Effects of Dobutamine on the in Vivo Urethra in the Female Dog

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MORIYA, I., NISHIZAWA, O., FUKUDA, T., HARADA, T. and TSUCHIDA, S. Effects of Dobutamine on the in Vivo Urethra in the Female Dog. Tohoku J. exp. Med., 1985, 147 (3), 311-314 —— The effect of dobutamine on the proximal urethra was investigated in vivo in female dogs. Dobutamine administered intra-arterially at the bifurcation of the iliac artery produced a rise in pressure and shortening along the transverse axis in the urethra. —— dobutamine; contractile response of urethra

β-Adrenoceptors have been divided into two subtypes, i.e., β₁ and β₂. Characterization of β-adrenoceptors in the lower urinary tract of the cat was previously studied in the in vitro preparation (Nergardh 1977). The β₁- and β₂-adrenoceptor agonists produced an relaxation of the urethra constricted by neosynephrine. The present study was attempted to clarify the effects of dobutamine (lacemi form) which has been shown to act on β₁-, β₂- and α-adrenoceptors in the vasculature of the pithed rat (Ruffolo and Yaden 1983), on the urethra in vivo in the dog. The urethral responses to dobutamine were assessed as changes in pressure and motility in the female dog.

Six female mongrel dogs were anesthetized with sodium thiamylal and α-chloralose. The respiration was mechanically controlled, as pancuronium bromide was used to abolish contraction of the urethral striated muscle. The bladder and the whole urethra were exposed through a midline laparotomy and removal of the symphysis pubis. The bladder was transected from the urethra at the bladder neck in order to detect both bladder and urethral responses to dobutamine separately. To eliminate reflex the pelvic nerves were cut bilaterally proximal to the pelvic plexus, and the hypogastric nerves were cut bilaterally distal to the lower mesenteric ganglion.

Fig. 1 shows the experimental setup. The paired extraluminal strain gauge force transducers for measuring urethral movements (Tsuchida et al. 1983) were implanted in the proximal urethra. The intraluminal pressure at the same site was monitored with a 4 Fr. microtip pressure catheter. Concomitantly the

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bladder, rectal and blood pressure were monitored by pressure transducers. Dobutamine dissolved in 0.9% saline was administered intra-arterially (i.a.) in a volume of 1 ml at the bifurcation of the iliac artery. Doses used were increased by a factor of about 0.5 log units, i.e., 0.003, 0.01, 0.03 and 0.1 mg.

Fig. 2 shows the effects of dobutamine on the bladder, urethra and rectum in a typical experiment. The urethral pressure was elevated and the urethra was shortened along its transverse axis after administration of 0.03 mg dobutamine i.a.
Fig. 3 Effects of dobutamine on urethral pressure (left) and to shorten the urethra along the transverse axis (right).

(Fig. 2). In 4 of 6 dogs urethral pressure was elevated in a dose-dependent manner after administration of dobutamine (Fig. 3). Except for one of 6 dogs the urethra was shortened along the transverse axis after administration of dobutamine (Fig. 3). The extent of shortening produced by dobutamine was substantially dose-dependent.

It is reported that the \( \beta_1 \)-adrenoceptor agonist produces an urethral relaxation in the cat (Nergårdh 1977) or little effect on the rabbit urethra (Khanna et al. 1980). Since it is considered that in the present experiments dobutamine acted preferentially on \( \beta_1 \)-adrenoceptors, there seem to be differences in \( \beta \)-adrenoceptor mediated responses among mammalian species. The detailed mechanisms underlying for these differences in the effects of \( \beta \)-adrenoceptor agonists on the urethra is unknown. The increase in cyclic AMP content elicited by dobutamine was reported to be mediated via \( \beta \)-adrenoceptors in the canine upper urinary tract tissue (Kondo et al. 1985). In addition, the physiological implications of the urethral contraction caused by dobutamine in the dog awaits further study.

References

