Urethrotomy of the glans penis in three male dogs with urolithiasis

Summary

Three intact male dogs with stranguria and hematuria caused by uroliths in the penile urethra underwent urethrotomy using a novel surgical approach directly over the caudal part of the *os penis* because conservative procedures to resolve the obstructions had failed. Haemorrhage was minimal, and the incisions healed rapidly by second intention. Complications did not occur during the six-month follow-up period. Urethrotomy directly over the *os penis* is straightforward, associated with few complications and holds promise for the removal of urinary calculi in the penile urethra.

Keywords: dog**,** uroliths, urethrotomy, *os penis*, penile urethra.

Introduction

Urolithiasis is a frequent cause of lower urinary tract obstruction in male dogs (Franti and others 1999, Case and others 1993). The most commonly reported site of obstruction is immediately proximal to the *os penis* but obstruction may also occur at the level of the ischial arch (Franti and others 1999). Diagnostic imaging techniques are recommended to confirm both the diagnosis and the complete removal of calculi after treatment (Weichselbaum and others 1999, Grant and others 2010). Treatment of urolithiasis of the penile urethra can be attempted by retrograde urethral hydropropulsion followed by cystotomy (Osborne and others 1999). If this is not successful because of the position, size or shape of the urolith(s), surgical treatment consisting of urethrotomy or urethrostomy is indicated (Smeak 2000). The urethrotomy incision is sutured or left to heal by second intention because the regenerative ability of the urethral epithelium is excellent (Boothe 2000). Possible urethrotomy complications include haemorrhage, urethral stenosis, infection and recurrence of the obstruction (McLoughlin 2011). The purpose of this report was to describe a novel surgical approach for the treatment of canine urolithiasis in the penile urethra directly over the caudal part of the *os penis*. To our knowledge, this technique has not been reported in the veterinary literature.

Case History

From 2008 to 2013, three, intact, small to medium, mixed-breed, male dogs weighing 6 to 18 kg and ranging in age from 5 to 10 years were referred to our clinic because of stranguria and haematuria. Physical

examination revealed mild pain during abdominal palpation and an enlarged urinary bladder, which was confirmed by ultrasonography. Radiography and ultrasonography showed uroliths in the penile urethra along the ventral groove of the *os penis*. Dog 1 had 5 stones measuring 2 to 5 mm, dog 2 had 6 stones measuring 2 to 6 mm and dog 3 had 9 stones measuring 2 to 5 mm (Fig 1**).** The dogs were sedated with intramuscular [IM] methadone hydrochloride (0.3 mg/Kg IM Semfortan 10mg/ml) and urinary bladder decompression and collection of urine was done via transcutaneous ultrasound-guided cystocentesis. Bacterial culture of the urine was negative in all the dogs, and the results of a complete blood cell count as well as blood biochemistry were all within reference intervals. General anaesthesia was induced with propofol (2-3 mg/kg intravenously [IV]) and maintained with isoflurane in 2% oxygen. Each dog was positioned in lateral recumbency, and cefazolin (22 mg/kg IV, Cefazolina Teva 1g) was administered. ~~A Foley catheter was introduced into the urethra and advanced to the obstruction located at the level of *os penis*; the balloon was filled with sterile saline and retrograde urohydropropulsion was carried out using warm sterile saline solution. In an attempt to increase hydrostatic pressure and to facilitate the movement of the uroliths into the urinary bladder, urohydropropulsion was accompanied by repeated rhythmic digital pressure applied transrectally to the urethra overlying the pubic rim.~~ Retrograde urohydropropulsion with Foley catheter was repeated several times but was unsuccessful in all the three dogs, and a decision was taken to remove the uroliths surgically. The patients were placed in dorsal recumbency, the Foley catheter was removed, and the caudal abdomen and prepuce were prepared for aseptic surgery. The penis was gently exteriorized and a sterile polypropylene catheter of appropriate size introduced into the penile urethra to identify the exact location of the uroliths. A piece of sterile gauze was tied around the base of the penis caudal to the *bulbus glandis* and pulled caudally to retract the prepuce during surgery. A longitudinal incision was made in the penile epithelium along the ventral midline of the glans penis into the lumen of the urethra (Fig 2). The urethral opening was then extended for a total length of 2.5 cm using Metzenbaum scissors to allow extraction of the uroliths with the help of tissue forceps. Complete removal of all calculi was confirmed using a non-traumatic, round-edged inspection probe, by the passage of a urinary catheter into the bladder (Video Clip S1) and by intraoperative fluoroscopic examination and postoperative radiographs of the caudal abdomen and penile region. The penis was repositioned into the prepuce, and the urethral incisions were left to heal by second intention. The dogs were discharged from the hospital 24 hours after surgery. Postoperative complications were limited to mild

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haemorrhage in the first six hours after surgery. The dogs were given pain medication (tramadol hydrochloride, 3 mg/kg, q 24 hours for 3 days, Altadol). Chemical analysis identified the calculi as xanthine stones in dogs 1 and 2 and as calcium phosphate brushite stones in dog 3. Postoperatively the dogs were fed diets to prevent lower urinary tract disease (Urinary U/C low purine in dogs 1 and 2; Urinary S/O Royal Canin in dog 3®). The dogs were physically examined at ten days, one month and six months after surgery. Complete healing of the surgical wound occurred within one month in all dogs (Fig 3), and at six months, all dogs were clinically healthy. There was no recurrence of urolithiasis in any of the dogs.

Discussion

Canine urolithiasis may cause acute complete occlusion or chronic partial obstruction of the urethra (Franti and others 1999). The urethra is relatively long (10 to 35 cm) in male dogs and is divided into a prostatic, membranous and penile portion (McLoughlin 2011). The membranous and penile portions are relatively distensible proximal to the *os penis*, whereas the bony ventral groove of the penile bone that harbours the penile urethra restricts urethral expansion (Evans and Christensen 1993, McLoughlin 2011). Because of this, urethral obstruction caused by uroliths is more common at the base of the *os penis* rather than along the bone (Osborne and others 1999). The standard procedure to relieve urethral obstruction consists in retrograde urohydropropulsion followed by cystotomy (Osborne and others 1999). ~~The standard procedure to relieve urethral obstruction at the level of the penile urethra is retrograde urohydropropulsion, which acts to distend the urethra and force the uroliths into the urinary bladder, followed by cystotomy and removal of the calculi (Osborne and others 1999).~~ Urethrotomy or urethrostomy is indicated when this procedure is unsuccessful (Smeak 2000). Laparoscopic-assisted cystotomy and laser and electrohydraulic lithotripsy have been reported to be viable alternatives to surgery but these techniques require costly equipment (Rawlings and others 2003, Adams and others 2008, Defarges and Dunn 2008). Placement of a small-bore urinary catheter into the urethra combined with retrograde urohydropropulsion was inadequate for mobilisation of the uroliths in our study, and a novel surgical approach was chosen instead. Ventral midline incision of the penile urethra in the proximal region of the *glans penis* is an optimal approach because of the superficial position of the urethra. Furthermore, there is little cavernous tissue and no bulbospongiosus muscle surrounding the urethra in this region, which minimises haemorrhage. Surgical access to the urethra in this region is also facilitated by the

absence of the *retractor penis* muscle (Smeak 2000, Evans and Christensen 1993). It was surprising how little intraoperative haemorrhage there was; the gauze used to retract the prepuce may have provided a tourniquet effect. Haemorrhage remained minimal after the gauze was removed, and it is therefore possible that prolonged compression caused by the calculi also reduced intraoperative haemorrhage. The incisions were left to heal by second intention, and complications such as haemorrhage were not encountered. Haemorrhage is a potential complication of prescrotal, scrotal and perineal surgical approaches to the urethra (Weber and others 1985). Primary closure of urethral incisions caudal to the base of the *os penis* was associated with less haemorrhage compared with secondary wound closure but sutures carry a greater risk of urethral stricture (Waldron and others 1985). Longitudinal tears or surgical incisions of the membranous urethra may heal in 7 days provided that the epithelium is continuous (Weaver and Schulte 1962), and rapid epithelialisation is common regardless of whether the incision is sutured or not and with or without urinary diversion (Weber and others 1985). Various complications may occur after lower urinary tract surgery (McLoughlin 2011). However, the only complication encountered in our patients was mild haemorrhage during surgery and for a few hours afterward. The incisions healed within one month of surgery. It is important to note that the number of patients was too small for a conclusive assessment of the complication risk of this technique. In summary, urethrotomy directly over the *os penis* is a straightforward procedure associated with minimal haemorrhage and has a low complication rate. This is a promising surgical approach for the resolution of urethral calculi at the level of the *os penis*.

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Figure legends

Fig 1. Laterolateral radiographic view showing uroliths in the penile urethra (white arrows) of dog 3, and corresponding penile cross-sections obtained from a cadaver dog of similar size showing the *os penis* (black dashed arrows) and the diameter of the urethra with a polypropylene catheter (black solid arrows).

Fig 2. Intraoperative assessment of the location of the urethral obstruction using a urinary catheter (a) in dog 2. Ventral approach to the penile urethra and removal of urethral calculi (b,c). Urethral patency is confirmed by passing a urinary catheter into the urinary bladder (d).

Fig 3. Postoperative assessment of the penile urethral incision left to heal by second intention (dog 3) ten days (a) and one month postoperatively (b). Healing was complete one month after the operation.

Supplemental material

The following supplemental material is available online for this article:

Video Clip S1. Novel surgical approach for the treatment of canine urolithiasis in the penile urethra (dog 2). This material is available as part of the online article.