

Use of an Aortic Stent Graft Extension for the Treatment of Urethral Stricture in a Dog

Jae Hyun BAE¹⁾, Yong Hwan KWON¹⁾, Ye Chan JUNG¹⁾, Ji Mo JUNG¹⁾, Hae Beom LEE¹⁾, Ki Chang LEE¹⁾, Nam Soo KIM¹⁾ and Min-Su KIM¹⁾*

¹⁾College of Veterinary Medicine, Chonbuk National University, 664-14 Duckjin-dong, Duckjin-ku, Jeonju 561-756, Korea

(Received 18 March 2013/Accepted 30 April 2013/Published online in J-STAGE 14 May 2013)

ABSTRACT. A 2-year-old male mixed dog was referred to us for further evaluation and treatment of a 4-week-history of oliguria and abdominal distension after a surgical repair of urethral injury. To relieve the urethral stricture, we placed a self-expanding aortic stent graft extension with a partial coverage with an expanded polytetrafluoroethylene (ePTFE). After the placement of the stent, the dog presented with a normal urinary voiding, despite the presence of urinary incontinence. The current case indicates that the ePTFE-covered, self-expanding ASGE is an effective intervention for the treatment of severe urethral stricture in the dog.

KEY WORDS: canine, expanded polytetrafluoroethylene (ePTFE), self-expanding aortic stent graft extension, urethral stricture.

doi: 10.1292/jvms.13-0146; *J. Vet. Med. Sci.* 75(10): 1363–1365, 2013

A urethral stricture is a narrowing of the urethra caused by neoplasia, urethroliths and trauma due to surgical injury or fracture [7]. The clinical signs include stranguria, overflow incontinence and secondary detrusor atony [8]. Diagnosis is performed with a retrograde urethrography or a urethros-copy. Surgery has commonly been used depending on the location of the stricture. To date, however, both surgical and non-surgical treatment modalities have been reported to treat the urethral stricture [1, 8]. Extrapelvic strictures are corrected by an urethrostomy, but intrapelvic ones are managed by urethral anastomosis. Recently, less invasive therapies including balloon dilation or placement of the stent have been reported in the field of veterinary medicine [6]. They are minimally invasive, safe and effective procedures that can be promptly performed to treat urethral obstructions [7]. In dogs and cats with malignant obstructions occurring in the respiratory, gastrointestinal, urogenital and cardiovascular systems, the stenting procedures have been introduced [4]. Of various types of stenting, self-expanding metallic stents are a prompt, reliable and safe procedure that can be used to establish urethral patency under the fluoroscopic guidance [7]. Expanded polytetrafluoroethylene (ePTFE) is one of the materials that are recommended to cover the metallic stent. Due to its resistance to the bacterial growth, it has a lower risk of occlusion [3]. The aortic stent graft extension (ASGE) is a medical device that is designed for the treatment of endovascular aortic disease. It is made of a self-expanding nitinol wire and a biocompatible polyester fabric composed of ePTFE. We placed the self-expandable ASGE to relieve obstruction due to severe urethral stricture in a dog.

A 2-year-old male mixed dog, weighing 7.8 kg, was referred to us for further evaluation and treatment of oliguria and abdominal distension. The owner reported that the dog had a 4-week-history of the symptoms occurring after surgery for removal of calculus within prostatic urethra. Physical examination revealed slight depression and moderately distended bladder, but were otherwise unremarkable. On neurological examinations, there were no abnormalities. Hematological results were within normal ranges. Serum biochemical abnormalities include increased blood urea nitrogen (BUN) of 35.0 mg/dl (reference range, 7–27 mg/dl). In addition, the urine sample was obtained through cystocentesis; the specific gravity was 1.028, pH was 7.5 and protein was detected. On ultrasound examination, there was hyperechoic signal intensity in the distal part of prostatic urethra, for which the biopsy was performed with a disposable biopsy system (Primo Cut, PAJUNK® Medical Technology, Geisingen, Germany) under guidance of ultrasound at the hyperechoic site. In the biopsy samples of urethra, there were multifocal regions with mild proliferative changes and mild lymphohistocytic inflammations. A histological examination confirmed the presence of chronic inflammation with proliferative epithelial changes. On radiological examinations including a retrograde urethrogram, urethral stricture was confirmed in the distal region to the bladder trigone. Because the site of stricture was too long, urethral anastomosis could not be achieved. Since the client did not want another abdominal surgery and the stricture might be present within the pelvic lumen, we placed a self-expanding ASGE (S&G Biotech Inc., Gyeonggi-do, South Korea) to relieve the urethral obstruction and re-establish the luminal patency in the dog (Fig. 1a). The stent-graft is a tubular structure, and it is composed of two parts. The stent is a mesh-like structure made of nitinol metal, which function is to support the graft. The stent-graft is packed in tubes with a small diameter, and it is expanded to its original diameter when released from the tubes (Fig. 1b). Under a general

*CORRESPONDENCE TO: KIM, M.-S., College of Veterinary Medicine, Chonbuk National University, 664-14 Duckjin-dong, Duckjin-ku, Jeonju 561-756, Korea.
e-mail: mskim@jbnu.ac.kr

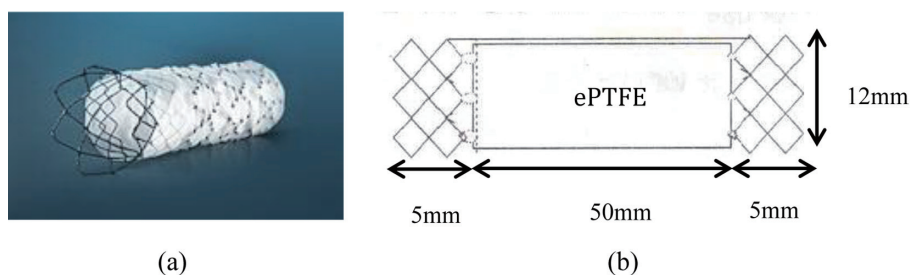


Fig. 1. (a) Self-expandable aortic stent graft extension (ASGE) (b) Schematic diagram of the stent with a partially ePTFE-covered structure to prevent the stent migration. Pictures courtesy of the S&G Biotech Inc. (South Korea, www.sngbio.com).

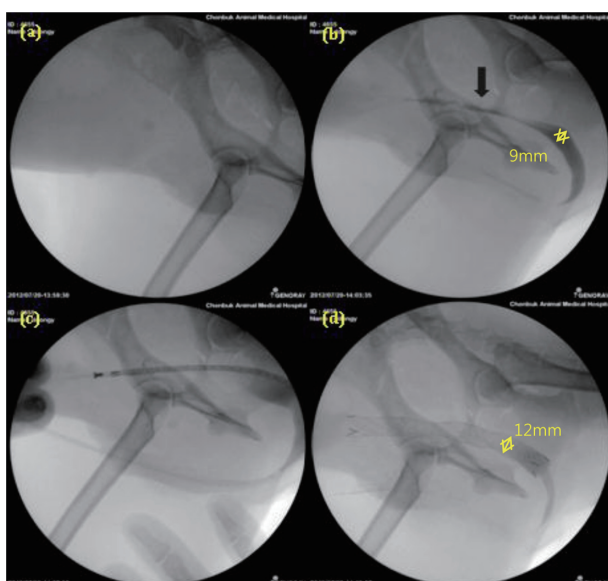


Fig. 2. Continuous fluoroscopic images; flat and narrow urethra can be observed on retrograde radiogram from the severe stricture site to the bladder due to less contrast medium (black arrow). The diameter of membranous urethra was about 9 mm (b), and the expanded diameter of the prostatic and membranous urethras was about 12 mm (d).

anesthesia after the prepuce was exposed from the penis, a 5-F urinary catheter was advanced into the urinary bladder in a retrograde fashion. The catheter was easily passed with mild resistance inside the stricture part. This was followed by contrast cytogram and urethrogram with an intravenous infusion of 50:50 mixtures of iohexol (iodine 500 mg/kg; Omnipaque[®] inj, GE healthcare, New York, NY, U.S.A.) and sterile saline (0.9% NaCl) solution (Fig. 2a). At the level of prostatic urethra, a partial obstruction was achieved, and its length was measured as approximately 40–50 mm distal to the bladder trigone (Fig. 2b). The diameter of urethra was measured at the site of membranous urethra. Then, we selected self-expanding ASGE with an appropriate size; it was greater than the normal urethra by 10–15% and was longer

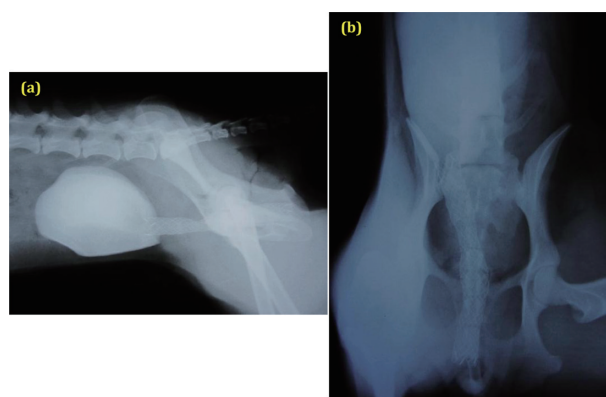


Fig. 3. Post-operative X-ray images taken following the placement of stent. (a) Lateral view, (b): Ventrodorsal view.

by 1 cm than the urethral obstruction from both the cranial and caudal ends. The stent was 6 cm long in length when fully expanded to a maximum diameter of 12 mm, and it was positioned across the stenotic lesion using an 8-Fr introducer system by withdrawing the outer sheath. This was followed by the removal of the delivery system (Fig. 2c and 2d). On post-procedural radiography, it was determined that the stent was placed in the appropriate location within the urethra and then extended into the bladder neck (Fig. 3). Following the procedure, the urinary catheter was appropriately maintained for 24 hr to minimize the occurrence of postoperative urethral swelling immediately after the procedure. At a 6-month follow-up, the owner reported that the dog had no voiding difficulty, but it had a urinary incontinence. But, there were no other clinical complications.

This is the first report that the self-expanding ASGE was placed in the urethra to relieve the urethral obstruction due to severe granulomatous reaction due to surgical trauma in a dog. In severe urethral stricture, surgery is the only treatment method for the stricture accompanied by uncontrolled symptoms of urethral narrowing [7]. But, they are disadvantageous in that they are a high-cost procedure that causes surgical damages and re-stricture [8]. In the field of veterinary medicine, urethral balloon dilation

is a relatively simple procedure for the management of stricture, but there is also a tendency that the re-stricture would occur again [1, 8]. Urethral metallic stents have a higher degree of external expansion than balloon stents. Therefore, they are indicated for humans and animals with severe urethral obstruction due to neoplasia or proliferative urethritis. Various forms of metallic stents are used to treat the obstructions of the urinary tract. It has been reported that self-expanding nitinol urethral stents can be stably used for the treatment of malignant urethral obstructions [6]. It has been reported that the PTFE-covered stents produce good clinical outcomes, such as a decreased risk of stent obstruction and a prevention of the bacterial growth [3]. In addition, it has a poor adhesion to other materials and is not prone to demolding, thus achieving a good patency [5]. From this point of view, the dog was treated with the self-expanding, ePTFE-covered stent to relieve the urethral stricture. The self-expanding ASGE, partially covered with ePTFE, can be used for the dog, although it is originally designed for the endovascular treatment of humans with abdominal aortic or aorto-iliac aneurysms. Urinary incontinence is one of the common unfavorable events occurring after the placement of urethral stent [2]. In addition, urinary tract infection can occur, because urethra is open to the outside environment. In the current case, the dog presented with a mild urinary incontinence. Urinary tract infection should be monitored for the longer period. But, it achieved such good treatment outcomes as to show normal urinary voiding with no other notable complications. In conclusion, the current case indicates that the ePTFE-covered, self-expanding ASGE is an effective intervention for the treatment of severe urethral stricture in the dog.

ACKNOWLEDGMENT. This research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education, Science and Technology (2012-004052).

REFERENCES

1. Bennett, S. L., Edwards, G. E. and Tyrrell, D. 2005. Balloon dilation of urethral stricture in a dog. *Aust. Vet. J.* **83**: 552–554. [[Medline](#)] [[CrossRef](#)]
2. Blackburn, A. L. and Weisse, C. 2013. Evaluation of outcome following urethral stent placement for the treatment of obstructive carcinoma of the urethra in dog: 42 cases (2004–2008). *J. Am. Vet. Med. Assoc.* **242**: 59–68. [[Medline](#)] [[CrossRef](#)]
3. Han, Y. M., Kwak, H. S., Jin, G. Y., Lee, S. O. and Chung, G. H. 2007. Treatment of malignant biliary obstruction with a PTFE-covered self-expandable nitinol stent. *Korean J. Radiol.* **8**: 410–417. [[Medline](#)] [[CrossRef](#)]
4. Hansen, K. S., Weisse, C., Berent, A. C., Dunn, M., Caceres, A. V., Todd, K. L. and Diroff, J. S. 2012. Use of a self-expanding metallic stent to palliate esophageal neoplasia obstruction in a dog. *J. Am. Vet. Med. Assoc.* **240**: 1202–1207. [[Medline](#)] [[CrossRef](#)]
5. Kotsar, A., Isotalo, T., Mikkonen, J., Juuti, H., Martikainen, P. M., Talja, M., Kellomäki, M., Törmälä, P. and Tammela, T. L. 2008. A new biodegradable braided self-expandable PLGA prostatic stent: an experimental study in the rabbit. *J. Endourol.* **22**: 1065–1069. [[Medline](#)] [[CrossRef](#)]
6. Latal, D., Mraz, J., Zerhau, P., Susani, M. and Marberger, M. 1994. Nitinol urethral stents: long-term results in dogs. *Urol. Res.* **22**: 295–300. [[Medline](#)] [[CrossRef](#)]
7. Weisse, C. and Clifford, C. 2006. Evaluation of palliative stenting for management of malignant urethral obstructions in dogs. *J. Am. Vet. Med. Assoc.* **229**: 226–234. [[Medline](#)] [[CrossRef](#)]
8. Wood, M. W., Vaden, S., Cerda-Gonzalez, S. and Keene, B. 2007. Cystoscopic-guided balloon dilation of a urethral stricture in a female dog. *Can. Vet. J.* **48**: 731–733. [[Medline](#)]