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Urodynamic Characteristics of Mixed Urinary Incontinence and Idiopathic Urge Urinary Incontinence

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Purpose: To evaluate and compare the clinical and urodynamic findings in patients with either mixed urinary incontinence (MUI) or simple urge urinary incontinence (UUI). **Materials and Methods:** A series of 100 consecutive female patients with MUI and UUI were identified from a database. Patients with neurogenic bladder, fistula, urethral diverticulum, prior urologic surgery or known urinary tract obstruction were excluded. All patients were classified according to the urodynamic classification of overactive bladder of Flisser et al. and all patients underwent history, physical examination, validated incontinence questionnaire, 24-hour voiding diary, 24-hour pad test, video urodynamic study (VUDS), and cystoscopy. **Results:** A significantly higher proportion of patients with UUI exhibited detrusor overactivity at VUDS, (67% of the patients with UUI vs. 24% of the MUI, $P < 0.05$). Patients with UUI had fewer episodes of incontinence (6.7 vs. 4.2, $P < 0.05$) with slightly less objective urine loss (24-hour pad test 94 gm vs. 128 g of loss, $P < 0.05$) and voided at higher pressures (p_{det} at Q_{max} 21.4 vs. 15.6 cm H_2O, $P < 0.05$). Patients in both groups had functional and urodynamic bladder capacities that were not statistically different. **Conclusions:** Women with UUI were more likely to exhibit detrusor overactivity but experienced fewer episodes of incontinence and less urinary loss when compared with women who had MUI. The "urge incontinence" component of MUI appears to be different than that of UUI, and suggests that urge incontinence may be overdiagnosed in patients with SUI who misinterpret their fear of leaking (because of SUI) for urge incontinence. *Neurourol. Urodynam. 27:376–378, 2008.* © 2008 Wiley-Liss, Inc.

Key words: mixed urinary incontinence; urge urinary incontinence; urodynamics

INTRODUCTION

Urinary incontinence in women is often categorized according to its precipitating factors: stress incontinence (SUI), urge incontinence (UUI), and "mixed" incontinence (MUI), in which both types are present. The broadly inclusive labels SUI and UUI themselves incorporate distinct subcategories of incontinence that have subtle internal distinctions. For example, SUI may be further characterized by the leak point pressure and degree of urethral hypermobility. Recently, we classified patients with urgency according to the presence or absence of specific urodynamic findings such as the presence of detrusor overactivity (DO).[1] While there is ongoing debate about the clinical utility of routine urodynamic testing in the treatment of what appears to be "simple" incontinence, it is undisputed that urodynamic testing can advance the understanding of bladder disorders. In an effort to define more precisely the specific pathophysiology of incontinence in women, we examined whether women suffering from UUI exhibit clinical and urodynamic characteristics that are distinct from patients with MUI.

MATERIALS AND METHODS

A series of 100 consecutive female patients with MUI and UUI were identified from a database. Patients with neurogenic bladder, fistula, urethral diverticulum, prior urologic surgery, or known lower urinary tract obstruction were excluded. All patients underwent history, physical examination, validated incontinence questionnaire, 24-hr voiding diary, 24-hr pad test, video urodynamic study (VUDS), and cystoscopy.

After the questionnaire was completed, the patient was interviewed by an urologist and the responses were confirmed. When there were discrepancies between the questionnaire and the history, the patient was asked to clarify her responses. A positive response to the question "Do you lose control and wet yourself when you cough, sneeze, laugh, strain, change position, or exercise?" was considered indicative of a history of stress incontinence. A positive response to the question "Do you lose control and wet yourself because you get a sudden urge to urinate?" was considered indicative of a history of urge incontinence.

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"Mixed" incontinence was diagnosed by history and physical and/or urodynamic confirmation of SUI in patients who complained of urge incontinence and/or who demonstrated DO that reproduced the incontinence during the filling phase of video urodynamic study. Women who did not have SUI on history, physical or urodynamic examination and who complained of urge incontinence and/or who demonstrated DO during the filling phase of VUDS were diagnosed with UUI. Detrusor overactivity was defined according to the criteria of the International Continence Society (ICS) as an involuntary detrusor contraction (IDC) of any amplitude during the filling phase of the VUDS.

According to ICS criteria, an IDC of any amplitude during the filling phase of the VUDS was defined as detrusor overactivity. Leakage that occurred synchronously with a rise in pad when the patient coughed or strained, in the absence of a rise in detrusor pressure was defined as genuine stress incontinence. According to the urodynamic classification of overactive bladder criteria of Flisser et al., patients were divided into four clinical categories: Type 1—no IDC on VUDS, Type 2—IDC present. The patient is aware and able to abort them, Type 3—IDC present. The patient is aware and able to contract the sphincter but not abort the detrusor contraction and Type 4—IDC present, but the patient is unable to contract the sphincter or abort the contractions.[1]

Video urodynamics was performed with a 7F dual-lumen vesical catheter and a 9F rectal balloon catheter at medium filling using radiographic contrast (200 ml iothalamate meglumine 60% mixed with 800 ml water) in the sitting position. Prior to the examination, patients were asked to void and post-void residual was measured with the catheter. During bladder filling, patients were instructed neither to void nor to inhibit micturition but simply to report their sensations to the examiner. If IDC were detected, patients were asked to describe what they felt and to try to abort the detrusor contraction voluntarily by contracting the sphincter.

RESULTS

Twenty-eight patients were excluded because of one of the diagnoses listed above. Forty-five patients had MUI and 27 patients had UUI. There were no significant differences with respect to age, hormone therapy, pelvic organ prolapse, number of voids/24 hr, bladder capacity, or urinary flow rate. Patients with MUI and UUI exhibited significant differences in the presence of detrusor overactivity at VUDS (24% of the MUI patients compared to 67% of the patients with UUI, $P = 0.035$). Patients with MUI had more frequent episodes of incontinence per 24-hr period compared with UUI patients (6.7 vs. 4.2, $P = 0.044$). Voiding pressures were significantly different in the two groups, with the detrusor pressure at maximum flow (p_{det} at Q_{max}) an average of 15.6 cm H_2O for MUI patients compared to 21.4 for UUI patients ($P = 0.042$). The voiding diaries revealed that UUI patients had a smaller functional bladder capacity (295 ml vs. 325 ml) but bladder capacity at VUDS was the same (336 ml vs. 407 ml). Finally, patients with MUI exhibited slightly more severe incontinence, with 24-hr pad test showing 128 g vs. 94 g of loss ($P = 0.047$; Table I).

With respect to overactive bladder (OAB) type, VUDS demonstrated that 77% of patients in the MUI group had type I OAB, 20% were type II OAB, 4% were type III, and no patients were type IV. Among UUI patients, 33% were type I, 55.6% were type II, 7% were type III, and 4% were type IV (Table II). Other than the higher overall incidence of DI in the UUI group, there were no significant differences in the distribution of OAB type between the MUI and UUI groups.

TABLE I. Urodynamic Characteristics: Mixed Versus Idiopathic Urge Urinary Incontinence

	MUI (N = 45)	UUI (N = 27)	*t*-Test
Age	62 (±12)	64 (±10)	NS
CMG bladder capacity (ml)	407.3 (±168.8)	335.7 (±138.4)	NS
Functional capacity (ml)	325 (±155)	295 (±107)	NS
Q_{max} (ml/sec)	24.9 (±11.0)	21.2 (±11.9)	NS
$p_{det}Q_{max}$	15.6 (±11.4)	21.4 (±8.3)	$P = 0.042$
Detrusor overactivity (n)	11	18	$P = 0.035$
Pad test	128 (±176)	94 (±186)	$P = 0.047$
No. of episodes incontinence	6.7 (±3.1)	4.2 (±4.5)	$P = 0.044$
No. of voids/24 hr	11.1 (±4.2)	11.0 (±3.6)	NS
Menopausal no HRT (n)	13	14	NS

DISCUSSION

In this study we compare two groups of patients, those with and without SUI, who suffer from urinary urge incontinence, to determine if urodynamic testing can identify differences between them. Other researchers have investigated the relationship among urgency, UUI, and detrusor overactivity in patients with sphincteric incontinence. Urodynamic comparisons by Wiskind et al. showed that compared to patients with DO alone, patients with MUI had significantly larger cystometric bladder capacities (396 vs. 308; $P < 0.02$) and lower maximum detrusor contraction amplitudes (38.8 cm vs. 49.9 cm H_2O; $P < 0.04$). Our findings were similar. They also concluded that patients with mixed incontinence might represent a subpopulation distinct from those with pure DO.[2]

In a paper based on a literature review, Mahony et al.[3] reported two urethro-detrusor reflexes that increased the excitability of the micturition reflex as urine flowed across the urethral mucosa, modeling the clinical relationship between SUI and detrusor overactivity. Hindmarsh et al.[4] proposed that urethral overactivity is often associated with unstable bladder contractions and suggested that bladder overactivity may originate from stimuli in the bladder outlet. Similarly, Jung et al.,[5] by measuring urethral perfusion pressure and isovolumetric bladder pressure in urethane-anesthetized female rats, demonstrated that fluid passing through the urethra could promote detrusor activity.

Clinical studies of patients with MUI have generally, though not universally, noted an impact on surgical success rate in patients with SUI and concurrent DO. Jorgensen et al.[6] treated patients with pelvic organ prolapse and motor urge incontinence (but not stress incontinence) by surgical anterior repair and found that DO resolved in 31% of patients, while Trockman et al.[7] found the success rate of modified Pereyra bladder neck suspension to be 26% in patients with MUI at 10-year mean follow-up of 125 patients, compared with 70% success in their patients with pure SUI. In contrast, Karram et al.[8] found that 81% of their series of MUI patients treated by Burch procedure were cured or improved and Morgan et al.[9] reported the resolution of urge incontinence in 74%

TABLE II. Overactive Bladder (OAB) Type in the MUI and UUI Patients

	MUI	UUI	*P*
Type I overactive bladder (n)	34	9	NS
Type II overactive bladder (n)	9	15	NS
Type III overactive bladder (n)	2	2	NS
Type IV overactive bladder (n)	0	1	NS

of their patients treated for incontinence with pubovaginal sling.

In our own experience, patients with "complicated" SUI including those with DO demonstrated at urodynamics had a cure/improved rate of 91% after autologous fascia pubovaginal sling using strict objective and subjective outcome measurements.[10] Subsequently, Chou et al.[11] observed that preoperative MUI does not change the success rate of PVS when compared with the success rate in patients with SUI.

Fulford et al.[12] found that in patients with SUI and associated "urge syndrome," the most important factor in resolving the urge syndrome was achieving a competent bladder neck. This provides an explanation for the finding that patients with MUI who undergo anti-incontinence surgery have resolution of both their stress and urge symptoms.[6–12]

In the present study, we found a significantly higher detection rate of DO in patients with UUI compared to MUI. One possible explanation for this is that some patients categorized as "mixed" UI may be overdiagnosed with respect to UUI due to the inclusion of patients with "urgency" that is related to their concern about wetting (because of SUI) rather than urgency due to involuntary detrusor contractions. Given that the diagnosis of "mixed" urinary incontinence may carry with it a different risk/benefit profile when a patient is considering surgical treatment, we feel it is important to develop a more precise definition of MUI so that treatment outcomes and prognosis can be more precisely defined.

The fact that patients with MUI had more episodes of incontinence and greater objective urine loss probably reflects the additive contributions of the two types of incontinence. That those with UUI voided with higher detrusor pressures for the same uroflow suggests that those with MUI have lower urethral resistance, consistent with sphincteric incontinence.

CONCLUSIONS

There are significant differences in the urodynamic and clinical characteristics of patients with MUI and UUI. Urgency in patients with UUI alone is more likely to be associated with detrusor overactivity than is urgency in patients with SUI, and it is likely that many patients thought to have "mixed" urinary incontinence have SUI alone. This possibility can have a considerable effect on treatment success in patients with incontinence.

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