

REASSESSMENT OF BLADDER CONTRACTILITY INDEX RELATIONSHIP

Hypothesis / aims of study

The bladder operates at approximately constant power leading to the now well know relationship between bladder pressure and flow rate. That is, if flow rate is reduced at constant contraction, pressure will rise, and vice versa. What is less well established is the magnitude of the relationship. On the Schäfer nomogram it is assumed that there is a factor of 5 (ref 1) which provides the basis of the commonly used estimate of isovolumetric bladder pressure, referred to as the bladder contractility index (BCI):

$$BCI = P_{det.Q_{max}} + 5 \times Q_{max}$$

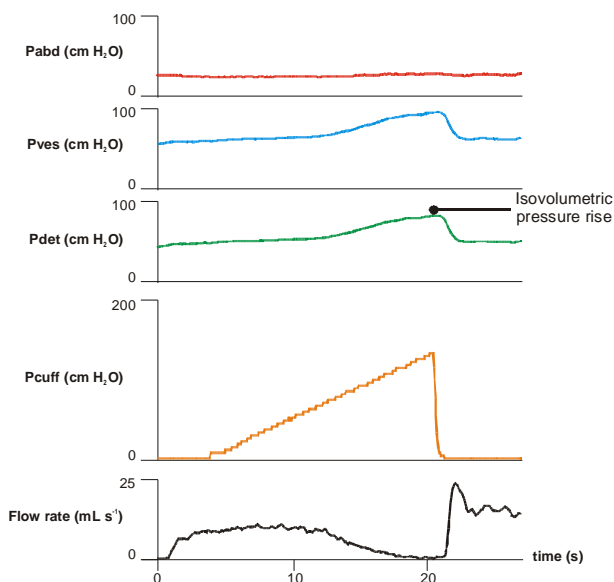
However evidence suggests that in elderly females the multiplication factor is much closer to one (ref 2).

Correct interpretation of urodynamic data, especially measurement of isovolumetric bladder pressure, depends on knowledge of this factor. The figure of 5 is based on assumptions about bladder contractility being unaffected by disobstructive surgery (personnal communication). The aim of the this study is to reassess the relationship between $P_{det.Q_{max}}$ and $P_{det.isv}$ as a function of flow rate and therefore provide direct evidence of the correct factor for the calculation of BCI in men with LUTS referred for pressure flow studies (PFS).

Study design, materials and methods

As part of a larger study, men with LUTS underwent conventional PFS followed by a second PFS during which the flow rate was passively reduced to zero by pneumatic inflation of a penile cuff (Fig 1). For each subject, the rise in bladder pressure from full flow to interruption was measured and plotted against Q_{max} . The average relationship was determined by linear regression.

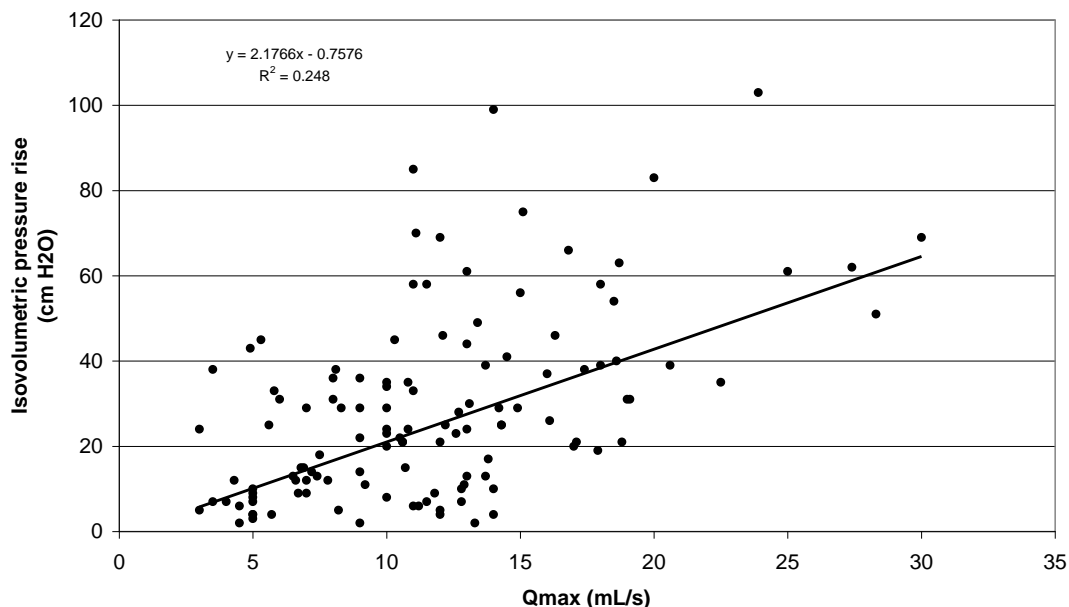
Figure 1. Rise to isovolumetric pressure as flow reduces to zero.



Results

Data were obtained from 140 patients and the isovolumetric pressure rise ($P_{det.isv} - P_{det.Q_{max}}$) is plotted against Q_{max} in Figure 2.

Figure 2. Isovolumetric pressure rise ($P_{det.isv} - P_{det.Q_{max}}$) plotted against Q_{max} .



Interpretation of results

There is clearly a relationship between the rise in pressure from full flow to isovolumetric and Qmax (Prise) though there is additional variability between patients. The best estimate is:

$$P_{\text{rise}} = Q \times 2.18 - 0.76 \text{ cmH}_2\text{O}$$

The low offset in the relationship suggests the regression line passes close to the origin which would be expected. The multiplication factor of close to 2 is much less than the factor of 5 previously proposed for men, though still higher than the factor of 1 found in reference 1 for elderly females. It is quite possible that the correct factor is population specific but the evidence here suggests a factor of 2 is more appropriate for men with LUTS. Conversely, these results also bring in to question the assumption that bladder contractility is not affected by surgery to relieve obstruction and lend indirect support to the findings of reference 3 which found contractility is reduced after surgery.

Concluding message

For BCI or other analysis relating pressure at full flow and isovolumetric pressure according to peak flow rate a factor of 2 should be used in stead of 5 in men with LUTS. It should however be recognised that there is significant variability about this mean correction factor for individual patients.

References

- World J Urol (1995) 13: 47-58.
 Scand J Urol Nephrol Suppl (2004) 215: 93-100.
 J Urol (2007) 178: 996-1001.

Specify source of funding or grant	Action Research
Is this a clinical trial?	No
What were the subjects in the study?	HUMAN
Was this study approved by an ethics committee?	Yes
Specify Name of Ethics Committee	Local ethics committeee
Was the Declaration of Helsinki followed?	Yes
Was informed consent obtained from the patients?	Yes