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STRESS URINARY INCONTINENCE IN MICE CAN BE INDUCED BY VAGINAL DISTENSION INDEPENDENT ON THE ESTROUS CYCLE

Hypothesis / aims of study

Vaginal delivery is a risk factor for stress urinary incontinence (SUI). We previously created a mouse model of SUI by simulated birth trauma-vaginal distension (VD) (1,2). As we know, the female reproductive tract including the vagina undergoes numerous sequential morphological changes over the course of the estrous cycle. In addition, the estrous cycle was reported to affect the urination patterns in mice. In order to exclude the plausible effects of estrous cycle when VD is performed on the varied LPP, we aimed to examine if performance of VD in different stages of the estrous cycle affects the successful induction of SUI in mice in this study. Leak point pressure (LPP, the bladder pressure at which the urine leaks from the urethra) was used to evaluate the urethral competence.

Study design, materials and methods

One hundred and twenty-eight female virgin C57BL/6 mice (aged 10 weeks) were equally distributed into 4 groups according to their estrous cycle stage: pro-estrus (P), estrous (E), metestrus (M) and diestrous (D). The estrous cycle was staged by staining vaginal smears with May-Grunwald Giemsa method. Each group was divided into four subgroups of eight mice for measurement of LPP 4 or 20 days after VD or sham VD. Twenty four-hour urinary habit was measured before LPP measurement. Under anesthesia, the vagina was accommodated using different sizes of urethral dilators. VD was induced by injection of 0.35 ml water into the balloon of a modified 6-Fr Foley catheter inserted in the vagina for 1 h. LPP was measured with an open abdomen method. A 24-gauge angiocatheter was inserted into the bladder dome and connected to a pressure transducer. Room temperature saline was infused at 1 ml/hour. Gentle pressure with two fingers was applied to the mouse's bladder at half bladder capacity. The pressure difference between the peak pressure and basal pressure was used to represent LPP. At least five LPP were obtained on each animal and the mean LPP was calculated.

Results

The bladder weight and 24-hr fluid consumed were similar in all groups. Voiding events and mean void volume were decreased significantly 4 days after VD but not 20 days after VD, regardless of the estrous cycle stage when VD was performed. When all the 24-hour urinary habit data from 4 stages were pooled together without considering estrous cycle stages, it showed the same trend. There were no differences in LPP among the four different stages either in the sham or VD group. Consistent with our previous report, LPP was decreased only 4 days after VD compared with the corresponding sham 4 days, sham 20 days, or VD 20 days in all four stages. When all the LPP data from 4 stages were pooled together without considering estrous cycle stages, it showed the same trend (Figure 1).

Interpretation of results

The above results suggest that VD causes reversible SUI in mice, and that VD-induced SUI in mice is not dependent on the stage of estrous cycle.

Concluding message

VD causes reversible SUI in mice. Successful induction of SUI in mice is not dependent on the estrous cycle. Therefore, the estrous cycles do not need to consider when the SUI model is induced in mice using our method. The open abdomen method is convenient and reproducible way to measure LPP.

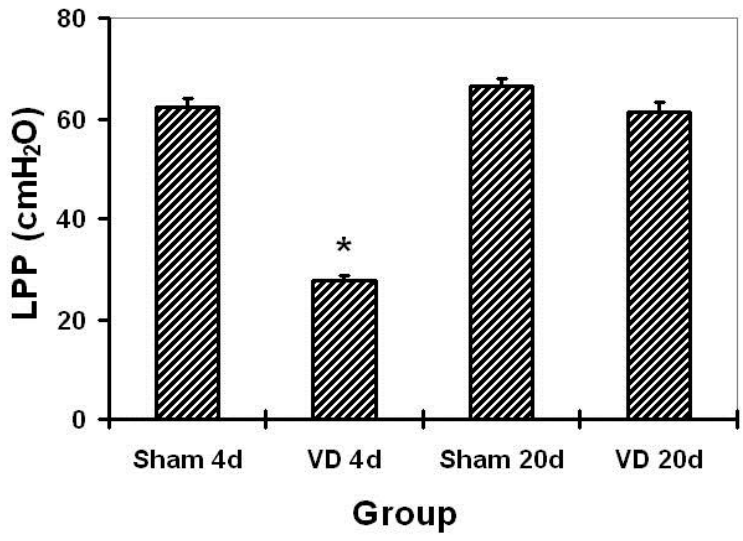

Figure 1. LPP values at 4 and 20 days after VD or sham VD in mice including all data from four different estrous cycle stages (mean ± SEM).
* significantly different from corresponding value in sham 4d, sham 20d, or VD 20d group ($P < 0.01$).

References
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Disclosures
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