

## Four Cases of Lowered Urethral Pressure in Canine Ectopic Ureter

Hiroshi KOIE<sup>1)</sup>, Yoshiki YAMAYA<sup>1)</sup> and Takeo SAKAI<sup>1)</sup><sup>1)</sup>College of Bioresource Sciences, Nihon University, Fujisawa-shi, Kanagawa 252-8510, Japan

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**ABSTRACT.** To evaluate the function of the constrictor urethrae of dogs that had urinary incontinence and were diagnosed as having ectopic ureter, the urethral pressure profile (UPP) was measured by means of a microchip catheter transducer. The UPPs ( $14.5 \pm 3.3$  mmHg) of the four dogs suffering from ectopic ureter were much lower ( $p < 0.001$ ) than the UPPs of clinically healthy female dogs ( $35.3 \pm 5.7$  mmHg). In the cases of ectopic ureter, it was shown that the UPP was lowered, and it was suggested that this would lead to the expression of urinary incontinence.

**KEY WORDS:** canine, ectopic ureter, urethral pressure.

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Ectopic ureter is a congenital disease, in which the junction of the ureter and the urinary bladder is not at the trigone, but the ureters open into the urethra or the uterus; the chief complaint in such cases is urinary incontinence. This disease is mainly caused by genetic factors and often occurs in Siberian Huskies, Golden Retrievers and Poodles [9]. Affected dogs are usually presented at a young age, with urinary incontinence as the chief complaint, and are diagnosed as having ectopic ureters by intravenous urography. Since these dogs do not urinate by contraction of the urinary bladder and are persistently incontinent, they suffer from perineal soiling, which predisposes to urinary tract infections and associated urethritis, urinary cystitis and ureteritis. Dogs kept inside a house can be treated by fitting them with “diapers” etc. In the usual surgical treatment of ectopic ureter, the ureter is repositioned to open into the urinary bladder, but in many cases, even after surgery continuous urinary incontinence persists [7]; in dog cases of ectopic ureter, it is reported that the urethral pressure is lowered [6]. This study was carried out to determine urethral pressure in dogs with ectopic ureter. A microchip transducer which gives more accurate and reproducible results than the perfusion method was used to measure urethral pressure [1, 4, 5].

The four dogs in this study were diagnosed as having an ectopic ureter, and all had urinary incontinence. They comprised two female Siberian Huskies (case A : four months old, 13 kg, unilateral intramural ectopic ureter; case B : four years old, 20 kg, bilateral ectopic ureters), a female Golden Retriever (case C : two years old, 25 kg) and a female Welsh Corgi (case D : five months old, 9.6 kg, bilateral extramural ectopic ureters). The urethral pressure profiles (UPPs) of cases A and D were obtained before surgery, and those of cases B and C were measured several years after the operation. As the control group, four clinically healthy female mongrel dogs were used (each weighed about 10 kg).

Before measuring the UPP each dog was injected subcutaneously with acepromazine (Prom Ace, Fort Dodge Laboratories, Iowa, U.S.A.) at a dose of 0.3 mg/kg after which ketamine (Ketalar 50, Sankyo, Tokyo, Japan) 10 mg/kg was intravenously administered. The animals were placed in

right-recumbency, and a catheter was inserted into the urethra with a speculum to remove urine from the urinary bladder, and a microchip catheter transducer (PC-460, 6 French, Millar Instruments, Houston, Texas, U.S.A.) was inserted to measure the UPP. The measurements were made after putting the catheter chip transducer with a baroreceptor into the urinary bladder and then removing the catheter along the urethra.

In this study, the maximum urethral pressure was used to evaluate the function of the urethral sphincter [2]. Generally, the urethra is roughly divided into the smooth muscles and the striated ones near the external urethral orifice, and more  $\alpha 1$  adrenal receptors exist in the smooth muscles than in the striated ones [3]. Therefore, the UPP is also useful for identifying abnormal parts of the smooth muscles and the striated ones, and is applied to the clinical choice of a remedy [8].

Maximal urethral pressure in dogs with ectopic ureter was as follows: 15 mmHg in case A, 18 mmHg in case B, 10 mmHg in case C, and 15 mmHg in case D, respectively (Table 1). The average maximal urethral pressure in the four cases was  $14.5 \pm 3.3$  mmHg. In contrast, maximal urethral pressure in each of the four clinically healthy female mongrel dogs was 40 mmHg, 37 mmHg, 37 mmHg and 27 mmHg, respectively (Table 1). The average was  $35.3 \pm 5.7$  mmHg.

Table 1. Maximal urethral pressures in female dogs with ectopic ureter and normal dogs

Case	Breed	MUP (mmHg)
A	Siberian Husky	15
B	Siberian Husky	18
C	Golden Retriever	10
D	Welsh Corgi	15
Mean $\pm$ SD		$14.5 \pm 3.3$
1	Mixed breed	40
2	Mixed breed	37
3	Mixed breed	37
4	Mixed breed	27
Mean $\pm$ SD		$35.3 \pm 5.7$

Case A-D: dogs with ectopic ureter, Case 1–4: normal dogs.  
MUP: Maximal Urethral Pressure.

The maximal urethral pressure in the dogs suffering from ectopic ureter was significantly lower than in the clinically healthy dogs ( $p < 0.001$ ). After the operation, only case A was cured of abnormal urination, but the others remained slightly incontinent.

In summary, it was shown that the UPPs of dogs with ectopic ureter were significantly lower than those of normal dogs. This suggests that imperfect uroschisis and anatomical abnormality caused weak urethral contraction. And the technique used to obtain the UPP was considered to be a useful way to evaluate the function of the urethral sphincter and to identify the abnormal part.

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