NEUROPROTECTION BY 17β-ESTRADIOL IN WHOLE RAT URINARY BLADDER SUBJECTED TO ISCHAEMIA/REPERFUSION INJURY

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Introduction: ischaemia and the following reperfusion, occuring during obstructed micturition, are responsible for the abnormal contractile behaviour of detrusor smooth muscle, generating bladder dysfunction (instability) in humans (1). Ischaemic neuronal damage is partially induced by free radicals and/or lipid peroxidation and by uncontrolled Ca2+ influx into the cells during the reperfusion of the ischaemic tissue. 17β-estradiol possesses antioxidant activity and it is capable of blocking voltage activated Ca2+ channels.
Aim: to study the neuronal response of male and female rat urinary bladders when they are subjected to ischaemia/reperfusion (I/R) injury and the effects of 17β-estradiol as a neuroprective agent.
Methods: whole rat urinary bladders, mounted in a 100 ml organ bath, were subjected to 60 min ischaemic-like condition, followed by 120 min of reperfusion. The bladders were electrically stimulated (60 V, 10 Hz, 1 ms, 5 s train pulses) every 10 min during the entire period of observation, to obtain a nerve-mediated contraction. 17β-estradiol (1, 3 and 10 μM) was added to the bath medium before applying I/R conditions (pre-incubation), during the I/R and the first 30 min of reperfusion period. In another series of experiments, male rats received a daily s.c. injection of vehicle (sweet almond oil), or 17β-estradiol (50 μg/kg body weight) for a week After treatment, they were sacrificed and the urinary bladders were removed. The experimental procedure was the same of the previous described one (see above), with the exception of 17β-estradiol addition.
Results: the recovery of the nerve responses in female urinary bladders were significantly higher than those of male. When male urinary bladders were pre-incubated with 17β-estradiol, a decrease of electrical field stimulation (EFS) responses, in a concentration dependent manner, has been shown. Moreover, a neuroprective effect of 17β-estradiol at 3 μM was evident in male urinary bladders subjectd to I/R injury. In the second series of experiments, a significant recovery of EFS responses of in vivo treated (17β-estradiol) male rats, as compared with those of oil, was also shown.
Conclusion: an higher susceptibility to ischaemic damage of male rat urinary bladder nerves compared to female ones has been demonstrated. We can suggest a neuroprotective role of 17β-estradiol in urinary bladders subjected to I/R injury.

1. Brading A.F. (1997) Scand. J.Urol. Nephrol. Suppl. 184: 51-58