Non-voiding Contractions Induced by Bladder Outlet Obstruction: Effects of C-fiber's Desensitization and an Alpha 1-adrenoceptor Blocker Naftopidil

Introduction and Objective: Non-voiding contractions (NVCs) are observed on cystometrogram in animal models of bladder outlet obstruction (BOO). NVCs are considered to be myogenic and may be modulated by the nervous system innervating the bladder because α1-adrenoceptor blockers attenuate NVCs. An α1-blocker, naftopidil is known to suppress C-fiber signaling in a rat model of cerebral infarction. To investigate whether C-fiber signaling is associated with the generation of NVCs and inhibitory effect of α1-blockers on NVCs, the effects of resiniferatoxin (RTX) and naftopidil on NVCs were examined in a rat model of BOO.
Materials and Methods: BOO was induced by incomplete urethral ligation in female Wistar rats (n=16). Cystometry was performed 4 weeks after the induction of BOO. RTX (0.3 mg/kg) was injected subcutaneously 3 days before cystometry in 7 rats. Bladder capacity (BC) and the frequency and amplitude of NVCs at 80% BC were measured before and after intravenous administration of naftopidil (1 mg/kg). The effect of naftopidil (60 μM) on spontaneous contractions in bladder strips in-vitro from female Wistar rats with BOO of 4 weeks duration (n=8) were also examined. Data were expressed as mean ± SEM.
Results: RTX-treatment increased BC and the frequency of NVCs (6.3 ± 0.9 and 9.5 ± 0.8 ml for BC, and 1.6 ± 0.2 and 2.5 ± 0.2 cycle/min for the frequency of NVCs, $p<0.05$ for both). Naftopidil increased BC and attenuated NVCs in BOO rats (6.3 ± 0.9 to 7.2 ± 0.8 ml for BC, and 11.1 ± 1.8 to 7.0 ± 1.8 cmH_2O for the amplitude of NVCs, $p<0.05$ for both), and decreased the frequency of NVCs even in RTX-treated BOO rats (2.5 ± 0.2 to 1.2 ± 0.1 cycle/min, $p<0.05$). Naftopidil did not attenuate spontaneous contractions in bladder strips *in vitro*.
Conclusions: C-fiber afferent is involved in neural circuits for micturition reflex in rats with BOO, but not essential for the generation of NVCs. The inhibitory effect of naftopidil on NVCs is not derived from the inhibition of C-fiber signaling or the direct inhibition of spontaneous contractile activity. Naftopidil may attenuate NVCs by the suppression of a neural pathway involving RTX-insensitive afferents.