

DOES THE CHOICE OF CYSTOMETRY CATHETER AFFECT URODYNAMIC DIAGNOSIS?

Hypothesis / aims of study

- 1) Comparison of published cystometry Quality Assurance (QA) data given catheter.
- 2) Comparison of urodynamic diagnoses made with water perfused catheters (WPCs) with and without filtering to simulate the effect of air-charged catheters (ACCs).

Study design, materials and methods

- 1) Two-tailed Fisher's test on published data (1).
- 2) Verification of the published frequency response (2), allowing design of a digital filter using Microsoft Excel to replicate this.
- 3) 19 consecutive clinical cystometrograms (recorded using WPCs) were exported to Microsoft Excel where diagnoses was made before and after digital filtering simulating the use of ACCs. The analysis was primarily qualitative, with some comparison of key pressure values using 95% confidence intervals and Bland-Altman analysis.
- 4) Conversion of the filter to Matlab to allow filtering of additional clinical recordings.

Results

In our study on a mixed group of patients, no qualitative differences in urodynamic diagnoses were identified before and after filtering of 19 CMGs recorded with WPCs. Five cases were entered into a paired comparison of maximum DO amplitude and nine values of Pdetmax during voiding were similarly compared. There were no differences between catheter types (figure 1) and a power calculation suggests that a total of 50 data points (in each comparison) would achieve 80% power in proving these equivalences. Bland Altman analysis suggested that for mild DO, ACCs recorded larger values than WPCs, but for larger contractions the WPC peak was larger (figure 2), however, differences <5 cmH₂O are unlikely to be clinically significant.

Interpretation of results

It has previously been shown that for female patients, while WPCs were better at achieving good resting subtraction when the patient was supine, ACCs had fewer problems in general during the filling phase (1). However, the total number of QA issues was the same for each type of catheter (Pves: 100/321 vs. 96/321, p=0.79; Pabd 109/321 vs. 109/321, P=1.00). Other published data (2) demonstrated that ACCs create a high-frequency cut-off of 2.5Hz with a fairly shallow roll-off. This effect was replicated most effectively by a two-pole Chebyshev recursive digital filter (2.5Hz cut-off and 0.5% pass band ripple).

In our study, WPCs and ACCs appear to be equivalent for making urodynamic diagnoses in a urology continence service including male and female patients with a range of diagnoses. For female patients with USI, cough leak point pressures (CLPPs) could be affected; a lab study (3), showed a 17% reduction in CLPP values for ACCs relative to WPCS, quantifying the adjustment required in clinical practice. The theoretical methodology we have devised could prove useful in the evaluation of other new physiological measurement equipment.

Concluding message

Our data demonstrate that WPCs and ACCs are interchangeable for making urodynamic diagnoses.

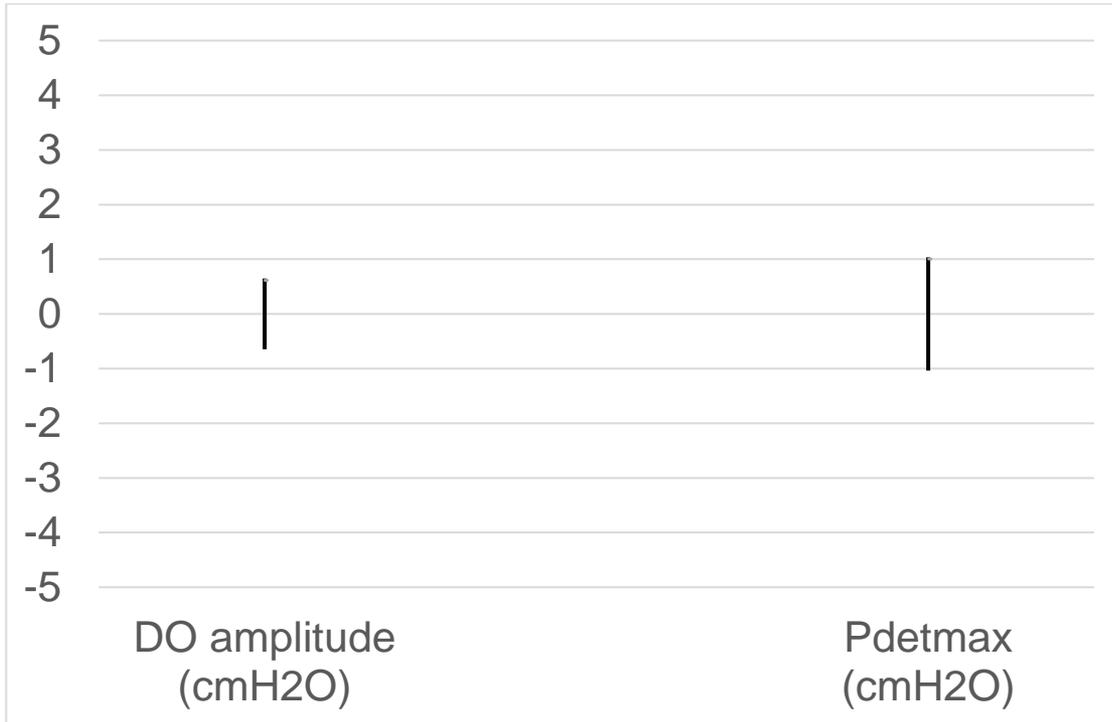


Figure 1: 95% CIs around the median difference between WPC and ACC amplitude.

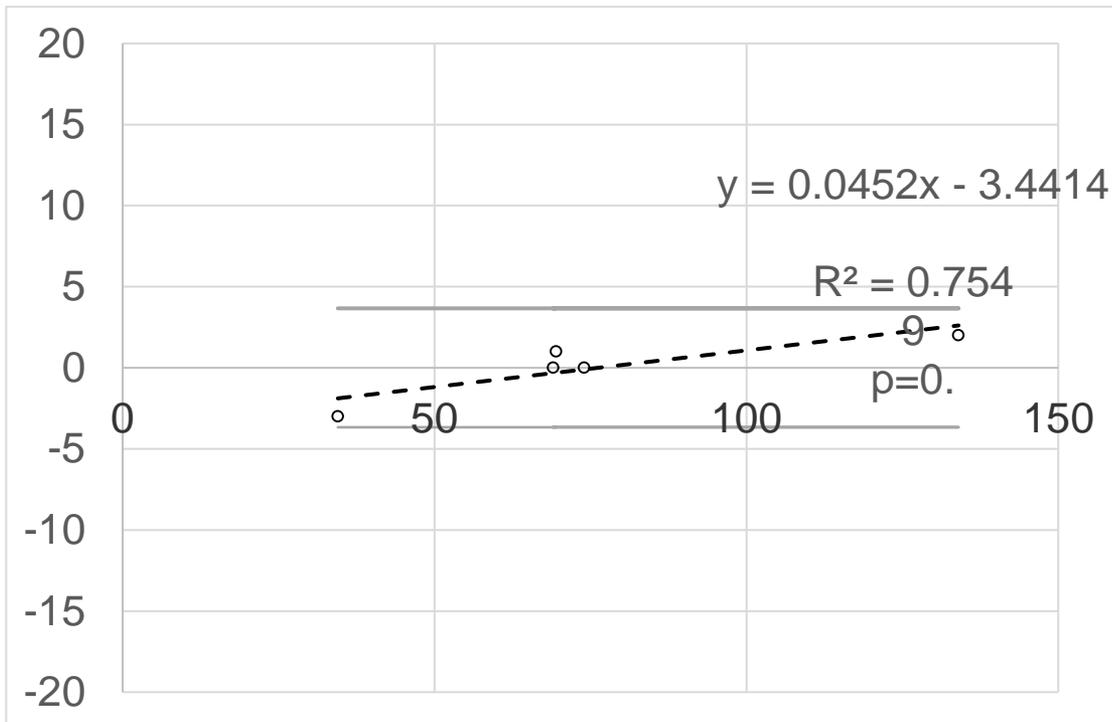


Figure 2: Mean DO peak amplitude plotted against their difference for each subject.

References

1. Simultaneous in Vivo Comparison of Water-Filled and Air-Filled Pressure Measurement Catheters: Implications for Good Urodynamic Practice. A.Gammie et al. *Neurourol. Urodynam.* 35 (8), 926-933. 2015
2. Comparison of air-charged and water-filled urodynamic pressure measurement catheters. M.A. Cooper et al. *Neurourol. Urodynam.* 2011; 30: 3. 329-33
3. Conversion of urodynamic pressures measured simultaneously by air-charged and water-filled catheter systems. H.K. Awada et al. *Neurourol. Urodynam.* 2015; 34(6):507-12.

Disclosures

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