

THE IMPACT OF AGING AND DETRUSOR OVERACTIVITY ON FEMALE BLADDER FUNCTION

Hypothesis / aims of study

Urge incontinence affects women of all ages but is most common among the aged, as is detrusor overactivity and incomplete urinary emptying. These observations suggest that there is an impact of aging on the urinary tract, yet relevant data are few and inconsistent. We therefore examined changes across the full spectrum of adult ages by conducting detailed urodynamic studies among women ranging in age from 20-90+ y, and here report the results.

Study design, materials and methods

We recruited cognitively competent, fully functional female volunteers aged ≥ 20 y with and without symptoms suggestive of detrusor overactivity. Comprehensive assessment included bladder diary, uroflowmetry and videourodynamics. The study was approved by the Institutional Review Board. Subjects were ranked, on a scale (DO+) representing a weighted average of symptoms and urodynamic findings, according to a computerized algorithm (using 2 history, 2 bladder diary and 2 urodynamic variables). Assignments were made blinded to other parameters. Values of DO+ ranged from +8, characterized by detrusor overactivity incontinence on urodynamics and congruent symptoms and bladder diary, to -6, characterized by the absence of both symptoms and urodynamic evidence of detrusor overactivity.

We examined urodynamic and bladder diary measurements in domains representing bladder capacity, bladder sensation, detrusor contractility, involuntary contraction characteristics, other voiding parameters, other filling parameters, and urethral sphincter function. Each domain contained 2-4 variables which were examined for association with age and DO+, using linear regression.

Results

Characteristics of 95 female subjects:	All subjects n = 95	20-39 y n = 21	40-59 y n = 35	60+ y n = 39
Median age [range]	53 [22-91]	30 [22-39]	50 [40-58]	67 [61-91]
Number of vaginal deliveries	1.7 $\pm$ 1.6	0.7 $\pm$ 1.1	1.4 $\pm$ 1.2	2.5 $\pm$ 1.8
AUA Symptom Index	9.3 $\pm$ 5.6	9.9 $\pm$ 6.7	9.6 $\pm$ 5.7	8.8 $\pm$ 5.1
Bladder surgery (suspension)	10/95	0/21	4/35	6/39
Estrogen medication (current)	32/95	4/21	11/35	17/39
Detrusor overactivity	46/95	9/21	17/35	20/39

Impact of Age: Bladder capacity variables did not decrease with age, but bladder sensation became significantly weaker with age (Fig. 1A). Maximum urethral closure pressure, detrusor contraction strength ($p_{\text{det.isv}}$ and PIP_1 , Fig. 1B) and urine flow rate declined significantly with age.

Impact of Detrusor Overactivity: On the other hand, maximum cystometric capacity, mean daytime voided volume and volume at strong desire to void all diminished significantly with detrusor overactivity, while isovolumetric pressure ($p_{\text{det.isv}}$) and max. detrusor pressure during involuntary contraction ($p_{\text{det.max.IC}}$) increased significantly.

Interaction of Age and Detrusor Overactivity: Detrusor contraction strength ($p_{\text{det.isv}}$, PIP_1 and $p_{\text{det.max.IC}}$) showed a marked increase among younger people with detrusor overactivity, but this increase was absent in older subjects (Fig. 2 A and B); the difference between younger and older subjects was statistically significant.

Interpretation of results

Bladder capacity and bladder sensation are both affected by aging and detrusor overactivity, which tend to act in different ways. Thus the common belief that bladder capacity decreases with age is related to an increased prevalence of detrusor overactivity rather than to aging itself. Similarly, bladder sensation declines with age *per se* but improves with detrusor overactivity.

Among younger subjects, if detrusor overactivity develops, detrusor contraction strength appears to increase. Among older subjects, however, not only is there a general decline in detrusor contraction strength, but their bladders do not appear to react to detrusor overactivity with increased contraction strength. It is possible that this failure to react is the beginning of a progression to failure to empty – that is, to DHIC (detrusor hyperactivity with impaired contractile function), a common condition in the frail elderly. Because of this age-related decline in muscle function, even in the presence of detrusor overactivity, the detrusor of an older person may respond differently to treatment (e.g. with anticholinergics) than that of a younger adult.

Fig. 1A

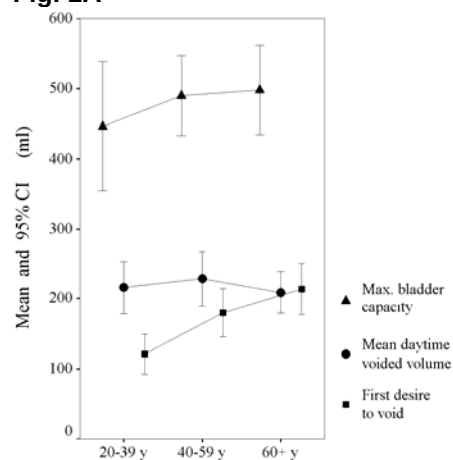


Fig. 1B

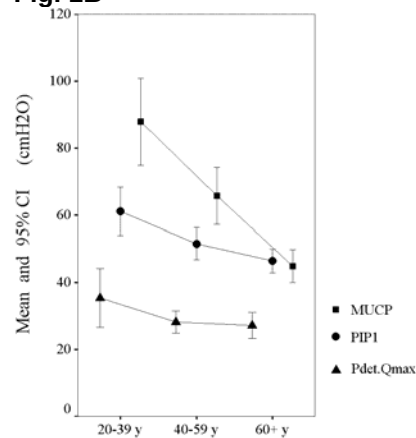


Fig. 2A

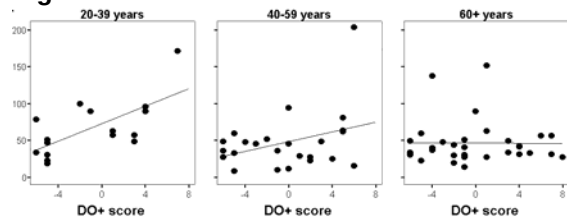


Fig. 2B

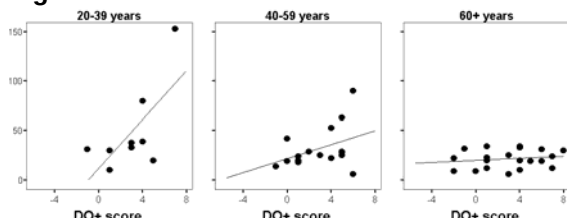


Fig. 2A: Isovolumetric pressure ($p_{det.isv}$) versus DO+ score at different ages.

Fig. 2B: Similar plots for maximum detrusor pressure in involuntary contraction ($p_{det.max.IC}$).

Concluding message

Aging is associated with marked decline in parameters of bladder and urethral function related to muscle strength and sensation, while detrusor overactivity is associated with increased detrusor muscle strength and increased sensation. Because detrusor overactivity becomes more common in old age, there is a complicated interaction between the effects of detrusor overactivity and aging. Moreover, older and younger bladders appear to react differently to detrusor overactivity, perhaps indicating incipient DHIC and explaining the observation that older incontinent patients seem to be more resistant to the therapeutic benefits of anticholinergic therapy.

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