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EFFECT OF LONG-TERM ESTROGEN REPLACEMENT ON BLADDER FUNCTION IN FEMALE RATS

Hypothesis / aims of study

Estrogen deficiency after menopause causes atrophic changes within the urogenital tract and is associated with lower urinary tract symptoms, such as frequency, urgency, and incontinence. However, the impact of estrogen withdrawal in menopause on the development of these symptoms and the role of estrogen replacement therapy in the management of lower urinary tract symptoms remain controversial.

To assess the efficacy of estrogen replacement therapy, we compared voiding behavior, urodynamics, muscle content and blood flow of the bladder in old female rats with and without estrogen replacement.

Study design, materials and methods

We divided 20 female Wister rats aged 16 months into 4 groups each with 5 animals.

Group 1 rats received no treatment. In group 2 and 3 rats, a silastic tube containing 2.50mg of estradiol (E2) was inserted subcutaneously for 4 weeks and for 8 weeks. In group 4 rats, silastic tube without E2 was inserted for 8 weeks. Each experiment was performed at 16 months old, 17 months old and 18 months old, in Groups 1, 2, 3 and 4, respectively.

In each experiment, the following data was obtained: Plasma E2 concentration, number of micturitions per day, voided volume, urodynamic parameters, blood flow at dome of the urinary bladder, bladder and body weight, average number of bladder vessels, ratio of smooth muscle area/connective tissue area.

Results

Average plasma E2 levels in Group 2, 3 were 38.5, 48.8 pg/ml respectively and significantly higher than those in group 1 and 4 (19.3 and 13.9 pg/ml). The number of micturitions per day significantly decreased in Group 3 compared with Group 4 and average voided volume was significantly increased in Group 2 and 3 compared with Group 4. In urodynamic parameters, bladder capacity and voided volume in Group 2 and 3 were significantly increased than those in Group 4.

Bladder weight was significantly higher in Group 3 than in Group 1 and 4. Bladder blood flow levels in Group 2 and 3 were significantly higher than those in Group 1 and 4. The area density between smooth muscle and connective tissues in Group 2 and 3 was significantly higher than that in Group 1 and 4.

Interpretation of results

Plasma E2 levels showed our rats were adequate for studying the effect of E2 replacement. The above results are considered reasonable, thinking that E2 replacement increases bladder blood flow and muscle content, and these changes increase bladder volume and finally decrease the number of micturitions per day in old female rats.

Concluding message

E2 replacement is suspected to improve urinary frequency in old female rats.