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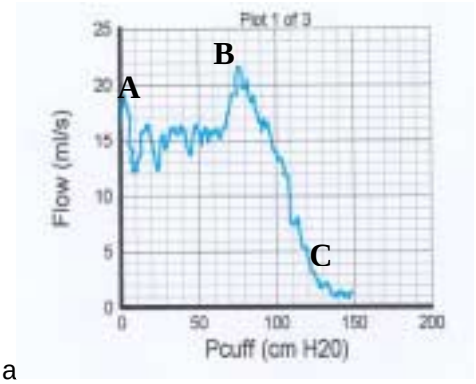
ASSESSMENT OF MINIMUM VOIDING PRESSURE USING A PENILE CUFF

Aims of Study

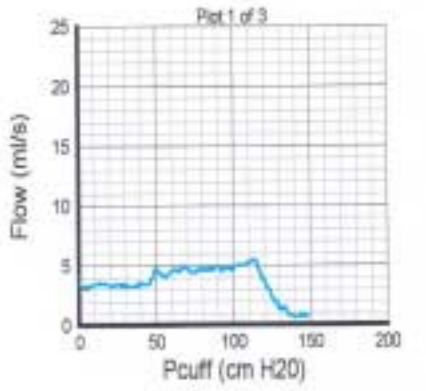
We are currently conducting a study evaluating the use of a penile cuff (similar to a neonatal blood pressure cuff) inflated during voiding, as a method of determining isovolumetric bladder pressure. The technique produces a graphical plot of cuff pressure against urinary flow rate. This enables us to determine the cuff pressure at which flow is interrupted, and it is suggested that this corresponds to isovolumetric bladder pressure (1).

Work in an experimental model, which included an area that could be pressurised to mimic an obstructive prostate, revealed that inflation of the cuff to a certain pressure, corresponding to a known external pressure exerted on the "prostatic urethra", did not affect flow rate, which remained constant (Figure 1a: A to B). Above this pressure, however, the cuff starts to govern flow rate and flow falls to zero at the point where bladder pressure is exceeded (Figure 1a: B to C). These patterns of cuff pressure and flow are also seen in clinical recordings (2). The point at which flow rate starts to fall has been termed the "knee" pressure (Figure 1a: point B).

We have been investigating this "knee" pressure to determine its relationship with bladder pressures during voiding.



a



b

Figure 1. 2 traces taken from the experimental model both with a "bladder pressure" of 120cmH2O. a) "prostate pressure" was set at 80cmH2O; b) "prostate pressure" set at 110cmH2O.

Methods

Male patients with LUTS were recruited from outpatients referred to our department. A specially designed penile cuff (Mediplus, UK) was placed around the penis and inflated during voiding using the Newcastle technique (1). Simultaneous intravesical pressures were recorded using a 6fr double lumen, fluid filled catheter (Mediplus, UK), connected to external pressure transducers zeroed at the level of the symphysis pubis, in accordance with the recommendations of the ICS standardisation committee.

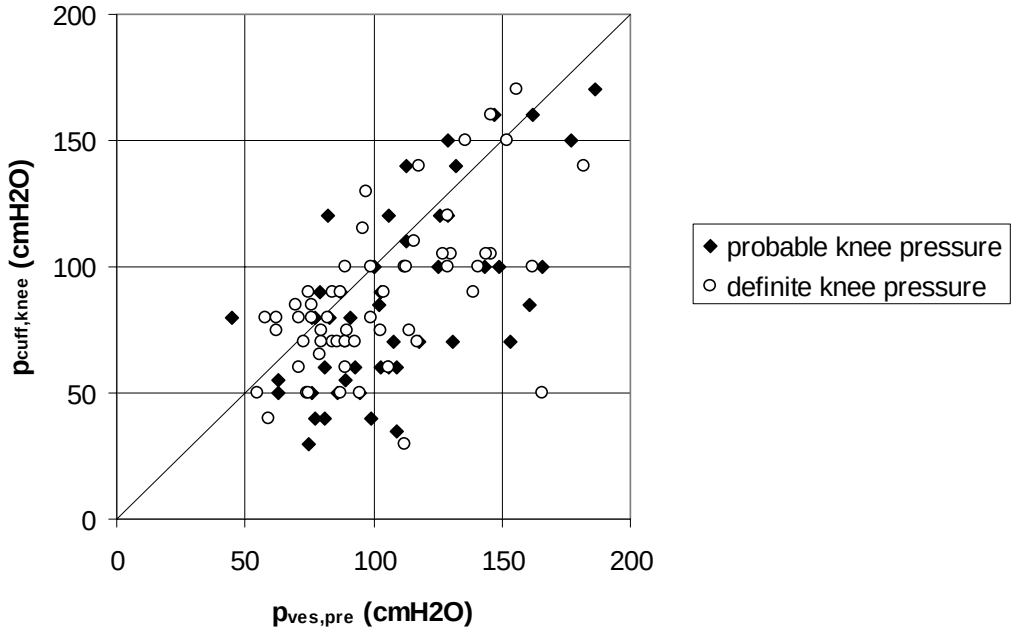
Cuff pressure vs. flow rate traces were analysed for the presence of a knee pressure. This pressure was then compared to vesical pressure at the point at which cuff inflation commenced, i.e. vesical pressure under conditions of normal flow.

Results

104 men (mean age 66years, range 42-86) underwent simultaneous cuff test and invasive pressure flow studies. 3 patients voided their urethral catheters and declined

recatheterisation, one patient was unable to void and in one patient no data was recorded by the equipment. 73 of the remaining 99 patients (74%) produced cuff pressure/flow plots with an identifiable knee pressure. In total 107 separate inflation cycles were included in the analysis. The knee pressures identified have been graded as "definite" (59/107) and "probable" (48/107) knee pressures. Graphical plot of knee pressure ($p_{cuff,knee}$) against vesical pressure at initiation of cuff inflation($p_{ves,pre}$) is shown below.

Bladder pressure at initiation of cuff inflation vs knee pressure



Conclusions

Where there is an identifiable knee pressure, allowing for the height difference between the cuff and bladder, bladder pressure at the start of cuff inflation ($p_{ves,\ pre}$) is approximately equal to or greater than the knee pressure. We therefore believe that $p_{cuff,\ knee}$ reflects bladder pressure under flow conditions, giving a reliable minimum value of p_{ves} during flow.

References

(1) Griffiths C, et al.; J Urol 167, 1344-1347. 2002.
(2) Drinnan M, et al.; Neurourology and Urodynamics 2003, 22(1):40-44.