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COMPARISON OF MEASUREMENTS OBTAINED WITH MICROTIP AND EXTERNAL WATER PRESSURE TRANSDUCERS

Hypothesis / aims of study

The aim of this study was to compare simultaneous pressure readings obtained with catheter-mounted microtip and external water pressure transducers during filling cystometry.

Study design, materials and methods

During multichannel urodynamic testing, two 8Fr urodynamic urinary catheters were simultaneously zeroed at the urethra and placed into the bladder. 107 women were recruited of whom 97 produced evaluable data; the primary reason for data being excluded was detrusor instability. Women were randomized to a combination of either two microtip (MM, n = 16) or two external water pressure transducer (WW, n = 18) catheters, or a combination of the two transducer types (MW, n = 63). Both transducers were connected to a multichannel urodynamic recorder so both pressure tracings could be recorded concurrently. A series of three coughs and two Valsalva manoeuvres of various strengths and at different volumes (150mL, 300mL) were then performed during the course of cystometric evaluation. Cough efforts generated pressures < 50, 50-100, and > 100cm water over baseline. Valsalva efforts generated pressures < 75 or ≥ 75cm water over baseline. The simultaneous intravesical pressure (IVP) readings generated by the two systems at baseline, and the maximum IVP readings at each event were then compared using paired t-tests and Pearson correlation coefficients.

Results

Data were analyzed from 97 patient volunteers. The subjects had a mean age of 54.2±13.0 years, 89% were Caucasian and 9% were African American.

The differences between IVP readings from the catheter pairs were calculated. Microtip catheters showed the smallest mean differences (0-1cm H_2O), while external water pressure transducers showed slightly larger mean differences (3-8cm H_2O). Large mean differences were observed when comparing microtip and external water pressure transducers catheters (8-24 cm H_2O pressure, all p-values <0.001 by paired t-test) (Table 1). The standard deviation of the differences were large between microtip and external water pressure transducers compared to those between catheters of the same type.

Table 1. Mean (±SD) IVP between transducers (cm H_2O)

Volume	IVP Difference Mean (±SD)	MM	MW	WW
300ml	Valsalva 1	0 (±2)	8 (±11)	-5 (±6)
	Valsalva 2	-1 (±2)	10 (±13)	-5 (±7)
	Cough 1	0 (±1)	10 (±14)	-3 (±5)
	Cough 2	-1 (±2)	17 (±19)	-6 (±7)
	Cough 3	-1 (±4)	24 (±27)	-8 (±11)

Correlation of maximum pressure readings was consistently high between microtip transducers (r = 0.99), regardless of the type of manoeuvre, or the volume of testing. Correlation between external water pressure transducers was also high across varying manoeuvre types at both testing volumes (r = 0.96-0.99). Correlations were lower between readings of microtip and external water pressure transducers (r=0.89-0.94). Within this group, correlations were lower for baseline readings and coughs compared to Valsalva manoeuvres (Table 2).

Table 2. Pearson correlation between transducers

		Groups					
		MM	MM*	MW	MW*	WW	WW*
150cc	Baseline	0.91	-	0.71	-	0.74	-
	Cough	0.99	0.99	0.87	0.89	0.97	0.96
	Valsalva	0.99	0.99	0.92	0.93	0.95	0.97
300cc	Baseline	0.93	-	0.66	-	0.80	-
	Cough	0.99	0.99	0.88	0.89	0.98	0.98
	Valsalva	0.99	0.99	0.92	0.94	0.94	0.97

*Adjusted for baseline pressure prior to event

Interpretation of results

Small standard deviations and high correlations were seen for transducers of similar type, suggesting excellent reproducibility. While correlation between microtip and external water pressure transducers was also high, there were significant differences in the maximum pressures measured by these two systems for individual pressure events. The mean differences between microtip and external water transducers for the strongest cough efforts were large and could be clinically significant. Differences were greatest for rapid pressure changes (cough efforts) and appear to increase in proportion to the magnitude of the pressure generated. A similar effect was not seen with Valsalva manoeuvres. The large standard deviations seen suggest considerable variability in pressures recorded by each transducer, indicating that these systems are not simply interchangeable.

Concluding message

The differences in pressure readings between microtip and external water pressure transducers are clinically significant, particularly for cough efforts of a strength used for clinical testing; therefore, pressures obtained from these catheters should not be assumed to be directly comparable. Research studies should use a consistent catheter type and not alternate between the two when recording leak point pressures. Microtip transducers showed the smallest intracatheter variability and may provide data of higher reproducibility.

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