# Unusual bilateral ureter strangulation by fibrous tissue after perineal hernia repair in a dog

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**Abstract**

A 10-year-old castrated male cross-breed dog was referred for the repair of perineal hernia with bladder retroflexion and a mass lesion in the hernial sac. Surgical treatment was performed and the mass was identified as degenerated adipose tissue that was suspected to be derived from the omentum. The hernial contents were reduced without difficulty, and the dog exhibited a normal recovery. Two days after surgery, the dog suddenly exhibited anorexia and azotemia. Exploratory laparotomy was performed, which showed the dilation of both ureters with discoloration of the bladder serosa and strangulation of the urinary bladder neck. Careful inspection confirmed that a fibrous band, which was connected to the mass-like degenerated adipose tissue, had caused the strangulation. Two days after removal of these tissues, the dog recovered, with normal findings on blood biochemical analysis. The condition described in this report is an uncommon complication of perineal hernia repair. The findings suggest that degenerative fat tissue should be resected during perineal hernia repair in dogs, in order to prevent possible bladder strangulation after surgery.

**Keywords:** Adipose tissue, Dog, Hydronephrosis, Hydroureter, Perineal hernia.

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## Introduction

Perineal hernia is caused by rupture of the pelvic diaphragm and characterized by the prolapse of abdominal organs such as the colon, bladder, or intestine into the subcutaneous perineal space. This disease develops more often in intact male dogs than in castrated dogs or female dogs (Aronson, 2012). Several types of surgery have been reported, including conventional herniorrhaphy with the placement of sutures between the external anal sphincter and levator ani or coccygeus muscle, transposition of the internal obturator muscle (Shaughnessy and Monnet, 2015), transposition of the superficial gluteal and semitendinosus muscles (Morello *et al*., 2015), placement of prosthetic implants (Szabo *et al*., 2007), and fixation of the abdominal organs toward the abdominal wall (Grand *et al*., 2013). Postoperative complications associated with these procedures include wound infection, seroma formation, hemorrhage, dehiscence, anorexia, fecal incontinence, sciatic nerve injury, urinary abnormalities, rectal prolapse, rectocutaneous fistula, anal sac fistula, flatulence, pain on defecation, and recurrence (Aronson, 2012; Snow, 2016). Dogs with bladder retroflexion can exhibit urinary dysfunction due to compromised blood supply or injury to the dominant nerves (Aronson, 2012; Snow, 2016). Preoperative hydronephrosis and hydroureter can also occur, although these problems are expected to resolve immediately after surgery. Here we report an unusual case involving a dog that underwent surgery for perineal hernia repair and subsequently developed hydronephrosis and hydroureter due to strangulation of both ureters by fibrous tissue connected to the hernial contents.

## Case Details

A 10-year-old castrated male cross-breed dog weighing 13.65 kg was referred to Hokkaido University Veterinary Teaching Hospital (HUVTH) for the repair of perineal hernia. The dog had been castrated for the treatment of pollakiuria 3 years prior. A hernia was diagnosed 2 years prior, but the owner refused surgical treatment because the dog could defecate with the gentle application of manual pressure around the perineal area. Three weeks before referral, the owner palpated a firm mass in the hernia and was eventually referred to our department for evaluation and treatment. At presentation, an apparent perineal swelling with a left semicircular perineal wall defect could be palpated. During rectal palpation, this swelling was determined to be caused by a left perineal hernia; a second soft mass ($30 \times 25$ mm) that could be easily reduced into the abdominal cavity was identified as the herniated contents. A complete blood count and serum biochemistry showed no abnormalities. Radiographs showed caudal displacement of the rectum and mild calcification of the hernial contents. Ultrasonography showed bladder displacement into the hernial sac, with slight dilatation of the renal pelvis in the right kidney (Fig. 1). Fine needle aspiration biopsy from the mass revealed only adipose cells. Herniorrhaphy was

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performed 20 days after presentation. The dog was anesthetized, followed by fixation of the bladder and colon by the placement of three throws of simple horizontal mattress sutures with 3-0 Polydioxanone Suture (PDS® II, Ethicon US LLC, Cincinnati, OH). Thereafter, the position was changed to sternal recumbency and the hernial contents, including the mass-like degenerated adipose tissue, were reduced into the abdomen. The procedure was completed smoothly. Subsequently, conventional herniorrhaphy using the sacrotuberal ligament was performed. The dog exhibited uneventful postoperative recovery and a normal appetite on the day after surgery. Two days after surgery, the dog suddenly exhibited anorexia without urination, and blood biochemical analysis revealed a blood urea nitrogen (BUN) level of 74.8 mg/dl (reference range: 9.2–29.2 mg/dl) and a creatinine level of 6.0 mg/dl (reference range: 0.4–1.4 mg/dl). Hyperkalemia was also observed, with sodium, potassium, and chloride levels of 140 (reference range: 141–152), 6.8 (reference range: 3.8–5.0), and 110 (reference range: 100–117) mEq/L, respectively. Abdominal ultrasonography revealed severe distention of the right renal pelvis (31.1 x 37.3 mm) and ureter (13.7 mm) (Fig. 2). The left ureter also showed mild distention (4.8 mm). Both ureters could be identified from the kidney to the bladder trigone. On the basis of these findings, obstruction of urinary flow at this site was suspected. A urinary catheter was placed into the bladder without difficulty and a lack of urinary retention was confirmed. An exploratory laparotomy was performed under general anesthesia. Following removal of the sutures used for cystopexy, dilation of both ureters was confirmed, with discoloration of the bladder serosa and strangulation of the neck of the urinary bladder. Careful inspection of the bladder neck revealed that a fibrous band connected to the mass-like degenerated adipose tissue had caused the strangulation (Fig. 3). On gross examination, the adipose tissue appeared necrotic. The fibrous tissue was dissected and removed, after which the color of the bladder serosa returned to normal (Fig. 4). Then, the necrotic adipose tissue was resected. After abdominal closure without cystopexy, the dog uneventfully recovered from anesthesia. The histopathological findings comprised degenerated adipose tissue with mild infiltration of lymphocytes. The urinary catheter was left in place for two days, then removed. Two days after surgery, the dog regained normal appetite and activity with no abnormalities on blood biochemistry; thus, it was discharged. Two weeks after the second surgery, the dog exhibited good health with no evidence of hydronephrosis and hydroureter. The dog was referred to HUVTH for the removal of urethral calculus 18 months later; abdominal ultrasound showed no abnormalities.
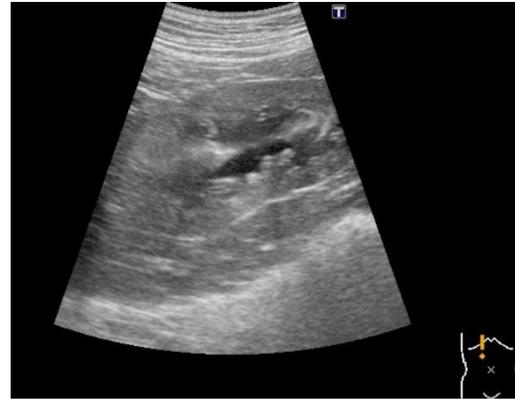


**Fig. 1.** Ultrasound findings for the right kidney on the first day of referral of a dog with perineal hernia, bladder retroflexion, and a mass lesion in the hernial sac. Mild renal pelvis distension (5.9 mm) can be observed.
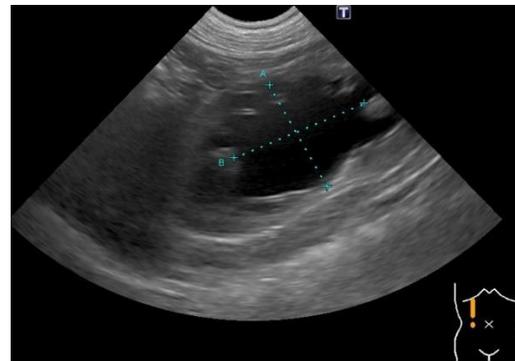


**Fig. 2.** Ultrasound findings for the right kidney at 2 days after repair surgery in a dog that presented with perineal hernia, bladder retroflexion, and a mass lesion in the hernial sac. Severe distention of the right kidney can be seen. The short and long axes of the renal pelvis measure 31.1 (A) and 37.3 (B) mm, respectively. The right ureter also showed severe distention (13.7 mm).
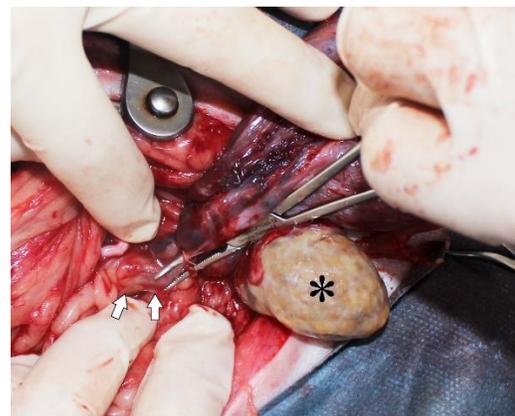


**Fig. 3.** Gross appearance of the urinary bladder during exploratory laparotomy after perineal hernia repair in a dog. The bladder neck is strangulated by fibrous tissue connected to the necrotic adipose tissue, causing discoloration and congestion of the urinary bladder (asterisk). The fibrotic band is isolated by the tip of the forceps. A mildly dilated left ureter can be identified (white arrow).
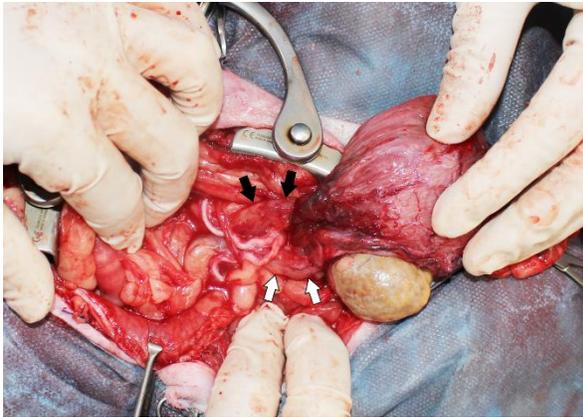
**Fig. 4.** Gross appearance of the urinary bladder after resolution of the strangulation that developed after perineal hernia repair in a dog. The strangulation was resolved by fibrous tissue removal. The color of the bladder has recovered to normal immediately after the procedure. Dilation of the right (black arrow) and left (white arrow) ureters has persisted.

## Discussion

We reported an unusual case of bilateral ureter strangulation after perineal hernia repair in a dog. Perineal hernias in dogs most commonly affect older intact males, which comprise more than 80% of affected dogs (Hayes and Wilson, 1977; Hosgood *et al*., 1995).

In the present case, castration was performed 1 year prior to the development of perineal hernia. It is well-known that castration at the time of herniorrhaphy can prevent the recurrence of hernia because of the influence of androgen, which induces relaxation of the pelvic diaphragm (Pirker *et al*., 2009). However, the cause of this condition remains unclear and is recognized to be multifactorial (Aronson, 2012).

Bladder retroflexion has been reported in 18–25% of dogs with perineal hernia (Burrows and Harvey, 1973; Hardie *et al*., 1983; Hosgood *et al*., 1995; Brissot *et al*., 2004). Some of these dogs may show clinical signs due to azotemia, while obstruction of blood flow causing necrosis of the bladder may be rarely observed (Hosgood *et al*., 1995; Brissot *et al*., 2004). In the present case, preoperative mild distention of the right renal pelvis was detected at the first presentation, although there was no abnormality in the left upper urinary tract. Preoperative mild strangulation of the right ureter was suspected to result in unilateral obstruction due to fibrous tissue, but complete strangulation was not established. This strangulation may have worsened after manipulation during the first surgery, and resulted in complete obstruction after surgery. This situation has not been observed in previous reports.

There are several reports about complications after perineal herniorrhaphy, including postoperative urinary incontinence after cystopexy (Grand *et al*., 2013), ligation of the proximal urethra during resection of a presumed paraprostatic cyst (Sereda *et al*., 2002), inadvertent prostatectomy and urethrectomy (Flesher *et al*., 2016), and persistent urinary incontinence and postoperative urine dribbling (Bilbrey *et al*., 1990; Brissot *et al*., 2004). In the present case, bladder neck entrapment by a fibrotic band connected to the degenerated mass-like adipose tissue was observed. This adipose tissue has been identified as the herniated omentum in some cases (Snow, 2016). Considering the potential risk of bladder strangulation by this twisted adipose tissue, it should be resected after careful identification of the surrounding tissues, although there are currently no clear guidelines regarding resection of this tissue.

Cystopexy and colopexy were performed to prevent relapse of the hernia and to ensure ease of subsequent procedures, which involved reducing hernial contents into the abdominal cavity. It is possible that ureteral strangulation or fibrous tissue formation was related to these procedures. In this case, however, the fibrous tissue was suspected to have been present before the first surgery, because preoperative distention of the right renal pelvis suggested the presence of some preoperative ureteral obstruction. Because removal of the suture of the cystopexy during the second surgery did not improve strangulation, cystopexy itself may not have been directly related to this complication.

In conclusion, the findings from the case suggest that degenerative fat tissue should be resected during perineal hernia repair in dogs, in order to prevent possible bladder strangulation after surgery.

### *Conflict of interest*

The authors declare that there is no conflict of interest.

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