CLINICAL CHARACTERISTICS AND AMBULATORY URODYNAMIC FINDINGS IN WOMEN WITH DIFFERENT MIXED URINARY INCONTINENCE SUBTYPES

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Introduction

Mixed urinary incontinence (MUI) presents a complex and challenging clinical scenario, characterized by the coexistence of symptoms of both stress urinary incontinence (SUI) and urgency urinary incontinence (UUI). International Urogynecology Association (IUGA) and the International Continence Society (ICS), define MUI as the complaint of involuntary loss of urine occurred with both urgency and during physical activities such as exertion, sneezing, or coughing [1]. The prevalence of MUI varies widely, ranging from 8% to 93%, depending on the studied population and diagnostic criteria used [2]. Despite its prevalence and clinical significance, the exact pathophysiological mechanisms underlying MUI remain incompletely understood. Previous reports have suggested that urethral failure may also contribute to the development of MUI [3]. Given the unclear nature of MUI, comprehensive evaluation techniques, even though computational modeling methods [3], have been proposed to gain deeper insights into its pathogenesis. This study aims to investigate the clinical characteristics and single voiding cycle ambulatory urodynamic monitoring (AUM) findings among women with different MUI subtypes.

Methods

Data of women with complete urogynecological evaluation and ambulatory urodynamic monitoring traces were retrospectively reviewed (n=848). Data of women with voiding dysfunction (n=66) and a history of anti-incontinence and/or pelvic reconstructive surgery (n=67) were excluded. The type of urinary incontinence and related bother were determined according to the responses to the short form of the Urogenital Distress Inventory (UDI-6) questionnaire; after exclusion of data of women who reported pure stress urinary incontinence (SUI) (n=47) and pure urgency urinary incontinence (UUI) (n=77), data of 591 women with MUI were included in the final analysis. MUI subtypes were determined based on the responses to the 2nd and 3rd questions of the UDI-6. Women with higher scores on question 2 than question 3 were categorized into the urgency-dominant MUI (U-MUI) group. Conversely, women with higher scores on question 3 than question 2 were classified into the stress-dominant MUI (S-MUI) group. Women with equal scores on questions 2 and 3 were placed in the equally balanced MUI (E-MUI) group. Baseline characteristics, scores of symptom and quality of life questionnaires (UDI-6, short form of the incontinence impact questionnaire-IIQ-7, overactive bladder awareness tool-OAB-V8 and Sandvik incontinence severity index), clinical and single voiding cycle AUM findings were compared among the groups. Statistical analyses were performed with SPSS version 24.0 software (IBM Corporation, Armonk, NY). Continuous variables were analyzed with one-way analysis of variance (ANOVA) and the chi-squared test was used for comparison of categorical variables. Statistical significance was set at $p < 0.05$ and post hoc tests were performed in case of statistically significant differences between groups.

Table 1. Comparison of baseline characteristics, questionnaire results, 3-day bladder diary and clinical findings in women with different MUI subtypes

	U-MUI (n=137)	S-MUI (n=136)	E-MUI (n=318)	*p*
Baseline characteristics				
Age *(years)*	56.8 ± 11.4 [a, b]	51.6± 12	54±10.4	0.001
Postmenopausal status, *n (%)*	105 (76.6) *	65 (47.8) *	199 (62.6)	0.013
BMI *(kg/m²)*	31.6 ± 8.1 [a]	29.1 ± 5.5 [c]	30.7 ± 5.2	0.003
Parity	3.1 ± 1.9	2.6 ± 1.4	3 ± 1.7	0.132
History vaginal delivery *n (%)*	96 (70.1)	101 (74.3)	218 (68.5)	0.374
Maximum birth weight *(grams)*	3580.8 ± 636.7	3549 ± 772.2	3727.2 ± 727.6	0.062
Questionnaires				
UDI-6 total score (0-100)	59.2 ± 19 [b]	54.3 ± 18.1 [c]	67.3 ± 22. 3	<0.001
UDI-6 irritative	27.6 ± 7.2 [a]	17.9 ± 7.4 [c]	26.9 ± 8.2	<0.001
UDI-6 stress	17.2 ± 7.5 [a, b]	24.4 ± 6.9	26.1 ± 8.8	<0.001
UDI-6 obstructive	14.3 ± 10.4	11.9 ± 10.3	14.1 ± 10.9	0.085
OAB-V8 score	26.1 ± 8.8 [a]	17.7 ± 8.6 [c]	25.5 ± 9.9	<0.001
IIQ-7 score	11.3 ± 6.2 [a]	8 ± 6 [c]	11.7 ± 6.3	<0.001
Sandvik severity index	8 ± 3.9 [a]	6.9 ± 3.7 [c]	8.5 ± 3.8	<0.001
3-day bladder diary				
24-hour urinary frequency	9.4 ± 4.7 [a]	7.8 ± 4.1	8.7 ± 4.1	0.026
Number of incontinence episodes	3.4 ± 3.6	2.6 ± 3.4	4 ± 3.7 [c]	0.002
Clinical findings				
Positive cough stress test, *n (%)*	42 (30.7) *	97 (71.3)	243 (76.4) *	<0.001
Positive supine empty stress test, *n (%)*	15 (11) *	60 (44)	103 (32.4)	<0.001
Stage III-IV pelvic organ prolapse, *n (%)*	35 (25.5)	17 (12.5) *	68 (21.4)	0.025

BMI: Body mass index, UDI-6: Short form of the Urogenital Distress Inventory, OAB-V8: 8-item overactive bladder questionnaire, IIQ-7: Incontinence impact questionnaire-7.
a: P<0.05, U-MUI versus S-MUI.
b: P<0.05, U-MUI versus E-MUI.
c: P<0.05, S-MUI versus E-MUI.
**: indicates statistical significance after post-hoc test*

Results

In the final study population comprising women with MUI, 23.2% had U-MUI (n=137), 23% had S-MUI (n=136), and 53.8% had E-MUI (n=318). Women in the U-MUI group were significantly older compared to the other groups (56.8 ± 11.4 years vs. 51.6 ± 12 years vs. 54 ± 10.4 years, p<0.001). More women were postmenopausal in the U-MUI group compared to the S-MUI and E-MUI groups (76.6% vs. 47.8% vs. 62.6%, p=0.013). Women in the S-MUI group had significantly lower body mass index (29.1 ± 5.5 kg/m2 vs. 31.6 ± 8.1 kg/m2 vs 30.7 ± 5.2 kg/m2, p=0.003). Women with E-MUI had significantly higher scores on the UDI-6 compared to the other groups (67.3 ± 22.3 vs. 59.2 ± 19 vs. 54.3 ± 18.1, p<0.001), whereas women with S-MUI had significantly lower scores on OAB-V8, IIQ-7 and Sandvik severity index, when compared with women in the U-MUI and E-MUI group (Table1).

Significantly fewer women in the U-MUI group had a positive cough stress test (30.7% vs 71.3% vs. 76.4%, p<0.001) and supine empty bladder stress test (11% vs. 44.1% vs. 32.4%, p<0.001) on clinical examination (Table 1).

On comparison of AUM findings among the MUI subtypes, the presence of detrusor overactivity (DO) (78.9% vs. 47.4% vs. 67.9%, p<0.001) and number of detrusor contractions during cystometry (8.5 ± 5.4 vs. 3.1 ± 2.5 vs. 5.6 ± 2.6, p<0.001) were significantly lower in the S-MUI group. Importantly, 50% of the women in this group pressed the urgency button without the presence of any DO (i.e. pure urgency), which was statistically higher than the other groups (50.7% vs 23.4% vs. 32.3%, p<0.001).

Table 2. Comparison of ambulatory urodynamic monitoring findings in women with different MUI subtypes

	U-MUI (n=137)	S-MUI (n=136)	E-MUI (n=318)	*p*
Cystometry				
Duration (minutes)	84.9 ± 26.5 [a, b]	94.8 ± 36.3	92.2 ± 33.5	0.034
Maximum cystometric capacity (mL)	348.4 ± 192.1 [a, b]	437.3 ± 201.5	413.4 ± 197.9	<0.001
Detrusor overactivity, *n* (%)	108 (78.9) *	65 (47.4) *	216 (67.9)	<0.001
Number of detrusor contractions	8.5 ± 5.4 [a, b]	3.1 ± 2.5 [c]	5.6 ± 2.6	<0.001
Number of feeling of urgency	9 ± 4.6	7.6 ± 4.8	9.7 ± 5.1	0.145
Presence of urgency, *n (%)*	133 (97.1)	128 (94.1)	306 (96.2)	0.536
Pure urgency, *n (%)*	32 (23.4) *	69 (50.7) *	102 (32.3)	<0.001
Number of incontinence episodes	8.5 ± 4.3	5.7 ± 3.3 [c]	9.7 ± 4.7	0.001
Pressure–flow study				
Voided volume (mL)	302.6 ± 185.2 [a, b]	394.3 ± 197.7	366.5 ± 196.3	0.001
PVR (mL)	46.3 ± 22.2	42 ± 21.9	45. 3 ± 22	0.243
Qmax (mL/sn)	25.8 ± 13.1	33.3 ± 21.1	28.8 ± 15.1	0.127
Pdet Qmax (cmH_2O)	43.2 ± 33.5	41.8 ± 27.4	35.9 ± 23.1	0.154
Flow time (seconds)	28.8 ± 19.1	36.5 ± 18.1	35.1 ± 16.9	0.085

PVR: Postvoid residual urine volume; Qmax: Maximum flow rate; PdetQmax: Detrusor pressure at maximum flow.
a: P<0.05, U-MUI versus S-MUI.
b: P<0.05, U-MUI versus E-MUI.
c: P<0.05, S-MUI versus E-MUI.
**: indicates statistical significance after post-hoc test*

Conclusions

More than half of women presenting with MUI reported subjective complaints of both stress and urge incontinence in equal proportions, rather than one type predominating over the other. Women with younger age and lower BMI tended to exhibit SUI predominance, while women with older age and higher BMI values presented UUI predominance. All women with MUI suffered from some form of urinary symptom bother but the impact of incontinence on quality of life was lower in the S-MUI group.

The higher positivity rate of clinical tests evaluating urethral function in the S-MUI group suggests that incompetence in urethral sphincteric mechanisms may play a role in exacerbating the symptom burden from SUI. In the event of sphincteric incompetency, a small amount of urine leaking into the urethra may induce a sensation of urinary urgency without initiating detrusor activity.

Urethral incompetency may indeed have a pivotal role in the development of stress-predominant mixed urinary incontinence. Conversely, factors such as aging, obesity, or menopausal status may contribute to the occurrence of urgency-predominant mixed urinary incontinence.

References

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