ORIGINAL ARTICLE

1. National University of Asunción – Hospital de Clínicas - Chair and Department of Gynecology and Obstetrics. San Lorenzo, Paraguay.
2. Obstetrician-gynecologist, Specialist in obstetric and gynecological ultrasound ORCID: https://orcid.org/0009-0004-9412-0130
3. Obstetrician-gynecologist, Specialist in obstetric and gynecological ultrasound, Master's Degree in Perinatal Medicine ORCID: https://orcid.org/0000-0003-0146-2947

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Correspondence:
Dr. Figueredo Romero, Igor Arturo
✉ igorfigueredo010@gmail.com

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Transperineal ultrasound findings in patients with stress urinary incontinence in the Department of Gynecology and Obstetrics of a public hospital in 2024

Hallazgos ecográficos transperineales en pacientes con incontinencia urinaria de esfuerzo en el Servicio de Ginecología y Obstetricia de un hospital público en el año 2024.

Figueredo Romero, Igor Arturo[1*,a], Ruoti Cosp, Miguel Antonio[1,b]

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ABSTRACT

Introduction: Stress urinary incontinence is common. Diagnostic aids are needed to provide objective data to optimize therapeutic strategies. Transperineal ultrasound can be used to evaluate patients with stress urinary incontinence. Objectives: To describe the transperineal ultrasound findings using measurement of urethral neck descent (BND), posterior urethrovesical angle (β angle) at rest and with de Valsalva maneuver, and the presence of bladder neck funneling in patients reporting stress urinary incontinence. Methodology: A descriptive, prospective, cross-sectional study. Transperineal ultrasound measurements were made of bladder neck descent (BND), posterior urethrovesical angle (β angle), and the presence of bladder neck funneling in patients reporting stress urinary incontinence. Results: A total of 52 patients were included. The mean bladder neck descent (BND) was 10.19 ± 5.2 mm. The mean resting posterior urethrovesical angle (β angle) was 129.27 ± 41.46°. The mean Valsalva posterior urethrovesical angle (β angle) was 129.67 ± 38.01°. Bladder neck funneling was present in fourteen (14) of the 52 patients. Conclusion: Transperineal ultrasound provides objective data for the evaluation of patients with stress urinary incontinence. Further studies with an analytical design are needed to evaluate transperineal ultrasound in the evaluation of stress urinary incontinence.
Key words: Stress urinary incontinence, ultrasound, pelvic floor.

RESUMEN

Introducción: La incontinencia de orina de esfuerzo es frecuente. Se precisan de métodos auxiliares diagnósticos que aporten datos objetivos para optimizar la estrategia terapéutica. Por medio de la ecografía transperineal es posible la evaluación de las pacientes con incontinencia urinaria de esfuerzo. Objetivos: Describir los hallazgos ecográficos transperineales mediante la medición del descenso del cuello de la uretra (BND), la medición del ángulo uretrovesical posterior (ángulo β) en reposo y con maniobra de valsalva y la presencia de embudización del cuello vesical en pacientes que refirieren incontinencia urinaria de esfuerzo. Metodología: estudio descriptivo, prospectivo, transversal. Mediante estudio ecográfico transperineal se realizaron las mediciones de: descenso del cuello vesical (BND), ángulo uretro-vesical posterior (ángulo β) y presencia de embudización del cuello vesical en pacientes que refirieron incontinencia urinaria de esfuerzo. Resultados: un total de 52 pacientes fueron incluidas. El valor promedio del descenso del cuello vesical (BND) fue de 10,19 ± 5,2 mm. El valor promedio del ángulo uretrovesical posterior (ángulo β) en reposo fue de 129,27 ± 41,46º. El valor promedio del ángulo uretrovesical posterior (ángulo β) en valsalva fue de 129,67 ± 38,01°. La embudización del cuello vesical estuvo presente en catorce (14) de las 52 pacientes. Conclusión: el estudio ecográfico transperineal brinda datos objetivos en la evaluación de las pacientes con incontinencia urinaria de esfuerzo. Realizar próximos estudios con un diseño analítico son necesarios para incluir la ecografía transperineal en la evaluación de la incontinencia urinaria de esfuerzo.
Palabras clave: Incontinencia urinaria de esfuerzo, ecografía, diafragma pélvico.

Introduction

Stress urinary incontinence, as defined by the International Continence Society, constitutes both a symptom and a clinical sign. As a symptom, it refers to the patient's report of involuntary urine leakage. As a sign, it denotes the objective observation of such leakage—whether through the urethra or another anatomical site—during physical examination[1].

Although it is a common condition, one of the primary reasons individuals refrain from seeking medical care is the sense of embarrassment associated with it[2]. Stress urinary incontinence significantly interferes with patients' social functioning[3]. In the United States, the prevalence of pelvic floor disorders is estimated at 25.0%, with urinary incontinence representing the most frequent condition, exhibiting a combined prevalence of 17.1%[4]. In Chile, a national study assessing the prevalence of urinary incontinence among older adults reported a prevalence of 12.1%[5].

The diagnosis of urinary incontinence is predominantly clinical. The initial evaluation of the patient includes medical history, urinalysis, physical examination, demonstration of urine leakage with exertion, evaluation of urethral mobility, and measurement of post-void residual urine[6]. Some patients have few or no symptoms, which leads to the use of urodynamic studies[7], but due to their high cost in our setting, therapeutic management is delayed. Since ultrasound is a non-invasive, harmless, and low-cost method, there are several ultrasound approaches for assessing the pelvic floor: transperineal ultrasound, also called translabial or perineal ultrasound; transvaginal ultrasound; and endoanal ultrasound[8]. Taking advantage of ultrasound's ability to perform a dynamic, real-time study, urethral hypermobility associated with urinary incontinence can be assessed by studying distances and angles[9] Transperineal ultrasound is valuable in the diagnosis of stress urinary incontinence and has the potential to become a routine examination method to aid clinical decision-making[10]. In the literature, transperineal ultrasound is increasingly used as a method to assess urethral mobility and pelvic floor contraction, but it has not been standardized[11]. The most commonly used measures to assess urethral mobility are bladder neck descent (BND), which has been shown to be extremely reliable[11]. Another measure is the posterior urethrovesical angle (angle β; formed between a line tangent to the proximal half of the urethra and a line tangent to the lower posterior aspect of the bladder base), which together with BND are the parameters frequently used[12]. It is also known that among the therapeutic options for stress urinary incontinence is surgical treatment which, although it is usually the first line of treatment in our setting, is not without risks, such as recurrence. In cases of SUI recurrence after surgery, transperineal ultrasound can guide and predict treatment[13].

However, based on what has been described in the literature, and despite the fact that bladder neck-symphysis descent is the most studied distance, the BND parameter, per se, is a poor predictor of stress urinary incontinence, since it is difficult to establish a defined cutoff point for the diagnosis of stress urinary incontinence[14], which means that there is a continuing need for further research into this modality as applied to stress urinary incontinence.

The objective of this study was to describe the transperineal ultrasound findings in patients who reported stress urinary incontinence during routine gynecological ultrasound or for another indication in the period from July 2024 to January 2025. The aim was to provide an information base for further inferential research using data from our population.

Methodology

Design, study site, inclusion criteria:

This prospective observational study was conducted in the Department of Gynecology and Obstetrics at the Hospital de Clínicas in San Lorenzo, Paraguay, between July 2024 and January 2025.

The inclusion criteria comprised women who initially presented for a routine transvaginal ultrasound or for another reason and who reported experiencing stress urinary incontinence during a brief interview.

Exclusion criteria included pregnant women and those with a history of surgical procedures for the treatment of urinary incontinence, pelvic organ prolapse, or abdominal or vaginal hysterectomy.

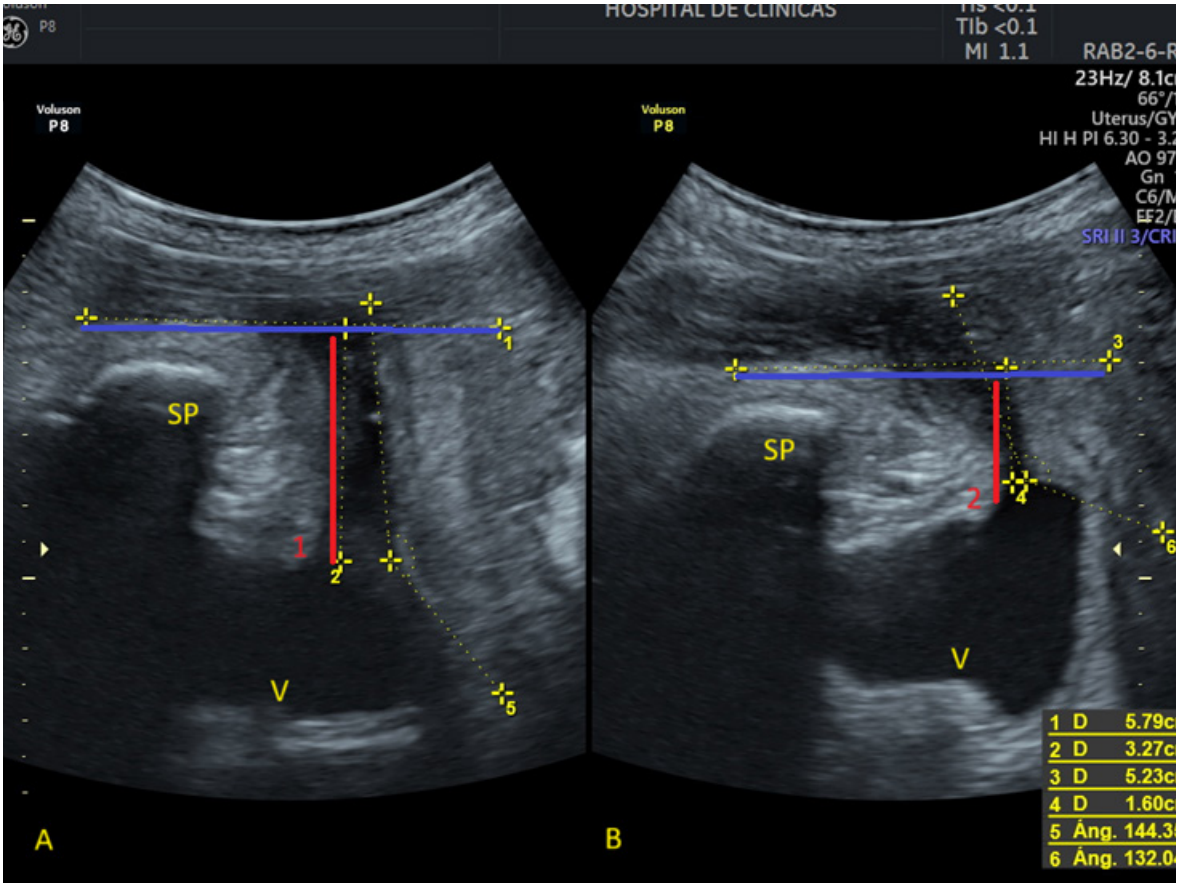
This study was approved by the Research Ethics Committee of the hospital where it was conducted, under file number UNA_FCM_DI No. 421/2025. All women provided written consent for the use of their data for research purposes, and the autonomy of each participant was respected by protecting their identity.

Procedures, instruments, and variables

Ultrasound evaluations were performed using GE Voluson P8 or GE Logiq P5 ultrasound equipment, both equipped with a 2-6 MHz multifrequency convex probe. No specific preparation was required, except for partial filling of the urinary bladder to approximately 150 ml, estimated by transabdominal ultrasound. Transperineal ultrasound was performed in the lithotomy position. The 2-6 MHz probe, covered with a sterile glove, was placed in the interlabial region of the vulva in a sagittal orientation after applying gel, using the lower edge of the pubic symphysis as a reference point to obtain views of the pubic symphysis, bladder, and urethra. The image orientation and screen display were standardized so that the transducer appears at the top, the left side represents the ventral side of the patient, and the top represents the caudal side. When the lower edge of the pubic symphysis, bladder, urethrovesical junction, and urethra at rest were visualized, the image was frozen and placed on one side of the screen. The participant was asked to perform a Valsalva maneuver, and again, the image was frozen and placed on the other half of the screen.

The variables studied corresponded to measurements of bladder neck descent (BND), the β angle at rest and during Valsalva, and the presence of bladder neck funneling using transperineal ultrasound. Bladder neck descent (Fig. 1) in the present study was considered to be the difference between the vertical distance from the bladder neck to the arbitrary horizontal line passing through

Figure 1. Transperineal ultrasound for evaluating bladder neck descent. In A, the distance measured (red line "1") from the arbitrary line (blue line) passing through the lower edge of the pubic symphysis (PS) at rest. In B, the same distance measured (red line "2") with the Valsalva maneuver. The difference between 1 and 2 corresponds to bladder neck descent (BND). B: bladder. Figueredo, I. (2024)



the posteroinferior margin of the pubic symphysis during rest and during Valsalva[14]. The β angle (Fig. 2) was considered to be the angle where one side is formed by the urethral axis and the other side by at least one-third of the bladder base near the bladder neck[12]. Bladder neck funneling was considered to be present when an opening of the proximal urethra was detected, visible as two sharp lines representing the internal boundaries of the urethral wall[12].

Using Epi Info™ software version 7.2.4.0, the variables were expressed in frequencies and percentages, and the mean and standard deviation were calculated.

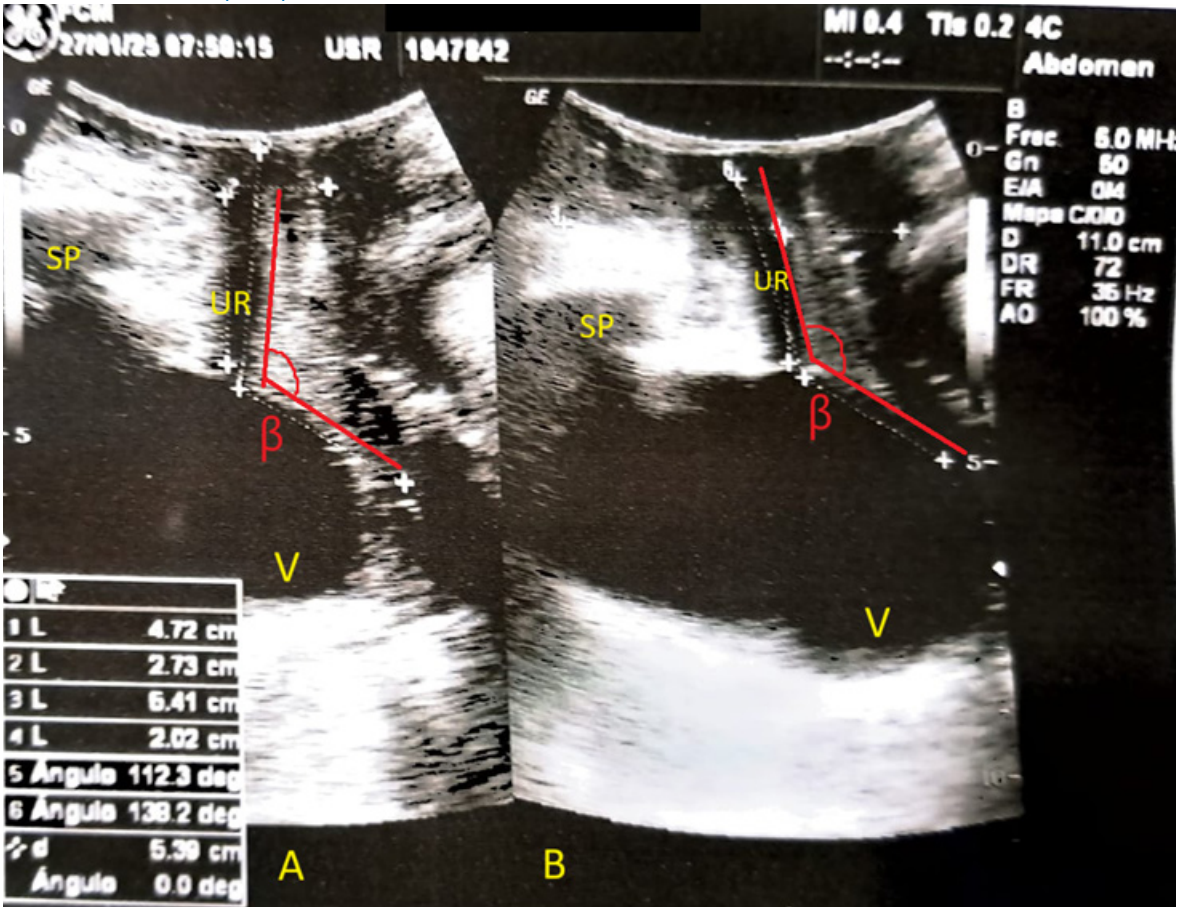
Results

During the study period, a total of 52 patients were evaluated, with an average age of 50.73 ± 10.89 years. Forty-two patients (80.76%) had a history of previous vaginal deliveries, of which only 19 patients had a history of only one or more vaginal deliveries. The average number of previous vaginal deliveries was 2.05 ± 2.02. The average number of previous cesarean sections was 0.71 ± 0.99. The average value of bladder neck descent (BND) was 10.19 ± 5.2 mm. The average value of the posterior urethrovesical angle (angle β) at rest was 129.27 ± 41.46°. The average value of the posterior urethrovesical angle (angle β) during Valsalva maneuver was 129.67 ± 38.01°. Bladder neck funneling was present in 14 (fourteen) of 52 patients.

Discussion

In this study, transperineal ultrasound findings were documented for all patients who reported stress urinary incontinence during a routine gynecological ultrasound examination or another clinical evaluation. This represents the first use of the transperineal approach for the assessment of stress urinary incontinence in our department.

Figure 2. Transperineal ultrasound for evaluating the β angle. In A, the β angle is shown in red lines. One of the sides corresponds to the axis of the urethra and the other side to at least one-third of the base of the bladder near the bladder neck. UR: Urethra, V: Bladder. Figueredo, I. (2024)



The diagnosis of stress urinary incontinence is clinical in nature. Through physical examination, supported by specific maneuvers, it is possible to objectively verify urine leakage induced by exertion. However, a physical examination cannot be successfully performed in all cases. Some patients may present with multiple overlapping symptoms, as well as inconclusive or ambiguous physical examination findings[15,17].

The pelvic floor, the anatomical region in which the organs involved in stress urinary incontinence are located, can be assessed using ultrasound. Ultrasound is an accessible and relatively low-cost modality that provides a significant advantage in the evaluation of pelvic floor disorders, as it allows dynamic and nearly real-time imaging[17]. The transperineal ultrasound approach is the most widely utilized and has been employed for at least two decades[16]; however, it is not commonly used in our clinical setting.

A study by Kesharvaz et al.[18] published a bladder neck descent (BND) value of 10.89 ± 5.5 mm, while in other publications, the BND value obtained by Turkoglu et al. [19] was 16.6 ± 4.22 mm. Meanwhile, Xiao et al. [20] obtained a BND value of 28.66 ± 9.57 mm. The BND value obtained in this study was 10.19 ± 5.2 mm.

Regarding the posterior urethrovesical angle (angle β), the average values reported by Turkoglu et al. [19] were 119.76 ± 7.54° and 139.62 ± 9.1° at rest and during the Valsalva maneuver, respectively. Keshavarz et al.[18] published average values for angle β during rest and Valsalva maneuver of 120.17 ± 25.16° and 144.22 ± 19.63°, respectively. Another study published by Al-Saadi et al.[21] obtained average β angle values of 107.53° and 123.87° at rest and during the Valsalva maneuver, respectively. The β angle value during the Valsalva maneuver in the latter study was similar to that obtained in the present study of 129.67 ± 38.01°.

Regarding funneling of the bladder neck, in two studies that recorded the presence of this sign, the group of Keshavarz et al.[18] reported its presence in 10 of a total of 44 patients, and Shear et al.[12] published the visualization of funneling of the bladder neck in 4 of 60 patients, which is similar to what was observed in this review in terms of the presence of funneling of the bladder neck in 14 (n=52) of the total number of patients studied.

The differences in measurements found in the literature could result from a combination of factors such as the ultrasound technique used, the ultrasound equipment used, and the effectiveness of the Valsalva maneuver performed by the patient[22]

Among the limitations of this study is its fully descriptive design, which lacks a control group and therefore precludes the possibility of performing analytical statistical assessments. Another limitation is the sample size. Nonetheless, the study's strengths include its prospective design and the fact that all ultrasound measurements were obtained by a single operator.

In conclusion, transperineal ultrasound is feasible in our setting and yields objective, quantifiable data regarding the organs involved in stress urinary incontinence in our patient population. Continued research on this ultrasound modality —particularly through analytical study designs with larger sample sizes— may enhance auxiliary diagnostic methods and thereby facilitate more timely relief for patients affected by stress urinary incontinence.

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References

1. Haylen BT, de Ridder D, Freeman RM, Swift SE, Berghmans B, Lee J, et al. An International Urogynecological Association (IUGA)/ International Continence Society (ICS) joint report on the terminology for female pelvic floor dysfunction. Int Urogynecol J. 2010;21(1):5–26. http://dx.doi.org/10.1007/s00192-009-0976-9

2. Perera J, Kirthinanda DS, Wijeratne S, Wickramarachchi TK, Descriptive cross-sectional study on prevalence, perceptions, predisposing factors and health seeking behaviour of women with stress urinary incontinence. BMC Women's Health 2014; 14(1), 78. https://doi.org/10.1186/1472-6874-14-78

3. Iwanowicz-Palus GJ, Stadnicka G, Włoszczak-Szubzda A. Medical and psychosocial factors conditioning development of stress urinary incontinence (SUI). Annals of Agricultural and Environmental Medicine: AAEM [Internet] 2013 20(1), 135–139. [consultado 15 de diciembre de 2024] Recuperado a partir: https://www.aaem.pl/Medical-and-psychosocial-factors-conditioning-development-of-stress-urinary-incontinence,71903,0,2.html

4. Wu JM, Vaughan CP, Goode PS, Redden DT, Burgio KL, Richter HE, et al. Prevalence and trends of symptomatic pelvic floor disorders in U.S. women. Obstet Gynecol. 2014;123(1) http://dx.doi.org/10.1097/AOG.0000000000000057

5. Fagerström-Sade C.K., López-González M.A. Prevalencia de Incontinencia urinaria en personas mayores chilenas y su impacto en la calidad de vida: Encuesta Nacional. Rev. chil. obstet. ginecol. 2020 Abr [citado 2025 Ene 17]; 85(2): 123-131. http://dx.doi.org/10.4067/S0717-75262020000200123

6. Committee on Practice Bulletins-Gynecology and the American Urogynecologic Society. ACOG practice bulletin no. 155: Urinary incontinence in women. Obstet Gynecol. 2015;126(5): e66–81http://dx.doi.org/10.1097/AOG.0000000000001148

7. Winters JC, Dmochowski RR, Goldman HB, Herndon CD, Kobashi KC, Kraus SR, Lemack GE, Nitti VW, Rovner ES, Wein AJ; American Urological Association; Society of Urodynamics, Female Pelvic Medicine & Urogenital Reconstruction. Urodynamic studies in adults: AUA/SUFU guideline. J Urol. 2012 Dec;188(6 Suppl):2464-72. htts://doi: 10.1016/j.juro.2012.09.081.

8. Santoro GA, Wieczorek AP, Dietz HP, Mellgren A, Sultan AH, Shobeiri SA, et al. State of the art: an integrated approach to pelvic floor ultrasonography. Ultrasound in Obstetrics & Gynecology 2011; 37(4), 381–396. https://doi.org/10.1002/uog.8816

9. Li YQ, Geng J, Tan C, Tang J, Yang X. Diagnosis and classification of female stress urinary incontinence by transperineal two-dimensional ultrasound. Technol Health Care. 2017 Oct 23;25(5):859-866. https://doi: 10.3233/THC-160786

10. Chen Y, Peng L, Liu M, Shen H, Luo D. Diagnostic value of transperineal ultrasound in patients with stress urinary incontinence (SUI): a systematic review and meta-analysis. World J Urol. 2023 Mar;41(3):687-693. htts://doi: 10.1007/s00345-022-04264-0

11. Jamard E, Blouet M, Thubert T, Rejano-Campo M, Fauvet R, Pizzoferrato AC. Utility of 2D-ultrasound in pelvic floor muscle contraction and bladder neck mobility assessment in women with urinary incontinence. J Gynecol Obstet Hum Reprod. 2020 Jan;49(1):101629. Htts://doi: 10.1016/j.jogoh.2019.101629.

12. Schaer G, Koechli O, Schuessler B, Haller U. Perineal ultrasound for evaluating the bladder neck in urinary stress incontinence. Obstetrics & Gynecology 1995, 85(2), 220–224. https://doi.org/10.1016/0029-7844(94)00369-O

13. Pizzoferrato AC, Fauconnier A, Bader G. Intérêt de la mesure échographique de la mobilité cervico-urétrale en cas d'incontinence urinaire d'effort féminine [Value of ultrasonographic measurement of bladder neck mobility in the management of female stress urinary incontinence]. Gynecol Obstet Fertil. 2011 Jan;39(1):42-8. French. doi: 10.1016/j.gyobfe.2010.09.019

14. Sainz JA, García JA, Borrero C. Ecografía transperineal del piso pélvico [Internet]. Sainz JA, García JA, editors. Tres Cantos. 28760 Madrid: YOU & US; 2021. [consultado 17 de enero de 2025] Avai https://campuspierrefabre.com/courses/manual-de-suelo-pelvico/#tab-course-section_overview

15. Holroyd-Leduc JM, Tannenbaum C, Thorpe KE, Straus SE. What type of urinary incontinence does this woman have? JAMA. 2008;299(12):1446–56. http://dx.doi.org/10.1001/jama.299.12.1446

16. Vellucci F, Regini C, Barbanti C, Luisi S. Pelvic floor evaluation with transperineal ultrasound: a new approach. Minerva Ginecol. 2018 Feb;70(1):58-68. Htts://doi: 10.23736/S0026-4784.17.04121-1.

17. Dietz HP. Pelvic Floor Ultrasound: A Review. Clin Obstet Gynecol. 2017 Mar;60(1):58-81. htts://doi: 10.1097/GRF.0000000000000264.

18. Keshavarz E, Pouya EK, Rahimi M, Bozorgan TJ, Saleh M, Tourzani ZM, et al. Prediction of Stress Urinary Incontinence Using the Retrovesical (β) Angle in Transperineal Ultrasound. Journal of Ultrasound in Medicine 2021; 40(8), 1485–1493. https://doi.org/10.1002/jum.15526

19. Turkoglu A, Coskun AD, Arinkan SA, Vural F. The role of transperineal ultrasound in the evaluation of stress urinary incontinence cases. International Braz j Urol 2022; 48(1), 70–77. https://doi.org/10.1590/s1677-5538.ibju.2020.1100

20. Xiao T, Xiao T, Chen Y, Gan Y, Xu J, Huang W, et al. Can Stress Urinary Incontinence Be Predicted by Ultrasound? American Journal of Roentgenology 2019; 213(5), 1163–1169. https://doi.org/10.2214/AJR.18.20893

21. Al-Saadi WI. Transperineal ultrasonography in stress urinary incontinence: The significance of urethral rotation angles. Arab J Urol. 2016 Mar;14(1):66-71. htts://doi: 10.1016/j.aju.2015.11.003.

22. Dietz HP. Ultrasound imaging of the pelvic floor. Part I: two-dimensional aspects. Ultrasound Obstet Gynecol. 2004 Jan;23(1):80-92. htts://doi: 10.1002/uog.939.