

THE EXPRESSION OF $\alpha 1$ - RECEPTOR AND NITRIC OXIDE SYNTHASE IN OOPHORECTOMIZED AND ESTROGEN SUPPLEMENTED RAT BLADDER AND URETHRA

Hypothesis / aims of study

The author aimed to examine the changes in the Nitric Oxide(NO) excreted at the $\alpha 1$ receptor and non-adrenergic and non-cholinergic (NANC) nerve terminal in the bladder and urethra in the white rats (Sprague Dawley) that have undergone oophorectomy and supplementation of estrogen by using immunohistochemical study and western blot in this Study. In addition, changes in the epithelial cells, muscle layer and collagen in the bladder and urethra were examined in order to determine the clues for the relevance between them.

Study design, materials and methods

Forty-five mature female Sprague-Dawley rats (10-11 weeks, 235-250g) were randomly assigned to one of three groups: Control group (Con), oophorectomy group (Ovx), or estradiol replacement group (Ovx+Est). The degree of expression of $\alpha 1$ receptor ($\alpha 1A$ and D) and NOS (nNOS and eNOS) in bladder and urethral tissues was investigated using immunohistochemical staining and Western blotting.

Results

Manifestation of $\alpha 1A$ receptor protein of the bladder tissue displayed the tendency of increase after oophorectomy while it displayed tendency of reduction following supplementation of estrogen. $\alpha 1D$ receptor protein of the bladder tissue displayed the tendency of increase after oophorectomy while it displayed tendency of reduction following supplementation of estrogen.

Manifestation of nNOS protein of bladder tissue increased significantly following oophorectomy and decreased after supplementation of estrogen to the extent similar to that of the Con group and eNOS in the bladder was increased in OvX group in comparison to the Con group and decreased in the OvX+Est group in comparison to the OvX group.

Manifestation of the $\alpha 1A$ receptor protein of the urethra tissue displayed the tendency of increase following oophorectomy and tendency of decrease after supplementation of estrogen.

$\alpha 1D$ receptor protein of the urethra tissue displayed the tendency of increase following oophorectomy and tendency of decrease after supplementation of estrogen. nNOS increased in all of the mucous membrane, smooth muscle and blood vessel of the urethra in the OvX group in comparison to the Con group, while it was reduced in the OvX+Est group in comparison to the OvX group. eNOS increased in all of the mucous membrane, smooth muscle and blood vessel of the urethra in the OvX group in comparison to the Con group, while it was reduced in the OvX+Est group in comparison to the OvX group.

Interpretation of results

nNOS was distributed mostly in the smooth muscles of the bladder and the urethra while eNOS displayed high concentration in the mucous membrane of bladder as well as in the blood vessel. Moreover, the manifestation of nNOS and eNOS increased significantly within the urethra tissues of white rats subjected to oophorectomy but were decreased at the time of supplementation of hormone. It was possible to confirm through this Study that the contractile force and resilience of urethra decreases due to increase in the relaxation of urethra due to NO, and the conditions for occurrence of urinary incontinence are generated due to the atrophy of urethra after menopause.

This Study has the limitation of having the difference between the results of the experiment and those predicted in the research plan from the perspective that the number of experimental animals was limited and larger animals such as rabbits, etc could not be used. It is deemed that more statistically significant results could be deduced if experiment could be carried out by definitively segregating the bladder and urethra, and the mucous membrane and smooth muscle by using larger number of experimental animals and larger animals.

Concluding message.

The manifestation rate of $\alpha 1$ receptor ($\alpha 1A$ and $\alpha 1D$) in the bladder of white rats that underwent oophorectomy increased, it was decreased again after the administration of estrogen. However, there was no statistical significance in the changes. The average manifestation rates of NOS (nNOS and eNOS) increased in the bladder of the white rat that underwent oophorectomy, the manifestations of nNOS and eNOS were reduced to the extent similar to that of the Con group through administration of estrogen. Although the manifestation rate of $\alpha 1$ receptor ($\alpha 1A$ and $\alpha 1D$) decreased in urethra of white rats that underwent oophorectomy, they increased again through administration of estrogen. However, there was no statistical significance in the changes. Although the average manifestation rates of NOS (nNOS and eNOS) increased in the urethra of the white rat that underwent oophorectomy, the manifestations of nNOS and eNOS were reduced to the extent similar to that of the Con group through the administration of estrogen. There was increase in collagen and decrease in smooth muscle in the urethra following oophorectomy. Since then, they returned to the state similar to that of the Con group through the supplementation of estrogen.

Disclosures

Funding: none **Clinical Trial:** No **Subjects:** ANIMAL **Species:** rat **Ethics Committee:** Institutional Review Board in Pusan National University School of Medicine, Yangsan