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DEPENDENCE OF PRESSURE-FLOW PARAMETERS ON BLADDER FILLING RATES AND SEVERITY OF URGE

Hypothesis / aims of study

For an accurate assessment of bladder outlet resistance and detrusor contractility, pressure-flow (PQ) studies are recommended for patients with complex voiding dysfunctions, especially in men with pharmacologically resistant Lower Urinary Tract Symptoms (LUTS). Despite the importance of PQ studies in the evaluation of patients with LUTS, the effects of technique-related factors implemented during cystometry on the subsequent PQ studies have not been extensively considered.

Although slow rates of bladder filling are preferred in simple cystometry to assess bladder compliance and detrusor reflex responses, it is not clear whether filling rates negatively affect PQ studies. Since these studies frequently must be repeated in a given patient to ensure reproducibility and to adjust technical issues such as signal noise, catheter displacements and others, the bladder filling rate has a significant impact on prolonging the procedure time and increasing patient discomfort and inconvenience.

Since the goal of PQ studies is to assess the acts of voiding, the degree of bladder sensation under non-voiding conditions is essentially not considered in the analysis. It is not uncommon that PQ studies that immediately follow cystometrograms are preceded by severe urge with the patients trying to prevent initiation of flow. However, whether the severity of urgency preceding the act of urination has an influence on P-Q parameters has not been determined. If these parameters are dependent upon the preceding degree of desire to void, analysis of PQ studies would require acknowledging these voiding conditions.

To address the impact of bladder filling rate and degree of urge on PQ parameters, we conducted a retrospective analysis of urodynamic studies performed in patients subjected to slower and faster rates of bladder filling, as well as in patients who had repeat PQ studies with two different types of initiation of micturition (urgency and no urge).

Study design, materials and methods

PQ studies conducted in adult men with LUTS during the last ten years at our institution were retrospectively analysed. These studies were performed in the standing position after a fluoroscopically-assisted filling cystometrogram and voiding cystourethrogram in the supine position. Patients with spinal cord injury, multiple sclerosis, Parkinson's disease, severe stroke and those with overt neuropathologies were excluded from the analysis. Only those who had interpretable repeat PQ studies were included in this analysis. In the first set of studies with slow, medium and fast filling rates, we used 25 ml/minute, 50 ml/minute and 100 ml/minute, respectively via a 7F dual lumen catheter. In the second set of PQ studies, patients were advised not to initiate voiding despite a strong desire to void; they were asked to prevent urination until they no longer could postpone the act. After they completed their urgency associated micturitional acts, bladders were refilled and PQ studies were repeated with instructions to the patients to initiate micturition despite the lack of desire to void. Only those who had repeat studies under these two sets of conditions were selected for analysis. Differences in pressure-flow parameters including detrusor contractility (Watts Factor), bladder outlet obstruction index (BOOI), detrusor pressure at maximum flow ($Pdet_{Qmax}$), detrusor opening pressure ($Pdet_{open}$), and detrusor closing pressure ($Pdet_{close}$) were analyzed.

Results

The age of the patients ranged from 51 to 92 years of age. One hundred patients had either PQ study repeated with urge-hold and no-urge voids (n=74) or studies done with different rates of bladder filling (slow vs fast fill studies were done in 26 patients, 8 of them had medium fill versus fast fill).

Faster filling rates did not significantly alter detrusor contractility, although half of the patients had lower WF values and five patients had higher WF values compared with slow fill rates. No significant changes in BOOI were seen; only two patients showed changes, one from obstructed to equivocal and the other from equivocal to the obstructive category. The opening time ranged from 2.1 to 20s in the first set of patients but there was no significant difference between the slow and fast filling rates. The post-void residual volume (PVR) was elevated after the second PQ study with fast fill in 12 patients, with PVR ranging from 110 ml to 250 ml.

In the second set of studies, 74 patients successfully completed both types of micturition. Among all the PQ parameters, $Pdet_{open}$ was significantly increased in urgency micturition compared to micturition without urge. No significant differences were noted with respect to WF and BOOI.

Interpretation of results

No statistically significant differences in PQ parameters were observed when comparing bladder filling rates, although a tendency for decreased WF and increased PVR was seen with the fast fill study. Since faster bladder filling does not significantly influence relevant PQ parameters and urodynamic diagnoses, the procedure time and patient inconvenience can be markedly reduced if repeat studies are performed using faster filling rates. Similarly, except for increased $Pdet_{open}$, no other significant changes in PQ parameters were observed with urgency micturition compared to micturition without urge.

Concluding message

Our studies in two sets of patient groups showed that the rate of bladder filling up to 100 ml/minute and the severity of urge prior to PQ studies do not significantly alter clinically relevant parameters such as WF for bladder contractility and BOOI for bladder outlet resistance. Since these findings are based on a retrospective analysis of urodynamic studies, a prospective study is needed to corroborate our observations.

Disclosures

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