

## THE PENILE COMPRESSION-RELEASE INDEX IS SENSITIVE TO CHANGE FOLLOWING PROSTATECTOMY

### Hypothesis / aims of study

The penile compression-release index (PCRi) has been proposed as a non-invasive screening test for bladder outlet obstruction (BOO)<sup>1</sup>. The PCRi quantifies the relationship between the surge in urine flow seen following release of urethral compression ( $Q_{\text{surge}}$ ) and the steady state flow rate ( $Q_{\text{ss}}$ ) which is equivalent to  $Q_{\text{max}}$ , by means of the formula:

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

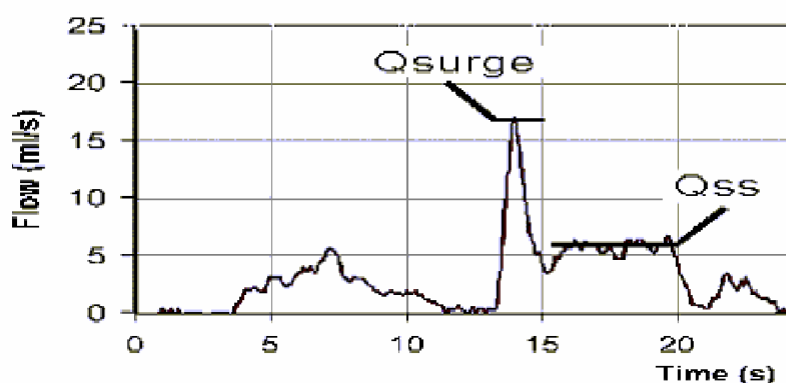


Figure 1 A typical flow rate trace obtained following penile compression and release

This diagnostic usefulness of this measurement has recently been evaluated using automated urethral compression and release by the controlled inflation of a pneumatic penile cuff<sup>2</sup>. Findings from this study suggested that values of PCRi above a threshold of 160% were indicative of BOO. The proposed use of PCRi as a non-invasive indicator of BOO suggests that it should decrease following treatment of BOO by transurethral prostatectomy (TURP). We have therefore tested the hypothesis that PCRi is sensitive to change following TURP.

### Study design, materials and methods

Following ethical approval and with prior written informed consent we prospectively recruited men who were already selected for surgical treatment of BOO in a single centre. Each patient underwent a symptom assessment and a non-invasive pressure flow study (penile cuff test) the day prior to surgery. All men were invited to return at 4 months following surgery for repeat symptom and non-invasive urodynamic assessment. A satisfactory surgical outcome was defined as a 50% or greater reduction in IPSS score.

For the purposes of measurement of PCRi, the penile cuff test provides an automated method of repeated urethral compression and release during voiding<sup>2</sup>. The cuff inflates at  $10 \text{ cmH}_2\text{O s}^{-1}$  until flow is interrupted. After 2 s of interrupted flow the cuff rapidly deflates to allow voiding to continue resulting in the characteristic flow surge followed by return to steady state flow. The highest value of PCRi obtained during the void was documented for each patient pre and 4 months post-operatively and the mean values compared using a paired Student's t-test. The change in values of  $Q_{\text{surge}}$  and  $Q_{\text{ss}}$  recorded before and after surgery were similarly examined. We also explored the relationship between change in PCRi and the outcome of surgery together with the pre-operative obstruction category defined by the proposed non-invasive pressure – flow nomogram<sup>3</sup>.

### Results

We recruited a total of 194 men with median (range) age 68 (47-88) years. From this sample, we were able to obtain a valid PCRi reading for 87 (42%) men both before and after surgery.

Results are shown in Table 1. Analysis of the relationship between change in PCRI and surgical outcome revealed the mean (SD) decrease in PCRI was 141 (155)% for those reporting a good outcome compared to 66 (116)% for the group with a poor outcome ( $P < 0.05$ ). In terms of obstruction grade those classified as definitely obstructed on the proposed non-invasive nomogram showed a mean (SD) decrease in PCRI of 168 (168)% compared with 86 (122)% in those unobstructed or not classified ( $P < 0.05$ ).

Table 1 Results of pre and post operative values of PCRI and its components. P values are derived from Student's t-tests comparing paired values pre and post operatively.

	PCRI %	$Q_{\text{surge}}$ mls <sup>-1</sup>	$Q_{\text{ss}}$ mls <sup>-1</sup>
<b>PRE OP</b>	226 (133)	19 (8)	6 (3)
<b>POST OP</b>	106 (95)	26 (14)	14 (10)
<b>P value</b>	< 0.01	< 0.01	< 0.01

#### Interpretation of results

If a valid recording of PCRI can be made, a marked change in the recorded value is seen following surgery to remove BOO. The decrease in PCRI is caused by a relatively greater increase in steady state flow which is roughly equivalent to  $Q_{\text{max}}$  compared to a smaller increase in  $Q_{\text{surge}}$ . The surge in flow following release of compression is thought to relate to capacitance of the bulbar penile urethra together with detrusor contraction strength and therefore is likely to be less subject to change following TURP than  $Q_{\text{max}}$ . This change in PCRI gives further validation to its possible role as a screening examination for BOO in preference to invasive PFS. This is also supported by analysis of its relationship with pre-operative obstruction category as defined by the proposed non-invasive nomogram which showed a significantly greater reduction in PCRI in the group of men classified as definitely obstructed. Furthermore those men reporting a good outcome from surgery also showed significantly greater reduction in PCRI.

The main problem associated with PCRI is the difficulty in ensuring an adequate recording which requires flow to return to its previous steady state after cuff deflation. This was hampered by small voided volumes pre-operatively and dramatically reduced voiding times post-operatively and we were able to calculate values for only half of the men recruited. If PCRI were to become clinically applied then more rapid automated inflation could be easily programmed in the existing penile cuff device.

#### Concluding message

These data provide further encouragement for the use of the penile compression-release index as a non-invasive indicator of bladder outlet obstruction. Sensitivity of the PCRI was mainly accounted for by the expected large increase in steady state flow that is equivalent to  $Q_{\text{max}}$ .

#### References

- 1 Penile urethral compression-release maneuver as a non-invasive screening test for diagnosing prostatic obstruction. *Neurourology and Urodynamics*. 2000;**19**:657-669
- 2 An automated penile compression release maneuver as a noninvasive test for diagnosis of bladder outlet obstruction. *Journal of Urology*, 2004; **172**: 2312-2315
- 3 Non-invasive bladder pressure: the case for using a modified ICS nomogram. *Neurourol Urodyn* 2003;22 (5):367

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**ACTION**

**MEDICAL**

**RESEARCH**