

## Vaginal prolapse complicated with urinary bladder retroflexion and colonic herniation in a dog

*Vaginale verzakking gecompliceerd met retroflexie van de blaas en hernia van de dikke darm bij een hond*

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### ABSTRACT

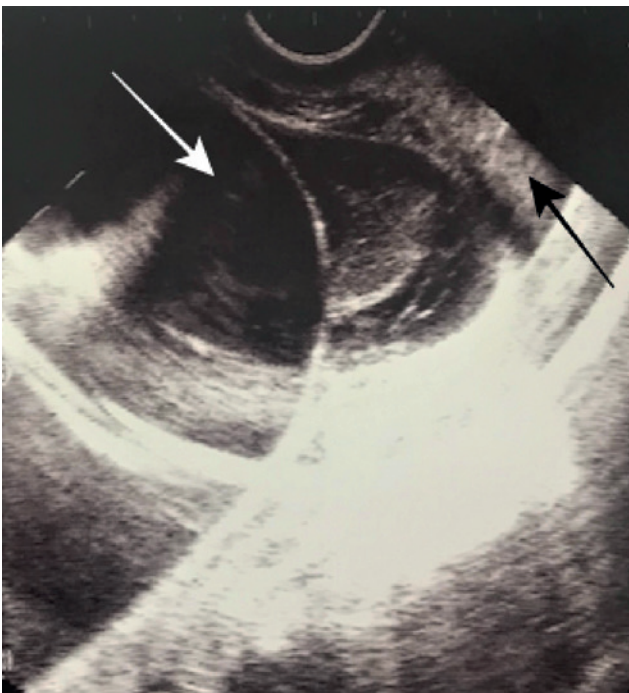
A four-year-old, intact, female Anatolian Shepherd dog was presented with a three-day vaginal prolapse and anuria. She was lethargic, dehydrated, tachycardic, and blood analysis showed leukocytosis and azotemia. Ultrasonographic examination demonstrated that the urinary bladder was located in the prolapsed vaginal tissue. Ultrasound-guided cystocentesis was performed to empty the obstructed bladder and intravenous fluid therapy was instituted. When the dog was deemed cardiovascularly stable, a caudal midline celiotomy incision was made. Through gentle retraction of the uterus, the colon descendens and the bladder were placed back to their normal positions. After resolution of the cervical invagination, the cervix was pinned to the abdominal wall to prevent recurrence and ovariohysterectomy was performed. The dog made an uneventful recovery and had normal urination at the one month follow-up. Chronic vaginal prolapse can be complicated by a retroflexed urinary bladder with urethral obstruction leading to life-threatening azotemia. Ultrasonography of the prolapsed tissues contributes greatly to early diagnosis of complicated cases.

### SAMENVATTING

Een vier jaar oude, intacte, vrouwelijke Anatolische herdershond werd aangeboden met een vaginale verzakking en anurie die reeds drie dagen aanwezig waren. De hond vertoonde lethargie, dehydratie en tachycardie; bloedanalyse toonde leukocytose en azotemie aan. Op echografisch onderzoek werd vastgesteld dat de urineblaas zich in het verzakte vaginale weefsel bevond. Echogeleide cystocentese werd uitgevoerd om de verstopte blaas te ledigen en er werd intraveneuze vloeistoftherapie ingesteld. Toen de hond cardiovasculair stabiel werd bevonden, werd de buikwand geopend in de middenlijn via een incisie caudaal van de navel. Door voorzichtige retractie van de baarmoeder werden de colon descendens en de blaas teruggebracht naar hun normale posities. Nadat de cervicale invagatie was verdwenen, werd de cervix (door middel van hechtingen) aan de buikwand gefixeerd om recidief te voorkomen. Daarna werd een ovariohysterectomie uitgevoerd. De hond herstelde zonder problemen. Bij het controleonderzoek één maand na de ingreep urineerde ze normaal. Chronische vaginale verzakking kan worden bemoeilijkt door een retroflexe urineblaas met urethrale obstructie, wat tot levensbedreigende azotemie kan leiden. Echografische onderzoek van de verzakte weefsels draagt in hoge mate bij tot de vroege diagnose van gecompliceerde gevallen.



**Figure 1.** Ventral view on the vaginal prolapse demonstrating the severely congested vaginal mucosa with superficial erosions.



**Figure 2.** Ultrasonographic view of the urinary bladder in the prolapsed vaginal tissue. White arrow: bladder, black arrow: vaginal tissue.

## INTRODUCTION

Vaginal prolapse in dogs is recognized as the protrusion of donut-shaped edematous vaginal tissue from the vulva (Sontas et al., 2010). It is more common in young dogs (<3 years), large breed dogs (Boxer, Mastiff, and Anatolian Shepherd dogs), and

dogs having their first estrus upon reaching puberty (Schaefers-Okkens, 2001; Nak and Kaşıkçı, 2013). It is more common in proestrus and early estrus periods of the reproductive cycle, during which estrogen hormone concentration is high (Sontas et al., 2010). The other causes of vaginal prolapse are considered to be constipation, dystocia or forced separation during mating. In pregnant dogs, the decrease in progesterone and increase in estrogen levels, and relaxin levels close to the parturition are important predisposing factors (Alan et al., 2007; Gouletsou et al., 2009). However, it can be rarely seen in diestrus in untreated chronic cases (Johnston et al., 2001). In addition, a case of vaginal prolapse has been reported as a side effect of exogenous estradiol benzoate administration used to induce estrus in a dog with prolonged anestrus (Sarrafzadeh-Rezaei et al., 2008).

When the vaginal prolapse goes unnoticed by the owners, or no treatment is given, further complications might occur (Feldman and Nelson, 2004; Alan et al., 2007). Female dogs with vaginal prolapse have no desire to mate; and even, when desire would be present, penetration can not occur during mating (Johnston et al., 2001). Decreased circulation in the prolapsed part of the vagina evolves from extensive edema and hemorrhage to necrosis (Feldman and Nelson, 2004; Sontas et al., 2010). This can be further exacerbated by automutilation. Also, pelvic organs might become entrapped in the vaginal prolapse leading to herniation into the prolapsed vaginal tissue (Ober et al., 2016). Herniation of the bladder as a complication of vaginal prolapse has been described (Alan et al., 2007; Canatan et al., 2015; Acar et al., 2017; Özgenç et al., 2017). The combination of vaginal and rectal prolapse has also been described (Ober et al., 2016). A potentially life-threatening complication is partial or total urethral occlusion leading to dysuria or anuria (Schaefers-Okkens, 2001; Sontas et al., 2010).

Retroflexion of the bladder in dogs is usually associated with degeneration of the pelvic diaphragm and perineal hernia (White et al., 1986). This is usually seen in male dogs and rarely in female dogs (Sontas et al., 2008; Adeyanju et al., 2011). In this case report, the treatment of a rare chronic vaginal prolapse complicated with urinary bladder retroflexion and colonic hernia in a dog is described.

## CASE REPORT

A four-year-old, intact, female Anatolian Shepherd dog of 43 kg was presented to the Selcuk University Veterinary Faculty Obstetrics and Gynecology Clinic. Approximately two to three weeks before presentation, a mass had appeared, protruding from the vulva. This mass gradually enlarged over time. The dog initially had symptoms limited to urinary straining, but later developed dysuria. The dog had become anuric three days prior to presentation and her general condition was deteriorating. Clinical examination revealed

weightloss, 6% dehydration (dry oral mucous membranes, eyes moist, mild loss of skin turgor), tachypnea, tachycardia, lethargia and a large, donut-shaped mass protruding from the vulva. Because of the central lumen, this was identified as a vaginal prolapse with edematous, hemorrhagic and superficially necrotic mucosa (Figure 1).

To evaluate the dog's general health, a complete blood count and biochemistry were performed revealing leukocytosis and azotemia (Table 1). Because of tachypnea and tachycardia, a blood gas analysis was also performed (Table 2). Despite the low bicarbonate level and base deficit in the blood, pH remained within the reference values due to the buffer and respiratory compensatory mechanism.

An attempt was made to place a urinary catheter, but this was not possible since the external urethral orifice could not be identified in the abnormal prolapsed tissue. Ultrasonographic examination showed that the urinary bladder was not located in the abdominal cavity; it was detected in the prolapsed vaginal tissues (Figure 2). Ultrasound-guided cystocentesis was performed to empty the obstructed bladder (Figure 3). Next, a bolus of lactated Ringer's solution was administered intravenously followed by a maintenance dose of 5 ml/kg/hr (PF Lactated Ringer Solution, Polifarma, Turkey). The dog also received oxygen supplementation through a mask.

As soon as the dog was considered cardiovascularly stable, she was scheduled for surgical treatment. As premedication, 20 µg/kg medetomidine (Domitor, Vetoquinol, UK) was administered intravenously ten minutes before induction. Induction of anesthesia was performed IV with 6 mg/kg propofol (Propofol 1%, Fresenius, Germany). Following endotracheal intubation of the dog, inhalation anesthesia was performed with 2% isoflurane (Isoflurane® 100 ml, Adeka, Turkey) in an oxygen mixture. As a preoperative antibiotic, 7 mg/kg amoxicillin-clavulanic acid (Synulox RTU, Zoetis, USA) was given subcutaneously 2.5 hours before surgery.

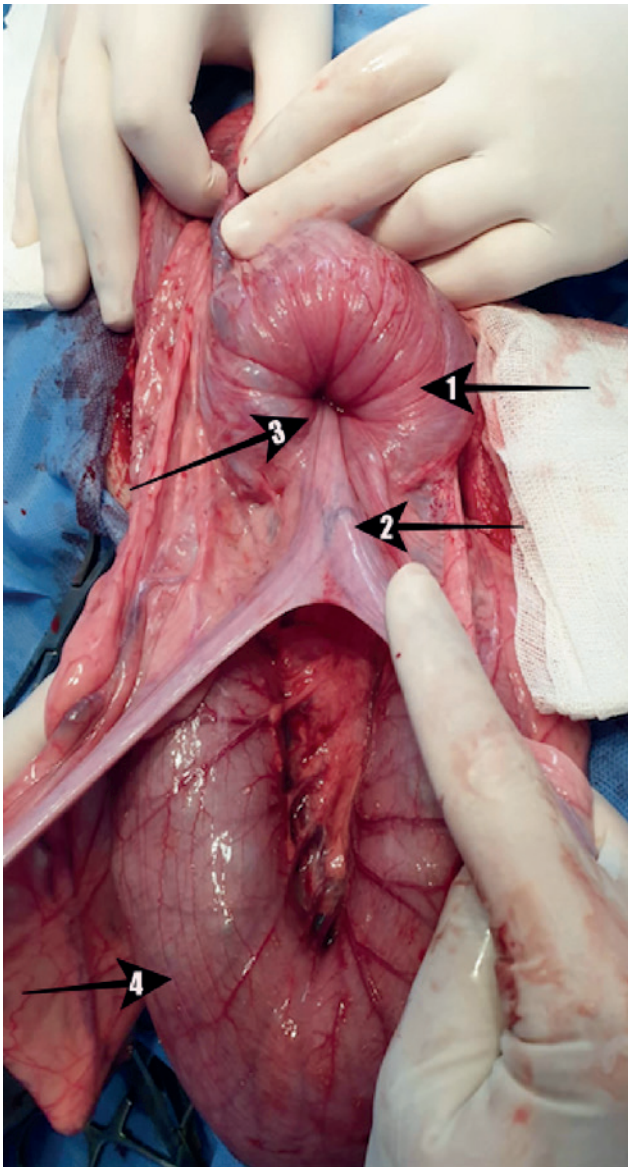
The dog was positioned in dorsal recumbency with the vulva and vaginal prolapse in the surgical field. Following fluid therapy, cystocentesis was again performed to evaluate the effect of the fluid therapy and to empty the bladder before surgery. The abdominal and perineal regions were prepared for surgery and draped. A midline celiotomy incision was made starting from 2 cm cranial from the umbilicus to the pubic bone. Abdominal exploration confirmed a total vaginal prolapse with the uterine body and cervix disappearing in the remaining abdominal part of the vagina, and an additional herniation of the colon descends and the bladder in the prolapsed vaginal tissue was seen. First, the urinary bladder and colon were placed back in their normal positions by gentle traction. Next, the prolapsed vaginal tissue was put back in its anatomical position by a combination of intra-abdominal pulling on the uterus and extra-abdominal

**Table 1. Complete blood count and biochemistry findings**

Parameter	Value interval	Reference	Unit
WBC	26.03*	6.0-17.0	m/mm <sup>3</sup>
Lym	4.76	0.6-5.1	m/mm <sup>3</sup>
Mon	4.06	0.1-1.7	m/mm <sup>3</sup>
Gra	17.21	3.0-13.6	m/mm <sup>3</sup>
RBC	7.26	5.5-8.5	m/mm <sup>3</sup>
PLT	508	120-600	m/mm <sup>3</sup>
<b>Electrolyte values</b>			
K	3.2	3.7-5.6	mEq/L
Na	149	141-153	mEq/L
Cl	98	90-115	mEq/L
<b>Metabolite values</b>			
Glu	82	55-102	mg/dl
Lac	0.7	<2	mmol/L
BUN	37*	5.600-11.80	mg/dL
Creatinine	3.6*	0.500-1.500	mg/dL
AST	40	10.00-88.00	U/L
Glucose	108	60.00-110.0	mg/dL
ALT	29	10.00-88.00	U/L
ALP	52	22.00-150.0	U/L
Magnesium	1.5	1.200-2.000	mg/dL
LDH	81	50.0-495.0	U/L
Total Bilirubin	0.1*	0.100-0.600	mg/dL
Direct Bilirubin	0.1	0.000-0.300	mg/dL
Phosphorus	4.9	2.200-5.500	mg/dL
Cholesterol	160	125.0-270.0	mg/dL
Albumin	2.8	2.300-3.800	g/dL
Calcium	9.4	8.600-11.20	mg/dL
Triglycerides	26	20.0-112.0	mg/dL
Protein	6.1	5.400-7.700	g/dL
GGT	1	1.000-10.00	U/L
CPK	207*	20.00-200.0	U/L



**Figure 3. Cystocentesis performed to empty the urinary bladder entrapped in the prolapsed tissues.**



**Figure 4.** After reduction of the vaginal prolapse, invagination of the uterine body and cervix remained. Note the overfilled colon due to obstruction from the previously herniated part. Arrow 1: cervix, arrow 2: uterus, arrow 3: invagination area, arrow 4: colon)

pushing on the vaginal prolapse. Then, the invagination of the uterine body and cervix into the vagina was gradually corrected manually (Figure 4). Finally, standard ovariohysterectomy using USP 1 polyglycolic acid (Alcasorb, Katsan, Turkey) was performed. To prevent recurrence, cervicopexy was performed by anchoring the cervix to the ventral abdominal wall with USP 2/0 polyglycolic acid. The abdominal wall was closed with a simple continuous suture with USP 0 polyglycolic acid. Subcutaneous tissues were closed with a simple continuous suture with USP 0 polyglycolic acid. The skin was closed with interrupted horizontal mattress suture USP 0 silk (Alcasilk, Katsan, Turkey).

For postoperative analgesia, 0.2 mg/kg dose of

meloxicam (Maxicam, Sanovel, Turkey) was administered on the day of surgery. In addition, 0.5 mg/kg ranitidine (Ulkuran Amp, Myfarma, Turkey) was given. A urinary catheter was placed and left for two days after the operation until the urinary output was normalized, vaginal swelling had lessened and the catheter was removed. Blood analysis performed on the second day after surgery showed blood urea nitrogen (BUN) and creatinine values were within the normal reference limits. After surgery, antibiotic treatment was continued with daily subcutaneous amoxicillin-clavulanic acid injections for seven days. The first three to four days after the surgery, there was vaginal discharge, which then decreased and ceased. After the surgery, the dog was hospitalized for seven days, after which the skin sutures were removed and the dog was discharged. Weekly control visits were performed. At the final follow-up one month after the operation, the dog had normal micturition without incontinence or straining. No other complications were observed (Figure 5).

## DISCUSSION

Urinary bladder retroflexion is a potentially life-threatening condition that occurs in both male and female dogs. In male dogs, bladder retroflexion is regularly seen in chronic perineal hernia (Sontas et al., 2008; Adeyanju et al., 2011). In female dogs, bladder retroflexion can occur as a rare complication of vaginal prolapse (Sontas et al., 2010; Acar et al., 2017). When bladder retroflexion leads to dysuria or anuria, the prognosis becomes grave to poor. Urethral obstruction can happen due to the external compression from swollen prolapsed vaginal tissue on the urethra, or when the vestibule prolapses together with the vagina leading to an external urethral orificium located on the ventral surface of the prolapsed tissue (Schaefer-Okkens, 2001; Sontas et al., 2010). Also herniation of the bladder into the vaginal prolapse might lead to urinary obstruction (Canatan et al., 2015). Urethral obstruction leads to acute kidney failure, recognized on blood analysis as postrenal azotemia (increased BUN and creatinine) and fast deterioration of the animal's general health condition (Niles and Williams, 1999). In the present case, it was thought that since the dog was not able to urinate because of urethral obstruction, the serum BUN and creatinine concentrations increased.

Emergency treatment consists of fluid treatment and establishing a patent urinary tract (Sontas et al., 2008). Since this is often not possible, early operative treatment of vaginal prolapse is recommended (Canatan et al., 2015). To improve the metabolic status of the dog in the present case, fluid therapy was installed and the bladder was emptied by cystocentesis before she was brought under general anesthesia.

Chronic straining and increased abdominal pressu-

re due to irritation of prolapsed vaginal tissue lead to worsening of the vaginal prolapse (Alan et al., 2007), which may become further complicated by the herniation of neighboring structures. Because of their close association and ligamentous connections, the colon descendens and the urinary bladder may become involved in the vaginal prolapse (Ober et al., 2016). In the present case, the urinary bladder was detected in the prolapsed tissue before surgery. However, the additional cervical invagination in the vagina and herniation of the colon descendens were only recognized during abdominal exploration.

Repositioning of incarcerated organs may lead to the release of toxins from these vascularly compromised tissues (Sontas et al., 2010). Therefore, the vaginal mucosa was carefully inspected, disinfected, and surgically debrided before surgical repositioning was attempted. During the abdominal exploration, the regional vasculature to the vagina was inspected. If the vaginal arterial supply would have been torn or the venous drainage thrombosed, vaginectomy would have been necessary (Prassinis et al., 2010). During abdominal retraction and repositioning of the retroflexed urinary bladder and the herniated descending colon, no major tissue trauma was identified.

Cystopexy can be performed in dogs to prevent the recurrence of bladder retroflexion (Rawlings et al., 2002). In this case, it was assumed that direct traction



Figure 5. Normal aspect of the vulva at seven days after surgery.

Table 2. Blood gas findings.

Parameter	Value interval	Reference	Unit
<b>Blood Gas</b>			
pH	7.365	7.33-7.44	mmHg
pCO <sub>2</sub>	32.5	35-42	mmHg
pO <sub>2</sub>	41.2	73-92	mmHg
<b>Acid-Base Balance</b>			
cBase (Ecf) <sub>c</sub>	-6.8	(-8.65)–(-5.30)	mmol/L
cBase (B) <sub>c</sub>	-5.9	(-6.25)–(-3.15)	mmol/L
cHCO <sub>3</sub> <sup>-</sup> (P,st) <sub>c</sub>	19.1	23-27	mmol/L
cHCO <sub>3</sub> <sup>-</sup> (P) <sub>c</sub>	18.6	16.40-19.45	mmol/L

of the bladder into the prolapsed vagina was the cause of its retroflexion. Since the vaginal prolapse was reduced and recurrence was prevented by cervicopexy, cystopexy was not deemed necessary.

In this presented case, ovariohysterectomy was performed to eliminate future hormonal effects causing potential recurrence of the vaginal prolapse. But at the same time, it also prevented a potential recurrence of the cervical invagination into the vagina.

## CONCLUSION

In conclusion, it should be taken into consideration that vaginal prolapse complicated with urinary bladder retroflexion is most frequently seen in large breed dogs. Such cases progress with the development of dysuria and uremia, which worsen the prognosis in time; an urgent surgical treatment option should always be considered. Furthermore, it was concluded that ultrasonographic examination contribute to the early diagnosis, differential diagnosis and prognosis of animals that have complications along with the vaginal prolapse.

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