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Severe stress urinary incontinence: Objective analysis of risk factors

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ABSTRACT

Objective: To assess differences between patients suffering from severe degree of stress urinary incontinence versus those with mild degree and to detect the risk factors of severity.
Materials and methods: 118 patients suffered from pure SUI were enrolled in a prospective study. According to VLPP, patients were categorized into 2 groups: mild (VLPP > 60) and severe (VLPP < 60). Risk factors included age, parity, gravidity, menopausal status, co-morbidities and surgical history were investigated.
Results: 35 patients had severe SUI; their mean VLPP ± SD was 47 ± 8 cm H2O, while in 83 patients with mild SUI, mean VLPP was 90 ± 20 cm H2O. No significant difference was detected between both groups concerning clinical parameters except for the presence of bronchial asthma in which the difference was approaching statistical significance ($P = 0.07$). Patients with multiple deliveries have triple risk to develop severe SUI. Obese patients with BMI > 30 and those with bronchial asthma are more prone to develop severe type (OR: 1.9, 95%CI: .07–5 and OR: 9.4, 95% CI: 0.7–25 respectively).
Conclusions: Bronchial asthma, obesity and multiple parities might be associated with low VLPP. Severe SUI is a resultant of multi-factors rather than one risk factor.

1. Introduction

Stress urinary incontinence (SUI) is defined as involuntary leakage of urine on exertion, cough or on sneezing [1]. It represents one of the most prevalent type of urinary incontinence (UI) according to many epidemiological studies [2–8] together with mixed urinary incontinence [9,10]. Age, parity and obesity were universally regarded as risk factors for development of SUI. Other factors such as hysterectomy, medical co morbidities, smoking, DM and major depression were identified by other reports [2–10]. Most of these reports were epidemiological studies in which the diagnosis of UI was self-reported rather than based on clinical or urodynamic data. In addition, the main goal of such studies was to report the prevalence UI and it risk factors rather than association between these risk factors and severity of incontinence. In these studies, the assessment of SUI severity was not standard: some studies utilized number of pads [3], others considered subjective severity index [9], or different forms of questionnaires [5,8,11]. This underscores the need for more objective method for evaluation of risk factors responsible for severe SUI [12–15].

This study was conducted aiming at detection of difference in risk factors for development of severe SUI in patients.

2. Materials and methods

2.1. Study cohort

Between January 2005 and June 2009, 250 patients with SUI underwent urodynamic study (UDS) as a preparatory step before receiving mid-urethral sling (MUS). Patients with mixed UI, neurological disorders, recent history of pelvic surgery (less than 6 months) and patients in whom leakage was not detected during UD session were excluded. Computed files of 118 eligible patients with diagnosis of urodynamic SUI were analyzed.

2.2. Urodynamic evaluation

All patients underwent standardized technique that follows ICS recommendations. Filling CMG was performed in the semi-setting position through a dual lumen urethral catheter (8 Fr) at a fill rate of 50 ml per minute using distilled water at 26 °C temperature. Abdominal pressure monitoring obtained simultaneously through a fluid-filled system (10 Fr feeding tube). Pressures were measured using external pressure transducers which were zeroed to atmospheric pressure with the reference point of the symphysis pubis.

Abbreviations: BMI, body mass index; POP, pelvic organ prolapse; QoL, quality of life; ICS, International Continence Society; SUI, stress urinary incontinence; TOT, transobturator vaginal tape; TVT, tension-free vaginal tape; UDS, urodynamics study; UI, urinary incontinence; UPP, urethral pressure profile; VLPP, Valsalva's leak point pressure.

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Any detected involuntary detrusor contraction with or without incontinence was documented.

At 200 ml bladder volume, patients were asked to strain to detect any leakage. If leakage did not occur at this stage, the same step was repeated at a 100 ml increment until SUI was documented. If leakage was still not detected, catheter was taken out and the patient was asked to strain maximally until leakage is detected. Only those with leakage detectable at 200 ml bladder volume were included. The patient had to leak at least twice at the same volume and have properly functioning, plausible measuring systems (i.e. 80% agreement between Pves and Pabd during the Valsalva maneuver) for VLPP measures to be included. Valsalva maneuvers were performed with and without reduction of the prolapse, in cases associated with high grade cystoceles.

2.3. Definitions and classifications

Urodynamic SUI is diagnosed when urinary leakage is identified during urodynamic session concomitant with increase abdominal pressure and absent detrusor contraction. Patients who met inclusion criteria were categorized into 2 groups based on VLPP, group 1: "severe SUI" with VLPP < 60 cm H2O and group 2: "mild SUI" in whom VLPP was >60 cm H2O cutoff value was based on the work of McGuire et al. [12]. Both groups were compared with regard to risk factors including age, menopausal status, BMI, gravidity, parity, co morbidities (e.g. DM, bronchial asthma. . .), history of hysterectomy or anti-incontinence procedures.

Risk of age, parity, menopause and obesity as well other resultant significant factors were estimated. Cutoff values of 50 years for age, 30 for BMI and 3 for parity were chosen to classify cohort into severe and mild groups.

2.4. Statistical analysis

Continuous variables were tested for normality using Kolmogorov–Smirnov test. Continuous variables were expressed by means ± SD. Mann–Whitney *U* test and independent *t*-test were used to compare means of severe and mild groups. Fisher's exact test (2-tailed) was utilized for comparison between categorical variables. Statistical significance was determined at $P < 0.05$. For significant variables, risk was estimated using odds ratio (OR). All statistical tests were conducted using software SPSS® (version 11, Chicago, Illinois).

3. Results

Urodynamics were carried out for 250 patients. After screening, 118 patients were eligible. Surgical intervention using one of MUS procedures (Pubovaginal fascial sling, TVT or TOT) was carried out in 160 patients. Mean age ± SD was 36 ± 7 years (range 30–60). Mean VLPP ± SD was 80 ± 29 cm H2O (range 30–150). Forty-five patients (38%) reported menopause at time of presentation. POP was diagnosed in 72 (61%) patients. Median number of pregnancies and deliveries were 5 and 4 respectively. Thirty-five patients had severe SUI, in who mean VLPP ± SD was 47 ± 8 cm H2O, while in 83 patients with mild SUI, it was 90 ± 20 cm H2O.

After cohort stratification into mild and severe form, there was no significant difference between both groups with regard to clinical parameters and risk factors except for presence of bronchial asthma in which *the difference was approaching statistical significance (P = 0.07)* in favor of the patients who had the disease (Table 1). On the other hand, when risk was estimated, none of risk factors was *statistically* significant. Age > 50 years was not a significant predictor for development of severe SUI (OR: 0.6 95% CI between 0.25 and 1.4). Women with multiple deliveries have twice the risk for severe form (OR: 2, 95% CI between 0.6 and 6.4). Patients suffer from bronchial asthma showed highest risk of development of severe SUI (OR: 9.4) as shown in Table 2.

Table 1
Clinical and epidemiological risk factors in severe and mild SUI.

	Severe SUI no: 35	Mild SUI no: 83	*P* value
Age[a] in years, mean ± SD	44 ± 6	47 ± 7	0.57
No. of pregnancies (%)			0.77
Less than 3	12	17	
≥3	88	83	
No. of deliveries[b] (%)			0.30
Less than 3	12	22	
≥3	88	78	
Menopausal state[b] (%)	31	41	0.29
BMI[a], mean ± SD	34 ± 5	32 ± 5	0.19
POP[b] (%)	71	56	0.15
Past-surgical history[b] (%)			
Hysterectomy	17.1	8.4	0.14
Anti incontinence	8.6	9.6	0.58
Comorbidity[b] (%)			
DM	8.6	6	0.68
Bronchial asthma	8.6	1.2	0.07

P value calculated using: independent student *t*-test (a), and Fisher's exact test (b).

4. Discussion

Many parameters have been used for evaluation and grading of SUI. Urethral pressure profile (UPP) is one of the commonly studied parameters used for evaluation of urethral incompetence. However, it is difficult to quantify measures resulting from UPP [16]. Moreover, its role in diagnosis of SUI and follow up of patients after surgical treatment is limited [17]. Similarly, evaluation of urethral hypermobility based on cotton swap test is not accurate enough to estimate the degree of severity [16].

Pathophysiology of stress urinary incontinence entails that leakage from the urethra occurs when the intra-abdominal pressure exceeds the urethral pressure [18]. VLPP has been established as a tool for the evaluation of (SUI) and is often used to categorize patients into different types of stress incontinence and to choose their treatment [13,14].

ALPP ≤ 60 cm H2O was chosen, in the current study, as a cutoff point to consider SUI as severe. This is based on McGuire's work which introduced the abdominal leak-point pressure (ALPP) as a tool for evaluating incontinent patients. A value of ≤60 cm H2O was regarded as a characteristic of ISD [12]. Although these values were not based on critical analysis, they correlate well with Video UD findings in most patients [13]. Swift and Ostergard reported that abdominal leak-point pressure has poor clinical correlation to the maximal urethral closure pressure, but they stated that the abdominal leak-point pressure of <60 cm H2O is 90% sensitive and 64% specific in detecting a low-pressure urethra [19]. We tried to overcome the limitation of using VLPP which is lack of standardization in methodology and definition by limiting our selection to patients with clinically detected leakage during UD test at certain volume (200 ml). So we excluded patients in whom leakage was not detected during UD test or leakage was detected at volumes higher than 200 ml.

Table 2
Estimated risk for development of severe SUI.

	OR	95% CI
Age ≥ 50 years	0.6	.25–1.4
No of deliveries ≥ 3	2	0.6–6.4
Menopause	0.7	0.3–1.3
Obesity, BMI ≥ 30	1.9	0.7–5
Presence of bronchial asthma	9.4	0.7–25

OR: odds ratio; CI: confidence interval.