

## EFFECT OF SEVERAL TYPES OF EXERCISE ON LEAK-POINT PRESSURE AND C-FOS AND NOS EXPRESSION IN THE PERI-AQUEDUCTAL GRAY AND PONTINE MICTURITION CENTER IN URETHROLYSIS RAT MODEL.

### Hypothesis / aims of study

Since the introduction of Kegel exercises in 1948, the efficacy of pelvic-floor muscle (PFM) exercises in the treatment of stress urinary incontinence (SUI) and mixed urinary incontinence (MUS) has been supported by the findings of several randomized controlled studies and systematic reviews. Although PFM exercises have been accepted as an effective intervention for SUI, many questions regarding exercise guidelines are not yet answered. Thus, evidence to guide various exercises from both exercise physiology and functional perspectives is needed. In the present study, the effect of several types of exercise on abdominal leak-point pressure, c-Fos and nitric oxide synthase (NOS) expression in the ventrolateral peri-aqueductal gray (vlPAG) and pontine micturition center (PMC) following urethrolysis in rats.

### Study design, materials and methods

Thirty female SD rats were randomly divided into five groups (n = 6 in each group) and their periurethral tissues were dissected (urethrolysis) to induce the rat model of SUI. Group I was had sham operation without any exercise. Group II was the disease control group and had urethrolysis operation without any exercise. Group III, Group IV and Group V had 30 min of different daily exercise (treadmill, swimming and whole body vibration, respectively). The rats in the exercise group performed each exercise for 30 min once a day starting 2 weeks after urethrolysis and continued for 3 weeks. Three weeks after operation, leak point pressure (LPP) was measured by using the pressure transducer after spinal cord transection at the level of T12-T13 to block the reflex of bladder contractions. Finally, the brain of each animal was removed and immunohistochemistry for c-Fos and NOS was performed.

### Results

Urethrolysis (Group II) decreased LPP significantly and several types of exercise (Group III-V) significantly increased the SUI-induced decreasing of LPP. The swimming (Group IV) showed more effect of improvement. Urethrolysis insult (Group II) enhanced c-Fos positive cells in the vlPAG and PMC significantly and several types of exercise (Group III-V) significantly suppressed the SUI-induced increasing of c-Fos positive cells in the vlPAG and PMC. However, the differences among the types of exercise were not observed in the vlPAG but in the PMC, the swimming (Group IV) showed the most potent suppressive effect on the c-Fos expression. Urethrolysis (Group II) insult enhanced NADPH-d positive cells in the vlPAG and PMC significantly and several types of exercise (Group III-V) significantly suppressed the SUI-induced increasing of NADPH-d positive cells in the vlPAG and PMC. However, the differences among the types of exercise were not observed. In addition SUI-induced decreasing of muscle size in the urethral sphincter was also improved by several types of exercise.

### Interpretation of results

Leak point pressure, urethral sphincter size was decrease and c-Fos, NOS expression in the vlPAG and PMC was increased in the rats with SUI. Each exercise improved leak point pressure, urethral sphincter size and suppressed the SUI-induced increase in c-Fos, NOS expression in the vlPAG and PMC. This study directly evaluated the role of c-Fos and NO in the central pathways.

### Concluding message

The present results demonstrated that symptoms of SUI could be alleviated by various types of exercise (treadmill running, swimming, and whole body vibration) through the peripheral and central pathways controlling the lower urinary tract.

### References

1. Pharmacol Rev (2004) 56:581-631.
2. Brain (2004) 124:369-377

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