

PHARMACOLOGICAL PROPERTIES OF REGENERATED RAT DETRUSOR MUSCLE FOLLOWING SUBTOTAL CYSTECTOMY

Aims of Study

The detrusor muscle in the bladder body contracts vigorously following muscarinic and purinergic receptor activation, whereas the bladder base contracts following alpha-adrenergic but less following cholinergic and purinergic receptor stimulation. The difference reflects the different innervation of the bladder base and the detrusor. Following subtotal cystectomy a new bladder body will develop. The aim of the study was to see if the new bladder body has pharmacological properties reminiscent of the normal bladder body or of the bladder base, the edges from which it had developed.

Methods

Female Sprague-Dawley rats were used. A suture was tied around the bladder just above the entrance of the ureters, and the tissue above was removed. 15 weeks later the bladders were dissected, and strips were cut from the bladder base and body, dissected free from urothelium, and mounted in organ baths. Strips from unoperated rats served as controls. Nerve mediated frequency-response relations were obtained by field stimulation in the absence and presence of scopolamine, prazosin, and P2X1 blockade (desensitization to alpha-beta-methylene-ATP). Dose-response curves were determined for carbachol and phenylephrine. Responses were expressed relative to contractions by K⁺-high solution.

Results

Maximal contractile response to field stimulation was about 60 % of that to K⁺-high solution. There was no difference between strips from control and cystectomy bladders. Prazosin had no effect on nerve-mediated response. Scopolamine decreased maximal nerve mediated response of bladder base to 62±6 (controls, n=6) and 61±4 per cent (operated, n=8) of that without blocker. For bladder body strips the decrease was to 81±5 (controls, n=6) and 58±8 per cent (operated, n=8). The difference between bladder body strips was significant.

After desensitization to alpha-beta-methylene-ATP, new frequency-response relations were obtained in the presence of scopolamine and prazosin. For the bladder base strips there was a pronounced additional inhibition up to 40 Hz by the desensitization. The response to 60 Hz was unaffected. There was no difference between operated and control animals. Strips from the control bladder body were completely inhibited at all frequencies. Strips from the bladder body of the operated rats showed an additional inhibition by the desensitization up to 20 Hz but at 40 and 60 Hz the desensitization did not influence the contractile response.

Maximum response to carbachol was for all groups about 50 per cent higher than the high-K⁺ response. There was no significant difference in -log EC₅₀ values (5.6±0.2) for any of the groups. Maximum response to phenylephrine was only about 10 to 20 per cent of the high-K⁺ response. There was no significant difference between the respective nonoperated and operated groups. There was no significant difference in -log EC₅₀ values (4.4±0.1) for any of the groups.

Conclusions

After subtotal cystectomy a new bladder body developed. The new detrusor muscle was functionally well innervated with no supersensitivity to muscarinic stimulation. The new bladder body and the normal bladder base had, in contrast to the normal bladder body, a considerable remaining response to nerve stimulation after cholinergic, adrenergic and purinergic blockade. The newly formed bladder body had thus pharmacological properties specific of the bladder base from which it had developed.