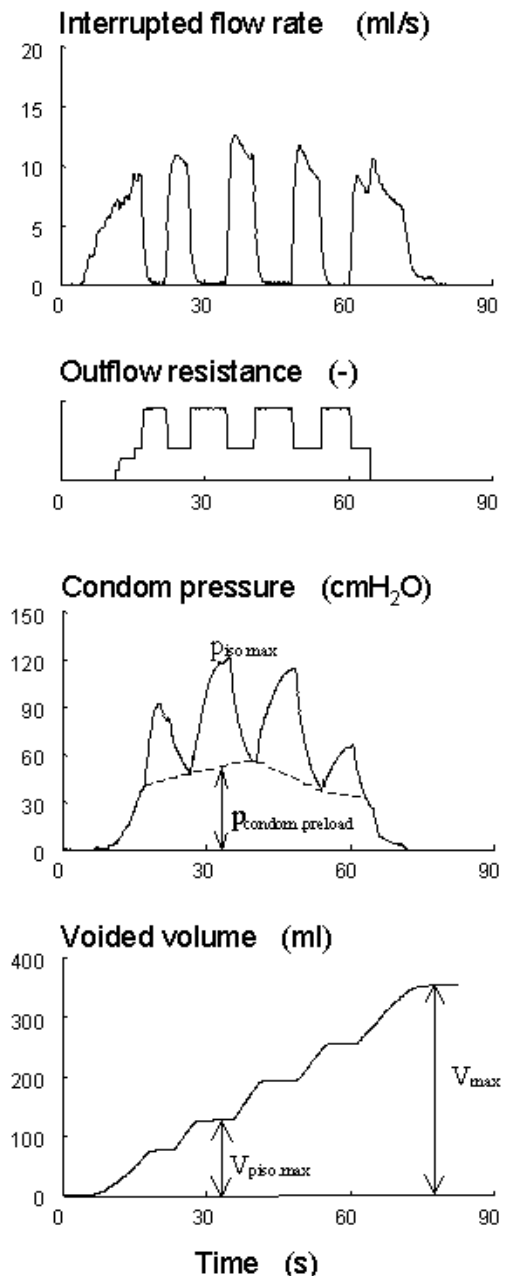


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Title: A MODIFIED PROCEDURE TO NON-INVASIVELY MEASURE THE BLADDER PRESSURE: PRELOADING THE CONDOM

Aims of study

In previous studies it was shown that the male urethral resistance may be assessed from a free flow rate combined with the highest maximum non-invasively measured isovolumetric bladder pressure using a condom type catheter [1]. Since this pressure depends on the bladder volume, it needs to be measured repeatedly (approximately 4 times) in one voiding to assess its highest value. At present, this pressure is measured in the condom during flow rate interruption [2] or estimated from pressure and flow rate values at different outflow resistances [3]. The latter of both methods, in which the outflow resistance is stepwise increased, is preferable since the risk of sphincter contraction or detrusor inhibition is reduced. Using both methods, the lowest outflow resistance was selected to restore the flow rate after each pressure measurement before a next measurement was done. This means that repeated filling of the condom was applied which reduced the number of possible bladder pressure measurements in one voiding. Presently, we studied if preloading the condom by maintaining a small outflow resistance between pressure measurements is feasible to more reliably assess the highest isovolumetric bladder pressure during voiding.



no	first measurement			second measurement		
	P _{iso,max}	V _{pi_{so,max}}	V _{max}	P _{iso,max}	V _{pi_{so,max}}	V _{max}
1	78	129	322	78	153	383
2	118	128	355	103	86	216
3	109	166	553	118	166	592
4	128	101	304	128	28	218
5	128	202	920	127	40	1020
6	99	125	208	113	132	774
7	88	50	312	93	47	311
mean	107	129	425	109	93	502
SD	19	48	242	18	57	306

Methods

The study was done in 7 healthy volunteers aged 62 ± 3 years (mean \pm SD). Each volunteer was measured twice on one day using a variable outflow resistance catheter, consisting of three parallel tubes with different diameters connected to the outflow opening of an incontinence condom. The flow of urine through the tubes was guided into a flow meter. A pneumatic valve was fitted over each tube to interrupt the flow rate through it. In this way, eight different outflow resistance values could be applied in one voiding. A pressure transducer was installed at the level of the catheter to record the pressure in the condom. All volunteers voided in privacy and were encouraged not to strain. The figure shows a typical example of the new measurement procedure incorporating preloading of the condom. When voiding started (first panel) in this volunteer, the outflow resistance was slightly increased (second panel) to fill the condom with urine. In the third panel, it can be seen that as a result of this small outflow resistance, the pressure in the condom increased to a preload, $p_{\text{condom,preload}}$. bladder volumes (last panel). Following each interruption, almost the same preload outflow resistance was established.

Results

All volunteers felt comfortable during the measurement. For each volunteer, the maximum isovolumetric pressure in the condom, $p_{\text{iso,max}}$, the corresponding bladder volume, $V_{\text{pi_{so,max}$, and the total voided volume, V_{max} , are summarised in the table.

No significant differences were found between pressures and voided volumes in both measurements (paired t-test). A significant paired sample correlation was found for the non-invasively measured isovolumetric bladder pressure in the volunteers, $r = 0.8$, the associated bladder volumes. This finding suggests that the highest pressure was not measured at a precise bladder volume. In the figure it can be seen that $p_{\text{condom,preload}}$ slightly increased and decreased during voiding, indicating that no sphincter contraction or detrusor inhibition occurred during the measurement. On average, the highest pressure values were measured at about 30% of the totally voided bladder volume.

Conclusions

Preloading the urethra before a pressure measurement in the condom enables the investigator to simultaneously test for bladder volume dependence to assess sphincter contraction / detrusor inhibition during voiding. The highest pressure measured in the condom may be combined with a maximum flow rate to non-invasively classify bladder outlet obstruction.

References

- [1] Neurourol&Urodynam 17: 394, 1998
- [2] Neurourol&Urodynam 18: 455, 1999
- [3] J Urol 165: 647, 2001

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