

THE ORIGIN OF THE PENILE COMPRESSION RELEASE INDEX – A VIDEO URODYNAMIC ANALYSIS

Hypothesis / aims of study

The penile compression release (PCR) index is thought to be a useful non invasive tool in the diagnosis of BOO [1,2]. Understanding of the origin of the PCR index is not well understood. An investigation into the origin of the initial surge of urine (Q surge) after release of the penile compression will be undertaken. The aim was to test the hypothesis that the Q surge was related to the volume of urine contained in the increased cross sectional urethra caused by the compression. An automated penile cuff device was used to produce the compression and release of the urine.

Study design, materials and methods

Following ethical approval and with informed written consent subjects underwent video urodynamic investigation according to ICS Good Urodynamic Practice [3]. Briefly the bladder was filled with radiopaque medium 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). In addition, a 5cm metal wire was placed on the skin in the suprapubic area of the patient and a metal wire was placed circumferentially around the edge of the penile cuff. The 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 cmH₂O reached. The cuff then automatically deflated allowing flow to resume. The cuff inflation cycle was repeated throughout the duration of the void. During the voiding cycle, fluoroscopy was undertaken in the posterior lateral position, observing the bladder neck and urethra region. The images were recorded digitally by the Dantec Duet urodynamic machine.

The Dantec Duet video analysis software was length calibrated using the known marker of 5 cm on the patient. This allowed urethral lengths and widths to be measured. In order to calculate the volumes observed, the two dimensional video image of the contrast in the urethra was assumed to be circular in cross section. However the urethras observed were irregular in shape, therefore a series of cylinders were used to calculate the volume contained in the urethra from the cuff to the bladder neck. The volume of the surge of urine was calculated just prior to the release of the cuff, and this was subtracted from the volume contained in the urethra just after the cuff deflation. This calculated volume was compared to the volume measured by the flow meter during the Q surge.

Results

A total of 20 patients were recruited into the trial. The mean age was 68 (55 - 84) A total of 18 patients with a total of 43 cycles of penile cuff inflation and deflation were suitable for analysis. Figures 1 and 2 illustrate the relationship between the calculated Q surge volume from video urodynamics and the measured volume from the flow meter.

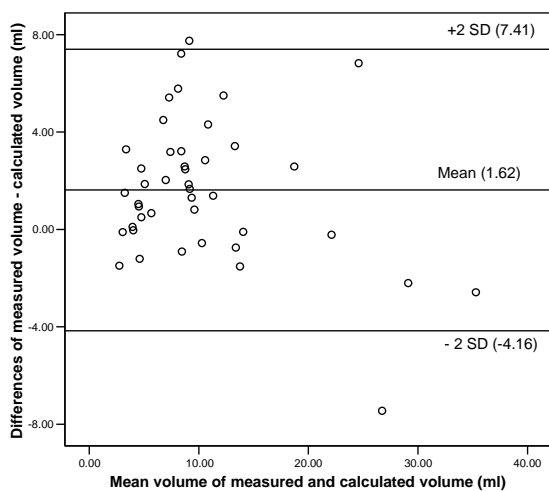


Figure 1: Bland Altman comparison of the measured and calculated Q surge volumes

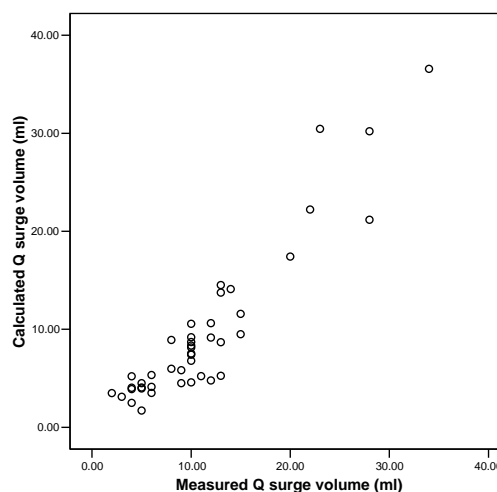


Figure 2 Correlation of the measured and calculated surge volumes (ml)

A student's t-test showed that the 2 volumes were not significantly different ($p=0.09$). The Pearson correlation coefficient was statistically significant at 0.931 ($p<0.0001$). The correlation between the Q surge and the isovolumetric detrusor pressure was also significant with a Pearson coefficient of 0.382 ($p=0.026$).

Interpretation of results

The results show that there is a close relationship between the calculated volume of urine contained in the urethra and the volume measured from the Q surge in the flow meter. The Bland Altman plot shows good agreement between the 2 different measures of the Q surge volume. A total of 95 % of the measurements lie within 2 standard deviations of the mean difference. Therefore the assumption made to assume the cross section was circular was reasonable. The calculated volume was generally less than the measured volume from the flow meter.

The isovolumetric detrusor pressure derived from the penile compression and prior to the penile release provides the driving force to the expulsion of the urine and will contribute to the magnitude of the Q surge. This factor may explain some of the variability of the results but to a less extent than the volume contained in the urethra. Others have demonstrated a positive relationship of the isovolumetric detrusor pressure and the Q surge [1]. This was also shown in this study.

Concluding message

The magnitude of the Q surge of the PCR index is related to the volume of urine contained in the urethra prior to release of the penile compression. The isovolumetric detrusor pressure also provides a contribution to the magnitude of the Q surge

References

1. J Urol. 2004 Dec;172(6 Pt 1):2312-5.
2. Neurourol Urodyn. 2000;19(6):657-69.
3. Neurourol Urodyn. 21, 167-78. 2002.

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HUMAN SUBJECTS: This study was approved by the Southmead hospital ethics committee and followed the Declaration of Helsinki Informed consent was obtained from the patients.