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Title: SMALL CHANGES IN FILLING MEDIUM TEMPERATURE AND FILLING RATE AFFECT URODYNAMIC RESULTS

Aims of Study

It is well known that large variations in technique can affect the results of urodynamics (UDS). These studies were designed to explore the effects of smaller variations of technique not previously studied in detail, which may help in interpretation of results from different centres and with future recommendations on standardisation.

Methods

Subjects were recruited from neurologically-normal patients referred for UDS. Repeated UDS were used, with an interval of at least 10 minutes.

Study 1 – to compare filling with room temperature (20°C, cool fill) and body temperature (37°C, warm fill) saline. To avoid bias from the effects of repeated filling, a randomised crossover design was chosen. Subjects were randomised to either warm or cool fill on the first fill, and then the alternative temperature on the second fill. Saline was warmed to 37°C using a blood-warmer.

Study 2 – to compare filling at 50 ml/min and 100 ml/min. As an order effect was considered likely [Sorensen], a randomised controlled design was used, with subjects filled at 50 ml/min on the first fill and then again either at 50 ml/min (Group A) or at 100 ml/min (Group B).

UDS traces were analysed by one observer (JS). Detrusor instability (DI) was diagnosed by a phasic rise of detrusor pressure of ≥ 5 cm H₂O. If no contraction occurred, the volume at first unstable contraction was assumed equal to the cystometric capacity. Compliance (C) was calculated from the rise in pressure from start to end of filling; if no stable baseline was achieved at capacity C was not calculated. If the pressure rise was zero or negative, to avoid nonsensical values of C the pressure rise was recorded as 1 cm H₂O. Normal C was defined as ≥ 40 ml / cm H₂O [Stott].

Statistics: Study 1 – comparison of means of paired results: paired 't' test. Proportions with DI: McNemar's test. Study 2 – comparison of mean differences between fills: two-tailed 't' test.

Results

Study 1 –

40 subjects were recruited (age 35 –77, mean 57.2 yrs; 12 men, 28 women). The results are presented in table 1. A significantly higher proportion of patients showed DI with cool fill. Volume at first desire to void (V@ FDTV; ml) and cystometric capacity (Cyst Cap; ml) were similar. In subjects with DI, there was a significant difference in the volume at first unstable wave (V@FW; ml), but not the amplitude of the largest contraction (max wave; cmH₂O). C (ml / cmH₂O) tended to be lower with cool fill, but this was not statistically significant. The mean maximum flow rate (Qmax; ml/s) was significantly lower with cool fill, but mean detrusor pressures at opening (pdet.open; cmH₂O) and at Qmax (pdet.Qmax; cmH₂O) and mean AG number were not statistically different. Table 1 – paired proportions / means for 40 patients. DI = number with DI; PVR = post-void residual.

Variable	DI	C Cap	V@ FDTV	V@FW	Max wave	C	pdet.open	pdet.Qmax	Qmax	AG No.	Vol. void	PVR
COOL FILL	29	270	129	120	28	165	40	42	13	16	254	21
WARM FILL	21	285	150	197	24	210	37	43	16	12	237	48
p=	0.02	0.28	0.38	0.02	0.4	0.08	0.17	0.54	<0.01	0.23	0.19	0.08

Study 2 -

50 women were recruited (aged 34 – 76, mean 52). The results are presented in Table 2. Mean C increased between fills in Group A, but decreased in Group B ($p < 0.01$). However, only 1 patient had abnormal C (38 ml/cmH₂O, Group A, 2nd fill). Cyst cap increased with second fill in Group A, but decreased in Group B. No other variables showed significant differences.

Table 2 – mean percentage change from first to second fill in Groups A and B.

Variable	C Cap	V@ FDTV	V@FW	Max wave	C	pdet.open	pdet.Qmax	Qmax	AG No.	Vol. void	PVR
Group A	+11.3	+40.0	+84.0	-41.6	+22.1	+8.9	+6.5	-0.6	+9.2	+4.6	+45.2
Group B	-8.4	+29.1	+14.8	-29.3	-32.8	+8.0	+4.8	-5.5	+10.1	-13.3	+71.1
p=	0.03	0.85	0.19	0.77	<0.01	0.87	0.81	0.68	0.92	0.10	0.57

Discussion

Only one published study is available on the effect of filling medium temperature in cystography [Zerin] and none in UDS. The current study suggests using room temperature filling medium during UDS significantly alters bladder behaviour. The mechanism is presumably similar to that of the ice water test, which has a median threshold temperature as high as 24°C [Geirsson], and which is positive in 15% of patients with DI [Petersen]. The reason for the lower Qmax with cool filling medium is not clear, although a cool stimulus to the urethra may play a part. In any event, there was no clinically significant difference in voiding pressures or AG number. We are reanalysing our records to find out whether those with DI only on cool fill have similar symptoms to the other patients with DI.

This study provides greater detail than previous studies of filling rates during standard UDS [Sørensen, Robertson, Wagg]. In contrast to those studies, the present study showed that increased filling rate caused a reduction in cystometric capacity and bladder compliance. However, abnormal compliance was rare.

In conclusion, filling medium temperature and filling rate both have significant effects on the results of UDS. Both these aspects of technique should be standardised in any multicentre trial or research.

References

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