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SHORT COMMUNICATION

Use of transvaginal ultrasound in females with primary bladder neck obstruction. A preliminary study

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Summary ***Introduction and aim: The video-urodynamics study is the principal exam to establish a possible primary bladder neck obstruction (PBNO) condition. While trans-rectal ultrasonography plays an important role in the evaluation of the low urinary tract symptoms (LUTS) and the severity of bladder outlet obstruction (BOO) in men, the use of the transvaginal ultrasound (TVUS) in women with symptoms suggesting BOO remains unclear. We tried to check the utility of the TVUS in women with PBNO condition.***
Material and methods: We selected female patients which presented BOO without pelvic organ prolapse (POP). According to the data of the video-urodynamic exam we selected the patients with the suspicion of PBNO. A TVUS in basal and during micturition was performed before and after surgery.
Results: TVUS showed a closed bladder neck bladder in basal condition and during micturition similarly to the fluoroscopic image during video-urodynamics. The mean distance from bladder neck to the vaginal mucosa resulted 1.3 cm in this patients.
Conclusions: TVUS results worthy in the evaluation of patients with PBNO before and after surgery.

KEY WORDS: *Primary bladder neck obstruction; Transvaginal ultrasound; Video-urodynamics; Bladder outlet obstruction.*

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INTRODUCTION

Bladder outlet obstruction (BOO) in women without pelvic organ prolapse (POP) remains still a controversial condition. Compared with the BOO in men, represent an uncommon condition which can be found in 2.7-8% in women complaining low urinary tract symptoms (LUTS) (1, 2). The cause of BOO in women may be anatomical and/or functional (3). Whereas the anatomical causes of BOO are more common, the functional ones can only be verified during micturition. Once excluded neurological disease, diabetes mellitus and other peripheral neuropathies the main non neurogenic functional causes described in literature are voiding dysfunction (VD) and PBNO (4, 5). *International Continence Society* describes the VD such as an intermittent and/or fluctuating flow rate due to involuntary intermittent contraction of the periurethral striated or levator muscles during voiding in neurologically normal woman (6). PBNO is described as the failure of the bladder neck to open during voiding. The diagnosis of PBNO is difficult due to non-specific criteria. A video-urodynamics study is considered fundamental in establishing a possible PBNO condition. Ultrasonography (US) plays an important role in evaluation of LUTS in men and women. While the role of transrectal US in the evaluation of the prostate central zone in men has been used to correlate LUTS and severity of BOO (7), the use of transvaginal ultrasound (TVUS) in women with BOO remains unclear. So in this paper we tried to check the role of TVUS in women complaining LUTS from PBNO.

MATERIAL AND METHODS

We evaluate all female patients presented with BOO symptoms in the last three years in our ambulatory division. A detailed comprehensive history, a clinical exam and urinalysis were performed. All patients with pelvic organ prolapse were excluded previously from the study. Urinary infection was excluded by a sterile culture obtained before video-urodynamics. Fifteen patients presented symptoms of BOO without POP. Uroflowmetry, video-urodynamics and electromyography (EMG) were performed and the data were analyzed by an experienced urologist. We found three patients with suspicion of PBNO according to criteria described by most authors in literature (8, 9). So patients with Maximal Flow (Q_{max}) < 12 ml/sec; Detrusorial Pressure at Maximal Flow (Pdet Q_{max}) > 20 cm H_2O, silent EMG and no images for urethral stricture at fluoroscopy were selected (Figure 1).
Subsequently the selected patients underwent a TVUS with a particular attention of urethra, periurethral tissues and bladder neck in basal condition with a comfortably full bladder and during micturition. We used a Logic 5 GE Medical Systems console with a 6.5 MHz transducer. The exam was conducted with patients lying in a lithotomic position with the probe adhering to the posterior vaginal wall. The urethra and the bladder neck was studied in both sagittal and transversal planes with particular attention to the bladder neck in the sagittal plane. A possible mass compressing urethra and bladder neck was excluded. The thickness from the bladder neck to the vaginal mucosa was measured. In order to exclude definitively an urethral stricture an urethrocystoscopy was performed.
Patients with PBNO were treated with alpha-blockers for 3 months. Uroflowmetry and a post-voiding residual urine were performed monthly. Collected data showed a therapy failure in all patients and a transurethral bladder neck incision was programmed. TVUS during micturition was repeated at 3 months after surgery.

No conflict of interest declared.

Figure 1.
Video-urodynamics evaluation of a forty-nine years old woman with primary bladder neck obstruction (PBNO).

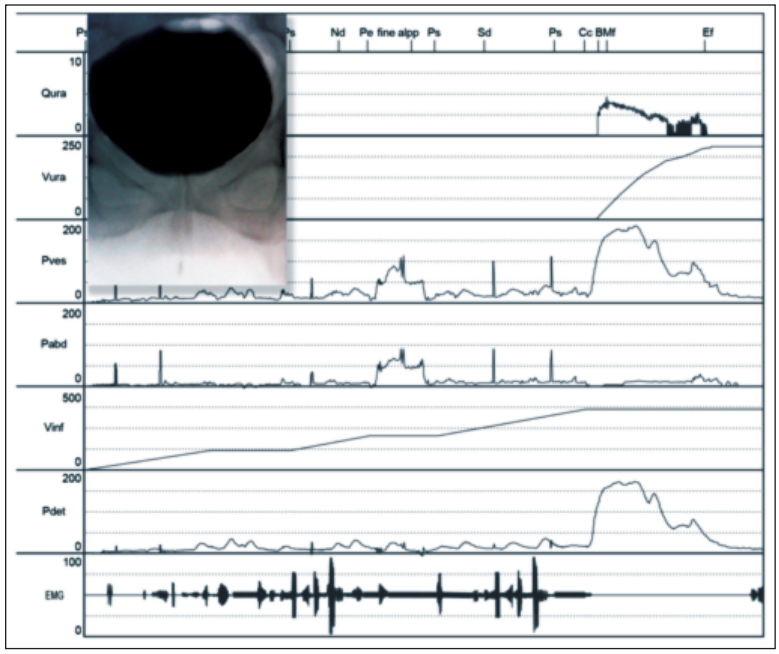


Figure 2.
Normal urethra and periurethral tissue in a sagittal plane.

Results

All patients well accepted TVUS. The urethra and the periurethral tissue in healthy females and in the patients with PBNO appears as a hypo echoic cylindrical structure (Figure 2).
During micturition in the patients with PBNO the images of the bladder neck remained almost the same with little urine flow (Figure 3).
The images were evaluated separately from the urologists, gynecologists and a radiologists which excluded a possible mass compressing the urethra.
Furthermore TVUS permitted us to measure the distance from the bladder neck to the vagina which is an important information prior to the surgery Figure 5. There was a mean distance of about 1.3 cm from the bladder neck to the vaginal wall. A trans-urethral incision of the bladder neck was performed in all patients. As it shown in Figure 5 the surgeon must be careful not to penetrate in the bladder neck to avoid perforation into the vagina. TVUS during micturition performed 3 months after surgery showed the opening of the bladder neck. TVUS after surgery in the sagittal plane showed the structure of the bladder neck, urethral and periurethral tissues as it is shown in Figure 4a and 4b. An hypoechoic image extends around the bladder neck after surgery and it seems like a stem of flower rather than cylindrical (Figure 4b).

Discussion

For many years, physicians specialized in Urogynecology and Female Urology have utilized urodynamics and then video-urodynamics to characterize disorders of female pelvic floor. In the last years increasing availability of US and Magnetic Resonance Imaging (MRI) has triggered a

Figure 3.
Bladder neck during micturition in patient with primary bladder neck obstruction (PBNO).

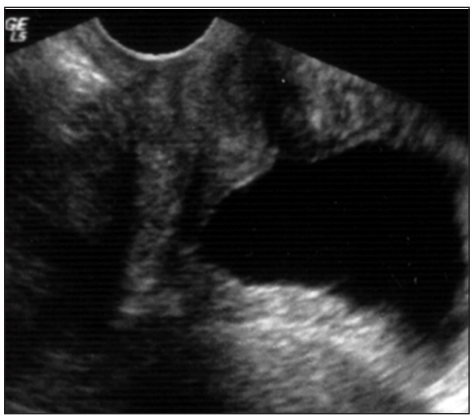
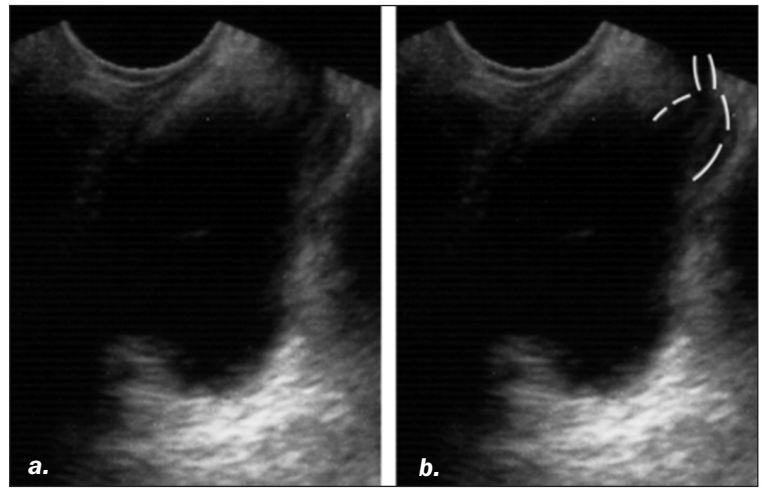


Figure 4a-b.
Bladder neck and urethra in a patient with primary bladder neck obstructuion (PBNO) after surgery. Note the stem of flower-like appearance designed in white (fig. 4b).



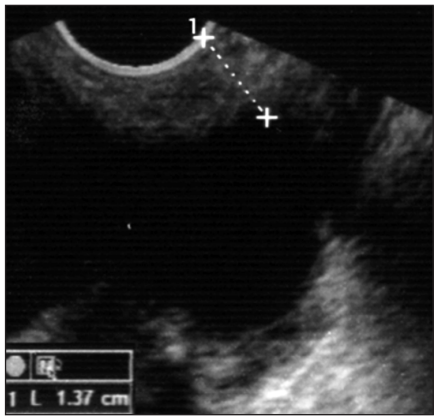


Figure 5. *Distance from bladder neck to vaginal mucosa.*

numerous series of studies in diagnostic imaging in Urogynecology, although MRI utilize remains limited due to costs and access problems. So US are currently used to better characterize different disorders of lower urinary tract. PBNO may be difficult to distinguish and symptoms may be confused with VD. Video-urodynamics plays an important role on assessing a PBNO suspicion representing the first examination to be performed in these women. Video-urodynamics with EMG evaluation show a closed bladder neck during detrusor contraction with normal sphincter activity. It's important to distinguish between VD and PBNO because of different therapeutic strategies. US have been used widely in the assessment of organic and functional diseases of female urethra and bladder neck (10, 11). In particular authors have described the use of TVUS to check urethral disease (10). Perineal ultrasound has been largely used to evaluate urethral angle and bladder neck mobility in women with urinary incontinence (11). It is widely accepted that the suprapubic US evaluation of post-void residual urine is the principal non-invasive method in the follow-up of patients complaining LUTS before and after any treatment. In our experience we performed TVUS to provide a further evaluation element in the study of women with PBNO.

Furthermore TVUS showed an adequate evaluation of bladder neck distance to vaginal mucosa and urethra position which are worthy of consideration before a surgical approach. In our study there is a limited number of patients in order to depict a model image of bladder neck in PBNO, but as we mention above the use of TVUS results worthy in the pre and post-surgery evaluation. In the pre-surgery the use of TVUS may be helpful to exclude other pathologies. If the conservative treatment fails, transurethral bladder neck incision is the surgical treatment of choice (12-14). TVUS permits to know preventively the distance between the bladder neck and the vaginal mucosa (15, 16), in order to prevent injuries.

Conclusions

Diagnosis and management of PBNO remains still controversial. Of course nowadays video- urodynamics with EMG remains the principal diagnostic imaging method. US plays an important role during the evaluation of the patients. Especially TVUS permitted to collect several information before surgery such as urethra position, distance from the bladder neck to vaginal mucosa and excluding periurethral masses. After surgery the TVUS during micturition was a non-invasive method of evaluation of the bladder neck.

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