

A NOVEL CYSTOMETRY METHOD COMBINED WITH BLADDER ULTRASONOGRAPHY REVEALS RAPID DECREASE OF BLADDER CAPACITY AND COMPLIANCE IN MICE LPS-INDUCED CYSTITIS

Hypothesis / aims of study

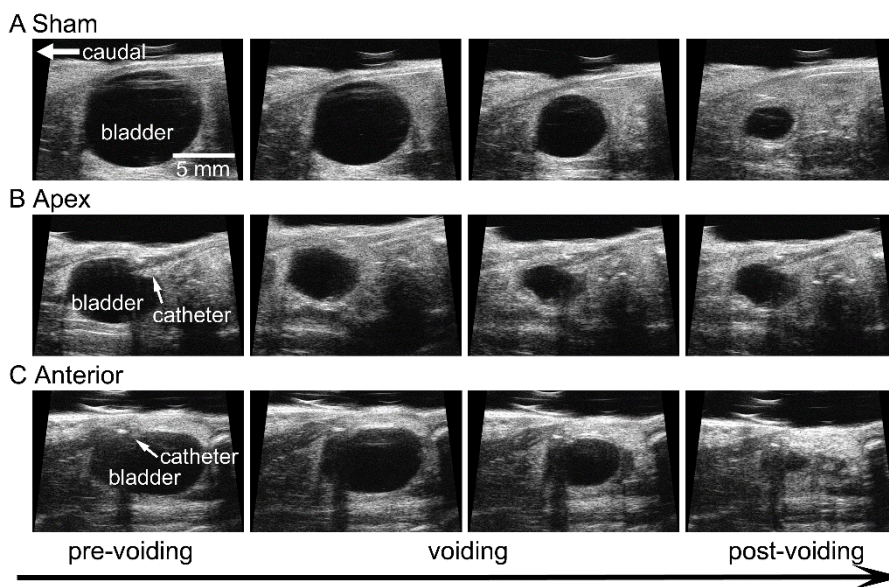
The mouse has become a highly useful model for biological research. However, the mouse remains less popular animal model in research into bladder function, the major reasons being the difficulties in functional analysis of the mouse bladder. Actually, in previous studies, the mouse cystometric voided volumes were remarkably small compared with spontaneous voided volumes. We hypothesised that bladder filling and emptying were physically inhibited by catheter conventionally implanted in bladder apex but not by catheter implanted in bladder anterior wall. Moreover, we thought that transabdominal ultrasonography (US) would be useful for analysing mouse bladder function and the effect of bladder catheter. The aim of this study was to examine the efficacy of transabdominal bladder US for analysing mouse bladder function and establish the most reliable cystometry method.

Study design, materials and methods

Male mice (12-16 weeks old) were used in this study. Transabdominal bladder US was performed with Vevo 770 Imaging System equipped with a 25-MHz transducer. Each mouse was anesthetized with urethane (1.2 g/kg, subcutaneously) and placed in the supine position. The US probe was placed on the lower abdomen. The maximum sagittal cross-section of the bladder was visualized, and the pre-voiding largest and post-voiding smallest cross-sectional areas (CSA) of the bladder were recorded. Cystometry was combined with bladder US, and performed in 2 different ways of catheter implantation: one was conventionally in bladder apex (Apex group), and the other was in bladder anterior wall (Anterior group). US findings of the two groups were compared with sham operation group (Sham group). Cystometric parameters were compared between the two groups. For the validation of combination of US and cystometry, functional changes in the bladder caused by Lipopolysaccharide (LPS) were analysed. LPS (1 mg/ml) was continuously infused into the bladder for 1 hour.

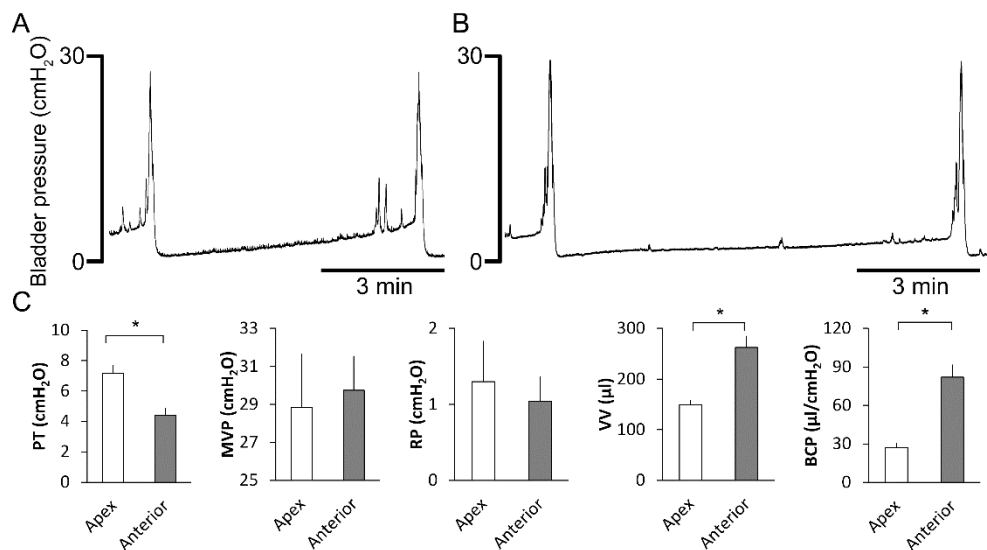
Results

US findings of voiding with or without bladder catheter.



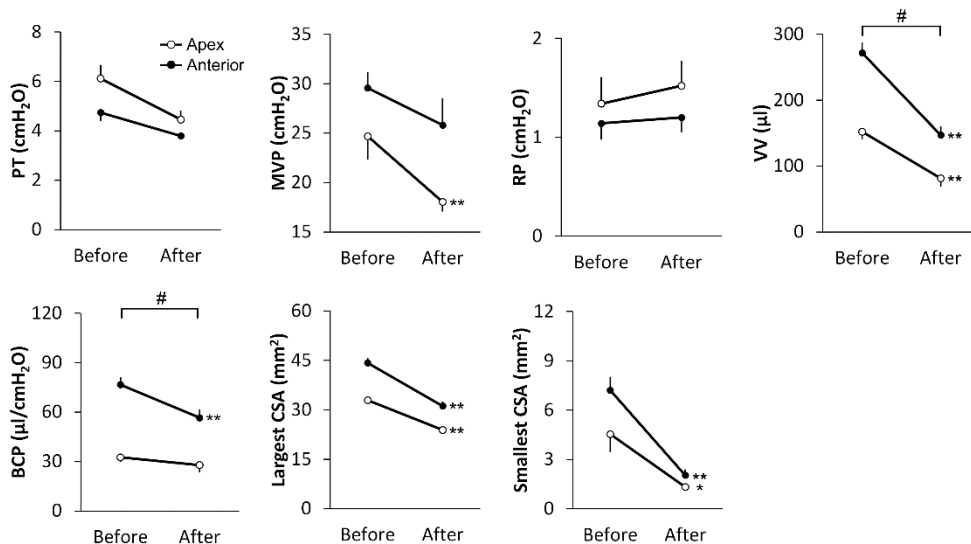
(A) In Sham group, bladder apex made a dynamic movement. The movement of bladder apex was obviously inhibited in Apex group (B), but not in Anterior group (C).

Bladder functional analyses in cystometry with different catheter placement.



(A) Cystometrogram from Apex group and (B) from Anterior group. (C) Pressure threshold was significantly higher in Apex than Anterior group. Voided volume and bladder compliance were significantly lower in Apex than Anterior group (n = 5 in each group). PT, pressure threshold; MVP, maximum voiding pressure; RP, resting pressure; VV, voided volume; BCP, bladder compliance. *P < 0.01, Student *t*-test.

Bladder functional analyses in LPS-induced cystitis by combination of US and cystometry.



In Apex group, LPS instillation significantly decreased MVP, VV, largest CSA, and smallest CSA. In the Anterior group, LPS instillation significantly decreased VV, BCP, largest CSA, and smallest CSA. The extent of decrease in VV and BCP were greater in Anterior than Apex group (n = 5 in each group). *P < 0.05, **P < 0.01, paired *t*-test. #P < 0.05, mixed effects models.

Interpretation of results

The present study demonstrates the usefulness of transabdominal bladder US on analysis of mouse bladder function and the validity of a new cystometry method with the bladder catheter in bladder anterior wall. In addition, rapid decrease of bladder capacity and compliance in mice LPS-induced cystitis are revealed by combination of bladder US and a new cystometry method.

Concluding message

We established combination of bladder US and a new cystometry method. This new method will become a powerful tool for analysis of mouse bladder function.

Disclosures

Funding: None **Clinical Trial:** No **Subjects:** ANIMAL **Species:** Mouse **Ethics Committee:** Animal Ethics Committee of Osaka University, Japan.