

DOES THE PRESENCE OF A URETHRAL CATHETER AFFECT PRESSURE-FLOW PARAMETERS MEASURED NON-INVASIVELY BY THE PENILE CUFF TECHNIQUE?

Aims of Study

The validation of non-invasive methods of measurement of voiding parameters necessarily involves the simultaneous invasive measurement of intra-vesical pressure which is most easily achieved by urethral catheters. Our studies of flow interruption by inflation of a penile cuff suggest that the penile cuff pressure sufficient to interrupt flow ($P_{\text{cuff,int}}$) should be equivalent to isovolumetric bladder pressure ($P_{\text{ves,isy}}$). Validation of the technique has compared $P_{\text{cuff,int}}$ with $P_{\text{ves,isy}}$ measured using a urethral catheter [1,2]. Though the results are encouraging, the variation in accuracy is greater than anticipated from measurements of pressure within the penile urethra compared to cuff pressure [3]. It is possible that the presence of a urethral catheter may influence the reliability of the technique. In this paper we test the null hypothesis that the presence of the catheter does not affect the measurement obtained. If true, repeated cuff tests on the same patients should have the same consistency, whether or not a catheter is present for one of the tests.

Methods

Ninety one men with lower urinary tract symptoms (LUTS) referred for invasive pressure flow studies (PFS) and non-invasive urodynamic assessment using the cuff method were included in this study. The non-invasive cuff method was performed both with and without the presence of a urethral urodynamic catheter (6F calibre) and the results compared. Agreement was investigated by the Bland Altman method plotting the difference of the two measures of $P_{\text{cuff,int}}$ versus the mean [4]. The values of $P_{\text{cuff,int}}$ with and without lines were analysed for significant differences using Student's t-test.

In addition sixty two subjects returned for repeat cuff tests and these results were compared with the previously obtained data using the Bland Altman method and Student's t-test. The repeat cuff tests were performed within a four week period to prevent disease progression influencing the results. Data sets were excluded if voided volume (VV) was less than 150ml in any of the voids analysed as this has previously been shown to be a minimum VV requirement [2].

Results

Following exclusions, sixty two data sets were included for analysis of the effect of the presence of urethral urodynamic catheters. The values of cuff pressure at flow interruption ($P_{\text{cuff,int}}$) with and without urethral lines were plotted and agreement assessed. The data obtained is shown below:-

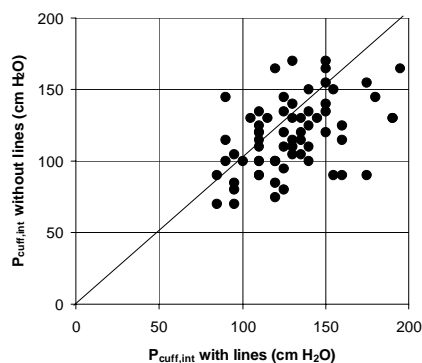


Fig 1a: Comparison of $P_{\text{cuff,int}}$ with and without lines.

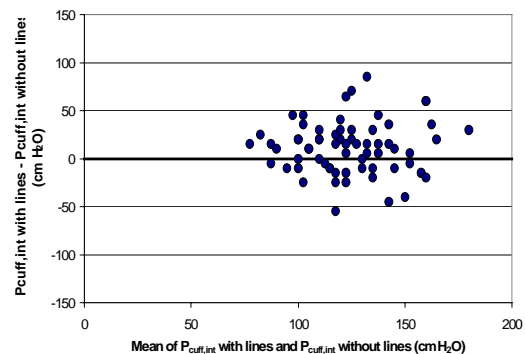


Fig 1b: Bland Altman plot of mean $P_{\text{cuff,int}}$ values versus difference.

	Mean $p_{\text{cuff,int}}$ (cm H ₂ O)	SD $p_{\text{cuff,int}}$ (cm H ₂ O)	P value (Student's t test)
With urethral lines	129.5	26.4	0.001
Without urethral lines	118.1	25.5	
Difference	11.4	27.1	

Table 1: Effect of urethral lines on $P_{\text{cuff,int}}$

These results show a significantly higher mean $P_{\text{cuff,int}}$ with a urethral urodynamic catheter present. Inspection of the Bland Altman plot reveals an offset towards higher values of $P_{\text{cuff,int}}$ in the presence of urethral lines. Application of Student's t-test has shown a very low probability that this difference is due to chance. Following exclusion, again on the basis of voided volume less than 150ml, the test/retest reliability of the cuff method was examined using the data from thirty four subjects who attended for follow up cuff tests. The values of $P_{\text{cuff,int}}$ pertaining to the two tests were plotted and any difference examined as shown below:-

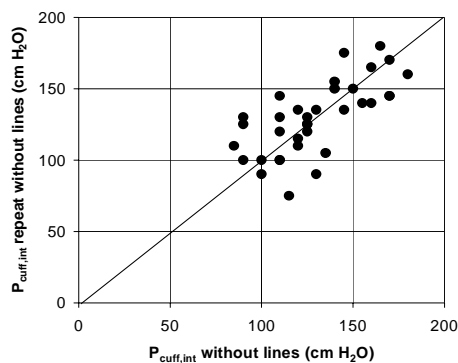


Figure 2a: Comparison of $P_{\text{cuff,int}}$ in two separate cuff tests.

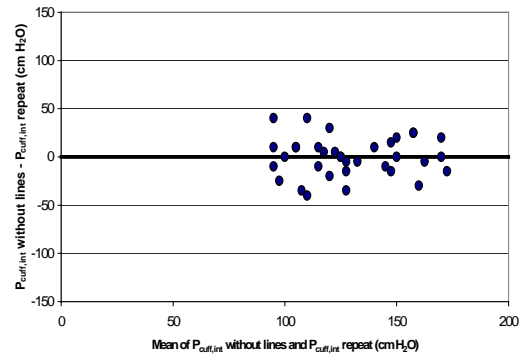


Figure 2b: Bland Altman plot of mean $P_{\text{cuff,int}}$ values versus difference in two separate cuff tests.

	Mean $p_{\text{cuff,int}}$ (cm H ₂ O)	SD $p_{\text{cuff,int}}$ (cm H ₂ O)	P value (Student's t test)
Cuff test 1	129.3	26.2	1.0
Repeat cuff test	129.3	25.6	
Difference	0.0	20.3	

Table 2: Comparison of $P_{\text{cuff,int}}$ in two separate cuff tests.

This data shows no significant difference between values of $P_{\text{cuff,int}}$ from the repeat cuff test when compared with the original investigation.

Conclusions

This study strongly suggests that the presence of a urethral urodynamic catheter significantly alters values of parameters measured using the cuff method. The variability between individual cuff tests has been shown, via the test/retest data, to be minimal and the difference in $P_{\text{cuff,int}}$ values seen in the invasively validated data could be assumed to be due to the presence of lines. Care must be taken therefore when any cuff parameters are measured in the presence of urethral lines. One possible reason for the differences seen may be that in the presence of a urethral line, compression and therefore occlusion of the penile urethra requires higher pressure from the cuff. Further work using supra pubic catheters to compare invasive measurements with those determined from the cuff test is needed.

References

- 1: J Urol 2002; 167: 1344-1347
- 2: Proceedings of 32nd Annual Meeting of the International Continence Society 2002
- 3: J Urol 2001; 166: 2545-2549
- 4: Lancet 1986; 1: 307-310