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ScienceDirect

Journal of the Chinese Medical Association xx (2017) 1−7

www.jcma-online.com

Original Article

Are patients with bladder oversensitivity different from those with urodynamically proven detrusor overactivity in female overactive bladder syndrome?

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Received July 5, 2016; accepted March 15, 2017

Abstract

Background: To determine if there are clinical and urodynamic (UD) differences between female overactive bladder (OAB) patients with bladder oversensitivity (BO) and detrusor overactivity (DO) via a much lower filling rate.
Methods: In total, 205 patients with OAB symptoms were recruited for this study. During filling cystometry, the bladder was filled at a more "physiological" rate of 20 ml/min. All patients underwent a complete urogynecological evaluation including detailed history, physical examination, urinalysis, pad test for quantification of urine leakage, 3-day frequency-volume chart (FVC) documentation, and completion of a UD study.
Results: The overall incidence of BO was 34.2% and that of DO was 65.8%. The first desire to void (FDV) in patients with BO and DO were at filling of 117.47 ± 21.68 ml and 135.23 ± 22.88 ml, respectively ($p < 0.05$). Maximal cystometric capacities (MCC) in patients with BO and DO were recorded at 259.44 ± 33.87 ml and 265.32 ± 44.05 ml ($p > 0.05$). A receiver operating characteristic (ROC) curve was used to find the cut-off values of FDV for sensitivity and specificity in patients diagnosed with DO. Area under the curve (AUC) was 0.702 ($p < 0.005$, 95% confidence interval: 0.626−0.779) if FDV was determined as more than 127 ml. Patients with BO experienced significantly increased daytime urinary frequency and nocturia symptoms (<0.05). Patients with DO had a significantly higher prevalence of urgent urinary incontinence ($p < 0.05$). In this study, a higher FDV and higher body mass index (BMI) were correlating factors for OAB patients with DO after multiple logistic regression analysis.
Conclusion: Patients with BO seemed to be on a different spectrum compared to those with DO and also had different symptom-specific and associative factors. It was also found that FDV could be good predictive indicator for detecting DO at a low filling rate.

Keywords: Bladder oversensitivity; Detrusor overactivity; Filling rate; Overactive bladder; Urgency

1. Introduction

Overactive bladder syndrome (OAB) and lower urinary tract symptoms (LUTS) are highly prevalent in women in both Western and Eastern countries.[1,2] The International Continence Society (ICS) has postulated that overactive bladder syndrome is a type of urinary urgency which may or may not

Conflicts of interest: The authors declare that they have no conflicts of interest related to the subject matter or materials discussed in this article.

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http://dx.doi.org/10.1016/j.jcma.2017.03.009

include urgency incontinence and is usually associated with increased daytime frequency and nocturia, if there is no proven infection or obvious pathology.[3] In clinical practice, urodynamic detrusor overactivity (DO) is detected in approximately 50% of women with OAB symptoms.[4,5] Two separate groups of researchers also noted a sex difference in clinical presentations and urodynamic findings for OAB.[6,7] For females in particular, researchers proposed that DO might not be a major underlying pathophysiology for OAB.[8] In the past, the condition of OAB symptoms was once divided into "motor urgency" and "sensory urgency" based on whether urodynamically-detected DO was found, leading to the belief that both conditions were on the same spectrum.[9] Instead, DO is always relegated to a surrogate factor in corresponding OAB animal studies.[10]

Bladder oversensitivity (BO), as is the case with DO, is diagnosed according to reported symptoms and urodynamic investigations including increased perceived bladder sensation during bladder filling, comprising (1) an early first desire to void (FDV), (2) early strong desire to void (SDV), which occurs at low bladder volume, and (3) a low maximum cystometric bladder capacity (MCC).[11,12] BO is also commonly referred to as *increased bladder sensation*[3] and has since replaced the now-obsolete term *sensory urgency*.[9] Some researchers have previously explored whether clinical and urodynamic characteristics differ between OAB women with and without DO (bladder oversensitivity).[5,9,13−16] However, at present, the results are inconclusive. Some researchers have shown that patients with DO have relatively small perception volumes during filling cystometry. These researchers have suggested that OAB with DO may be the late and more severe form of OAB in comparison with those without DO,[9,15] but the precise association between OAB and DO remains unclear.

In a conventional urodynamic study (UDS), the bladder is normally filled at a rate of between 30 and 100 ml/min, which is significantly higher than maximal physiological diuresis. Filling rate is one of crucial factors in detecting DO.[17] Sensitivity of the afferents toward bladder filling is reduced at higher filling rates.[18] One study also demonstrated that a higher filling rate is correlated with a lower incidence of DO.[19] Therefore, the aim of this prospective study was to identify the clinical and urodynamic parameters to predict DO in female OAB patients. We also compared the differences between clinical characteristics and urodynamic perception volume with filling cystometry set at a relatively lower filling rate (20 ml/min).

2. Methods

Initially, 251 consecutive patients with OAB symptoms who were referred to our urodynamic unit were recruited to take part in this study. All patients underwent a complete urogynecological evaluation including detailed history, physical examination, urinalysis, pad test for quantification of urine leakage, 3-day frequency-volume chart (FVC) documentation, and completion of a UDS. Forty-six patients with cerebral vascular disease, previous anti-incontinence, reconstructive pelvic surgery, hysterectomy, or a radical hysterectomy history and polyuria were excluded. In total, 205 patients were recruited for this study. The study protocol was approved by the Institutional Review Board of Chung Shan Medical University Hospital.

These study subjects were interviewed with five validated structural questions to specify their lower urinary tract symptom, including daytime frequency, urgency, nocturia, urge incontinence, and stress urinary incontinence as described previously.[20] Subjects were also informed to avoid diuretic drinks such as coffee and tea 6 h before UDS. We chose 20 ml/min as the filling rate in order to reduce urothelial impact in comparison with a higher filling rate and also to better minimize natural filling volume effect. UDS was performed using a Dantec DUET (Medtronic, Denmark) by a senior technician in an isolated room. Following uroflowmetry and measurement of post void residual urine, each woman was directed to assume a supine position. During filling cystometry, the bladder was filled with sterile normal saline at room temperature at a filling rate of 20 ml/min using a 6-F double-lumen filling catheter in the bladder and a 9-F rectal balloon catheter. Volume at first desire to void (FDV, ml), volume at maximal bladder capacity (MC, ml), pressure changes during filling phase and involuntary detrusor contraction spontaneously or provoked by suprapubic tapping, coughing, the Valsalva maneuver, listening to running water, and postural change from supine to standing were measured.[21] Urodynamic diagnosis was made according to urodynamic parameters formulated by one of the coauthors (GD Chen), who was blinded to patient symptoms and clinical findings. According to An International Urogynecological Association (IUGA)/International Continence Society (ICS) Joint Report on the Terminology for Female Pelvic Floor Dysfunction in 2010,[12] BO referred to sensory urgency (now-obsolete). We defined BO, previous termed sensory urgency, as OAB with increased perceived bladder sensation during filling, an early first desire to void and low bladder capacity in the absence of recorded urinary tract infection (UTI) or DO. Previously termed motor urgency, DO was defined as occurrence of involuntary detrusor contractions during filling cystometry.

Student's *t*-test was used for continuous variables, and a Chi Squared test was completed for categorical variables to compare the differences between two groups. Pearson's correlation coefficients were estimated to determine associations between DO and variables. We began with univariate regression models to identify baseline variables that were predictive of DO. The baseline variables that showed a significant association in univariate regression models were entered into a multivariate regression model. Receiver operating characteristic (ROC) analysis was performed to identify the optimal cut-off value for detecting DO. All data were analyzed using a qualified statistical software package (SPSS for Windows, Version 16.0, SPSS, Inc., Chicago, IL, USA). A *p*-value of less than 0.05 was considered to be statistically significant.

Please cite this article in press as: Chen S-L, et al., Are patients with bladder oversensitivity different from those with urodynamically proven detrusor overactivity in female overactive bladder syndrome?, Journal of the Chinese Medical Association (2017), http://dx.doi.org/10.1016/j.jcma.2017.03.009