

## DEGREE OF URGE, PERCEPTION OF BLADDER FULLNESS AND BLADDER VOLUME: HOW ARE THEY RELATED?

### Hypothesis / aims of study

A sensation related bladder diary gives important information on bladder storage function, by measuring voided volumes coupled with a measure of sensation on an "urge scale". Studies using such scales have shown that the mean voided volumes are significantly different for each "urge" grade.

For some people, the need to measure all voided volumes with a measuring cup can be a burden considering their social and professional life. The use of an "urge" scale does not resolve this issue, because voided volumes show a big overlap for different degrees of urge. The current study evaluates 1) the reliability of the use of an urge scale and a perception of bladder fullness scale, 2) the relationship between both scales and bladder volume to evaluate whether the use of both scales can replace the need to measure voided volumes, and 3) possible differences between bladder sensation experienced in a controlled or uncontrolled setting.

### Study design, materials and methods

Twenty-six healthy volunteers and 12 patients with OAB symptoms participated in the protocols. They were asked to grade their bladder sensation on a 4 point 'urge' scale ranging from: 0) no sensation, 1) normal desire; voiding can be postponed for at least 30 min., 2) strong desire; voiding can be postponed for about 10 min., to 3) need to void now. Furthermore they assess the 'perception of fullness' on a visual analogue scale ranging from 0) "empty" to 10) "full". This was assessed on a 3 day bladder diary at home, and again a second time with 10 days interval during a forced diuresis session in the hospital, by giving a high water load protocol to the subjects. This makes a non-invasive evaluation of bladder filling possible<sup>1</sup>.

Linear mixed models, with a random intercept and slope, were used to evaluate the relation between either the 'urge' scale or the 'perception of bladder fullness' scale and bladder volume, and both scales with each other. This model was used since it adjusts for correlated measurements within individuals. To evaluate if the information from a sensory measure can replace the observed voided volume, the agreement between observed and estimated bladder volume at home, obtained from linear mixed model with perception of bladder fullness and/or urge scale as explanatory variable(s), was evaluated by means of Bland and Altman plots. A p-value  $\leq 0.05$  was considered as statistically significant.

### Results

The reliability of the urge scale and the perception of fullness VAS scale was tested by means of the intraclass correlation coefficients between the first 3 and second 3 days. Except for the ICC with perception of fullness score 1 and degree of urge score 0 the coefficients were above 0.7, which means good to excellent reliability.

During the forced diuresis session in the hospital the 'urge' scale as well as the 'perception of bladder fullness' scale were significantly related to bladder volume ( $p < 0.001$ ) for both patients and volunteers. The Bland and Altman analysis shows however, that for the individual measurements, the agreement between the sensory measure (urge and fullness) and voided volume is poor, with volumes ranging up to 800 ml for a single urge scale or fullness measure.

Patients and volunteers grade their bladder fullness and degree of urge to be higher in an uncontrolled setting than in a controlled setting.

### Interpretation of results

The degree of urge and the perception of bladder fullness are reliable to use and both scales have a significant relation with bladder volume in a controlled and uncontrolled setting. However, because of the poor agreement between the sensory measures and the voided volume, neither the established urge scale nor the continuous perception of fullness VAS, nor the combination of both scales can replace the measurement of the voided volume.

The use of the combination of both scales may however help to differentiate patients with OAB complaints, as both scales are independently related to volume.

The difference in bladder sensation found in uncontrolled and controlled settings might be due to central modulation of sensory information. Other possible explanations may be 1) the fact that during the session all subjects were aware that their bladder was becoming full, they were asked to postpone voiding as long as possible and graded their sensation during one bladder filling on a regular basis. At home a sensation from the bladder, of either intensity, might sooner interfere with activities and therefore the bladder might be classified fuller than during the session. 2) During the hospital session patients and volunteers are in a less relaxed state and therefore have a higher basic tension of their pelvic floor. This effect might trigger the detrusor inhibition reflex or guarding reflex and so increase the detected bladder volumes<sup>2</sup>.

### Concluding message

The degree of urge and the perception of bladder fullness are reliable to use and both scales have a significant relation with bladder volume in a controlled and uncontrolled setting. The use of the sensory scales independently or in combination cannot replace measuring voided volumes. However both scales provide independent information on bladder volume and may therefore be interesting to use in combination. Bladder sensation in a uncontrolled setting is different from bladder sensation in a controlled setting and might be more dependent on influences from within or outside of the subject.

### References

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<b><i>Is this study registered in a public clinical trials registry?</i></b>	<b>Yes</b>
<b><i>Specify Name of Public Registry, Registration Number</i></b>	<b>clinical trials gov; NCT00821314</b>
<b><i>Is this a Randomised Controlled Trial (RCT)?</i></b>	<b>No</b>
<b><i>What were the subjects in the study?</i></b>	<b>HUMAN</b>
<b><i>Was this study approved by an ethics committee?</i></b>	<b>Yes</b>
<b><i>Specify Name of Ethics Committee</i></b>	<b>Ethical Committee of Maastricht University Medical Centre</b>
<b><i>Was the Declaration of Helsinki followed?</i></b>	<b>Yes</b>
<b><i>Was informed consent obtained from the patients?</i></b>	<b>Yes</b>