

## TRANSURETHRAL URINARY BLADDER EVERSION AND PROLAPSE IN A CASTRATED MALE PET RABBIT

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A 7-year-old castrated male rabbit was presented with a red oedematous mass at the prepuce. The tissue was identified as the urinary bladder, and the condition was diagnosed as complete transurethral urinary bladder eversion. Exploratory laparotomy was performed, the prolapse was successfully reduced and the bladder was secured to the body wall with cystopexy. The surgery was successful and the bladder remained in place without complications until the time of this report (three years after surgery). Transurethral bladder prolapse is a very rare condition previously reported only in women, mares, cows, bitches, queens, and rabbit does. The case herein is the first reported case of transurethral bladder prolapse in a male of any species.

**Key words:** Rabbit, bladder, prolapse, eversion, surgery, cystopexy

Organ prolapse is a condition in which organs slip out of place. In veterinary medicine, prolapse of the rectum, vagina, uterus, oviduct, penis, cloaca and eye are common (Aiello and Moses, 2016). Organ prolapse is usually the result of an underlying condition: for instance, diarrhoea and tenesmus can predispose to rectal prolapse, the problems of parturition can cause uterine prolapse, and eye prolapse is usually the result of trauma. During prolapse, organs remain in their proper anatomic orientations. In other words, the serosal and mucosal surfaces do not change positions. In women, the bladder can prolapse through an opening in the vaginal wall and form a cystocele. When this lesion occurs, only the external (serosal) surface of the bladder is exposed.

However, prolapse can occur in combination with eversion. Eversion describes the process of an organ turning inside out. During eversion, the internal side (mucosa) of an organ is exposed. In veterinary medicine, prolapse of the rectum, vagina and oviduct usually results in eversion (Aiello and Moses, 2016).

Transurethral bladder eversion has been reported in women, mares, cows, queens, bitches and rabbit does (James, 1951; Donaldson, 1973; Ducharme and

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Stem, 1981; Greenacre et al., 1999; Kalorin et al., 2009; Adin et al., 2011). The present report describes the first case of bladder eversion and prolapse in a male of any species.

### Case description

A 7-year-old castrated male rabbit weighing 2 kg was presented emergently with organ prolapse and haematuria. The owner noticed the prolapse three days before, and the prolapsed tissue had begun to bleed a few hours before the consultation. The rabbit had eaten less for a few days and was passing soft faeces and bloody urine. The owner noticed no other abnormalities and reported no trauma.

The rabbit lived indoors in a small rabbit cage. He spent most of the day out of the cage, often without direct supervision by the owner. The rabbit was fed various brands of timothy hay and rabbit pellets and a variety of vegetables. He was not vaccinated, and the owner was not administering any anti-parasitic treatments, medications or supplements. The rabbit was housed alone and had no exposure to other rabbits or animals. The owner reported no relevant previous illness.

On physical examination, the mucous membrane of the conjunctiva was pale, and based on eyelid tent and skin turgor, the rabbit was approximately 8% dehydrated and markedly depressed. A red, oedematous prolapsed mass was present at the prepuce. The mass was approximately 2 cm × 1 cm × 1 cm in size and blocked the preputial orifice completely (Fig. 1). The perianal and pubic regions were soiled with blood and soft faeces. The bladder could not be identified during abdominal palpation. Physical examination of other organs revealed no abnormalities.

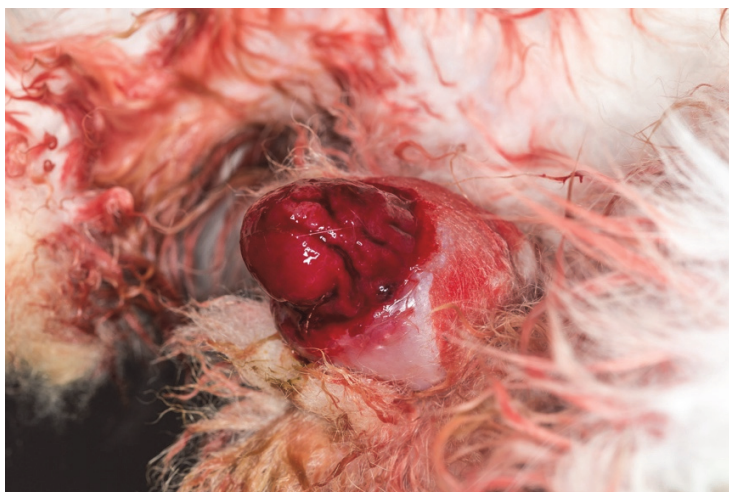


Fig. 1. The everted bladder is blocking the preputial orifice

After the rabbit was admitted to the hospital, a 0.5-mL blood sample was obtained from the right saphenous vein with a 25-gauge needle and 1-mL syringe. Haematological and plasma biochemical parameters were evaluated and measured in-house. The blood tests revealed low red blood cell count and haematocrit values and high albumin, total protein, creatinine, blood urea nitrogen and glucose values. Other measured parameters were within normal ranges.

An intravenous (IV) catheter was placed in the marginal ear vein, and fluid therapy was initiated using saline solution at a rate of 8 mL/kg per hour. The rabbit was housed in a dedicated rabbit ward and sedated with a combination of buprenorphine (0.03 mg/kg IV) and midazolam (1 mg/kg IV). Ventrodorsal and laterolateral whole-body radiographs were taken; they revealed a moderately distended stomach and homogenous abdomen.

The prolapsed tissue was thoroughly cleaned, and a sterile probe was advanced 3–4 cm into the prepuce ventral to the mass. Because of its appearance and location, the prolapsed tissue was suspected to be the urinary bladder, and the condition was presumptively diagnosed as complete transurethral urinary bladder eversion and prolapse.

During the hospitalisation, the rabbit received the following medications in addition to IV fluid therapy: enrofloxacin (10 mg/kg per os [PO] q12h), vitamin B complex (nicotinamide, pyridoxine, panthenol, thiamine, riboflavin) (Troy Laboratories, Glendenning, Australia) (0.1 mL/kg intramuscularly q7d), ranitidine (2 mg/kg PO q12h) and buprenorphine (0.03 mg/kg subcutaneously q6h). Nutritional support was provided with the herbivore Critical Care<sup>®</sup> formula (Oxbow Animal Health, Murdock, Nebraska, USA) administered with a syringe five times daily every 2 h between 9 a.m. and 7 p.m. The rabbit accepted the supplementary feeding very well.

Exploratory laparotomy was recommended. The owner consented, and the surgery was scheduled on the second day of hospitalisation. On the day of surgery, the rabbit was sedated with a combination of buprenorphine (0.03 mg/kg IV) and midazolam (1 mg/kg IV), anaesthesia was induced with ketamine (10 mg/kg IV) and maintained with 1.5%–2% isoflurane via a 3-mm non-cuffed endotracheal tube. Warmed saline solution was administered at a rate of 16 mL/kg per hour during the surgery. The rabbit was placed on a warm-air heating pad, and vital parameters were constantly evaluated. Routine midline caudal abdominal exploration was performed by making an incision from the mid-abdomen to the pubis. The urinary bladder was absent in the abdominal cavity. The kidneys appeared grossly normal, but both ureters were dilated and measured approximately 3 mm in diameter.

Subsequently, the everted and prolapsed organ was identified as the urinary bladder. The prolapsed portion of the bladder was inverted and pushed forcefully back to its normal anatomical position through the urethra with lubricated sterile cotton-tipped applicators. The wall of the bladder was thickened,

oedematous and hyperaemic (Fig. 2). The lumen of the bladder was empty, and there were no signs of necrosis, mass or neoplasm.

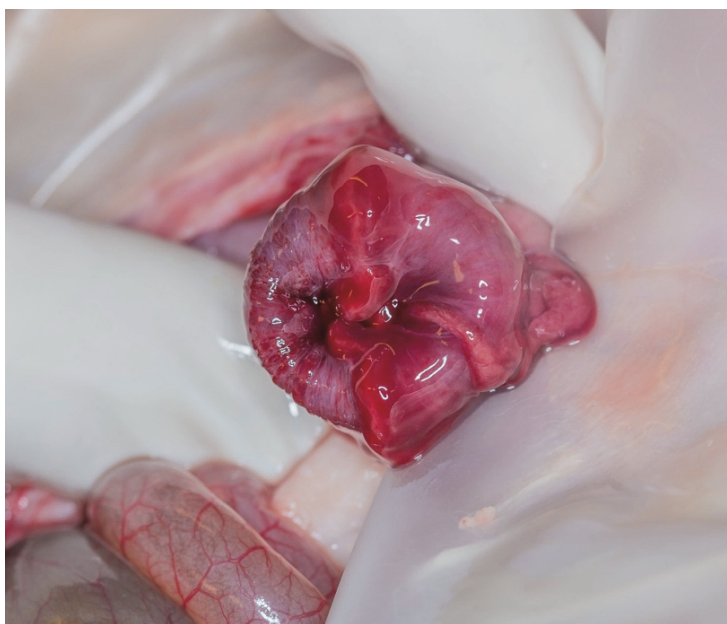


Fig. 2. The prolapsed bladder was pushed back to the abdominal cavity through the urethra

Cystopexy was then performed to prevent a recurrence of the prolapse. The wall of the bladder was scarified and secured to the abdominal wall lateral to the coeloscopy incision with 4-0 USP absorbable monofilament poliglecaprone suture material (Monocryl<sup>®</sup>, Ethicon, Somerville, New Jersey, USA) on an atraumatic needle (Fig. 3). The abdominal cavity was closed routinely and then the external genitalia of the rabbit were thoroughly examined. The opening of the prepuce was abnormally wide (Fig. 4), the penis was short and flat, and the diameters of both the external preputial orifice and the urethra were extremely wide (Fig. 5).

The rabbit recovered from the anaesthesia uneventfully. He began to eat and passed normal faeces a few hours later but continued to pass bloody urine. The haematuria stopped on the third day of hospitalisation. A blood sample was obtained, and haematological and biochemical analyses yielded normal results. On the same day, the rabbit was prescribed ranitidine (2 mg/kg PO q12h), enrofloxacin (10 mg/kg PO q12h) and tramadol (5 mg/kg PO q12h), and discharged to the care of his owner.

The animal was presented for a postsurgical check-up 10 days later. The owner reported no abnormalities. The rabbit had good appetite and was passing

normal urine and faeces. No abnormalities were found on physical examination, and the appearance of the prepuce and penis was close to normal (Fig. 6). The bladder remained in place without complications, and the rabbit had no further haematuria at the time of this report (3 years after surgery).

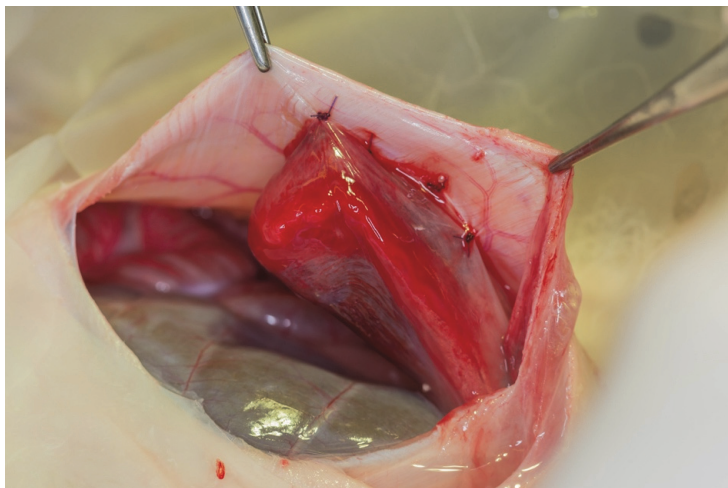


Fig. 3. Cystopexy was performed: the wall of the bladder was sutured to the abdominal wall

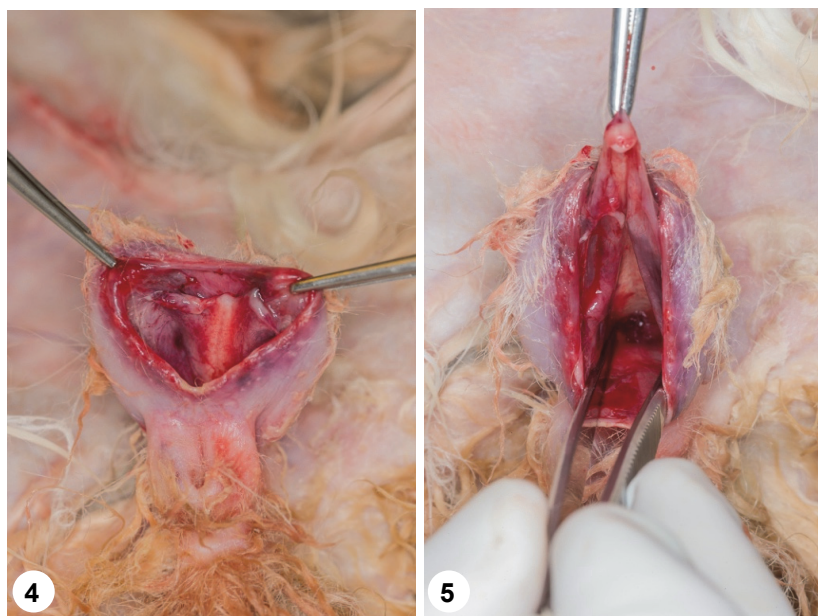


Fig. 4. The preputial orifice was abnormally wide, and the penis was flat

Fig. 5. The external urethral orifice was extremely wide



Fig. 6. At 10 days after the surgery, the appearance of the prepuce and penis was close to normal

### Discussion

Transurethral bladder eversion is an extremely rare condition in humans and is usually concurrent with uterovaginal prolapse. Multiparous postmenopausal women appear to be at the highest risk (Mastropietro et al., 2002; Kalorin et al., 2009; Kim et al., 2010). Bladder eversion through a vesicovaginal fistula has also been described (Dunn et al., 2004) as a result of bladder adenocarcinoma (Kim et al., 2006), due to self-removal of an indwelling Foley catheter (Acharya and Mishra, 2007), during parturition (Heyns, 1941) and after hemipelvectomy (Lowe et al., 2010).

In dogs, bladder prolapse was first described in a Spaniel bitch (James, 1951). McNamara (1997) described a case of chronic vaginocervical prolapse with visceral incarceration in a dog. The bitch was presented for a vaginal prolapse of five years' duration. Herniation of the uterine body, urinary bladder and distal aspect of the colon was identified within the prolapse. The prolapse was reduced surgically, and ovariohysterectomy, cystopexy and colopexy were performed.

A few case reports have described bladder eversion in cows, with a higher incidence in multiparous dairy cattle (Frazer, 1988; Friesen et al., 1995). Frazer (1988) described uterine torsion followed by jejunal incarceration in a cow with a partially everted urinary bladder. Friesen (1995) reported a case of chronic urinary bladder eversion in a cow. The cow calved 2–3 weeks earlier without assistance. One week before presentation, the referring veterinarian had diagnosed a



prolapse of perivaginal fat through a vaginal tear and had partially closed the vulva with a purse-string suture. On presentation to the second veterinarian, the cow was dehydrated and depressed. The vaginal suture was removed, and a large ovoid mass was found in the vagina. The cow was azotaemic, and the results of ultrasound examination showed that the left kidney lacked a distinct lobular pattern. Because the bladder prolapse was irreducible and renal failure was present, the cow was euthanised. Postmortem examination confirmed the clinical diagnoses of complete urinary bladder eversion, endometritis, hydronephrosis and hydroureter.

In mares, bladder eversion is a rare condition and may occur as a result of excessive straining during pregnancy or during the postpartum period. Mares are predisposed to this condition because the urethral diameter is large and parturition is powerful (Donaldson, 1973; Serth, 1973). Kumas and Maden (2014) described a case of urinary bladder eversion in a non-pregnant, 3-year-old mare as a result of chronic cystitis. The mare was presented with tenesmus and stranguria. She was passing small amounts of urine, and a mucosal structure was visible at the ventral vulvar commissure during tenesmus. Bladder eversion was diagnosed by transrectal ultrasound. The mare was treated conservatively with antibiotics, steroids and non-steroidal anti-inflammatory drugs. After 4 days of treatment, the straining ceased and the bladder returned to its normal position.

Adin et al. (2011) described a case of urinary bladder inversion (without prolapse) in a 6-month-old domestic shorthair cat with bacterial cystitis and haematuria. The bladder eversion was diagnosed by abdominal ultrasonography. Exploratory surgery was performed, and the invaginated bladder apex was manually reduced. Partial cystectomy was then performed to remove the invaginated section of bladder wall. Histologic findings were consistent with vascular congestion and oedema secondary to partial invagination.

Bladder eversion in female rabbits has been reported. Pompeu et al. (1995) described a case of complete urinary bladder eversion in an intact adult New Zealand white rabbit doe. The rabbit was euthanised, and the results of postmortem examination showed irregularly distributed reddish papillomatous structures measuring 3–7 mm in length in the bladder. The results of histological examination suggested nonspecific chronic cystitis. Greenacre et al. (1999) described two cases of transurethral urinary bladder eversion in two rabbit does with histories of recent dystocia. Both rabbits were presented with a pyriform mass protruding from the vulva. The first rabbit kindled 4 days before presentation. Cystectomy and cystopexy were used to correct the prolapse and remove the necrotic portion of the bladder, and the doe remained clinically normal one year later. The second rabbit kindled a few days before presentation, and several fetuses remained palpable in the abdomen. The owner of this rabbit elected euthanasia. The results of necropsy showed bladder eversion through the urethra with necrosis of the majority of the exposed bladder mucosa.

The case herein is fundamentally different from previously mentioned reports of transurethral bladder eversion and prolapse, all of which occurred in females, usually during the postpartum period, or in elderly postmenopausal women. In order for prolapse to occur, the urethra must be wide and the urethral sphincter must be weakened. The condition almost always occurs in females because, compared with males, they have much shorter urethras. In male rabbits, the length of the penis (and therefore the length of the urethra) is greatly reduced after castration (Fig. 7). Therefore, the appearance of the external genitalia and length of the urethra of the rabbit described herein became very similar to those of female rabbits. This change made the rabbit in this case susceptible to this rare condition. Increased abdominal pressure or straining due to cystitis likely caused the eversion.

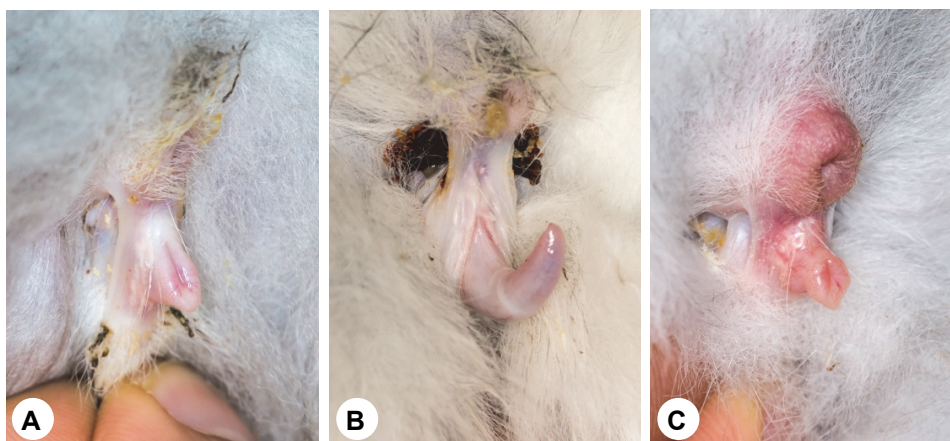


Fig. 7. The external genitalia of a female rabbit (A), an intact male rabbit (B), and a castrated rabbit (C)

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