

## SUTURE TO CLOSE PART OF THE URINARY MEATUS: A NOVEL ANIMAL MODEL OF BLADDER OUTLET OBSTRUCTION

### Hypothesis / aims of study

Traditional open surgery causes some complications such as incision infection and bladder stone formation in mouse BOO model. It is also difficult to standardize the firmness of ligation, or exclude foreign material from rings in surgery models such as bladder ischemia[1, 2]. Mouse bladders are oval shaped, and bladder vessels depart from the bladder neck. The posterior urethra, which can be ligated, is short and difficult to identify unless operating under a microscope. If the bladder neck were pulled over or ligated, bladder ischemia would occur. We produced a novel model of bladder outlet obstruction (BOO) by suture to close part of the urinary meatus and compared the cystometric features, postoperative complications, and histopathological changes of that model between different degrees of obstruction.

### Study design, materials and methods

Six to 8-week-old female BALB/c mice were divided into four groups. In all the groups, the pediatric venous indwelling catheter (26G, i.d.=0.4 mm, o.d.=0.6mm, 16mm length) was used for urethral catheterization, and then the needle for suture was entering the urinary meatus at the 3 o'clock position. (figure) We withdraw the needle slightly and aim for the 9 o'clock position (1/2 closed group and sham-operated group), 11 o'clock position (1/3 closed group) or 12 o'clock position (1/4 closed group) respectively. In the sham-operated group, we just slightly tied a knot but not ligated the urinary meatus. After 1, 2 and 4 weeks, filling cystometry, postoperative complications, and histopathological features were evaluated in each group.

### Results

In 1/2 closed group and 1/3 closed group, we tested increased maximum cystometric capacity, maximum bladder pressure, micturition interval, and post-void residual urine volume compared with control ( $p < 0.01$ ). The closed groups had significantly shortened operative time, less incidence of incision infection compared with the traditional surgery according to the previously research. Smooth muscle hypertrophy was showed by Hematoxylin and eosin (HE) staining and Proliferating cell nuclear antigen (PCNA) quantified by Western Blot was increased in both closed groups. In 1/2 closed group and 1/3 closed group, as observed in Masson trichrome staining, the collagen deposition in partial detrusor muscle bundles increased compared to the control group.

### Interpretation of results

Smooth muscle hypertrophy and cell proliferating were the marker of early stage of BOO, and our results shows that close 1/3 part of external orifice of urethra, which are closely and reliably mimics the human condition of chronic BOO than the other groups, while avoiding open surgery and its complications. It also indicated that was in the early stage of BOO without large number of collagen depositi[1]on due to Masson trichrome staining in 1/3 closed group compared with 1/2 closed group.

### Concluding message

Suture to close part of the urinary meatus is a minimal invasive and accurate method to generate the animal model of BOO compared with traditional method.

Figure



#### References

1. Miyazaki, N., et al., Preventive Effect of Hydrogen Water on the Development of Detrusor Overactivity in a Rat Model of Bladder Outlet Obstruction. J Urol, 2016. 195(3): p. 780-7.
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#### Disclosures

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