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## HOW THE BLADDER SENSES? : A FIVE-GRADE MEASURE

### Hypothesis / aims of study

During bladder filling, bladder starts to sense it and the sensation steadily increases. However, little is known concerning volume-sensory correlation in normal bladder; and pressure-sensory correlation during detrusor overactivity (DO). We aimed to real-time assess bladder sensation in normal bladder and in DO using a five-grade measure.

### Study design, materials and methods

We enrolled 74 normal individuals and 87 patients with DO (51 terminal, 36 phasic). During slow bladder filling, we instructed individuals to indicate sensation in five grades: 1, first sensation; 2, obviously greater than 1 but less than 3; 3, first desire to void when he or she usually goes to toilet; 4, obviously greater than 3 but less than 5; and 5, strong desire to void. We also instructed individuals to report other sensations such as pain.

### Results

1) The five-grade measure is feasible in all participants, showing a volume and pressure- sensory correlation. 2) Among five grades, grade 0 to 1 was the longest, followed by grade 4 to 5, in all participants. 3) Grade 0 to 1 in phasic DO and grade 4 to 5 in terminal and phasic DO were shorter than those in normal bladder ( $p < 0.05$ ), e.g., their sensory grade rapidly increased during DO. 4) 86% of patients with DO reported that the rapidly-increased sensory grade is akin to urinary urgency in daily life.

### Interpretation of results

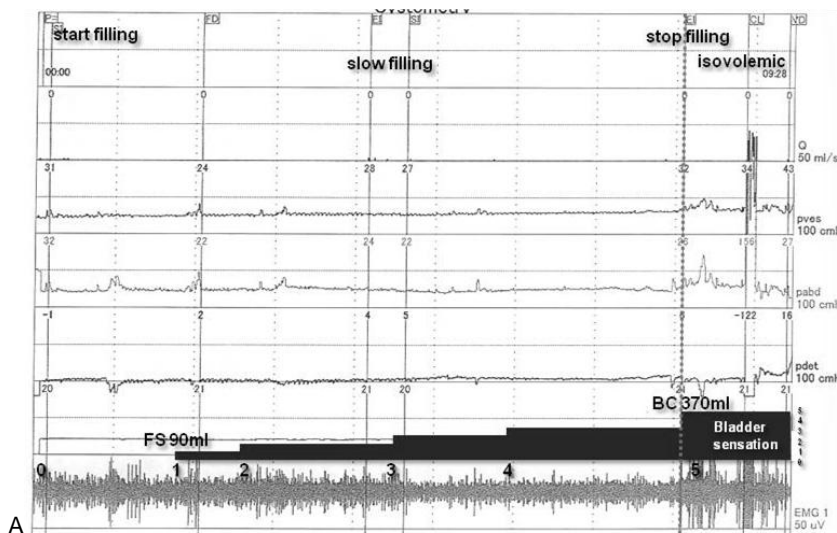
In the present study, grade 0 to 1 in phasic DO and grade 4 to 5 in phasic and terminal DO were shorter than those in normal bladder ( $p < 0.05$ ). Previously Lowenstein reported the similar findings. The findings indicate that the sensory grade rapidly increases during DO. In addition, 86% of patients with DO reported that the rapidly-increasing sensory grade is akin to urinary urgency in daily life. Whether urgency is reproduced during urodynamics and it is different from normal sensation remains uncertain. In light of the present study results, the rapidly-increased sensory grade seems be a factor to contribute to the occurrence of urinary urgency in daily life. However, we still need further clarification using an ambulant urodynamics and other devices to assess the nature of urinary urgency in daily life.

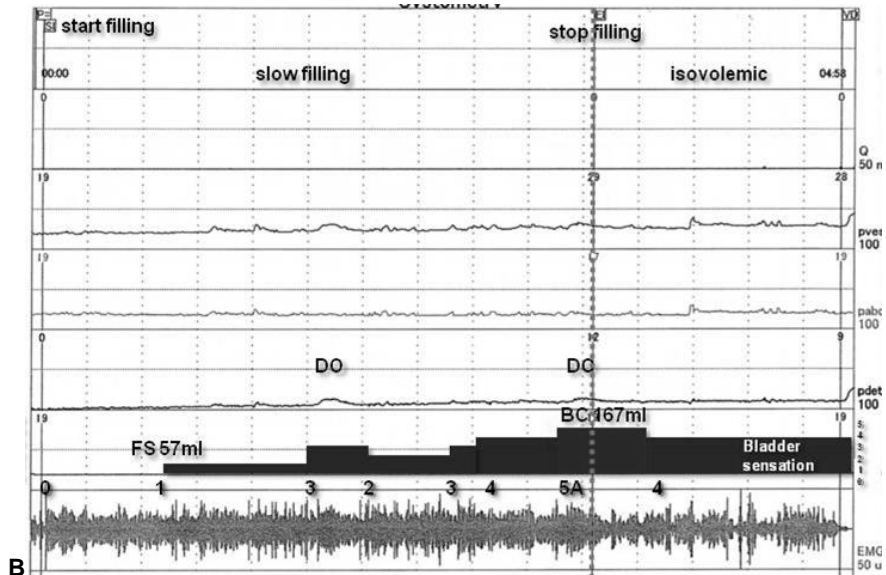
### Concluding message

The five-grade measure is feasible to assess a volume and pressure- sensory correlation. Using this measure the sensory grade rapidly increased during DO as compared with normal bladder, and 86% of the patients with DO reported that it is akin to urinary urgency in daily life.

### References

Lowenstein L, FitzGerald MP, Kenton K, Brubaker L, Gruenwald I, Papier I, Durazo-Arvizu RA, Elliot C, Mueller ER, Vardi Y. Validation of a real-time urodynamic measure of urinary sensation. *Am J Obstet Gynecol* 2008; 198: 661.e1-5.





**Figure 1 A five grade bladder sensory measure of normal bladder (A) and phasic detrusor overactivity (B).**  
 FS: first sensation, BC: bladder capacity, DO: detrusor overactivity. Note that the bladder sensory grade goes up and down along with the bladder pressure increase and decrease during DO in this case (B).

| sensation grade     | 0 to 1             | 1 to 2               | 2 to 3         | 3 to 4         | 4 to 5          | average        |
|---------------------|--------------------|----------------------|----------------|----------------|-----------------|----------------|
| DO- (n=74)          | 123.8 ml           | 39.8 ml              | 46.2 ml        | 36.7 ml        | 70 ml           | 72.5 ml        |
| DO+ (n=87)          | terminal DO (n=51) | 40.3 ml              | 30.8 ml        | 36.7 ml        | 52.2 ml*        | 73.3 ml        |
|                     | phasic DO (n=36)   | 90.9 ml <sup>^</sup> | 35.9 ml        | 32.6 ml        | 36.7 ml         | 47.4 ml*       |
| <b>total (n=87)</b> | <b>108.1 ml</b>    | <b>38.6 ml</b>       | <b>31.5 ml</b> | <b>36.7 ml</b> | <b>50.4 ml*</b> | <b>68.1 ml</b> |

\*: p<0.05  
<sup>^</sup>: not significant

**Table 1 Bladder volume relevant to sensation grade.**

References

1. Lowenstein L, FitzGerald MP, Kenton K, Brubaker L, Gruenwald I, Papier I, Durazo-Arvizu RA, Elliot C, Mueller ER, Vardi Y. Validation of a real-time urodynamic measure of urinary sensation. Am J Obstet Gynecol 2008; 198: 661.e1-5.

Disclosures

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