pISSN 1598-298X / eISSN 2384-0749
J Vet Clin 36(3) : 176-179 (2019)
http://dx.doi.org/10.17555/jvc.2019.06.36.3.176

Journal of Veterinary Clinics
www.ksvc.or.kr

Giant Prostatic Urethral Calculus in a Maltese Dog: a Case Report

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(Received: January 09, 2019 / Accepted: February 21, 2019)

Abstract : A giant prostatic urethral calculus has not been previously reported in dogs and should be distinguished from prostatic calculus. A 7-year-old castrated male Maltese dog with a 2-month history of relapsing hematuria and urinary incontinence with slowly progressing paraphimosis was referred. On abdominal radiography and ultrasonography, there was a giant calculus in the region of prostate or urethra, one left ureteral calculus, one urinary bladder calculus, and two penile urethral calculi. On computed tomography for evaluating the accurate location and planning the surgical approach, the giant calculus was located at the prostatic urethra. The calculi in urinary bladder, prostatic and penile urethra were surgically removed. These calculi were mixed-type of calcium oxalate monohydrate, struvite and calcium phosphate carbonate. On the basis of the urolith analysis and urine bacterial culture results, antibiotics and prescription diet were adjusted. At the 3-month follow-up, there were no clinical sings but paraphimosis was still remained, and ultrasonography revealed newly-formed, small urethral calculi at the prostatic urethra. This is the first report to describe the case of a canine giant prostatic urethral calculus and its clinical signs, diagnostic imaging findings, treatment, and outcome. CT may be useful to assess the accurate location and surgical approach for such calculi.

Key words **:** calculus, computed tomography, dog, giant calculus, prostatic urethra.

Introduction

A giant prostatic urethral calculus has not been previously reported in dogs and should be distinguished from prostatic parenchymal calculi that are associated with prostatic cancer and benign prostatic hyperplasia. Although the etiology of giant urethral calculus has not been fully investigated, urethral strictures, posterior urethral valves, and urethral diverticula are thought to be associated (1,3,8). This is the first report to describe the case of a giant prostatic urethral calculus in a Maltese dog and its clinical signs, diagnostic imaging, treatment, and outcome.

Case Report

A 7-year-old castrated male Maltese dog was examined because of a 2-month history of relapsing hematuria and urinary incontinence. Slowly progressing paraphimosis had been observed over a one-year period. The dog was castrated at 7-months of age. No abnormalities were detected on the physical examination, except for paraphimosis. The complete blood count, serum biochemical analysis, and electrolyte examination results were all normal.

On abdominal radiography, there was a smooth, oval-shaped, giant, bone-opacity object in the region of the prostate or urethra, caudal to the urinary bladder, measuring 9.1 × 14.9 mm. Furthermore, there were four additional bone-opacity objects as follow: one in the left ureter (2.4 × 4.1 mm), one in the urinary bladder (12.9 × 23 mm), and two in the penile urethra (diameter, 3.5 and 4.5 mm, respectively). The calculi in prostate or prostatic urethra and the urinary bladder had well-distinguished layers of a nidus, stone, and shell (Fig 1). The contours of both kidneys were unclear, so their size could not be evaluated. On ultrasonography, the location of the giant calculus was still ambiguous as prostatic urethra or membranous urethra, because of the prostatic parenchymal atrophy. The wall of the urinary bladder was slightly thickened with respect to the degree of bladder distention (Fig 2A). Both kidneys had moderately poor corticomedullary demarcation with mild calcification of the renal cortices and a small left

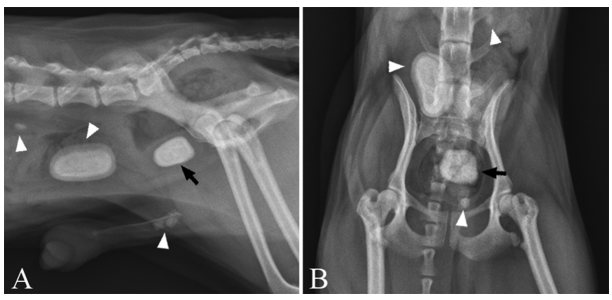

Fig 1. Lower abdominal radiographs (A, B). A giant bone-opacity object with well-distinguished layers of a nidus, stone, and shell is shown in the urethra (arrows). Furthermore, there are four calculi, one in the left ureter, one in the urinary bladder, and two in the penile urethra (arrowheads).

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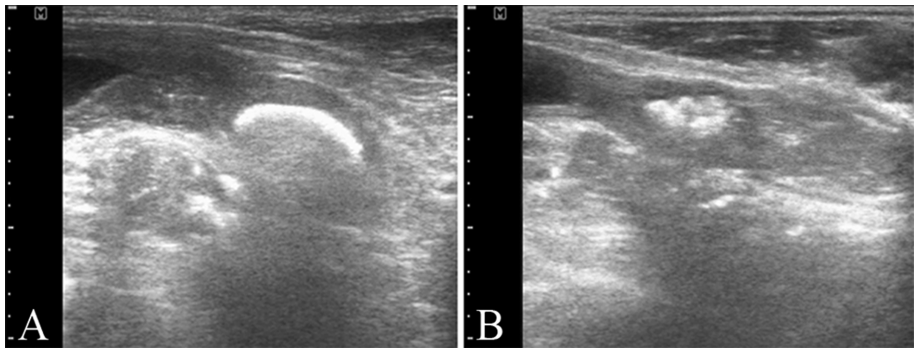

Fig 2. Ultrasonography of the proximal urethra. A giant calculus with acoustic shadowing is shown in the prostate/urethra region. The urinary bladder neck and urethral wall are thickened. The exact location of this calculus was ambiguous, because of the prostatic parenchymal atrophy (A). At 3-month follow-up, numerous small urethral calculi are identified in the location of the previous giant calculus (B).

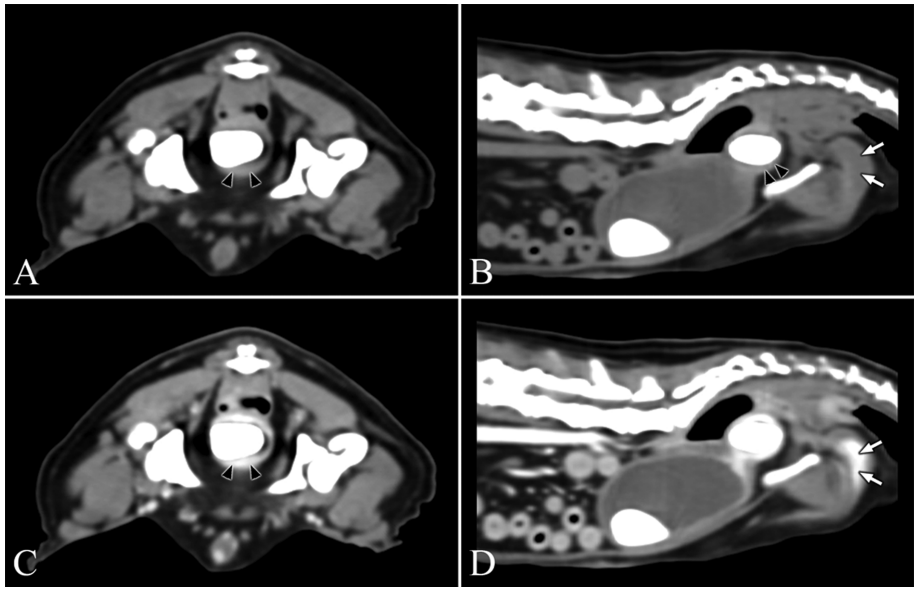

Fig 3. Abdominal computed tomography. On non-contrast images (A, B), the attenuation value of the tissue peripheral to the calculus (arrowheads) is 62 HU, while the membranous and penile urethra have a value of 50 HU (arrow). On contrast images of the portal phase (C, D), strong enhancement of the urethral tissue (arrow, 240 HU) is confirmed, while tissue peripheral to the calculus shows a contrast enhancement value of 110 HU. On the basis of these findings, the tissue near the calculus is revealed as the prostate. HU, Hounsfield unit.

kidney (16.6 × 26.5 mm) was observed.

In order to determine the accurate location of the uroliths and plan the surgical approach, computed tomography (CT) of the abdomen was performed using a 32-row multi-detector CT scanner (Alexion, Toshiba Medical System; Tokyo, Japan). The dog was placed under general anaesthesia using propofol (5 mg/kg, IV, Provive; Myungmoon Pharm Co.) for induction and isoflurane (2-3% inspired volume, Ifran; Hana Pharm Co.) for maintenance, and positioned in dorsal recumbency on the CT table. The scanning parameters were a contiguous slice thickness of 2 mm, 150 mA, and 120 kV. Iohexol (600 mg iodine/kg, Omnipaque; Nycomed Imaging) was injected intravenously for the contrast studies, and the arterial, portal venous, and delayed phases were acquired. On the CT images, four calculi were evident in the left ureter, urinary bladder, and penile urethra. In addition, the attenuation value of the tissue near the calculus with an ambiguous location on ultrasonography was 62 Hounsfield units (HU) on the non-contrast images, with contrast enhancement of 110 HU, while the membranous and penile urethra showed a value of 50 HU on non-contrast images, with strong contrast enhancement (240 HU). On the basis of these CT findings, a giant prostatic urethral calculus was diagnosed (Fig 3). For surgical planning, the distances between the giant prostatic urethral calculus and the skin near the perineum and the scrotal region were measured as 2.7 and 2.6 cm, respectively.

Before surgery, the urinary bladder was decompressed by collection of urine via ultrasound-guided cystocentesis. Cephalosporin (22 mg/kg, IV, Cefozol; Hankook Korus Pharm Co.) and meloxicam (0.2 mg/kg, IV, Metacam; Boehringer Ingelheim) were administered for prophylaxis and analgesia, respectively. The dog was placed in dorsal recumbency, and a sterile polypropylene catheter was inserted into the penile urethra and advanced to the site of calculus. After placing moistened pads and stay sutures on the bladder apex, a longitudinal incision was made on the ventral surface of the blad-

der. The calculus in bladder was removed, and the enlarged prostate containing the giant urethral calculus was palpated. Gentle manual pressure to cranial was applied to the prostate while urohydropropulsion was performed using warm saline. The calculi in the prostatic urethra and penile urethra were flushed into the bladder and removed in consecutive order. Complete removal of the calculi, except for the left ureteral calculus, was confirmed on radiographs. Closure of the surgery site was performed in a routine fashion. The dog was hospitalised for 5 days for postoperative observation and care with a Foley catheter during the first 48 hours. Maintenance fluid therapy with normal saline, as well as cephalexin (22 mg/kg, PO, BID, Falexin; Dongwha Pharm Co.), meloxicam (0.1 mg/kg, PO, once daily, Metacam; Boehringer Ingelheim), and famotidine (0.5 mg/kg, PO, twice daily, Hana Famotidine; Hana Pharm Co.) were administered orally for 10 days.

On bacterial culture of the urine and bladder mucosa, *Staphylococcus pseudointermedius* was isolated. Based on sensitivity testing, cephalexin dosage was continued for an additional 10 days. The diet of the dog was also changed to a prescription diet. On uroliths analysis, the prostatic urethral calculus was composed of a nidus of calcium oxalate monohydrate, a stone of struvite and calcium phosphate carbonate, and a shell of struvite and calcium phosphate carbonate. The calculus from the urinary bladder showed a similar result. At the 3-month follow-up, the left ureteral calculus was no longer present. However, the paraphimosis remained, with mild improvement, and newly-formed, small urethral calculi were observed in the prostatic urethra on ultrasonography (Fig 2B).

Discussion

Although urolithiasis is a common disease in veterinary medicine, a giant prostatic urethral calculus has not been previously reported. Urethral calculi are generally classified as native, which form in the urethra, or migratory, which form in the bladder or kidney and descend to the urethra (6). Swift Joly classified urethral calculi according to their location as follows: (1) vesico-urethral, (2) urethro-prostatic, and (3) urethral. Vesico-urethral calculi are located partly in the urethra and urinary bladder, leaving a constriction mark on the calculus due to the internal sphincter. Urethro-prostatic calculi are located partly in the prostate gland (5). According to this classification, the giant prostatic urethral calculus in this patient was a urethro-prostatic calculus.

The etiology of the giant prostatic urethral calculus is still unknown and urethral strictures, posterior urethral valves, and urethral diverticula have been suggested as causes (1,3,8). One previous report in humans also suggested the presence of a congenital diverticulum in the prostatic urethra or a persistent utricle as the causes after ruling out other predisposing diseases using the prior history (8). The exact cause in this case study was also uncertain, due to the lack of cystoscopy: however, a posterior urethral valve was excluded as a cause, considering the patient's age and history. Urethral stricture originating from urethritis secondary to urolith movement, prostatic urethral diverticulum, and persistent utricle were considered as potential causes in this case. It is well-known that native urethral calculi are generally struvite, while migrating calculi are composed of calcium phosphate or calcium oxalate (6). In our case, the nidus of the giant prostatic urethral calculus was calcium oxalate, in accordance with a migrating calculus while the stone and shell were composed of a mixture of struvite and calcium phosphate. Therefore, this giant calculus may have originated as a migrating calculus that was then covered by other components in the prostatic urethra.

The main clinical signs of a giant prostatic urethral calculus are nonspecific in previous human reports and include urinary retention, increased urinary frequency, a burning sensation in the urethra on urination, a burning sensation in the perineum and/or rectum, and a stringing in the anus. Minor clinical signs include hematuria, urine dribbling or incontinence, and interruption of the urinary system (1,3,8). In this case, the clinical signs were also nonspecific urinary tract signs, except for the progressive paraphimosis. In veterinary medicine, the causes of paraphimosis without obvious orifice defects have not been fully investigated: however, ineffective preputial muscles, paralysis of the retractor muscle, chronic urethritis, and trauma have been suggested as underlying causes (7,9). Though the definite pathoetiology of the progressive paraphimosis in this case was not determined, urethritis originating from the urolithiasis and deep perineal nerve damage caused by compression from the giant prostatic urethral calculus are possibilities.

In this case, the accurate location of the giant prostatic urethral calculus was only confirmed on CT. Ultrasonography has been widely used to evaluate the urinary system in veterinary medicine because of its convenience and ability to evaluate morphology. However, in this case, ultrasonography could not distinguish the prostatic urethra from the membranous urethra, due to prostate atrophy secondary to castration. In addition, acoustic shadowing by the giant calculus prevented accurate evaluation. Furthermore, ultrasonography did not allow assessing the possibility of an urethrostomy by measuring the distance of the calculus from the incision site. On the contrary, CT confirmed the accurate location of the giant urolith by its HU value and contrast enhancement of the prostate compared with that of the urethra. Although no study has reported on CT imaging of prostatic atrophy or the urethra in dogs, a previous study on CT in healthy intact dogs revealed values of 50-68 HU for the prostate on non-contrast images, with values of 80-119 HU on contrast enhancement (10). These findings are consistent with our results that showed a value of 62 HU for the prostate with a contrast enhancement value of 110 HU. On the other hand, the urethra showed a lower HU value than that of the prostate, as well as a higher HU value on post-contrast images, which could help to distinguish the prostate from the urethra. In addition, CT was useful to exclude the possibility of an urethrostomy in this case by measuring the distance between the prostatic urethral calculus and the perineum.

The treatment options for a giant prostatic urethral stone in humans are open transvesical prostatolithotomy, bladder neck incision with bladder neck reconstruction, radical prostatectomy, open retropubic prostatolithotomy, and endoscopic lithotripsy (1,3,8). However, the surgeries that manipulate the prostate have several side effects in dogs, such as haemor-

rhage, urinary haemorrhage, urine leakage, infection, urethral stricture, and urinary incontinence (7). Endoscopic lithotripsy also has its limitations in a small breed male dog (< 6 kg) because of the small urethral diameter, and endoscopic lithotripsy is not suitable for a giant urethral calculus (2,4). In this case, several surgical options were considered for removal of the prostatic urethral calculus and are listed in increasing order of postoperative side effects as follows: (1) urohydropropulsion, (2) gentle manual pressure to the urinary bladder, (3) urethrotomy with prostatic incision, and (4) prostatectomy. Consequentially, the uroliths, including the prostatic urethral calculus, were removed completely by urohydropropulsion with gentle manual pressure in this case. Therefore, urohydropropulsion with careful manual pressure may be considered as the first option for surgical removal of a giant prostatic urethral calculus in order to reduce postoperative side effects.

Although surgery was performed successfully, along with proper antibiotic therapy and a change to a prescription diet, recurrences of uroliths in the prostatic urethra was confirmed at the 3-month follow-up. The uroliths in the prostatic urethra may have formed in the cavity created by the previous giant calculus, and the persistent paraphimosis may have exacerbated stone formation by allowing for ascending infection. This suggests the need for regular medical examinations in dogs with a history of a giant prostatic urethral calculus.

Conclusions

This case report describes the first case of a canine giant prostatic urethral calculus and its clinical signs, characteristics of diagnostic imaging, treatment, and outcome. CT may be useful to assess the accurate location of calculi and plan the surgical approach for dogs with a giant urethral calculus.

References

1. Bello A, Maitama HY, Mbibu NH, Kalayi GD, Ahmed A. Unusual giant prostatic urethral calculus. J Surg Tech Case Rep 2010; 2: 20-22.
2. Defarges A, Dunn M. Use of electrohydraulic lithotripsy in 28 dogs with bladder and urethral calculi. J Vet Intern Med 2008; 22: 1267-1273.
3. Demir O, Kefi A, Cahangirov A, Cihan A, Obuz F, Esen AA, Celebi I. The giant calculus within the prostatic urethra. Uro Res 2011; 39: 319-321.
4. Grant DC, Were SR, Gevedon ML. Holmium: YAG laser lithotripsy for urolithiasis in dogs. J Vet Intern Med 2008; 22: 534-539.
5. Joly JS. Stone and calculus disease of the urinary organs. St. Louis: C. V. Mosby. 1929.
6. Kalphan M, Atakan IH, Kaya E, Aktoz E, Inci O. Giant prostatic urethral calculus associated with urethrocutaneous fistula. Int J Urol 2006; 13: 643-644.
7. MacPhail CM. Surgery of the reproductive and genital systems. In: Small Animal Surgery, 4th ed. Philadelphia: Elsevier. 2013: 780-855.
8. Okulu E, Ener K, Aldemir M, Onen E, Keske M, Kayigil O. Multiple giant prostatic urethral stones with an ureteral stone in a young patient. Urol Res 2012; 40: 185-187.
9. Papazoglou LG. Idiopathic chronic penile protrusion in the dog: a report of six cases. J Small Anim Pract 2001; 42: 510-513.
10. Pasikowska J, Hebel M, Niżański W, Nowak M. Computed tomography of the prostate gland in healthy intact dogs and dogs with benign prostatic hyperplasia. Reprod Domest Anim 2015; 50: 776-783.