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THE RISE IN ISOVOLUMETRIC DETRUSOR PRESSURE IS GREATER IN MALE PATIENTS WITH DETRUSOR OVERACTIVITY

Hypothesis / aims of study

Isovolumetric detrusor pressure ($p_{det.isv}$) is a measure of detrusor contractility and tends to be elevated in conditions causing detrusor hypertrophy such as bladder outlet obstruction (BOO) and detrusor overactivity (DO). The magnitude of the pressure rise from conditions of maximum flow ($p_{det.Qmax}$) to the isovolumetric state ($p_{det.isv}$) may be related to the available reserve of smooth muscle contractility and we therefore set out to determine firstly whether the difference $p_{det.isv}$ - $p_{det.Qmax}$ was greatest amongst men with DO and secondly whether the pressure rise was influenced by the presence of BOO.

Study design, materials and methods

Data for analysis were obtained as part of a study investigating the usefulness of a non-invasive measure of bladder contractility - the penile cuff test (1). Following ethical approval and with informed written consent subjects underwent a conventional pressure flow study (PFS) conducted according to ICS good urodynamic practice. Briefly the bladder was filled until the subject experienced a strong desire to void with continuous monitoring of abdominal (p_{abd}), bladder (p_{ves}) and subtracted detrusor pressure (p_{det}) together with flow rate (Q). A penile cuff was then positioned and the subject was asked to void. Once voiding commenced the cuff was automatically inflated until flow was interrupted or a safety limit of 200 cmH_2O reached. The cuff then automatically deflated allowing flow to resume. The cuff inflation cycle was repeated throughout the duration of the void (Figure 1).

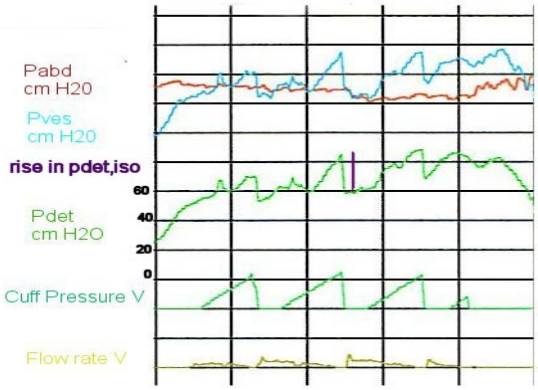

Fig 1 Measurement of rise in $p_{det.isv}$

Men were classified according to position on the provisional ICS nomogram using the combination of $p_{det.Qmax}$ and Q_{max} as being obstructed, equivocal or unobstructed (2). The difference $p_{det.isv}$ - $p_{det.Qmax}$ was then calculated for each flow interruption within each subject and the greatest difference selected for use in the analysis (Figure 1). Traces were independently examined by 2 observers and the presence or absence of phasic detrusor pressure rises during filling typical of DO was noted, any disagreement being settled by discussion. The values for $p_{det.isv}$ - $p_{det.Qmax}$ expressed as mean (SD) for the diagnostic groups were compared using Student's 't' test.

Results

A total of 248 men with mean age 66 years (range 20 - 87 years) underwent simultaneous cuff test and invasive PFS. Data collection for the purposes of this study was incomplete in 23 (9 %) men who were therefore excluded from further analysis. The reasons were; loss of urethral catheter (n =3), inability to void during the test (n = 1), equipment failure (n =3), missing traces (n = 3), voided volume < 150 ml (n =9), failure to interrupt flow (n =2) and failure to recommence flow after interruption (n =2).

Of the 225 men with complete data, 146 (65 %) with mean age 65 years (range 20 - 87 years) had detrusor overactivity during filling whilst 79 (35 %) with mean age 66 years (range 44 - 82 years) had no evidence of detrusor overactivity. The rise in detrusor pressure following establishment of isovolumetric conditions ($p_{det.isv}$ - $p_{det.Qmax}$) for the 225 men studied according to the categorisation of obstruction and the presence of DO is shown in Table 1 and represented graphically in Figure 2. Statistical analysis showed that the difference $p_{det.isv}$ - $p_{det.Qmax}$ found in men with DO was significantly higher than those without DO for those with BOO ($P < 0.01$), equivocal findings ($P < 0.03$) and no obstruction ($P < 0.01$).

	DO Group (n=146)			Non DO group (n=79)		
ICS Nomogram	(%)	$p_{det.isv}$ - $p_{det.Qmax}$ cm H_20 Mean	SD	(%)	$p_{det.isv}$ - $p_{det.Qmax}$ cm H_20 Mean	SD
Obstructed	82 (56)	28	21	34 (38)	17	15
Equivocal	29 (20)	31	27	25 (32)	17	14
Unobstructed	35 (24)	35	30	20 (30)	15	12

Table 1 Mean and standard deviation of the difference $p_{det.isv}$ - $p_{det.Qmax}$ for the different groups

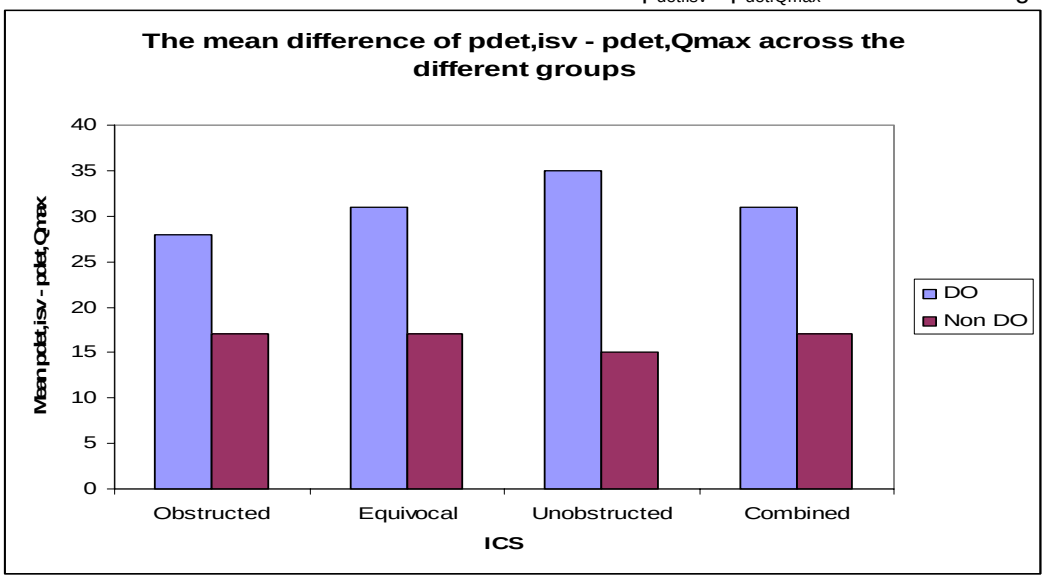

Fig 2 The mean difference $p_{det.isv}$ - $p_{det.Qmax}$ across the different groups

Interpretation of results

The results show that in men with detrusor overactivity there is a significantly greater rise in detrusor pressure from conditions of maximum flow to the isovolumetric state which is independent of the outlet status as defined on the provisional ICS nomogram. As predicted from consideration of contractility status the difference is most marked amongst men with DO who are not obstructed group and least marked in the obstructed group. These findings may aid the non invasive urodynamic diagnosis of detrusor overactivity by using cuff interupption pressure ($p_{cuff.int}$) as a measure of contractility.

Concluding message

The rise in p_{det} under isovolumetric conditions is greater in men with detrusor overactivity, independent of the presence of obstruction.

References

1. Non-invasive measurement of bladder pressure by controlled inflation of a penile cuff. Journal of Urology 167, 1344-1347. 2002.
2. The standardisation of terminology of lower urinary tract. Neurourology and Urodynamics, 21, 167-78. 2002.