

## THE ROLE OF ELASTIN FIBERS IN THE BLADDER AND BLADDER FUNCTIONS-RELATED WITH BLADDER OUTLET OBSTRUCTION -

### Hypothesis / aims of study

Elastin, working in partnership with collagen, allows the body's organs to stretch and relax. Collagen and elastin fibers, the major components of connective tissue, are present throughout the wall of the urinary bladder and are intimately related to bladder compliance<sup>1,2)</sup>. This present study intends to investigate the role of elastin fibers in the bladder and their role in bladder functions.

### Study design, materials and methods

Four groups of Japanese White rabbits (about 1200g, 5 rabbits per group) were either partially obstructed by ligation of the urethra (groups 1 and 2: 2 and 4 weeks of partial bladder outlet obstruction (BOO)) or non-obstructed (groups 3 and 4: 2 and 4 weeks of sham operation). We investigated detrusor contractile responses to electrical field stimulation (EFS), carbachol (20  $\mu$ M) and KCl (120mM) in each group. Histopathological examination was performed using Elastic van Gieson stain, Masson's trichrome stain, scanning electron microscope (SEM) and 3D-analysis using electron-tomography.

### Results

Bladder weight increased after the obstruction (mean bladder volume; group 1: 2.43 g, group 2: 4.72g, group 3: 1.02g, group 4: 1.42g). Contractile response to FES, carbachol and KCL was diminished after urethral obstruction. Increased bladder wall thickness as well as a larger proportion of elastin and collagen fibers were observed histologically in the BOO models. Additionally, SEM analysis revealed thicker elastin fibers in the BOO animals. 3D-analysis using electron-tomography revealed that elastic fibers in the rabbit urinary bladder show a coil-like appearance in the muscle layer and each fiber was composed of several fibrils. Such particular structure may be closely related to physiological function of the urinary bladder.

### Interpretation of results

In this study, we found that elastin in the bladder is heavily focused at voiding function. It is believed that changes in the configuration of the exterior matrix cells due to aging relates greatly not only to the blood vessels, but also to the bladder, leading to problems of the lower urinary tract.

### Concluding message

This leads us to propose that future studies should take up the question of how elastin changes with age in the case of other age-related diseases and how those changes might in fact parallel those of the bladder.

### References

- 1) Stevenson K, et al.; Functional changes in bladder tissue from type III collagen-deficient mice. Mol Cell Biochem (2006) 283: 107-114.
- 2) Levin RM, et al.; Effect of strip length on the contractile dysfunction of bladder smooth muscle after partial obstruction., Urology (2005) 66: 659-664.

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