One of the major aetiology of stress urinary incontinence (SUI) in women is vaginal childbirth. Rats with simulated birth trauma induced by vaginal distention (VD) has been used as a model of child birth related injuries. In this study, we observed that urethral pressure elevation due to urethral sphincter muscle injuries, related injuries inducing SUI.

**Aims of study**

The present study was performed to investigate the functional changes in urethral continence function due to urethral sphincter muscle injuries and explore the usefulness of a novel method capable of measuring LPP and urethral pressure simultaneously under the bladder neck open condition.

**Material and methods**

Forty-nine female SD rats were used. Rats underwent spinal cord transection at the T8 level to block the spin-bulbo-spinal voiding reflex under isoflurane anesthesia. One day after the spinal cord transection, the rats underwent a procedure to open the bladder neck. The additional damage of internal sphincter function at baseline.

**Study design**

In the multiple birth trauma model with 3 times VDs, which showed the relatively long duration of risk [2], the urethral catheter insertion does not affect the measurement of LPP and urethral pressure fluctuations (point F in Fig. 1), which corresponded to the timing when urethral pressure reached a plateau despite the increase of intravesical pressure. Pno was measured as the vesical pressure when the bladder neck begins to open.

**Results**

Experiment 1: Results indicate that simultaneous recordings of bladder and urethral pressure using an intravesical catheter and a urethral microtransducer-tipped catheter are useful for detailed characterization of the urethral continence function in a SUI animal model and (2) the urethral catheter insertion does not affect the measurement of LPP during passive intravesical pressure elevation.

Experiment 2: We observed that urethral pressure elevation due to urethral sphincter muscle contraction started when the intravesical pressure exceeded UBP (point D of Fig. 1), and lasted until urethral contraction increased. Bladder neck opening was confirmed by the beginning of amplitude increases of urethral contractions or the steep elevation of urethral pressure. Pro was measured as the vesical pressure when the bladder neck begins to open. MUP was calculated as the urethral pressure at which bladder neck is opened. The timing of bladder neck opening was determined by the time of appearance of urethral pressure fluctuations (point E in Fig. 1), which corresponded to the timing when urethral pressure reached a plateau despite the increase of intravesical pressure.

**Interpretation of results**

Experiment 1: These results indicate that (1) simultaneous recordings of bladder and urethral pressure using an intravesical catheter and a urethral microtransducer-tipped catheter are useful for detailed characterization of the urethral continence function in a SUI animal model and (2) the urethral catheter insertion does not affect the measurement of LPP during passive intravesical pressure elevation.

Experiment 2: We observed that urethral pressure elevation due to urethral sphincter muscle contraction started when the intravesical pressure exceeded UBP (point D of Fig. 1), and lasted until urethral contraction increased. Bladder neck opening was confirmed by the beginning of amplitude increases of urethral contractions or the steep elevation of urethral pressure. Pro was measured as the vesical pressure when the bladder neck begins to open. MUP was calculated as the urethral pressure at which bladder neck is opened. The timing of bladder neck opening was determined by the time of appearance of urethral pressure fluctuations (point E in Fig. 1), which corresponded to the timing when urethral pressure reached a plateau despite the increase of intravesical pressure.

**Conclusions**

• Rats with multiple VDs, which showed the relatively long-lasting SUI condition (>2 weeks after VDs), would be a reliable model to study the pathophysiology of multiple child birth related injuries inducing SUI.

- Our new methods of simultaneous recordings of bladder and urethral pressures would be useful to fully evaluate the functional changes in urethral continence function in SUI models.

Conflict of interest:

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