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REGIONAL VARIATION IN BLADDER RESPONSE TO CHRONIC PARTIAL OUTLET OBSTRUCTION IN RATS

Aims of Study

Some animal models of chronic partial bladder outlet obstruction (pBOO) have demonstrated that neuromuscular compensatory changes in the bladder develop in response to obstruction. Whether these changes are uniform throughout the bladder however is not known. Since the neuromuscular and vascular anatomy may not be homogeneous in the bladder, the compensatory response of the bladder to chronic outlet obstruction may be region dependent. Therefore, the goal of this study was to determine the differences in the functional response of the bladder base and body to pBOO.

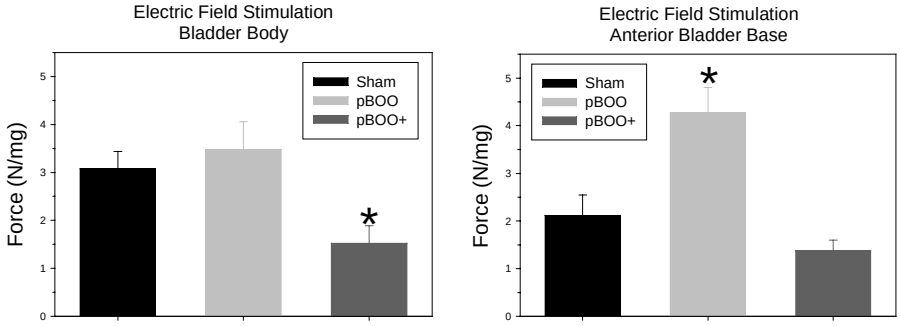
Methods

Age-matched female rats were anesthetized with isoflurane and the urethra was catheterized with a 3F catheter. The urethra and bladder neck were exposed via a midline laparotomy under sterile conditions. The catheter placement was confirmed and pBOO was created by placing a 3-0 silk ligature around the catheterized urethra (n=6). The catheter was then removed and the rectus fascia closed with a running suture. Sham operated animals (n=6) underwent the same procedure without urethral ligation. Bladders were removed 12 weeks post-op, placed in cold Krebs solution and separated into body and base at the level of the ureters. Full thickness strips from the body and base were attached to force transducers, suspended between platinum electrodes and stimulated with 20V at 32 Hz for 10 seconds. The response to electric field stimulation was compared between the bladder body and base and analyzed using ANOVA.

Results

Despite attempts to create a similar severity of obstruction, the bladder responses of some animals were more severe. Thus, three groups of animals were analysed: sham-operated animals (n=6), partially obstructed animals with moderate increases in bladder weight (pBOO, n=3) and pBOO with stones/sludge formation and bladder weight >300mg (pBOO+, n=3).

In the bladder body, contractile force generated in response to electric field stimulation was not different between sham and pBOO groups; however, contractile force generated in the pBOO+ group was significantly less than the other groups. There were no significant differences in force generation by posterior bladder base among groups. However, in the anterior base, a 2-fold greater force was generated in the pBOO group (4.3∀.9 N/mg) compared to sham (2.1∀1.1N/mg) or pBOO+ (1.4∀.4N/mg) groups. The responses of anterior base between sham and pBOO+ groups were not different.



Conclusions

This study suggests that responses of the bladder to chronic pBOO are region dependent and that the anterior lower region of the bladder may play a dominant role in maintaining bladder force during the compensatory phase. The increased response of the anterior base in the pBOO group without a reduction in force in the body suggests that compensation is more effective in the anterior base. This regional compensation may be due to facilitation of hypertrophy/hyperplasia by its unique anatomic characteristics. The reduction in force generation by the body and anterior base observed with pBOO+ may indicate bladder decompensation in obstructed rats.