ISSN Print: 2664-8393
ISSN Online: 2664-8407
Impact Factor: RJIF 5.44
IJGS 2020; 2(1): 01-04
www.gynaecologyjournal.net
Received: 04-01-2020
Accepted: 09-02-2020

Patrícia Alves
Department of Gynecology and Obstetrics, Trás-os-Montes and Alto Douro Hospital Center, Vila Real, Portugal

Inês Sá
Department of Gynecology and Obstetrics, Trás-os-Montes and Alto Douro Hospital Center, Vila Real, Portugal

Yida Fan
Department of Gynecology and Obstetrics, Trás-os-Montes and Alto Douro Hospital Center, Vila Real, Portugal

Osvaldo Moutinho
Department of Gynecology and Obstetrics, Trás-os-Montes and Alto Douro Hospital Center, Trás-os-Montes and Alto Douro University, Vila Real, Portugal

Corresponding Author:
Patrícia Alves
Department of Gynecology and Obstetrics, Trás-os-Montes and Alto Douro Hospital Center, Vila Real, Portugal

Comparison between pelvic floor ultrasound and physical examination in the evaluation of cystocele

Patrícia Alves, Inês Sá, Yida Fan and Osvaldo Moutinho

Abstract
The main aim of this study was to explore the agreement between physical examination and ultrasound findings in the assessment of cystocele.
It was a prospective observational study of women with primary cystocele. It enrolled 54 patients who underwent an interview, physical examination and 2D/3D transperineal ultrasound. The study included two observers: one who conducted the interview and carried out the examination, and another who performed the transperineal ultrasound.
There was a concordance of 51.8% between examination and ultrasound concerning cystocele grading. In paravaginal defects, the concordance was 46.3%. In 42.6% of the patients, the ultrasound yielded better results for diagnosing paravaginal defect than the physical examination. Ultrasound revealed that levator ani muscle avulsion was present in 60.4% of patients and hiatal ballooning in 69.8%.
In conclusion, the main utility of transperineal ultrasound is the evaluation of levator ani muscle integrity and urogenital hiatus through the axial plane in 3D.

Keywords: Cystocele, pelvic floor, pelvic organ prolapse, ultrasonography

1. Introduction
Cystocele, prolapse of the anterior vaginal wall, is the most frequent form of female pelvic organ prolapse. Pelvic organ prolapse (POP) affects 40-60% of parous women, and 18.7% of women undergo at least one prolapse surgery during their lifetime [1, 2, 3]. The known risks factors for POP are post menopause, pregnancy, vaginal delivery and obesity [1, 3].
Anterior vaginal wall prolapse corresponds most commonly to the descent of the bladder [4]. The main structures involved in the anterior vaginal wall support are the anterior vaginal wall plus the pubocervical fascia, *arcus tendineus* fasciae pelvis, *arcus tendineus* levator ani, endopelvic fascia, and levator ani muscle (LAM) [5]. Depending on the damaged structure, cystoceles can be due to lateral defect, midline defect or both. The lateral paravaginal (PV) defect is due to detachment of endopelvic fascia at *arcus tendineus* fasciae pelvis. The midline defect is caused by failure of insertion of pubocervical fascia at the cervical ring [5, 6]. Another factor that has been related to POP is trauma of the LAM, usually a complication of vaginal delivery [2].
Women with prolapses should only be subjected to surgery when they become symptomatic and affect the patient's quality of life. The surgical correction of cystocele is associated with high recurrence rates, approximately 36% [2, 7]. LAM avulsion, the preoperative prolapse stage, family history of prolapse, and increased urogenital hiatal area are risks factors for prolapse recurrence [7]. It has been debated that a surgical correction more customized to the defect in question may decrease the recurrence rate.
Categorization of cystocele as caused by lateral or midline defect or both has been difficult. Physical examination has been inconsistent in detecting PV defects [1]. Thus, imaging studies have been used as a complementary study in the evaluation of POP, namely magnetic resonance imaging and, more recently, pelvic floor ultrasound [8, 9]. For this purpose, the use of transperineal ultrasound (TUS) for the evaluation of the female pelvic floor has become increasingly important in Urogynecology, especially as the required equipment is widely available; its use is affordable, easily feasible, and capable of dynamic evaluation. The association of volumetric three-dimensional (3D) techniques coupled with two-dimensional (2D) transperineal ultrasound allows visualization of the axial plane and the LAM plane along with the visualization of the midline structure of the pelvic floor [10].

The primary aim of the present study is to explore the agreement between physical examination and ultrasound findings in the assessment of cystocele, by evaluating for cystocele grade and paravaginal defects. By this comparison the authors intended to understand whether TUS adds information to physical examination in order to plan a targeted surgical correction and consequently decrease the recurrence rate of the POP. Additionally, urogenital hiatus area and integrity of LAM were evaluated by TUS.

2. Materials and Methods

The present study was a prospective observational study of women with primary cystocele, that is, only women not previously intervened by cystocele were included. Ethics approval was obtained from the Ethics Committee of our hospital. We enrolled 54 patients who were referred to Urogynecology Consultation and agreed with inclusion in our study. All of them underwent a structured interview, a physical examination and a two and three-dimensional pelvic floor ultrasound.

The study included two observers: one conducted the interview and carried out the physical examination, and another performed the TUS. Both authors were blind to each other's results. The interview consisted in questions on obstetric history, including number of pregnancies, births and weight of the heaviest child at birth, age at menopause (if appropriate), duration of symptoms of POP and a body mass index (BMI) assessment. The physical examination was performed at rest and at maximal Valsalva maneuver in lithotomy position. The cystocele was graded using the Baden-Walker classification. In order to detect the PV defect, the anterior compartment was examined with forceps applied to the vaginal wall so that each tip of the forceps was held against the ischial spines in an attempt to imitate the PV support from the *arcus tendineus*. The patient was asked to perform maximal Valsalva, and if the prolapse did not appear, it was identified as a PV defect. Depending on the side, it can appear on the right, left or bilaterally. If prolapse is still observed, the cystocele is categorized as midline defect. Additionally, loss of central vaginal rugal folds was considered as being part a midline defect. This technique was described by Richardson in 1976 and modified by Shull in 1993 [1, 11].

A two and three-dimensional pelvic floor ultrasound was performed in all the patients, by introital approach, using a vaginal probe of Voluson 730 Expert (GE Kretz Medical Ultrasound, Zipf, Austria), with a 90º acquisition angle. The ultrasonography was performed with the patient in supine position with both hips in flexion and slight abduction. In the two-dimensional mid-sagittal plane, the degree of cystocele was determined at maximal Valsalva maneuver. It was classified as absent, slight (grade 1 or 2) and moderate/large (grade 3 or 4) cystocele according to the descent of the bladder/anterior vaginal wall in relation to the symphysis pubis. A cut-off of 10 mm below symphysis pubis was used for the definition of moderate/large cystocele [12]. Ultrasound volume datasets (3D) at rest, maximal Valsalva and maximal pelvic floor muscle contraction were acquired. The PV insertions from the anterior compartment, urogenital hiatus area and integrity of LAM were evaluated. The PV defect was detected when the H-shaped appearance of the vagina was distorted in the axial view (bilateral, right or left PV defect) (figure 1) [1]. The urogenital hiatus was measured in the plane of minimal hiatal dimensions, which is defined as the shortest distance between symphysis pubis and the anterior border of LAM, just posterior to the anorectal muscle (figure 2). When the acquired area was equal or superior to 25 cm^2, it is considered hiatal ballooning.

Descriptive analysis was performed for all the variables. Mean and standard deviation (SD) were calculated for normally distributed variables; median for non-normally distributed variables. Agreement between grade 3 or 4 at examination and moderate/massive cystocele on ultrasound was tested using Cohen's kappa (κ).

Statistical analyses were performed using SPSS® 25 software (IBM Corp. Armonk, New York, USA).

3. Results & Discussion

The mean age of the 54 patients was 64.7 years (range 38-82 years, SD 9.6 years). Median parity was 2 (range 0-10). Evaluating the weight of the heaviest child at birth, the mean was 3725 g (SD 632g). The mean body mass for the patients index was 28.5 Kg/m^2 (SD 4.3 Kg/m^2), with 44.2% being obese. Forty-nine women were in menopause, with an average of 17.9 years (SD 9.4 years) since the age of menopause.

Fourteen patients didn't complain about vaginal bulge. Among those who did complain, the duration of the symptoms was about 2 years (median, range from 4 months to 16 years). Seventeen patients had prolapse in more compartments (apical or posterior) beside the anterior compartment.

Most frequently, cystocele was identified as grade 2 at gynecological examination (n = 21) (Table I). On ultrasound, the moderate/large cystocele was the most common finding (n = 24). There was a concordance of 51.8% between physical examination and ultrasound concerning cystocele grading. But there was a weak agreement between grade 3 or 4 on physical examination and moderate/large cystocele on ultrasound (κ = 0.39).

Midline defect was diagnosed in 42 patients (77.8%) at examination. The Table II shows the distribution of PV defects in both examination and ultrasound. The prevalence of PV defects was 71.2% at clinical examination and 84.6% at ultrasound. It was not possible to evaluate the PV defect on the ultrasound in two cases, due to the large cystocele causing technical difficulties. However, neither of them showed PV defect on physical examination. In PV defects, the concordance between examination and ultrasound was 46.3%. In twenty-three patients (42.6%), the ultrasound was better at diagnosing PV defect than the physical examination. For instance, seven patients did not present PV defect at physical examination. However, a bilateral paravaginal defect was shown on TUS in the same subjects (Table II).

On ultrasound, LAM avulsion was present in 60.4% of patients (32 women): 32.1% were bilateral, 3.8% on the right and 24.5% had a left avulsion. Hiatal ballooning was present in 69.8% of patients (n = 37).

In our study, the agreement between cystocele grade classification and ultrasound was weak. It was the weakest agreement found when compared to previous studies [9, 13, 14]. The recent study of Volløyhaug *et al*. found a moderate agreement between POP-Q (International Continence Society pelvic organ prolapse quantification system) and ultrasound for the anterior compartment, with an 83% proportional agreement [9]. Dietz *et al*. examined 825

women and found 75% of proportional agreement [13]. Broekhuis *et al*. also reported a moderate correlation between ultrasound and POP-Q [14]. The major difference between these studies and ours is that we used Baden-Walker classification instead of POP-Q. The latter is a more complete and complex grading and classification system that requires accurate measurements in a time-consuming process, which is not feasible during the time allocated for each consultation in our department. Nonetheless, it is more easily reproducible and a less subjective than the Baden-Walker classification. We acknowledge that using the latter is a great limitation for the present study.

The prevalence of PV defects has been inconsistently reported in anterior vaginal wall prolapse. There are studies reporting a high prevalence of PV defects in anterior compartment prolapse. Youngblood *et al*. reported that PV defect occurred in more than 75-80% of patients with anterior vaginal wall prolapse; DeLancey found PV defect in more than 89% of cases; and more recently Duraisamy *et al*. reported an 85-90% prevalence [1, 13-15]. However, Barber and Segal *et al*. reported a lower surgical detection of PV defects ranging between 38-48% [11, 15]. Regarding TUS, PV defects are studied in the axial plan using 3D. The absence of the H-shape of the vagina is considered as a "loss of tenting" phenomenon, which is related to PV defects [1]. Despite the high detection rate of PV defects in physical exams and ultrasound, agreement between the two was low in our study. This apparently confirms the findings of Dietz *et al*. who concluded that ultrasound (at the 3 planes: mid sagittal, axial and coronal) did not correlate well with the clinical assessment for PV defects [6]. In our study, TUS was able to add information about loss of tenting in 42.6% of the cases.

LAM and hiatal ballooning are the main etiological and independent risk factors for POP [12, 16]. Both are related with greater surgical recurrence rate, especially in the anterior compartment [9, 12]. Therefore, information about LAM and hiatal ballooning are important for the choice of treatment and counseling about surgical prognosis [9].

According to Dietz *et al*. "the main utility of 3D transperineal ultrasound imaging is the axial plane that allows assessment of levator ani muscle and urogenital hiatus" [12]. The three-dimensional TUS adds, indeed, valuable information to the evaluation of the anterior compartment.

The anterior compartment is considered to be the most difficult compartment to repair surgically. It holds the highest recurrence rate - 36% on average [7, 17]. Using the information derived from ultrasound about the defects involved (midline, PV, muscular trauma and/or ballooning) could be the ideal way to direct a pelvic reconstructive surgery focused on the very specific defects in each patient. However, this field is still under study and further data are required.

In addition to the mentioned limitation of our study, this is an observational study with all the restrictions this format entails. One of the restrictions was that 17 patients had prolapse in more compartments (apical or posterior) beside the anterior compartment. Studying women with single cystocele could have given different results. In few cases it was difficult to gather all the ultrasound parameters, especially during Valsalva maneuvers because of the extent of the cystocele.

Nonetheless, this is a study that evaluates different ultrasound parameters related to cystocele and correlates with the physical examination findings. Having two independent examiners for physical examination and ultrasound, blind to each other's assessment eliminates potential inter-rater disagreement and other influential bias.

Table 1: Grade of cystocele at examination and on ultrasound (expression in number)

At examination	On ultrasound			Total
(Baden-Walker classification)	none	Slight (grade 1 or 2)	Moderate to large (grade 3 or 4)	
1	3	8	2	13
2	7	6	8	21
3	4	0	11	15
4	2	0	3	5
Total	16	14	24	54

Table 2: Evaluation of paravaginal defect at examination and on ultrasound (expression in number)

At examination	On ultrasound				Total
PV defect	None	Bilateral	Right	Left	
None	5	7	0	3	15
Bilateral	1	19	0	1	21
Right	0	11	0	0	11
Left	2	2	0	1	5
Total	8	39	0	5	52

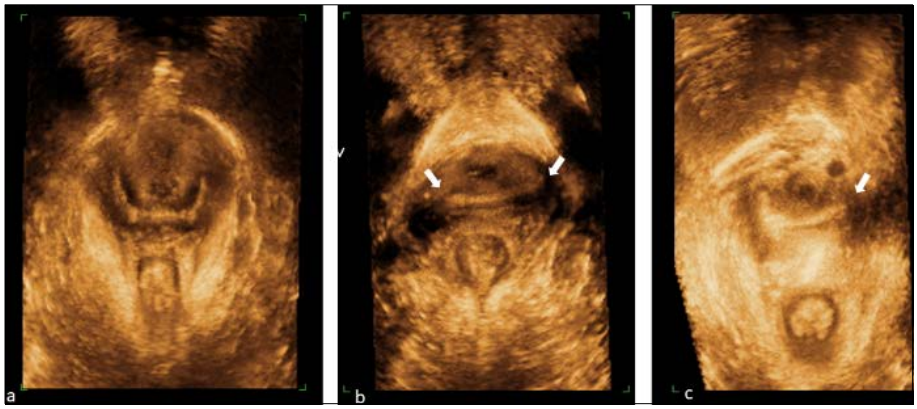

Fig 1: Ultrasound images of paravaginal insertions at valsalva: a - no paravaginal defect; b - bilateral paravaginal defect (arrows); c - left paravaginal defect (arrow)

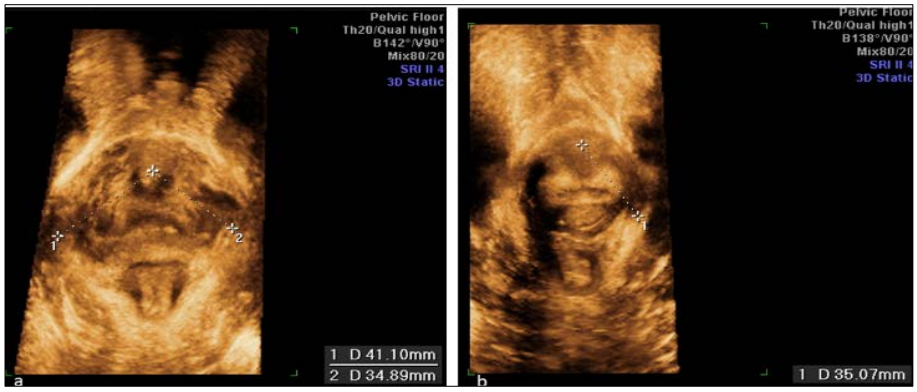

Fig 2: Ultrasound image of levator ani muscle: a- bilateral avulsion; b - left avulsion

4. Conclusions

In conclusion, there was a weak agreement between transperineal ultrasound and physical examination in the evaluation of cystocele. The main utility of transperineal ultrasound is the evaluation of levator ani muscle integrity and urogenital hiatus through the axial plane in 3D. Both levator ani muscle avulsion and hiatal ballooning are etiological factors of prolapse and recurrence after surgery.

The authors believe that transperineal ultrasound evaluation of the associated defects would lead to a more efficient reconstructive surgery with better outcomes.

5. References

1. Arenholt L, Pedersen BG, Glavind K, Glavind-Kristensen M, DeLancey J. Paravaginal defect: anatomy, clinical findings, and imaging. Int Urogynecol J. 2017;28(5):661-673.
2. Notten K, Vergeldt TF, van Kujik SMJ, Weemhoff M, Roovers JPWR. Diagnostic Accuracy and Clinical Implications of Translabial Ultrasound for the Assessment of Levator Ani Defects and Levator Ani Biometry in Women with Pelvic Organ Prolapse: A Dystemic Review. Female Pelvic Med Reconstr Surg. 2017;23(6):420-428.
3. Vergeldt TFM, Weemhoff M, IntHout J, Kluivers KB. Risk fcators for pelvic organ prolapse and its recurrence: a systematic review. Int Urogynecol J. 2015;26(11):1559-73.
4. Haylen B, Ridder D, Freeman R, *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(5):5-26.
5. Lamblin G, Delorme E, Cosson M, Rubod C. Cystocele and functional anatomy of the pelvic floor: review and update of the various theories. Int Urogynecol J. September. 2015;9:1297-305.
6. Dietz H, Pang S, Korda A, Benness C. Paravaginal defects: a comparison of clinical examination and 2D/3D ultrasound imaging. Aust N Z J Obstet Gynaecol. 2005;45:187-190.
7. Friedman T, Eslick G, Dietz H. Risk factors for prolapse recurrence: systemic review and meta-analysis. Int Urogynecol J. 2018;1:13-21.
8. Larson K, Luo J, Guire K, Chen L, Ashton-Miller J, DeLancey J. 3D analysis of cystoceles using magnetic resonance imaging assessing midline, paravaginal and apical defects. Int Urogynecol J. 2012;23(3):285-293.
9. Volløyhaug I, Rojas R, Mørkved S, Salvesen K. Comparison of transperineal ultrasound with POP-Q for assessing symptoms of prolapse. Int Urogynecol J. 2019;30(4):595-602.
10. Salsi G, Cataneo I, Dodaro G, *et al*. Three-dimensional/four-dimensional transperineal ultrasound: clinical utility and future prospects. Int J Womens Health. 2017;12(9):643-656.
11. Segal J, Vassallo B, Kleeman S, Silva W, Karram M. Paravaginal defects: prevalence and accuracy of preoperative detection. Int Urogynecol J. 2004;15:378-383.
12. Dietz H. Ultrasound in the assessment of pelvic organ prolapse. Best Pract Res Clin Obstet Gynaecol. 2019;54:12-30.
13. Dietz H, Kamisan Atan I, Salita A. Association between ICS POP-Q cordinates and translabial ultrasound findings: implications for definition of "normal pelvic organ suport". Ultrasound Obstet Gynecol. 2016;47(3):363-8.
14. Broekhuis S, Kluivers K, Hendriks J, Futterer J, Barentsz J, Vierhout M. POP-Q, dynamic MR imaging, and perineal ultrasonography: do they agree in the quantification of female pelvic organ prolapse? Int Urogynecol J Pelvic Floor Dysfunct. 2009;20(5):541-9.
15. Barber M, Cundiff G, Weidner A, Coates K, Bump R, Addison W. Accuracy of clinical assessmeent of paravaginal defects in women with anterior vaginal wall prolapse. AM J Obstet Gynecol. 1999;181(1):87-90.
16. Dietz H, Franco A, Shek K, Kirby A. Avulsion injury and levator hiatal ballooning:two independen risk fcators for prolapse? An observational study. Acta Obstet Gynecol Scand. 2012;91(2):211-4.
17. Maher C, Freiner B, Baessler K, Christmann-Schmid C, Haya N, Brown J. Surgery for women with anterior compartment prolapse (Review). Cochrane Database Syst Rev. 2016;30(11 CD004014).
18. Youngblood J. Paravaginal repair of cystourthrocele. Clinical Obstet Gynecol. 1993;36:960-66.
19. Delancey J. Fascial and muscular abnormalities in women with urethral hypermobility and anterior vaginal wall prolapse. AM J Obstet Gynecol. 2002;187(1):93-6.
20. Duraisamy K, Balasubramaniam D, Kakollu A, Chinnusamy P, Periyasamy K. A Prospective Study of Minimally Invasive Paravaginal Repair of Cystocele and Associated Pelvic Floor Defects: Our Experience. J Obstet Gynaecol India. 2019;69(1):82-88.