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Title (type in CAPITAL LETTERS, leave one blank line before the text):

THE EFFECT of PRESSURE MEASUREMENT TECHNIQUE in URODYNAMICS

AIMS of STUDY – good urodynamics (UDS) depends on the accurate measurement of pressure during filling and voiding, normally using either a fluid-filled catheter connected to an external transducer (ET) or by a catheter-mounted microtransducer (MT). ETs are prone to problems such as air bubbles, leaks or kinks in connecting tubing, and damping of pressure transmission. MTs are delicate and temperature-sensitive. Once inserted they cannot be re-zeroed to atmospheric pressure without being removed. Artefactual pressure changes may occur due to impact of the transducer with faeces or with movement.

An important theoretical objection to the use of MTs relates to the difference in the pressure measured by the different systems[1].The pressure recorded by an ET depends on the level of the ET in relation to the body. If the ETs measuring abdominal and vesical pressure (p_{abd} and p_{ves}) are at the same level, in the absence of active contraction or passive distension the recorded pressures should be the same, and thus detrusor pressure (p_{det}) will normally be close to zero. On the other hand, the pressure measured by an MT depends on its position in the body cavity, which is not normally known. As rectal and vesical MTs may well be at different levels in the body, the p_{det} will tend to be inaccurate. Absolute pressures measured by MTs will also differ from those recorded by ETs. We were unable to identify any published data on the magnitude of the difference in recorded pressures at rest, or on the measurement of other pressure changes (e.g. due to detrusor contraction or coughing) by the two systems, and therefore designed the present study.

METHODS - women referred for UDS were recruited. Pressures were recorded throughout UDS using MTs and ETs, with simultaneous pressure subtraction using a Dantec Duet machine. Both systems were zeroed to atmospheric pressure, with ETs fixed at the level of the symphysis pubis. A single transducer Gaeltec MT catheter, and an epidural catheter piggy-backed on an 8 Fr filling catheter, were inserted together into the bladder. A single-transducer Gaeltec MT catheter and a 6 Fr catheter, protected by finger cots, were inserted together into the rectum. Equal pressure transmission was tested by coughing, and connecting tubing for ETs was checked for bubbles, leaks or kinks.

The p_{abd}, p_{ves} and p_{det} were recorded at rest in different postures before UDS, which was performed with the patient sitting, filling at 30-50 ml/min and removing the filling catheter at capacity. Computer traces were reviewed by a single reviewer (J.S.) for the measured pressures during coughs, unstable detrusor contractions, voiding contractions, and after-contractions (ACs). Traces were also assessed for the overall quality of cough and live signal subtraction.

RESULTS – 20 women agreed to join the study. One woman found catheter insertion too painful, leaving 19 tests for analysis. The mean pressures recorded using ETs and MTs are shown in the table below. All means are in cmH_2O.

Posture	SUPINE			SITTING			STANDING		
Pressure Measured	P_{ves}	P_{abd}	P_{det}	P_{ves}	P_{abd}	P_{det}	P_{ves}	P_{abd}	P_{det}
External Transducer (ET)	6.2	5.1	1.1	28.9	28.4	0.5	35.8	34.7	1.0
Micro Transducer (MT)	11.4	16.1	-4.7	32.2	35.2	-3.1	33.0	33.4	0.4
Mean Diff. between ET and MT	5.2	11.0	5.8	3.3	6.8	3.6	-2.8	-1.3	1.4

Cough subtraction was normally good with both systems. Live signal subtraction was generally more precise with MTs, giving a smooth p_{det} trace. Detrusor instability was noted in 8 patients. In 3 of these the measured amplitude of detrusor contractions was markedly different (>20 cm H_2O). In all 3 cough tests suggested reasonable pressure subtraction, although in 2 of the 3 there were other suggestions of imperfect pressure transmission. Four patients were unable to void with catheters in, and 2 patients had 1 or more lines displaced during voiding. In 3/13 patients with complete voiding data the p_{det} at maximum flow differed by >20 cm H_2O, again with reasonable cough

subtraction in all 3, but with some other evidence of imperfect pressure transmission in 2 patients. ACs were noted in 4 of the patients who voided. In all 4 cases, the peak pressure measured by MT during ACs was higher than with ET (+23 to +168 cm H_2O), despite otherwise good evidence of equal pressure transmission in 3 out of 4.

CONCLUSIONS – the differences in absolute resting pressures recorded using ETs and MTs are relatively modest, but should perhaps be borne in mind when analysing absolute p_{abd} or p_{ves} values, e.g. during leak point pressure measurement. Differences in resting p_{det} are small, and in the sitting and standing positions are not likely to have a signifcant impact on the interpretation of UDS results. However, comparison of simultaneous measurement with ETs and MTs showed moderate or large differences in the magnitude of changes in p_{det} in 7 of 19 patients, despite apparently good pressure transmission in both systems in most cases. Whether these differences reflect problems with ETs (e.g. kinking of fluid-filled tubing), or MTs (e.g. direct contact of the bladder wall with the transducer), or both, is unclear. This small study suggests that it cannot be assumed that detrusor pressure changes are measured equally by different measurement systems. The quantification of p_{det} changes with ETs and / or MTs - e.g. in diagnosing bladder outlet obstruction or in grading detrusor instability - may be less accurate than previously thought. As both systems are widely used, this is an area worthy of further study.

REFERENCES – 1. Proceedings of the 12th Annual Meeting of the ICS, Leiden, 1982, pp 53-5.

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Title (type in CAPITAL LETTERS, leave one blank line before the text):
SENSATIONS DURING URODYNAMICS AND SENSATIONS SCORED IN VOIDING DIARIES: ARE THEY COMPARABLE?

AIMS OF STUDY: In idiopathic detrusor instability an objective diagnosis is made with urodynamic investigations. The severity of the patients' symptoms of urge and frequency correlate poorly with urodynamic findings [1]. Traditionally detrusor instability has been the main focus for diagnosing patients and directing their management. Little progress has been made with the evaluation or management of the sensations of urge. The presence of an indwelling catheter can produce the perception of urge [2] which may confound the urodynamic assessment. We have developed a more objective measure of the sensations perceived by patients during filling cystometrograms. The aim of this study was to compare the graded scores of sensations of urge recorded by the patients in voiding diaries with the same graded urge scores measured objectively during filling cystometrograms.

METHODS: 5 patients with an established diagnosis of idiopathic detrusor instability were studied. Medication prescribed for an overactive bladder was discontinued. Patients completed a voiding diary for one week. In this diary they recorded the measured volume of each void, whether they felt empty after voiding and the degree of urgency prior to voiding. The degree of urgency was scored from 0 to 4 where 0 = no urge, 1 = mild urge, 2 = moderate urge, 3 = strong urge and 4 = "desperate" urge. Patients then attended the urodynamic department for medium fill cystometry. Serial CMGs were performed and during each CMG a keypad device was used by the patients to score their levels of urge, according to the same scale used in the diary. The keypad device enabled patients to signal their sensations without prompting by, or discussion with, the investigator. The urge score was continuously recorded on our standard urodynamic equipment. Sensations recorded in diaries were then compared to those obtain during CMGs.

RESULTS: Correlation between the 4 point urge score recorded in voiding diaries and the urge score recorded during filling cystometry was good in 4 patients. In the other patient, bladder volumes recorded during urodynamics were less than those recorded in the diary for each urge level scored. It is possible this effect was due to catheter interference. All other patients did not consider that the catheter interfered with their perception of bladder sensation.