

INTRODUCTION AND AIMS

Lower urinary tract dysfunction (LUTD) is common in clinic practice. Rat model is the most common way to study LUTD and cystometry in conscious rats is a critical investigative methodology in evaluating the bladder function. Cystostomy is a necessary procedure in rat conscious cystometry. In addition, in rat chronic cystometric model, the rats need to carry catheter in bladder for a long time. The cystostomy procedure and carrying catheter for a long time might injury bladder tissue easily considering rats' bladder are very small which capacity range were only 0.2-3ml. In order to find the effect of intervention procedures on bladder function in experiment, it is important to know the change process of rat's bladder function after cystostomy over time.

The aim of this study is to explore the changes of bladder function in conscious rats after cystostomy, and find the best time window for performing cystometry in conscious rats.

METHODS

Rats were randomly divided into 8 groups with group 1 to 7 for cystostomy groups and group 8 for control. Rats in group 1 been carried out cystometry on day 1 after cystostomy, group 2 on day 3, group 3 on day 5, group 4 on day 7, group 5 on day 11, group 6 on day 15, group 7 on day 21 after cystostomy. The rats in group 8 voided freely as control group. Parameters of basal bladder pressure ($P_{ves,basal}$), maximum bladder pressure ($P_{ves,max}$), bladder threshold pressure ($P_{ves,thre}$), voiding interval (VI), duration of urination (DU) which referred to the time that bladder pressure curve suddenly rose followed $P_{ves,thre}$ to recover to $P_{ves,basal}$, bladder compliance (ΔC), voiding volume (VV), post voiding volume (PVR) and bladder capacity (BC) been compared among first 7 groups and parameters of BC, VV, PVR were compared between the first 7 groups and control group. After cystometry we collected rats' bladders for bladder weighting and hematoxylin-eosin (HE) staining to investigated the pathological changes.

CONCLUSIONS

The best time to perform cystometry in conscious rats is on day 5-15 after cystostomy. During day 1-3, rat's bladder is in Acute inflammatory phase and in OAB condition. On day 21 after cystostomy BC of rat's will bigger than normal bladder.

RESULTS

The trends of $P_{ves,basal}$, $P_{ves,max}$, $P_{ves,thre}$ were downward, while BC, IV, VV and ΔC were upward from day 1-5 after cystostomy in conscious rats (Figure 1). The BC and VV were reduced significantly on day 1 and 3 after cystostomy than control group (0.33 ± 0.19 , 0.43 ± 0.19 VS 1.23 ± 0.42 ($p < 0.01$), 0.32 ± 0.19 , 0.42 ± 0.19 vs 1.23 ± 0.42 ($p < 0.01$)). During 5 to 15 days after cystostomy the parameters of $P_{ves,basal}$, $P_{ves,max}$, $P_{ves,thre}$, VI, VV, BC and PVR had no significant different among first 7 groups, and BC, VV and PVR had no significant different between the first 7 groups and control group. The BC increased significantly on day 21 after cystostomy. Bladder weight in experiment groups all were greater than control group, among experiment groups the bladder weight increased day 1 and 3 after cystometry, then reduced and kept stable during day 5-15, then increased significantly again on 21 days after cystostomy. HE staining showed diffuse neutrophils and lymphocytes infiltrated in both the lamina propria and muscularis propria, apparent edema was in lamina propria and muscularis propria and surface ulcerations were in urothelium layer on day 1 and 3 after cystostomy. During day 5-15 after cystostomy bladder inflammation was mild which there was just little lymphocytes infiltrated in lamina propria. On 21 days after cystostomy, more fibrin deposited in the lamina propria was found in rats' bladders though the inflammation sensitive was familiar with day 5-15 after cystostomy.

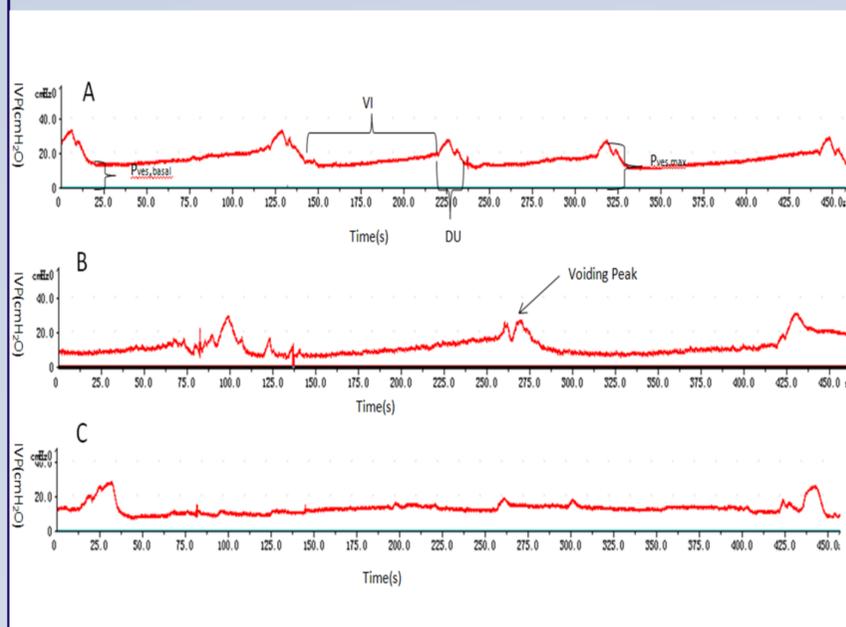


Figure 1: rats' cystometry curves 1-5 days after cystostomy. A: The cystometry curve of day 1 after cystostomy. B: The cystometry curve of day 3 after cystostomy. C: The cystometry curve of day 5 after cystostomy. From A-C, the trends of voiding interval was upward. IVP: intravesical pressure. VI: voiding interval. $P_{ves,basal}$: minimum pressure between two maturations. $P_{ves,max}$: voiding stage maximum bladder pressure.

REFERENCES

1. Yaksh TL, Durant PA, Brent CR. Micturition in rats: a chronic model for study of bladder function and effect of anesthetics. Am J Physiol. 1986;251:R1177-1185.