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ORIGINAL ARTICLE

Is urodynamics necessary to identify occult stress urinary incontinence?

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Abstract

Purpose To investigate Occult Stress Urinary Incontinence (OSUI) using physical exam (PE) and urodynamics (UDS) in women with advanced pelvic organ prolapse (POP), and compare the two methods.

Methods This study comprised 105 women with POP stage-III and -IV, according to POP quantification (POP-Q) system, evaluated prospectively between January and December 2015. A standard history, an incontinence questionnaire and PE were completed before the investigation of the OSUI that was performed in the supine and standing positions, reducing the prolapse using gauze and Cheron dressing forceps. The stress test was performed with and without the prolapse reduction.

Results The mean patient age was 65.7 years, mean parity 5.1 and mean body mass index 27.4. From a total of 105 patients, 70 (66.7%) presented with POP-Q stage III and 35 (33.3%) stage IV. Sixty-three (60%) women were identified as having OSUI, 27 (25.7%) as continent, and 15 (14.3%) having stress urinary incontinence. From the 63 OSUI subjects, 48 (76.2%) were identified in both evaluations, eight were identified only during PE, and seven only during UDS. The sensitivity to detect OSUI during PE and UDS was 88.9 and 87.3%, respectively ($P = .783$). The kappa value to measure the agreement between both tests was .648 (95% CI .441–.854).

Conclusion UDS and PE are equivalent and concordant to demonstrate OSUI, thus it is not necessary to perform UDS to exclusively identify OSUI. UDS utility in OSUI patients, to evaluate urethral and detrusor function, deserves further investigation.

Keywords Pelvic organ prolapse · Urinary incontinence, Stress · Urodynamics · Physical exam · Diagnosis

Introduction

Pelvic organ prolapse (POP) can be associated with various lower urinary tract symptoms, including storage symptoms, urinary incontinence and voiding symptoms [1, 2].

Occult stress urinary incontinence (OSUI) is defined as stress incontinence only observed after the reduction of a co-existent prolapse [3]. This is believed to be due to correction of anatomic urethral kinking or obstruction from advanced prolapse [4]. Some authors recommend the investigation of OSUI before surgery for POP because they believe it is associated with a higher risk for postoperative stress incontinence [5, 6].

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The incidence of OSUI is variable because there is no standard method of prolapse reduction, with some authors reporting rates up to 80% [4]. One study tested five prolapse reduction methods and found that the use of a pessary had the lowest rate of detection (6%) and a speculum the highest (30%), but the swab technique had the highest positive predictive value in controls (79%) for postoperative leakage [5].

Studies have shown that performing urodynamic investigation in uncomplicated SUI did not result in better outcomes in terms of a difference in urinary incontinence rates after treatment [7, 8]. Urodynamics (UDS) is considered invasive, expensive and may have adverse effects such as dysuria and urinary tract infection [9].

The diagnostic value of urodynamic investigation in patients with genital prolapse has not been well-established. It is unclear how lower urinary tract symptoms correlate with urodynamic findings. In addition, it is unknown whether OSUI can be equally effectively diagnosed by non-urodynamic tests. Due to a lack of relevant literature, the therapeutic benefits of urodynamic investigation tests are even more difficult to assess than the diagnostic benefits [10]. The aim of this study was to investigate OSUI using physical exam (PE) and urodynamics (UDS) in women with pelvic organ prolapse (POP) stages III and IV, and to compare the two methods.

Patients and methods

Study population

This study comprised 105 consecutive women with POP stage-III and -IV, according to the Pelvic Organ Prolapse Quantification (POP-Q) system [11], evaluated prospectively between January and December 2015 in two public hospitals in Sao Paulo, Brazil. The study was approved by the Institutional Research Ethics committee of the two participating hospitals and all included subjects signed informed consent.

Women with POP stage-III or -IV and planning surgical treatment were eligible. The exclusion criteria were failure to complete the questionnaire due to cognitive impairment or to be subjected to examination with prolapse reduction. Patient with SUI symptoms were not excluded.

Data collection

All patients submitted a medical history in the form of a questionnaire on urinary symptoms and also completed the International Consultation on Incontinence Questionnaire-Short Form (ICIQ-SF) to measure the intensity of urinary incontinence and its impact on quality of life [12]. Physical exam for genital prolapse staging was performed according to POP-Q system [11].

The investigation of OSUI was performed in both supine and standing position. The prolapse was reduced using a gauze held by a Cheron forceps. The reduction was done in such a way as to mimic the surgical correction, directing the forceps in the cranial and posterior directions, not to obstruct the urethra or to compress the bladder. A single experienced examiner evaluated all subjects.

The stress testing during PE was performed with a naturally comfortably full bladder. Patients were instructed to cough and perform the Valsalva maneuver without prolapse reduction. The prolapse was then reduced and they were asked to repeat the same procedure. To make sure the bladder was filled at around 300 ml, the patients were asked to void into a graduated container and the post-void residual volume was measured by catheterization. If the volume voided plus the post-void residual volume was less than 250 ml or over 350 ml, the bladder was artificially filled with 300 ml of saline solution and the stress testing was repeated. Six (5.7%) patient needed to be retested after retrograde filling. The OSUI was defined when there was urine leakage only after the prolapse reduction.

UDS was performed using Uranus (Alacer Biomédica, São Paulo, Brazil) or Dynapack MPX 816 (Dynamed Pro-Life Technology, São Paulo, Brazil). The urodynamics evaluation included free uroflowmetry, filling cystometry and a pressure flow study. The free uroflowmetry was performed without the prolapse reduction. During cystometry the bladder was filled with 300 ml of room temperature saline solution at 50 ml/min in a supine position. The maximum cystometric capacity was not evaluated. The patients were then asked to repeat the same procedure they performed during PE, with and without prolapse reduction. Finally, the pressure flow study was performed without the prolapse reduction. A six French catheter was used to measure intravesical pressure. The urodynamic OSUI was defined when there was urine leakage only after reduction in the absence of detrusor contraction.

Urodynamic techniques, terms and diagnostic criteria conformed to the recommendations of the International Continence Society [13].

Statistical analysis

Considering an alpha significance level of 5%, sample power of 80%, it was estimated that a sample size of 68 patients would be required to identify 20% difference between tests statistics. The Cohen's kappa coefficient was used to measure the agreement between the tests.

The data were then analyzed for positive and negative predictive rates, sensitivity, specificity and accuracy. Statistical values were compared as independent measures of validity for diagnosing OSUI.

Table 1 Diagnosis of OSUI by physical exam and urodynamics vs composite SUI (63 patients)

OSUI PE	Composite SUI (63 patients)		OSUI UDS	Composite SUI (63 patients)	
	Yes	No		Yes	No
Yes	56	0	Yes	55	0
No	7	27	No	8	27

Data were analysed using the software SPSS® version 22.0.

Results

During the 12-month period, 105 consecutive women met the inclusion criteria. The mean age was 65.7 years (range 40–89), mean parity was 5.1 (range 0–16), mean body mass index was 27.4 (range 18.9–41.3), and mean ICIQ-SF score was 10 (range 0–21). A total of 91.5% were postmenopausal and 19% had already undergone surgery for prolapse or urinary incontinence; 66.7% had stage III prolapse and 33.3% stage IV.

From these 105 women, 12 (11.4%) reported SUI symptoms, 17 (16.2%) urge urinary incontinence (UUI), 32 (30.5%) mixed urinary incontinence (MUI), 86 (81.9%) storage symptoms (urgency, increased daytime frequency, nocturia), and 62 (59.0%) voiding symptoms.

For our results, we only considered objective stress leakage (stress leakage during PE or UDS). Twenty-seven (25.7%) subjects were diagnosed as continent because they did not leak in any evaluation, even after prolapse reduction, and 15 (14.3%) were diagnosed as stress urinary incontinent because they leaked without prolapse reduction. The other 63 (60.0%) were diagnosed as OSUI. Of these, in 48 (76.2%) OSUI was identified by both tests, in seven (11.1%) women OSUI was identified by UDS and not by PE. In contrast, in eight (12.7%) women, OSUI was identified only by PE.

To evaluate concordance between both tests, the 15 SUI patients were excluded. The kappa value to measure agreement between tests was 0.648 (95% CI .441 to .854).

To calculate the sensitivity, specificity and predictive rates, we created a model that we called composite SUI which is composed of the sum of patients diagnosed with OSUI on PE and UDS (63 patients) as shown in Table 1.

There were no significant differences between UDS and PE for each statistical value (Table 2).

Patient position during examination did not influence the diagnosis of OSUI. One patient could not be examined in a standing position and was excluded from this analysis (Table 3).

Table 2 Statistical analysis comparing physical exam and urodynamics

	Physical exam (%)	UDS (%)	*P* value*
Sensitivity	88.9	87.3	0.783
Specificity	100	100	1.000
PPV	100	100	1.000
NPV	79.4	77.1	0.819
Accuracy	92.2	91.1	0.787

*Binomial test

Table 3 Patient position and diagnosis of OSUI

		Standing	Supine	*P* value*
Physical exam	Positive	47	47	1.000
	Negative	15	16	
Urodynamic study	Positive	48	47	0.791
	Negative	14	16	

*McNemar's test

Table 4 Continence status and severity of POP

	Stage III *n* (%)	Stage IV *n* (%)	*P* value*
Continent	21 (30)	6 (17.1)	0.126
SUI	14 (20)	1 (2.9)	0.006
OSUI	35 (50)	28 (80.0)	0.003

*Chi-square test

We also evaluated the mean Valsalva leak point pressure in different positions and found no difference ($P = .901$) between standing (mean 87.6 cm H_2O; SD ± 42) and supine positions (mean 89.5 cm H_2O; SD ± 39.3).

When we compared the continence status, POP stage IV showed increased risk for OSUI (Table 4).

Despite 81.9% participants reporting storage symptoms, only eight subjects (7.6%) had urodynamic-demonstrated detrusor overactivity (DO).

Discussion

The incidence of OSUI in our study was 60%. According to the literature it can vary from 17 to 80% [1, 5, 14, 15], but the lack of standard diagnostic criteria makes it difficult to determine the exact incidence of OSUI. Manodoro et al. [14] found a rate of OSUI of 28.7% using a ring pessary and performing UDS, and Ghoniem et al. [16] found a rate of 69% using a vaginal pack.

We found that only 25% of the 44 patients who complained of SUI symptoms leaked without prolapse reduction. One explanation for this finding would be to consider that these patients could be stress-leaking with prolapse reduced, even if unintentionally, therefore, the OSUI prevalence might be underestimated. The validated questionnaires do not differentiate if the leakage occurs with the prolapse reduced or not. Another possibility is to suppose that they would leak only at maximum cystometric capacity, which was not evaluated in our study. But one study found no difference retesting at maximum capacity rather than 300 ml volume [5].

When we compared PE and UDS, we found a substantial agreement between them (kappa > 0.6), and the statistical analysis showed no significant difference when calculating sensitivity, specificity and predictive values for PE and UDS.

Urodynamics is the most used tool for the evaluation of urinary incontinence. However, for uncomplicated SUI it is well-established that performing UDS does not result in better clinical outcomes [7]. Sirls et al. [8], showed that after performing UDS, clinical diagnoses changed in 56.8% of subjects due to findings related to overactive bladder and voiding dysfunctions. These findings changed global treatment plans in only 14% patients, and were not associated with more successful treatment outcome (OR 0.96 (0.41, 2.25; $P = 0.92$).

A non-inferiority randomized controlled trial comprising 59 subjects, evaluated treatment outcomes based on urodynamic diagnosis and compared treatment based on clinical history, voiding diary, and PE, concluded that UDS omission did not impair the outcomes in women with uncomplicated SUI [17].

Our study shows that urodynamics does not add to the physical exam for OSUI diagnosis, which does not mean that UDS is not useful before POP treatment. The UDS utility for the OSUI patient was not the focus of our study. Detrusor function evaluation is another possible usefulness of UDS in patients with high grade prolapses.

Our study did not find any differences between stress-testing in a supine or standing position. Arunkalaivanan performed cystometrogram in the supine and sitting positions, and found that if only supine cystometry had been performed, 51 (53%) cases of stress incontinence, 44 (46%) cases of detrusor overactivity and all cases with mixed incontinence would have been missed [18].

We found more OSUI in women with POP stage IV (80%), which corroborates the hypothesis that the prolapse causes urethral obstruction, and it is proportional to POP severity. Synergistically, higher POP severity implies in worse pelvic floor damage and higher SUI prevalence.

The low incidence of DO (7.6%) can be possibly explained by the fact that filling cystometry was performed in supine position. A review showed that supine cystometry detects a significantly smaller percentage of patients with DO when compared to standing position [19]. We registered only one case of urinary incontinence due to DO and it was observed only in the standing position. Rosenzweig [1] suggested that prolapse reduction improved DO by correcting the urethrovesical junction deformity. However, in our study the filling cystometry was performed without the prolapse reduction. The prolapse was reduced only for the stress testing, not during bladder filling. Moreover, according to integral theory, "Problems of bladder, bowel, prolapse, and some types of pelvic pain, mainly originate from the vaginal ligaments, not from the organs themselves" [20].

We have been unable to find any study that compared UDS with PE in women with advanced POP to identify OSUI. The American Urological Association recommends investigating OSUI either by PE or UDS [21].

One limitation of our study is the lack of postoperative outcomes evaluation, to observe de novo SUI and sling failure prevalence, to determine the importance of OSUI preoperative diagnosis. Furthermore, the prolapse reduction method could be a potential limitation since it may imply different rates of OSUI detection. As the prevalence of OSUI identified was relatively high compared to the literature, we believe that our method was effective.

Our study demonstrates that PE and UDS are equivalent and concordant to demonstrate OSUI, thus it is not necessary to perform UDS to exclusively identify OSUI. UDS utility in OSUI patients, to evaluate urethral function, and in advanced POP patients to evaluate detrusor function, deserves further investigation.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Informed consent Informed consent was obtained from all individual participants included in the study.

Research involving human participants The study was approved by the Institutional Research Ethics committee of the two participating hospitals. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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