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HOW DOES A DIFFERENCE IN PRESSURE MEASUREMENT AFFECT DIAGNOSIS OF MALE BLADDER OUTLET OBSTRUCTION?

Hypothesis / aims of study

The accuracy of different measurement techniques in urodynamics is a topic of current debate [1]. The ICS has given guidance as to the desired accuracy for a urodynamic system, on the grounds that a system is only required to meet a clinical need and is not required to be more accurate than that need [2]. When comparing water-filled systems and air-filled systems, studies in women have shown that the values obtained are different by up to 10 cmH_2O [3], with a recent study even reporting 15 cmH_2O. We determined to see what difference such disparity would have on diagnostics in men, where bladder outlet obstruction (BOO) is diagnosed on the basis of measured pressure and flow.

Study design, materials and methods

A large database of urodynamic tests covering 32 years of clinical use with water-filled systems was analysed and the pressure flow studies of male patients were extracted. Tests on male patients aged 18 or over and with voided volumes of 150 ml or over only were included. Since BOO is diagnosed using the BOO Index (BOOI), the change in BOOI was calculated for varying levels of disparity in the pressure measurement. The range of 1 to 15 cmH_2O disparity was chosen, this being the maximum range of difference found in recent studies between systems using water and air. The BOOI will change by the same amount as the change in pressure at maximum flow, since the Index is directly calculated from that pressure less twice the maximum flow rate.

Results

5207 male pressure flow studies carried out between 1985 to 2016 met the inclusion criteria. Of these, 2063 (40%) were classified as unobstructed (BOOI < 20), 2001 (38%) as obstructed (BOOI >=40) and 1143 (22%) as equivocal (BOOI 20 – 39). The distribution of change in this classification with increasing change in the pressure at maximum flow is plotted on the graph in Fig 1, taken from the figures listed in Table 1.

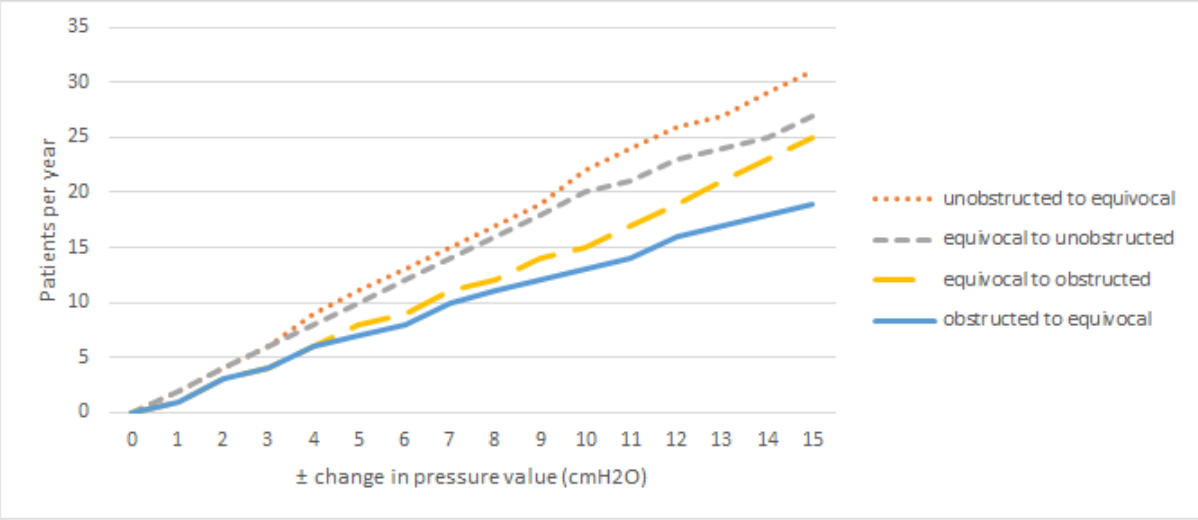

Fig.1 Number of patients on average per year having diagnostic classification changes against variation in pressure measurement

± change in pressure value (cmH2O)	unobstructed to equivocal (i.e.20 > BOOI > 20 - change)	equivocal to unobstructed (i.e.20 < BOOI < 19 + change)	equivocal to obstructed (i.e. 40 > BOOI > 40 - change)	obstructed to equivocal (i.e. 40 < BOOI < 39 + change)
0	0	0	0	0
1	2	2	1	1
2	4	4	3	3
3	6	6	4	4
4	9	8	6	6
5	11	10	8	7
6	13	12	9	8
7	15	14	11	10
8	17	16	12	11
9	19	18	14	12
10	22	20	15	13
11	24	21	17	14
12	26	23	19	16
13	27	24	21	17
14	29	25	23	18
15	31	27	25	19

Table1. Numbers of patients per year having diagnostic classification changes
for a given variation in pressure measurement. (BOOI = bladder outlet obstruction index)

Interpretation of results

Out of an average of 163 men tested per year, 28 (17%) would have had different diagnoses of obstruction if the pressures measured had differed by 10 cmH_2O. Potentially, 13 per year would not have had operations when they needed one, and 15 per year would have had operations when it might not have been offered. Clinicians must therefore be aware of the issues surrounding accuracy of measurement when discussing the management of men with BOO, and cannot use the ICS BOOI nomogram for diagnosis, as this was derived from water-filled systems.

The analysis made is a worst case scenario, because not all of the differences in measurement between air and water systems will be at the limits quoted above. Those figures are the 95% limits of agreement, so many differences seen will be less than 10 cmH_2O. Until the reasons for these differences are known, however, clinicians will not be sure which readings are more accurate and should plan according to the worst case examined here.

Another issue which has not been investigated fully is the effect on flow and pressure of the presence of the different catheters used to measure, particularly for the air-filled systems as they place a balloon in the urethra. Studies are apparently planned or are under way to examine this issue.

Concluding message

The choice of measurement system (air or water) in urodynamics will change the diagnosis and management in a proportion of male patients. Comparative urodynamic studies in men with air-filled catheters are imperative before they can be used with confidence in diagnosing obstruction.

References

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