Micturitional Urethral Pressure Profilometry for the Diagnosis, Grading, and Localization of Bladder Outlet Obstruction in Adult Men: A Comparison With Pressure-flow Study

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OBJECTIVE To investigate the accuracy of micturitional urethral pressure profilometry (MUPP) for diagnosis, grading, and localization of bladder outlet obstruction (BOO) in men with obstructive lower urinary tract symptoms.

METHODS This prospective study included adult men with voiding symptoms qualifying for urodynamics (UDS). Patients with urethral stricture, urinary-tract infection, and inflammatory diseases of the bladder were excluded. Patients were subjected to UDS followed by VCUG the same day. UDS was performed using Solar Silver (MMS International, Enschede, the Netherlands) and included uroflowmetry, resting cystometry with UPP, pressure-flow study with MUPP, and perineal surface-electromyography. The study was performed in accordance with International Continence Society Good Urodynamic-practice Guidelines (2002). VCUG was considered the gold standard for presence and localization of BOO.

RESULTS A total of 64 male patients with mean age 53.3 ± 17.8 years and International Prostate Symptom Score 17.2 ± 6.8 completed the study. Uroflowmetry revealed maximum urine flow 10.1 ± 7.1 mL/s, voided-volume 218.9 ± 161.6 mL, and postvoid residue 129.8 ± 126.5 mL. For diagnosis of BOO, Abrams-Griffith number, Schaefer obstruction-grades, and obstruction-coefficient had weak agreement with VCUG (Cohen's kappa k <0.20), whereas urethral closure-pressure (Pclo) had strong agreement (k = 0.78). For grading, Pclomax had a significant positive linear correlation with Abram-Griffiths number (R^2 = 0.562; P = .0001). MUPP was able to localize the site of obstruction correctly in 55 of 57 obstructed patients.

CONCLUSION MUPP is highly accurate in diagnosis, grading, and localization of BOO in men with voiding dysfunction. It might be a useful supplement to VCUG/UDS. UROLOGY 83: 550–555, 2014.

The diagnosis of bladder outlet obstruction (BOO) is fundamental to the practice of urology not least because minor degrees of obstruction can be associated with quite marked symptoms of detrusor overactivity. The diagnosis of obstruction is clinic-urodynamic. As important as the diagnosis and grading is the localization of BOO. Apart from in symptomatic men in benign prostatic obstruction age group without significant neurologic disorder (diabetes mellitus, Parkinsonism, cerebrovascular accident, and so forth), practically in every other patient presenting with voiding dysfunction, it is important to diagnose and localize functional BOO for appropriate management, particularly when considering irreversible surgical treatment (eg bladder neck incision, sphincterotomy).

Classically, BOO is considered to be present when there is high detrusor pressure and low flow type of voiding pattern. Several researchers have defined BOO in terms of numerical values and graphical localization through their landmark research.[1-3] However, interpretation of such relations might not always be diagnostic, particularly in presence of detrusor underactivity in which case a low pressure–low flow pattern might be observed. Apart from CHESS curve[4] no other method has ever been claimed to point toward the etiologic diagnosis of BOO. For localization and detection of associated anatomic abnormalities, videourodynamics (VUDS) is

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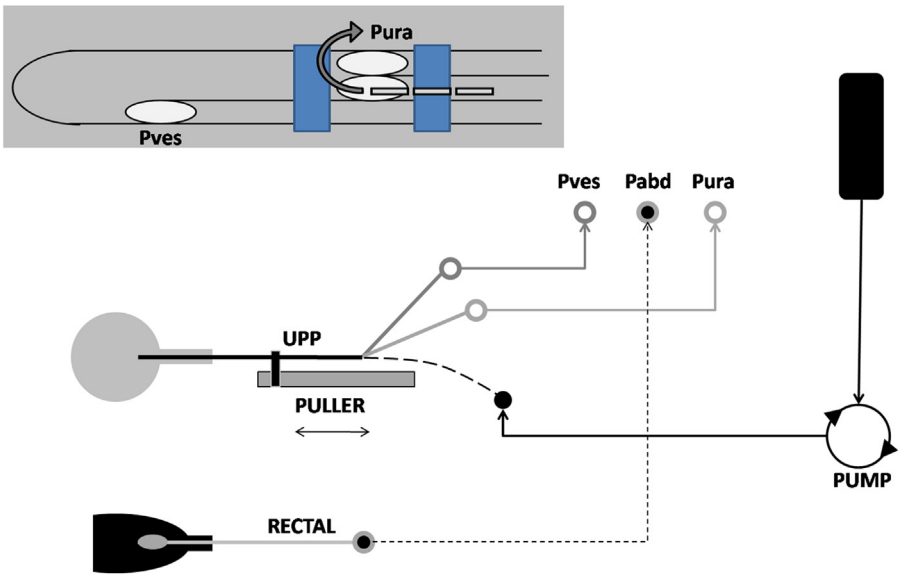

Figure 1. The circuit of urethral pressure profilometry using Solar Silver urodynamic apparatus. The anatomy of 3-lumen urethral pressure profilometry catheter is shown in inset on top. (Color version available online.)

considered the gold standard. However, it is not practicable in every urodynamics (UDS) facility predominantly because of cost of installation; moreover, radiation exposure is also another concern. To circumvent the former problem, Dr. Abrams suggested that voiding cystourethrography (VCUG) performed separately was a reasonable alternative.[5] However, this was an expert opinion not formally studied and proven.

Micturitional urethral pressure profilometry (MUPP) was introduced by Yalla et al[6] for dynamic measurement of urethral pressures during the act of voiding. Some studies found it useful for diagnosis, grading, and localization of BOO.[7,8] However, with the advent of videourodynamics and with perceived difficulty in performing and interpreting UPP, it remained poorly studied and even now lacks standardization. We planned to reinvestigate the role of MUPP in diagnosis, grading, and localization of BOO.

METHODS

Design

Prospective interventional study.

Duration

June 2011-October 2012.

Inclusion Criteria

Adult men with bothersome voiding type lower urinary tract symptoms who qualified for UDS were included.

Exclusion Criteria

Patients with constrictive BOO (urethral stricture), active urinary tract infection within last 4 weeks, and diseases of the bladder (cancer, stone) were excluded.

After a written informed consent, these patients were evaluated using a proforma-based clinical evaluation encompassing history, bladder diary, examination (including focused neurologic examination), international prostatic symptom-score, ultrasonography of kidney, bladder and prostate, urine culture, creatinine, and catheter-free uroflowmetry with postvoid residual urine. Multichannel UDS included cystometry and urethral pressure profilometry (resting and micturitional). All urodynamic studies were performed in urodynamic suite of investigative urology division of our department. Solar Silver digital urodynamic machine with neuro module (MMS International, Enschede, the Netherlands) was used. A filling and VCUG was performed on the same day of UDS in the uroradiology suite of the same investigative urology division. To note, we do not have a dedicated C-arm attached to our urodynamic machine; therefore, a VUDS was not possible. The study was performed in accordance with International Continence Society Good Urodynamic practice guidelines (2002).

Urodynamic Procedure

After giving prophylactic antibiotic, the patient was comfortably seated in electromechanical urodynamic chair (Sonesta 6210, Stille Surgical Inc., Solna, Sweden). The study was performed in sitting position in all patients for convenience; standing or squatting positions were used only if required for inability to void in sitting position. A rectal balloon catheter (5F; MMS) was inserted *per anum*, and surface electrodes were placed on either side of anus. Triple-lumen UPP catheter (7F; MMS) was inserted per urethra and fixed to an automated mechanical puller. The anatomy of UPP catheter is detailed in Figure 1. The catheters were connected to the pressure transducers (Capto SP 844, Memscap AS, Norway) leveled at superior edge of pubic symphysis, and zeroing was performed in standard manner. Resting UPP was performed at 100 mL bladder volume at filling rate of 6 mL/s and puller speed of 2 mm/s; total 3 profiles were recorded. As the Pura enters closed bladder neck, catheter was replaced back and kept in such a way that urethral pressure (Pura) orifice and filling orifice were at bladder neck, and bladder pressure orifice (Pves) inside bladder, marked by a rise in Pura over Pves. Filling was resumed marking all sensations as standard till maximum cystometric capacity was reached; we do not fill beyond strong desire. At this time, the