



## CASE REPORT

### Balloon Dilation and Bougienage of a Urethral Stricture in a Cat

Yongwon Shin, Dai-Jung Chung, A-JinLee, Hyunwook Myung, Jaiho Shin, Kihoon Kim, Young-Uk Chung, Taikyung Kim, Saejong Yoo and Hwi-Yool Kim\*

Department of Veterinary Surgery, College of Veterinary Medicine, Konkuk University, Seoul, 143-701, South Korea

\*Corresponding author: [hykim@konkuk.ac.kr](mailto:hykim@konkuk.ac.kr)

#### ARTICLE HISTORY (14-477)

Received: September 14, 2014

Revised: April 24, 2015

Accepted: June 20, 2015

#### Key words:

Balloon dilation

Bougienage

Cat

Perineal urethrostomy

Urethral stricture

#### ABSTRACT

A 3-year-old male cat was referred to the Konkuk University Veterinary Medical Teaching Hospital with a urethral stricture following the performance of a perineal urethrostomy. A surgical revision was performed, but the stricture recurred. To dilate the urethra, balloon dilation and bougienage were performed. No clinical signs of urethral stricture and no complications were observed after bougienage following 12 months.

©2015 PVJ. All rights reserved

**To Cite This Article:** Shin Y, DJ Chung, AJ Lee, H Myung, J Shin, K Kim, YU Chung, T Kim, S Yoo and HY Kim, 2015. Balloon dilation and bougienage of a urethral stricture in a cat. *Pak Vet J*, 35(4): 540-542.

#### INTRODUCTION

The most common complication of perineal urethrostomy is stricture formation of the urethra (Fossum, 2013). Generally, urethral stricture formation in cats following perineal urethrostomy results from insufficient dissection to the bulbourethral glands, which leads to the creation of a small orifice or results from postoperative subcutaneous urine leakage or scar tissue formation caused by inadequate skin to mucosa apposition (Fossum *et al.*, 2013). Strictures within the penile urethra in both dogs and cats are typically treated with urethrostomy (McLoughlin, 2011).

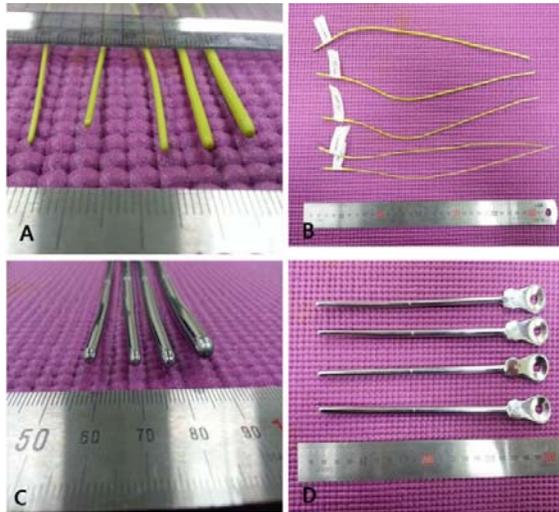
A bougie refers to a slender, flexible instrument used for exploring and dilating tubal organs such as the male urethra. The mechanism by which tight tubular organs are dilated involves carefully introducing a bougie through the cicatrix, and increasing the lumen diameter by creating radial expansion within the tight segment (Katib and Al-Adawi, 2013). The process is then gradually repeated with larger dilators until the desired caliber of the lumen is restored (Katib and Al-Adawi, 2013). To our knowledge, the current case study is the first report of the successful management of a feline urethral stricture using a bougie.

**History and clinical examination:** A 3-year-old castrated male Korean domestic short-haired cat was referred to the Konkuk University Veterinary Medical Teaching Hospital for surgical correction of a recurrent urethral obstruction. On presentation, the physical examination revealed mild abdominal distention and an enlarged bladder. Result

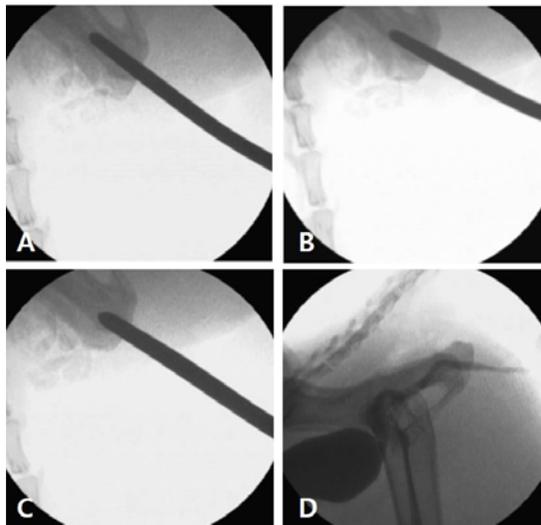
were within normal range in complete blood counts and serum biochemical profiles. A 3-French Foley catheter (Buster Cat Catheter, Buster, Denmark) could not be advanced through the urethra and abdominal ultrasonographic examination revealed the presence of hyperechogenic materials in the bladder and urethra. Analysis of urine obtained by cystocentesis revealed hypersthenuria as well as the presence of red blood cells (RBCs) and protein. Further, numerous RBCs, white blood cells, and struvite crystals were detected following microscopic evaluation of the urine sediment. Nonetheless, the results of bacterial cultures were negative.

**Treatment adopted:** A modified perineal urethrostomy using the prepuce mucosa was performed as previously described by Yeh and Chin (Yeh and Chin, 2000). Three weeks after the surgery, the owner reported that the cat had intermittent stranguria and urine dribbling, and was producing only a small stream of urine when urinating. Ultrasonographic examination and retrograde positive contrast urethrogram revealed subcutaneous urine leakage and urethral urethral stricture was observed at the junction of the urethra and prepuce.

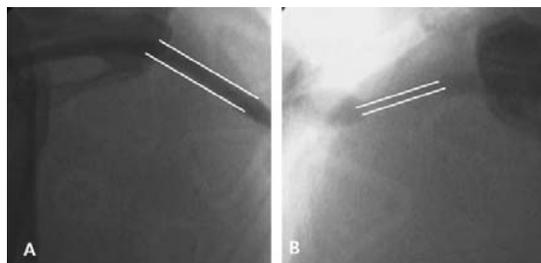
A second modified perineal urethrostomy was performed to alleviate the urethral stricture. Careful debridement of surrounding fibrotic tissues from the urethra and prepuce was done but excessive hemorrhage occurred during the procedure. After control of local hemorrhage, urethral mucosa and prepuce were reopposed. Ten days after the second surgical procedure, clinical signs of the urethral stricture recurred.



**Fig. 1:** Two kinds of bougies for urethral dilation. The filiform bougies are made with plastic, and the HEGAR uterine dilators are made with metal. They all have a tapering cylindrical shape, round tip and slightly curved profile. A) tip of filiform bougies, B) filiform bougies; C) tip of HEGAR uterine dilator and D) HEGAR uterine dilator.



**Fig. 2:** Bougienage A-C: Each bougie was kept 30 seconds and then was removed. Inserted bougie size was gradually increased using 10.5, 12, 13.5-French HEGAR uterine dilator. D: A retrograde positive urethrogram performed after 3<sup>rd</sup> bougienage. 12-French Foley catheter could be passed through urethra without resistance and complications such as hemorrhage and perforation were not observed.



**Fig. 3:** Comparison of urethrogram of immediately after and 10 days after bougienage. A) Urethrogram right after third bougienage session, B) Urethrogram 10 days after catheter removal. Urethral diameter was decreased compared to immediately after last bougienage. Urethral diameter was suspected to be 1.5mm.

The owner declined additional surgery and, as an alternative treatment, balloon dilation of the urethra was performed. Under general anesthesia, retrograde contrast urethrography was performed to determine the stricture location, length, and dimensions. A single stricture was located at a distance of 20 mm from the stoma, and the diameter and length were suspected to be less than 1 mm and greater than 10 mm, respectively. Under the fluoroscopic guidance, a balloon of 2.7 French balloon catheter (Maverick™ PTCA balloon catheter, Boston Scientific, USA) was expanded a burst strength of 6 atmospheres with a balloon-inflating device (Encore™26, Boston Scientific, USA) and contrast mixture (OMNIPAQUE™, GE healthcare) for 5 minutes. The burst strength was selected by diameter of urethra and feeling of resistance during balloon inflation (Power *et al.*, 2010). After the procedure, an 8-French Foley catheter was maintained for a five days in order to retain the diameter. Nonetheless, the clinical signs and urethral stricture recurred a few days after the catheter was removed.

The balloon catheter was damaged due to repeat use. As an alternative treatment, urethral bougienage was performed with various sized filiform bougie (Fig. 1A, 1B), as well as HEGAR uterine dilators (Fig. 1C, 1D, 53-1001, 1002, 1003, 1004; GAIA, Pakistan). Under general anesthesia and fluoroscopic guidance, a well lubricated filiform bougie the same approximate size of the strictured urethral diameter was passed through the stricture area. The bougie was left in place for 30 seconds, and was then removed. Subsequently, a slightly larger bougie was inserted (Fig. 2A, 2B, 2C). To avoid excessive mucosal injury, bougienage was stopped when extreme resistance was felt. The first bougienage session was performed with filiform bougies and 10.5-French HEGAR uterine dilator and 8-French Foley catheter was inserted for five days to maintain the urethral diameter. Normal urination was examined but 3 days after removing Foley catheter, clinical signs such as urine dribbling was recurred. At the second bougienage session, 10.5 and 12-French dilators were used to expand urethral stricture and 10-French Foley catheter was installed and maintained for 5 days. But clinical signs were relapsed 3 days after removing Foley catheter, and the third procedure was performed with 12 and 13.5-French dilator. Following the completion of the third procedure, a 12-French Foley catheter could be passed through the urethra without encountering resistance and any stricture was not detected in urethrogram (Fig. 2D). The final catheter was maintained for 5 days.

Ten days after catheter removal, that cat was still able to urinate normally, but the urethral diameter had decreased compared to the diameter measured by a contrast urethrogram after the last bougienage and was estimated approximately to be 1.5mm (Fig. 3). No additional bougienage procedures were performed, and the cat has maintained normal urination for 12 months to date.

## DISCUSSION

Urethrostomy is the permanent diversion of urine to a location proximal to the site of a urethral obstruction or

disease. The control of local hemorrhage is important, as excessive bleeding from the urethrostomy site can lead to inflammation, hematoma formation, and wound dehiscence (McLoughlin, 2011). In the current case, the cause of the urethral stricture after the second corrective surgery was most likely uncontrolled hemorrhage from the fibrotic tissue and cavernous tissue, which led to the formation of a hematoma despite the meticulous handling of the soft tissue.

Balloon dilation is considered to be safe and effective for the treatment of urethral strictures in human medicine, but only a limited number of cases of this procedure have been reported in veterinary medicine (Bennett *et al.*, 2005; Wood *et al.*, 2007). The distended balloon applies a radial force that stretches the urethral wall, which counteracts the contraction of the incised mucosal edges, and potentially increases the blood flow around the urethral incision (Powers *et al.*, 2010).

In the literature pertaining to human studies, timing, duration, and various protocols related to balloon dilation have been reported (MacDiarmid *et al.*, 2000). However, in veterinary medicine, the application of balloon dilation is difficult because of the requirement for general anesthesia and fluoroscopy, the associated cost constraints, the lack of available balloon sizes for small animals and the descriptions of the dilation technique and type of catheter used are inadequate.

In the current case report, balloon dilation was not an effective method for treating urethral stricture, because various sizes of balloon dilators could not be applied due to financial constraints of the owners. As well, repeat use of the balloon dilator may have caused modulations in the mechanical, physical, or chemical characteristics of the balloon, which prevented expansion to the intended volume.

Bougienage refers to dilation of the stricture with mechanical force, and has been used frequently for treatment of strictures, in particular those occurring in the esophagus (Bissett *et al.*, 2009) and urethra (Katib and Al-Adawi, 2013). A balloon dilator allows radial force to be applied to an area of stenosis, whereas a mechanical dilator, or bougie, results in progressive distal-to-proximal application of longitudinal and radial forces (Bissett *et al.*, 2009). Compared to balloon dilation, bougienage involves a relatively short procedure time, and is less complicated than balloon dilation.

One of the most serious complications associated with bougienage is the excessive expansion of a narrow segment that can result in blunt trauma, which manifests immediately as fresh bleeding and later as reoccurrence of the stricture (Katib and Al-Adawi, 2013). In our practical experience, the success of every bougienage depends on the veterinarian's knowledge regarding the resistance at

which to stop the bougienage procedure in order to prevent perforation and damage of the urethral tissue. For this reason, smallest possible size of the dilator should be chosen at the initial procedure and careful application of larger dilators progressively checking the resistance with discretion is important. Also careful examination of bleeding which means mucosal injury or perforation should be accomplished.

In our case, a Foley catheter was maintained after each procedure to reduce the risk of re-stricture, despite associated risks of a catheter-induced urinary tract infection. The purpose of catheterization was to minimize the ongoing exposure of sub-epithelial urethral tissue to urine, and to allow the inflammation and active fibroplasias to subside, to prevent further development of the stricture (Bennett *et al.*, 2005).

Another treatment option of urethral stricture is urethral stent. This procedure has some advantages such as short procedure time and need of 1 anesthetic episode (Hill *et al.*, 2014). Due to lack of feline studies of urethral stenting, cost constraints and lack of availability, we could not consider this options.

To the best of our knowledge, this is the first clinical description of the use of bougienage to dilate a urethral stricture in a cat. However, questions remain as to the optimal size and number of bougienage to perform. Consequently, further studies are required to optimize the size and number of bougies to use when applying this technique in veterinary medicine.

## REFERENCES

- Bennett SL, GE Edwards and D Tyrrell, 2005. Balloon dilation of a urethral stricture in a dog. *Aust Vet J*, 83: 552-554.
- Fossum TW, CW Dewey, MG Radlinsky, CV Horn, KS Schulzet *et al.*, 2013. *Small Animal Surgery*. 4th Ed, Mosby, USA, pp: 815.
- Hill TL, AC Berent and CW Weisse, 2014. Evaluation of urethral stent placement for benign urethral obstructions in dogs. *J Vet Intern Med*, 28: 1384-90
- Katib AA and MA Al-Adawi, 2013. Bougie urethral dilator: revival or survival? *Cent Eur J Urol*, 66: 488-493.
- MacDiarmid S, CT Harrigan, JL Cottone, WJ McIntyre and DE Johnson, 2000. Assessment of a new transurethral balloon dilation catheter in the treatment of urethral stricture disease. *Urology*, 55: 408-13.
- McLoughlin M, 2011. Complications of lower urinary tract surgery in small animals. *Vet Clin North Am Small Anim*, 41: 889-913.
- Powers MY, BG Campbell and C Weisse, 2010. Porcine small intestinal submucosa augmentation urethroplasty and balloon dilatation of a urethral stricture secondary to inadvertent prostatectomy in a dog. *J Am Anim Hosp Assoc*, 46: 358-65.
- Wood MW, S Vaden, S Cerda-Gonzalez and B Keene, 2007. Cystoscopic-guided balloon dilation of a urethral stricture in a female dog. *Can Vet J*, 48: 731-33.
- Yeh LS and SC Chin, 2000. Modified perineal urethrostomy using preputial mucosa in cats. *J Am Vet Med Assoc*, 216: 1092-1095, 1074.