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VALIDATION OF THE PENILE COMPRESSION-RELEASE MANOEUVRE FOR NON-INVASIVE DIAGNOSIS OF BLADDER OUTFLOW OBSTRUCTION

Aims of Study

The invasive nature of conventional cystometry has encouraged the development of alternative urodynamic techniques that do not require bladder catheterisation. Most non-invasive methods rely on flow interuption during voiding to allow an estimate of isovolumetric bladder pressure. The currently available methods include mechanical interuption at the external meatus using a condom catheter (1), interruption at the level of the penile urethra using an inflatable cuff (2) and manual compression and release of the penile urethra during voiding (3). All of these measures seek to differentiate between the urodynamic diagnoses of bladder outlet obstruction (BOO), detrusor hypocontractility (DH) and detrusor overactivity (DO). The present study aimed to validate the penile compression-release manoeuvre described by Sullivan and Yalla (2000) by repeating their study using mechanical interuption of flow with a penile cuff rather than manual compression.

Methods

One hundred and fifty men with lower urinary tract symptoms (LUTS) attending for conventional and non-invasive pressure-flow studies (PFS) were included in this study. Invasive data were collected and used to classify men into the diagnostic groups of Normal (NOR), Bladder outlet obstruction (BOO), Detrusor Hypocontractility (DH) and Detrusor Overactivity (DO).

A flexible plastic cuff was placed around the penis and inflated during micturition until flow was interrupted. After flow interruption the cuff was deflated automatically and voiding resumed. This cycle was then repeated throughout the course of the void (Fig 1). The PCR index was then calculated using maximum flow obtained post-compression (Qsurge) and the quasi-steady state flow rate (Qss):

$$\text{PCR INDEX (\%)} = (Q_{surge} - Q_{ss}) / Q_{ss} \times 100$$

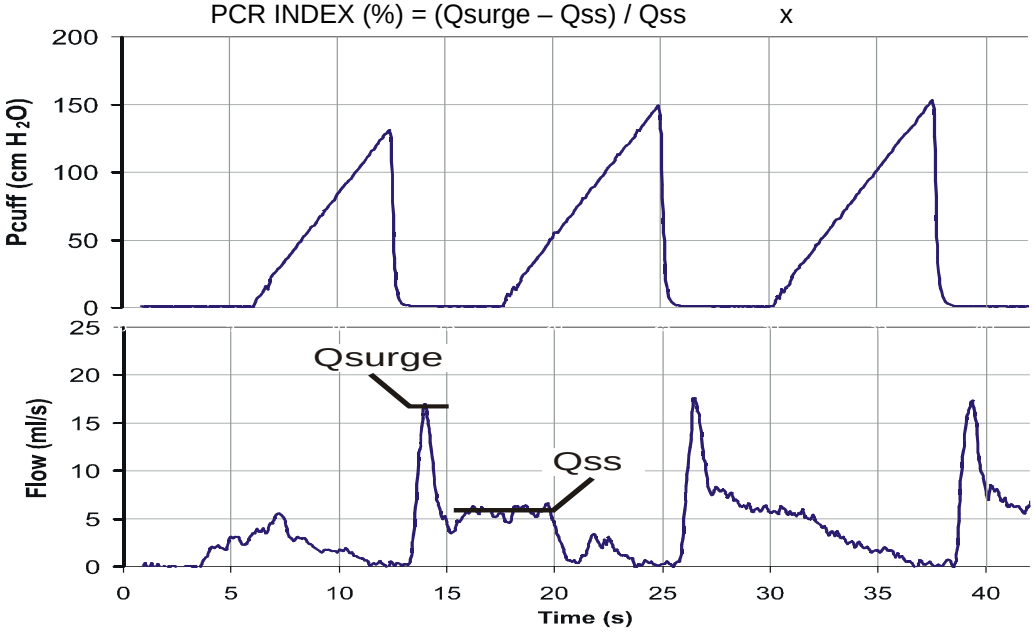

Fig 1 Penile compression-release manoeuvre by automated inflation of a penile cuff

The mean PCR index (%) was calculated for each patient and the results analysed for each urodynamic group and compared by variance analysis. A receiver-operator characteristics

curve (ROC) was constructed to define PCR index threshold above which prediction of BOO was optimised.

Results

Forty-nine subjects were excluded because of low voided volume, no arrest or return of voiding, lack of comparible PFS data or technical failure leaving one hundred and one data sets for analysis.The table below shows the data obtained:

GROUP	NUMBER	**MEAN PCR INDEX (%)**	**STANDARD DEVIATION**	**P VALUE** (cf. NOR)
BOO	28	213	84.3	<0.0001
DO	19	151.3	87	0.027
NOR	16	97.8	38.7	-------
DH	38	102.5	54.5	0.73

Table 1 PCR indices for different urodynamic groups

A variance analysis was initially applied to all of the four groups which showed a significant difference ($p<0.00001$). Each diagnostic group was then compared to the normal group using Student's t-test and the p-values tabulated above. These results show a significantly higher mean PCR index in the obstructed (BOO) and the DO groups. The predictive value of the PCR index was examined by plotting a receiver-operator characteristics curve defining obstruction as a positive result.

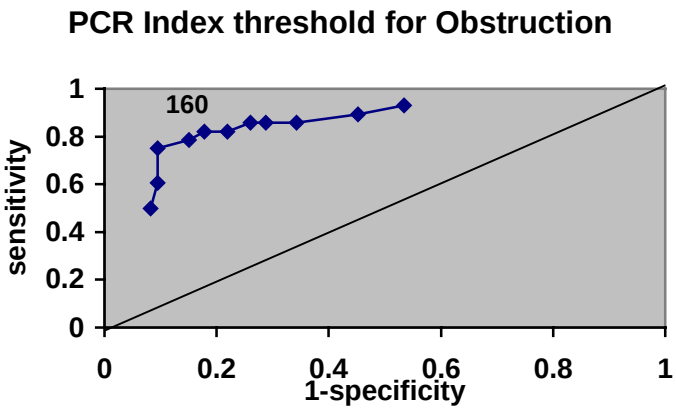

Fig 2 The ROC curve suggests that a PCR index of 160% is the optimum threshold above which BOO can be diagnosed with sensitivity of 0.81, specificity of 0.84 and positive predictive value of 69%.

Conclusions

This study confirms that the PCR index shows promise as a simple, reliable and non-invasive method of evaluating men with LUTS. The surge in urine flow that occurs following release of penile urethral compression is thought to represent the action of isovolumetric bladder pressure on the reservoir of urine contained within the compliant anterior urethra. Thus the PCR index expresses pressure flow data for each void. In the present study the significantly higher PCR index in the obstructed group is likely to represent higher isovolumetric bladder pressure and lower flow rate. It does not appear to be affected by the presence of detrusor overactivity. Our threshold value for PCR index of 160% above which BOO could be diagnosed was higher than that of 100% set by Sullivan and Yalla (2000). This may represent an advantage of automated penile compression which has been shown not to inhibit detrusor contraction. Further comparitive studies are required to determine how the PCR index compares with other non-invasive measures of voiding function in predicting the presence of BOO and the response to treatment.

Reference

1 BJU Int 1999;84:195-203 2 J Urol 2002;167:1344-7
3 NeuroUrol. Urodyn 2000;19:657-669