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THE FIRST FEW SECONDS OF THE URODYNAMIC STUDY; MIND THE ZERO!

Hypothesis / aims of study

During a cystometry reliable measurements of intra-vesical (p_{ves}) and (intra-rectally or intra- vaginally measured) intra-abdominal pressure (p_{abd}) are required to determine subtracted detrusor pressure (p_{det}). 'Evident' p_{det} increases are clinically interpreted as a sign of detrusor muscle activity. At present ICS recommends, in the 'good urodynamic practices'-report (ICS-GUP) to refer p_{ves} and p_{abd} to atmospheric pressure; the pressures should be set as the 'zero' before the start of urodynamic studies with the pressure lines opened to atmospheric pressure.(1)

From illustrations that are accompanying published scientific literature, handbooks and from scientific presentations; from studies that we see with referred patients and from discussions with others in the field of urodynamic testing we have the impression (that is not otherwise possible to quantify) that the 'strict adherence to this standardization' mentioned in the ICS-GUP is not universal. In other words: some (or many?) clinical examinators do not 'zero' to the surrounding atmospheric pressure preceding the cystometry, but 'zero' to the intra-corporeal p_{ves} and p_{abd} at the start of the investigation. This 'zero' is therefore the pressure that is registered in each of the pressure lines before the start of the filling phase of the study.

This topic (or 'problem') of practice variation is already addressed in the mentioned report. The argument to oppose the ICS recommendation seems to persist that p_{det} is a 'relative pressure' in any case, and that the diagnosis of detrusor filling function (-over-activity -non-compliance) depends on 'pattern recognition' and relative changes during the course of the cystometry, and not on the absolute values of p_{ves}. The absolute p_{det} -changes, in relation to the 'resting' and or 'empty bladder' p_{det} play a slightly larger role in the analysis of voiding and in (detrusor) leak point pressures. However theoretically, also to these aims, the result of both of the 'zero' setting methods is equivalent when the pressures that are subtracted were in balance from the start of the measurement, at the moment of 'zeroing'. The ICS–GUP refers to (differences in) hydrostatic pressure(s) and 'important aspects of quality and plausibility control', as the arguments for the recommendation in the report. Furthermore, also the report states: 'It is only meaningful to subtract one pressure from the other… when both pressures are recorded to the same reference level'.

It is obvious that the reference is identical when both pressures are open to atmosphere and therefore this setting to 'zero' is in conformity with the last of the here above mentioned statements from the ICS-GUP. However it is never studied if both pressures are equivalent and or reliable when the pressure lines are in the patient at the beginning of the study.

We report on the results of our retrospective study to answer: Are both pressure lines (p_{ves} and p_{abd}) measuring equal, balanced and reliable -physiologic and responsive- pressures at the start of the cystometry?

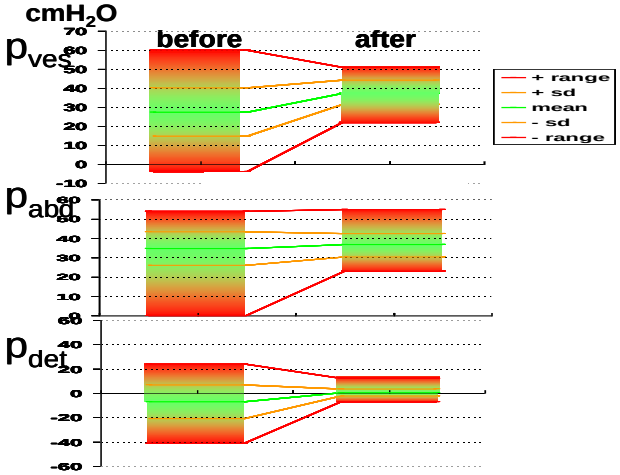
Study design, materials and methods

We took a retrospective unselected, random, sample of 136 (out of the 516 = 26%) adult patients cystometries -for all indications- performed at our department in 2008. The patients included in this cohort have had (ICS-GUP) standard transurethral cystometry in sitting position with 25-50 ml/min fill, external fluid pressure transducers, with room temperature saline. All patients received an information leaflet about the study that also included the advise to 'come to us with an empty bowel (rectum), if possible'. Cystometry catheterisation was done after (uncatheterized) uroflowmetry and subsequent complete emptying of the bladder with a Ch 14 (hydrophilic coated) single use catheter. Some (2-10 ml) intra-urethral gel was used to introduce the F8 double lumen PVC cystometry p_{ves} catheter. A water filled –open side hole- Ch 12 feeding tube was, also with some gel, introduced in the rectum to measure intra-rectal p_{abd}. 3-way stopcocks were used between the pressure domes and the intracorporeal catheters to reference to atmospheric pressure. The pressure lines were 'flushed' from an infusion bottle connected at ± 80 cm above the pressure domes and infusion lines to remove air, before catheterisation. Pressure domes were adjusted to the level of the symphysis pubis of the patient. According to ICS-GUP we have a (digitally) recorded zeroed to atmosphere in every patient before filling start of the cystometry. We also have the habit to 'flush' both pressure lines again at the start of the filling cystometry. The intracorporeally recorded p_{ves} and p_{abd} pressures immediately *after ICS-GUP zeroing to atmosphere* and *before* the second –intracorporeal- flushing were retrospectively determined and compared to the pressures after flushing and some filling. We report pressures before and after flushing as well as intravesical volume and time span until physiologically and equally responsive pressures.

Results

Patients were on average 55 years (range 19-95 sd 17y); male 65%. The table shows initial 'before flushing-empty bladder' pressures ($p0_{ves}$, $p0_{abd}$ and $p0_{det}$); 'after flushing and some filling' p_{ves}, p_{abd} and p_{det}, and the p0–p differences (before-after), all in cmH_2O.

N 136	'before' pressure: p0 (Mean; sd; range)	'after' pressure: p (Mean; sd; range)	difference p0-p (Mean; sd; range)	t-test p0-p
P_{ves}	27.4; 12,7; -4<>60	37.3; 5,9; 22<>51	9,9; 12,4; -13<>41	.000
P_{abd}	34,7; 8,7; 0<>54	36,8; 6,5; 23<>55	2,2; 6,1; -15<>25	.000
P_{det}	-7,2; 13,8; -41<>24	0,5; 2,81; -7<>12	-7,7; 13,4;-41<>18	.000



The figure graphically displays the pressure ranges before and after 'flushing'. In 11 patients (%) we did not flush the catheters; in 99 (73%) one flush; in 23 (17%) patients two and in 3 (2%) of patients three flushes were necessary. No patient had detrusor activity at the start of the study but 6 had significant rectal activity. Mean volume infused *and* flushed until reliable pressures was 16ml, (sd 16ml range 1-108ml) and corresponding time was on average 30s (sd 24 range 1-120s). Mean cystometric capacity was 437ml (sd 166ml). There was no correlation between cystometric

capacity and time or volume to 'physiological' pressures. In 67% of cases the p_{ves} difference was ≥+/-5 cmH_2O; p_{abd} showed this difference in 29%. Unbalanced p_{det} (difference ≥+/-5 cmH_2O) at the start of cystometry was observed in 62% of patients.

Interpretation of results

The intracorporeal pressures that are recorded before the start of filling, without flushing of air, debris and gel in the catheter, are unphysiological in >60% of the patients.

Concluding message

Intracorporeal zeroing before the start of any filling will give unbalanced and unphysiological pressures in 67% of the patients and should be discouraged. Some (20 ml/ 30s) filling and flushing of both pressure lines after introduction is necessary before reliable pressures are obtained during a cystometry.

References

1. Schäfer W.: Neurourol Urodynam 21:261-274 (2002)

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Is this a clinical trial?	**No**
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