6

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A NEW METHOD FOR NON-INVASIVE MEASUREMENT OF VOIDING PRESSURE? ASSESSMENT OF PENILE CUFF OCCLUSION

Aims of Study

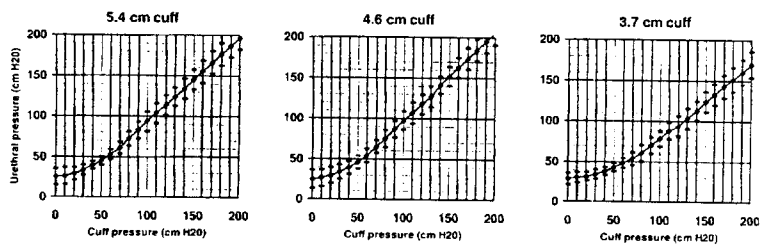
Although pressure flow studies define the presence of bladder outlet obstruction in men with lower urinary tract symptoms, widespread application is restricted by their invasive nature. In common with other groups we have been studying different non-invasive methods of measurement of voiding parameters (1, 2, 3). During voiding there exists a continuous column of fluid between the bladder and external urethral meatus. If flow is stopped by an external force distally whilst the urethra (including the 'flow controlling zone') remains open, then the pressure required to stop flow will theoretically be equivalent to intravesical pressure if the height difference is allowed for. We are currently investigating a new non-invasive method for measuring bladder pressure during voiding using distal urethral occlusion achieved by the step-wise inflation during voluntary voiding of a paediatric blood pressure cuff placed around the penile shaft. We now report the results of a series of experiments in healthy volunteers designed to test the validity of the basic assumption of this technique, namely that cuff inflation pressure is equal to urethral pressure, in particular at the point of occlusion.

Methods

Four asymptomatic volunteers were studied. In each subject urethral pressure within the segment encircled by a paediatric blood pressure cuff was measured with a microtip transducer (Gaeltec, Isle of Skye, UK) in the presence of lidocaine lubricant. For one subject, measurements were repeated using an air-filled balloon (supplied by D. James, Exeter, UK). Penile cuffs of width 3.7, 4.6 and 5.4 cm were inflated in turn and urethral pressure recorded. The pressure transducer was placed at the mid point of the cuff which was then inflated with 10 cm H_2O increments throughout the range 0 - 200 cm H_2O using a specially constructed apparatus. This procedure was repeated for each cuff size after displacing then repositioning the catheter. The mean urethral pressure recorded at each 10 cm H_2O increment of cuff inflation was then calculated and expressed graphically. For 3 of the subjects, for each cuff size, the Gaeltec transducer was withdrawn through the cuff region to give a profile measurement and the peak pressure measured.

Results

Cuff inflation to 200 cm H_2O was well tolerated by the volunteers with little discomfort. Penile diameter ranged from 3 - 3.5 cm. The 3 graphs below show urethral pressure measured with the microtip transducer plotted against cuff pressure in 10 cm H_2O increments for each of the 3 cuff sizes. For each pressure, the mean and standard deviation of 8 values are show (4 subjects x 2 measurements each).



Above 50 cm H_2O, the balloon catheter (sensing length 1.5 cm) gave very similar results to the microtip transducer for the 5.4 cm cuff, but increasingly underestimated for the narrower cuffs. The peak pressures measured during the withdrawal were 127 ± 12, 120 ± 22 and 109 ± 14 cm H_2O (mean ± SD) respectively.

Conclusions

It is concluded that pressure generated by stepwise inflation of a penile pressure cuff is a valid and reliable method of controlling intraurethral pressure at mid-cuff level. Of the cuff widths investigated, the wider cuffs (5.4, 4.6 cm) allow greater accuracy whilst the narrowest of the cuffs investigated (3.7 cm) underestimates urethral pressure by approximately 20% in the range of interest. These data encourage the use of incremental penile cuff inflation as a non-invasive method of measuring isovolumetric bladder pressure during voiding.

References

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7

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AMBULATORY URODYNAMICS: DO WE NEED IT?

INTRODUCTION

Ambulatory urodynamics is not widely used in clinical practice as many authors reported a high prevalence of abnormal detrusor contractions in asymptomatic subjects[1]. Additionally many clinicians have no access to this diagnostic tool which requires specialised expertise, is expensive and time-consuming. Therefore when conventional urodynamic investigation results are inconclusive women with urinary symptoms are often treated symptomatically, on the basis of the frequency/volume chart or using specific laboratory urodynamic parameters,.

The aim of this study was to evaluate whether ambulatory urodynamics alters the management of women with urinary symptoms but non-diagnostic laboratory urodynamics.

METHODS

The clinical records of women with urinary symptoms but non-diagnostic laboratory urodynamics were analysed. They all underwent ambulatory urodynamics. Four different assessers examined the medical history, gynaecological examination findings, urinary symptoms questionnaire, frequency/volume chart and laboratory urodynamic reports but were blinded to the ambulatory urodynamic result and their subsequent management. The assessors decided a plan of treatment for each woman, specifying which amongst the medical history, gynaecological examination findings, urinary symptoms questionnaire, frequency/volume chart and urodynamic parameters which were most important in deciding the management of the woman.

The data were entered into a dedicated database and used to compare the proposed treatment with the actual management, decided upon after ambulatory urodynamics.

RESULTS

In this study one hundred women were investigated (mean age of 47.9 years, range 18-83 years). After ambulatory urodynamics 44 had a final diagnosis of abnormal detrusor contractions whereas 56 had a stable bladder. In 60% of the women management was different after ambulatory urodynamic. Table 1 shows the actual treatment received after ambulatory urodynamics and the one proposed in this study.

Actual treatment	33	3	21	37
Proposed treatment	36	31	17	16

Table 2 shows the treatment proposed after AU and after reviewing the same cases without considering AU. The patients were grouped according to the final AU result of stable (no DI) or unstable bladder (DI).

		Antichol.	Antichol. ± Physio	Physio	Other
Standard management	DI/no AU	22	13	5	4
	DI after AU	31	8	3	2
Management after ambulatory uds	No DI/No AU -	14	18	12	12
	No DI after AU	2	1	18	35

When deciding on management without the benefit of ambulatory urodynamics the following parameters were felt to be important (figure 1)