more urogynaecology nurses compared to units with none (16/22 versus 5/15, p=0.0176) and in units with a regular nurse led clinic compared to those without (47/75 vs. 4/13, p=0.031). The top three challenges in expanding pessary self-management tuition were: Lack of human resources, lack of patient engagement or suitability and lack of clinic time. The majority stated that main barriers could be overcome with adequate clinic time to address patient concerns and encourage them to try changing their own pessary. A significant number of patients who are suitable for pessary self-management are currently receiving clinic-based care. Research is necessary to further evaluate the cultural and organisational barriers to wider utilisation of self-management of pessaries.

Keywords: Pessary self-management; pelvic organ prolapse; cystocele

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Received: 12 February 2025 **Accepted:** 30 April 2026 **Publication Date:** 04 August 2026

INTRODUCTION

Pelvic organ prolapse (POP) is a common condition that can cause distress and negatively affect the quality of life of women. The prevalence of POP varies world-wide. The International Urogynaecology Association published a consultation paper in 2023 quoting a 1-65% prevalence rate, based on symptoms (1-31%), pelvic examination (10-50%), or both (20-65%).[1] POP can be managed conservatively or surgically. Interest in conservative management has increased subsequent to the widely publicised complications of mesh prolapse repair. One of the conservative treatment options available for POP is the use of a vaginal pessary to support the prolapse. The pessary helps to restore prolapsed organs to their natural position with the aim to relieve associated symptoms. Vaginal pessaries are typically fitted by a healthcare professional in an outpatient clinic setting. Patients will then return every 4-6 months for a review and have the pessary renewed. This is referred to as clinic-based pessary management. Having to attend regular clinic appointments can be inconvenient for the women and it can be a reason women opt for surgical management of POP.[2] Other reasons for pessary discontinuation include side-effects such as vaginal discharge.[2,3] A proportion of prolapse sufferers end up having an operation for their prolapse. The life-time risk of undergoing surgery for POP in the UK is 9.5%.[4]

The alternative to clinic-based pessary management is pessary self-management, in which women are taught how to remove, clean and reinsert the pessary themselves. This allows the women to manage their condition in a way that best suits their lifestyle. The treatment of prolapse with self-care pessary (TOPSY) trial demonstrated that self-management of vaginal pessaries for prolapse is not only feasible and cost-effective but also associated with fewer complications.[5] By reducing the number of patients attending the clinic for routine pessary changes. Outpatient clinic capacity is increased to accommodate new referrals, and healthcare resources are utilised more efficiently. Pessary self-management also has the potential of a lower carbon footprint for the service. However, the implementation of pessary self-management is still not widely adopted in the United Kingdom (UK) and many other countries. This project aims to understand the organisational set up of urogynaecology departments in the UK and evaluate the obstacles, as viewed by the British Society of Urogynaecology (BSUG) specialists, in implementing pessary self-management for patients with pelvic organ prolapse.

MATERIALS AND METHODS

The survey was conducted in the UK in 2023. A total of 466 members of BSUG were contacted by e-mail by the BSUG secretary and asked to complete a 7-item survey. Data were collected on unit demographics, including the number of urogynaecologists, the number of urogynaecology nurses and the availability of a regular nurse-led pessary clinic in the unit. The survey also aimed to identify the number of patients who were suitable for pessary self-management being seen in the clinic per week and whether pessary self-management tuition was being offered to those suitable patients. Participants were asked about the obstacles in their unit to widen the implementation of pessary self-management. Free-text comments were invited to further understand the opinions of the BSUG specialists regarding pessary self-management.

Statistical Analysis

Data were analysed using SPSS version 15.0 for Windows software (SPSS, Chicago, IL, USA). Quantitative data were presented as ratios and percentages, and analysed using the chi-squared test to test for associations between demographics and responses. The free-text section was analysed using a Framework Approach.[6] A significance level of $p<0.05$ was considered statistically significant.

RESULTS

Eighty-eight responses were received and evaluated. The Table 1 summarises the baseline characteristics of the units from which the specialists responded. Among the 88 responses received, 4 (4.5%) of them did not have a urogynaecologist in their unit and 15/88 (17.1%) of them did not have a urogynaecology specialist nurse in their unit. Of the 88 respondents, 46 (52.3%) had more than three urogynaecologists in their units, whereas 22/88 (25.0%) had more than three urogynaecology specialist nurses in their units. A total of 75/88 (85.2%) respondents had a regular nurse-led clinic in their unit and 13/88 (14.8%) did not have a regular nurse-led clinic.

Table 1. Number of urogynaecologists and urogynaecology specialist nurses in the unit

	Number of urogynaecologist in the unit	Number of urogynaecology specialist nurses in the unit
None	4 (4.5%)	15 (17.1%)
One	11 (12.5%)	23 (26.1%)
Two	27 (30.7%)	28 (31.8%)
More than three	46 (52.3%)	22 (25.0%)

Among the 88 responses received, 100% of respondents reported seeing at least one patient who is suitable for pessary self-management per week in the clinic and up to 47/88 (53%) stated that they see at least 3 of those patients per week. Only 39/88 (44%) of the respondents' units offered pessary self-management tuition to more than half of their suitable patients. Some units did not offer self-management tuition to their patients at all: 11/88 (12.5%), Figure 1. In our endeavour to study factors that affect whether a unit offers pessary self-management tuition regularly or not, we studied three factors: Number of urogynaecologists, number of urogynaecology nurses and whether there was a nurse-led pessary clinic. The numbers were too small for a multivariable analysis, so we performed a comparative analysis of variables where the numbers allowed a comparison. Four respondents had no urogynaecologist in their units and 6 respondents had more than four urogynaecologist in their units. Regarding the number of urogynaecology specialist nurses, in units with three or more urogynaecology nurses, 16/22 offered pessary self-management to at least 20% of their patients. In comparison, only 5/15 of units with no urogynaecology nurses offered pessary self-management to at least 20% of their patients [$X^2(1, n=88)=5.64$, $p=0.0176$). Regarding the presence or absence of a nurse-led pessary clinic, 47/75 of the respondents who had a regular nurse led pessary clinic, offered pessary self-management to at least 20% of their patients, compared to only 4/13 respondents who did not have a regular nurse led pessary clinic in their unit [$X^2(1, n=88)=4.62$, $p=0.031$].

The top three challenges in expanding pessary self-management tuition for patients as reported by our respondents were lack of human resources 52/88 (59%), lack of patient engagement or suitability 49/88 (56%) and lack of clinic time 44/88 (50%), Figure 2. The lack of human resources mainly referred to practitioners who can deliver pessary self-management tuition to patients.

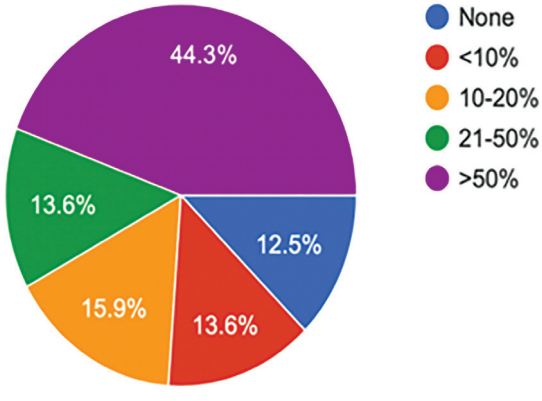

Figure 1. The percentage of patients under your care who are suitable for pessary self-management, being offered pessary self-management tuition

There were 40 free-text comments received. Most of the clinicians were concerned about the suitability of pessary self-management for patients of a certain age group, especially elderly patients with limited manual dexterity and physical fitness. Respondents felt that the idea of self-management is still not widely accepted by patients mainly due to lack of confidence. Most respondents stated that the main barriers could be overcome with adequate clinic time to address patient concerns and encourage them to try managing their pessary themselves.

DISCUSSION

This study focused on understanding the organisational setup of urogynaecology clinics and evaluating the obstacles, as viewed by the BSUG specialists, in implementing pessary self-management for patients with pelvic organ prolapse. This study demonstrated that a significant number of patients who are suitable for pessary self-management are currently receiving clinic-based care in the UK. Those units with the availability of regular nurse-led clinics and higher number of urogynaecology specialist nurses tend to offer pessary self-management tuition to more of their patients compared to other units. One of the top three challenges faced by healthcare professionals in implementing a pessary self-management service is the lack of human resources. This highlights the importance of recruiting and training more urogynaecology specialist nurses in the UK and of having a recognised clinical training and academic pathway for urogynaecology nurses. Vaginal pessary service is delivered by various healthcare professionals worldwide. In Australia it is commonly delivered by appropriately trained physiotherapists,[7] whilst in the UK, physiotherapists rarely offer pessary services. The role of the urogynaecology nurse is developing into an essential resource in every gynaecology

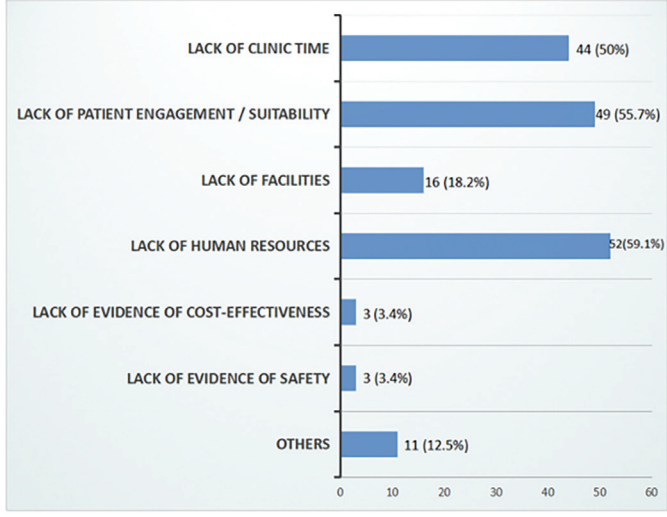

Figure 2. The challenges in expanding pessary self-management tuition

unit, similar to colposcopy nurses and hysteroscopy nurses, but various units are at different stages of embracing this role, partly due to the lack of a recognised training programme. Dwyer et al.[8] highlighted the importance of having a robust training or guidance for pessary practitioners offering pessary services to women.

The UK Clinical Guideline for best practice in the use of vaginal pessaries for POP recommends that women who are identified to be suitable for pessary self-management should be offered the option to manage their own pessaries.[9] There are several studies confirm the feasibility of women managing their own pessary,[10,11] and they suggest that it is associated with fewer complications compared to clinic-based care.[12] Attending the clinic every 6 months to change the pessary can have an impact economically on the healthcare system and personally to the patient. It also has a carbon footprint related to travel. The TOPSY trial demonstrated the cost- effectiveness of pessary self-management compared to clinic-based care.[13] According to the responses received in this survey, more than half of the units were seeing at least three patients who are suitable for pessary self-management per week, but only 44% of the respondents' units offered pessary self-management tuition to more than half of their suitable patients. This implies that a significant number of patients who are suitable for pessary self-management are currently receiving clinician-led care. This has also been reported by Paulussen et al.[14] who found that 80% of the patients who were receiving clinic-based care were suitable for self-management. The 2024 Royal College of Obstetricians and Gynaecologists report demonstrated that waiting lists for gynaecology in the UK have increased by a third since 2022.[15] If those units start to expand the service of pessary self-management, it may enable them to manage their clinic waiting times better.

A number of specialists felt that many patients would not be suitable for or keen to self-manage their pessaries. This view is also borne out of a survey of women in the UK. Dwyer et al.'s [16] survey of 89 women showed that 50% of women who were not taught pessary self-management before, were not willing to learn to self-manage their pessary. The reasons provided were lack of confidence; feeling physically unable; wanting clinician-led care and fear of problems or previous problems with their pessary. However, the TOPSY trial showed that pessary self-management is suitable for and well mastered by most women.[5] One explanation for the above views by patients and carers is unchallenged traditional views of paternalistic care. These can be overcome by education.[8] Concerns of women and carers can be addressed by training and education to affect a culture change in which self-management of pessary is a routine default option. A study by Mohamed and Eltohamy[17] mentioned that nurses should educate women regarding self-care of vaginal pessaries as this would increase their confidence. They concluded that empowering self-management of pessary in women with POP tends to improve the quality of life of women using vaginal pessaries. Another explanation for these views amongst carers is the resistance to let go of a recurring, relatively easy and in the case of private care, profitable-consultation. To address this, health policies and health insurance remuneration plans need to change to encourage and promote self-management of medical conditions.

One of the strengths of this study is that, to our knowledge, it is the first national study of factors influencing the offer of pessary self-management tuition for patients from the specialist viewpoint. Understanding the views of those healthcare professionals will greatly improve the success rate in expanding pessary self-management service because they are the care providers for women with POP and they know the dynamics within their department. The survey was conducted using a reliable method, collecting a mixture of quantitative and qualitative data.

Study Limitations

One of the limitations of this study is the relatively low response rate, with only 88 responses received from the 466 BSUG members contacted. This relatively low response rate introduces the potential for non-response bias, where the views and experiences of those who chose to participate may differ systematically from those who did not respond. For example, respondents may have been more engaged with the topic or more likely to work in units already offering pessary self-management, potentially leading to an overestimation of awareness, acceptance, or implementation of the practice. Consequently, the findings may not be fully representative of the wider clinical landscape in the UK. Despite the low response rate, the findings obtained reflect a diverse range of clinical settings and professional perspectives, offering valuable insights into current practice. Future research with improved response rates or supplementary qualitative methods could help to validate and build upon these findings. Another limitation of this survey is the lack of in-depth information about obstacles in implementing pessary self-management in individual units. Even though there were free text columns provided to encourage respondents to leave their comments and elaborate further on their views, there were only 40 free text comments received out of the 88 responses. Free text comments may not provide an in-depth insight into the reasons behind the reduced rate of offering pessary self-management tuition compared to qualitative interviews. It is possible that some respondents were from the same units leading to duplication. Also, the survey was exclusive

to specialists. Patients, nurses, and health managers could have different views on the issue. Therefore, further qualitative research may be conducted to investigate the perspectives of patients, healthcare professionals, and healthcare managers concerning pessary self-management.

CONCLUSION

Further in-depth qualitative research with a focus on implementation will provide more information on the challenges faced in expanding a the pessary self-management service. This, in turn, may facilitate the identification of effective strategies to address these challenges and enhance the uptake of pessary self-management across the UK.

Acknowledgements

We would like to thank Mrs Amanda King and the British Society of Urogynaecology for circulating the survey and the members who completed the survey. We also would like to thank members of the TOPSY research group for their comments.

FOOTNOTES

Contributions

Concept: A.K., Design: C.Y.Y., M.D., R.K., S.H., C.B., A.K., Analysis or Interpretation: C.Y.Y., A.K., Writing: C.Y.Y., M.D., R.K., S.H., C.B., A.K.

DISCLOSURES

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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DOI: 10.34057/PPj.2026.45.02.43531
Pelviperineology 2026;45(2):58-64

Impact of wedge labiaplasty with or without adjunctive procedures on genital self-image and sexual function

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Citation: Ceylan Y, Yüksel Aybek Ö, Yüksel B, Çalışkan E. Impact of wedge labiaplasty with or without adjunctive procedures on genital self-image and sexual function. Pelviperineology. 2026;45(2):58-64

ABSTRACT

Objective: To evaluate the motivations of women undergoing wedge labiaplasty and to evaluate the effect of the procedure on female sexual function and female genital self-image by comparing preoperative and postoperative outcomes.

Materials and Methods: A total of 54 sexually active women who underwent wedge labiaplasty performed by the same surgeons were prospectively enrolled in this study. Demographic characteristics, labial morphology, and surgical details were recorded. Patient motivations for surgery were documented preoperatively. Female genital self-image and female sexual function were assessed using the female genital self-image scale (FGSIS) and the female sexual function index (FSFI), administered before surgery and at three months postoperatively. Preoperative and postoperative scores were compared using paired-samples t-tests.

Results: The mean age of the participants was 39±5.2 years. Aesthetic concerns were reported by all patients, although a subset also described functional complaints as contributing factors. Concomitant procedures included labia majoraplasty in 64.8% and clitoral hood reduction in 87% of the patients. Partial wound dehiscence occurred in 9.3% of the cases and required revision surgery. The mean total FGSIS score increased significantly from 10.6±1.7 preoperatively to 25.9±1.1 postoperatively (p<0.001). The mean total FSFI score improved from 16.6±2.5 to 27.4±2.4 after surgery (p<0.001), with statistically significant improvements observed in all FSFI domains; arousal, lubrication, desire, satisfaction, orgasm, and pain.

Conclusion: Wedge labiaplasty, frequently performed in combination with adjunctive procedures, appears to be a safe and effective approach associated with significant improvements in genital self-image and sexual function. However, given the high rate of concomitant procedures, the specific contribution of the wedge technique alone should be interpreted with caution. Comprehensive preoperative counseling and individualized surgical planning remain essential to optimize outcomes.

Keywords: Wedge labiaplasty; genital self-image; female sexual function; FGSIS; FSFI; cosmetic gynecology

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Received: 04 March 2026 **Accepted:** 02 June 2026 **Publication Date:** 04 August 2026

INTRODUCTION

Labiaplasty, defined as a surgical procedure aimed at reducing the size of the labia minora, is currently the most commonly performed type of female genital cosmetic surgery (FGCS).[1] In recent years, the number of labiaplasty procedures has increased substantially worldwide, and the procedure is carried out by both gynecologists and plastic surgeons. This trend is reflected in the annual statistics of the International Society of Aesthetic Plastic Surgery (ISAPS) as well as various national societies.[2] According to the 2021 ISAPS Global Survey, a total of 171,088 labiaplasty procedures were reported, representing a 20.4% increase compared to 2020 and a 23.3% increase compared to 2017.[2]

Labiaplasty is often perceived primarily as a cosmetic procedure; however, in a substantial subset of patients, it is indicated for functional reasons. Labia minora hypertrophy may lead to pain and discomfort caused by friction, traction, and mechanical pressure during daily activities such as walking, sitting, wearing tight clothing, and engaging in physical exercise, thereby significantly limiting routine activities and exercise tolerance.[3,4] In addition, protruding labial tissue may promote moisture retention and reduced aeration of the vulvar region, predisposing patients to recurrent irritation, chronic vulvar discomfort, and an increased susceptibility to infections.[5] Some patients also report difficulties in maintaining adequate hygiene and reduced comfort during menstruation. Furthermore, during sexual intercourse, infolding or traction of hypertrophic labial tissue may contribute to dyspareunia and functional sexual dysfunction.[4] Pronounced labial asymmetry can similarly result in localized pressure and repetitive microtrauma. In this context, when performed with appropriate patient selection and surgical techniques that respect vulvar anatomy, labiaplasty should be regarded not merely as an aesthetic intervention but as a therapeutic surgical procedure aimed at alleviating mechanical symptoms, improving functional comfort, and enhancing overall quality of life.[4,5]

The labia minora and clitoral hood exhibit considerable anatomical variability with respect to size, shape, prominence, thickness, rugosity, pigmentation, and symmetry, underscoring the need for individualized surgical approaches. The two most commonly employed techniques for labiaplasty are the edge (trim) technique and the wedge technique. Although the edge (trim) technique is reproducible, this procedure disrupts the natural contour of the labia minora and may result in an irregular suture line that fails to achieve satisfactory aesthetic outcomes. In the wedge technique, a V-shaped segment of tissue is excised and subsequently closed, a procedure first described and refined by Alter.[1] Postoperative outcomes of labiaplasty procedures performed using the wedge technique have been reported to preserve the natural labial edges, thereby achieving more aesthetically favorable results.[6]

The present study aimed to systematically analyze the motivations of women undergoing wedge labiaplasty and to evaluate the effects of the procedure on body image, genital self-image, sexual satisfaction, and body confidence in the preoperative and postoperative periods.

MATERIALS AND METHODS

This study included 54 patients who underwent wedge labiaplasty performed by the same surgeons. The study received ethical approval from the İstanbul Medipol University Non-Interventional Clinical Research Ethics Committee (approval no: 1130; date: 11.09.2025) and all participants provided written informed consent. Although the study included surgical procedures, all interventions were performed as part of routine clinical practice, and the study design was observational. Therefore, approval was obtained from a non-interventional clinical research ethics committee. Data on demographic variables, including age, parity, and mode of delivery, were obtained.

During the preoperative genital examination, labia minora morphology was classified into three types: Type I (hypertrophy confined to the introitus), type II (hypertrophy extending laterally toward the superior region of the clitoral prepuce), and type III (hypertrophy extending across the entire clitoral prepuce).[7] Labial asymmetry was also recorded. Patients younger than 18 years and those without a history of sexual activity were excluded.

Participants were asked to specify their primary motivations for surgery, including functional complaints, aesthetic concerns, or symptoms associated with labial hypertrophy. At the preoperative planning stage, the wedge excision technique and any concomitant procedures, including labia majoraplasty or clitoral hood reduction, were documented. Wedge labiaplasty was planned with preservation of the free edge of the labia minora. A full-thickness wedge-shaped resection area was marked on the mid-portion of the labia minora using a sterile marking pen. The marked tissue was excised with cold scissors. After achieving hemostasis, layered closure was performed to reduce tension. The deep tissues and mucosal surface were closed using absorbable suture material. Interrupted sutures were placed using polyglytone monofilament sutures (Caprosyn®, 4-0/5-0, round needles). The procedure was completed after confirmation of symmetry and adequate tissue perfusion (Figure 1). Postoperatively, all patients were hospitalized overnight.

Following discharge, patients were prescribed oral antibiotics twice daily for one week and were instructed to cleanse the surgical area with an antiseptic solution three times daily for ten days. Representative photographs obtained preoperatively and at the 1-month postoperative follow-up in three patients are presented in Figures 2 and 3.

Clinical follow-up assessments were carried out at postoperative week 1, and at months 1 and 3. Resumption of sexual activity was permitted one month after surgery. Postoperative complications as well as any revision procedures were recorded during the follow-up period. Sexual function and genital self-perception were assessed using the female sexual function index [(FSFI), 19 items] and the female genital self-image scale [(FGSIS), 7 items], administered preoperatively and at three months postoperatively. Questionnaires were completed by the patients in private within a designated room.[8,9] To reduce potential response bias, patients were asked to complete the questionnaires independently in a private environment.

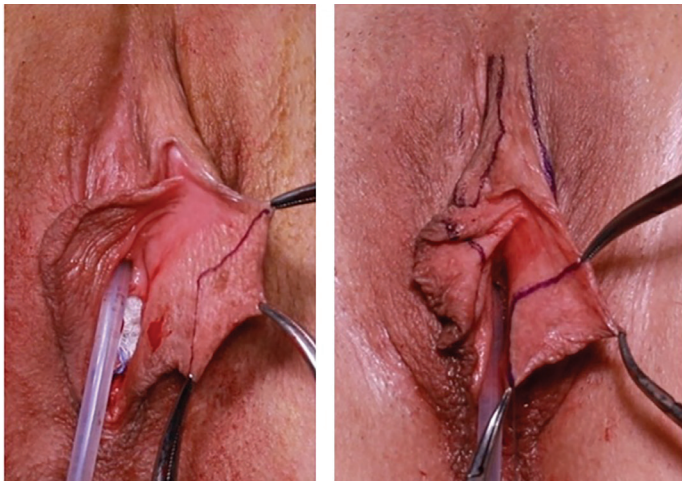

Figure 1. Intraoperative marks are made for wedge labiaplasty

Standardized Measures

Female sexual function was evaluated using the FSFI, a validated 19-item instrument assessing six domains: Desire, arousal, lubrication, orgasm, satisfaction, and pain. Total scores range from 2 to 36, with higher scores reflecting better sexual function. A score below 26.55 indicates the presence of sexual dysfunction.[8,10]

Genital self-image was evaluated using the FGSIS, a validated 7-item instrument. Responses are rated on a 4-point Likert scale ranging from strongly agree to strongly disagree, producing total scores between 7 and 28, where higher scores represent a more positive genital self-image.[7,9]

Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 25 (IBM Corp., Armonk, NY, USA). Categorical variables were described as frequencies and percentages, and continuous variables were presented as mean ± standard deviation. The normality of data distribution was assessed using the Shapiro-Wilk test prior to the application of parametric tests. Paired-samples t-tests were used to compare preoperative and postoperative FSFI and FGSIS scores. Statistical significance was defined as $p<0.05$.

A formal sample size calculation was not performed due to the exploratory nature of the study. However, all consecutive eligible patients within the study period were included, and the paired study design increased the statistical power to detect within-subject changes.

RESULTS

Patients had a mean age of 39±5.2 years, with ages ranging from 28 to 54 years. Of the study population, 19 patients (35.2%) were smokers and 35 patients (64.8%) were non-smokers. According to the classification of labia minora morphology, type II was the

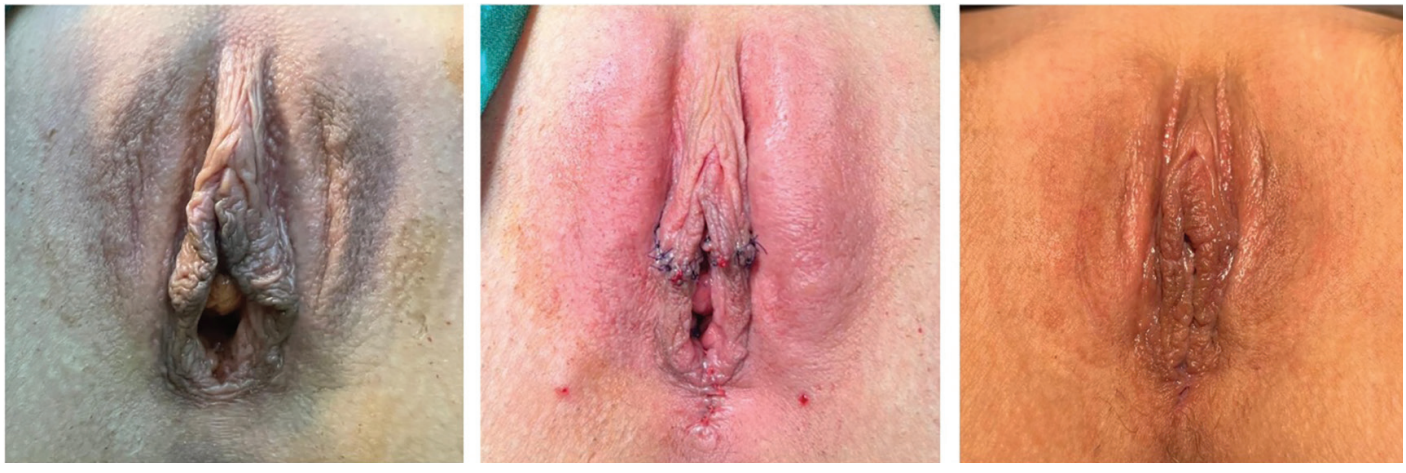

Figure 2. Preoperative and postoperative (1st month) photographs of patient

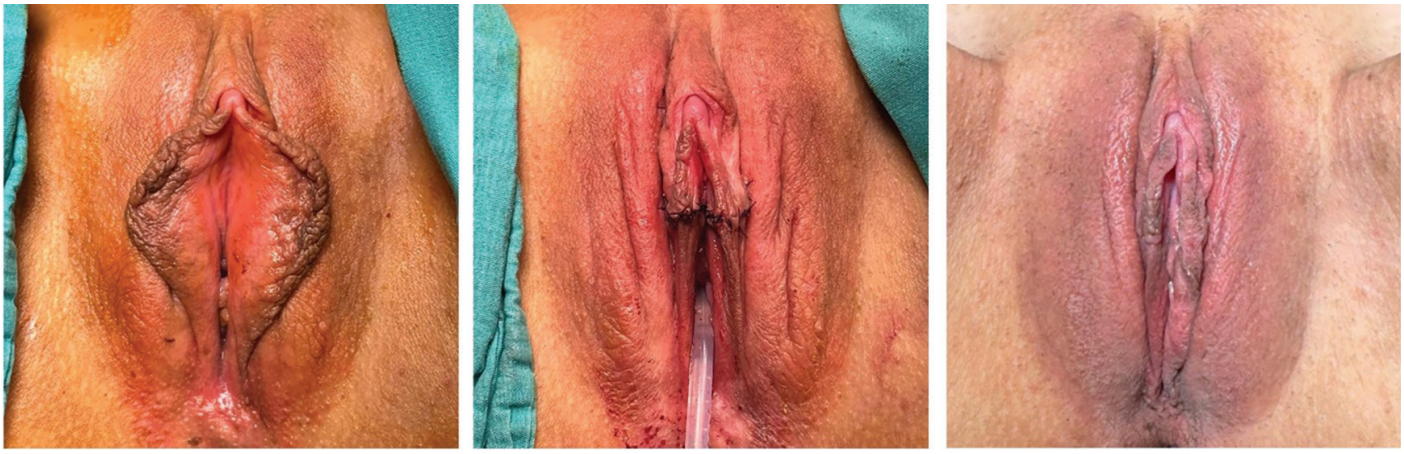

Figure 3. Preoperative and postoperative (1st month) photographs of patient

most common type in both labia, and labial asymmetry was observed in 26 patients (48.1%) (Table 1).

The surgical procedures had a mean duration of 98.8±20.9 minutes, with operative times ranging from 60 to 150 minutes. Aesthetic concerns were reported by all patients, although 32 patients also described functional complaints as contributing factors in their decision to undergo surgery. In addition to wedge labia minoraplasty, labia majoraplasty was performed in 35 patients (64.8%), and hoodoplasty in 47 patients (87%) as adjunct procedures. In patients undergoing labia majoraplasty, hyaluronic acid injections were performed in 33 (61.1%), while lipid fillers were used in 2 (3.7%). The most commonly applied hoodoplasty technique was lateral hoodoplasty, which was performed in 39 patients (72.2%). Cold scissors or a scalpel was used for tissue resection in all patients.

Partial dehiscence was identified as the most frequent complication following wedge labia minoraplasty, affecting 9.3% of the patients. Postoperative local infections were treated with oral and topical antibiotics, and five patients who developed wound dehiscence underwent revision labiaplasty (Table 2). Postoperative wound dehiscence was observed only among patients who were active smokers. In the revision procedure, scar tissue at the dehiscence site was excised using cold scissors, with restoration of adequate vascularity in the surrounding tissue. Closure was performed using 5-0 polyglytone monofilament sutures. No recurrent dehiscence was observed on follow-up.

A statistically significant improvement was observed in the total FGSIS score, increasing from 10.6±1.7 preoperatively to 25.9±1.1 postoperatively (p<0.001). The total FSFI score increased significantly from 16.6±2.5 preoperatively to 27.4±2.4 postoperatively (p<0.001). Preoperative FSFI domain scores were 2.5±0.6 for desire, 2.4±0.4 for arousal, 2.4±0.6 for lubrication, 2.5±0.6 for orgasm, 2.3±0.9 for satisfaction, and 4.5±0.5 for pain. Postoperatively, domain scores improved to 4.8±0.7, 4.6±0.7, 4.5±0.8, 4.5±0.7, 5.4±0.5, and 3.6±0.7, respectively, demonstrating statistically significant improvements across all domains (p<0.001) (Table 3). Before surgery, all patients had total FSFI scores below 27.2, while after surgery only 13 patients (24.7%) remained below this cut-off. In terms of FGSIS scores, 52 patients (96.2%) scored between 7-14, and 2 patients (3.8%) scored between 15-21 preoperatively. Postoperatively, no patients had scores within these ranges, and all patients (100%) scored between 22-28 points.

Table 1. Demographic data of patients

		Mean ± SD
Age		39±5.2 (28-54)
Gravida		2.07±1.06
Parity		1.88±0.96 (0-5)
Smoking		19 (35.2%)
Left labium minor classification	**Type 1**	26 (48.1%)
	Type 2	24 (44.4%)
	Type 3	4 (7.4%)
Right labium minor classification	**Type 1**	25 (46.3%)
	Type 2	26 (48.1%)
	Type 3	3 (5.6%)
Presence of asymmetry	**Present/observed**	26 (48.1%)
	Absent/not observed	28 (51.9%)

SD: standard deviation

DISCUSSION

The heightened societal emphasis on female body image, coupled with aesthetic concerns and media influence, has contributed to the rising demand for cosmetic gynecologic procedures worldwide. The findings concerning the motivations and influencing factors of women seeking labiaplasty have

been corroborated by previous research. Aesthetic concerns emerged as the most prevalent motivating factor, followed by physical discomfort, diminished self-confidence, and critical remarks from sexual partners and peers.[11] Among these factors, aesthetic concerns (52.1%) and sexual dysfunction (46.5%) have been reported as the most prevalent indications.[12] In our study, all patients identified aesthetic concerns as their primary reason for pursuing labiaplasty. Previous studies have demonstrated that dissatisfaction with genital appearance is the leading determinant for undergoing labiaplasty.[5] Furthermore, it has been well established that labia minora hypertrophy adversely impacts patients in both functional and aesthetic domains. In our study, patients undergoing wedge labiaplasty demonstrated significant improvements in body image, along with increased satisfaction with genital appearance compared to the preoperative period.

Table 2. Surgical characteristics

		Mean ± SD	n (%)
Operation duration (min)		98.8±20.9 (60-150)	
Reason for operation	**Hypertrophy**		27/54 (50%)
	Functional		32/54 (59.2%)
	Aesthetic concern		54/54 (100%)
Procedures performed	**L. minoraplasty**		54 (100%)
	L. majusplasty		35 (64.8%)
	Hoodoplasty		47 (87%)
L. majoraplasty technique	**Hyaluronic acid**		33 (94.3%)
	Lipid filler		2 (5.7%)
Hoodoplasty technique	**Lateral hoodoplasty**		39 (83.0%)
	Central hoodoplasty		4 (8.5%)
	Wedge hoodoplasty		4 (8.5%)
Suture material	**4.0**		9 (16.7%)
	5.0		45 (83.3%)
Energy modality used	**Cautery**		0 (0%)
	Cold		54 (100%)
Complications observed in wedge labium minoraplasty	**Infection**		0 (0%)
	Dehiscence (partial)		5 (9.3%)
	Dyspareunia		0 (0%)
	Contracture		0 (0%)
Revision operation	**Yes**		5 (9.3%)

Patients were allowed to report more than one reason for surgery; therefore, percentages may exceed 100%; SD: standard deviation

Table 3. Evaluation of FGSIS and FSFI scores before and after surgery

		Before surgery Mean ± SD	After surgery Mean ± SD	*p**
FGSIS total score		**10.6±1.7**	**25.9±1.1**	**<0.001**
FSFI	**Desire**	2.5±0.6	4.8±0.7	<0.001
	Arousal	2.4±0.4	4.6±0.7	<0.001
	Lubrication	2.4±0.6	4.5±0.8	<0.001
	Orgasm	2.5±0.6	4.5±0.7	<0.001
	Satisfaction	2.3±0.9	5.4±0.5	<0.001
	Pain	4.5±0.5	3.6±0.7	<0.001
	FSFI total score	16.6±2.5	27.4±2.4	<0.001

FSFI: female sexual function index; FGSIS: female genital self-image scale; SD: standard deviation; *: Paired-samples t-test

The labia minora constitute essential anatomical structures that contribute not only to female sexual pleasure but also to the overall perception of the genital area. Women's perceptions of their genitalia have a considerable impact on their sexuality and overall sexual quality of life. Previous studies have shown a close relationship between body image and sexual satisfaction.[13,14] In this study, assessment with the FGSIS demonstrated that participants had a negative genital self-image in the preoperative period. However, postoperative evaluations revealed a significant improvement in self-perception scores, indicating that surgical intervention exerts a positive impact on both body image and sexual well-being. Although the FSFI pain domain score decreased postoperatively, this finding should be interpreted cautiously, as higher scores indicate less pain. This may reflect variability in patient perception or early postoperative adaptation.

The wedge resection technique preserves anatomical integrity while maintaining the natural mucosal edge of the labia minora. An important advantage of this method lies in its potential to enhance both aesthetic and functional outcomes. Previous studies have shown that wedge resection procedures are associated with significant improvements in sexual function scores.[12,15,16] Zahedi et al.[17] reported that the selection of a labiaplasty technique should consider functional expectations as well as aesthetic concerns, and proposed that the wedge technique may have a higher potential to improve functional outcomes depending on the preservation of residual labial tissue. Another study emphasized that the wedge technique offers advantages in preserving labial tissue, which may play a key role in achieving long-term sexual and functional satisfaction.[18] Accordingly, the preservation of a larger amount of labial tissue during wedge resection may represent an important determinant of more substantial improvements in sexual function. Overall, these data support the use of the wedge resection technique, particularly in relation to sexual function outcomes.[12] In this study, in accordance with the existing literature, we observed significant improvements in sexual function parameters following wedge resection.

Study Limitations

One of the potential limitations of the wedge technique is the risk of vascular compromise due to disruption of labial arterial supply, which may lead to wound dehiscence or, rarely, tissue necrosis. For this reason, some surgeons prefer the trim technique despite its potential aesthetic disadvantages. Various intraoperative strategies, such as careful tissue handling and preservation of vascular structures, may help minimize these risks. Future studies directly comparing wedge and trim techniques may provide further insight into their relative safety profiles.

It is crucial that patients are comprehensively counseled regarding possible postoperative complications of labiaplasty, including scarring, infection, altered sensitivity (either hypersensitivity or reduced sensation), and wound dehiscence. The literature presents heterogeneous findings concerning the safety profile and complication rates of this procedure.[11,19] In a retrospective study of 753 patients undergoing wedge labiaplasty, Köle et al.[20] reported 3 cases of local infection and 21 cases of partial wound dehiscence. In our study, no postoperative infections were observed in any of the patients. In a comparable study, minor dehiscence occurred in 3 of 131 patients, and none of these cases required reoperation.[21] In our study, minimal wound dehiscence was observed in 5 patients, all of whom subsequently underwent successful revision surgery. Notably, wound dehiscence in our cohort was observed only among active smokers, suggesting a possible association between smoking and impaired wound healing. This finding is consistent with the known negative effects of smoking on tissue perfusion and postoperative healing, and should be considered during preoperative patient counseling.

With the increasing global demand for FGCS, evaluating patient-reported outcomes such as female genital self-image and female sexual function has become increasingly important.[22] Our findings support the growing evidence that wedge labiaplasty may improve both aesthetic perception and psychosexual well-being in appropriately selected patients.

In our cohort, wedge labiaplasty was frequently performed in combination with adjunctive procedures. Therefore, the observed improvements in genital self-image and sexual function cannot be attributed solely to the wedge technique. The high rate of concomitant procedures should be taken into account when interpreting the results. Comprehensive preoperative counseling and individualized surgical planning remain essential to optimize outcomes.

The relatively short follow-up period of 3 months represents an important limitation, particularly for assessing long-term outcomes such as scar maturation, sensory changes, and sustained sexual function. Additionally, factors that may influence sexual function, such as psychological status, partner-related variables, and hormonal status, were not fully evaluated.

CONCLUSION

Wedge labiaplasty, frequently performed in combination with adjunctive procedures, appears to be a safe and effective surgical approach associated with significant improvements in genital self-image and female sexual function. However, given the high

rate of concomitant procedures, the specific contribution of the wedge technique alone should be interpreted with caution. Further studies with larger cohorts and longer follow-up are needed to better define the independent effects of each surgical component.

ETHICS

Ethics Committee Approval: The study received ethical approval from the İstanbul Medipol University Non-Interventional Clinical Research Ethics Committee (approval no: 1130; date: 11.09.2025).

Informed Consent: All participants provided written informed consent.

FOOTNOTES

Contributions

Surgical and Medical Practices: Y.C., Ö.Y.A., E.Ç., Concept: Y.C., E.Ç., Design: Y.C., Ö.Y.A., E.Ç., Data Collection or Processing: Y.C., Analysis or Interpretation: Ö.Y.A., B.Y., Literature Search: Y.C., Writing: Y.C., Ö.Y.A.

DISCLOSURES

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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DOI: 10.34057/PPj.2026.45.02.25733
Pelviperineology 2026;45(2):65-72

Association of physical activity with female sexual function across BMI categories in reproductive-age women

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Citation: Atıgan A, Atıgan Ay, Kılıç Güler D. Association of physical activity with female sexual function across BMI categories in reproductive-age women. Pelviperineology. 2026;45(2):65-72

ABSTRACT

Objective: Female sexual function is influenced by multiple biological, psychological, and lifestyle factors. Physical exercise and obesity have been linked to metabolic health and psychological well-being, which may influence sexual performance. The purpose of this study was to assess the association between exercise level and female sexual function in women of reproductive age, as well as to look into the impact of obesity and self-esteem on sexual health.

Materials and Methods: This cross-sectional study included 60 women of reproductive age. Participants were categorized as sedentary (n=21) or non-sedentary (n=39) according to the International Physical Activity Questionnaire (IPAQ). Additionally, participants were classified as group 1 [body mass index (BMI) ≥25; n=23] or group 2 (BMI <25; n=37) based on BMI. Anthropometric measurements including body weight, height, BMI, waist circumference, and waist-to-height ratio were recorded. Laboratory parameters including total testosterone, prolactin, and HbA1c levels were analyzed. Female sexual function was assessed using the Arizona Sexual Experiences Scale (ASEX) and self-esteem was evaluated using the Rosenberg Self-Esteem Scale.

Results: Sedentary and non-sedentary groups showed no significant differences in age, BMI, hormonal parameters, ASEX scores, or Rosenberg self-esteem scores ($p>0.05$). However, the sedentary group had significantly higher HbA1c values than the non-sedentary group ($p=0.028$). Group 1 subjects had significantly higher ASEX scores than group 2 subjects (17.3±3.4 vs. 14.8±3.1, $p=0.004$), suggesting poorer sexual function. Group 1 participants had substantially lower Rosenberg self-esteem levels (20.5±5.2 vs. 23.2±4.6, $p=0.036$). Group 1 subjects had considerably larger waist-to-height ratios ($p<0.001$).

Conclusion: Higher BMI is connected with poorer female sexual function and lower self-esteem in women of reproductive age, but a sedentary lifestyle appears to be associated with adverse metabolic markers such as elevated HbA1c. Promoting a healthy body weight and regular physical activity in women may help to promote metabolic health and sexual well-being.

Keywords: Female sexual function; self-esteem; Arizona sexual experiences scale; international physical activity questionnaire

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Received: 12 March 2026 **Accepted:** 05 June 2026 **Publication Date:** 04 August 2026

INTRODUCTION

Female sexual function is a complex and multifaceted process driven by biological, hormonal, psychological, and interpersonal factors. Studies show that female sexual dysfunction, encompassing issues with sexual desire/arousal, orgasm, and genital-pelvic discomfort, affects nearly half of women of reproductive age and is associated with poor quality of life and relational unhappiness.[1] The American Psychiatric Association's current diagnostic framework defines female sexual dysfunction as disorders of sexual interest/arousal, orgasm, and genito-pelvic pain/penetration, recognizing the biopsychosocial basis of female sexual response.[2]

Hormonal modulation via the hypothalamic-pituitary-gonadal axis is an important aspect of female sexual function. Women's libido and sexual satisfaction have been connected to reduced levels of testosterone, which has been shown to be a primary regulator of sexual desire and arousal.[3,4] However, because hyperprolactinemia decreases gonadotropin secretion and central dopaminergic pathways, it has been linked to decreased sexual desire, arousal difficulties, and orgasmic dysfunction.[4] These findings underscore the importance of measuring prolactin and testosterone levels when investigating factors influencing sexual function in reproductive-age women.

Physical activity is one aspect that can be modified to improve female sexual health. Regular exercise has been associated with increased cardiovascular performance, reduced depressive symptoms, enhanced body image perception, and improved endothelial function, all of which may have a good impact on sexual functioning.[5,6] Through vascular, neuroendocrine, and psychological mechanisms, physical activity is a modifiable lifestyle factor that may impact female sexual health.[7] The short form of the International Physical Activity Questionnaire (IPAQ) has shown adequate reliability and validity for assessing physical activity levels across several countries.[8] Another major factor that influences female sexual function is psychological well-being, namely self-esteem. Higher global self-esteem has been positively connected with increased sexual satisfaction and sexual well-being.[9]

Research combining physical activity level, prolactin and testosterone concentrations, and self-esteem within the same cohort of reproductive-age women is still scarce, despite the fact that previous studies have independently investigated relationships between exercise, hormonal parameters, or psychological factors and female sexual function. A multimodal approach incorporating physiological, behavioral, and psychosocial assessments can provide a more complete understanding of the modifiable elements impacting female sexual function. Thus, the current study aims to examine prolactin and testosterone levels, as well as the effect of self-esteem, while also investigating the impact of physical activity level on female sexual function in reproductive-age women.

MATERIALS AND METHODS

A total of 60 patients who voluntarily applied to the Obstetrics and Gynecology Outpatient Department of a Pamukkale University Hospital were included in the study after providing informed consent. Patients who underwent hormone testing for any reason within a one-month period were consecutively invited to participate in the questionnaire study according to their order of admission during the same month. Fasting morning blood samples obtained during the menstrual period were evaluated. After measuring the patients' height, weight, and waist circumference, serum total testosterone, prolactin, and HbA1c levels were analyzed. Body mass index (BMI) was calculated using the formula: BMI = weight (kg)/height $(m)^2$. Participants were categorized as group 1 if BMI ≥25 kg/m^2 and as group 2 if BMI <25 kg/m^2. According to waist-to-height ratio (WHtR), participants were classified as normal (<0.50) or high (≥0.50).[10] All patients were asked to complete the following questionnaires.

Questionnaires

The IPAQ group's shortened version is a well-validated measure for measuring physical activity levels in adult populations.[8] Validation of the Turkish version of the IPAQ has been conducted.[11] Evaluation of the survey: Walking MET-min/week =3.3 X minutes walked X number of days walked. Moderate intensity MET-min/week =4.0 X minutes of moderate-intensity activity X number of days of moderate-intensity activity. Vigorous MET-min/week =8.0 X minutes of vigorous activity X number of days of vigorous activity. Accordingly, there are 3 activity levels: 1. Inactive (Category 1): This is the lowest level of physical activity. Situations that cannot be included in Categories 2 and 3 are considered inactive. 2. Minimally active (Category 2): Those who meet any of the following criteria are minimally active. a) Performing at least 20 minutes of vigorous activity for 3 or more days. b) Performing at least 30 minutes of moderate-intensity activity or walking for 5 or more days. c) Combination of walking and moderate-intensity activity for 5 or more days, achieving a minimum of 600 MET-min/week. 3. Very active (Category 3): This measurement is approximately equivalent to at least one hour or more of moderate-intensity activity per day. This category is the level required to achieve health benefits. a) At least 3 or more days of vigorous activity achieving a minimum of 1500 MET-min/week. b) Combination of walking, moderate-intensity,

or vigorous activity for 7 or more days achieving a minimum of 3000 MET-min/week. However, in our study, participants were dichotomized into two categories for analytical clarity: those classified as "inactive" according to the IPAQ were defined as sedentary, whereas those categorized as "minimally active" and "very active" were combined and defined as non-sedentary. This approach was adopted to simplify comparisons and enhance the interpretability of physical activity status.

Morris Rosenberg developed the Rosenberg Self-Esteem Scale, which remains one of the most extensively used instruments for assessing global self-worth in research contexts.[12] A Turkish validity and reliability study of the Rosenberg Self-Esteem Scale has been conducted.[13] Total score = the sum of 10 items. Range: 0-30 points. A score of 0-14 score indicates low self-esteem; a score of 15-25 score indicates normal self-esteem; a score of 26-30 score indicates high self-esteem.

The Arizona Sexual Experiences Scale (ASEX), created at the University of Arizona, is a quick and verified assessment of sexual drive, arousal, lubrication, orgasm, and satisfaction.[14] ASEX consists of a total of 5 questions, and these questions are scored overall. The score range is between 5 and 30 points. A high score indicates worse sexual function. Sexual dysfunction is present if the total score is ≥19; any question is scored ≥5 points; or 3 or more questions are scored ≥4 points.

Ethical approval was obtained from the Pamukkale University Faculty of Medicine Ethics Committee (approval number: E-60116787-020-839579, date: 24.02.2026). Informed consent was obtained.

Statistical Analysis

A priority power analysis was performed using G*Power 3.1 software to establish the minimal sample size needed to detect a medium effect size (Cohen's d =0.5) with a power of 0.80 and an alpha level of 0.05 for two-tailed comparisons. According to this estimate, at least 51 persons (21 sedentary and 30 non-sedentary) were required for group comparisons, showing that the current sample of 60 participants has sufficient statistical power to detect medium effect sizes.

The Shapiro-Wilk test was used to determine whether continuous variables were normal. Normally distributed variables were represented as mean ± standard deviation and compared using independent t-tests. The Mann-Whitney U test was used to assess variables that did not follow a normal distribution. Categorical variables were given as counts and examined using chi-square tests or Fisher's exact test when anticipated frequencies were low. Correlation analyses were performed using Spearman rank correlation coefficients, and logistic regression analysis was used to identify independent predictors of sexual dysfunction with ASEX-defined dysfunction as the dependent variable and BMI, IPAQ score, and Rosenberg score as independent variables. A p-value of <0.05 was considered statistically significant. All statistical analyses were conducted with IBM SPSS Statistics version 27.0 (IBM Corp., Armonk, NY, USA).

RESULTS

As shown in Table 1, the demographic, anthropometric, hormonal, and questionnaire characteristics of participants were compared according to sedentary status. Of the 60 participants, 21 were classified as sedentary and 39 as non-sedentary. The mean age was 26.4±4.4 years in the sedentary group and 25.4±4.6 years in the non-sedentary group (p=0.333). The mean weight was 63.1±13.4 kg vs. 64.2±14.4 kg (p=0.889); height was 161.2±3.9 cm vs. 162.3±5.6 cm (p=0.448); and BMI was 24.3±5.3 kg/m^2 vs. 24.4±6.1 kg/m^2 (p=0.914) for sedentary and non-sedentary participants, respectively. In the sedentary group, 7 participants and in the non-sedentary group, 16 participants had a BMI ≥25, with no statistically significant difference observed (p=0.559). Waist circumference and WHtR were also similar between groups (84.6±15.3 cm vs. 84.0±13.2 cm, p=0.877; 0.52±0.09 vs. 0.51±0.08, p=0.786). The number of smokers was 8 in the sedentary group and 12 in the non-sedentary group (p=0.566). Hormonal parameters including total testosterone ng/dL (36.6±18.2 vs. 38.6±22.4, p=0.852) and prolactin µg/L (16.6±7.4 vs. 17.4±7.8, p=0.694) showed no significant differences. ASEX scores were 16.0±4.0 in the sedentary group and 15.6±3.2 in the non-sedentary group (p=0.634). The distribution of ASEX groups was similar, with 14 vs. 28 participants classified as functional and 7 vs. 11 as dysfunctional (p=0.679). Rosenberg scores were 23.0±5.0 vs. 21.7±5.0 (p=0.361), and the distribution of Rosenberg groups was also comparable (low: 1 vs. 2; normal: 12 vs. 22; high: 8 vs. 15, p=0.997). However, HbA1c levels (%) were significantly higher in the sedentary group (5.2±0.3 vs. 5.1±0.4, p=0.028). As expected, IPAQ scores were lower in sedentary participants (840.4±1209.4 vs. 2740.0±2440.1, p<0.001), reflecting the classification criteria. These results suggest that sedentary status was associated with higher HbA1c levels but not with differences in hormonal or psychosocial measures.

As shown in Table 2, participants were compared according to obesity status. Of the 60 participants, 23 were placed in group 1 because their BMI ≥25, and 37 were placed in group 2 because their BMI <25. The mean age was 26.3±4.6 years in group 1 and 25.4±4.5 years in group 2 (p=0.425). Mean weight was significantly higher in group 1 (77.8±11.7 kg) compared with

group 2 (55.1±5.7 kg, $p<0.001$). Similarly, BMI (30.0±5.5 vs. 20.9±2.1 kg/m^2, $p<0.001$), waist circumference (96.1±12.4 vs. 76.8±8.6 cm, $p<0.001$), and WHtR (0.59±0.08 vs. 0.47±0.05, $p<0.001$) were significantly higher in group 1 participants. When classified according to WHtR risk categories, the majority of group 1 participants were in the "high" category (22/23) compared with group 2 participants, most of whom were in the "normal" category (24/37), and this difference was statistically significant ($p<0.001$). There were no significant differences in age, smoking status (9 vs. 11 smokers, $p=0.453$), total testosterone ng/dL (41.8±26.0 vs. 35.4±16.9, $p=0.253$), prolactin µg/L (15.7±8.9 vs. 18.0±6.7, $p=0.259$), or HbA1c levels (%) (5.1±0.3 vs. 5.2±0.5, $p=0.907$) between groups. In terms of sexual function, ASEX scores were significantly higher in group 1 participants (17.3±3.4 vs. 14.8±3.1, $p=0.004$), indicating poorer sexual function. The distribution of ASEX functional and dysfunctional groups was similar between groups (functional: 15 vs. 27; dysfunctional: 8 vs. 10, $p=0.524$). Rosenberg self-esteem scores were significantly lower in group 1 (20.5±5.2 vs. 23.2±4.6, $p=0.036$), while the Rosenberg group distribution was similar (low: 2 vs. 1, $p=0.419$). IPAQ scores were not significantly different between group 1 and group 2 participants (2292.4±2859.9 vs. 1940.1±1848.9, $p=0.825$). These findings suggest that having a high BMI is associated with higher ASEX scores and lower self-esteem, while

Table 1. Comparison of variables according to sedentary status

	Sedentar n=21 mean ± SD	**Non-sedentar n=39 mean ± SD**	***p*-value**
Age	26.4±4.4	25.4±4.6	0.333
Weight	63.1±13.4	64.2±14.4	0.889
Height	161.2±3.9	162.3±5.6	0.448
BMI	24.3±5.3	24.4±6.1	0.914
BMI ≥25			0.559
Yes	7	16	
No	14	23	
Waist circumference	84.6±15.3	84.0±13.2	0.877
WHtR points	0.52±0.09	0.51±0.08	0.786
WHtR risk			0.681
Normal	8	17	
High	13	22	
Cigarette			0.566
Smoker	8	12	
Non-smoker	13	27	
Total testosterone ng/dL	36.6±18.2	38.6±22.4	0.852
Prolactin µg/L	16.62±7.4	17.4±7.8	0.694
HbA1c %	5.2±0.3	5.1±0.4	**0.028***
ASEX score	16.0±4.0	15.6±3.2	0.634
ASEX group			0.679
Functional	14	28	
Dysfunctional	7	11	
Rosenberg score	23.0±5.0	21.7±5.0	0.361
Rosenberg group			0.997
Low	1	2	
Normal	12	22	
High	8	15	
IPAQ score (MET-min/week)	840.4±1209.4	2740.0±2440.1	**<0.001***

BMI: body mass index; IPAQ: international physical activity questionnaire; SD: standard deviation; ASEX: Arizona sexual experiences scale. Participants were categorized as group 1, if BMI ≥25 kg/m^2 and as group 2, if BMI <25 kg/m^2; WHtR was categorized as normal (<0.50) or high (≥0.50); *: $p<0.05$ was considered statistically significant; WHtR: waist-to-height ratio

other demographic and hormonal measures did not differ between groups.

As shown in Table 3, correlation analysis revealed a significant negative relationship between Rosenberg self-esteem scores and ASEX scores (r=-0.35, p=0.008), indicating that participants with higher self-esteem had better sexual function. No significant correlation was observed between IPAQ scores and ASEX scores (r=-0.12, p=0.350), whereas BMI showed a modest positive correlation with ASEX scores (r=0.28, p=0.025). Logistic regression analysis, using ASEX-defined sexual dysfunction as the dependent variable, demonstrated that Rosenberg self-esteem was independently associated with sexual dysfunction [odds ratio (OR) =0.86, 95% confidence interval (CI): 0.77-0.97, p=0.013], while BMI also remained an independent predictor (OR =1.13, 95% CI: 1.02-1.26, p=0.020).

DISCUSSION

This cross-sectional study included anthropometric, hormonal, and psychosocial (ASEX, Rosenberg) assessments of sedentary and non-sedentary adults, as well as individuals according to their BMI status. The findings demonstrated a significant association between high BMI, sexual dysfunction, and low

Table 2. Comparison of variables according to weight status

	Group 1 (BMI ≥25) n=23 mean ± SD	**Group 2 (BMI <25) n=37 mean ± SD**	***p*-value**
Age	26.3±4.6	25.4±4.5	0.425
Weight	77.8±11.7	55.1±5.7	**<0.001***
Height	161.3±5.2	162.1±5.1	0.493
BMI	30.0±5.5	20.9±2.1	**<0.001***
Sedentar			0.559
Yes	7	14	
No	16	23	
Waist circumference	96.1±12.4	76.8±8.6	**<0.001***
WHtR	0.59±0.08	0.47±0.05	**<0.001***
WHtR risk			**<0.001***
Normal	1	24	
High	22	13	
Cigarette			0.453
Smoker	9	11	
Non-smoker	14	26	
Total testosterone ng/dL	41.8±26.0	35.4±16.9	0.253
Prolactin µg/L	15.7±8.9	18.04±6.71	0.259
HbA1c %	5.1±0.3	5.15±0.51	0.907
ASEX score	17.3±3.4	14.8±3.1	**0.004***
ASEX group			0.524
Functional	15	27	
Dysfunctional	8	10	
Rosenberg score	20.5±5.2	23.2±4.6	**0.036***
Rosenberg group			0.419
Low	21	1	
Normal	14	20	
High	7	16	
IPAQ score (MET-min/week)	2292.4±2859.9	1940.1±1848.9	0.825

BMI: body mass index; IPAQ: international physical activity questionnaire; SD: standard deviation; ASEX: Arizona sexual experiences scale. Participants were categorized as group 1, if BMI ≥25 kg/m^2 and as group 2, if BMI <25 kg/m^2; WHtR was categorized as normal (<0.50) or high (≥0.50); *: p<0.05 was considered statistically significant; WHtR: waist-to-height ratio

Table 3. Correlation and regression analysis of ASEX scores with Rosenberg, BMI, and IPAQ				
Variable	**r (Spearman)**	***p*-value**	**OR (95% CI)**	***p*-value**
Rosenberg score	-0.35	**0.008***	0.86 (0.77-0.97)	**0.013***
BMI	0.28	**0.025***	1.13 (1.02-1.26)	**0.020***
IPAQ score (MET-min/week)	-0.12	0.350	0.999 (0.998-1.000)	0.245

ASEX: Arizona sexual experiences scale (used as outcome in regression and correlation analyses); r = Spearman correlation coefficient; BMI: body mass index; IPAQ: international physical activity questionnaire; OR: odds ratio; CI: confidence interval; *: $p<0.05$ was considered statistically significant

self-esteem, while physical activity level was associated with HbA1c but showed limited association with hormonal markers and sexual function measures in our cohort. These findings are consistent with prior research that has assessed the metabolic and psychological elements of obesity and physical activity at the same time, bolstering the notion that this is a health issue that necessitates a multidisciplinary approach.[15]

The significantly higher ASEX scores obtained in high BMI individuals, indicating a higher frequency of impaired sexual function, are consistent with previous research. Large epidemiological studies have also discovered that women with a higher BMI have less sexual activity and function, which has been connected to body image and psychosocial issues.[15] Obesity is thought to impact female sexual function through factors such as hormonal alterations, vascular dysfunction, inflammation, and negative body image.[16] Increased adipose tissue, in particular, can disrupt sex hormone metabolism and decrease endothelial function, resulting in reduced sexual stimulation and orgasmic response.[17]

Another significant conclusion in our study is that high BMI patients exhibited reduced Rosenberg self-esteem levels. Prior research has demonstrated that obesity substantially impacts both physical health and psychological well-being, as well as body image.[18] Previous research has found that obese people have lower Rosenberg scores, which is similar to our results. Excess weight has been linked to poor body image and psychological well-being, as well as problems with sex and self-esteem.[19] Low self-esteem and unfavorable body image are associated with diminished sexual desire and satisfaction in women. In this context, the influence of psychological variables related to excess weight on sexual function is considered to be as significant as biological mechanisms.[20]

WHtR is a strong indication of obesity, including abdominal obesity and cardiometabolic hazards. Values above 0.50 indicate significant risk.[10] Obese people had higher WHtR readings, suggesting a higher cardiometabolic risk profile. Central obesity is closely linked to cardiometabolic risk factors and endothelial dysfunction.[21] This could be viewed as a potential mechanism influencing the physiological components of sexual function.

Sedentary persons had higher HbA1c levels, indicating poorer glycemic control. Studies have found a positive relationship between HbA1c levels, BMI, and other anthropometric parameters, suggesting obesity's deleterious impact on glucose homeostasis.[22] The higher HbA1c values in the sedentary group support the unfavorable impact of physical inactivity on metabolic health, although the absolute difference between groups was relatively small. Physical activity has long been associated with increased insulin sensitivity and better glycemic management.[23] Metabolic diseases may have an indirect effect on sexual function by influencing vascular function and hormonal balance over time.[24]

The literature offers conflicting findings about the effects of different types of exercise on sexual function. While pelvic floor exercises usually improve sexual function, the efficacy of aerobic and strength activities is less consistent. Studies, particularly those on postmenopausal women, demonstrate that aerobic exercise has inconsistent impacts on the quality of sexual life, emphasizing the necessity for individualized exercise programs.[25] Unfortunately, our study did not allow for the diversification of exercise types. The significantly higher physical activity scores in our study's non-sedentary group were expected and reflected the study classification criteria. Although previous studies suggest beneficial effects of physical activity on sexual function, psychological well-being, and general health, our study did not demonstrate a significant difference in ASEX scores between sedentary and non-sedentary participants. There have also been studies in men demonstrating that the risk of sexual dysfunction increases with decreased physical activity.[26] While literature indicates beneficial effects of physical activity on sexual function, this association is not uniformly evidenced across all studies.[27] This indicates that the impact of physical activity may be contingent upon characteristics such as duration, intensity, and frequency of exercise.

Total testosterone and prolactin levels did not differ substantially between sedentary and non-sedentary participants or between BMI group 1 and group 2 in our study, implying that changes in sexual function may be influenced more by psychosocial and anthropometric factors than by measurable hormonal alterations. However, because the relationship between

hormones and sexual function in women is complex and multifaceted, additional research is required.[28] Although diverse assessment instruments are used to examine sexual function in women, the connection between BMI and abdominal obesity indicators with sexual dysfunction has been reported in numerous studies; particularly strong impacts have been discovered in certain domains (e.g., orgasm).[29]

In the current study, we found an inverse association between Rosenberg self-esteem and ASEX scores, implying that high self-esteem is linked to better sexual function. Conventional tests have shown a positive association between self-esteem and sexual quality of life, similar to our study.[30] This substantiates the impact of psychological influences on sexual function. Collectively, these studies suggest that women's sexual health is affected by hormonal parameters, metabolic condition, psychological well-being, and lifestyle choices. Addressing obesity and instituting healthy lifestyle interventions may be crucial not only for metabolic health but also for improving women's sexual health.

Study Limitations

A limitation of our study is that participants may have underreported or overreported behaviors related to physical activity or sexual experiences due to social acceptability or personal perceptions. Additionally, the relatively small sample size may limit the generalizability of the results to a larger population. While the sample size is sufficient to detect moderate effect sizes, larger multicenter studies would provide stronger statistical power and external validity.

CONCLUSION

This study's cross-sectional methodology makes it impossible to definitively determine causality. However, the ability to evaluate numerous factors simultaneously (anthropometry, survey scores, and hormonal levels) is a strength. The relationship between high BMI, sedentary lifestyle, self-esteem, and sexual function is an important public health issue, affecting both individual and community health. These findings suggest that weight control, psychosocial support, and promotion of physical activity may contribute to improvements in metabolic health and overall sexual health.

ETHICS

Ethics Committee Approval: Ethical approval was obtained from the Pamukkale University Faculty of Medicine Ethics Committee (approval number: E-60116787-020-839579, date: 24.02.2026).

Informed Consent: Informed consent was obtained.

FOOTNOTES

Contributions

Concept: A.A., Ay.A., D.K.G., Design: A.A., Ay.A., D.K.G., Data Collection or Processing: A.A., Ay.A., Analysis or Interpretation: A.A., Ay.A., Literature Search: A.A., Ay.A., D.K.G., Writing: A.A., Ay.A., D.K.G.

DISCLOSURES

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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DOI: 10.34057/PPj.2026.45.02.80774
Pelviperineology 2026;45(2):73-78

Hysteroscopy before repeated IUI in unexplained infertility: A randomized study

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Citation: Sarıkaya S, Öztekin D, Sağlam Purut C, et al. Hysteroscopy before repeated IUI in unexplained infertility: a randomized study. Pelviperineology. 2026;45(2):73-78

ABSTRACT

Objective: To evaluate whether diagnostic hysteroscopy performed before a third intrauterine insemination (IUI) cycle improves clinical pregnancy outcomes in women with unexplained infertility after two previous unsuccessful IUI attempts.

Materials and Methods: This prospective randomized controlled study included 100 women with unexplained infertility who had undergone two unsuccessful IUI cycles. Participants were randomly allocated into two groups. Women in the hysteroscopy group underwent diagnostic hysteroscopy before the third IUI cycle, whereas women in the control group proceeded directly to the third IUI cycle without hysteroscopic evaluation. The primary outcome was clinical pregnancy rate. Secondary outcomes included the detection of intrauterine pathology and procedure-related complications.

Results: Baseline demographic and clinical characteristics were comparable between the groups. Clinical pregnancy was achieved in 10 of 50 women in the hysteroscopy group and 9 of 50 women in the control group, corresponding to pregnancy rates of 20.0% and 18.0%, respectively. The difference was not statistically significant (p=0.79; relative risk: 1.11, 95% confidence interval: 0.52-2.36). Intrauterine pathology was detected in 3 women (6.0%) in the hysteroscopy group, all of whom had endometrial polyps that were resected during the same procedure. No major hysteroscopy-related complications were observed.

Conclusion: Routine diagnostic hysteroscopy before a repeated IUI cycle did not significantly improve clinical pregnancy rates in women with unexplained infertility and previous unsuccessful IUI attempts. Given the low rate of unsuspected intrauterine pathology in this population, hysteroscopy may be more appropriate as a selective rather than routine intervention, particularly in women with abnormal imaging findings or clinical suspicion of intrauterine pathology.

Keywords: Clinical pregnancy; endometrial polyp; hysteroscopy, intrauterine insemination; unexplained infertility

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Received: 17 June 2026 **Accepted:** 28 July 2026 **Publication Date:** 04 August 2026

INTRODUCTION

Infertility affects approximately 10-15% of couples worldwide and remains a major clinical and psychosocial challenge despite advances in reproductive medicine.[1,2] Unexplained infertility represents a distinct subgroup in which no identifiable cause is detected after standard diagnostic evaluation, including confirmation of ovulation, tubal patency, and normal semen parameters. This condition accounts for approximately 10-15% of infertile couples and often creates uncertainty regarding the optimal sequence of diagnostic and therapeutic interventions.[3]

Intrauterine insemination (IUI), particularly when combined with ovarian stimulation, is widely used as a first-line treatment option for couples with unexplained infertility. Recent evidence-based guidance also supports IUI with ovarian stimulation as an appropriate first-line active treatment in this population.[4] However, pregnancy rates after IUI remain modest, and the probability of success may decrease after repeated unsuccessful cycles. Therefore, clinicians frequently consider additional diagnostic procedures before proceeding with further IUI attempts or before moving to more advanced assisted reproductive technologies such as in vitro fertilization (IVF).[5]

Assessment of the uterine cavity is an important component of infertility evaluation because intrauterine abnormalities, including endometrial polyps, submucosal fibroids, adhesions, and congenital uterine anomalies, may impair implantation and reduce pregnancy rates. Hysterosalpingography (HSG) is commonly used as an initial screening tool because it provides information about both tubal patency and the uterine cavity. Nevertheless, HSG has limitations in detecting subtle intracavitary lesions. In contrast, hysteroscopy allows direct visualization of the uterine cavity and offers the possibility of simultaneous treatment when pathology is identified.[6]

Previous studies in infertile women undergoing assisted reproductive treatment have reported that hysteroscopy may detect unsuspected intrauterine abnormalities even when previous imaging appears normal.[7,8] This has led some clinicians to advocate hysteroscopic evaluation before assisted reproductive treatment, particularly in patients with recurrent implantation failure or suspected uterine pathology. However, the clinical value of routine hysteroscopy in asymptomatic women with unexplained infertility remains uncertain. In the context of IUI, the potential benefit of detecting and treating occult uterine lesions must be balanced against the invasiveness, cost, discomfort, and resource utilization associated with the procedure.[9,10]

Data specifically evaluating the role of hysteroscopy before repeated IUI cycles are limited, and the routine use of hysteroscopy in this setting remains controversial. Therefore, the aim of the present randomized controlled study was to evaluate whether diagnostic hysteroscopy performed before a third IUI cycle improves clinical pregnancy outcomes in women with unexplained infertility who had previously undergone two unsuccessful IUI attempts.

MATERIALS AND METHODS

Study Design and Participants

This prospective randomized controlled study was conducted at a tertiary referral centre between May 2013 and December 2014. Ethical approval was obtained from the Local Institutional Ethics Committee of University of Health Sciences Türkiye, İzmir Tepecik Education and Research Hospital with the approval number 03/05, dated 12.05.2013. All procedures were performed in accordance with the principles of the Declaration of Helsinki. Written informed consent was obtained from all participants prior to enrolment.

A total of 100 women diagnosed with unexplained infertility were included in the study. Unexplained infertility was defined as the absence of an identifiable cause after standard infertility evaluation, including confirmation of ovulation, assessment of tubal patency, and semen analysis. Eligible women were between 20 and 38 years of age, had undergone at least two previous unsuccessful IUI cycles, had evidence of ovulation based on regular menstrual cycles and/or mid-luteal serum progesterone levels greater than 3 ng/mL, and had bilateral tubal patency confirmed by HSG. Male partners had normal semen parameters according to World Health Organization criteria.[11]

Patients with known intrauterine pathology, endometriosis, severe male factor infertility, previous uterine surgery, or systemic or endocrine disorders that could affect fertility were excluded.

Randomization and Study Groups

Eligible patients were randomly assigned in a 1:1 ratio to one of two groups using a computer-generated randomization sequence. Allocation concealment was ensured using sealed opaque envelopes. In Group A, patients underwent diagnostic hysteroscopy before the third IUI cycle. In Group B, patients proceeded directly to the third IUI cycle without hysteroscopic evaluation.

Hysteroscopy Procedure

In the hysteroscopy group, the procedure was performed during the early proliferative phase of the menstrual cycle, between cycle days 6 and 10. A rigid hysteroscope with an outer diameter

of approximately 4 mm was used, and normal saline served as the distension medium. The uterine cavity, endometrial surface, and tubal ostia were systematically evaluated.

When intrauterine abnormalities were detected, they were treated during the same session using operative hysteroscopic techniques. The procedure was performed under minimal analgesia when required.

Ovarian Stimulation and IUI Protocol

All patients in both groups underwent controlled ovarian stimulation with gonadotropins followed by hCG triggering. Gonadotropin stimulation was performed using human menopausal gonadotropin with individualized dosing.

Follicular development was monitored by transvaginal ultrasonography starting from cycle days 8-10. When at least one dominant follicle reached a mean diameter of 18 mm or greater, ovulation was triggered with an intramuscular injection of 5,000-10,000 IU human chorionic gonadotropin. IUI was performed 34-36 hours after ovulation trigger using prepared semen samples processed by standard density gradient centrifugation.

Outcome Measures

The primary outcome measure was the clinical pregnancy rate. Clinical pregnancy was defined as the presence of a gestational sac with fetal cardiac activity detected by transvaginal ultrasonography at 6-7 weeks of gestation. Pregnancy follow-up was limited to the confirmation of clinical pregnancy; therefore, miscarriage and live birth outcomes were not systematically recorded.

Secondary outcome measures included the detection and characterization of intrauterine pathology during hysteroscopy and procedure-related complications.

Statistical Analysis

Statistical analysis was performed using IBM SPSS Statistics for Windows, version 23.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation, whereas categorical variables were presented as frequencies and percentages. The normality of distribution was assessed using the Kolmogorov-Smirnov test.

Comparisons between groups were performed using the independent samples t-test for normally distributed continuous variables and the Mann-Whitney U test for non-normally distributed continuous variables. Categorical variables were compared using the chi-square test or Fisher's exact test, as appropriate. In addition, the absolute risk difference and relative risk for clinical pregnancy were calculated with corresponding 95% confidence intervals (CIs). A *p*-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 100 women with unexplained infertility were enrolled and completed the study protocol. Patients were randomly assigned into two groups, with 50 women in the hysteroscopy group and 50 women in the control group. No dropouts or protocol deviations were recorded.

Baseline demographic and clinical characteristics were comparable between the two groups. There were no statistically significant differences in age, body mass index, duration or type of infertility, basal follicle-stimulating hormone levels, endometrial thickness, or dominant follicle count between the groups (Table 1). All patients in both groups received the same ovarian stimulation protocol with gonadotropins followed by hCG triggering; therefore, there was no difference between the groups regarding the stimulation protocol.

Table 1. Baseline demographic, infertility-related, and cycle characteristics of the study groups

	Group A (hysteroscopy + IUI) (n=50)	Group B (IUI only) (n=50)	*p*
Age (years)	29.8±4.2	30.1±4.5	0.72
BMI (kg/m²)	24.6±2.8	24.9±3.1	0.65
Duration of infertility (years)	3.2±1.1	3.4±1.3	0.58
Primary infertility, n (%)	32 (64.0%)	30 (60.0%)	0.68
Basal FSH (IU/L)	6.8±1.9	7.0±2.1	0.61
Endometrial thickness (mm)	8.7±1.2	8.5±1.3	0.47
Dominant follicle count	1.8±0.6	1.7±0.5	0.39

Values are presented as mean ± standard deviation or number (percentage), as appropriate. BMI: body mass index; IUI: intrauterine insemination; FSH: follicle-stimulating hormone

Clinical pregnancy was achieved in 10 of 50 women in the hysteroscopy group and in 9 of 50 women in the control group, corresponding to clinical pregnancy rates of 20.0% and 18.0%, respectively. The difference between the groups was not statistically significant (p=0.79). The absolute risk difference for clinical pregnancy was 2% (95% CI: -13% to 17%), and the relative risk of clinical pregnancy in the hysteroscopy group compared with the control group was 1.11 (95% CI: 0.52-2.36). Miscarriage and live birth outcomes were not analyzed because follow-up was limited to the confirmation of clinical pregnancy.

In the hysteroscopy group, intrauterine pathology was detected in 3 of 50 women (6.0%). All detected abnormalities were endometrial polyps and were resected during the same hysteroscopic procedure. No intrauterine adhesions, uterine septa, or submucosal fibroids were identified.

No major hysteroscopy-related complications, including uterine perforation, infection, or fluid overload, were observed. Because intrauterine pathology was detected in only three patients, subgroup analysis according to hysteroscopic findings was not performed.

DISCUSSION

In the present randomized controlled study, diagnostic hysteroscopy performed before a third IUI cycle did not significantly improve clinical pregnancy rates in women with unexplained infertility who had previously undergone two unsuccessful IUI attempts. Clinical pregnancy rates were similar between the hysteroscopy and control groups, and the relative risk estimate did not demonstrate a clinically meaningful benefit. These findings suggest that routine hysteroscopic evaluation before repeated IUI cycles may not provide additional reproductive benefit in women with unexplained infertility and no prior suspicion of intrauterine pathology.

The role of hysteroscopy in infertility management remains a matter of debate. Hysteroscopy is widely regarded as the most accurate method for direct evaluation of the uterine cavity because it allows both visualization and simultaneous treatment of intrauterine abnormalities.[6] However, whether this diagnostic advantage translates into improved reproductive outcomes in unselected infertile women is less certain. In patients with unexplained infertility, current evidence-based recommendations support IUI with ovarian stimulation as an appropriate first-line active treatment, while additional invasive diagnostic procedures should generally be individualized according to clinical findings and previous evaluation results.[4]

Previous studies in infertile women scheduled for assisted reproductive treatment have shown that office hysteroscopy may detect unsuspected intrauterine abnormalities even when conventional imaging findings are normal.[7] Reported rates of occult pathology vary widely, depending on patient selection, previous imaging methods, and whether the population includes women with recurrent implantation failure or other risk factors. In the present study, the prevalence of intrauterine pathology was low, with abnormalities detected in only 6.0% of women undergoing hysteroscopy. All detected lesions were endometrial polyps and were resected during the same procedure. This low rate of pathology may explain why routine hysteroscopy did not lead to a significant improvement in clinical pregnancy rates.

Endometrial polyps are among the most frequently reported intracavitary lesions in infertile women and may interfere with implantation through mechanical effects, altered endometrial receptivity, or local inflammatory changes.[12] In selected infertile women with identified polyps, hysteroscopic polypectomy has been associated with improved reproductive outcomes.[13] Similar observations have also been reported in assisted reproductive treatment populations after outpatient hysteroscopy.[14] Nevertheless, the potential benefit of polypectomy or hysteroscopic treatment should not be extrapolated to women with a normal uterine cavity or to routine hysteroscopic screening of all patients. In our cohort, the small number of detected polyps limited any possibility of subgroup analysis and suggests that the overall benefit of routine hysteroscopy in this setting would be small.

The available literature also supports a selective rather than routine approach to hysteroscopy before assisted reproductive treatment. Earlier reviews suggested that hysteroscopy might be useful before IVF, particularly in women with recurrent implantation failure or suspected uterine abnormalities.[15] An earlier systematic review and meta-analysis also suggested that hysteroscopy before the first IVF cycle might be associated with improved reproductive outcomes, although the authors emphasized the need for more robust randomized evidence.[16] However, subsequent large randomized trials have challenged the routine use of hysteroscopy in unselected patients. The inSIGHT trial reported that routine hysteroscopy before a first IVF cycle did not improve live birth rates in women with a normal transvaginal ultrasound of the uterine cavity.[17] Similarly, the TROPHY trial found no improvement in live birth rates after routine outpatient hysteroscopy in women with recurrent IVF failure and normal ultrasound findings.[18] Although these trials were conducted in IVF populations rather than IUI populations, they reinforce the broader concept that routine hysteroscopy is unlikely to improve reproductive outcomes when there is no clinical or imaging suspicion of intrauterine disease.

Evidence specifically addressing screening hysteroscopy before IUI remains limited, and current systematic review data do not provide high-certainty support for its routine use in unselected patients.[10] This is consistent with our findings and supports an individualized approach. Patients with abnormal HSG or ultrasound findings, abnormal uterine bleeding, previous intrauterine surgery, recurrent pregnancy loss, or a strong clinical suspicion of intracavitary pathology may still benefit from hysteroscopic evaluation.

The present study has several strengths. Its randomized design reduced selection bias, and the study population was relatively homogeneous, consisting of women with unexplained infertility who had already undergone two unsuccessful IUI cycles. In addition, all patients completed the study protocol, and both groups were comparable in baseline demographic and clinical characteristics. These features strengthen the internal validity of the findings.

Study Limitations

However, several limitations should also be acknowledged. First, the sample size was relatively small and may not have been sufficient to detect small differences in clinical pregnancy rates. Second, the study was conducted at a single tertiary centre, which may limit the generalizability of the findings. Third, miscarriage and live birth outcomes were not systematically recorded because some pregnancies were followed in other centers. Therefore, follow-up was limited to the confirmation of clinical pregnancy. This should be considered an important limitation, since live birth represents the most clinically meaningful reproductive outcome. Fourth, the prevalence of intrauterine pathology was low, preventing meaningful subgroup analysis of women with detected abnormalities. Finally, although the study evaluated clinical pregnancy after the third IUI cycle, it did not assess cumulative pregnancy outcomes over subsequent treatment cycles.

CONCLUSION

In conclusion, routine diagnostic hysteroscopy before a repeated IUI cycle did not significantly improve clinical pregnancy rates in women with unexplained infertility and two previous unsuccessful IUI attempts. Given the low prevalence of unsuspected intrauterine pathology and the absence of a measurable reproductive benefit, hysteroscopy should not be considered mandatory before repeated IUI in patients with normal prior evaluation. Instead, it appears more appropriate as a selective intervention for women with abnormal imaging findings, clinical suspicion of intrauterine pathology, or other risk factors that may justify direct uterine cavity assessment.

ETHICS

Ethics Committee Approval: This prospective randomized controlled study was conducted at a tertiary referral centre between May 2013 and December 2014. Ethical approval was obtained from the Local Institutional Ethics Committee of University of Health Sciences Türkiye, İzmir Tepecik Education and Research Hospital with the approval number 03/05, dated 12.05.2013. All procedures were performed in accordance with the principles of the Declaration of Helsinki.

Informed Consent: Written informed consent was obtained from all participants prior to enrolment.

FOOTNOTES

Contributions

Surgical and Medical Practices: S.S., D.Ö., C.S.P., G.H.D., A.D.T., Y.E.P., A.K., Concept: S.S., D.Ö., Y.E.P., Design: S.S., D.Ö., C.S.P., Data Collection or Processing: S.S., G.H.D., A.D.T., A.K., Analysis or Interpretation: S.S., D.Ö., C.S.P., Y.E.P., Literature Search: S.S., G.H.D., A.D.T., Writing: S.S., D.Ö., C.S.P., Critical Review: D.Ö., Y.E.P., A.K.

DISCLOSURES

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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DOI: 10.34057/PPj.2026.45.02.03522
Pelviperineology 2026;45(2):79-85

Short-term outcomes of laparoscopic and vNOTES-assisted lateral suspension for anterior and apical pelvic organ prolapse

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Citation: Bekmezci M, Bülbül R, Genç ŞÖ. Short-term outcomes of laparoscopic and vNOTES-assisted lateral suspension for anterior and apical pelvic organ prolapse. Pelviperineology. 2026;45(2):79-85

ABSTRACT

Objective: Pelvic organ prolapse (POP) is a common condition affecting pelvic floor support. It often leads to significant difficulties in daily activities and reduces patients' quality of life. Different surgical methods, such as laparoscopic lateral suspension (LLS) and vaginal natural orifice transluminal endoscopic surgery (vNOTES)-assisted lateral suspension, have become increasingly popular. This study aimed to evaluate early anatomical outcomes, measure intraoperative performance, and monitor postoperative complications in patients undergoing laparoscopic or vNOTES-assisted lateral suspension for anterior and/or apical POP.

Materials and Methods: This retrospective study included 29 patients who underwent LLS for anterior and/or apical POP between January 2023 and May 2026. Demographic characteristics, prolapse stages, surgical data, perioperative outcomes, and follow-up findings were evaluated. The primary endpoint was defined as anatomical success. Factors influencing anatomical success were also analyzed.

Results: The mean age of the patients was 49.7±9.9 years, and the mean body mass index was 27.3±2.8 kg/m². 72.4% of patients underwent vNOTES-assisted lateral suspension, while 27.6% underwent conventional LLS. The mean operation time was 110.5±44.1 minutes. No intraoperative or major postoperative complications were observed. The mesh-related complication rate was 20.7%. At the last follow-up evaluation, anatomical success was achieved in 22 patients (75.9%). The recurrence rate was 17.2%, and the rate of re-operation was 24.1%. Preoperative POP-Q stage was significantly higher in patients who developed anatomical failure (p=0.010). Advanced prolapse (POP-Q ≥3) was associated with anatomical failure (p=0.035) and the need for re-operation (OR=10.5; p=0.035) (p=0.020).

Conclusion: Laparoscopic and vNOTES-assisted lateral suspension are feasible and safe methods for treating anterior and apical POP. Advanced prolapse and prolonged operation time appear to be risk factors for anatomical failure. Studies with larger sample sizes and longer follow-up periods are needed.

Keywords: Lateral suspension; vNOTES; apical prolapse; pelvic organ prolapse, mesh

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Received: 19 June 2026 **Accepted:** 28 July 2026 **Publication Date:** 04 August 2026

INTRODUCTION

Pelvic organ prolapse (POP) develops when weakening of the connective tissue and muscular support network permits downward displacement of one or more pelvic organs. Clinical manifestations commonly include a sensation of vaginal protrusion, pelvic heaviness, lower urinary tract symptoms, defecatory difficulties, and sexual dysfunction.[1] Epidemiological studies suggest that the lifetime risk of undergoing surgery for prolapse or urinary incontinence approaches 20%, highlighting the considerable healthcare burden associated with pelvic floor disorders.[2]

POP affects a significant number of women globally. The mechanism underlying POP development is not completely understood. However, it is believed to arise due to complex biological processes, age-related tissue alterations, obstetric trauma that are affected by hormonal influences as well as inherited susceptibility.[3] Furthermore, risk factors such as vaginal delivery, obesity and menopause which affect the levator ani muscle and support of the pelvic floor do exist. All these factors can lead to an increased risk of developing apical support defects, which are the most complex reconstructive strategies.[3,4]

The surgical options available for the correction of POP include conventional tecniques which are associated with substantially greater complications ratea than current minimally invasive alternative techniques. These surgical approaches rely on anatomical support that are achieved by direct tissue apposition and not by the use of implanted materials. In the laparoscopic route for POP repair, a mesh is either inserted through ports [as in abdominal sacrocolpopexy, that is the gold standart approach or fixed to ligaments within or outside the pelvis through incisions 8 as in laparoscopic lateral suspension (LLS)]. Both have been associated with various complications (e.g., urinary retention and incontinence, permanent loss of sensation, bladder injury, vaginal scarring, and failure to void), and therefore are not widely performed in routine practice. These issues are further compounded when a prior surgical history is present.[5] The optimal surgical approach will depend on a number of factors, including the quality of the pelvic floor dissection and mesh placement, expertise at a particular approach, and patient anatomy preference.

Abdominal and laparoscopic sacrocolpopexy have long been regarded as reference procedures for apical prolapse because of their favorable long-term anatomical outcomes.[6] Nevertheless, sacrocolpopexy requires dissection of the sacral promontory, which may increase operative complexity and carries risks of vascular, neurologic, and osteoarticular complications.[7] Furthermore, postoperative lumbosacral pain and rare but serious complications such as spondylodiscitis have been reported after promontory fixation.[8,9]

In response to these concerns, several techniques that eliminate the need for sacral promontory dissection have been introduced. LLS, first described by Dubuisson et al.,[10] provides support to the anterior and apical compartments through lateral mesh suspension and has emerged as an attractive minimally invasive alternative to sacrocolpopexy.[11,12] Several studies have reported anatomical success rates exceeding 80%, with low rates of severe perioperative complications and acceptable long-term outcomes.[13-15]

More recently, vaginal natural orifice transluminal endoscopic surgery (vNOTES) has expanded the possibilities of minimally invasive gynecologic surgery. By combining endoscopic visualization with transvaginal access, vNOTES eliminates abdominal incisions while potentially reducing postoperative pain and facilitating recovery.[16,17] Although initially introduced for benign gynecologic procedures, the application of vNOTES in pelvic floor reconstruction has gained increasing interest. Early studies suggest that vNOTES-assisted prolapse repair is technically feasible and may offer satisfactory anatomical outcomes.[17,18]

Despite growing enthusiasm for both laparoscopic and vNOTES-assisted lateral suspension, evidence remains limited, particularly regarding real-world outcomes and factors associated with surgical failure. Therefore, the aim of the present study was to evaluate short-term anatomical outcomes, perioperative results, and complication profiles in women undergoing laparoscopic or vNOTES-assisted lateral suspension for anterior and/or apical POP. Additionally, potential predictors of anatomical failure and reoperation were investigated.

MATERIALS AND METHODS

Study Design and Patient Selection

A retrospective observational cohort was assembled from patients who underwent laparoscopic or vNOTES-assisted lateral suspension for anterior and/or apical prolapse at Aksaray Training and Research Hospital between January 2023 and May 2026. Patients under the age of eighteen, those with incomplete medical records, those for whom postoperative follow-up data were unavailable, and those with a concomitant diagnosis of pelvic malignancy were excluded from the study. Patient-related variables including age, body mass index, parity, menopausal status, prior pelvic surgery, and prolapse characteristics were extracted from institutional electronic records. The preoperative prolapse stage of the patients was also obtained from the hospital information management system (HIMS). In our clinic, prolapse

grading of all patients is performed using the POP quantification (POP-Q) system. In the perioperative evaluation, operation time, concurrently performed surgical procedures, and intraoperative complications were recorded by examining the HIMS. In the postoperative evaluation, hospital stay duration, follow-up period, anatomical success rate, recurrence development, mesh-related complications, and the need for re-surgery were also recorded.

Ethics Committee Approval

This study was approved by the Ethics Committee of Aksaray University Faculty of Medicine (approval no: 2026/201, date: 18.06.2026). The study was conducted in accordance with the principles of the Declaration of Helsinki. Due to the retrospective nature of the study, the requirement for informed consent was waived by the Ethics Committee.

Surgical Technique

Surgical procedures were carried out by a dedicated urogynecology team using standardized operative protocols. Twenty-one patients underwent vNOTES-assisted lateral suspension, whereas eight patients underwent conventional LLS. A sterile, non-absorbable polypropylene mesh was used in all patients. The mesh was tailored intraoperatively into strips approximately 1 cm in width according to the patient's pelvic anatomy. The anterior vaginal wall was dissected, and the mesh was secured to the anterior vaginal fascia using interrupted 0 polypropylene (Prolene®) sutures. The mesh arms were then advanced bilaterally through the retroperitoneal tunnel and fixed to the lateral abdominal wall under appropriate tension. Care was taken to avoid excessive tension during fixation, and peritoneal closure was completed after ensuring adequate hemostasis.

LLS Technique

All patients were operated on under general anesthesia in the dorsal lithotomy position. Abdominal access was established after carbon dioxide insufflation, and standard laparoscopic port placement was performed.

After evaluating the pelvic anatomy, vesicovaginal dissection was performed to expose the anterior vaginal wall. A polypropylene mesh of appropriate size was secured to the anterior vaginal wall with non-absorbable sutures. Both arms of the mesh were advanced retroperitoneally and directed to the bilateral abdominal lateral wall. Mesh arms were secured on both sides in the anterior superior iliac spine region to ensure appropriate tension. After mesh peritonization was completed, hemostasis was checked and the operation was terminated.

vNOTES Supported Lateral Suspension Technique

In cases where vNOTES was applied, the operation was performed via a vaginal approach. After posterior colpotomy, the vNOTES port system was placed and pneumoperitoneum was created.

Pelvic anatomy was evaluated under endoscopic imaging. After establishing a connection between the vaginal dome or cervical structure and the mesh, the mesh arms were directed to the bilateral pelvic lateral wall. After ensuring appropriate tension, the mesh was secured and the vaginal entrance was closed, terminating the procedure.

Simultaneous Surgeries

In some patients, total laparoscopic hysterectomy, bilateral salpingectomy, or other pelvic floor surgeries were performed simultaneously as required by clinical necessity.

The principal outcome measure was anatomical success at follow-up assessment. Successful anatomical correction was considered to be maintenance of POP-Q stage 0-1 without evidence of recurrent anterior or apical prolapse during follow-up. Secondary endpoints were defined as operation time, estimated blood loss, length of hospital stay, intraoperative and postoperative complications, mesh-related complications, recurrence rate, reoperation rate, and follow-up time.

Statistical Analysis

Data analysis was conducted using SPSS software (version 26.0; IBM Corp., Armonk, NY, USA). Continuous variables are presented as mean ± standard deviation or median (range), whereas categorical variables are presented as frequencies and percentages. Continuous variables were compared using the Mann-Whitney U test, and categorical variables were compared using Fisher's exact test. A p-value <0.05 was considered statistically significant.

RESULTS

A total of 29 patients who underwent LLS due to anterior and/or apical POP during the study period were included in the analysis. The demographic and clinical characteristics of the patients are presented in Table 1.

The mean age of the patients was 49.7±9.9 years, and the mean body mass index was 27.3±2.8 kg/m^2. The median parity was 3 [interquartile range (IQR): 2-4]. Eleven patients (39.3%) were menopausal, and 10 (35.7%) had a history of previous pelvic surgery. Preoperative evaluation revealed anterior compartment prolapse in 21 patients (80.8%) and apical prolapse in 6 patients (20.7%). When the POP-Q stage distribution was examined, it was observed that 48.3% of the patients had advanced stage (stage

Table 1. Demographic and clinical characteristics of the patients (n=29)

Variable	Value
Age (years), mean ± SD	49.7±9.9
Body mass index (kg/m^2), mean ± SD	27.3±2.8
Parity, median (IQR)	3 (2-4)
Menopause, n (%) *	11 (39.3)
Previous pelvic surgery, n (%) *	10 (35.7)
Anterior prolapse, n (%)†	21 (80.8)
Apical prolapse, n (%)	6 (20.7)
Stage 1	4 (13.8)
Stage 2	11 (37.9)
Stage 3	12 (41.4)
Stage 4	2 (6.9)
vNOTES	21 (72.4)
Laparoscopy	8 (27.6)
Concomitant surgery, n (%)	19 (65.5)

SD: standard deviation; IQR: interquartile range; vNOTES: vaginal natural orifice transluminal endoscopic surgery; *: missing data in one patient (n=28); †: missing data in three patients (n=26)

Table 2. Perioperative and safety outcomes (n=29)

Outcome	Value
Operative time (min), mean ± SD	110.5±44.1
Operative time (min), median (range)	110 (30-185)
Length of hospital stay (days), median (IQR) *	2 (1-2)
Follow-up duration (months), median (IQR)	4 (3-5)
Intraoperative complications, n (%)	0 (0.0)
Postoperative complications, n (%)	0 (0.0)
Mesh-related complications, n (%)	6 (20.7)

SD: standard deviation; IQR: interquartile range; *: missing data in one patient (n=28)

≥3) prolapse. As a surgical approach, vNOTES was performed on 21 patients (72.4%), and conventional laparoscopy on 8 patients (27.6%). Additionally, simultaneous surgical intervention was performed on 19 patients (65.5%).

When perioperative outcomes were evaluated, the mean operation time was found to be 110.5±44.1 minutes (Table 2). The median hospital stay was 2 days (IQR: 1-2) and the median follow-up period was 4 months (IQR: 3-5). No intraoperative or major postoperative complications were observed. However, mesh-related complications developed in 6 patients (20.7%). Mesh-related complications were observed in six patients during follow-up. Four of these patients underwent reoperation because of symptomatic vaginal mesh exposure. Mesh excision was performed at postoperative 3, 6, 8, and 10 months, respectively. All patients recovered without major postoperative morbidity following mesh excision. In addition, three patients required reoperation because of recurrent POP. Reoperations for prolapse recurrence were performed at 1 year, 18 months, and 2 years after the initial surgery.

The primary endpoint of the study, anatomical success, was achieved in 22 patients (75.9%) at the last follow-up evaluation. During the follow-up period, recurrence occurred in five patients (17.2%). Three of these patients required repeat surgery because of recurrent POP, whereas the remaining two patients were managed conservatively. Overall, seven patients (24.1%) underwent further surgical intervention, including four patients who underwent mesh excision because of symptomatic vaginal mesh exposure and three patients who underwent repeat surgery because of recurrent prolapse.

When factors affecting anatomical success were examined, it was found that preoperative POP-Q stages were significantly higher in patients who developed anatomical failure (median 3 vs. 2; p=0.010) (Table 3). Similarly, advanced prolapse (POP-Q ≥3) was significantly associated with anatomical failure (85.7% vs.

Table 3. Comparison of patient characteristics and outcomes according to anatomical success

Variable	Anatomical success (+) (n=22)	Anatomical success (-) (n=7)	*p*-value
Age (years), median (range)	48.5 (37-69)	42.0 (40-66)	0.386
Body mass index (kg/m^2), median (range)	27.1 (23.0-32.8)	25.7 (24.2-32.8)	1.000
Parity, median (range)	3 (1-6)	3 (1-5)	0.714
Preoperative POP-Q stage, median (range)	2 (1-3)	3 (2-4)	0.010
Advanced prolapse (POP-Q ≥3), n (%)	8 (36.4)	6 (85.7)	0.035
Operative time (min), median (range)	97.5 (30-155)	180.0 (50-185)	0.020
Length of hospital stay (days), median (range)	2 (1-7)	1 (1-6)	0.497
Follow-up duration (months), median (range)	4 (3-9)	6 (3-12)	0.261

Continuous variables were analyzed using the Mann-Whitney U test, and categorical variables were analyzed using Fisher's exact test. POP-Q: pelvic organ prolapse quantification

36.4%; p=0.035). Operation time was also significantly longer in patients who developed anatomical failure (180 minutes vs. 97.5 minutes; p=0.020). In contrast, no significant relationship was found between age, body mass index, parity, length of hospital stay, and follow-up time and anatomical success (p>0.05 for all comparisons).

In additional analyses, it was observed that operation time was significantly longer in patients who developed mesh-related complications (180 minutes vs. 95 minutes; p<0.001). Furthermore, advanced prolapse was found to be significantly associated with the need for repeat surgery (odds ratio =10.5; p=0.035).

DISCUSSION

This analysis provides insight into the early clinical performance of laparoscopic and vNOTES-assisted lateral suspension in routine urogynecologic practice. Several noteworthy observations emerged from the current dataset. First, anatomical success was achieved in approximately three-quarters of patients. Second, no intraoperative or major postoperative complications were observed. Third, advanced preoperative prolapse stage emerged as the most important factor associated with anatomical failure and the need for reoperation.

The overall anatomical success rate of 75.9% observed in our cohort is somewhat lower than that reported in many previously published series. Dubuisson et al.[10] reported success rates exceeding 90% following LLS, while subsequent studies generally demonstrated anatomical success rates ranging between 80% and 95%.[13,19,20] Several factors may explain this difference. Nearly half of our cohort presented with advanced prolapse (POP-Q stage ≥3), a proportion higher than that reported in many surgical series. Moreover, our analysis reflects routine clinical practice rather than highly selected study populations, potentially providing a more realistic representation of contemporary outcomes.

One of the most important observations of our study was the association between advanced prolapse and unfavorable surgical outcomes. Patients with POP-Q stage ≥3 had significantly higher rates of anatomical failure and reoperation. This finding is consistent with previous evidence indicating that baseline prolapse severity is among the strongest predictors of recurrence following reconstructive pelvic floor surgery.[3,20] Advanced prolapse likely reflects more extensive connective tissue deterioration and pelvic floor dysfunction, which may compromise the long-term durability of surgical repair.

Recurrence occurred in 17.2% of patients. Although recurrence rates following lateral suspension vary considerably across studies because of differences in follow-up duration and outcome definitions, published rates generally range between 5% and 20%.[13,19] Therefore, our findings remain within the upper range of previously reported outcomes. Importantly, the relatively short follow-up period in our cohort may not fully capture delayed recurrences, emphasizing the need for longer-term evaluation. The relatively short follow-up duration may partly explain the observed recurrence and complication profile.

The overall reoperation rate of 24.1% deserves particular attention. At first glance, this rate appears higher than those reported in most contemporary prolapse series. However, detailed review demonstrated that not all repeat procedures were performed because of recurrent prolapse. A substantial proportion involved management of mesh-related complications.[15] Consequently, reoperation rates should be interpreted cautiously and not considered a direct surrogate for anatomical failure alone.

Another noteworthy finding was the association between prolonged operative time and both anatomical failure and mesh-related complications. Longer procedures may indicate technically demanding surgery, advanced disease, distorted pelvic anatomy, or the need for concomitant procedures. Although causality cannot be established within a retrospective design, operative duration may represent a useful surrogate marker for surgical complexity and deserves further investigation in larger cohorts.

Mesh-related complications occurred in 20.7% of patients. This rate is higher than that reported in several large LLS series.[15,19] The relatively small sample size likely contributed to this finding, as a limited number of events may substantially affect percentage-based estimates. Differences in complication definitions and reporting standards across studies may also hinder direct comparison. Nevertheless, these findings underscore the importance of careful mesh handling, meticulous surgical technique, and structured postoperative surveillance. Although the overall rate of mesh-related complications appeared relatively high in our cohort, all mesh-related reoperations were performed because of symptomatic vaginal mesh exposure, which represents one of the most frequently reported mesh-related adverse events after transvaginal or abdominal mesh surgery. Importantly, all affected patients were successfully managed by surgical mesh excision without severe morbidity. Likewise, prolapse recurrence requiring reoperation occurred in three patients during longer-term follow-up (1-2 years after surgery), suggesting that recurrence developed gradually rather than as an early technical failure. Considering the relatively small sample size of the present study, a limited number of adverse events may have resulted in a seemingly higher complication rate when expressed as percentages.

An additional strength of our study is the inclusion of patients undergoing vNOTES-assisted lateral suspension. Although vNOTES has rapidly gained popularity in gynecologic surgery, evidence regarding its application in prolapse repair remains relatively limited.[16-18] Because nearly three-quarters of patients in our cohort underwent the vNOTES-assisted approach, our findings provide further real-world evidence supporting the technical feasibility of this procedure. However, adequately powered comparative studies are still needed before definitive conclusions regarding comparative effectiveness can be drawn.

The absence of intraoperative and major postoperative complications observed in the present study supports the overall safety profile of lateral suspension. Avoidance of promontory dissection may reduce the risk of major vascular injury and presacral complications that are traditionally associated with sacrocolpopexy.[7,8] This advantage may be particularly relevant in patients with obesity, extensive adhesions, or challenging pelvic anatomy.

Study Limitations

Several limitations should be acknowledged. The retrospective design introduces the potential for selection bias and incomplete data collection. The relatively small sample size limits statistical power and restricts subgroup analyses. Furthermore, the single-center nature of the study may reduce generalizability. Finally, the short follow-up period precludes comprehensive assessment of long-term durability and delayed mesh-related complications.

CONCLUSION

In conclusion, laparoscopic and vNOTES-assisted lateral suspension appear to be feasible minimally invasive options for the treatment of anterior and apical POP. Although satisfactory short-term outcomes were achieved and major perioperative complications were not encountered, advanced prolapse stage was associated with increased risks of anatomical failure and reoperation. Larger prospective multicenter studies with longer follow-up are warranted to further clarify the long-term effectiveness and safety of these approaches.

ETHICS

Ethics Committee Approval: This study was approved by the Ethics Committee of Aksaray University Faculty of Medicine (approval no: 2026/201, date: 18.06.2026). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Informed Consent: Due to the retrospective nature of the study, the requirement for informed consent was waived by the Ethics Committee.

FOOTNOTES

Contributions

Surgical and Medical Practices: M.B., R.B., Ş.Ö.G., Concept: M.B., R.B., Ş.Ö.G., Design: M.B., R.B., Ş.Ö.G., Data Collection or Processing: M.B., Analysis or Interpretation: M.B., Ş.Ö.G., Literature Search: M.B., Writing: M.B., Ş.Ö.G.

DISCLOSURES

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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DOI: 10.34057/PPj.2026.45.02.44153
Pelviperineology 2026;45(2):86-91

Clitoral abscess: A rare gynecologic entity– case report & literature review

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Citation: Aydoğan HÖ, Temiz BE, Çamur E, Dülger D. Clitoral abscess: a rare gynecologic entity– case report & literature review. Pelviperineology. 2026;45(2):86-91

ABSTRACT

Clitoral abscesses are rare clinical entities with no standardized treatment protocols, mainly due to the limited number of reported cases, and recurrence is common regardless of initial therapeutic approach. We report a 24-year-old nulliparous woman with a three-day history of pelvic-perineal pain and a palpable vulvar mass. Initial antibiotic therapy with ciprofloxacin and paracetamol failed to relieve symptoms. Examination revealed a 3×3 cm fluctuant, tender mass beneath the clitoral prepuce. Laboratory tests showed mild neutrophilic leukocytosis and elevated inflammatory markers. Ultrasonography confirmed a localized abscess, and pelvic magnetic resonance imaging—used for the first time in this context—demonstrated a well-defined fluid collection without osteomyelitis or adjacent involvement. Surgical incision and drainage were performed preserving neurovascular integrity. Histopathology revealed chronic active inflammation, and microbiology indicated polymicrobial infection. The patient recovered uneventfully, with no recurrence at six-month follow-up. This case, with literature review, underscores individualized evaluation and highlights limited data guiding clinical decision-making.

Keywords: Abscess; clitoris; magnetic resonance imaging; vulvar diseases; case report

INTRODUCTION

Spontaneous clitoral abscess is a rare gynecological emergency. Although some cases are associated with identifiable etiological factors such as pilonidal disease, female circumcision, or genital trauma, no clear cause has been identified in most cases reported in the literature.[1] This localized inflammatory lesion in the nerve-rich clitoral region can cause severe pain and significant morbidity.[2] Management approaches include antibiotic therapy alone or surgical interventions such as incision and drainage (I&D) and marsupialization. Due to the limited number of reported cases, no standard treatment protocol has been established.[1,3] In this article, a rare case of clitoral abscess is presented, and the clinical management process from diagnosis to treatment is discussed in light of current literature.

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Received: 26 February 2026 **Accepted:** 24 April 2026 **Publication Date:** 04 August 2026

CASE REPORT

A 24-year-old nulliparous woman presented to the emergency department with a three-day history of pelvic-perineal pain and a palpable vulvar swelling. She had previously been prescribed ciprofloxacin (2×500 mg/day) and paracetamol (3×500 mg/day) at another facility; however, due to lack of clinical improvement, she was referred to our institution.

The patient was sexually active, reported condom use, and had no new partner in the past six months. She denied unusual sexual behaviors, use of sex toys, prior sexually transmitted infections, or additional genitourinary/systemic symptoms such as vaginal discharge, dysuria, abdominal pain, fever, or chills. Vital signs were normal. Her medical history was unremarkable, except for tobacco use, with no evidence of immunosuppression.

On examination, marked tenderness and swelling were present in the clitoral region. A 3×3 cm, tender, fluctuant, mildly erythematous spherical mass was palpated beneath the clitoral prepuce, causing noticeable enlargement (Figure 1). Due to severe tenderness, direct visualization of the clitoris was not possible. Vaginal speculum examination was normal.

Laboratory tests showed mild neutrophilic leukocytosis (11,000/mm^3), elevated C-reactive protein (14 mg/L), and increased erythrocyte sedimentation rate (40 mm/hour), while urinalysis, biochemistry, and coagulation parameters were within normal limits.

Grayscale ultrasonography demonstrated a well-defined, hypoechoic, heterogeneous fluid collection in the clitoral body, suggestive of abscess formation. Color Doppler imaging revealed peripheral hyperemia, consistent with active inflammation.

Given the atypical localization and severity of pain, magnetic resonance imaging (MRI) was performed to evaluate deeper extension and potential complications, including osteomyelitis, fistulization, or involvement of adjacent urogenital and neurovascular structures. To our knowledge, this represents the first reported MRI of a clitoral abscess (Figure 2). Pelvic MRI showed a ~3 cm T1-hypointense, T2-hyperintense fluid collection with diffusion restriction (b=1000) and peripheral gadolinium enhancement. No bone marrow signal abnormality was detected in the pubic symphysis, excluding osteomyelitis. Adjacent soft tissues and neurovascular structures were normal, with no evidence of pilonidal sinus. Combined ultrasonography and MRI findings confirmed an isolated clitoral abscess.

During I&D, care was taken to preserve the dorsal clitoral artery and surrounding neurovascular structures. No sinus tract was identified. Histopathological examination of the capsule-like

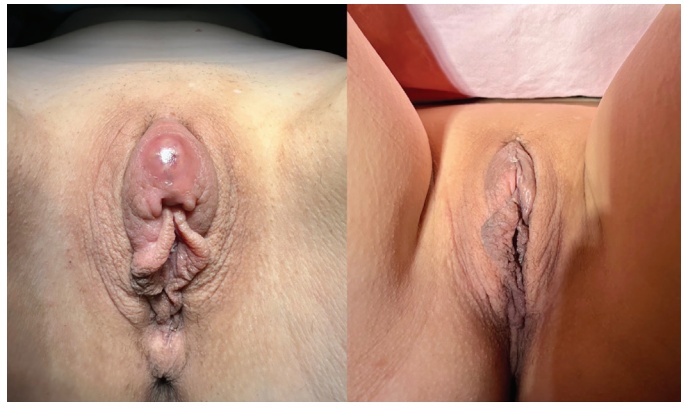

Figure 1. Clinical appearance of the clitoral abscess at presentation and at one-month follow-up

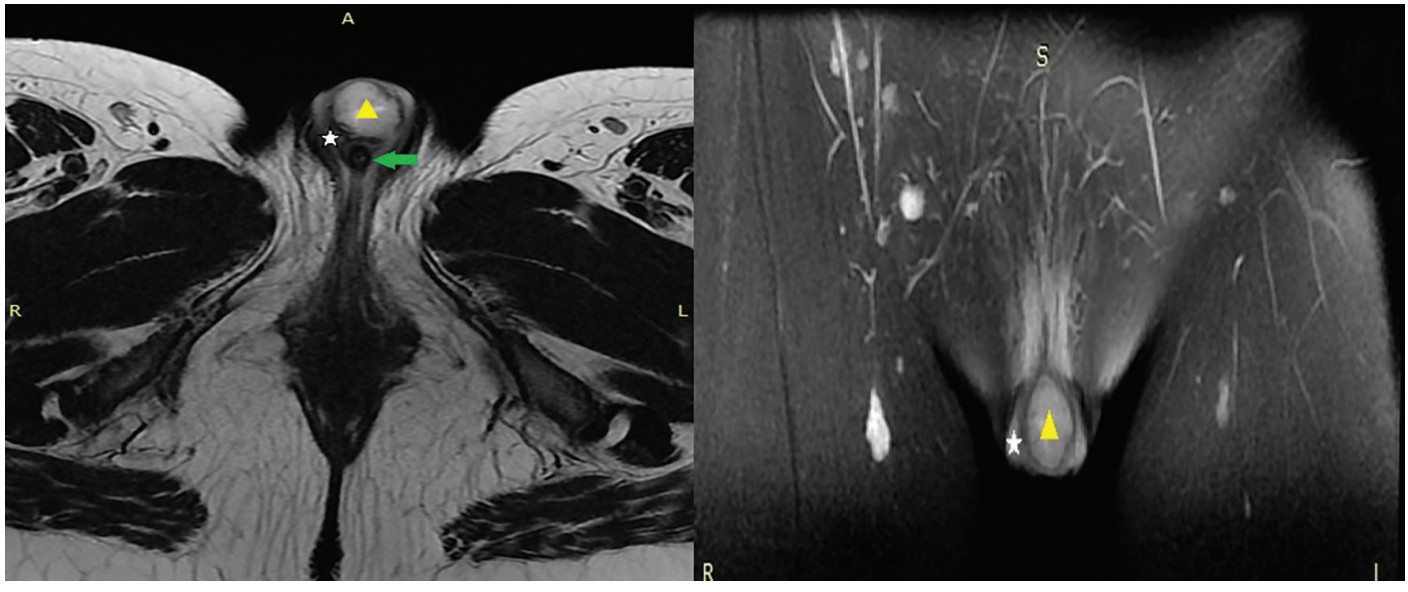

Figure 2. Pelvic MRI demonstrating a clitoral abscess asterisk: Clitoral body; triangle: Abscess cavity; arrow: Urethra
MRI: magnetic resonance imaging

tissue showed chronic active inflammation with epithelial reparative atypia, without malignancy. Microbiological analysis of purulent material revealed no specific pathogen; however, microscopy demonstrated abundant polymorphonuclear leukocytes, anaerobic Gram-negative *Bacilli*, and Gram-positive *Cocci*, consistent with a polymicrobial infection. Postoperatively, edema and tenderness resolved completely, with full relief of pain.

In the postoperative period, the patient was prescribed a seven-day course of oral ampicillin-sulbactam (2×750 mg) and metronidazole (3×500 mg), providing broad-spectrum coverage against Gram-positive, Gram-negative, and anaerobic organisms, consistent with the polymicrobial nature of vulvar abscesses and supported by microbiological findings in this case. At one-month follow-up, she was asymptomatic, with no neurological deficits or cosmetic abnormalities (Figure 1). The prepuce had healed completely, and no recurrence was observed at six months.

Written informed consent for publication of this case report and accompanying images was obtained from the patient. Formal ethics committee approval was not required for this single case report. The study was conducted in accordance with the principles of the Declaration of Helsinki (2013 revision).

DISCUSSION

Spontaneous clitoral abscess is an extremely rare condition in gynecological practice, and no standardized approach to diagnosis, treatment, or follow-up has been established. Although specific risk factors remain unclear, smoking and pregnancy have been reported in some cases as potential contributors.[4]

The clitoris is highly sensitive due to its rich neurovascular network and complex anatomy. Therefore, in surgical interventions involving the clitoral region—particularly invasive procedures such as abscess drainage—preservation of anatomical integrity and function is essential. Ultrasound is generally preferred as the first-line imaging method because it is widely available and, with Doppler, allows vascular assessment while distinguishing cystic from solid lesions. In cases of atypical presentation, large or deep collections, or suspected complications such as osteomyelitis and fistulization, MRI provides a more detailed and reliable assessment owing to its superior soft tissue contrast. Although clitoral abscesses are often diagnosed clinically, in our case MRI images were obtained for the first time in the literature (Figure 2). MRI may be valuable when severe pain limits examination or when a detailed anatomical evaluation is required. Notably, since clitoral abscesses are usually identifiable through clinical examination, routine MRI is not necessary.

Including our case, 24 clitoral abscess cases have been reported in the English literature (Table 1). As available data are largely based on case reports and the number of documented cases is limited, management decisions are mostly left to the clinician's experience. Findings suggest that definitive surgical approaches—such as marsupialization or sinus tract excision—may be more effective in reducing recurrence. Among 24 cases, recurrence occurred in 16, and 12 required subsequent definitive surgery. These observations indicate that invasive procedures supported by histopathological diagnosis may improve long-term outcomes, although larger patient series are needed to confirm these findings.

When the histopathological evaluations of the 24 clitoral abscess cases reported in the literature are examined, more than half of them did not receive a specific histopathological diagnosis. "Non-specific inflammation" was reported in five cases,[5,6] "inflammatory changes" in three;[4,6] and in seven, no histopathological examination or biopsy was performed.[1-3,7] Although very rare, specific pathologies causing clitoral abscess have also been mentioned in the literature, including Crohn's disease and ectopic breast tissue—each reported in only a single case.[8,9]

Among cases with an established diagnosis, the most frequent pathology was pilonidal abscess in the clitoral region, observed in seven cases. This shows that pilonidal disease, although rare, can occur in this area and should be considered in the etiology of clitoral abscesses. Initial treatments included spontaneous drainage in three cases, I&D in two, and local excision in one. Recurrence occurred in five of six diagnosed cases, often with multiple episodes. As definitive treatment, surgical excision of the sinus tract was performed in four cases.[1,7,10] These findings suggest that clitoral abscesses originating from pilonidal sinus carry a high recurrence risk, and in most cases surgical excision is required for permanent resolution.

Of eight cases with histopathological findings of inflammatory changes but no specific diagnosis, recurrence was reported in six. Marsupialization was performed in five of these to achieve permanent resolution, while one was managed conservatively despite prolonged recurrences.[5,6] In one of the remaining two cases—our own—no recurrence occurred during six months of follow-up, whereas in the case reported by Ferhi et al.,[4] lack of long-term follow-up prevented assessment of recurrence.

Data from the seven cases without biopsy are limited, restricting clarification of etiological factors and analysis of treatment responses. Although surgical interventions such as marsupialization or repeat drainage were used in some recurrence-reported cases without biopsy, the lack of histopathological

Table 1. Reported spontaneous periclitoral abscess cases								
Year	**Author**	**Age**	**Initial management**	**Antimicrobial therapy**	**Microbiological culture**	**Recurrence**	**Definitive treatment**	**Histopathological examination**
1957	Palmer	29	Spontaneous drainage	Sulfadiazin	None reported	1 year	Excision of cyst-track	Pilonidal
1962	Betson et al	29	Spontaneous drainage		None reported	1 year	Excision of cyst-track	Pilonidal
1972	Radman and Bhagavan	22	Incision & drainage		None reported	Multiple times within 2 years	Excision of cyst-track	Pilonidal
1975	Devroede et al.	28	Spontaneous drainage		*S. aureus, S. epidermidis, Peptostreptococcus*	None (5 months follow-up)		Crohn's disease
1980	Reeves and Kaufman	29	Incision & drainage		None reported	8 days later	Excision of mass	Ectopic breast tissue
1982	Kent and Taxiarchis	24	Incision & drainage		None reported	Multiple times within 11 years	Conservative	Non-specific
1982	Kent and Taxiarchis	23	Spontaneous drainage		None reported	Multiple times within 6 years	Marsupialization	Non-specific
1982	Kent and Taxiarchis	29	Spontaneous drainage		*Bacteroides, Diphtheroids*	10 years	Marsupialization	Non-specific
1982	Kent and Taxiarchis	31	Incision & drainage		Coag-positive *Staphylococcus*	Multiple times within 1.5 years	Marsupialization	Non-specific
1983	Sur	41	Incision & drainage		*Streptococcus bovis*	2 months	Marsupialization	Non-specific
1983	Sur	16	Incision & drainage		None identified	3 months	Marsupialization	Inflammatory changes
1990	Werker and Kon	23	Local excision		None reported	Multiple times within 1 year	Excision of cyst-track	Pilonidal
2003	Chinnock	41	Conservative	Cephalosporin	None reported	None (no follow-up reported)		No biopsy
2004	Lara-Torre et al.	11	Spontaneous drainage	Unspecified	None reported	None (6 months follow-up)		No biopsy
2007	Mendilcioglu	33	Spontaneous drainage	Ampicillin/ sulbactam	None identified	21 years	Marsupialization	No biopsy
2008	Baker et al.	30	Incision & drainage	Cefazolin + metronidazole	None reported	Multiple times within 2 years	Excision of cyst-track	Pilonidal
2010	Maor-Sagie et al.	8	Local excision		None reported	3 months	Excision of tract	Pilonidal
2011	Koussidis	17	Incision & drainage		Coag-positive Staphylococcus	None (8 months follow-up)		No biopsy
2017	Jain	21	Incision & drainage	Unspecified	None reported	None (no follow-up reported)		No biopsy
2020	Zeitoun	53	Incision & drainage	Co-amoxiclav	*S. anginosus*	None (no follow-up reported)		Pilonidal

Table 1. Continued

Year	Author	Age	Initial management	Antimicrobial therapy	Microbiological culture	Recurrence	Definitive treatment	Histopathological examination
2022	Dielentheis	17	Incision & drainage	Trimethoprim/ sulfamethoxazol	*S. anginosusand Staphylococcus*	2 days later	Incision & drainage	No biopsy
2023	Palacios	42	Incision & drainage	Amoxicillin	*Actinomyces turicensis*	6 weeks	Marsupialization	No biopsy
2023	Ferhi	26	Incision & drainage	Flucloxacillin	Polymicrobial organisms, no specific bacterial identification.	None (no follow-up reported)		Inflammatory changes
2025	Our case	24	Incision & drainage	Ampicilline/ sulbactam + metronidazol	Polymicrobial organisms, no specific bacterial identification.	None (6 months follow-up)		Inflammatory changes

(A review of English-language literature was conducted through the PubMed database (National Library of Medicine, Bethesda, MD), covering publications from January 1, 1950, to May 31, 2025. The search utilized various combinations of the following keywords: "periclitoral abscess," "clitoral abscess", "clitoral inflammation," "periclitoral inflammation," and "clitoral pilonidal")

information restricts interpretation of underlying causes. Indeed, even among the cases where biopsy was performed, a specific diagnosis could not be established in approximately half. While histopathological diagnosis is important for clinical management, it should also be acknowledged that biopsy may not always be sufficient to explain the underlying etiology.

In the limited number of abscess cultures evaluating the microbiological etiology of clitoral abscesses, various microorganisms have been isolated, including *Streptococcus bovis*, coagulase-positive *Staphylococcus* species, *Bacteroides* species, and *Diphtheroids*.[1,4] Culture results were reported in only 10 cases, insufficient to implicate a single specific pathogen. In most culture-positive cases, a polymicrobial flora was identified; additionally, *Actinomyces turicensis* was isolated in only one case.[3] Current data reveal a heterogeneous microbial profile and provide no evidence for a role of sexually transmitted infections in the etiology of these abscesses.[4]

CONCLUSION

Spontaneous clitoral abscesses require an individualized approach due to their high risk of recurrence and the absence of a standardized treatment algorithm. Findings in the literature suggest that I&D alone may be insufficient; particularly in recurrent cases, definitive surgical approaches such as marsupialization or sinus tract excision may yield more successful outcomes. Although histopathological examination obtained through biopsy can support clinical management, a specific diagnosis cannot be established in approximately half of cases. Advanced imaging methods can be helpful in the diagnostic process—especially when clarification of anatomical relationships is necessary—but are not recommended for routine use. Given the limited number of reported cases and the heterogeneity in therapeutic approaches, further well-documented case series and systematic analyses are needed to better define optimal management strategies and reduce recurrence rates in clitoral abscesses.

ETHICS

Informed Consent: Written informed consent for publication of this case report and accompanying images was obtained from the patient. Formal ethics committee approval was not required for this single case report. The study was conducted in accordance with the principles of the Declaration of Helsinki (2013 revision).

FOOTNOTES

Contributions

Surgical and Medical Practices: H.Ö.A., B.E.T., E.Ç., Concept: H.Ö.A., Design: H.Ö.A., Data Collection or Processing: H.Ö.A., B.E.T., D.D., Analysis or Interpretation: H.Ö.A., B.E.T., Literature Search: H.Ö.A., B.E.T., E.Ç., D.D., Writing: H.Ö.A., B.E.T.

DISCLOSURES

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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DOI: 10.34057/PPj.2026.45.02.02411
Pelviperineology 2026;45(2):92-99

Standards of care and future directions in vaginal atrophy

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Citation: Roncati L, Sadykova D. Standards of care and future directions in vaginal atrophy. Pelviperineology. 2026;45(2):92-99

ABSTRACT

Vaginal atrophy (VA) affects about half of the female population in post-menopause, a rate that justifies the growing interest in research, and is due to an estrogen deficiency. This involves dryness, thinning of the epithelium, and a concomitant loss of glycogen in epithelial cells with progressive reduction in the number of glycogen-feeding acidophiles *Lactobacilli*. The lack of *Lactobacilli* in turn causes pH alterations and less resistance to infections. If left untreated over the years, VA progresses from mild to moderate and severe forms. Current management is based on hormone replacement therapy (HRT), with the vaginal route of administration being preferred, as it shows fewer side effects and is in direct contact with the mucosa; selective estrogen receptor modulators, particularly ospemifene; selective estrogen enzyme modulators, an example of which is tibolone; and non-HRT interventions. The last ones represent the standards of care in mild VA to be started as early as possible, and a first-line treatment in moderate to severe forms not complicated by osteoporosis as part of a step-up approach. A focus on innovative techniques such as laser, radiofrequency combined with electroporation, and ozone-oxygen therapy is here carried out, together with an excursus on products of proven efficacy virtually free of side effects, i.e., hyaluronic acid, fat-soluble vitamins (vitamins A and E), probiotics (*Lactobacilli*), polynucleotides, exosomes, phytoestrogens (soy isoflavones), monocots (*Aloe vera, Triticum aestivum*), and platelet-rich plasma. Future directions for therapeutic intervention specifically aim to protect women's health and well-being by encouraging research in the field of non-HRT, and its integration with hormonal treatments; in this way, it will be possible to further reduce the minimum effective dose of hormones to be taken, if necessary, by moving from low to ultra-low doses for an increasingly shorter period of time.

Keywords: Vaginal atrophy; genitourinary syndrome of menopause; hormone replacement therapy; selective estrogen receptor modulators; phytoestrogens; laser; radiofrequency; electroporation; ozone-oxygen; hyaluronic acid; *Lactobacilli*; polynucleotides; exosomes; platelet-rich plasma

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Received: 14 February 2026 **Accepted:** 02 June 2026 **Publication Date:** 04 August 2026

INTRODUCTION

The term vaginal atrophy (VA) refers to the post-menopausal involution of the vagina due to estrogen deficiency; it is estimated that half of the female population suffers from it after menopause. Menopause can be achieved physiologically following the exhaustion of the follicular reserve, or it can be induced by bilateral oophorectomy, hypothalamic-pituitary dysfunctions, and pelvic chemoradiotherapy; a decrease in estrogen levels also occurs in breast cancer survivors treated with antiestrogens, in primary ovarian insufficiency, and during postpartum lactation. Cigarette smoking is another well-known risk factor that compromises vaginal trophism.[1]

Estrogen deficiency unleashes three main changes in the vagina (Figure 1). At first, it causes a thinning of the epithelium and a decline in subepithelial collagen, with loss of vaginal elasticity and increased susceptibility to trauma and bleeding during sexual penetration. Secondly, it influences vaginal hemodynamics resulting in reduced secretions; this event is related to the onset of intimate dryness and loss of lubrication during sexual intercourse, which then becomes painful (dyspareunia). Third, it causes a reduction of glycogen in epithelial cells, and a consequent decrease in the number of glycogen-feeding *Döderlein bacilli*. Through the production of lactic acid, these commensal bacteria are responsible for maintaining an acidic pH (3.5-5.0) in the vagina, which prevents the growth of pathogenic microorganisms; with the lack of *Lactobacilli* the pH becomes less acidic (6-7) or basic (7-8), a condition that favors vaginal infections, smelly discharge, unpleasant odors, burning, and itching.[1]

When vaginal inflammation overlaps with atrophy, we are referring to atrophic vaginitis that, together with vulvovaginal atrophy and atrophic dysfunction of the urethra and bladder, constitutes the genitourinary syndrome of menopause (GSM); while vasomotor symptoms of climacteric tend to regress over time, VA progressively worsens if left untreated.[1]

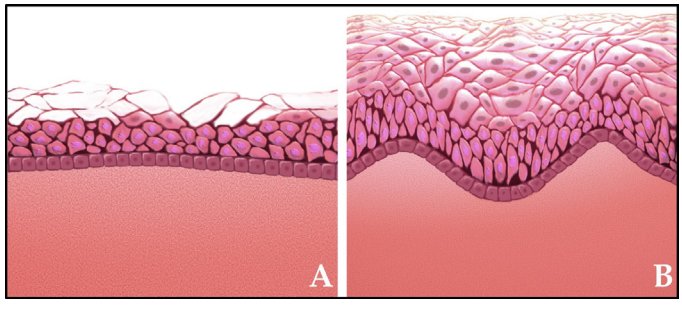

Figure 1. Atrophic vaginal epithelium of menopause (A) compared to epithelium of reproductive age (B): note the reduction in thickness, the loss of roughness, and the empty glycogen lacunae on the surface (by courtesy of Blausen Medical Communications, Inc.)

The following analyses the therapies currently available in an attempt to combat it, and the future directions of research.

Hormone Replacement Therapy

Hormone replacement therapy (HRT) is a form of hormone therapy to treat symptoms associated with menopause, including osteoporosis, hot flashes, and VA. Contraindications to HRT are represented by: history of breast or ovarian cancer; endometrial or breast hyperplasia; ongoing female malignancy; uterine leiomyomas; undiagnosed vaginal bleeding; hypercholesterolemia/hypertriglyceridemia; decompensated diabetes mellitus or uncontrolled arterial hypertension; angina; coronary stenosis; venous thrombosis; pulmonary embolism; coagulation defects; liver, gallbladder, and/or kidney diseases; stroke; migraines; dementia; epilepsy; otosclerosis; systemic lupus erythematosus; porphyria; angioedema; asthma; allergy to excipients or active ingredients; thrombophilia or genetic predisposition to endometrial, ovarian, and/or breast cancer; a body mass index >30 kg/m^2.[2]

In an effort to increase tolerability and reduce side effects, among which spotting, breast tenderness, headache, fluid retention and weight gain, gastric discomfort, lipid profile alterations, thrombosis, ictus, hormone-dependent cancer/hyperplasia, cognitive or mood decline, visual disturbances, and skin manifestations, bioidentical HRT has gained popularity in the 21st century. It consists of artificial compounds with exactly the same chemical and molecular structure as hormones produced by women. However, it also requires careful monitoring through weight and blood pressure measurement and gynecological examination with transvaginal ultrasound after the first three months to assess adverse effects, symptom relief, and ensure proper dose; long-term follow-up should be annual and include blood tests, Pap smear, breast assessment and, if necessary, a bone mineral density scan.[3]

The main routes of HRT administration are oral, vaginal, transdermal, subcutaneous, and intramuscular, of which the first three are by far the most used. Oral HRT can be considered the standard of care for moderate to severe VA in patients who have been postmenopausal for more than one year, with osteoporosis, vasomotor symptoms, and no contraindications to treatment.

Oral HRT

Over the years, estrogen-only pills have been replaced by those that also contain progesterone, since unopposed estrogen promotes endometrial hyperplasia and significantly increases the risk of cancer in non-hysterectomized patients. Estradiol is the primary female sex hormone, but its synthetic derivative

ethinylestradiol, when administered orally, is about 100 times more potent than estradiol or conjugated equine estrogens (CEEs), so its unit dose is reduced to 1/100, i.e., 0.0025 mg or 0.005 mg per tablet instead of 0.25 mg or 0.5 mg (Table 1). Among the progestins used in combined pills there are: drospirenone, dydrogesterone, medroxyprogesterone, nomegestrol, norethisterone, and norgestimate (Table 1).

Vaginal HRT

Vaginal HRT can improve VA with fewer systemic effects than oral HRT, as it is not subject to first-pass metabolism through the liver. In this way, coagulation cascade is not activated, which may explain why oral HRT is associated with a higher risk of thromboembolism, stroke, and heart attack. For this reason and because of direct contact with the mucosa, vaginal HRT is preferable to oral HRT in the absence of osteoporosis and vasomotor symptoms, and it is available in the form of suppositories, creams, and vaginal rings or pessaries. The ovules contain 0.004 mg or 0.01 mg, depending on the needs, of bioidentical estradiol; one is applied in the evening before going to bed for fifteen consecutive days, and then continue with two maintenance applications per week. Suppositories based on the synthetic estrogen promestriene are also available at a dosage of 10 mg, to be used for 3 week treatment cycles; it does not appear to convert into estradiol and therefore has negligible systemic effect. The ring is an interesting option as it releases 0.0075 mg of bioidentical estradiol daily and lasts for three months. Suppositories containing prasterone (dehydroepiandrosterone) are also available on the market at a unit dose of 6.5 mg to be inserted at bedtime; the exact reason why prasterone is effective in treating VA is still unknown, although it may be due to its local aromatization to estrogen.[4]

Transdermal HRT

Similar to vaginal HRT, transdermal HRT does not undergo first-pass metabolism; it is available in gel, spray or patches. The last ones can contain only estradiol delivered at a daily dose of 0.025 mg, 0.0375 mg, 0.05 mg, 0.06 mg, 0.075 mg, or 0.1 mg for a duration of one week per patch, or a combination of estradiol (0.045 mg or 0.05 mg) and levonorgestrel (0.015 mg) or norethindrone (0.14 mg or 0.25 mg), to be applied once or twice a week on clean, dry skin, avoiding the breast and the same previous area.[5]

Phytoestrogens

Phytoestrogens are plant-derived xenoestrogens, such as soy isoflavones; without significant health risks, they can attenuate

Table 1. Active ingredients, unit doses, and posology of the oral HRT available on the market for the treatment of VA

Active ingredients	Unit doses (mg)	Posology
Estradiol	0.5, 1 or 2 (per tablet)	1 per day (for 21 days then 7 days off)
Estradiol + drospirenone	0.25+0.5, 0.5+1 or 1+2 (per tablet)	1 per day (continuous)
Estradiol + dydrogesterone	1+5, 1+10 or 2+10 (from 15th to 28th tablet)[1]	1 per day (continuous)
Estradiol + medroxyprogesterone	2+10 (from 12th to 21st tablet)[1]	1 per day (for 21 days then 7 days off)
Estradiol + nomegestrol	1.5+2.5 or 1.5+3.75 (from 1st or 11st to 24th tablet)[1]	1 per day (continuous or for 24 days then 4 days off)
Estradiol + norethisterone	0.5+0.1 or 1+0.5 (per tablet)	1 per day (continuous)
Estradiol + norgestimate	1+0.09 (from 4th to 6th, 10th to 12nd, so on in sequence per tablet)[1]	1 per day (continuous)
Estradiol + progesterone	1+100 (per tablet)	1 per day (continuous)
Estradiol[2]/estrone[2]/equilin[2]	0.3, 0.45, 0.625, 0.9, 1.25 or 2.5 (per tablet)	1 per day (for 21 days then 7 days off)
Estradiol[2]/estrone[2]/equilin[2] + medroxyprogesterone	0.3+1.5, 0.45+1.5, 0.625+2.5 or 0.625+5 (per tablet)	1 per day (continuous)
Ethinylestradiol + norethisterone	0.0025+0.5 or 0.005+1 (per tablet)	1 per day (continuous)

[1]: the other tablets contain only estradiol at the same unit dose; [2]: conjugated equine estrogens (CEEs); HRT: hormone replacement therapy; VA: vaginal atrophy

VA but to a lesser extent than animal-derived estrogens. They are available both in the form of suppositories and supplements, the former to be preferred for the treatment of VA. Depending on the case, they should be considered as a first-line treatment before switching to vaginal HRT.[6]

Selective Estrogen Receptor/Enzyme Modulators

Selective estrogen receptor modulators (SERMs) are a class of tissue-specific drugs that act on estrogen receptors (ERs), selectively stimulating or inhibiting estrogen-like action in various tissues. On the other hand, selective estrogen enzyme modulators (SEEMs) are drugs that do not directly stimulate or inhibit ERs, but whose metabolites act selectively on ERs in various tissues; they therefore first require enzymatic metabolism. SERMs/SEEMs have similar indications and contraindications as oral HRT, although this class of drugs also includes active ingredients used in the treatment of luminal breast cancer, so fewer side effects on mammary tissue are expected.[7]

By virtue of this, they can be considered the standard of care for moderate to severe VA in patients who have been postmenopausal for more than one year, with osteoporosis, vasomotor symptoms, and no contraindications to treatment or at low risk of developing breast cancer. Some of these molecules are of particular interest in the treatment of VA.

Ospemifene

Ospemifene is a synthetic SERM with agonist action on the vagina and bone tissue, with mixed action on the endometrium, and with antagonist action on the breast, which gives it a possible chemoprevention on mammary tumor. It binds ERs-α and ERs-β with similar affinity; both are present in the vagina during reproductive age, but only ERs-α are found in the vagina even after menopause. For this reason, ospemifene can be used in the treatment of VA, particularly when associated with moderate to severe dyspareunia, at a unit dose of 60 mg per daily tablet to be taken continuously until the symptom is relieved.[8]

Tibolone

Tibolone is a synthetic SEEM whose two major active metabolites, 3α-hydroxytibolone and 3β-hydroxytibolone, act as potent, fully activating agonists of the ERs, with a high preference for ERs-α; hence its usefulness in the treatment of VA. Since it also has a weak progestogenic and androgenic action, it is available alone at a unit dose of 2.5 mg per daily tablet to be taken continuously until the symptom disappears. Androgenic activity is responsible for possible side effects, such as acne and increased hair growth.[8]

Bazedoxifene

Bazedoxifene is a synthetic SERM with agonist action on bone, and antagonist action on the breast and endometrium. Classically used for the prevention of osteoporosis in post-menopause, it is also commercially available in combination with 0.45 mg CEEs at a unit dose of 20 mg per tablet to be taken daily; since CEEs are active on the vagina, this combination may be used off-label in the treatment of VA.[9]

Lasofoxifene

Lasofoxifene is a synthetic SERM with agonist action on bone, and antagonist action on the breast and endometrium. Recently, two phase III trials enrolling 444 and 445 women have shown significant benefits at twelve weeks on VA through oral lasofoxifene at unit doses of 2.5 mg or 0.5 mg daily, compared to placebo. In 2025, a further study in 72 patients with metastatic breast cancer has confirmed its usefulness in the treatment of VA at a dosage of 5 mg per day.[10,11]

Non-hormone Replacement Therapy

Non-HRT includes all treatments that do not exploit hormones and can be effectively used as a replacement therapy in VA patients who are unwilling or unable to take hormones (e.g., breast cancer survivors, ovarian cancer survivors). Non-HRT can be considered the standard of care in mild VA to be started as soon as possible, and a first-line treatment in moderate to severe forms not complicated by osteoporosis as part of a step-up approach.

Laser

Fractional carbon-dioxide (CO_2) laser is able to activate fibroblasts which are stimulated to synthesize new collagen and, to a lesser extent, elastin, both fundamental proteins of the extracellular matrix. In addition, it can also reactivate microcirculation, thus promoting the hydration process of the matrix. The result is a rejuvenating effect on vaginal tissues, including the epithelium. Fractional CO_2 laser is a minimally invasive outpatient technique that exploits an intravaginal probe capable of releasing the laser beam in a controlled radial manner at a depth of less than 5 mm. After placing the patient in the lithotomy position and applying an inserter that acts as a guide, a graduated probe with an open end is inserted deep into the vagina (Figure 2A); once the probe has been positioned deeply, the first automatic 360° scan is performed for 1-5 seconds. The scanning can be repeated at the physician's discretion by rotating the probe 45° first to the left and then to the right, in order to direct the beam uniformly. On the market, there are also probes with 90° closed ends that

allow the laser beam to be directed into a single quadrant of the vaginal canal. The probe is then retracted one notch, and the scan is repeated once or twice again in a checker-board motion; this procedure continues until the entire vagina has been treated based on individual length. Normally a session lasts 15-20 minutes, and three sessions spaced one month apart are required; during the first session it is recommended to use a lower power (20-30 W) to let the tissues get used to it, and then move on to a higher power (40 W) in subsequent sessions. After a session, mild swelling, redness, and slight bleeding may occur, which generally resolves within 24-48 hours. A couple of days before the session the patient must avoid ovules or creams that could interfere with the laser emission, while after the sessions hydrating and nourishing substances can be applied, avoiding vaginal intercourse for a week. Adding oral supplementation with bioactive collagen peptides offers significant benefits over laser treatment alone, and 1-2 maintenance sessions are recommended one year after the treatment cycle. Patients with active infections (*Candida, Herpes, Papilloma, Chlamydia, Ureaplasma, Mycoplasma, Gardnerella, Klebsiella, Gonococcus, Streptococcus, Staphylococcus, Treponema, Trichomonas, Haemophilus, Escherichia*, etc.) or dysplastic/neoplastic changes cannot undergo treatment unless the problem has been resolved; it is therefore necessary to screen patients with a Pap smear, papilloma test, and with a set of cervico-vaginal swabs. Further contraindications to treatment are recent pelvic surgery performed within one year, uterine prolapse of grade ≥2, and ongoing antihormonal or anticoagulant/antiplatelet therapy; mesh erosion or extrusion are absolute or relative contraindications depending on the case.[12]

Erbium-doped yttrium aluminum garnet (Er:YAG) laser has emerged as a promising alternative for VA treatment as well. Unlike CO_2 laser which delivers high-speed pulses up to a wavelength of 10.6 μm, Er:YAG laser emits infrared light with a typical wavelength of 2.94 μm; for this reason, it can be chosen

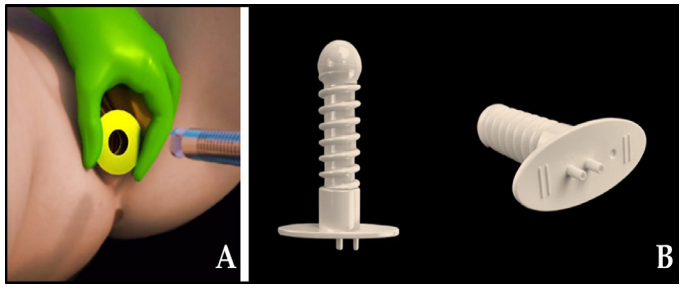

Figure 2. A graduated laser probe with an open end and its inserter in place at the vaginal entrance as guidance (A), compared to a threaded O3-O2 probe with a double connection at the base for vaginal insufflation and the safety device (B)

when even more superficial applications, and consequently a quicker recovery, are desired.[13]

Radiofrequency

Fractional radiofrequency (RF) exploits electromagnetic waves capable of generating heat in depth to stimulate fibroblasts and promote neocollagenesis with subsequent mucosal remodeling. As in laser technology, fractional energy is distributed from the endovaginal handle to equidistant points, producing only microscopic columns of thermal lesions that allow for faster re-epithelialization. However, RF uses even lower power than laser and the risk of operator-dependent adverse events is quite low.[14]

In order to maximize its effectiveness, especially in cases of vaginal laxity, it can be combined with electroporation (EP), which can transiently increase the permeability of the mucosa by means of electrical impulses. The treatment plan includes one session per week for seven consecutive weeks, avoiding vaginal intercourse; each session lasts 20 minutes, including 10 min of RF and 10 min of EP, during which a 2% hyaluronic acid solution is delivered. A booster session is recommended after six months. The treatment is absolutely contraindicated in patients with pacemakers; the other contraindications are the same as those of the laser. According to a 2025 randomized controlled trial on 48 postmenopausal women, both RF and laser are effective treatments for the symptoms of GSM. In light of what emerged from a further 2025 study on 62 breast cancer survivors receiving adjuvant therapy, both treatments produced significant improvements in VA comparable to those achieved with promestriene. Another prospective randomized open-label clinical trial conducted with 62 postmenopausal women from 2024 reached an overlapping conclusion. In the same year, a descriptive study of 48 postmenopausal women has concluded that both RF and CO_2 laser are valid alternatives to vaginal estrogen creams, and, in a randomized clinical trial of 32 women, RF has demonstrated similar efficacy to vaginal estrogen administration.[14-18]

Ozone-oxygen (O_3-O_2)

Similarly to fractional laser, O_3-O_2 has a rejuvenating effect on tissues, combined with antiseptic properties; for this reason, it is also indicated for patients with active infections, including *Candida*, *Herpes*, *Papilloma*, *Chlamydia*, *Gardnerella*, and *Trichomonas*. It can be effectively delivered into the vagina via lipogel or ovules, made from ozonated sunflower oil, or by insufflation; this latter route of administration has the advantage of diffusing O_3-O_2 in a uniform manner along the entire length of the vagina. Initially, vaginal irrigation with saline solution is performed to remove any mucus buildup. Subsequently, a

lubricated probe made of O_3-resistant material that does not release phthalates is inserted deep into the vagina; the base of the probe is equipped with two connections, one central and one lateral, to which two silicone tubes must be connected (Figure 2B). The opposite end of the central cannula is connected to an O_3 generator, while the lateral tube is connected in series with a liquid collector and an O_3 destructor to avoid gas leaks in the room. The concentric multi-ring thread of the vaginal probe is also designed to prevent O_3 leakage during treatment (Figure 2B). After placing the patient in the lithotomy position under the control of a pulse oximeter to monitor vital parameters, proceed with the insufflation of the O_3-O_2 mixture at a concentration between 10-30 µg/mL with constant flow, gradually extracting the probe ring by ring, for 5-10 min per day or every other day or per week. The volume of O_3-O_2 mixture to be used varies between 1-2 L; in total, ten procedures are recommended once a year or more, depending on the clinical scenario. Prolonged concentrations above 30 µg/mL should be avoided due to the increased risk of suppression of the saprophytic flora, and to avoid excessive local oxidative stress with irritation of the mucous membranes. The procedure must be stopped immediately in case of alteration of the patient's vital parameters (<90% SpO_2; >100 bpm), due to a possible remote risk of air embolism. It is recommended to lubricate the vagina immediately after the procedure with synthetic mucus based on hyaluronic acid, and to restore the *Lactobacilli* flora with vaginal ovules to be applied in the evening before bed; sexual penetration should be avoided for one week after the end of the entire treatment cycle. Contraindications to treatment include: coagulation disorders, cardiovascular instability, decompensated hyperthyroidism, seizures, substance abuse, alcohol intoxication, hepatolenticular degeneration, hemochromatosis, current use of antihormonal drugs, iron or copper supplements, anatomical abnormalities, and favism. A glucose-6-phosphate dehydrogenase test is therefore required prior to any O_3-O_2 therapy; if the patient suffers from favism, it is possible to opt for treatments without O_3 and based on intravaginal hyperbaric O_2.[19]

Hyaluronic Acid

Hyaluronic acid is another of the main components of the extracellular matrix able to absorb significant amounts of water, giving turgor to the tissues. It is available both in lubricating creams and in ovules to be applied preferably before going to bed for long periods of time (12 weeks), in order to obtain concrete benefits. Two recent systematic reviews evaluated its use in VA, concluding that it shows an efficacy profile comparable to vaginal estrogens, but with higher safety and tolerability.[20,21] Therefore, hyaluronic acid can be considered a valid alternative to vaginal estrogens in patients who cannot or do not want to undergo hormonal therapies, and a first-line treatment for mild VA virtually free of side effects; treatment requires boosters as needed depending on the clinical picture.

Fat-Soluble Vitamins

Among the fat-soluble vitamins useful in the topic treatment of VA are vitamins A and E. Vitamin A maintains the homeostasis of epithelium and mucosal membranes through its metabolites, while vitamin E acts as an antioxidant protecting them from free radicals and reactive O_2 species. Both are available in the form of ovules, also in combination with hyaluronic acid, virtually devoid of side effects. An 8 week study in 42 patients found benefits from the use of suppositories containing 1 mg (2.22 IU) of vitamin E compared to placebo, while another 8 week trial enrolling 40 patients showed that the benefits obtained with 5 mg hyaluronic acid ovules were greater than those of 1 mg vitamin E, taken separately. Therefore, the preferred formulation is the one in combination with hyaluronic acid for 8-12 weeks, to be repeated as needed. Two other 12 week studies in 52 patients each found no difference between the use of high vaginal doses (100 IU) of vitamin E and vaginal estrogens, findings suggesting its efficacy in VA.[22]

Moreover, receptors for vitamin D, another well-known fat-soluble vitamin, are expressed in the superficial layers of the female urogenital tract, and, in addition to playing a role in the prevention and treatment of postmenopausal osteoporosis, vitamin D may help support urogenital health in women with GSM. In 2023, a randomized, double-blind clinical study in 64 patients compared a CEEs vaginal cream with a vaginal cream based on vitamins D and E, concluding, after twelve weeks of treatment, that it is a suitable alternative to vaginal estrogens.[23]

Lactobacilli

As previously reported, *Lactobacilli* are essential in the vaginal microbiota and form a biofilm in women of reproductive age, which protects them from infections by producing lactic acid. In addition to lactic acid, they release hydrogen peroxide and butyric acid which inhibit the growth of *Candida albicans*. The dominant strains of *Lactobacilli* in healthy women are: *Lactobacillus crispatus*, *Lactobacillus gasseri*, *Lactobacillus iners*, *Lactobacillus jensenii*, and *Lactobacillus plantarum*. Restoring the vaginal flora with probiotic ovules is therefore a key moment in the treatment of VA, virtually free of side effects, to be associated with other therapeutic options. Recent findings suggest that not only vaginal HRT but also laser therapy, both with CO_2 and

Er:YAG lasers, helps restore its balance in favor of *Lactobacilli*. To maintain the vaginal microbiome, oral dietary supplements are available on the market.[24,25]

Monocots

Among the monocots of interest in the treatment of VA there are *Aloe vera* and *Triticum aestivum (Triticum sativum, Triticum vulgare)* for their hydrating properties. The latter, available in ovules, cream, or vaginal solution, is made up of starch, glycolipids, and phospholipids that create a surface film that prevents fluid loss and promotes re-epithelialization. A 6 week study in 60 patients compared *Aloe vera* vaginal cream to an estrogen cream, finding that both treatments significantly improved symptoms of VA, but the *Aloe vera* group showed superior results in terms of fluid volume without side effects.[26,27]

Polynucleotides

Polynucleotides are biopolymers composed of nucleotide monomers covalently linked in a chain, very well tolerated in regenerative and aesthetic medicine. They are now available as vaginal ovules or intradermal injections to promote, at the doctor's discretion, the physiological repair mechanisms in atrophic-dystrophic conditions of the vagina or vulva.[28]

Exosomes

Exosomes are extracellular vesicles ranging in size from 30 to 150 ηm that are produced in the endosomal compartment of most eukaryotic cells, including vaginal ones; they have in fact been detected in human vaginal fluid. Mesenchymal stem cells-derived exosomes are now being exploited in cosmetics, and studied for tissue rejuvenation and reconstruction. Still at the experimental level, a promising line of research is evaluating the usefulness of exosomes derived from human umbilical cord mesenchymal stem cells to also ameliorate VA.[29]

Platelet-rich Plasma (PRP)

As a concentrated source of autologous platelets and plasma proteins, PRP contains multiple growth factors that can stimulate tissue regeneration and healing, including vaginal abrasions and ulcers. Still in the experimental phase, PRP appears to give promising results in the treatment of VA and GSM.[30]

CONCLUSION

There are currently several therapeutic options available for the management of VA; when the clinical picture allows it, treatments that do not expose patients to side effects and health risks are preferable. Future directions for therapeutic intervention aim to protect women's health and well-being by encouraging research in the field of non-HRT, and its integration with hormonal treatments; in this way, it will be possible to further reduce the minimum effective dose of hormones to be taken, if necessary, by moving from low to ultra-low doses for an increasingly shorter period of time.

Acknowledgments

The authors gratefully acknowledge Flavio Polisena, medical information specialist at Best Medical S.r.l. (Italy), for his technical assistance on fractional CO_2 laser, and Bruna Garzone, medical information specialist at Top Quality Group S.r.l. (Italy), for her technical assistance on radiofrequency combined with electroporation.

FOOTNOTES

Contributions

Surgical and Medical Practices: L.R., D.S., Concept: L.R.; Design: L.R., Data Collection or Processing: L.R., Analysis or Interpretation: L.R., D.S., Literature Search: L.R., D.S., Writing: L.R.

DISCLOSURES

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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