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Case Report

# Surgical Management of Urethral Obstruction in a Dog by Urethrostomy: A Case Study

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## Abstract

An eleven-year-old male Shih-tzu dog was presented with acute onset of stranguria, pollakiuria and haematuria. On the clinical examination, a full distended bladder of a massive size was palpated which was evident on radiography as well. Moreover, there was radiographic evidence of radiopaque calculi affecting the penile part of the urethra. However, there was not any radiographic evidence of urolithiasis of the bladder and the rest of the abdominal organs appeared radiographically normal. These finding were consistent with total urethral obstruction and after several unsuccessful attempts for resolution with retrohydropulsion, cystotomy and urethrostomy were performed, to inspect for potential presence of bladder uroliths and to create a new urethral stoma. After a short hospitalisation period the animal was discharged and the owner reported significant improvements four weeks post operatively. Finally, the patient adapted fully to the new condition eight weeks after the procedure. Aetiology and reliability of the diagnostic and surgical techniques of urethral obstruction are discussed as well as management of post-operative complications.

**Keywords:** Dog; Urinary Obstruction; Animals

## Introduction

Urinary obstruction is considered as one of the most common emergencies of small animals [1]. Cystolithiasis involves the production of calculi, solid particles formed by crystals, within the urinary bladder. The crystals are formed by salts which are eliminated in the urine and are constituted by minerals which accumulate in the urine because of urine saturation with minerals as well as bacteria that produce urease [2]. Embedded calculi in the urethra can be the cause of urinary obstruction [3]. Several causes such as infectious, non-infectious, dietary and genetic have been associated with the aetiopathogenesis of uroliths [4].

Symptomatology might include stranguria, dysuria, pollakiuria and haematuria. Furthermore, more generalised symptoms such as anorexia, vomiting, lethargy and abdominal pain as well as more specific such as anuria or oliguria might be present [5]. Finally, hyperkalemia, acidemia and azotemia can further compromise an obstructed patient and cause cardiac compromise [6]. Untreated obstructions can become life- threatening in a few days.

Diagnosis is usually highly indicated by the history and the clinical examination. Confirmation of initial suspected diagnosis is usually made after initial stabilisation of the patient by plain radiographs and ultrasound scan in cases that is needed [7].

The management of urinary obstruction depends significantly on a lot of factors that can vary among cases depending on the individual and on clinical factors [8]. Individual components include gender, age and clinical presentation whereas the anatomical location of the calculi, the presence of calculi in the bladder, the success of retrohydropulsion are considered clinical reasons that can affect the treatment choice.

### History

An 11year-old male Shih-Tzu with history of bladder uroliths presented with stranguria, pollakiuria and haematuria for the past week. There were no other abnormalities detected by the owner. The animal has been previously treated for urocystoliths a few months before the current presentation.

## Clinical examination and diagnostic techniques

On physical examination, a full distended bladder of a massive size palpated, indicating urinary obstruction. Additionally, a systolic heart murmur grade II/VI was detected, and a full haematology and biochemistry profile was performed to detect any electrolyte or other disturbances. The heart murmur was detected before, but the animal remained asymptomatic and the owner declined any investigation. Mild neutrophilia and monocytosis were observed, but absence of azotaemia indicated recent obstruction (Appendices; Appendix A). Urinalysis did not reveal crystaluria.

Moreover, radiographs taken to confirm the suspected diagnosis. Radiopaque calculi were present in the penile part of the urethra as shown on figure 1, 2 and 3 below. There was not evidence of any uroliths in the bladder, but it was taken into consideration that more specific diagnostic procedures are needed for evaluation of radiolucent uroliths [9].

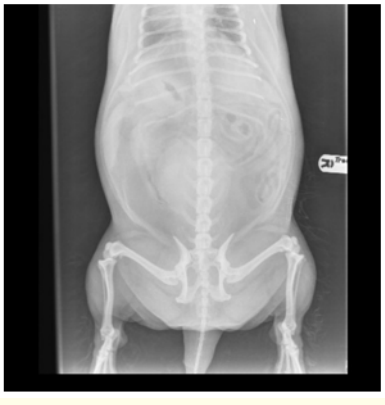

**Figure 1**

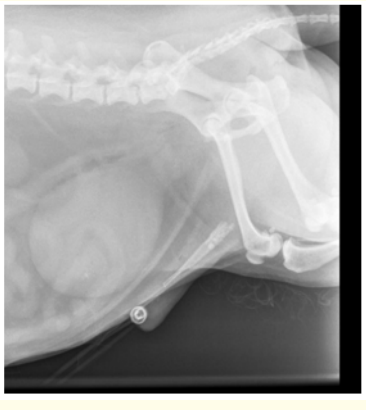

**Figure 2**

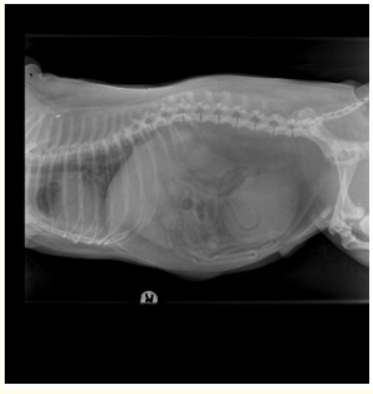

**Figure 3**

Despite retrohydropropulsion, it was unable to treat the obstruction with catheterisation. Moreover, efforts to remove calculi endoscopically failed; urethra appeared severely inflamed possibly due to traumatic injury by catheterisation attempts and uroliths could not be deviated further higher to the urethra and the bladder. Therefore, the treatment of choice at the time was cystotomy and urethrostomy.

The owner has already been familiar with the condition as it was the second time in a period of 4 months that the patient presented with uroliths. Cystotomy was performed for urolith removal 4 months ago. Unfortunately, the owner's bad compliance with the prescription diet lead to reformation of uroliths.

The owner was advised about the procedure; due to reoccurring urolith formation and due to the location of the obstruction, urethrostomy was a permanent solution to guarantee permanent urine output. Furthermore, potential perioperative complications were explained. Firstly, the age and the undetermined heart condition of the dog might have had effects due to the anaesthetic management. However, the patient remained asymptomatic and the low-grade heart murmur has not progressed. Therefore, no special anaesthetic management requirements were needed. Secondly, post-operative bleeding, risk of infection and management of the surgical wound were issues discussed upon admission and the owner was prepared for close post-operative monitoring. Finally, the owner was advised about the importance of the prescription diet as part of the medical management of the condition and warned about prognosis depending on this. The owner acknowledged the fact that reoccurring obstruction is not completely prevented by the procedure.

An estimate created including perioperative treatments and the owner signed a consent form acknowledging the risks of the general anaesthetic and the procedure.

## Pre-operative preparation

### Prep room

Preparation room is considered a contaminated area. The dog was prepared for the surgery in the anaesthesia and preparation room. The ventral abdomen was clipped up to the scrotal area - including the prescrotal where the incision was made- and the hairs were vacuumed. The abdomen was clipped 20 cm on each side of the incision. The area was scrubbed with chlorhexidine gluconate (Hibiscrub) 4% using gauzes from the centre to the periphery by a nurse wearing gloves. The prepuce was cleaned as well as it consisted source of contamination and the area was sprayed with spirit. The patient was then transferred to the theatre.

### Scrub sink and scrubbing technique

The scrub sinks are cleaned during the day and used consumables such as scrub brushes and soap are replaced. A deep stainless-steel sink with elbow-operated water activator is placed near the operating theatre but in an ideal distance from sterile supplies to avoid contamination (Fossum., *et al*. 2013).

Chlorhexidine gluconate 4% was used with a sterilized reusable brush to complete a five-minute scrubbing prior to surgery. However, studies in human surgery have shown that the efficacy of medicated soap scrubbing is worse compared to the alcohol based rub technique, which is applied in veterinary surgery as well [10].

### Gowning and gloving area

It is not yet clear about the ideal location for gowning and gloving. Therefore, it can be done in or out the operating theatre (Fossum., *et al*. 2013).

Hats, masks and sterilized gloves and gowns are worn in every surgery to prevent microbial contamination, by hair, mouth/nose, hands and clothing. Also, theatre-only shoes are worn for surgeries. The hats, masks and gloves are disposable, but the gowns are fabric and reusable. A closed gloving technique was used in this case.

### Instruments

Instruments are first scrubbed manually and then soaked in Reprodis (MediZyme®; Ethical Agents LTD) cleaner solution for 10 minutes. The cleaner is changed once a week. Metal instruments and endotracheal tubes are soaked in different solutions. After they are dried, they are packaged using paper/plastic bags and Bowie-Dick tape by the responsible nurse. The paper plastic bags have many advantages comparing to the cloth ones and offer a convenient choice for packaging. Each pack includes the necessary instruments, gauzes and TST indicator stripes as well, to confirm appropriate conditions for sterility have been met (Fossum., *et al*. 2013) and are marked to indicate the purpose of the pack, the date of packaging and the name of the nurse. In our practice, the sterilisation is done in a steam sterilizer.

### Theatre

The theatre is built in a key place in the practice so that cross contamination is avoided, and it is close to the preparation room for quick transfer. It includes the surgical table, a trolley, a monitoring system, a cupboard and a two-way door. The theatre is daily cleaned with separate cleaning equipment using Trigene solution in 1:100 dilution; it is first wiped down and then mopped. Deep clean takes place once weekly. As a practice protocol, clean procedures are done first, and the movements are kept to the minimum to avoid contamination. Also, the door of the operating room is always kept closed.

### Surgical technique

With the dog positioned on a dorsal recumbency, an abdominal incision was made from the umbilicus caudal to the pubis, the bladder was isolated using abdominal swabs and place sutures were used to allow manipulation. An intraoperative cystocentesis was performed before cystotomy. The obtained sample was sent away for culture and sensitivity testing, which is a common practice in our surgery. The bladder was emptied from small uroliths using a surgical spoon and uroliths were sent to the laboratory for identification. The dog's urethra was catheterised from the bladder up to the obstruction point to confirm the urethral patency. A 3 cm incision was made between the caudal aspect of the penis and the scrotum in the urethral mucosa and its length was 6 times the diameter of the urethral luminous (Fossum., *et al*. 2013). The bladder was closed with a two-layer pattern using 4/0 monofilament absorbable suture. The urethral mucosa was sutured with the skin in a simple interrupted pattern with 4/0 monofilament absorbable suture. Before closing of the abdomen, a swab and needle count was performed.

### Medication

There were no special precautions taken into consideration despite the heart murmur as the animal had no symptoms and the murmur was low grade [11].

A reduced dose of acepromazine 0.001mg/kg in combination with morphine on a loading dose of 0.1 mg/kg was given slowly intravenously as premedication and analgesia 10 minutes pre- operatively. Morphine was selected as it is a full mu agonist with a good effect in moderate to severe pain and is an "as-needed opioid" [12]. A continuous rate infusion (CRI) of Morphine/Lidocaine/Ketamine (MLK) was given perioperatively for pain management (0.03/1.5/0.6 mg/kg/hr respectively) at 1 ml/kg/hr. The patient was weaned off from the CRI over 2 hours post operatively, reducing the CRI to half and methadone was continued for analgesia every 4 hours.

Additionally, intravenous fluids were being administered at 2 mL/kg/hr using an infusion pump. There were no electrolyte abnormalities and the only finding on haematology was mild neutrophilia and monocytosis. Therefore, there was not any need for electrolyte corrections and fluids were given as supportive treatment until food and water uptake was reassured.

Meloxicam was given subcutaneously pre-operatively to add to the analgesia and add an antiflammatory effect.

Local anaesthetic was used to an amount calculated to prevent toxicity as lidocaine was already added on the CRI as well to contribute to the analgesia of the patient [13].

Propofol used for induction of anaesthesia to effect at 4 mg/kg.

Cefuroxime (Zinacef®; GSK UK) at 15 mg/kg every 4 hours was used as prophylactic treatment to prevent complications associated with post-operative infections. Zinacef was used as cephalosporines are found in high concentration in the urine and have a bactericidal effect against not only Gram-positive bacteria but gram-negative as well (Fossum., *et al*. 2013).

### Justification of surgical procedure

Urethrotomy was prohibited due to the location of the obstruction. Although urethrotomy of the glans penis showed few complications in a case report (Cinti., *et al*. 2015), it was not the surgery of choice of the surgeon. Urethrostomy was performed because of the prohibiting location of the obstruction for urethrotomy and mainly because of the reoccurrence of the obstruction in a period of 4 months. Additionally, there was an indication by the endoscopy that the uroliths were lodged in the urethral wall. The latter was another contributing factor to the decision for urethrostomy. Furthermore, the poor compliance of the owner regarding the prescription diet was another supporting factor for the choice of the surgery. Unfortunately, the possibility of a reoccurring obstruction was not prevented completely, but due to the bigger diameter of the urethral lumen above the os penis the risks were decreased.

### Post-operative recovery area

Analgesia was important for post-operative recovery; the MLK CRI was discontinued 5 hours after the end of the operation and analgesia was maintained with methadone pro re nata (prn) and meloxicam depending on Glasgow pain scoring [14]. The patient was discharged from the hospital 24 hours after surgery and pain management and antibiotics were continued at home along with a special prescription diet; meloxicam every 24 hours and tramadol every 8 hours until the next evaluation 3 days after the operation, amoxycillin was given at 12.5 mg/kg [15] every 12 hours until a course of 2 weeks was completed according to the guidelines for wise antimicrobial use [16]. The uroliths were submitted for identification.

### Outcome

The owner was advised about aftercare and possible complications. The owner was informed about potential haemorrhage by the urethra and was asked to closely monitor for voluntary urination. Also, he was informed about hygiene of the area until complete healing of the surgical wound. Finally, the possibility of recurrent urolith formation was discussed and the importance of the prescription diet (Royal Canin® Urinary S/O) was advised.

The animal was checked 3 days after the operation when there was significant improvement in healing of the incisions. On the 10-day POC the animal appeared to be getting gradually used to the urethrostomy and 4 weeks after the procedure complete healing of the wound was observed. The dog seemed to have fully adapted to the new condition two months later.

## Discussion and Conclusion

There are three main etiological elements that contribute to small animal urolithiasis; the first one is associated with infectious microorganisms, the second one is demographic and is correlated with factors such as the breed, the gender and the genetic susceptibility, and the last one is related mostly to the water and food quality [17].

There are several types of stones that have been identified in small animals such as struvite, oxalate, urate, cystine and silicate but in the recent years about 40-50% of canine uroliths are stru-

vite in origin and an increase in oxalate stones has been noted [18]. A retrospective study by Hesse., *et al*. [19] showed that 29.8% of uroliths -collected from 1979-2015- were calcium oxalate and the majority originated from older male dogs. The same study showed some breed related predisposition. Poodles, terriers, schnauzers, bichon frises, pinschers, Pomeranians and Lhasa apsos were the most predisposed breeds in United Kingdom [20]. In the same study, the average age of dogs with uroliths was 7 years, struvite stones were detected in 43% of the cases and interestingly, there was an age difference between the patients that were diagnosed with struvite comparing to those with oxalate stones [20].

Urethral obstruction results in various changes which can be prominent clinically as well as biochemically, such as increase in the pressure in the bladder. Additionally, the pressure increase in the urethral lumen proximally to the site of the obstruction, causing damage of the urethral epithelium and furthermore the kidneys and the ureters can be secondary affected [6]. Interestingly, in the case described in this report the animal received treatment before any occurrence of biochemical abnormalities.

Surgery of the urethra for the management of urethral obstruction is not recommended by the Consensus Statements of the American College of Veterinary Internal Medicine [21]. Thus, minor invasive techniques for stone removal are encouraged including voiding urohydropropulsion, basket retrieval or per- cutaneous cystolithotomy. However, in cases similar to the one described in this paper when less invasive techniques failed, recurrent obstruction resulted and the owner's financial and individual circumstances would not allow alternative treatments, then urethrostomy is the choice of treatment. Although this case was successfully treated with urethral surgery, an endoscope was used pre-operatively and allowed to the author to understand the extend of the obstruction with regards to the size of the urolith, the type of the obstruction and the damage caused to the urethral mucosa. However, the lack of specific instrumentation such as a basket retrieval device, the lack of endoscopic experience by the author and the financial restrictions by the owner, were all factors that contributed to the invasive treatment choice. Additionally, cystotomy could have been replaced by less invasive techniques such as cystoscopic-guided basket retrieval, cystoscopic-guided laser lithotripsy, and percutaneous cystolithotomy (PCCL) but the risk of potential recurrence of urethral obstruction limited the author's choices [22]. Moreover, it was finally proved necessary to enrich the facilities of the practice with instrumentation which help resolve similar cases with the least invasive way.

The surgery described in this paper had not had any serious complications both perioperatively and post-operatively. However, there are various described complications of the lower urinary tract surgery such as leakage of urine, loss of luminal diameter (stricture or stenosis), urinary incontinence and urinary tract infection [23]. Another common complication is haemorrhage from the surgical site or haematuria which can last up to three weeks post-operatively [24]. In a study made in six healthy dogs, it was noted that administration of tranexamic acid resulted in decreased fibrinolysis and raised clot strength [25]. Similar results were found in a study made to explore the effect of Yunnan Baiyao administration [26]. However, more studies are needed to evaluate the effect of the above to haemorrhage by specific conditions such as urethral surgery.

The improvement of the practice facilities is definitely the gold standard that allows more time efficient and less invasive treatments of serious and even life-threatening conditions. However, financial and individual reasons do not always warrant such treatment options. Therefore, minimizing and preventing when possible the potential complications as well as improving of the surgical techniques are important elements when considering more invasive treatment options.

## Appendices

Appendix A

MCHC: 377 300 - 375 g/L

WBC: 20.03 5.50 - 16.90 x10^9/L

Neutrophil: 15.33 2.00 - 12.00 x10^9/L H

Lymphocyte: 1.39 0.50 - 4.90 x 10^9/L

Monocyte: 2.93 0.30 - 2.00 x 10^9/L H

Eosinophil: 0.24 0.10 - 1.49 x 10^9/L

Basophil: 0.14 0.00 - 0.10 x 10^9/L H

Platelet: 565 175 - 500 x 10^9/L H.

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