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Abstract Reproduction Form B-1

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Title (type in CAPITAL LETTERS): SEX AND REGIONAL DIFFERENCES IN NORADRENALINE RELEASES FROM RABBIT LOWER URINARY TRACT SMOOTH MUSCLES

Aims of Study

The sympathetic nervous system plays an important role in the function of the lower urinary tract (1). A major neurotransmitter for the storage phase of micturition is noradrenaline released from prejunctional, sympathetic nerve endings. Noradrenaline elicit contractions of the bladder base and urethral smooth muscle, and relaxation of the bladder body mediated mainly through alpha-1 and beta-2 adrenoceptors, respectively (2). Furthermore, several reports have demonstrated that there are sex-related differences in the sympathetic nervous system in the lower urinary tract (3, 4). However, little information is as yet available about sex and regional differences in noradrenaline release in the lower urinary tract smooth muscles. In the present study, using microdialysis procedure (5) and high-performance liquid chromatography with electrochemical detection (HPLC-ECD), we have investigated the release of noradrenaline induced by electrical field stimulation (EFS) from the detrusor and urethral smooth muscle strips isolated from rabbits of both sexes.

Methods

Four-month-old New Zealand white rabbits, weighing 2.0-2.5 kg were killed by exsanguination after intravenous administration of sodium pentobarbital. The bladder and urethra were removed out through a abdominal midline incision. The bladder body, base and urethral smooth muscle strips were transferred to thermostatically controled 20-ml organ baths filled with Krebs-Henseleit solution, and were attached to two L-shaped metal specimen holders. Atropine (1 μM) and indomethacine (1 μM) were present in the muscle baths throughout the experiment. One end of each strip was connected to a force-displacement transducer and isometric forces were recorded and monitored on a pen writing recorder. The microdialysis probe (O-P-100-10, Eicom, Kyoto, Japan) was inserted through the muscle strip and the inlet cannula of the probe was connected to a microinfusion syringe pump.

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In order to minimize the degree of breakdown of noradrenaline, Ringer solution (pH 7.4) containing 0.05 mM ascorbic acid was continuously perfused at a rate of 2 μl/min. The dialysate during EFS (supramaximum voltage, pulse duration 0.5 ms, frequency 5-80 Hz and train of pulse 2 s, interval between stimulations 1 min; ten muscle contractions were induced by shocks.) was collected and a volume of 10 μl of the dialysate of each sample was injected into the noradrenaline determination system. The amount of noradrenaline released in the dialysate was calculated by reference to the peak area of the standard noradrenaline solution (0.1 pmol) by a chromatogram recorder. The sex and regional differences in noradrenaline release during EFS were evaluated.

Results

In the assay system, the detection limit of noradrenaline was 0.01 pmol/injection. After pretreatment with tetrodotoxin (1 μM) or guanethidine (50 μM), the noradrenaline release induced by EFS was significantly suppressed to the spontaneous level. Noradrenaline releases and contractile response induced by EFS increased in the frequency dependent manner in both sexes and all regions. Noradrenaline release from the urethra and bladder base was significantly higher than that from the bladder body in both sexes. Noradrenaline release from the urethra and bladder base of the male rabbits was significantly higher than that of the female rabbits (Table 1).

Table 1

Sex and regional differences in noradrenaline release induced by EFS in rabbit lower urinary tract smooth muscles.

	bladder body	bladder base	urethra
male	0.25 ± 0.01	0.80 ± 0.05*	0.93 ± 0.12*
female	0.22 ± 0.04	0.45 ± 0.07	0.46 ± 0.07

(pmol/g)

*Significantly different from comparable values for female experiments.

Conclusions

The data suggest that there are sex and regional differences in noradrenaline release induced by EFS in rabbit lower urinary tract smooth muscles

References

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