

Surgical Management of Urethral Plugs in a Male Shih-Tzu Dog

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Abstract : A 6-year-old castrated male Shih-Tzu was admitted to the Gyeongsang Animal Medical Center with hematuria and vomiting. Serum chemistry indicated increases in blood urea nitrogen and creatinine values. Radiography showed radiopaque materials attached to the ventralis of the inner bladder wall. Penile urethra also was filled with radiopaque materials. Ultrasonography revealed bilateral perineal effusion in the kidney, thinned bladder wall, and materials with acoustic shadowing at the caudal extremity of the os penis. Because urination was not identified by urinary obstruction, cystocentesis was performed. Hematuria was diagnosed by urinalysis, but clear crystals were not identified. Owing to failure of securing patency to the bladder using retrohydropropulsion, cystotomy and urethrotomy with retrohydropropulsion were performed. In this report, we describe the clinical and radiographic findings of urethral plugs in a male Shih-Tzu dog, wherein the urethral plugs were treated successfully with hydropropulsion, cystotomy, and urethrotomy. It provides an option for the treatment of urethral plugs in a dog.

Key words : Urethral plugs, Urethrotomy, Retrohydropropulsion, Cystotomy.

Introduction

Urethral plugs in cats are soft and paste-like with a classic cylindrical shape. They are composed of matrix components (mucoprotein; mucus and inflammatory debris) and varying amount of minerals (1,4). Over the past several years, a similar phenomenon of urethral plugs in male dogs has been observed (1).

One theoretical contributing factor in the development of urethral plugs in cats is that the bladder mucosal cells secrete excessive mucus in response to irritation or inflammation (7). In a study involving dogs, the plug-forming process could have had an underlying bladder disorder that was responsible for the production of the cellular and proteinaceous component of the plugs (1).

The case of urethral obstruction in male dogs was similar to cases reported with male cats. In as with the management of urethral obstruction in common with male cats, cystotomy with retrohydropropulsion remains one of the most common methods of removing uroliths in male dogs (2). If retrohydropropulsion is failed, remove the obstruction may potentially be removed with urethrotomy. When the lesion cannot be removed, urethrostomy most likely will be performed.

This report describes the surgical management case of a male dog with urethral plugs as diagnosed by clinical and radiographic findings.

Case

A 6-year-old castrated male Shih Tzu weighing 5.1 kg presented to the Animal Medical Center at Gyeongsang National

University with hematuria, vomiting, and dysuria over the previous 2-3 days. The dog had been seen previously at a local animal hospital, and bladder stones were a presumptive diagnosis. Retrohydropropulsion was tried unsuccessfully by the local animal medical center. In addition, the dog was diagnosed with intervertebral disc disease several years ago, and underwent knee surgery one year ago.

On physical examination, the dog revealed normal heart rate and panting at the time of referral. In additionally, abdominal distension and UMN sign on the hindlimb were revealed. A complete blood count (CBC) and serum biochemistry analysis and urinalysis were performed prior to surgery. The serum biochemistry analysis revealed elevated values of blood urea nitrogen (BUN) (99 mg/dL, reference range: 7-25 mg/dL) and creatinine (4.5 mg/dL, reference range: 0.3-1.4 mg/dL).

Radiography confirmed that the bladder was filled with urine. Radiopaque materials were attached to the ventral sur-



Fig 1. (A) Lateral view of abdominal radiography. Radiography confirmed the presence of the bladder, which was filled with urine. In addition, the penile urethra was filled with radiopaque materials (arrow head). (B) Ventrodorsal view of abdominal radiography. Bilateral pelvic luxation was revealed (white arrow).

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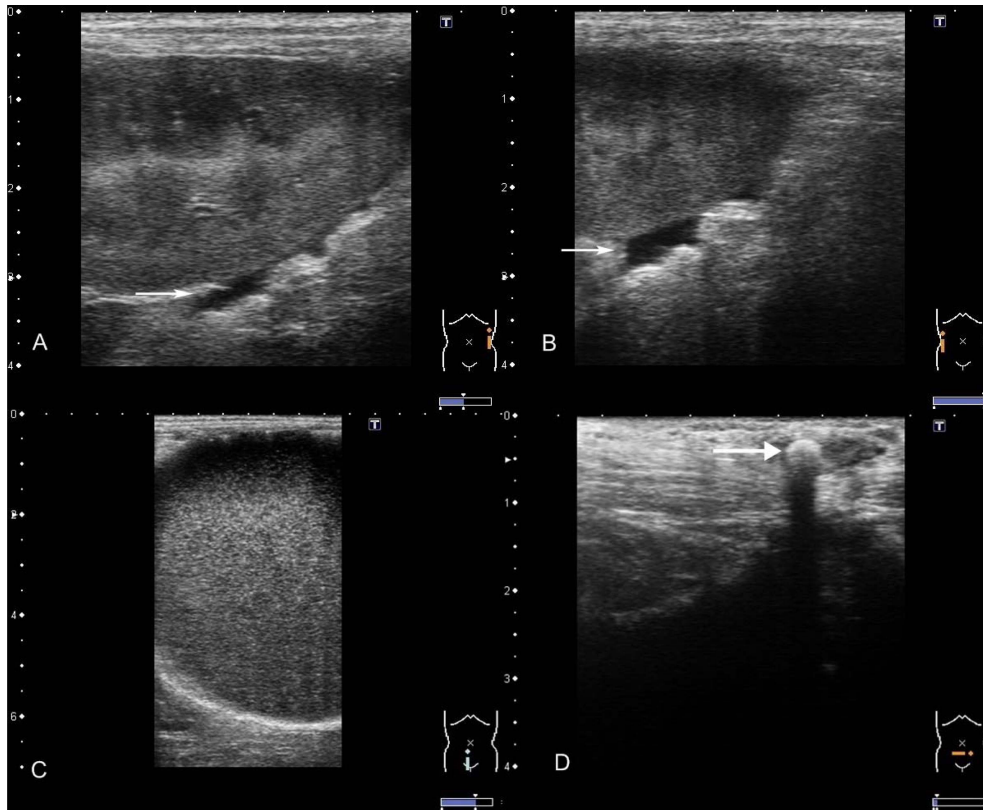


Fig 2. (A) Ultrasonograms of the left kidney. Ultrasonograms revealed perineal effusion in the left kidney (white arrow). (B) Ultrasonograms of the right kidney. Ultrasonography revealed perineal effusion in the right kidney (white arrow). (C) Ultrasonogram of the bladder. Thinned bladder wall, material with acoustic shadowing identified within the bladder. (D) Ultrasonogram of caudal extremity of the os penis. Material with acoustic shadowing identified (white arrow).

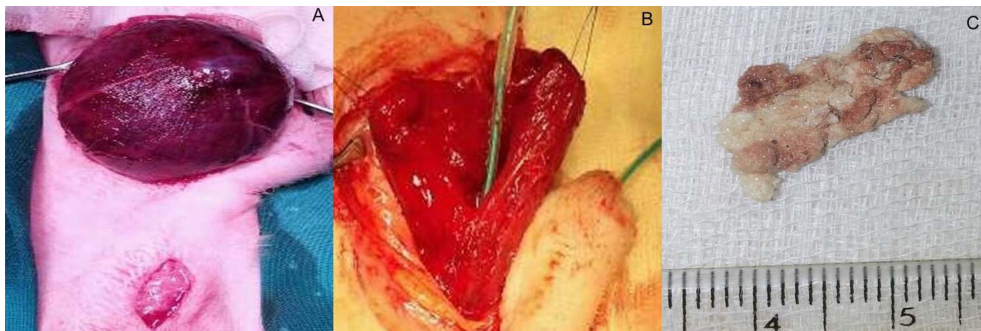


Fig 3. (A) Bladder of dog with urethral plugs. Bladder wall was thinned, with loose elasticity, and bladder had hyperemia. (B) Gross appearance of the bladder. Removal of bladder sludge and urethral plugs was performed through approaching the urethra and bladder with curette and flushing. (C) Gross appearance of urethral plugs.

face of the inner bladder wall. Further, the penile urethra was filled with radiopaque materials (Fig 1A). Bilateral pelvic luxation was revealed (Fig 1B). Ultrasonograms revealed bilateral perineal effusion in the kidney (Fig 2A, 2B), thinned bladder wall, and material with acoustic shadowing identified within the bladder (Fig 2C) and caudal extremity of the os penis (Fig 2D). For the treatment, 200 mL of urine was removed by cystocentesis; urinalysis revealed dark brown color, hemolysis, proteinuria, and pH 7, specific gravity 1.020. However, cytology revealed abnormal blood counts, specifically red blood cells, white blood cells, and neutrophils; because of bleeding, urinalysis did not yield valid

results. Based on diagnostic imaging, cystostomy with retrohydropropulsion was strongly recommended. Subsequently, retrohydropropulsion failed and urethrotomy was recommended.

Atropine (0.04 mg/kg, subcutaneous [SC] administration), butorphanol (0.2 mg/kg, SC), and diazepam (0.2 mg/kg, intravenous [IV] administration) were used as preanesthetic drugs for surgical treatment, and cefazolin (25 mg/kg, IV) was used as a prophylactic antibiotic. After induction with etomidate (1.5 mg/kg, IV), anesthesia was maintained with inhaled isoflurane. Location of urethral obstruction was not clear. Based on diagnostic image results, urethrotomy was performed. On

ultrasonogram, material with acoustic shadowing was identified at the caudal extremity of the os penis. Therefore, urethrotomy was performed at this site. Urethral plugs were broken pettily and had a mud-like consistency. Retrohydropropulsion was retried but failed. Because urethral patency could not be secured, curettage and cystotomy was performed. Bladder wall was thinned and characterized by loose elasticity, and bladder had hyperemia (Fig 3A). Removal of bladder sludge and urethral plugs was performed by approaching urethra and bladder with curette and flushing (Fig 3B). This treatment was repeated several times until we were able to secure patency of the urethra to the bladder. Urethral plugs were removed entirely from bladder and urethra. After securing patency, we were able to perform catheterization. We used the inversion suture technique and covered the omentum to prevent leaking.

Butorphanol (0.2 mg/kg, SC, SID [once daily]) for immediate pain management and cefazolin (25 mg/kg, IV), Vit K (1 mg/kg, SC, SID) was administered. Cefazolin (25 mg/kg, IV, BID [twice daily]), ketoprofen (1.1 mg/kg, IM, SID), ranitidine (2 mg/kg, IV, BID), tramadol (2 mg/kg, IV, BID), furosemide (2 mg/kg, SC, TID) were administered postoperatively. Fluid therapy was performed for 3 days. After the surgical treatment, urethral plugs were resolved. The dog had urinary incontinence similar to that experienced before the surgery. Results of analysis of the sludge and plugs showed composition of struvite 80% and carbonate apatite 20% (Fig 3C). One week from surgery, the dog's food was changed to Royal Canin (Gard, France) urinary struvite formula. Two months after surgery, there was no recurrence and urination was normal.

Discussion

Although crystalline-matrix urethral plugs in dogs have been described rarely in the past, the phenomenon has been found recently (1) and there is interest in characterizing them so that clinical and surgical approaches to management can be clarified and optimized.

In cats, treatment approaches including surgical management must be determined by the cause of the obstruction and its location in the urethra (10). Urethral plugs are a common cause of urethral obstruction in male cats. Urethral plugs in cats are soft and paste-like with a classic cylindrical shape. They are composed of matrix (mucoprotein, composed of mucus and inflammatory debris) and varying amounts of mineral (1). Similar phenomenon of urethral plugs in male dogs was increased during past several years (1).

In most such cases, a male cat can be catheterized and urethral plugs or uroliths flushed back into the bladder. When retrohydropropulsion is not feasible or is unsuccessful, surgery should be recommended (10).

The case of urethral obstruction in male cats was recommended several surgical options. Manually, cystotomy combined with retrohydropropulsion and/or urethrostomy (when required) was performed. But, perineal urethrostomy was recommended when repeated urethral obstruction or obstruction cannot be relieved by catheterization (10). In some cases, prepubic urethrostomy may be recommended if failed surgi-

cal option which outlined above. It should be noted that there is no indication for urethrotomy in the male cat (10).

Similar options are available for management of urethral obstruction in male dogs. Cystotomy with retrohydropropulsion remains one of the most common methods of removing uroliths in male dogs (2). Because of the risks associated with urethrotomy, cystotomy is the preferred technique for removal of calculi (6). If this fails, removal of the obstruction with urethrotomy is a possibility (3). Generally, urethrotomy is performed in male dogs to facilitate passage of catheters into the bladder and to remove urethral calculi. Additionally, urethrotomy may be performed in the prescrotal or perineal regions, depending on the location of the obstructive lesion. Based on accessibility and depending on prognosis, the prescrotal region is a preferred site than the perineal region because of accessibility, prognosis. When the lesion cannot be removed, urethrostomy most likely will be performed (3). In the management of uroliths, localization and characterization of the obstruction using radiography is important for purposes of planning the appropriate surgical technique. In urethral plugs, struvite was interspersed in a deformable matrix of cellular and proteinaceous material rather than as discrete uroliths (1). Therefore, in this case, removing urethral plugs by common surgical procedure is difficult.

In case of lithotripsy, lithotripsy was repeated until resulting fragments were smaller than the urethral diameter. Uroliths and urolith fragments were removed either with various endoscopic stone baskets, voiding retrohydropropulsion, or both (5). In this case, penile urethra was filled with urethral plugs in which struvite was interspersed in a deformable matrix of cellular and proteinaceous material, rather than as discrete uroliths. Therefore, lithotripsy was not appropriate. Additionally, localization and characterization was difficult. Based on diagnostic image results, urethrotomy was performed. Especially on the ultrasonogram, material with acoustic shadowing identified caudal extremity of os penis. In addition, the perineal urethra is much less accessible than the prescrotal portion, because it lies deep in the perineal tissue and is surrounded by the bulbospongiosus muscles (6). Therefore, urethrotomy was performed at the site of the caudal extremity of os penis. Because there is no specific surgical treatment for urethral plugs in male dogs, cystotomy with retrohydropropulsion and urethrotomy would be recommended as a surgical treatment option.

Dogs in which urethral plugs form could have underlying bladder disorders that are responsible for the production of the cellular and proteinaceous component of the plugs (1). Moreover, stones that contain struvite may originate *de novo* or grow on pre-existing stones, which are infected with urea-splitting bacteria (9). Struvitolytic diets and antibiotic therapy need to continue at least 1 month beyond surgery, with evaluation and radiographic evidence of urethral plug dissolution (8). In this case, components of urethral plugs identified struvite (80%) and carbon apatite (20%). It is considered that cystitis was induced because of infection secondary to stones and that cystitis subsequently caused urethral plugs. A 7-day course of antibiotics was prescribed, and one week from surgery, the client was instructed to change the dog's food to Royal Canin's urinary struvite formula. Two months

after the surgery, no recurrence was seen and urination was normal.

In one study, all of the plugs were from male dogs, whereas struvite urolithiasis was more common in females (1). Anatomical differences between sexes might explain the male predisposition. Male dogs have longer, narrower urethras, placing male dogs at increased risk for urethral obstruction (1).

Conclusion

Over the past several years, urethral plugs in male dogs has been observed (1). There is no specific surgical treatment for urethral plugs in male dogs, cystotomy with retrohydropropulsion and urethrotomy would be recommended as a surgical treatment option.

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수컷 시츄견에서 발생한 유레쓰랄 플러그의 수술적 관리

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요 약 : 6년령의 중성화된 수컷 시츄가 본 병원에 혈뇨와 구토로 내원하였다. 혈액검사 결과 BUN, Creatin 수치가 증가한 상태였다. 방사선 상에서 방광 벽 배쪽으로 방사선 비투과성 물질이 붙어있었다. 또한 음경요도에 방사선비투과성 물질로 가득차 있었다. 초음파 상에서는 신장에서 양측에서 유출물이 나타났으며, 방광벽은 얇아져 있었고, 음경골 뒤쪽으로 아쿠아텍 세도잉을 나타내는 물질이 있었다. 요도폐색으로 인해 배뇨가 확인되지 않아서 방광천자를 하였다. 요분석 결과 혈뇨소견이 나타났으며, 명확한 입자들은 확인되지 않았다. 요로수압추진술을 하였으나 방광까지 개통성을 확보하는 것을 실패하였기 때문에 방광절개술과 요도절개술을 요로수압추진술과 함께 진행하였다. 이 case report는 유레쓰랄 플러그를 가진 수컷 시츄 견에서 임상적 소견, 방사선학적 소견을 설명하였다. 유레쓰랄 플러그가 방광절개술과 요도절개술, 요로수압추진술을 통해 성공적으로 치료된 케이스이다. 이것은 유레쓰랄 플러그를 가진 강아지에서 한가지의 치료방법이 될 수가 있다.

주요어 : 요도결석, 요도절개술, 요로수압추진술, 방광절개술