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EFFECTS OF CASTRATION ON IN VITRO DETRUSOR CONTRACTILITY OF THE RAT

Aims of Study

Skeletal muscle is well-known target tissue of androgen. Androgen has anabolic effects on muscle, and is thought to promote muscle growth as well as to increase muscle power. Recently, androgen receptors were found in bladder smooth muscle. However, their roles in detrusor remain unclear. In this study, we investigated whether androgen influences power of detrusor muscle.

Methods

Male rats, 16 weeks old, were used for this study. These rats are divided into the two groups: castration group and control group. 4 weeks after castration, using isolated detrusor strips, in vitro contraction studies were performed to evaluate the contractile responses to agonist, the responses to electrical field stimulation (EFS) and the force-velocity relation to determine power of detrusor muscle.

Results

As a consequence of androgen deprivation, prostate weight was significantly decreased 4 weeks after castration. However, bladder weight and body weight showed no change.

1, Responses to Carbachol and α,β -methylene ATP

The responses to carbachol and α,β -methylene ATP did not differ between detrusor strips from control and castrated rats. Thus, function of muscarinic receptor and purinoceptor were not changed after castration.

2, Responses to EFS

Electrical stimulation (supramaximum voltage, 0.5msec. duration) produces frequency-dependent contraction. At lower frequency (below 10 Hz), there seems to be slightly weak responses in castration group. However, at higher frequency, the contractile responses are not altered by castration. These results may suggest that castration influences function of nerve and/or secretion of neurotransmitters such as purinergic neuron.

3, Isotonic contraction study

Power is an intrinsic energy for muscle contraction and consists of force and speed contraction (velocity) of muscle. Thus, we carried out an isotonic contraction study to measure velocity of detrusor muscle contraction. When electrical stimulation is applied, detrusor strip shortens against a load. This shortening is recorded by a displacement transducer and velocity of shortening is calculated from a gradient of this shortening curve. Since a weight of load is regarded as a force generated on each detrusor strip. A force-velocity curve of castration group is situated under the curve of control group (Fig.1). On the basis of the Hill equation, this relation between force and velocity was analysed using computer. Thus, we obtained the power of each detrusor strips. Average power per unit tissue weight is 6.57×10^{-3} watt/g on control group and 3.18×10^{-3} watt/g on castration group. These results showed that power of detrusor muscle is decreased after castration (Fig.2).

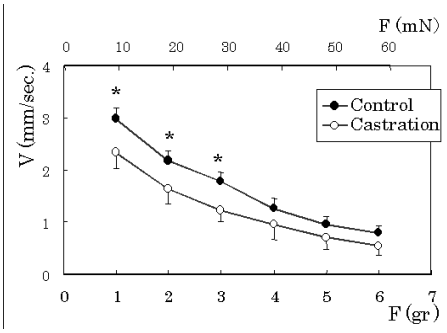

Fig.1: Force-Velocity curve

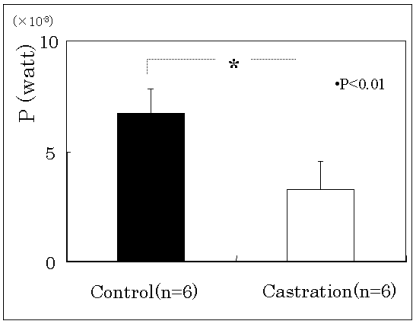

Fig.2: Power per unit tissue weight

Conclusions

This study suggests that androgen influences power of detrusor muscle. Thus, the question arises as to where is androgen's site of action in bladder muscle. Concerning this, muscle power is supplied from a molecular interaction between contractile proteins, actin and myosin. Therefore, it is speculated that contractile protein in bladder smooth muscle cell could be a possible target of androgen. Clinically, there may be a relation between eldery males with voiding symptoms such as slow stream, hesitancy and androgen, although they have with and without benign prostatic hyperplasia.