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# PELVIPERINEOLOGY

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# EDITORIAL

**Dear Reader,**

The first issue of 2026 is released. As always, you will enjoy reading the Journal of Pelviperineology's content in one sitting. Our "readibility rates" are increasing day by day across in many different continents of the world, and the trust shown in our Journal makes us not only very happy but also very proud. The most important medical indexes such as Scopus, EBSCO Host, Gale, J-Gate, CNKI and TR Dizin have been indexing the Journal of Pelviperineology, however, we have been continuing to exert our intensive efforts in order that our journal to be indexed in other important medical indexes as well. On the other hand, for the purpose of alleviating some of the financial burden that would allow our journal to continue its publication and maintain a quality publishing policy, we have already decided to apply an Article Processing Charge (APC) as of May 1st, 2026, from accepted manuscripts. The APC have been kept to a minimum. You can check the necessary information regarding the fees at https://www.pelviperineology.org/article-processing-charges-apc. We believe you will appreciate this decision that we have made for the sake of sustainability and quality of the Journal of Pelviperineology, and we definitely know that you will continue to support the Journal of Pelviperineology as you always have been.

**Prof. Ahmet Akın SIVASLIOĞLU**

**Editor-in-chief**

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# Chronic pelvic pain of unknown origin is potentially curable by uterosacral ligament repair

Peter PETROS

School of Mechanical and Mathematical Engineering, University of Western Australia, Perth, WA, Australia

**Citation:** Petros P. Chronic pelvic pain of unknown origin is potentially curable by uterosacral ligament repair. Pelviperineology. 2026;45(1):1-4

## INTRODUCTION

Expert opinion, (one example is the British Journal of Urology), regularly states that chronic pelvic pain (CPP) has no known pathogenesis or cure.[1] Such statements are challenged by data from the posterior fornix syndrome (PFS) paradigm "PFS", (co-occurring CPP, urge, frequency, nocturia (now "OAB"), abnormal bladder emptying/retention) caused by uterine/apical prolapse (even of minor degree), and cured by native uterosacral ligament (USL) repair[2] (see rectangle, algorithm, Figure 1). Nor is CPP "incurable". There are copious data of CPP cure by USL laxity, when part of the PFS paradigm (Video 1).[2-13]

Lax USLs as cause of CPP was reported for the first time in the German literature in 1938 by Heinrich Martius,[14] and independently for the first time in the English literature by Peter Petros 60 years later, in 1996.[3] In a laparoscopically controlled trial, Petros reported 70% cure of CPP at 12 months by native tissue USL plication. He also reported relief of CPP in 50% of women with ring pessaries.[3] Petros hypothesized that CPP originated from inability of lax uterosacral ligaments to support visceral nerve plexuses. These fired off afferent impulses which were interpreted by the cortex as pain originating in the end organ, Figure 2.

## DIAGNOSIS

CPP of unknown origin requires co-occurrence of urge or emptying symptoms (see rectangle, diagnostic algorithm, Figure 1. The speculum test, Figure 2, mechanically supports the USLs, and therefore, the visceral plexuses (VP).[15]

Uterosacral ligament causation for CPP is easily tested. The speculum test, when it works, relieves multiple pain sites simultaneously. As such, it is a predictive test for cure of CPP by USL repair.

The definitive test for USL causation of CPP is the Bornstein test, local anesthetic (LA) injected transvaginally into the proximal end of USLs. LA anaesthetizes the VPs, and relieves multiple pain sites simultaneously.

## TREATMENT

"Repair the structure and you will restore the function"- Integral Theory.

Younger women with CPP are potentially curable by USL native tissue plication.[3] Older women have collagen deficiency and require a posterior sling or wide-bore polyester plication of USLs (Video 2).

**Address for Correspondence:** Peter Petros, School of Mechanical and Mathematical Engineering, University of Western Australia, Perth, WA, Australia
**E-mail:** p@kvinno.com **ORCID ID:** orcid.org/0000-0002-9611-3258
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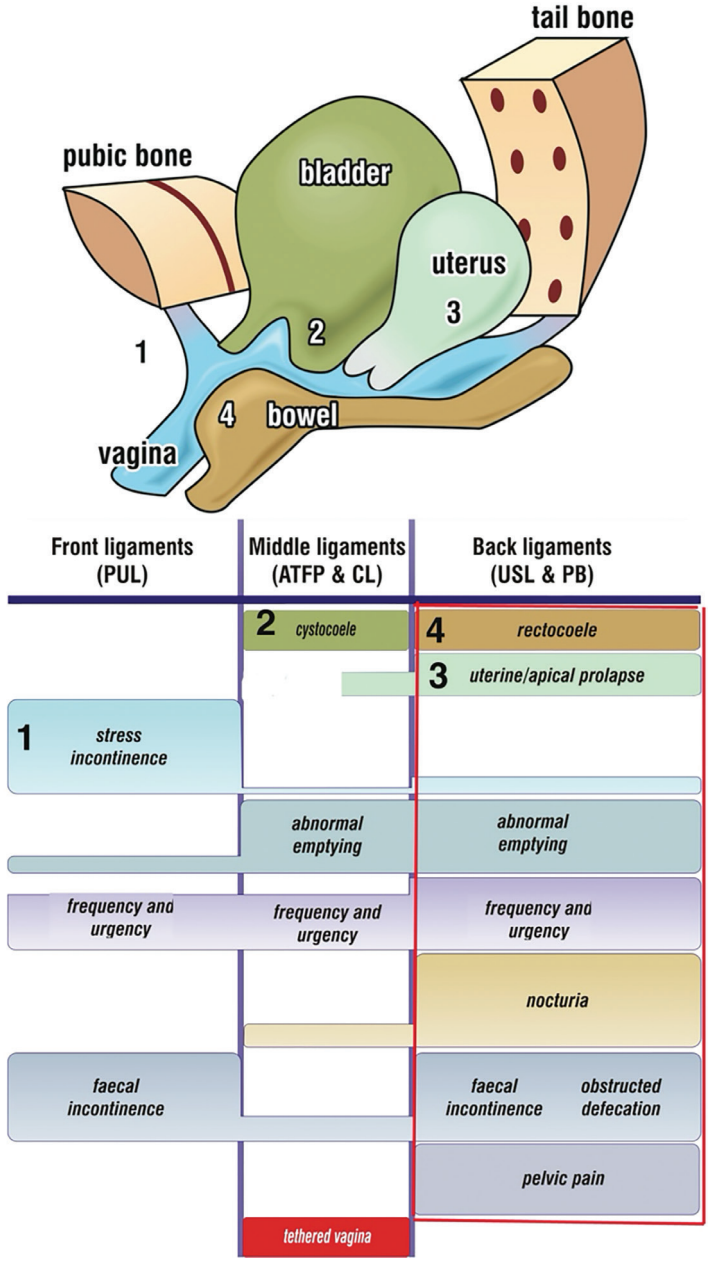


**Figure 1.** The diagnostic algorithm, causally relates symptoms to organ prolapse and damage in specific ligaments. The symptoms in the rectangle are all caused by collagen deficiency in the uterosacral ligaments

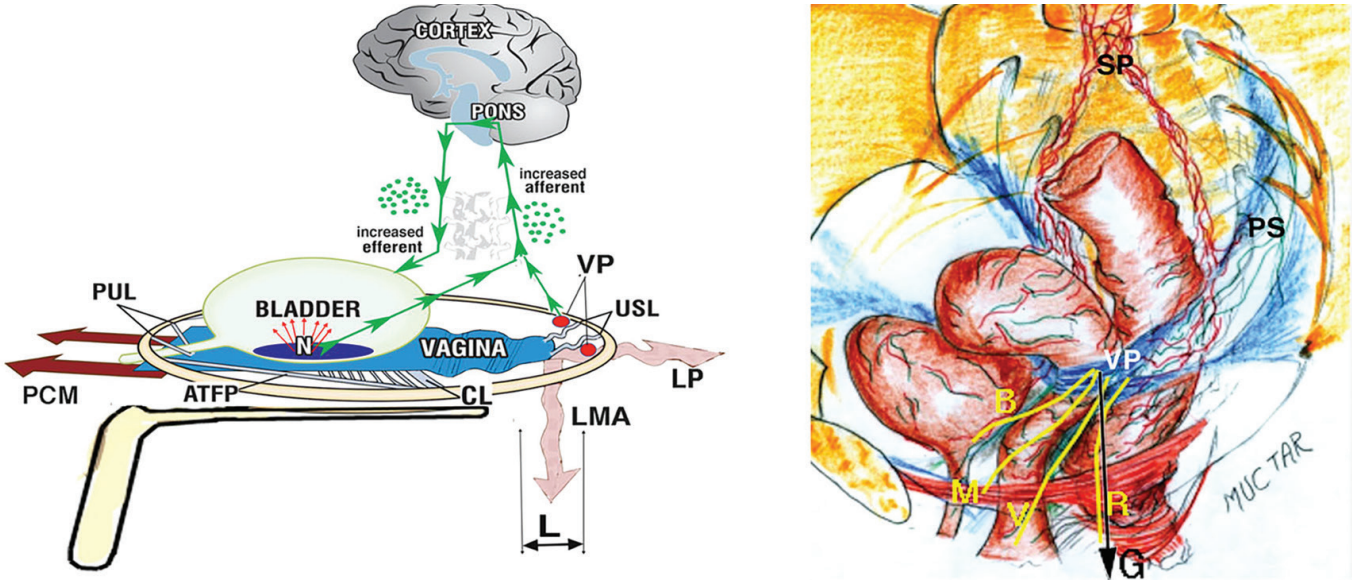


**Figure 2.** Speculum test. **Left figure:** 3D view of the bladder sitting on the anterior vaginal wall. The vagina is suspended from the pelvic brim by ligaments, pubourethral (PUL), cardinal (CL), and uterosacral USL. The wavy form of the arrows signifies weakened muscle forces LP (levator plate) and LMA (conjoint longitudinal muscle of the anus) because their insertion points, USL, are weak or loose "L".
A speculum inserted into the posterior fornix mechanically supports lax USLs, the visceral nerve plexuses (VP) S2-4, T11-L2 and also, the stretch receptors "N", to decrease afferent impulses to the micturition centre of the brain, which are interpreted as urgency from "N" and pain from "VP". **Right figure:** Visceral plexus (VP) with components "SP" (sympathetic T11–L2) and parasympathetic "PS" (S2-4). Endorgan afferent visceral nerves M (muscles), B (bladder), V (vagina), R (rectum) travel to VP where they group (explaining co-occurrence of endorgan site pain); VP serves as a type of relay junction. G signifies forces of gravity acting on these nerves in the upright position. If they are unsupported by competent USLs, the VPs can directly fire off signals to the brain which are interpreted as pain arising from the end organs such as M,V,P, R and lower abdomen. Right figure by permission, Muctar S.

**Video 1:** https://youtu.be/g3SXKzD4it8?si=mSg9P1ju3qdIv3mO

**Video 2:** https://youtu.be/pEa61sWHkaQ?si=oJ7tZIFwNi2Ff1-L

**Keywords:** Chronic pelvic pain; uterosacral ligament causation speculum test; surgocal cure

## FOOTNOTES

## DISCLOSURES

**Conflict of Interest:** The author of this article (P.P.) is a member of the Editorial Board of this journal. He was completely blinded to the peer review process of the article.

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Pelviperineology 2026;45(1):5-11

# $CO_2$ laser therapy for genitourinary syndrome of menopause with sham comparator in randomized controlled trials: A systematic review

Alifah Wahyu HARIANI[1], Eighty Mardiyan KURNIAWATI[2], Gatut HARDIANTO[2]

[1]Department of Obstetrics and Gynecology, Universitas Airlangga Faculty of Medicine, Surabaya, Indonesia
[2]Division of Urogynecology Reconstructive, Department of Obstetrics and Gynecology, Universitas Airlangga Faculty of Medicine, Surabaya, Indonesia

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## ABSTRACT

To critically evaluate the efficacy of fractional $CO_2$ laser therapy for genitourinary syndrome of menopause (GSM) by systematically reviewing evidence exclusively from sham-controlled randomized controlled trials (RCTs). A systematic review was conducted following preferred reporting items for systematic review and meta-analyses guidelines. Major scientific databases were searched for sham-controlled RCTs comparing fractional $CO_2$ laser to a sham procedure for GSM treatment. The primary outcomes analysed were patient-reported symptom improvement, changes in sexual function, and histological changes in the vaginal epithelium. Seven RCTs, encompassing a total of 319 participants, met the inclusion criteria. While a subset of trials reported statistically significant improvements in sexual function and reductions in symptoms like dryness and dyspareunia compared to sham, an equal number of trials found no significant difference between the active and sham interventions. Only one study included the use vaginal histology as a primary outcome and found no significant difference in epithelial remodelling between the laser and sham groups. While fractional $CO_2$ laser therapy has yet to be established as a routine clinical option for GSM, its potential remains promising. The current evidence highlights the need for further large-scale, multi-centre, long-term trials with standardized protocols to fully explore and confirm its therapeutic benefits.

**Keywords:** Genitourinary syndrome of menopause; vaginal atrophy; menopause; $CO_2$ laser

## INTRODUCTION

Genitourinary syndrome of menopause (GSM) is a condition that affects the majority of postmenopausal women, with estimates suggesting that up to 50% or more experience its manifestations.[1] This syndrome was caused by the decline in estrogenic levels following menopause, which leads to various anatomical and physiological changes in the vulva, vagina, and lower urinary tract.[2] The symptoms of GSM include dryness of the vagina, burning sensation, irritation, dyspareunia, and various urinary

**Address for Correspondence:** Alifah Wahyu Hariani, Department of Obstetrics and Gynecology, Universitas Airlangga Faculty of Medicine, Surabaya, Indonesia
**E-mail:** alifah123@gmail.com **ORCID ID:** orcid.org/0009-0005-7321-9323
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issues such as urgency and recurrent infections. GSM is often chronic and progressive if left untreated, potentially leading to a significant decline in quality of life and sexual function.[3]

The impact of GSM was observed to be more than physical discomfort, it also affects women's intimate relationships, self-esteem, and overall well-being.[4] Many women that had GSM do not consult a clinician due to embarrassment or the misconception that these symptoms are an inevitable part of aging.[5] Current treatment for GSM ranges from non-hormonal options like lubricants and moisturizers for milder symptoms[6] to hormonal therapies, primarily local oestrogen application, which directly address the underlying estrogenic deficiency and are considered highly effective for moderate to severe symptoms.[7] However, some women may have contraindications to hormonal treatments, such as a history or a present hormone-sensitive cancers, or may prefer non-hormonal alternatives due to concerns about side effects.[4,8,9]

In recent years, energy-based devices, particularly fractional $CO_2$ laser therapy, have emerged as a novel, non-hormonal treatment option for GSM. The proposed mechanism of action involves a laser delivering controlled micro-ablative thermal energy to the vaginal tissue. This process can stimulate tissue remodelling, including the formation of new collagen, elastin production, and revascularization.[10] The final aim of $CO_2$ laser therapy is to restore vaginal epithelial thickness, elasticity, and lubrication. Athanasiou et al.,[11] reported that $CO_2$ laser therapy provides a significant improvement, even in the absence of GSM, up to a 12 month follow-up.

Despite its increasing use and anecdotal reports of success, the efficacy of vaginal $CO_2$ laser therapy for GSM remains uncertain.[12] This uncertainty lies in the relationship between the histological changes induced by the laser and the patient-reported symptomatic improvements. While some studies have reported increased epithelial thickness and collagen, others, including sham-controlled RCTs,[13] have found no significant difference between the active and sham laser groups.[14] Therefore, this systematic review aims to critically evaluate the effect of vaginal $CO_2$ laser treatment compared to sham laser treatment on validated measures of vaginal histological changes and patient-reported symptom improvements in postmenopausal women with atrophic vagina.

## MATERIAL AND METHODS

### Eligibility Criteria

This systematic review was conducted in accordance with the preferred reporting items for systematic review and meta-analyses 2020 guidelines. The primary research question was: "What is the effect of vaginal $CO_2$ laser treatment when compared to sham laser treatment in women with GSM in histological and quality of life?".

The research question was formulated using the PICO framework, Population (P): Women diagnosed with GSM; Intervention (I): $CO_2$ laser treatment; Comparison (C): sham laser treatment as a placebo; and Outcome (O): improvement in histological and quality of life aspects.

Studies included in this analysis were full-text, randomised controlled trial peer-reviewed studies that reported improvements in histological and quality of life aspects. Studies that included non-GSM-related vaginal pathologies, non-English studies, lacked data, reviews, editorials, letters, conference abstracts, or case reports were excluded.

### Information Sources

A comprehensive electronic search (date) was conducted in multiple academic digital databases, including PubMed, Scopus, Virtual Health Library, as well as grey literature sources, to reduce publication bias via Open Access Thesis and Dissertation Repositories.

### Search Strategy

The literature search was conducted using a combination of MeSH terms and free-text keywords related to GSM, Athropic Vagina, and CO2 laser therapy. The following search strategy used were: ("Genitourinary Syndrome of Menopause" OR "Athropic Vagina" OR "vaginal atrophy" OR "vulvovaginal atrophy") AND ("CO2 Laser" OR "Laser Therapy" OR "Laser Treatment"). Any necessary adjustment were made for each database category to adapt the search term. The search was done on June 16th, 2025.

### Selection Process

Two independent reviewers with relevant expertise conducted the study selection. All retrieved records will be imported to EndNote 20 (Clarivate Analytics, Philadelphia, USA) for reference management. Duplicate entries will be removed using two separate methods. First, automatic duplicates were detected by EndNote 20, and second, manual screening was performed using Microsoft Excel.

The first study selection was done by title and abstract reviews. Articles that meet the initial eligibility criteria will proceed to a full-text review to determine final inclusion. Additionally, when a reviewer finds articles in the selection process that raise doubts, the article will proceed to the next round of review.

### Data Collection

From eligible studies, general data will be extracted including authorship, publication year, study design, and sample characteristics (such as sample size, age, menopausal status, baseline GSM severity, comorbidities, and prior GSM treatments). Detailed information regarding the $CO_2$ laser intervention (device, parameters, session details) and the specifics of the comparator, particularly for sham procedures, will also be systematically recorded.

For the primary and secondary outcomes, data will be collected regarding the vaginal maturation index, including assessment methodology and scores, and vaginal pH measurements. We will also extract total and domain scores for the female sexual function index (FSFI), overall and component scores for the vaginal health index (VHI). Additionally, we will obtain visual analog scale (VAS) scores for key GSM symptoms including dryness, dyspareunia, itching, and burning. For all these measures, baseline values, post-treatment values, and change scores will be recorded.

## RESULTS

The literature search resulted in a total of 634 studies. Initially, automatic duplicate detection was performed using EndNote (n=191), followed by manual duplication detection to identify further instances of duplication (n=53). The initial exclusion of title relevance resulted in the exclusion of 266 articles, while 390 articles continued to undergo abstract reading. It is essential to note that when the title is ambiguous, it will proceed to the next round. Abstract reading screened 124 articles, and 10 articles were included in the full-text reading, with three studies excluded due to no sham comparator (n=2) and not being a randomised controlled trial study (n=1). The database selection flowchart shown in Figure 1 and the summary of included study shown in Table 1.

### Study Characteristics

Seven studies were included in this review, with a total of 163 observed in the treatment arm and 156 in the sham arm.[14-20] Two studies included an additional condition of the cohort with gynecologic and breast cancer survivors.[16,20] The most commonly used device is the SmartXide2 V2LR (n=4), followed by MonaLisa Touch (n=2) and Femilift (n=1). The post-treatment measurement averaged at 3.5 months, ranging from 1 to 6 months.

One study reported the histological changes in GSM patients,[14] which summarizes that there is no significant difference in the

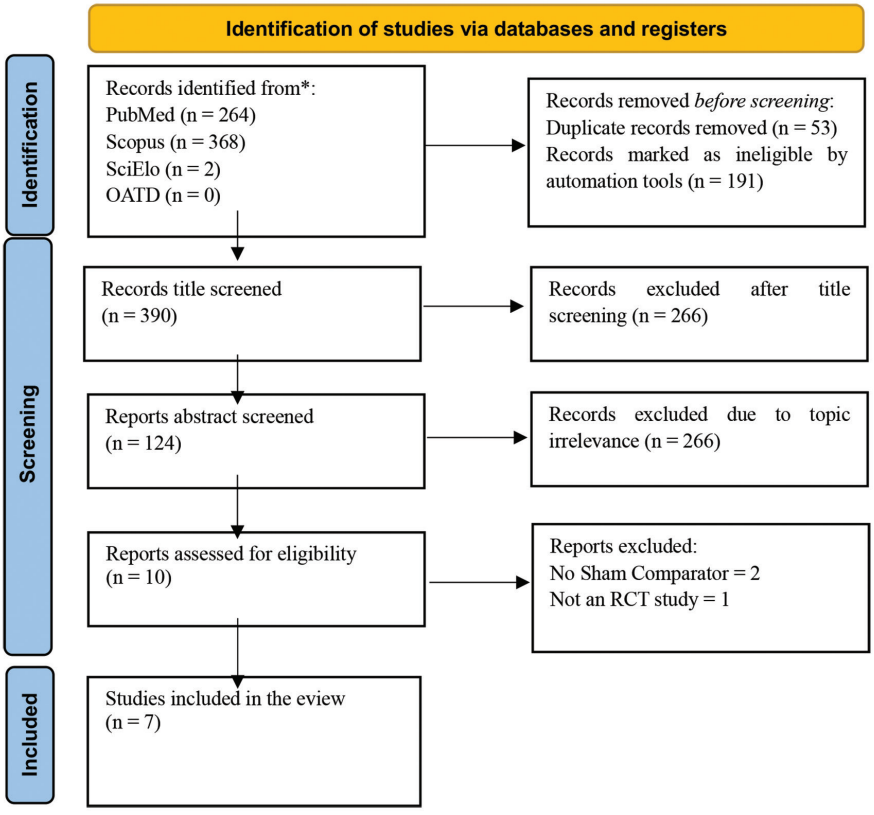


**Figure 1.** Database selection flowchart based on PRISMA reviews

*RCT: randomized controlled trial; PRISMA: preferred reporting items for systematic review and meta-analyses*

microscopjc features of the vaginal epithelium following either laser or sham treatment ($p$=0.2) and in the VAS scale as well ($p$=0.17).

The overall results of various variables reported in the studies are reported in Table 2[14-20] and Table 3.[18-20] The findings are mixed, resulting in differing conclusions across studies. Most importantly, three studies indicated that fractional $CO_2$ laser therapy did not demonstrate a significant advantage over sham for primary bothersome symptoms.[17,19,20] Jaber et al.,[20] trial in breast cancer survivors found no significant difference between three laser treatments and sham for dyspareunia and intercourse dryness. Cruff and Khandwala[17] reported no significant difference in patient improvement in GSM-related dyspareunia, with an underpowered study. Lastly, Page et al.,[19] concluded that the treatment response for laser and sham at 4 months offers no measurable long-term benefits.

Conversely, other studies have reported significant benefits for laser treatments compared to sham treatments. Salvatore et al.[18] concluded that the $CO_2$ laser was better than sham in reducing dryness, dyspareunia, and improving FSFI scores. Ruanphoo and Bunyavejchevin[15] reported significantly improved VHI and VAS scores compared to the sham group. A more detailed examination from the Quick et al.[21] study in gynaecological cancer survivors also reveals improvements in FSFI scores, as well as some objective improvements in vaginal pH, moisture, and elasticity.

## DISCUSSION

The current systematic review was conducted to evaluate the efficacy of fractional $CO_2$ laser therapy for GSM treatment by exclusively analysing evidence from sham-controlled RCTs. Overall, the data aggregated from this study includes seven clinical trials with a total of 319 participants. It was observed that the studies did not yield a definitive conclusion, but instead presented an evidentiary conflict of findings. There were inconsistencies in outcomes across the studies, preventing an explicit endorsement of fractional $CO_2$ laser treatments.

The initial introduction of $CO_2$ laser therapy for GSM was largely driven by prospective and case series studies. These early, uncontrolled studies reported significant improvements and

**Table 1. Summary of included studies**

| Author (year) | Additional conditions | Device | Post treatment measurement |
|---|---|---|---|
| Ruanphoo and Bunyavejchevin[15] | None | SmartXide2 V2LR, DEKA, Florence, Italy | 3 months |
| Quick et al.[16] | Gynecologic cancer survivors | MonaLisa Touch, DEKA, Florence, Italy | 1 month |
| Cruff and Khandwala[17] | None | MonaLisa Touch, DEKA, Florence, Italy | 6 months |
| Salvatore et al.[18] | None | SmartXide2 V2LR, DEKA, Florence, Italy | 4 months |
| Li et al.[14] | None | SmartXide2 V2LR, DEKA, Florence, Italy | 2 months |
| Page et al.[19] | None | SmartXide2 V2LR, DEKA, Florence, Italy | 3 months |
| Jaber et al.[20] | Breast cancer survivors | FemiLift | 6 months |

**Table 2. Summary of the included studies on VHI, VAS, FSFI, and UDI-6 values**

| Author (year) | Sham | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | n | Age | Baseline | | | | Post | | | |
| | | | VHI | VAS | FSFI | UDI-6 | VHI | VAS | FSFI | UDI-6 |
| Ruanphoo and Bunyavejchevin[15] | 44 | 59.84±7.49 | 14.66±2.91 | 2.02±0.4 | - | - | 16.08±3.27 | 2.06±0.49 | - | - |
| Quick et al.[16] | 8 | 56.8±5.95 | - | - | - | - | - | Δ-1 | Δ-0.3 | Δ-21 |
| Cruff and Khandwala[17] | 12 | 59 | 11.5 | 80 | 11.3 | 33.3 | Δ5 | Δ-0.31 | Δ6.6 | Δ-18.8 |
| Salvatore et al.[18] | 30 | 57±6.8 | - | - | 9.7±7.8 | 17.4±21.5 | - | - | 12.1±8.3 | 14.7±21.3 |
| Li et al.[14] | 24 | Histological data | | | | | | | | |
| Page et al.[19] | 29 | 56.2±6.3 | 10.7±3.56 | ++ | 11.2±6.64 | - | 10.7±3.56 | ++ | 14.3±6.96 | - |
| Jaber et al.[20] | 9 | 47 | 11.73±2.12 | 4.59±2.02++ | 13.58±7.29 | - | 14.7±4.6 | 2.97±1.89 ++ | 13.18±9.48 | - |

**Table 2. Continued**

| Treatment | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Baseline | | | | Post | | | |
| n | Age | VHI | VAS | FSFI | UDI-6 | VHI | VAS | FSFI | UDI-6 |
| 44 | 61.73±8.01 | 14.18±3.39 | 2.27±0.4 | - | - | 17.45±2.61* | 1.83±0.51* | - | - |
| 10 | 56 ±11.17 | - | - | - | - | - | Δ-3 | Δ6.5 | Δ-14.6 |
| 11 | 61 | 10.5 | 81 | 9.3 | 54.2 | Δ3 | Δ-19 | Δ6.4 | Δ18.8 |
| 30 | 58.4±6 | - | - | 11.4±8.2 | 24±22.1 | - | - | 23.8±6.6* | 15.9±17.4* |
| 22 | Histological data | | | | | | | | |
| 28 | 57.4±7.07 | 11.7±3.68 | ++ | 10.3±6.65 | - | 14.6±4.67 | ++ | 13.9±8.35 | - |
| 18 | 45 | 12.89±2.78 | 4.67±2.06 ++ | 11.37±7.52 | - | 16.67±3.88 | 3.38±1.75++ | 15.2 ±8.59 | - |

Δ: difference between observations on baseline and post; *: significant difference between baseline and post; ++: a detailed observation was reported; VHI: vaginal health index; FSFI: female sexual function index; VAS: visual analog scale; UDI-6: urogenital distress inventory-6

high patient satisfaction rates.[22] For example, Di Donato et al.,[23] reported significant improvements in various aspects, including VHIS and reduced pH, in their prospective observational cohort study. In our study inclusion, the trial by Salvatore et al.[18] concluded that the $CO_2$ laser was superior to sham treatment for improving the FSFI score, and Ruanphoo and Bunyavejchevin[15] found that laser treatment led to a significantly enhanced VHI and VAS when compared to the sham group.

On the contrary, Studies Page et al.,[19] Jaber et al.,[20] and Cruff and Khandwala[17] all concluded that fractional $CO_2$ laser therapy offered no significant benefit over the sham intervention for the most bothersome symptoms of GSM, including dyspareunia. While valuable for generating initial hypotheses and monitoring patients' improvement over time, such study designs are susceptible to bias, particularly performance bias and the placebo effect, especially when dealing with subjective, quality-of-life-related symptoms.[24] It is considered that using sham-controlled RCTs research, a methodologically stringent and clinically realistic appraisal can be observed in the therapy's efficacy can be observed.

The findings of this review align with the trend of evidence observed in a broader $CO_2$ GSM therapy literature. Early meta-analysis, which pooled data from observational studies alongside non-sham-controlled trials, tended to report positive effects. For example, Filippini et al.,[12] included 2022 studies, and found that there was a significant improvement in GSM symptoms and FSFI scores, but appropriately cautioned that the overall quality of evidence was "very low" or "low" due to the amount of non-randomized designs, which can induce bias. This chronological progression of evidence can be observed as an initial excitement based on lower-quality and biased evidence. However, a more rigorous analysis using sham-controlled trials needs to be done.

Clinically, changes in GSM were observed in the vulvar appearance, including alterations in tissue thickness due to the loss of fat, labia agglutination, and a significant reduction in pubic hair.[25] Histologically, GSM causes dysfunction in the mucosa of the urinary tract and vagina, resulting in decreased flexibility, elasticity, strength, and sensitivity of the mucosa. Specifically, the endometrium undergoes hypoplastic changes, along with extensive de-epithelialization. Uneven thinning of the transitional epithelium on the urothelium was also noted, accompanied by moderate oedema. In the vagina, severe atrophy and thinning of the vaginal mucosa are evident, often associated with a decrease in *Lactobacillus* prevalence, leading to the alkalization of vaginal secretions.[26]

The therapeutic rationale for the fractional $CO_2$ laser is to induce a specific biological mechanism of action. The technology is designed to deliver controlled micro-ablative thermal energy to the vaginal tissue, creating a micro-injury that stimulates the wound-healing process.[27,28] This process can induce a tissue remodelling, including neocolagenesis, neo-elastinogenesis, and neo-angiogenesis, which aim to restore the thickness, elasticity, and physiological function of the vaginal ephitelium.[29,30] The findings for this review, however, are contrary to the premise. Although the search also targeted sham-controlled histological evidence, only Li et al.,[14] observed the vaginal histology as the primary outcome measured. In this methodologically rigorous double-blind, sham-controlled study, direct comparison of vaginal biopsies taken before and after the intervention. It was found that there is no statistically significant difference in any microscopic features between active and sham laser groups. Further studies focusing on the histological aspect improvement need to be done.

Future studies should incorporate large-scale, multi-centre RCTs, as such trials are necessary to provide adequate statistical power to detect clinically meaningful differences and minimize the impact of single-centre biases. Furthermore, a standardized protocol for $CO_2$ laser therapy must be developed, including

**Table 3. Studies measuring detailed observations using the visual analogue scale**

| | Sham | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Pre | | | | | Post | | | | |
| | Dryness | Burning | Itching | Dyspareunia | Dysuria | Dryness | Burning | Itching | Dyspareunia | Dysuria |
| Page et al.[19] | 4.07±3.63 | 3.48±3.07 | 3.24±2.61 | 8.62±2.29 | 1.64±2.6 | 4.07±3.75 | 2.1±2.76 | 1.69±2.24 | 6.45±3.32 | 1.21±2.53 |
| Salvatore et al.[18] | 7.5±1.9 | 4.6±3.4 | 3.1±3.2 | 8.7±1.4 | 0.9±1.6 | 5.6±2.9* | 3.7±3.4 | 1.8±2.6* | 7.6±1.9 | 0.9±1.2 |
| Jaber et al.[20] | 7.67±3.44 | 2.67±2.61 | 2.7±2.96 | 9±1.55 | 2.4±3.2 | 4.53±3.72 | 1.07±1.58 | 1.27±1.49 | 6.82±3.16 | 0.6±1.35 |

| Treatment | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Pre | | | | | Post | | | | |
| Dryness | Burning | Itching | Dyspareunia | Dysuria | Dryness | Burning | Itching | Dyspareunia | Dysuria |
| 4.28±3.63 | 3.03±3.03 | 2.1±2.76 | 8.24±2.82 | 1.32±2.64 | 3.58±3.38 | 2±2.93 | 1.86±2.63 | 5.93±3.54 | 0.72±1.79 |
| 8±1.7 | 3.6±3 | 3.9±3.1 | 8.6±1.5 | 1.6±2.4 | 2.4±2.9* | 1.4±2.4* | 1±2.1* | 2.6±2.6* | 0.6±1.5* |
| 5.26±4.03 | 2.89±3.23 | 3.26±2.94 | 8.88±1.82 | 2.44±3.24 | 4.16±3.53 | 1.78±1.99 | 2±2.52 | 7.25±3.15 | 1.83±2.36 |

*: significant difference between baseline and post-treatment

the device, energy settings, pulse characteristics, and treatment schedule. Detailed reporting of these protocols is essential to allow a homogenous comparison across studies.

## CONCLUSION

In conclusion, this systematic review of seven sham-controlled randomized trials highlights the potential of fractional $CO_2$ laser therapy in treating GSM, despite considerable methodological heterogeneity, including differences in $CO_2$ laser devices, treatment parameters, follow-up periods (1-6 months), and patient populations (e.g., inclusion of cancer survivors). While some smaller trials have shown subjective advantages of $CO_2$ laser over a sham procedure (e.g., VHI, FSFI, VAS), this study reveals a lack of clear and consistent efficacy in treating dyspareunia and vaginal dryness. Importantly, the one research that specifically looked at objective parameters showed no discernible histological advantage. The observed improvements in specific trials underscore the importance of innovative approaches and the need to build on this foundation with rigorous future studies.

## FOOTNOTES

### Contributions

Surgical and Medical Practices: E.M.K., G.H., Concept: A.W.H., E.M.K., G.H., Design: A.W.H., E.M.K., G.H., Data Collection or Processing: A.W.H., E.M.K., G.H., Analysis or Interpretation: A.W.H., E.M.K., G.H., Literature Search: A.W.H., E.M.K., G.H., Writing: A.W.H., E.M.K., G.H.

## DISCLOSURES

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# Translation, cross-cultural adaptation and psychometric properties of Gujarati version of pelvic floor health knowledge quiz

Rhythm Prakash THACKER, Megha Sandeep SHETH

S.B.B. College of Physiotherapy, Gujarat, India

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## ABSTRACT

**Objective:** Weak pelvic diaphragm can cause pelvic organ prolapse, urinary incontinence (UI), sexual dysfunction. Pelvic floor health knowledge quiz (PFHKQ) is a self-reported scale developed in Turkish, used to assess level of knowledge about pelvic floor health. Aim of study was to translate and cross-culturally adapt PFHKQ into Gujarati and assess its psychometric properties.

**Materials and Methods:** The methodological study conducted involving forward and backward translation according to World Health Organization recommended guidelines. Permission for translation was obtained from the original author. Expert panel included five experts in the field of physiotherapy. Pilot study was performed on 30 Gujarati speaking females aged between 18 to 64 years living in community. A pre-final version was presented to expert panel and their reviews on Likert scale of 0 to 5, where 0 indicated strongly disagree and 5 indicated strongly agree, were noted. Validity of Gujarati version was assessed using item content validity index (I-CVI) and scale content validity index (S-CVI). Test-retest reliability was calculated by the intraclass coefficient (ICC).

**Results:** Gujarati version of the PFHKQ showed good I-CVI ranging from 0.72 to 1 and S-CVI of 0.873. Good reliability having a single measure ICC of 0.983 (95% confidence interval 0.96 to 0.99) and Cronbach's alpha of 0.876.

**Conclusion:** Gujarati version of PFHKQ is reliable and valid self-report tool to assess knowledge about pelvic floor health in men and women. Using this tool, health care professionals can understand patient's level of knowledge which helps to provide appropriate education and treatment in all age groups.

**Keywords:** Pelvic floor health knowledge quiz; Gujarati translation; PFHKQ

**Address for Correspondence:** Rhythm Prakash Thacker, S.B.B. College of Physiotherapy, Gujarat, India
**E-mail:** dr.rhythmthacker@gmail.com **ORCID ID:** orcid.org/0009-0001-3088-2329
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## INTRODUCTION

The pelvic floor consists of muscles, ligaments, and fascia which are important for the stability and tone of the pelvic girdle, continence, urination, and sexuality.[1] A weak pelvic floor muscle tension may cause disorders and pathologies, including prolapse, urinary incontinence (UI), constipation and sexual dysfunctions. It is estimated that pelvic floor disorders (PFDs) will increase by 35% over the next two decades, to an average of around 1.6 million per year till 2030.[2] In women, the prevalence of UI is linked to age, as it tends to increase with age and physiological changes associated with ageing in women which adds to its higher impact. Other known causes include obesity, smoking, physical inactivity, extended periods of inactivity, poor perceived health, and chronic illnesses such as diabetes, hypertension, and chronic obstructive pulmonary disease.[3]

In India, pelvic floor problems cause embarrassment to most women and are still a taboo, making it a neglected area of women's health and an important public health issue.[4] The literature on prevalence of PFDs in postpartum females in Indian population is limited, wherein studies assessing all domains of pelvic health are inadequate. Furthermore, no studies, in the Indian population, have focused on assessing the awareness of role of physiotherapy for the treatment of PFDs.[4] Most females hesitate to report symptoms either due to embarrassment, lack of awareness about treatment options, or misconception on normal aging process. Women usually seek help when the symptoms worsen to an extent where it makes surgical intervention essential.[4] Many questionnaires have been developed to evaluate the symptoms and the quality of life related to pelvic floor dysfunctions. These tools assess the symptoms of incontinence and prolapse only and not the knowledge about it. The pelvic floor dysfunction has a wide range, but the tools that assess individuals' knowledge level related to these dysfunctions are limited. It is very important to assess the level of knowledge about pelvic floor heath in community dwelling population for early identification of the problems.[4]

The pelvic floor health knowledge quiz (PFHKQ) is a self-report questionnaire originally developed in Turkish to evaluate the level of knowledge about pelvic floor health in men and women. The subscales were pelvic floor function/dysfunction, risk factors, diagnosis, and treatment of pelvic floor dysfunctions.[5] Twenty-nine questions with positive and negative answers for these subscales were prepared. The distribution of content in the subscales of this test: Function/dysfunction has eight items, risk factors have thirteen items, and diagnosis and treatment eight items. All items can be answered in yes, no, I do not know.[5]

Presently in Gujarat, there are tools to assess PFDs available to evaluate various impacts as well but no tool that assess the individual's knowledge about pelvic floor health. So, this study aims to translate and culturally adapt the PFHKQ into Gujarati to better understand knowledge of pelvic floor health among Gujarati speaking community dwelling populations.

## MATERIALS AND METHODS

A methodological study was conducted following the Guidelines given by World Health Organization (WHO). This study involved two steps: translation and cross- cultural adaptation of the Gujarati version and testing its validity and reliability. Permission for translation was obtained from the authors of the original questionnaire by email. Written informed consent was taken from participants. The Institutional Review Board (IRB) SBB IRB approved the study (protocal number: PTC/IEC15/2024-25, date: 30.08.2024). Forward translation in Gujarati from English was done by two bilingual independent translator who were native speakers of Gujarati language and fluent with English language. There were not familiar with the concepts being translated. The first translator had the background of healthcare, and the other translator had a background of literature and education. An independent bilingual translator then translated the draft back into English. The pre final version was presented to the expert committee of five physiotherapists and their reviews on Likert scale of 0 to 5, where 0 indicated strongly disagree and 5 indicated strongly agree were noted. The process of translation and cultural adaptation had minor linguistic changes. The draft was made with modifications according to expert panel's suggestions which was more suitable to Gujarati culture. Validity was found based on reviews of the expert panel. Based on their review, the words were changed to simpler Gujarati terms, making it easier for the Gujarati speaking population to understand. No questions were removed, added or changed completely.

The Gujarati version was given to 30 females aged between 18 to 64 years within the community, as a self-report test. Sample size was decided based on a study, WHO recommendation for translational studies.[6] The procedure was explained to the participants and written informed consent was taken. The questions were clear and comprehensible and the participants did not have any problems understanding the instructions and the questions. To determine test-retest reliability, participants completed the self-report test twice, with a two-day gap between the administrations. The final draft was sent to the original author.

### Statistical Analysis

Validity was assessed through the calculation of the item content validity index (I-CVI) and scale content validity index (S-CVI). For assessing the reliability, the intraclass correlation coefficient (ICC) and Cronbach's Alpha were calculated.

## RESULTS

The Gujarati version of the PFHKQ was tested for content validity and reliability. The item-level content validity index (I-CVI) for individual questions ranged from 0.72 to 1. The overall S-CVI was 0.873. For reliability, a test-retest method was used. The ICC for a single measure was 0.983 (95% confidence interval 0.96 to 0.99). Additionally, Cronbach's alpha for the scale was 0.876.

Tables 1 and 2 show demographics of expert panel and participants in form of mean and standard deviation

## DISCUSSION

The PFHKQ Gujarati version has adequate psychometric properties. The statistical evaluation showed good item content validity and scale content validity. I-CVI scores ranged from 0.72 to 1. The S-CVI of 0.873 provides an overall justification for the relevance and comprehensiveness of the questionnaire consistent with values recommended in literature.[7,8] Excellent reliability, with an ICC of 0.983 and Cronbach's alpha of 0.876, which demonstrates that the questionnaire has a high consistency and internal consistency for stable and reliable responses over time and between participants. The psychometric properties suggests that the Gujarati version of the PFHKQ is an effective instrument both for clinical and research settings, providing much-needed insights into knowledge and understanding of pelvic floor health. This study lays the foundation for broad usage of the questionnaire in the Gujarati-speaking population, with its application towards health education and for improving pelvic health awareness.

The reliability of the subscales showed good consistency for the domain of function/dysfunction (α=0.880), risk factors/etiology (α=0.758) and diagnosis/treatment (α=0.598) which is comparable to the Spanish version of the Australian pelvic floor questionnaire exhibited good psychometric properties, with a Cronbach's alpha of 0.795 for the complete questionnaire, indicating acceptable internal consistency.[9] The reliability for individual domains showed strong consistency for bladder function (α=0.864), bowel function (α=0.796), and prolapse symptoms (α=0.851) (Medrano-Sánchez et al.[9]). The consistency of the diagnosis and treatment subscale was found to be moderate which can be due to broader scope of approaches and treatment outcomes.

Zhu et al.[10] found that the Chinese version of the PFIQ-7 demonstrated strong psychometric properties, with high internal consistency (α=0.801) and test-retest reliability (ICC =0.862) and factor analysis confirmed good construct validity.[11] Ketki V et al.[11] found that the Marathi version of revised UI scale demonstrated good psychometric properties, with internal consistency (r=0.88) and test-retest reliability (r=0.86). Good construct validity with Cronbach's alpha of 0.882.[10]

In the present study, some changes were made i.e., in question 6, sexual health, that is "jaatiya sambandh" was changed to "sharirik sambhand" (physical relation). In question 11, multiple, that is "bahuvida" was changed to "ek karta vadhare" (more than one) and vaginal birth to normal birth. In question 16, older people - "vrudh loko" was changed to "moti umar na loko-people in higher age group." In question 18, "posture disorder" was changed to "sharir ni sthirta na santulan ma padti takleefo" (difficulty in maintaining balance of body) as it is more appropriate and easier to understand for Gujarati speaking population.

### Study Limitations

Face validity was not calculated for this study.

## CONCLUSION

The Gujarati version of PFHKQ is a reliable and valid self-report tool to assess the knowledge about pelvic floor health among the Gujarati-speaking population across all age groups, in both men and women about pelvic floor issues, enabling them to identify problems early. As a self-report tool, it allows healthcare professionals to efficiently evaluate a patient's understanding, enabling more targeted discussions and better treatment based on the patient's knowledge.

**Table 1. Demographics of experts in the panel**

| | |
|---|---|
| Gender (Male: Female) | 1:4 |

**Table 2. Demographics of participants**

| Variables | Mean± SD |
|---|---|
| Age (years) | 36.16+16.40 |
| SD: standard deviation | |

## ETHICS

**Ethics Committee Approval:** The Institutional Review Board (IRB) SBB IRB approved the study (protocal number: PTC/IEC15/2024-25, date: 30.08.2024).

**Informed Consent:** Written informed consent was taken from participants.

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## FOOTNOTES

### Contributions

Concept: R.P.T., M.S.S., Design: R.P.T., M.S.S., Data Collection or Processing: R.P.T., Analysis or Interpretation: R.P.T., M.S.S., Literature Search: R.P.T., Writing: R.P.T.

## DISCLOSURES

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# Surgical management and clinical outcomes in Fournier's gangrene: Our clinical experience

İsmail BAĞLAR[1], Fatih ŞANLIKAN[2], Mustafa MARAŞLI[1], Tamer TOPALOĞLU[1], Bahadır Alper SARGIN[1], Önder ALTIN[3], Hatice Merve ÜÇÜNCÜOĞLU[1], Ceren ÖZÇELİK GÜLCAN[1]

[1]Department of Obstetrics and Gynecology, University of Health Sciences Türkiye, Kartal Dr. Lütfi Kırdar City Hospital, İstanbul, Türkiye
[2]Department of Gynecologic Oncology, University of Health Sciences Türkiye, Kartal Dr. Lütfi Kırdar City Hospital, İstanbul, Türkiye
[3]Department of General Surgery, University of Health Sciences Türkiye, Kartal Dr. Lütfi Kırdar City Hospital, İstanbul, Türkiye

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## ABSTRACT

**Objective:** Fournier's gangrene (FG) is a rapidly progressive necrotizing fasciitis of the perineal and genital regions with a high mortality rate. Although it is less common in women than in men, serious cases are reported. This study aimed to evaluate the clinical characteristics, laboratory findings, treatment processes, and outcomes of female patients diagnosed with FG in our center and to compare them with the existing literature.

**Materials and Methods:** Thirteen female patients diagnosed with FG between January 2010 and December 2024 were retrospectively reviewed. Demographic characteristics, comorbidities, sources of infection, laboratory parameters, surgical interventions, and clinical outcomes were recorded. All patients underwent emergency surgical debridement and broad-spectrum antibiotic therapy.

**Results:** The mean age of the patients was 60 years, and the most common comorbidity was diabetes mellitus (46.2%). The most frequent source of infection was perianal abscess (38.5%). The mean laboratory risk indicator for necrotizing fasciitis score was 8.1. More than half of the patients (53.8%) required multiple debridements, 30.7% underwent fecal diversion, and 46.1% required intensive care. One patient (7.6%) died due to severe sepsis and multiorgan failure.

**Conclusion:** FG in females, although rare, represents a life-threatening condition with high mortality. Early diagnosis, prompt initiation of treatment, and a multidisciplinary approach are critical determinants of survival. Careful evaluation of perineal infections in women with risk factors such as diabetes mellitus and obesity can be lifesaving.

**Keywords:** Fournier's gangrene; necrotizing fasciitis; multidisciplinary approach; mortality

**Address for Correspondence:** İsmail Bağlar, Department of Obstetrics and Gynecology, University of Health Sciences Türkiye, Kartal Dr. Lütfi Kırdar City Hospital, İstanbul, Türkiye
**E-mail:** ismailbg@gmail.com **ORCID ID:** orcid.org/0009-0008-0619-7111
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## INTRODUCTION

Fournier's gangrene (FG) is an extremely rapidly progressing and life-threatening necrotizing fasciitis affecting the perineal, genital, and anorectal regions. Although first described in 1883 by Jean Alfred Fournier in young, healthy men, it has been established over the years that it can also occur in women.[1] The incidence in women is quite low, and far fewer cases have been reported in the literature compared to men. Although large series report a male-to-female ratio of approximately 10:1, increasing case reports in women in recent years have highlighted the growing importance of this group.[2]

The etiology of the disease is usually based on anorectal, urogenital, or skin-related infections. In women, perianal abscesses, urinary tract infections, and gynecological infections are among the triggering factors.[3] Pathophysiologically, aerobic and anaerobic bacteria within the polymicrobial flora spread rapidly in the tissue, leading to small vessel thrombosis and tissue hypoxia. This mechanism results in progressive necrosis.[4]

The mortality rate in FG has been reported in the literature to be between 20% and 40%, and this rate has reached up to 70% in patients with sepsis at the time of presentation.[2,4] Patients often require multiple surgical debridements, prolonged hospital stays, and reconstructive surgical interventions.[5] Delays in the diagnosis of FG are associated with a more severe course and an increased risk of complications. Early diagnosis, aggressive surgical debridement, and broad-spectrum antibiotic therapy play a decisive role in survival. However, current data indicate a need for larger-scale studies, particularly in female patients.[6] In our study, we aimed to contribute to the literature by evaluating the clinical characteristics, laboratory findings, treatment processes, and outcomes of female patients diagnosed with FG and treated at our clinic, and comparing our data with the literature.

## MATERIALS AND METHODS

Our study is a single-center, retrospective cohort analysis. Female patients treated at our clinic with a diagnosis of FG between January 2010 and December 2024 were retrospectively reviewed. The study was conducted with the approval of the hospital ethics committee and was planned in accordance with the principles of the Helsinki Declaration. All data were obtained from the hospital electronic record system and patient files.

Female patients with a diagnosis of FG confirmed by clinical examination, laboratory findings, and radiological imaging were included in our study. Cases with limited skin necrosis due to trauma, patients under 18 years of age, and cases where the diagnosis or treatment process could not be adequately evaluated due to missing file information were excluded from the study.

The age at presentation, body mass index (BMI), comorbidities (particularly diabetes mellitus, hypertension, obesity, malignancy, chronic renal failure), duration of symptoms, and clinical findings of all patients were retrospectively analyzed. Laboratory parameters included complete blood count, C-reactive protein (CRP), serum creatinine, electrolytes, blood glucose levels, and white blood cell count. In addition, the laboratory risk indicator for necrotizing fasciitis (LRINEC) score was calculated for all cases. Contrast-enhanced computed tomography was used in the vast majority of patients, and typical findings (fascial thickening, subcutaneous air, fluid collection) were evaluated for the diagnosis of necrotizing fasciitis. Ultrasonography and magnetic resonance imaging were used as complementary methods only in selected cases.

All patients underwent emergency surgical debridement at the time of diagnosis. During debridement, necrotic tissue was completely removed, and repeat debridement was performed when necessary. Fecal diversion (colostomy or Flexi-Seal system) was performed in some cases, and secondary reconstructive surgery (flap or skin graft) was required for large defects. Medical treatment initially involved a broad-spectrum antibiotic combination (usually carbapenem or third-generation cephalosporin + metronidazole ± aminoglycoside), followed by treatment adjustment based on culture and antibiogram results. Blood sugar regulation was ensured in diabetic patients, and patients requiring intensive care were monitored using a multidisciplinary approach. The primary endpoint in our study was defined as the mortality rate, while secondary endpoints were assessed as morbidity indicators (development of sepsis, number of repeat debridements, length of hospital stay, need for reconstructive surgery, complication rate).

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The study was approved by the Ethics Committee of University of Health Sciences Türkiye, Kartal Dr. Lütfi City Hospital (approval no: 2025/010.99/20/26, date: 29.09.2025).

### Statistical Analysis

Data were analyzed using SPSS Statistics (IBM Corp., Armonk, NY) software. Continuous variables were presented as mean ± standard deviation or median (minimum-maximum). Categorical variables were expressed as frequency and percentage values.

Student's t-test was used for parameters showing a normal distribution, and the Mann-Whitney U test was used for those not normally distributed. Categorical variables were compared using the chi-square or Fisher's exact test. Statistical significance was set at $p<0.05$.

## RESULTS

The mean age of the 13 female patients evaluated in our study was 60 years (range 45-74), and it is noteworthy that the vast majority were in the older age group. The mean BMI was calculated as 31.2 kg/m² and regarding BMI 6 patients (46.2%) were overweight (BMI 25.0-29.9 kg/m²), while 7 patients (53.8%) were obese (BMI ≥30.0 kg/m²) (Table 1). This finding supports the literature emphasizing obesity as an important risk factor for the development of FG.

When comorbidities were evaluated, type 2 diabetes mellitus was found to be the most common accompanying disease. A total of 6 patients (46.2%) had diabetes, and some of these cases were accompanied by additional diseases such as hypertension, obesity, or chronic renal failure. Hypertension was detected in 4 patients (30.8%), chronic obstructive pulmonary disease (COPD) in 2 patients (15.4%), and obesity in 2 patients (15.4%). Less commonly, chronic renal failure, a history of malignancy, and alcohol use were also among the risk factors (Table 1). This situation shows that FG in women often occurs in conjunction with metabolic and vascular risk factors.

The patients' presenting complaints usually began with non-specific symptoms such as pain, edema, and fever, while in advanced cases, necrosis in the vulvar or labial region became prominent. It was observed that necrosis developed more rapidly in patients with accompanying factors such as diabetes and obesity.

When infection sources were evaluated, perianal abscess was found to be the most common cause. Details of other infection sources are provided in Table 1. These results reveal that FG in women often begins with perianal and vulvar infections, but less common gynecological and urinary causes can also lead to the condition.

Looking at the surgical treatment processes of the patients, the average number of debridements was 2.1 (range 1-4), and multiple surgical interventions were required in 7 patients (53.8%). Fecal diversion was performed in 4 patients (30.7%), and most of these patients also required intensive care support. Reconstructive surgery (flap or skin graft) was performed in three patients (23%). Laboratory findings showed a mean white blood cell count of 17.9 x10³/µL, mean CRP of 261 mg/L, creatinine of 1.8 mg/dL, and glucose level of 244 mg/dL. These values indicate the contribution of diabetes mellitus and sepsis to the clinical picture. The average LRINEC score was 8.1, with 6 patients classified as high risk (≥8).

The only mortality in the study occurred in a 72-year-old patient with a history of Type 2 DM and COPD. In this case, laboratory values were at their highest levels (CRP: 398 mg/L, creatinine: 3.2 mg/dL, glucose: 389 mg/dL), and the LRINEC score was calculated as 11. Details of the patients' surgical treatment processes and laboratory findings are provided in Table 2. When all cases were evaluated, sepsis developed in 7 patients (53.8%), and all of these cases required intensive care support. The hospital stay of

**Table 1. Demographic and clinical characteristics of patients (n=13)**

| Patient no | Age (years) | BMI (kg/m²) | Comorbidities | Complaint at presentation | Source of infection |
|---|---|---|---|---|---|
| 1 | 45 | 27.8 | DM Type 2, HT | Perineal pain, fever | Perianal abscess |
| 2 | 52 | 32.4 | Obesity | Vulvar pain, edema | Vulvar abscess |
| 3 | 61 | 29.5 | COPD, HT | Vulvar swelling, pain | Perianal abscess |
| 4 | 48 | 34.2 | Type 2 diabetes | Labial necrosis, fever | Bartholin abscess |
| 5 | 67 | 26.9 | Chronic renal failure | Perineal pain, sepsis | Urinary catheter |
| 6 | 70 | 35.6 | Type 2 diabetes, obesity | Vulvar necrosis | Vulvar abscess |
| 7 | 59 | 28.1 | Smoking, alcohol | Vulvar necrosis | Perianal abscess |
| 8 | 63 | 31.7 | History of malignancy | Perineal pain, fever | After radiotherapy |
| 9 | 56 | 30.5 | HT | Vulvar pain, edema | Perianal abscess |
| 10 | 72 | 37.9 | Type 2 diabetes, COPD | Labial necrosis, fever | Vulvar abscess |
| 11 | 60 | 29.4 | Type 2 diabetes | Vulvar necrosis | Urinary tract stone |
| 12 | 74 | 33.5 | HT, Type 2 DM | Perineal necrosis | Perianal abscess |
| 13 | 53 | 27.6 | Alcoholism | Vulvar edema, fever | Idiopathic |

BMI: body mass index; DM: diabetes mellitus; HT: hypertension; COPD: chronic obstructive pulmonary disease

patients with sepsis was also significantly longer, calculated as an average of 29 days. In contrast, this period remained around 15 days on average in the group without sepsis.

The most common complications were wound site infection and delayed healing, detected in 4 patients (30.7%). Three patients developed progression of necrosis or flap necrosis, while two patients had concomitant renal dysfunction. The clinical outcomes of the patients in our study and the complications that developed during the treatment process are detailed in Table 3.

## DISCUSSION

Our study shows that FG in female patients mostly occurs in association with advanced age, obesity, and diabetes mellitus, that it rapidly progresses to necrosis despite non-specific initial complaints, and that the most common source of infection is perianal abscess. Our findings indicate that advanced age and metabolic comorbidities are important risk factors for the disease in women. Similarly, the literature indicates that the presence of diabetes mellitus, hypertension, and obesity plays a critical role in both the onset of the disease and the determination of mortality and morbidity rates.[2] Previous large e-series have also reported that diabetes is the most common accompanying risk factor and significantly increases mortality rates, similar to our study.[1,7]

The incidence of FG in female patients is considerably lower than in males. Studies by Beecroft et al.[5] and Khalid et al.[8] have shown

**Table 2. Surgical treatment processes and laboratory findings of patients (n=13)**

| Patient no | Number of debridements | Fecal diversion | Reconstructive surgery | Intensive care | White blood cell count (x10³/µL) | CRP (mg/L) | Creatinine (mg/dL) | Glucose (mg/dL) | LRINEC score | Result |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | None | None | No | 12.8 | 186 | 1.1 | 198 | 6 | Lived |
| 2 | 2 | None | None | No | 15.4 | 221 | 1.3 | 245 | 7 | Lived |
| 3 | 2 | None | None | Yes | 18.9 | 268 | 1.5 | 233 | 8 | Lived |
| 4 | 1 | None | None | No | 14.2 | 197 | 0.9 | 178 | 6 | Lived |
| 5 | 3 | Yes | No | Yes | 21.1 | 342 | 2.7 | 298 | 10 | Lived |
| 6 | 2 | None | Yes | Yes | 19.5 | 276 | 1.9 | 265 | 9 | Lived |
| 7 | 2 | None | None | No | 16.8 | 254 | 1.4 | 211 | 8 | Lived |
| 8 | 3 | Yes | No | Yes | 22.3 | 301 | 2.2 | 276 | 10 | Lived |
| 9 | 1 | None | None | No | 13.7 | 189 | 1.0 | 187 | 5 | Lived |
| 10 | 4 | Yes | Yes | Yes | 24.6 | 398 | 3.2 | 389 | 11 | Exitus |
| 11 | 2 | None | None | Yes | 17.5 | 263 | 1.8 | 228 | 8 | Lived |
| 12 | 3 | Yes | Yes | Yes | 20.8 | 327 | 2.5 | 312 | 10 | Lived |
| 13 | 1 | None | None | No | 11.9 | 178 | 1.0 | 174 | 5 | Survived |

CRP: C-reactive protein; LRINEC: laboratory risk indicator for necrotizing fasciitis

**Table 3. Clinical outcomes and complications of patients (n=13)**

| Patient no | Sepsis | Intensive care requirement | Complications | Hospital stay (days) | Outcome |
|---|---|---|---|---|---|
| 1 | No | No | No wound infection | 14 | Experienced |
| 2 | No | No | Wound site infection | 16 | Experienced |
| 3 | Yes | Yes | Sepsis | 24 | Survived |
| 4 | No | No | Delayed wound healing | 12 | Experienced |
| 5 | Yes | Yes | Sepsis, kidney dysfunction | 28 | Survived |
| 6 | Yes | Yes | Sepsis, progression of necrosis | 30 | Survived |
| 7 | No | No | Local recurrence | 18 | Survived |
| 8 | Yes | Yes | Sepsis, delayed wound healing | 34 | Experienced |
| 9 | No | No | No wound infection | 13 | Experienced |
| 10 | Yes | Yes | Severe sepsis, multiple organ failure | 41 | Death |
| 11 | Yes | Yes | Sepsis, prolonged recovery | 26 | Survived |
| 12 | Yes | Yes | Sepsis, flap necrosis | 29 | Survived |
| 13 | No | No | Wound site infection | 15 | Experienced |

that the disease is less common in women but can be as clinically severe as in men. In our series, the only mortality occurred in an elderly patient with a history of diabetes and COPD. This finding once again demonstrates the importance of comorbidities in determining prognosis. One of the most important characteristics of FG is its rapid progression and potential to develop into sepsis within a short period of time. In our study, the mortality rate was determined to be 7.6%. This result suggests that mortality can be kept low in our series through early diagnosis and rapid intervention. Our data also confirmed that complication rates are higher in patients presenting with a high LRINEC score. This situation once again highlights the importance of the LRINEC score in clinical prediction.[9]

The need for multiple debridements is an indicator of the invasive nature of the disease, as seen in our study. Chawla et al.[10] emphasized that repeated surgical interventions are critically important for survival, and that incomplete or delayed debridement significantly increases mortality. The mean number of debridements in our study was 2.1, and more than one-third of these patients required fecal diversion. This finding is consistent with other studies in the literature.[11,12] A multidisciplinary approach in the management of FG is one of the most important determinants of survival. The collaboration of intensive care specialists, infectious disease specialists, general surgeons, urologists, and gynecologists reduces both morbidity and mortality rates. Ozkan et al.[9] have shown that such multidisciplinary approaches are life-saving, especially in elderly patients with comorbidities. In our series, thanks to the multidisciplinary approach, we achieved a successful clinical course with only one mortality.

While FG is generally reported in male patients, our study's focus solely on female patients fills an important gap in the literature. The 14-year retrospective time frame of our study allowed for long-term evaluation of the patients' clinical course. The fact that all patients were followed up and treated at the same center ensured homogeneity in the diagnostic and treatment protocols applied.

### Study Limitations

This study has several limitations. First, the small sample size of only thirteen female patients limits the statistical power and generalizability of the results. Second, the retrospective and single-center design may have introduced selection bias, and some clinical or laboratory data might have been incomplete or missing. Third, because the study focused exclusively on female patients, comparisons with male patients regarding clinical presentation, management, and prognosis could not be performed.

## CONCLUSION

In conclusion, FG is a rare but severe disease in women. Early diagnosis, prompt initiation of treatment, and multidisciplinary teamwork are key factors in reducing mortality and morbidity rates. Therefore, careful evaluation of infections developing in the perineal or vulvar region and prompt surgical intervention are of great importance, especially in female patients with risk factors such as diabetes and obesity. Mortality risk is significantly increased in patients with high LRINEC scores, emphasizing the importance of rapid evaluation of laboratory parameters.

## ETHICS

**Ethics Committee Approval:** The study was approved by the Ethics Committee of University of Health Sciences Türkiye, Kartal Dr. Lütfi City Hospital (approval no: 2025/010.99/20/26, date: 29.09.2025).

**Informed Consent:** Retrospective study.

## FOOTNOTES

### Contributions

Surgical and Medical Practices: İ.B., F.Ş., M.M., T.T., B.A.S., Ö.A., H.M.Ü., C.Ö.G., Concept: İ.B., M.M., T.T., B.A.S., Ö.A., H.M.Ü., C.Ö.G., Design: İ.B., M.M., T.T., B.A.S., Data Collection or Processing: F.Ş., M.M., H.M.Ü., C.Ö.G., Analysis or Interpretation: İ.B., F.Ş., M.M., T.T., B.A.S., Ö.A., H.M.Ü., C.Ö.G., Literature Search: İ.B., F.Ş., T.T., B.A.S., Ö.A., H.M.Ü., C.Ö.G., Writing: F.Ş., M.M., T.T., B.A.S., Ö.A., H.M.Ü., C.Ö.G.

## DISCLOSURES

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

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# Prevalence of *Chlamydia trachomatis* in vaginal swab samples from women diagnosed with pelvic inflammatory disease or presenting with clinical complaints

Funda ÇİMEN AÇIKGÜL[1], Hatıra BABASOY[2]

[1]Department of Microbiology, Ağrı İbrahim Çeçen University Faculty of Medicine, Ağrı, Türkiye
[2]Department of Obstetrics and Gynecology, Ağrı İbrahim Çeçen University, Ağrı Training and Research Hospital, Ağrı, Türkiye

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## ABSTRACT

**Objective:** *Chlamydia trachomatis* (*CT*) represents a major global health concern with over 130 million annual infections. Epidemiological data remain limited in Eastern Anatolia, Türkiye. This study determined *CT* prevalence among women presenting with pelvic inflammatory disease (PID) or genital symptoms in this region.

**Materials and Methods:** Vaginal and cervical specimens from 100 female patients attending gynecology services at a university hospital in Eastern Anatolia during 2025 were examined. Participants presented with genital discharge, burning during urination, and pain during sexual intercourse. DNA extraction utilized the NucleoGene kit, followed by polymerase chain reaction (PCR) amplification targeting the cryptic plasmid with primers KL1 and KL2. Products showing 241 bp bands were considered positive.

**Results:** Among 100 participants (mean age 36.3 years), PCR identified *CT* in 14 samples (14%). The mean age of *CT*-positive cases was 34.5 years. Clinical presentations included 5 PID diagnoses, 90 vaginal discharge complaints, and 5 routine examinations. *CT* was detected in one PID case (20%) and thirteen genital discharge cases (14.4%).

**Conclusion:** This investigation demonstrates 14% *CT* prevalence in Eastern Anatolia, confirming a substantial regional health issue. The relatively higher positivity observed in younger women suggests a potential benefit of targeted screening. Expanding molecular diagnostics and establishing screening programs are essential for identifying asymptomatic infections and preventing reproductive complications.

**Keywords:** Chlamydia trachomatis; PID; vaginal swab; PCR; Türkiye

**Address for Correspondence:** Funda Çimen Açıkgül, Department of Microbiology, Ağrı İbrahim Çeçen University Faculty of Medicine, Ağrı, Türkiye
**E-mail:** funda_mku@hotmail.com **ORCID ID:** orcid.org/0000-0002-8904-1444
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## INTRODUCTION

*Chlamydia trachomatis* (*CT*) is one of the most common sexually transmitted infections worldwide, estimated to be responsible for over 130 million new cases annually.[1] Its prevalence, particularly among women aged 15-25, makes it a significant public health issue.[2] As an obligate intracellular bacterium, *CT* can cause ocular, genital, and systemic infections through its various biovars. Genital serovars (D-K) are primarily responsible for urogenital infections and are associated with urethritis, cervicitis, pelvic inflammatory disease (PID), and serious reproductive system complications.[3] Systemic inflammatory indices are increased in many different diseases such as celiac disease and hepatosteatosis, as well as in infectious conditions and malignancies.[4,5]

Untreated genital *CT* infections in women can lead to serious consequences such as PID, ectopic pregnancy, infertility, and chronic pelvic pain. Furthermore, chlamydia infection is reported to increase susceptibility to other sexually transmitted infections, particularly human immunodeficiency virus (HIV).[6] The fact that the infection is often asymptomatic or presents with mild symptoms leads to delayed diagnosis and silent spread of the infection.[7]

PID is a clinical syndrome that causes significant morbidity in women. Although its etiology is multifactorial, *CT* is considered one of the most important pathogens in the development of PID.[8] The limited specificity of the clinical diagnosis of PID necessitates the use of sensitive laboratory methods in identifying the underlying agents. Currently, nucleic acid amplification tests (NAATs), especially polymerase chain reaction (PCR), are considered the gold standard methods for diagnosing *CT* due to their high sensitivity and specificity.[9]

Despite the clinical significance of *CT* infection, epidemiological data are limited in some regions of Türkiye, such as the Eastern Anatolia Region. Therefore, this study aimed to determine the prevalence of *CT* in vaginal swab samples taken from women diagnosed with PID or presenting with genital symptoms in the Eastern Anatolia Region. The hypothesis that *CT* infection occurs with a clinically significant frequency in this patient group was tested.

## MATERIALS AND METHODS

The study was conducted using vaginal and cervical swab samples taken from 100 female patients who presented to the Obstetrics and Gynecology Outpatient Clinics of a Ağrı İbrahim Çeçen University, Ağrı Training and Research Hospital in the Eastern Anatolia Region of Türkiye in 2025 with complaints of genital discharge, burning during urination, and pain during sexual intercourse, and who were suspected of having genital infections. Ethical approval for the study was obtained from the Kafkas University Ethics Committee on May 29, 2024, with decision number 2024/472, within the scope of the research titled "Investigation of Chlamydia Prevalence in Vaginal Swab Samples Taken from Women with PID and Clinical Complaints", and the study was conducted in accordance with the principles of the Declaration of Helsinki. Exclusion criteria were defined as: Individuals under 18 years of age, those who did not sign the voluntary consent form, those who refused to participate in the study, and individuals who received antibiotic treatment in the last 3 months.

DNA isolation from swab samples for PCR studies was performed according to the NucleoGene Genomic DNA Extraction kit (Türkiye) manufacturer's instructions. For the PCR amplification reaction, 4 µL of master mix (10 × PCR buffer, 3.5 mM $MgCl_2$, 200 µM dNTPs, 1 U Taq DNA polymerase), 0.6 µL of forward primer (0.5 µM), 0.6 µL of reverse primer (0.5 µM), and 8 µL of template DNA were added to each sample, and the total volume was completed to 20 µL with nuclease-free water. For the detection of *CT* DNA, primers KL1 (5′-TCCGGAGCGAGTTACGAAGA-3′) and KL2 (5′-AATCAATGCCCGGGATTGGT-3′) targeting the cryptic plasmid, were used. PCR amplification was performed with an initial denaturation of 95 °C for 5 minutes; this was followed by 40 cycles of denaturation at 94 °C for 45 seconds, annealing at 58 °C for 1 minute, and extension at 72 °C for 1 minute. Amplification was completed with a final extension step of 5 minutes at 72 °C. PCR products were analyzed by 1.8% agarose gel electrophoresis, performed at 120 V for 30 minutes, and samples exhibiting a 241 bp amplicon were considered positive.[10]

### Statistical Analysis

The PCR results obtained in the study were transferred to a computer environment, and the data were analyzed using descriptive statistics. Categorical variables were presented as numbers and percentages, while continuous variables were presented as mean and range (minimum-maximum) values. No statistical comparisons were made; the findings were evaluated at the descriptive level.

## RESULTS

A total of 100 female patients aged between 18-55 years, with an average age of 36.3 years, were included in the study. Ninety-eight of the patients were married, and 2 were single. As a result of PCR analyses, *CT* positivity was detected in 14 (14%) of the vaginal swab samples (Figure 1). The age range of the entire patient group participating in the study was 18-55 years, with an average age of 36.3. The age range of *CT* positive cases was 23-

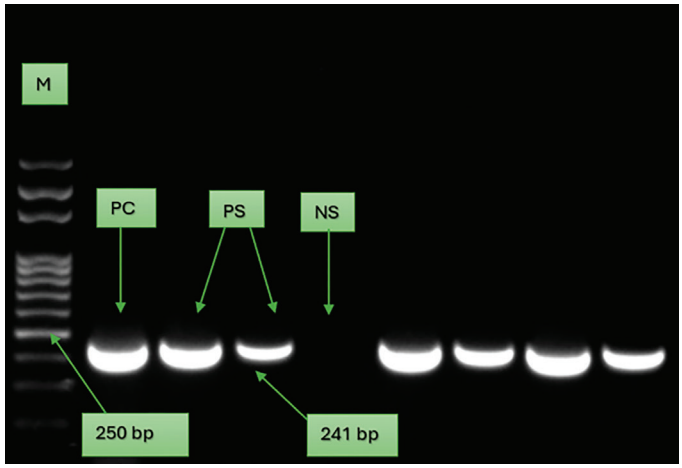


**Figure 1.** Agarose gel electrophoresis of CT isolates
*M: marker; PC: positive control; PS: positive sample; NS: negative sample; bp: base pair; CT: Chlamydia trachomatis*

48 years, with an average age of 34.5. The age range of negative cases was 18-55 years, with an average age of 37.3. When the distribution of patients according to their reasons for clinical presentation was examined, it was determined that 5 patients were diagnosed with PID, 90 patients presented with complaints of vaginal discharge, and 5 patients presented to the center for routine check-ups. According to PCR results, *CT* was detected in 1 of the 5 cases (20%) diagnosed with PID and in 13 of the 90 cases (14.4%) presenting with complaints of vaginal discharge. No positivity was determined in the asymptomatic group (n=5). The findings reveal the descriptive distribution of age and clinical characteristics of *CT* positive cases (Table 1).

## DISCUSSION

In this study, the prevalence of *CT*, detected by PCR, was determined to be 14% in women diagnosed with PID or presenting with genital symptoms in the Eastern Anatolia Region of Türkiye. This rate is consistent with the prevalence range reported in low- and middle-income countries. A systematic meta-analysis reported a chlamydia prevalence of 6.9% (95% confidence interval: 5.2-8.7%, n=169 observations) in women of reproductive age in Sub-Saharan Africa.[11] A study in pregnant women in Brazil reported a *CT* prevalence of 18%.[12] Similarly, the prevalence of *CT* was reported as 15.6% in Vietnamese women experiencing infertility problems.[13] A limited number of studies in different regions of Türkiye have reported variable prevalence rates. In the Marmara Region, the prevalence of *CT* among individuals with sexually transmitted diseases in İstanbul was 11.1%,[14] while in a study conducted in Ankara, Central Anatolia, among HIV+ men with sexually transmitted diseases, the rate of *CT* was 2.5%,[15] and a similar study reported this rate as 1%.[16] In addition, a study in the Black Sea Region of Türkiye (Samsun) involving an equal number of HPV+ and non-HPV patients presenting with vaginal discharge complaints found the rate of *CT* to be 2%, and these patients were reported as HPV+.[17] In a study conducted in the Aegean Region (Manisa) with patients presenting with a preliminary diagnosis of vaginitis, the rate of *CT* was found to be 4%.[18] In another study involving male patients from whom urethral discharge and ejaculate fluid samples were taken, and which retrospectively examined ten years of data, the rate of *CT* was found to be 5.2%.[19] The 14% positivity rate detected in our study, considering regional differences, shows that *CT* infection is a significant public health problem in the Eastern Anatolia Region.

The fact that the average age of positive cases (34.5 years) is lower than that of negative cases (37.3 years) is an important finding supporting the idea that genital chlamydia infections are more common, especially in the younger age group. According to the World Health Organization and the Centers for Disease Control and Prevention (CDC), *CT* infections are observed in women aged 15-49 years, but the incidence is significantly higher in women under 25 years of age and decreases with age.[20,21] This is associated with the higher prevalence of cervical ectopia in young women, differences in immunological responses, and behavioral risk factors.[22] The age distribution observed in our study is consistent with these findings in the literature and emphasizes the importance of screening programs for younger age groups. In our study, the vast majority of *CT* positive cases (92.9%; 13/14) consisted of patients who presented with complaints of vaginal discharge. Although the number of cases

**Table 1. Demographic and clinical features of CT positive and negative cases**

| Variable | Positive (n=14) | Negative (n=86) | Total (n=100) |
|---|---|---|---|
| Age range (years) | 23-48 | 18-55 | 18-55 |
| Mean age (years) | 34.5 | 37.28 | 36.3 |
| PID | 1 (20%) | 4 (80%) | 5 (5%) |
| Vaginal discharge | 13 (14.4%) | 77 (85.6%) | 90 (90%) |
| Asymptomatic | 0 | 5 (100%) | 5 (5%) |

PID: pelvic inflammatory disease; CT: *Chlamydia trachomatis*

diagnosed with PID was limited (n=5), the positivity rate of 20% (1/5) in this group is noteworthy. In the literature, chlamydia positivity rates in women diagnosed with PID are reported to range widely from 5.8% to 41.6%.[23,24] These differences are related to the heterogeneity of diagnostic criteria, the characteristics of patient populations, and the sensitivity of the laboratory methods used. Studies have reported that 30-34% of women diagnosed with PID are positive for *CT*.[25,26] Although a definitive comparison is not possible due to the limited sample size in our study, the clinical importance of investigating the etiology of chlamydia in PID cases is clear.

One of the most important characteristics of genital *CT* infections is that approximately 70% of cases in women are asymptomatic.[27] This can lead to the infection remaining undetected for a long time and causing serious complications such as PID, tubal infertility, ectopic pregnancy, and chronic pelvic pain. Mathematical modeling and cohort studies show that approximately 10-15% of untreated chlamydia infections progress to PID over time.[28] Although no positive cases were detected in the asymptomatic group (n=5) in our study, it is not possible to draw a definitive conclusion about the true prevalence of asymptomatic infections due to the small sample size of this subgroup. However, literature data show that focusing only on symptomatic cases may underestimate the actual disease burden. In this context, it is clear that implementing routine screening programs could contribute to the early detection of asymptomatic infections and the prevention of complications.

NAATs are considered the gold standard in the diagnosis of *CT* due to their high sensitivity (60-85%) and specificity (97-99%).[9] In our study, cryptic plasmid targeting was performed using the PCR method, and the presence of a 241 bp amplicon was evaluated.[29] Since the cryptic plasmid is found in 7-10 copies in the *CT* genome, it provides higher analytical sensitivity compared to single-copy genes such as ompA or *16S rRNA* genes.[30] The use of NAATs provides a significant advantage, especially in the detection of subclinical and low bacterial load infections. Approximately 20-50% more positive cases can be detected compared to culture methods.[31] These results are consistent with previous reports supporting molecular diagnostics in subclinical infections. Given the high prevalence and complications of *CT* infection, cost-effectiveness analyses of screening programs are crucial. A study in the United States reported that annual chlamydia screening in sexually active women under 25 years of age resulted in savings of approximately USD 2.500 per preventable PID case.[32] Population-based screening programs implemented in some countries have been linked to decreased PID incidence in young women.[33] Currently, a nationwide chlamydia screening program has not been implemented in Türkiye. The 14% prevalence rate was found in our study suggests the potential benefit of targeted screening strategies, particularly in regions with limited healthcare resources, such as the Eastern Anatolia Region.

Although the treatment of *CT* infection is relatively simple, the high rate of reinfection (17.24%) is a significant problem.[34] Partner treatment and reporting are critical for preventing reinfections and controlling community transmission. The CDC guidelines recommend treating all sexual partners of *CT* positive cases within the last 60 days, and increasing access to partner treatment can reduce reinfection rates.[35] Strengthening partner reporting and treatment systems in Türkiye is a significant deficiency with respect to infection control.

High treatment success rates have been reported with first-line tetracycline and macrolide antibiotics (azithromycin and erythromycin) in *CT* infections;[36] however, resistance-associated mutations have been identified mainly *in vitro* and in limited clinical samples.[37] Treatment failure varies between 5% and 23%, depending on many factors and the population studied.[38] Therefore, adherence to treatment guidelines and the performance of follow-up tests (test of cure) at appropriate indications are important.

The Eastern Anatolia Region is a region characterized by relatively lower socioeconomic indicators, and access to health services is more limited compared to other regions.[39] In this context, the 14% chlamydia prevalence detected in our study highlights the need to review regional health policies and strengthen sexual health services. In populations with low health literacy, strategies to raise awareness about sexually transmitted infections and increase early diagnosis opportunities should be fundamental components of public health interventions.

## Study Limitations

This study has some limitations. The relatively small sample size (n=100) and the fact that the data were obtained from a single center limit the generalizability of the results. In particular, the small number of patients diagnosed with PID (n=5) prevented statistical analyses from being performed in this subgroup. The fact that only vaginal and cervical samples were evaluated may have led to the underdiagnosis of urethral or rectal infections. The study did not evaluate patients' sexual behavior characteristics, number of partners, contraceptive methods, and other sociodemographic risk factors. In addition, post-treatment follow-up data and serotype determination were not performed.

## CONCLUSION

In this study, the prevalence of *CT* in women diagnosed with PID or exhibiting genital symptoms in the Eastern Anatolia Region was determined to be 14%. This rate suggests that *CT* infection may represent an important public health concern in the region. *CT*-positive cases had a lower mean age compared to negative cases, highlighting the need for risk-based screening strategies. Widespread adoption of molecular diagnostic methods may improve early detection of asymptomatic infections and the prevention of serious reproductive health complications. Strengthening regional health policies, increasing sexual health education, and improving partner treatment systems may contribute to the control of *CT* infection.

## ETHICS

**Ethics Committee Approval:** Ethical approval for the study was obtained from the Kafkas University Ethics Committee on May 29, 2024, with decision number 2024/47.

**Informed Consent:** Informed consent was obtained.

## FOOTNOTES

### Contributions

Surgical and Medical Practices: H.B., Concept: F.Ç.A., Design: F.Ç.A., Data Collection or Processing: F.Ç.A., H.B., Analysis or Interpretation: F.Ç.A., Literature Search: F.Ç.A., Writing: F.Ç.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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# Restoring pelvic stability and nerve function with dextrose injections: A clinical framework for chronic pelvic pain

Jacques BECO[1], Aurélie SIMON[2]

[1]Department of Gynecology, Clinique Sainte-Elisabeth - CHC, Verviers, Belgium
[2]Department of Gynecology, Liège University Faculty of Medicine, Liège, Belgium

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## ABSTRACT

**Objective:** Chronic pelvic pain without a clear etiology remains a diagnostic challenge in gynecology. In many women, standard investigations are normal, yet symptoms persist. A substantial proportion of these cases may involve neuromuscular mechanisms, particularly obturator and pudendal neuralgias. The objective of this work is to propose a structured clinical framework to support diagnostic evaluation and management.

**Materials and Methods:** This article presents a narrative clinical framework derived from routine perineological practice. It describes a stepwise approach based on clinical history, pelvic nerve examination, assessment of sacroiliac stability, and evaluation of generalized hypersensitivity. Targeted treatment strategies are outlined using dextrose injections: low concentration (5%, perineural injection therapy) for neural involvement and higher concentrations (15-25%, prolotherapy) for ligamentous instability. The identification of psycho-traumatic factors is based on structured clinical history, and autonomic modulation strategies may be considered in selected patients.

**Results:** This framework allows patients to be classified into clinically coherent profiles, including isolated neuralgia, generalized hypersensitivity associated with psycho-traumatic history, and sacroiliac instability. In clinical practice, dextrose injections may be associated with symptom improvement and functional recovery, although responses vary and should be interpreted within an observational context. Evidence from other peripheral neuropathies provides indirect support for the proposed mechanisms.

**Conclusion:** This integrative clinical framework may help structure the evaluation and management of chronic pelvic pain by linking clinical findings to targeted therapeutic strategies. It should be considered hypothesis-generating rather than confirmatory, and further controlled studies are required to assess clinical effectiveness.

**Keywords:** Pudendal neuralgia; obturator neuralgia; sacroiliac instability; post-traumatic stress disorders; pelvic pain; lower urinary tract symptoms; urge incontinence; cystalgia; dyspareunia; PGAD

**Address for Correspondence:** Jacques Beco, Department of Gynecology, Clinique Sainte-Elisabeth - CHC, Verviers, Belgium
**E-mail:** jacques.beco@skynet.be **ORCID ID:** orcid.org/0000-0002-7538-2459
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## INTRODUCTION

Chronic pelvic pain is a frequent reason for consultation in perineology.[1] In a significant proportion of patients, standard investigations (pelvic imaging, urological assessment, infectious disease work-up) are normal, leading to diagnostic uncertainty and, at times, a psychogenic interpretation of symptoms.

However, numerous clinical observations show that these complaints often correspond to pain of neuromuscular origin, primarily obturator and pudendal neuralgia. Such neuralgia may be accompanied by reflex myofascial contractures, functional urogenital disorders, and persistent perineal pain.

Beyond these peripheral lesions, two major factors contribute to chronicity: firstly, sacroiliac instability, sometimes associated with hyperlaxity or Ehlers-Danlos syndrome; and secondly, generalized hypersensitivity observed in patients with post-traumatic stress disorder.[2]

The emergence and progressive validation of dextrose injections—either at 5% around the nerve [perineural injection therapy (PIT)] or at 15-25% within the ligaments (prolotherapy)—have provided clinicians with a simple, inexpensive, and pathophysiologically plausible tool for managing this patient group.[3]

The aim of this article is to describe an integrated clinical approach, beginning with the patient's history and physical examination and leading to targeted treatment with dextrose injections.

## MATERIALS AND METHODS

### Study Design

This manuscript presents a narrative clinical framework intended to support structured diagnostic reasoning in chronic pelvic pain. It is not designed as a formal case series with predefined inclusion criteria, standardized outcome measures, or protocolized follow-up.

### Clinical Evaluation

Evaluation of a patient presenting with unexplained chronic pelvic or perineal pain is based on four complementary components: targeted history taking, pelvic nerve examination, assessment of sacroiliac stability and evaluation of generalized hypersensitivity.

### Targeted History

The medical history aims to distinguish between pain of pudendal origin and pain of obturator origin. Pudendal pain is typically aggravated by sitting or cycling and affects the superficial vulvo-anal or clitoral region.[4-6] The presence of a PGAD-SAS (persistent genital arousal disorder–sexual arousal syndrome; intrusive sexual sensations occurring out of context) or proctalgia fugax is very suggestive.[7,8]

Obturator pain is deeper, unaffected by position, and often associated with inguinal, hip, or knee radiation, uterine pain (contractions) or sensations of a vaginal or rectal foreign body.[9]

A systematic search for functional urinary disorders (pollakiuria, nocturia, dysuria, painful bladder), sometimes with recurrent cystitis, dyspareunia, coccygodynia, or anorectal disorders (dyschezia, incontinence), is essential, as these are often secondary to pelvic nerve irritation rather than primary bladder or rectal pathology.

The history should also explore traumatic or psycho-traumatic events such as assaults, harassment, sexual abuse, or car accidents. These elements are common in patients with generalized cutaneous hypersensitivity or PTSD (post-traumatic stress disorder) and should be considered as potential contributing clinical factors requiring careful evaluation.

Finally, complaints of low back pain, restless legs, leg pain or paresthesia, unsteadiness while walking, or difficulty turning over in bed suggest sacroiliac or pelvic instability, particularly in hypermobile individuals.

These four components are assessed sequentially to differentiate primary neural pain from secondary musculo-ligamentary mechanisms and generalized autonomic hypersensitivity.

### Clinical Examination

### Pelvic Nerve Assessment

The examination is performed in the gynecological position and follows a structured and standardized clinical sequence linking symptoms to the structures involved.

The first step involves palpating the pudendal nerves vaginally or rectally at 5 and 7 o'clock, below the ischial spine and within Alcock's canal (Figure 1).[10,11] Sharp pain on pressure is suggestive of neuralgia. The compression test between the sacrospinous and sacrotuberous ligaments reproduces sitting pain and reinforces the diagnosis. Para-urethral palpation of the pubis is frequently painful on the side of pudendal neuralgia and can serve as a screening test.

The obturator nerves are palpated at 3 and 9 o'clock within the obturator foramen; provoked pain here also suggests neuralgia.[9]

A skin-rolling test is then performed over the cutaneous innervation territory: from the para-coccygeal to the para-clitoral region for the pudendal nerve, and along the medial aspect of the knee for the obturator nerve. A painful skin-rolling test is clinically suggestive of neuralgia (Figure 2).

Pinprick sensitivity is also tested in the vulvo-perineal areas (pudendal nerve) and the inner knee (obturator nerve).[12]

## Contractures and Myofascial Trigger Points

Pelvic neuralgia frequently induces reflex contraction, with trigger points, of the obturator internus, piriformis and puborectalis muscles. Such secondary muscle spasm may mechanically irritate the adjacent pelvic nerve, leading to cross-irritation; pudendal neuralgia may therefore arise as an indirect consequence of primary obturator neuralgia, and vice versa.

Stress may also contribute to sustained perineal muscle contraction, potentially leading to mechanical irritation of the obturator nerve. The analogy of a terrified dog holding its tail between its hind legs illustrates this posture-related mechanism.[13] In humans, the coccyx represents the vestigial equivalent of the tail, and chronic stress-related perineal contraction may contribute to mechanical irritation of the obturator nerve.

Of course myofascial trigger points can be induced by postural or podiatric disorders and may be treated manually (trigger points release), but they have been observed to improve once the neuralgia itself is treated with PIT, without establishing a direct causal relationship.[13]

## Assessment of Sacroiliac Instability

Sacroiliac instability is evaluated using several simple signs: Pain on palpation of the sacroiliac joints and/or pubic symphysis, unstable single-leg stance improved by a sacroiliac belt, and improvement in the straight leg raise test (20°) under transverse pelvic compression.

This instability should prompt active investigation for hypermobility or Ehlers-Danlos syndrome using the Hamonet questionnaire (Table 1).[14]

Percussion of the sacroiliac joints, sacrotuberous ligaments, or the pubic symphysis with a standard reflex hammer may reproduce characteristic pain irradiation, supporting a ligamentary contribution to neurological symptoms involving the lower limbs, lumbar spine, or perineum.

## Generalized Hypersensitivity (Polyneuralgia) and PTSD

The arm skin-rolling test is routinely performed: If painful, it suggests generalized cutaneous hypersensitivity related to sympathetic nervous system hyperactivity (Figure 3). When the test is positive, skin sensitivity should also be assessed (skin rolling or pinch) at other body sites to rule out a localized upper-limb neuralgia, including reference areas such as the

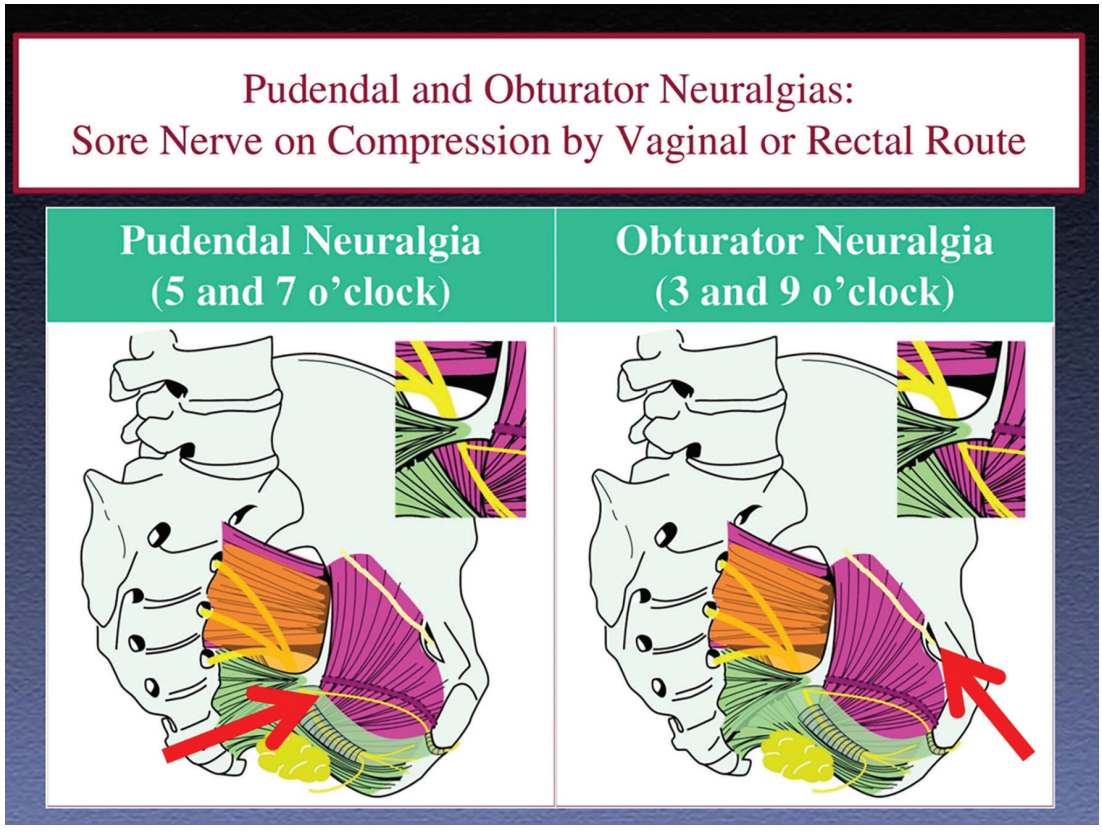


**Figure 1.** Clinical palpation of the pudendal and obturator nerves.
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acupuncture points CV6 and CV12, discussed later in this article. Patients with confirmed generalized hypersensitivity require specific management incorporating autonomic nervous system modulation.

In this observational framework, psycho-traumatic factors were identified through structured clinical history-taking and, when available, previously established psychiatric diagnoses reported by the patient. No standardized PTSD screening instrument was systematically applied. The association described should therefore be interpreted as a clinical correlation rather than as evidence of causation.

This structured clinical assessment allows patients to be classified into clinically coherent profiles guiding therapeutic strategy.

## Ethical Considerations

All patients received clear and comprehensive information regarding the diagnostic procedures and injection techniques described in this article. Informed consent was obtained from all participants prior to treatment, in accordance with institutional and ethical requirements.

The study protocol and manuscript were approved by the Ethics Committee of CHC Liège (Belgium; OM087 accreditation), reference number 25/43/1360.

## Statistical Analysis

This study is a descriptive and observational clinical work based on routine medical practice. No randomization, control

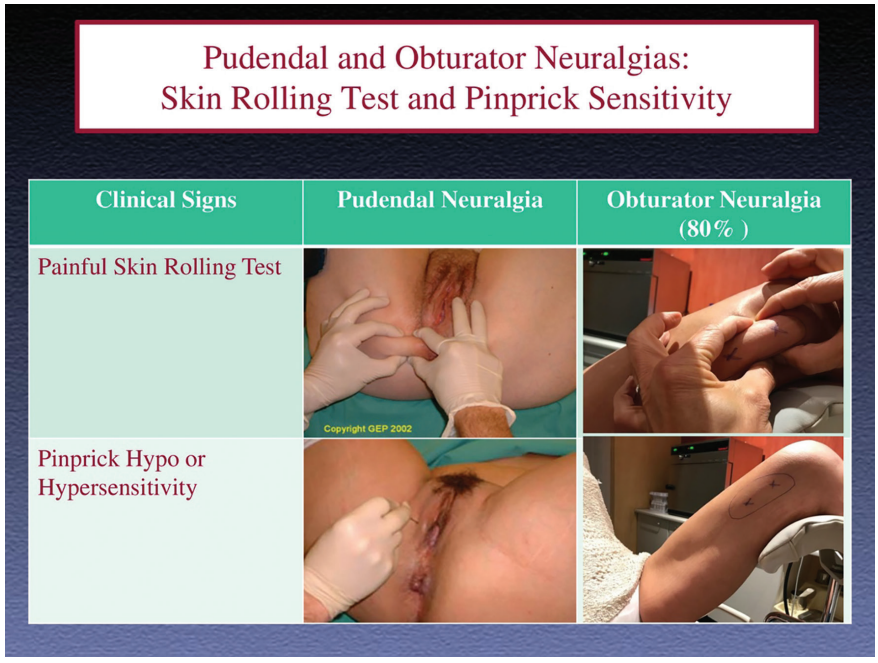


**Figure 2.** Skin-rolling test and pinprick sensitivity in pudendal and obturator nerve territories.
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**Table 1. Screening for Ehlers-Danlos syndrome: Hamonet ECSS-62**

| No. | Symptom domain | Typical clinical features (examples) |
|---|---|---|
| 1 | Articular and peri-articular pain | Multiple sites; neuropathic quality or paroxysmal crises on a background of continuous pain; worse the day after physical effort |
| 2 | Marked fatigue | Present on waking with a sensation of bodily heaviness; highly disabling; sometimes associated with somnolence |
| 3 | Impaired voluntary motor control (proprioceptive origin) | Clumsiness; bumping into obstacles (“door sign”); gait deviation |
| 4 | Joint instability | Pseudo-sprains; subluxations or dislocations; joint cracking or locking episodes |
| 5 | Thin, pale, translucent skin | Visible venous network; electrostatic discharge sensations |
| 6 | Joint hypermobility | Past or present extreme flexibility; may be masked by pain and muscle contractures |
| 7 | Gastro-oesophageal reflux | Recurrent or persistent reflux symptoms |
| 8 | Easy bruising/purpura | Bruising after minimal trauma; miget sign after blood test |
| 9 | Hyperacusis | Noise intolerance; difficulty understanding speech in noisy environments |
| A screening result is considered suggestive when more than 5 of the 9 symptom domains are present | | |

group, or hypothesis-driven statistical testing was performed. Consequently, no inferential statistical analysis was applied.

## CLINICAL PROFILES AND THERAPEUTIC MANAGEMENT

Applying this approach allows three main clinical profiles to be distinguished:

(1) isolated pudendal or obturator neuralgia;

(2) polyneuralgic patients with a clinical history suggestive of PTSD or psycho-traumatic exposure;

(3) patients with sacroiliac instability causing mechanical irritation of the pelvic nerves.

### Isolated Neuralgia: Perineural Injection Therapy (PIT)

Isolated pudendal and obturator neuralgias are primarily treated with 5% dextrose (D5W) injections using the PIT described by Lyftogt.[15] Dextrose is injected subcutaneously or perineurally along the painful pathway and at points identified by the skin-rolling test (Figures 4-8). Three to four sessions, spaced 7-14 days apart, are often followed by normalization of palpation findings and symptom reduction in clinical practice, although responses may vary between patients.

The rapid analgesic effect has been hypothesized to relate to correction of C-fibers neuroglycopenia caused by compression of the vasa nervorum and/or to modulation of TRPV1-mediated nociceptive signaling. Randomized studies at other sites of peripheral neuropathy (e.g., carpal tunnel syndrome, ulnar nerve) suggest a potential benefit of D5W over corticosteroids or placebo, providing indirect biological plausibility for its use; extrapolation to pelvic neuralgia should be interpreted cautiously.[16,17]

Of course, in cases of pudendal neuralgia, protective strategies—such as using a U-shaped cushion when sitting, avoiding cycling or heavy lifting, and shifting backwards on the toilet seat in cases of perineal descent—should be combined with dextrose injections. If these conservative measures fail to provide adequate symptom relief, surgical pudendal nerve decompression may be considered.[7,18,19]

### Generalized Hypersensitivity and PTSD: Anti-stress Point Injections

In patients with polyneuralgia, a positive arm skin-rolling test, and a history of trauma, it is useful to add, at the end of the session, D5W infiltration of seven acupuncture points described by Wancura-Kampik, corresponding to the main sympathetic nerve relays (Figure 9).[20]

This technique, inspired by Mulvaney's work on stellate ganglion block in PTSD, represents an extrapolation of autonomic modulation concepts to the pelvic context, and has been

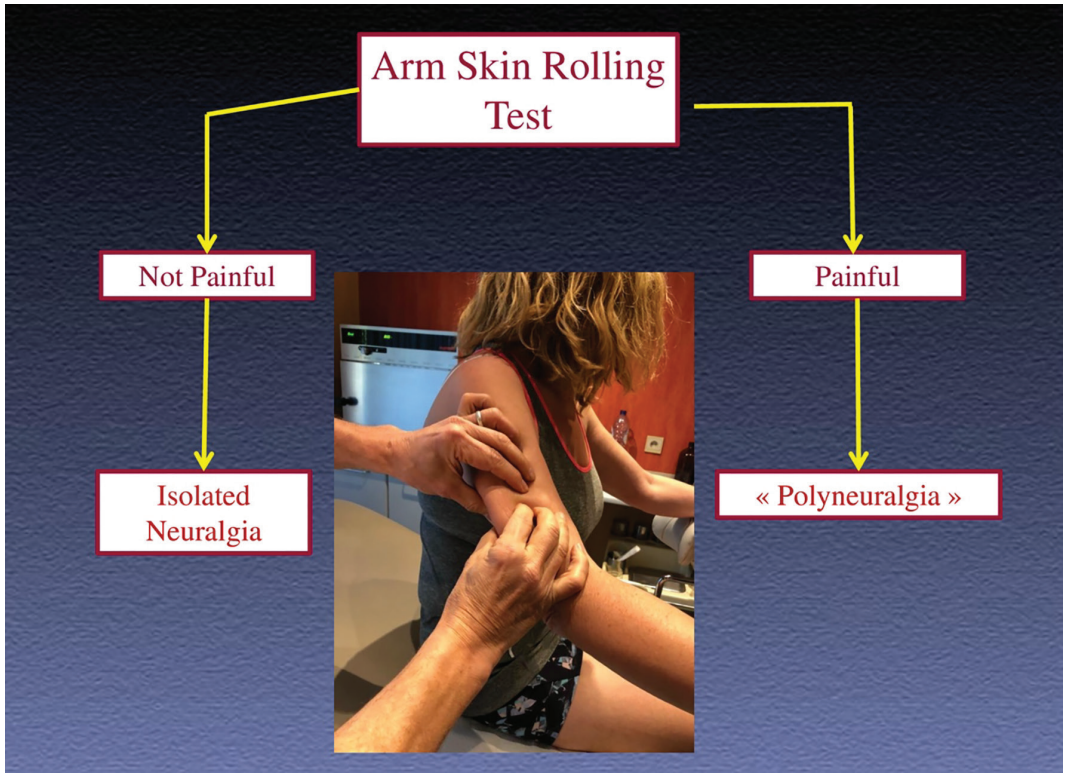


**Figure 3.** Arm skin-rolling test used to identify generalized cutaneous hypersensitivity and distinguish polyneuralgia from localized neuralgia. Reproduced from Simon A, Beco J. Gunaïkeia. 2025;30(1), with written permission from the publisher

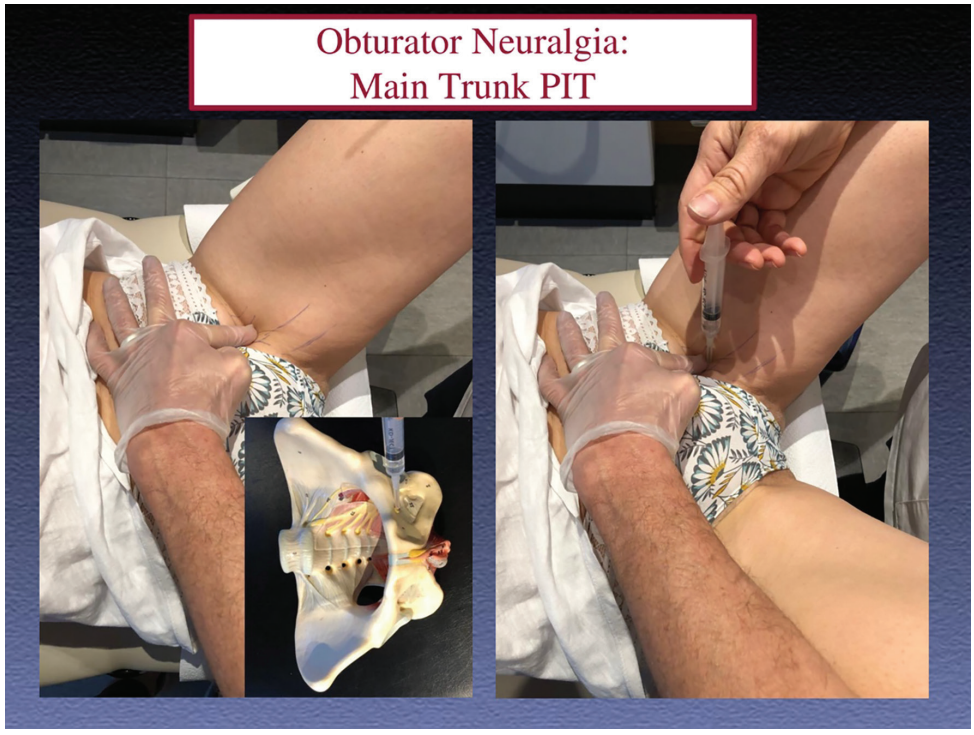


**Figure 4.** Perineural injection technique (PIT) targeting the main trunk of the obturator nerve.
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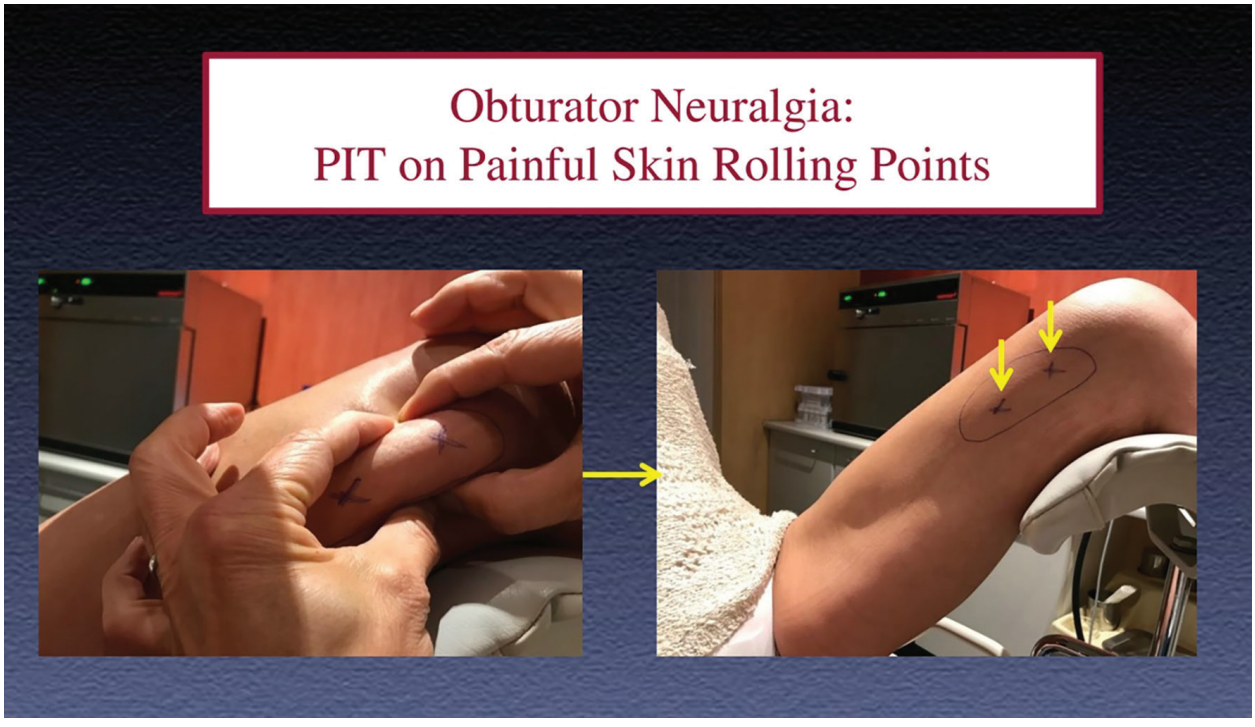


**Figure 5.** Perineural injection technique (PIT) applied to painful skin-rolling points in obturator neuralgia.
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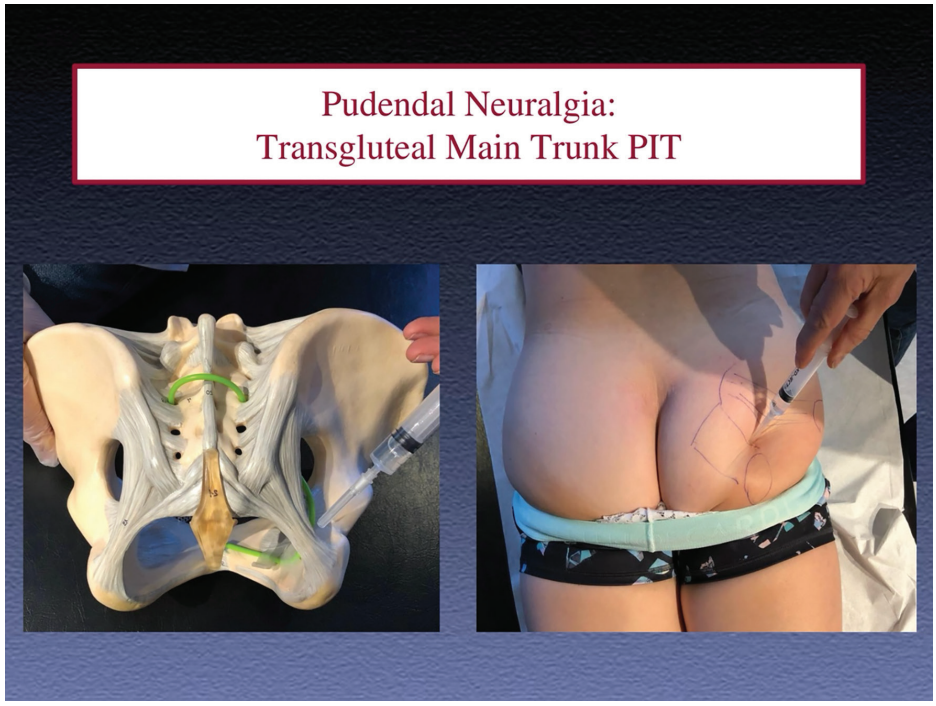


**Figure 6.** Transgluteal approach for perineural injection of the pudendal nerve main trunk.
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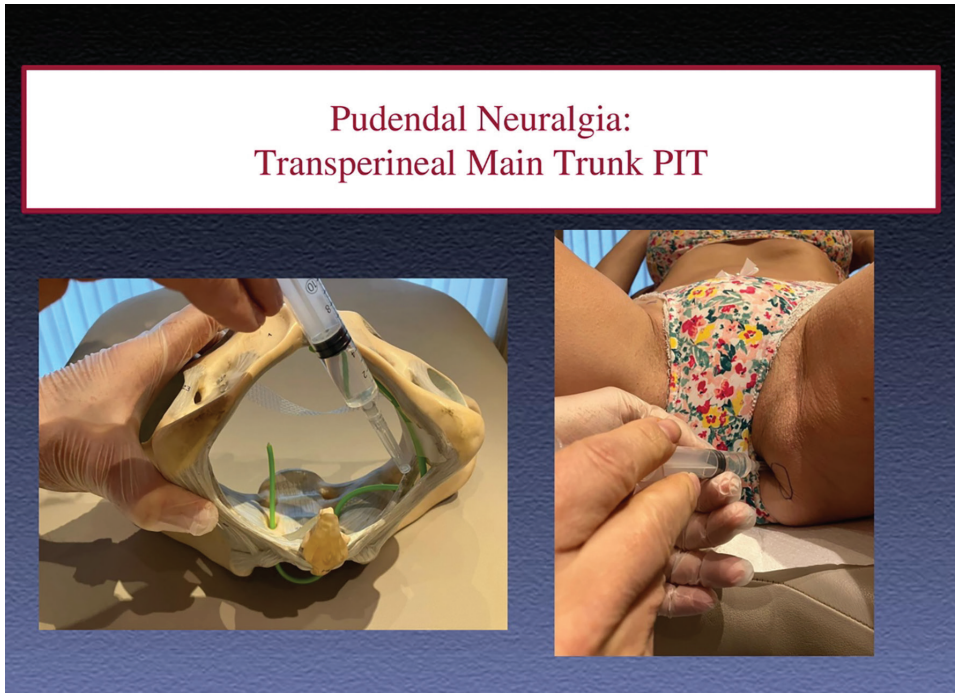


**Figure 7.** Transperineal approach for perineural injection of the pudendal nerve main trunk.
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reported to provide relief, reduce hypervigilance, and enhance receptivity to body-oriented psychotherapies.[2,21]

## Sacroiliac Instability: Prolotherapy

When clinical examination reveals sacroiliac instability, a therapeutic option is prolotherapy with concentrated dextrose injections (15-25%) into the sacroiliac and sacrotuberous ligaments and the pubic symphysis (Figures 10 and 11). Concentrated dextrose is intended to induce controlled inflammation followed by fibroblast proliferation and collagen neosynthesis, thereby tightening the ligamentous structures. Four sessions spaced two to three weeks apart are commonly

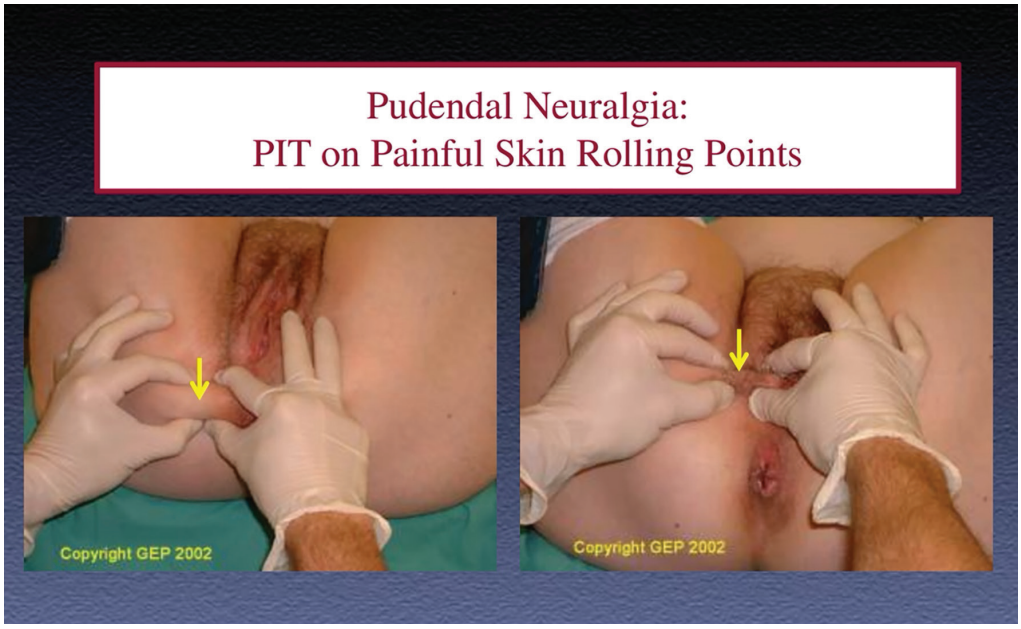


**Figure 8.** Perineural injection technique (PIT) at painful skin-rolling points in pudendal neuralgia.
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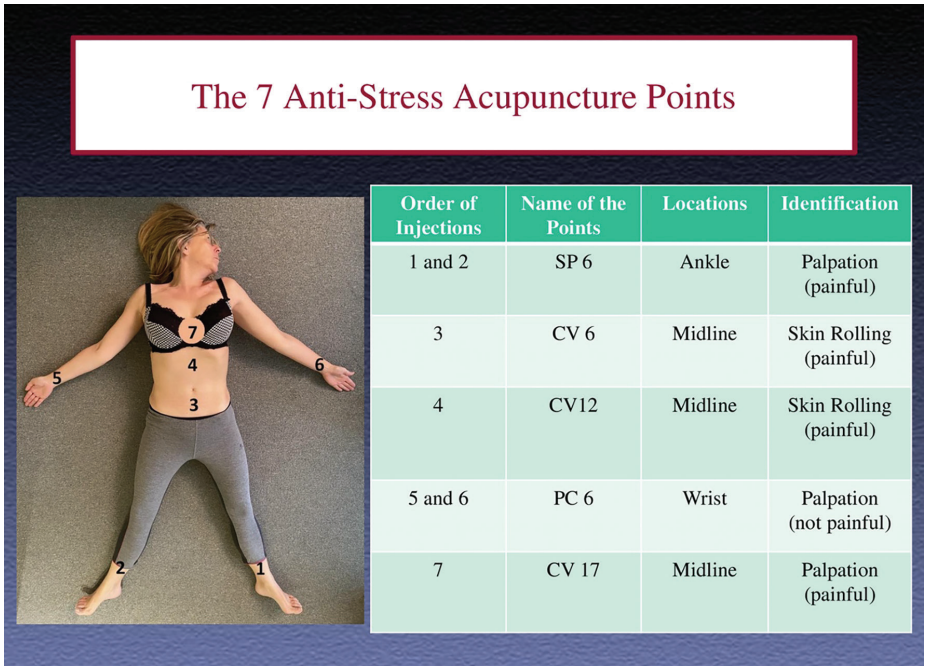


| Order of Injections | Name of the Points | Locations | Identification |
|---|---|---|---|
| 1 and 2 | SP 6 | Ankle | Palpation (painful) |
| 3 | CV 6 | Midline | Skin Rolling (painful) |
| 4 | CV12 | Midline | Skin Rolling (painful) |
| 5 and 6 | PC 6 | Wrist | Palpation (not painful) |
| 7 | CV 17 | Midline | Palpation (painful) |

**Figure 9.** Seven anti-stress acupuncture points used for autonomic modulation, including SP6, CV6, CV12, PC6, and CV17.
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used in clinical practice. The patient can use a sacroiliac belt throughout the duration of the treatment.[22]

These injections can also serve a diagnostic purpose, as lidocaine is always injected together with dextrose. If the pudendal and obturator nerves are not more painful after these injections, it supports a sacroiliac contribution to the pain pattern, although it does not establish definitive causality.

Anti-inflammatory drugs are contraindicated during the treatment period because inflammation is essential for healing. Several studies have shown parallel improvement in pelvic, perineal, and leg pain, supporting a mechanical link between pelvic instability and irritation of the pelvic nerves.[23,24]

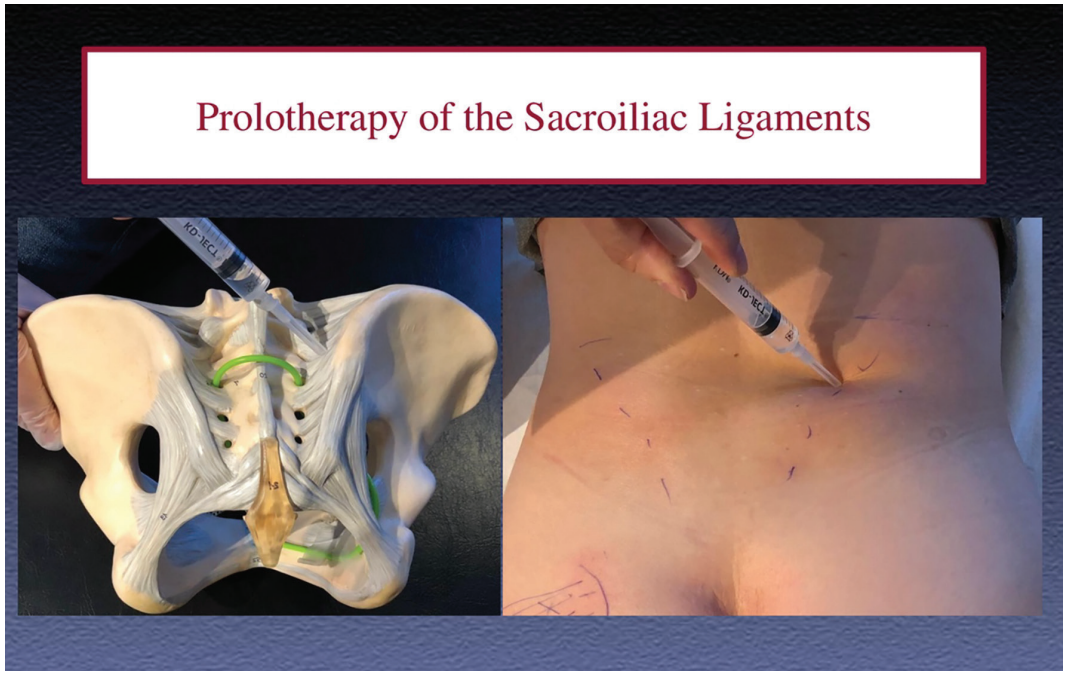


**Figure 10**. Prolotherapy technique targeting the sacroiliac ligaments.
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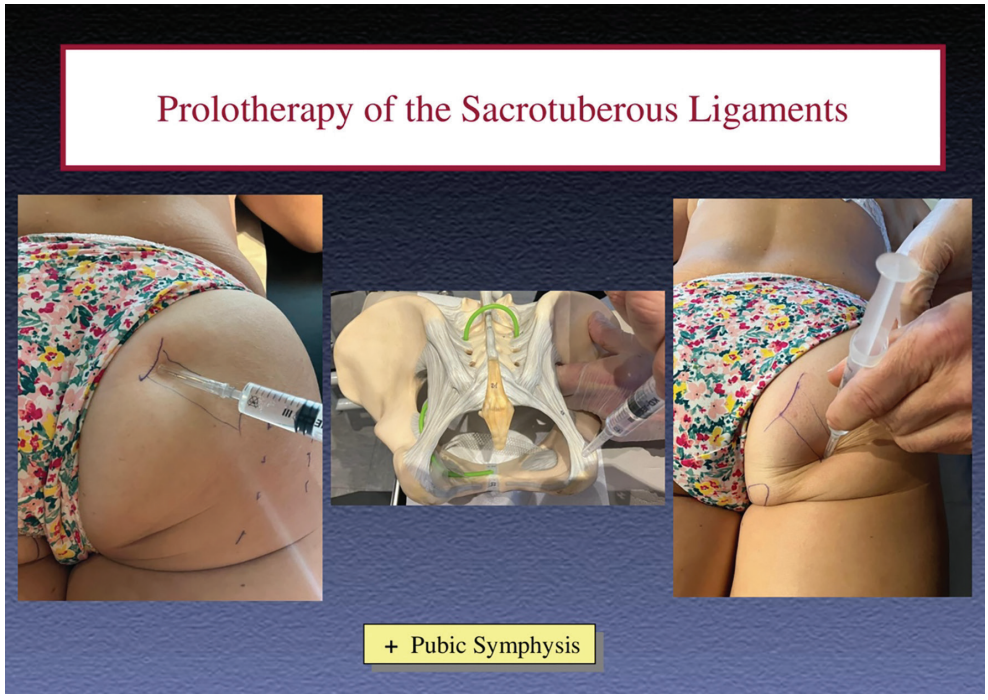


**Figure 11**. Prolotherapy technique targeting the sacrotuberous ligaments.
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## DISCUSSION

This examination-centered approach offers a framework in which symptoms long considered "functional" may be interpreted in relation to anatomical and pathophysiological mechanisms.

Dextrose injections serve a dual purpose: diagnostic and therapeutic. Clinical improvement following perineural injection or prolotherapy may support a neuromuscular contribution to symptoms but should not be considered diagnostic proof.

The safety profile and low cost of dextrose and the possibility of repetition make it particularly suitable for pelvic floor rehabilitation.

The mechanisms of action are proposed to differ according to concentration. At 5%, dextrose may restore nutrition of C fibers under compression, reduce intraneural oedema, and modulate nociceptive discharge. At 15-25%, it is intended to induce a transient inflammatory response followed by ligament regeneration, which is particularly valuable in sacroiliac instability. This dual action enables treatment of both the painful nerve and the underlying mechanical source of irritation.

The sympathetic component should not be underestimated. Many patients with pelvic pain report chronic stress or a history suggestive of PTSD, and the work of Mulvaney and Lipov suggests that targeted sympathetic blockade can improve a range of conditions (hot flushes, ulcerative colitis, CRPS).[25] These observations originate outside the field of pelvic neuralgia and therefore serve as conceptual support rather than condition-specific evidence. Infiltrating the seven anti-stress points with 5% dextrose at the end of each session is a simple, minimally invasive adaptation of this principle to perineological practice.[2] This approach also facilitated timely referral of patients for hypnotherapy and eye movement desensitization and reprocessing, both of which function as complementary modalities to the seven-points anti-stress protocol.

Of course, other nerves and ligaments can also contribute to pelviperineal pain and should be treated accordingly—for example, lax iliolumbar ligaments inducing testicular or vaginal pain, or genitofemoral nerves causing anterior vulvar pain.[22,26] Similar principles of mechanical and neural modulation may be applied. Occasionally, a “sweet caudal” (caudal epidural with 5% dextrose) has been described as potentially beneficial by targeting multiple sacral roots simultaneously.[27]

### Study Limitations

The limitations of this approach lie in the still largely observational nature of the evidence. Most available data derive from case series or extrapolations from other fields and should be regarded as indirect and hypothesis-generating. Randomized controlled trials incorporating quality-of-life scores and specific pelvic pain assessments are required.

Of course, true organic causes of pain—such as trans-obturator surgery complications, endometriosis, abscesses or lichen sclerosus—must be excluded, as they may act as persistent nociceptive drivers and precipitate recurrent symptoms.

Furthermore, several potential applications deserve exploration, including prolotherapy of the uterosacral ligaments in certain types of vulvar pain and lower urinary tract symptoms, or of the pubo-urethral ligaments in stress incontinence.[28-30]

## CONCLUSION

The management of chronic pelvic pain must systematically include assessment of obturator and pudendal neuralgia, PTSD-type hypersensitivity, and sacroiliac instability. By linking patient history, clinical examination, and targeted dextrose injections, the perineologist gains a coherent and pathophysiological framework. This framework may help reduce diagnostic uncertainty and may support more targeted management strategies in selected patients, while prospective controlled studies are required to evaluate clinical effectiveness.

## ETHICS

**Ethics Committee Approval:** The study protocol and manuscript were approved by the Ethics Committee of CHC Liège (Belgium; OM087 accreditation), reference number 25/43/1360.

**Informed Consent:** Informed consent was obtained from all participants prior to treatment, in accordance with institutional and ethical requirements.

## FOOTNOTES

### Contributions

Concept: J.B., A.S., Design: J.B., A.S., Data Collection or Processing: J.B., A.S., Analysis or Interpretation: J.B., A.S., Literature Search: J.B., A.S., Writing: J.B., A.S.

## DISCLOSURES

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

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ORIGINAL ARTICLE

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# Posterior vaginal wall support and nocturia: perineal ultrasonographic findings in the context of the integral theory

Derya KILIÇ

Department of Obstetrics and Gynecology, Pamukkale University Faculty of Medicine, Denizli, Türkiye

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## ABSTRACT

**Objective:** To examine the relationship between nocturia, pelvic organ support, and bladder neck mobility by perineal ultrasonography in women with nocturia

**Materials and Methods:** In this case-control study, 62 women presenting with nocturia were compared with 62 matched controls without nocturia. Groups were matched for age, body mass index (BMI), and apical prolapse (C point). Pelvic organ prolapse was graded using the pelvic organ prolapse quantification system system, and bladder neck descent during the Valsalva maneuver was measured by perineal ultrasonography. The coexistence of stress urinary incontinence (SUI) was documented. A pre-specified subgroup analysis was then performed after excluding patients with SUI to isolate the nocturia-specific results.

**Results:** Baseline characteristics including age, BMI, and apical prolapse were similar between groups. Women with nocturia had significantly higher gravidity and more vaginal deliveries than controls. Posterior compartment measurements (Ap and Bp points) were significantly greater in the nocturia group, while anterior wall measurements did not differ. Bladder neck descent during Valsalva was also greater among women with nocturia. SUI co-occurred in 79% of the nocturia group versus 38.7% of controls. When SUI cases were excluded, posterior vaginal wall defects remained to be associated with nocturia, whereas the significance in bladder neck descent disappeared.

**Conclusion:** Nocturia appears to be associated with posterior vaginal wall support defects and increased bladder neck mobility. When cases with SUI are removed from the analysis, posterior compartment abnormalities persist while the bladder neck mobility difference resolves pointing to a mechanism that is at least partly independent of urethral hypermobility. These findings are consistent with Integral Theory.

**Keywords:** Nocturia; perineal ultrasonography; posterior vaginal wall defects; integral theory

## INTRODUCTION

Nocturia is one of the most common lower urinary tract symptoms and is defined as the need to wake from sleep to void one or more times during the night.[1,2] Classically attributed to systemic causes such as nocturnal polyuria, sleep disorders, or detrusor overactivity, its etiology has long been viewed through a predominantly urological or cardiorenal lens.[3] Besides these

**Address for Correspondence:** Derya Kılıç, Department of Obstetrics and Gynecology, Pamukkale University Faculty of Medicine, Denizli, Türkiye
**E-mail:** deryakilic.md@gmail.com **ORCID ID:** orcid.org/0000-0001-8003-9586
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problems, structural pelvic floor dysfunction may also contribute to this symptom.[4]

The Integral Theory of the Pelvic Floor suggests that lower urinary tract symptoms arise from defects in the connective tissue support structures of the pelvic floor.[5] According to this theory, laxity in pelvic ligaments can disrupt the biomechanical balance of the pelvic floor and impair the normal mechanisms responsible for continence and bladder control. As a result, lower urinary tract symptoms may develop.[6]

Several studies have demonstrated that defects in pelvic support structures, particularly those affecting the anterior vaginal wall and urethral support, contribute to stress urinary incontinence (SUI) and bladder dysfunction.[7] However, the relationship between nocturia and specific pelvic compartment abnormalities remains less investigated.

Perineal ultrasonography (PUS) is a non-invasive and widely available method for assessing pelvic floor structures and bladder neck mobility in a dynamic condition.[8] Degree of the bladder neck descent (BND) during the Valsalva maneuver can be used as an indicator of urethral support defect and pelvic floor dysfunction.

Despite growing interest in examining pelvic floor dysfunction with perineal ultrasonography, the role of pelvic support defects in patients presenting with nocturia has not been deeply investigated. Understanding whether nocturia is associated with specific pelvic compartment abnormalities may provide new insights into its pathophysiology and help tailor specific surgical approaches.

The aim of this study was therefore to evaluate pelvic organ support and bladder neck mobility in women with nocturia using pelvic organ prolapse quantification and perineal ultrasonography.

## MATERIALS AND METHODS

### Study Design and Population

This was a retrospective case-control study conducted at a tertiary urogynecology referral center. We reviewed the medical records of women who underwent PUS as part of their routine urogynecologic evaluation.

Women reporting nocturia were identified and included in the study group. Nocturia was defined according to the International Continence Society terminology as waking from sleep one or more times to void during the night.[9] The control group consisted of women without nocturia who underwent PUS during routine gynecological assessment. Controls were matched on age, body mass index (BMI), and apical pelvic support pelvic organ prolapse quantification (POP-Q) point D to reduce confounding by demographic and anatomical factors.

In total, 124 women were included: 62 with nocturia and 62 matched controls.

Ethical approval was obtained from the Research Ethics Committee of Pamukkale University (date: 14.04.2024, number: 07).

### Clinical and Pelvic Floor Evaluation

All participants underwent a structured urogynecologic evaluation including medical and obstetric history. A standardized pelvic examination was performed. Pelvic organ support was graded using the POP-Q system,[10] which provides a standardized method for characterizing prolapse at each vaginal compartment. Measurements were taken at maximal Valsalva in the lithotomy position by the same clinician with expertise in urogynecologic assessment.

### Perineal Ultrasonography

All transperineal examinations followed a standardized protocol. Patients were positioned in the lithotomy position with a partially filled bladder. A curved-array probe was applied to the perineum in the midsagittal plane, providing visualization of the symphysis pubis, urethra, and bladder neck. Ultrasound images were obtained in two conditions; at rest and during maximal Valsalva.

The position of the bladder neck was identified relative to the symphysis pubis. The distance between the bladder neck and the symphysis pubis was measured in both resting and Valsalva conditions according to previously described standardized methods. All ultrasound examinations were performed by the same examiner using the same standardized protocol. BND was defined as the displacement of the bladder neck during straining, calculated as the difference between resting and Valsalva bladder neck positions.

### Statistical Analysis

Statistical analyses were carried out using the IBM Statistical Product and Service Solutions (version 22, IBM SPSS Statistics for Windows, Armonk, NY) program. Continuous variables are presented as mean ± standard deviation; categorical variables as frequencies and percentages. Group comparisons were performed with independent samples t-tests for continuous variables and chi-square tests for categorical data. Statistical significance was set at $p<0.05$.

A secondary subgroup analysis was conducted after excluding patients with SUI, in order to evaluate whether these associations persisted independently of SUI.

## RESULTS

Sixty-two women with nocturia and 62 matched controls were included. The baseline characteristics of these cases are summarized in Table 1. The mean age of cases was 50.1±8.2 years, while that of controls was 47.4±7.4 years. The mean BMI of controls and the cases with nocturia was also comparable (27.8±3.7 vs. 28.6±4.2). Number of vaginal deliveries was higher (2.7 vs. 1.9, $p<0.001$) in the nocturia group. Both groups had similar C point measurements (-6.2±2.3 vs. -5.9±2.6, $p=0.503$).

Anterior compartment measures (points Aa and Ba) did not differ significantly between groups. However, Ap and Bp measurements were significantly greater than that of the controls (-1.9±1.2 vs. -1.4±1.3, $p=0.036$ and -2.0±1.3 vs. -1.3±1.4, $p=0.016$, respectively). When BND was measured during the Valsalva maneuver, greater descent was observed in the group with nocturia (2.3±1.4 vs. 1.8±1.2, $p=0.032$) (Table 2).

SUI was considerably more prevalent among women with nocturia: 79.0% versus 38.7% in the control group ($p<.001$; Table 3). Because of this high co-occurrence, a subgroup analysis described below was performed.

After excluding patients with SUI, the posterior compartment differences persisted in Ap and Bp point. However, BND was found to be similar between the groups (1.7±1.1 vs. 1.9±1.0, $p=0.509$) (Table 4).

**Table 1. Baseline characteristics of the study population**

| | Without nocturia n=62 | With nocturia n=62 | *p*-value |
|---|---|---|---|
| Age, mean (SD) | 47.4 (7.4) | 50.1 (8.2) | 0.062 |
| BMI | 27.8 (3.7) | 28.6 (4.2) | 0.317 |
| C point | -6.2 (2.3) | -5.9 (2.6) | 0.503 |
| Gravida | 2.7 (1.4) | 3.2 (1.6) | 0.045 |
| Vaginal delivery number | 1.9 (1.2) | 2.7 (1.3) | <0.001 |

SD: standard deviation; BMI: body mass index

**Table 2. Comparison of POP-Q measurements and bladder neck descent in women with and without nocturia**

| | Without nocturia n=62 | With nocturia n=62 | *p*-value |
|---|---|---|---|
| Point Aa | -1.5 (1.1) | -1.2 (1.4) | 0.209 |
| Point Ba | -1.6 (1.4) | -1.2 (1.6) | 0.127 |
| Point Ap | -1.9 (1.2) | -1.4 (1.3) | 0.036 |
| Point Bp | -2.0 (1.3) | -1.3 (1.4) | 0.016 |
| Bladder neck descent | 1.8 (1.2) | 2.3 (1.4) | 0.032 |

POP-Q: pelvic organ prolapse quantification system

**Table 3. Association of nocturia with the presence of stress urinary incontinence**

| | Without SUI | With SUI | Total | *p*-value |
|---|---|---|---|---|
| No nocturia | 38 (61.3%) | 24 (38.7%) | 62 (100.0%) | <0.001 |
| Nocturia | 13 (21.0%) | 49 (79.0%) | 62 (100.0%) | |

SUI: stress urinary incontinence

**Table 4. Comparison of POP-Q measurements and bladder neck descent in women with and without nocturia after excluding SUI cases**

| | Without nocturia | With nocturia | *p*-value |
|---|---|---|---|
| Point Aa | -1.6 (1.3) | -1.3 (1.4) | 0.496 |
| Point Ba | -1.5 (1.4) | -1.3 (1.6) | 0.731 |
| Point Ap | -2.1 (1.0) | -1.2 (1.6) | 0.075 |
| Point Bp | -2.1 (1.0) | -0.9 (1.6) | 0.032 |
| Bladder neck descent | 1.7 (1.1) | 1.9 (1.0) | 0.509 |

SUI: stress urinary incontinence; POP-Q: pelvic organ prolapse quantification system

## DISCUSSION

The present study investigated the relationship between nocturia, pelvic organ support, and bladder neck mobility using both POP-Q examination and perineal ultrasonography. The findings demonstrate that women with nocturia exhibit greater posterior vaginal wall descent and increased bladder neck mobility compared with matched controls. Importantly, when patients with SUI were excluded, the association between nocturia and posterior compartment support defects persisted, whereas BND became similar. These findings suggest that posterior pelvic support abnormalities may play a role in the pathophysiology of nocturia independent of urethral hypermobility.

Nocturia is a multifactorial symptom, and its association with posterior compartment support defects observed in our study suggests that structural pelvic floor dysfunction may represent an underrecognized contributing mechanism. While systemic etiologies such as nocturnal polyuria and detrusor overactivity remain important, our findings indicate that pelvic floor assessment should be considered in the evaluation of women presenting with nocturia, particularly in the urogynecologic setting.[11,12] Besides these problems, structural pelvic floor dysfunction may also contribute to this symptom. According to the Integral Theory of the Pelvic Floor, urinary symptoms may arise from defects in pelvic connective tissue support structures rather than from primary organ dysfunction alone. Laxity of pelvic ligaments can alter the balance of the forces acting on the bladder base and urethra, consequently affecting the mechanisms responsible for continence.[13,14]

Our findings are consistent with the prediction of Integral Theory. The observation that posterior vaginal wall measurements (Ap and Bp) were significantly greater in women with nocturia suggests that posterior compartment support may indirectly influence bladder function. The posterior vaginal wall is supported by structures such as the rectovaginal fascia and uterosacral ligament complex, which contribute to the stability of the pelvic floor and the proper positioning of the contracting rotational forces.[15] Defects in these support structures may alter continence dynamics, potentially leading to abnormal stimulation of bladder stretch receptors and increased nocturnal voiding.

The association between nocturia and increased BND observed in the overall cohort is also notable. Bladder neck mobility is commonly used as a marker of urethral support deficiency and is generally reported to be associated with SUI.[16] In our study, coexisting SUI was significantly more prevalent among women with nocturia. However, when SUI cases were excluded in the subgroup analysis, BND did not significantly differ between groups. This finding indicates that urethral hypermobility may primarily reflect the presence of SUI rather than representing an independent mechanism underlying nocturia.

In contrast, posterior compartment differences remained evident even in cases of isolated nocturia. This observation suggests that posterior pelvic floor support may influence nocturnal urinary symptoms through mechanisms distinct from those involved in SUI. According to integral theory, defects in the posterior compartment may impair the normal tensioning mechanisms of the pelvic floor that help stabilize the bladder base during filling. These alterations could potentially induce reflex afferent signaling from the bladder that can result in nocturnal urgency or voiding.[17]

PUS has been reported to be a good modality for evaluating pelvic floor dynamics.[8] As a non-invasive and widely available imaging technique, it allows real-time and dynamic assessment of bladder neck mobility and pelvic floor structures. Previous studies have demonstrated the value of PUS in the evaluation of pelvic floor disorders, particularly in assessing urethral mobility and pelvic organ prolapse. Our findings also support its utility as an adjunctive tool in the evaluation of patients presenting with nocturia.

### Study Limitations

Several limitations should be considered when interpreting these results. First, the retrospective design limits the ability to conclude a direct causal relationship between pelvic support defects and nocturia. In addition, nocturia was assessed based on patient-reported symptoms rather than voiding diary data, which may introduce recall bias. The study was conducted at a single tertiary center, which may limit the generalizability of the findings to other populations.

Despite these limitations, this study has several strengths. First, cases and controls were carefully matched for important potential confounders such as age, body mass index, and apical pelvic support. Second, pelvic organ support was assessed using the standardized POP-Q system, which provides a reproducible and internationally accepted method for evaluating pelvic floor anatomy. Third, bladder neck mobility was objectively measured using PUS both in resting and during Valsalva.

## CONCLUSION

PUS provided an objective method for evaluating pelvic floor dynamics and bladder neck mobility, allowing visualization of structural support defects that may contribute to lower urinary tract symptoms. Our findings support the concept that pelvic floor support mechanisms, particularly those involving the

posterior vaginal compartment, may influence nocturia. Future research involving interventional studies regarding posterior compartment defects may further clarify the causal relationship between pelvic floor structural abnormalities and nocturia in the absence of systemic disorders.

## ETHICS

**Ethics Committee Approval:** Ethical approval was obtained from the Research Ethics Committee of Pamukkale University (date: 14.04.2024, number: 07).

**Informed Consent:** As the study was retrospective in nature, it was not applicable.

## FOOTNOTES

## DISCLOSURES

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

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# Colossal enterocele repair by modified technique- A case report

Ayesha SHAHID, Nazlı HAMEED, Sheema YOUSAF

Clinic of Urogynecology, Shalamar Hospital, Punjab, Pakistan

**Citation:** Shahid A, Hameed N, Yousaf S. Colossal enterocele repair by modified technique-a case report. Pelviperineology. 2026;45(1):44-46

## ABSTRACT

Enterocele repair is challenging due to different surgical options including opening of peritoneum, removal of hernial sac or plication of uterosacral (USL) ligaments. We present a case report on colossal enterocele repair by a modified technique without opening parietal peritoneum or removing hernial sac. Enterocele was reduced and plication done of rectovaginal fascia with USL ligaments bilaterally.

**Keywords:** Enterocele; enterocele repair; urogynaecology

## INTRODUCTION

Enterocele is a form of pelvic organ prolapse consisting of bowel protruding into the vagina where peritoneum lies directly under vaginal epithelium without any intervening fascia.[1,2] It can be adjuvant with uterovaginal prolapse as presented in our case. Surgical treatment is challenging due to different options including either removal of hernial sac, Moschcowitz or Halban operations or plicating the uterosacral (USL) ligaments like the McCall procedure.[1,2] We are going to report a case of colossal enterocele repair without removing hernial sac or opening the peritoneal cavity. Informed consent was taken from the patient. The aim of the illustration is to provide anatomic insight and surgical steps for a successful repair.

## CASE REPORT

A 48-years-age Para 5 previous all normal vaginal deliveries, menopausal for 7 years presented in outpatient department of Urogynaecology, Shalamar Hospital, Lahore. She had bothersome symptoms of something coming out of vagina for the last 12 years with the need of digitation for a year during defecation. Her physical and sexual quality of life has been affected.

On examination, there was Stage IV U-V prolapse and huge enterocele with 3x3 cm decubitus ulcer on posterior wall (Figure 1). Vaginal hysterectomy with enterocele repair was planned. Written informed consent was taken from patient and pre-anaesthesia evaluation done.

### Surgical Steps:

Preoperatively bowel preparation was done and antibiotic prophylaxis were administered at induction of anaesthesia. The patient received general anaesthesia and was placed in the lithotomy position.

1. Initially vaginal hysterectomy was performed in a conservative fashion (Figure 2a).

**Address for Correspondence:** Ayesha Shahid, Clinic of Urogynecology, Shalamar Hospital, Punjab, Pakistan
**E-mail:** ayeshashahidred@gmail.com **ORCID ID:** orcid.org/0000-0002-7973-0991
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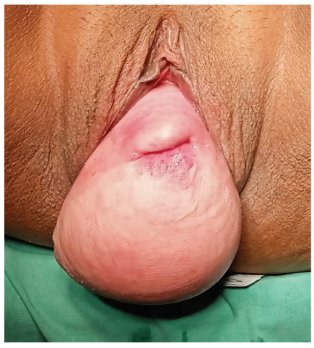

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**Figure 1.** Stage IV U-V prolapse with huge enterocele

2. Following vaginal hysterectomy, vertical midline incision was given on posterior vaginal to gain access to the rectovaginal space (Figure 2b).

3. Vaginal wall along with rectovaginal fascia dissected in craniocaudal fashion away from underlying enterocele till sac neck was identified. Care was taken to establish a proper plane using metzenbaum scissors as well as blunt dissection using a moist gauze (Figure 2c).

4. The enterocele was isolated without opening parietal peritoneum.

5. Redundant vaginal tissue was trimmed vertically keeping in mind to avoid shortening vaginal length (Figure 2d).

6. Enterocele was reduced and plication done of rectovaginal fascia with USL ligaments identified bilaterally (Figure 2e).

7. Absorbable sutures were tightened to reapproximate apexes of anterior and posterior endopelvic fascia.

8. Vaginal wall closed with absorbable polyglactin vicryl 2/0 (Figure 2f).

## RESULTS

The surgery was completed in 100 minutes and blood loss was approximately 200 mL. No surgical complication was detected. Final evaluation exhibited good pelvic support along with well-preserved vaginal length of approximately 8 cm. Patient was discharged and on follow-up of 1 month, she was asymptomatic and no recurrence was observed.

## DISCUSSION

Different surgical options are present for enterocele repair through vaginal or abdominal route. They either comprises of using mesh, USL plication, or removing hernial sac. Transvaginal USL ligament suspension along with endopelvic fascia is a well-documented technique as described by Cardozo et al.[1] Our modified technique excludes opening of peritoneal cavity and removing hernial sac to lessen risks of damage to abdominal contents. More enterocele repair cases need to be reported to foster educational material and literature review.

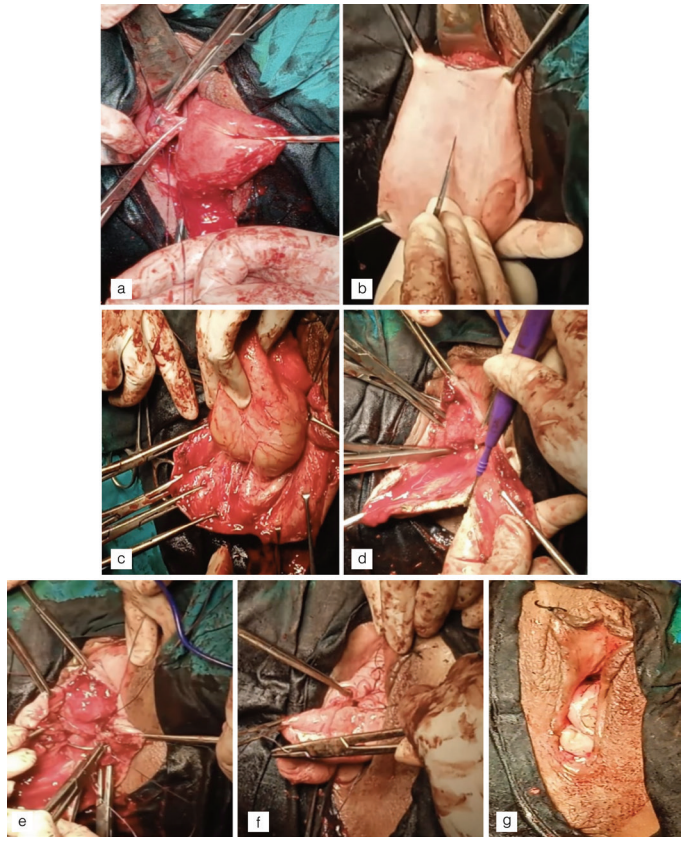


**Figure 2.** a: Vaginal hysterectomy, b: Vertical midline incision given on posterior vaginal wall, c: Enterocele was cleaved off the rectovaginal fascia, d: Redundant vaginal tissue trimmed, e: USL plication, f: Closure of posterior vaginal wall, g: post-operative picture

*USL: Uterosacral*

## CONCLUSION

This surgical illustration represents a significant tool for learning and important steps for modified procedure for a colossal enterocele repair. Good understanding of anatomy and proper surgical technique is necessary to obtain surgical success with less complications.

## ETHICS

**Informed Consent:** Informed consent was taken from the patient.

## FOOTNOTES

### Contributions

Surgical and Medical Practices: N.H., Concept: A.S., Design: A.S., Data Collection or Processing: A.S., S.Y., Analysis or Interpretation: A.S., N.H., Literature Search: S.Y., Writing: A.S., N.H.

## 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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# Intraoperative evaluation of the effectiveness of sling positioning

Sandip MAITI[1], Diana Lidia Leija AGUILAR[1], Francisco Javier Castro APODACA[2]

[1]Center for Advanced Pelvic Medicine, Doctors Hospital Auna, University of Monterey, Nuevo León, Mexico
[2]Department of Gynecological Urology, Autonomous University of Sinaloa, Culiacan, Sinaloa Faculty of Nutrition and Gastronomy Science, Sinaloa, Mexico; Civil Hospital of Guadalajara, Autonomous University of Guadalajara, Guadalajara, Jalisco, Mexico

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## ABSTRACT

Stress urinary incontinence is a common condition in women, and the prevalence increases as age increases. Since the introduction of suburethral tapes, they have become the surgical treatment of choice, with success rates of up to 97%. Despite this, up to 20% may have failures or complications. A determining factor is the position of the tape to avoid these complications, which is why intraoperative ultrasound is essential, resulting in an effective tool to improve postoperative results in the placement of suburethral tapes, so its systematic use must be standardized to minimize complications and avoid subsequent reoperations.

**Keywords:** Stress urinary incontinence; suburethral sling; diaphragm; intraoperative ultrasound

## INTRODUCTION

Urinary incontinence is a common condition in women, with stress urinary incontinence predominating, which can negatively impact different aspects of the lives of people who suffer from it.[1] The prevalence of urinary incontinence increases with age, with a prevalence rate of 20 to 30% in young adults, with a peak around middle age with a prevalence of 30 to 40%, and a steady increase in old age of 30 to 50%.[2] Complications related to the different types of approach are bladder perforation, bleeding, and bruising, which are usually more common in the retropubic approach.[2,3] Other complications associated with suburethral tapes include emptying dysfunction, tape infection and erosion, and long-term chronic pain, dyspareunia, and *de novo* urge urinary incontinence.[4]

Among the related factors that have been investigated to explain these complications, the position of the tape has received significant attention due to its potential impact on post-surgical outcomes.[5] This is where intraoperative ultrasonographic evaluation in tape placement becomes invaluable in improving short- and long-term postoperative outcomes.[6]

Figure 1 shows a schematic image that represents the position that the tape should maintain with respect to the urethra, the distance to the urethra, the distance to the SP (GAP SLINGPUBIS) and the type of vector and shape.

**Address for Correspondence:** Francisco Javier Castro Apodaca, Department of Gynecological Urology, Autonomous University of Sinaloa, Culiacan, Sinaloa Faculty of Nutrition and Gastronomy Science, Sinaloa, Mexico; Civil Hospital of Guadalajara, Autonomous University of Guadalajara, Guadalajara, Jalisco, Mexico
**E-mail:** francisco.castroapodaca@uas.edu.mx **ORCID ID:** orcid.org/0000-0002-1857-1595
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## CASE REPORT

This is a 57-year-old female patient, who presented stress urinary incontinence of 10 years of evolution. Within her gynecological-obstetric history, 3 pregnancies stand out, which were vaginal deliveries with a product of maximum weight of 3500 kg, questionnaires were applied to evaluate urinary incontinence international incontinence consultation questionnaire with a result of 15 points (severe incontinence), as well as pelvic ultrasound (USG) highlighting urethral hypermobility 3.96 with an open urethrovesical angle 186° rotation of the urethra 79°, urethral hypermobility, Q tip 50°. It was decided to place a suburethral tape, evaluating its intraoperative placement with USG. Prior to the procedure, the patient was placed in a lithotomy position and evaluation of urethral mobility parameters was performed. The procedure is initiated under sensory block to allow the valsalva (V) maneuver to be carried out during the procedure. Suburethral tape (Steema TOT®) was placed with the "8/4" technique, USG of the pelvic floor was performed with Mindray I9 equipment, using a 6 Hz 2D transducer with images of the pelvic floor (Figure 2A, B, Figure 3), corroborating the correct placement of the tape, observing the position of the tape at a distance from the veiscal neck at rest (R) of 1.77 mm and V 1.23 mm with respect to the meatus in R at 0.86 mm and V at 1.1 mm, the distance of the urethra with respect to the tape in R at 0.52 mm and V at 0.35 mm. Correction of urethral hypermobility was observed after tape placement compared to preoperative parameters (urethral hyperlaxity 2.28 with an open urethrovesical angle of 172°, urethral rotation of 51°), hemostasis was verified, leakage was negative by cough test, and the surgical procedure ended without incident. The patient was discharged 3 hours after spontaneous urination. The patient was scheduled 10 days postoperatively, the position of the sling was assessed, and complications such as urethral obstruction and mobility were detected by translabial USG. At the post-30-day appointment, the USG is performed again to evaluate the tape by looking at the sling at a distance from the bladder neck of R of 2.53 mm and V 1.69 mm, with respect to the meatus in R at 1.35 mm and V at 1.29 mm, the distance of the urethra with respect to the urethral tape in R at 0.38 mm and V at 0.23 mm and the distance of the urethra in R at 0.38 mm and the distance of the urethra at R at 0.38 mm and the distance of the urethra at 0.33 mm and the distance of the urethra at R at 0.38 mm and V at 0.23 mm and the distance of the urethra at R at 0.38 mm and the distance of the urethrale band at R at 0.38 mm and the distance of the urethra at R at 0.38 mm and the distance of the urethra at R at 0.38 mm and the distance of the urethra of the urethra of the sling R 1.57 mm and V 1.49 mm. Follow-up was by USG and at 6 months after surgery she is dry without any change in the sling profileometry.

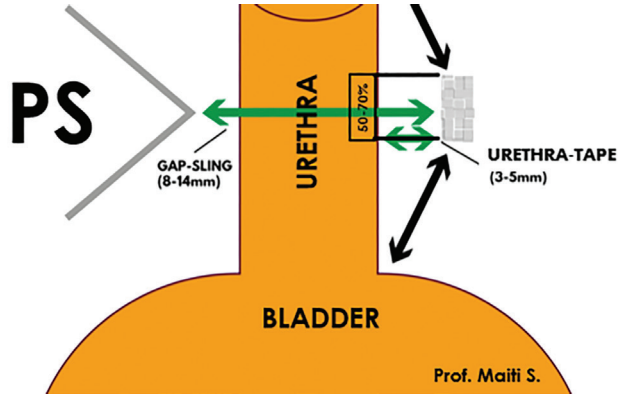


**Figure 1.** Schematic representing the position that the tape should maintain with respect to the urethra

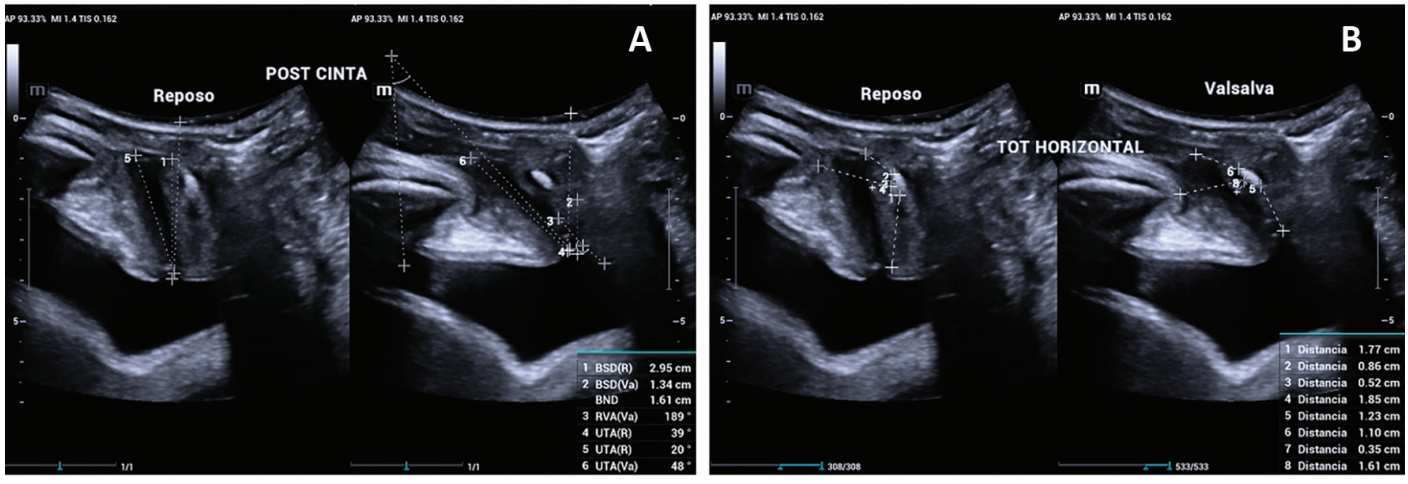


**Figure 2. A)** Transoperative ultrasonographic images of urethral mobility at rest and valsalva, observing immediate improvement in the descent of the bladder neck in Valsalva and improvement in the stability of the pubouretral ligament. **B)** Transoperative ultrasonographic images performed profilometry of the tape, corroborating the distance of the tape within normal parameters and ruling out post-application urethral compression

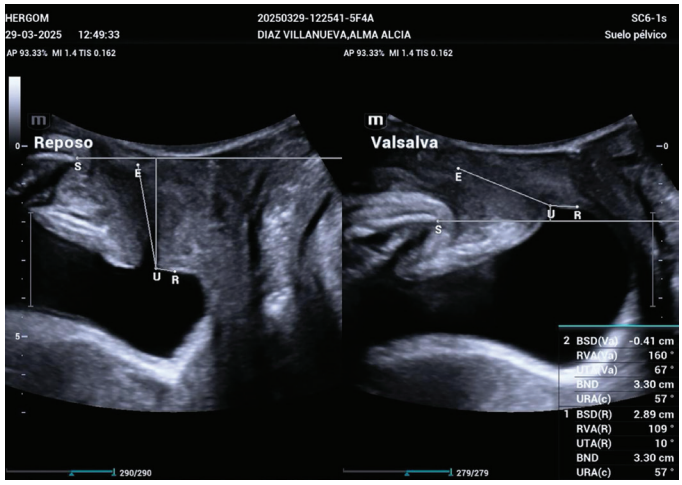


**Figure 3.** Ultrasonographic images of urethral mobility at rest and valsalva prior to surgery

## DISCUSSION

Urinary incontinence is a problem with a high prevalence in women, despite this, few seek care from specialists, due to the mistaken belief that it is a normal part of women's aging.

Since the first description of the Petros-Ulmsten comprehensive theory in 1993, which describes an anatomical defect of the anterior vaginal wall as a cause of stress urinary incontinence and overactive bladder, as well as the use of mid-urethral straps to reinforce the functioning of the puburithral ligaments and levator ani muscles.[7]

Currently, both retropubic and transobturator suburethral tapes have similar rates of long-term efficacy, reaching up to 97% and 85%, respectively.[3] Despite being safe to drive, it is not exempt from complications or failures, which are reported in up to 20% of cases.[5] Complications related to the different types of approach are bladder perforation, bleeding, and hematomas, which are usually more common in the retropubic approach.[2,3]

The primary requirement to avoid lower urinary tract symptoms such as frequency, urgency, nocturia, slow flow, terminal drip emptying and urinary retention, is with a correct placement of the tape, since an incorrect position or displacement of the tape can be the cause of the aforementioned complications, reporting rates ranging from 7.6% to 10%.[4] Other complications associated with suburethral tapes include infection, tape erosion and long-term chronic pain, dyspareunia, and *de novo* urge urinary incontinence.[4] The incidence of urgency urinary incontinence and persistent and *de novo* urgency is reported around 15% and 30%, respectively, after this type of procedure.[7]

Among the factors explaining these complications, the position of the tape has received significant attention due to its potential impact on post-surgical outcomes.[5] This is where intraoperative ultrasonographic evaluation in tape placement acquires great value to improve postoperative results in the short and long-term.[6]

The correct placement of the suburethral tape is essential to optimize results and reduce complications and one way to achieve this is through the transoperative USG assessment of the pelvic floor to visualize the correct positioning of the tape, identify and correct the position if necessary, as well as help identify possible complications early.[6,8,9] However, ultrasonographic evaluation should be standardized and unified for better postoperative outcomes.[6,10]

The recommended intraoperative USG measurements are to measure the urethral length and place the tape in relation to the length of the tape in a percentage between 50% and 60% (+10%); 3 and 5 (+1.5) mm, the recommended sling-urethra distance and the distance between the tape and the pubic symphysis (Gap-sling) is 8 to 14 mm; and the shape of the tape in V should be flat or C-shaped and not V-shaped for this it is recommended to use the pubic symphysis as a reference point, evaluating the placement of the tape in the middle sagittal plane at rest and V.[11,12]

A complete evaluation, including a pelvic USG, preoperative, intraoperative and postoperative testing immediately after the placement of suburethral tapes, are key tools to optimize continence and reduce complications related to lower urinary symptoms as well as bladder emptying dysfunction, as well as avoid subsequent surgical interventions for persistent incontinence, improving the safety and efficiency of the procedure. Therefore, the systematic implementation of intraoperative testing is recommended to optimize functional outcomes in urinary incontinence surgery and improve surgical success.[13]

As mentioned by Illiano et al.,[14] in factors associated with surgical their study, which aimed to evaluate dynamic translabial USG to know the failure, in which, they reported that the participants who presented incontinence after the placement of the mesouretral sling, it was due to the fact that it was located at the proximate or distal level of the urethra, which caused a discordant mobility with asymmetry in the arm and funnel of the bladder neck, concluding that an inadequate position of the sling due to errors in the technique is a cause of failure in anticontinence surgery ($p$=0.0001). Although Illiano et al.,[14] did not perform intraoperative translabial USG as in this case report, they emphasize the importance of proper placement of the mesouretral sling to avoid new-onset urinary incontinence, therefore, this case report is aimed at avoiding these errors when performing the assessment of the mesouretral sling at the

surgery moneto allowing the correct position to be evaluated more objectively.

Tan et al.,[15] conducted research with 100 patients to evaluate the association between translabial USG features in 4D-TLUS of the retropubic mesourethral sling and pelvic floor symptoms, reporting an 89% patient-reported success rate after surgery, 2% had mesh exposure, while the rest had pain symptoms; they observed a sifnificative association between surgical success and a gap of the urethral sphincter when performing the V maneuver of 10-12mm ($p$=0.001); highlighting that a gap narrower or closer to 10 mm is associated with voiding symptoms ($p$=0.036).[15] With respect to the present clinical case in which translabial USG is performed transoperatively, this allows us to perform a measurement during the procedure between the pubic symphysis, the tape and the angle between the pubis and the tape in reporso and with the V maneuver, this does not allow us to achieve a success in the treatment of retropubic pain syndrome. By placing the appointments under direct visualization we can maintain the separation between the pubis and the tape.

## CONCLUSION

Intraoperative USG for real-time mesourethral tape placement (TOT or TVT) represents a valuable tool that could optimize clinical outcomes. This is not currently a standardized or widely used procedure. Its use ensures a more precise placement of the tape, highlighting its importance, since placing it in an incorrect position could lead to complications such as urethral obstruction, bladder perforation, voiding dysfunction or persistence/recurrence of incontinence.[15]

In the same way, the intraoperative use of USG allows confirming the adequate tension of the tape, it also facilitates clinical follow-up, by allowing the objective evaluation of the position and dynamic behavior of the tape over time;[14] the systematic incorporation of USG in these procedures is not only desirable, but should be part of standardized surgical protocols.

The systematic use of intraoperative USG for the correct placement of mesourethral tape would contribute to homogenizing surgical techniques and clinical results between the different centers, reducing operative variability. Therefore, standardizing the use of pelvic USG during mesourethral tape placement not only has the potential to improve surgical outcomes and reduce complications, but also represents a step toward safer, more accurate, and evidence-based surgery.

## ETHICS

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

## FOOTNOTES

### Contributions

Surgical and Medical Practices: S.M., D.L.L.A., Concept: S.M., D.L.L.A., F.J.C.A., Design: S.M., D.L.L.A., F.J.C.A., Data Collection or Processing: S.M., D.L.L.A., Analysis or Interpretation: S.M., D.L.L.A., F.J.C.A., Literature Search: S.M., D.L.L.A., F.J.C.A., Writing: S.M., D.L.L.A., F.J.C.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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