

Urethral diverticula in a 26-year-old gelding: a unique case report

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Abstract

Urethral diverticula have been described in other species. Congenital anomalies of the urinary tract in horses are rare. A 26-year-old gelding presented with complaints of abdominal discomfort and dysuria. Urine dribbling was reported since several years. General clinical examination was within normal limits. Rectal palpation showed a distended bladder, which was emptied spontaneously after manipulation. Urine cytology showed an increased white blood cell count and presence of bacteria. Bacterial culture however remained sterile. Cystoscopy identified two symmetrical urethral diverticula dorsal to the entrance of the bladder, lined with normal epithelium. Mucosa of the bladder, urethra and two diverticula were hyperemic with evidence of urine accumulation in both diverticula. Ultrasound, abdominal and transrectal, did not identify the diverticula. Treatment included trimethoprim-sulfamides and meloxicam. After 2 weeks, the owner reported resolution of clinical signs. It is unclear if the diverticula in this case were congenital or acquired. In humans it is described that urethral diverticula can be asymptomatic and incidental findings. Surgical intervention has been described in small animal and human medicine with complete resolution of clinical signs, however in this case was not possible due to financial restraints.

Urethral diverticula in a 26-year-old gelding: a unique case report

Urethral diverticula

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Summary

Urethral diverticula have been described in other species. Congenital anomalies of the urinary tract in horses are rare.

A 26-year-old gelding presented with complaints of abdominal discomfort and dysuria. Urine dribbling was reported since several years. General clinical examination was within normal limits. Rectal palpation showed a distended bladder, which was emptied spontaneously after manipulation. Urine cytology showed an increased white blood cell count and presence of bacteria. Bacterial culture however remained sterile. Cystoscopy identified two symmetrical urethral diverticula dorsal to the entrance of the bladder, lined with normal epithelium. Mucosa of the bladder, urethra and two diverticula were hyperemic with evidence of urine accumulation in both diverticula. Ultrasound, abdominal and transrectal, did not identify the diverticula. Treatment included trimethoprim-sulfamides and meloxicam. After 2 weeks, the owner reported resolution of clinical signs.

It is unclear if the diverticula in this case were congenital or acquired. In humans it is described that urethral diverticula can be asymptomatic and incidental findings. Surgical intervention has been described in small animal and human medicine with complete resolution of clinical signs, however in this case was not possible due to financial restraints.

Main text

Introduction:

Urethral diverticula have been described in other species, and to our knowledge there is only one report of a urethral diverticulum in a breeding stallion (Diel de Amorim *et al.* 2014).

In human medicine, urethral diverticula are described as epithelized outpouchings of the urethral lumen into surrounding periurethral fascia (Crescenze *et al.* 2015; El-Nashar *et al.* 2014; Reeves *et al.* 2014). It is a rare condition that affects mainly adult women with a reported incidence between 1 and 6% (Crescenze *et al.* 2015; El-Nashar *et al.* 2014). There are only few reports of diverticula in males (Thakur *et al.* 2016; Cinman *et al.* 2012; Popoola *et al.* 2009; El Ammari *et al.* 2012; Mohanty *et al.* 2014). Diverticula are congenital or acquired and the latter is the most frequent. Rupture of periurethral glands into the urethral lumen, secondary to repeated obstruction and infection is thought to be the main etiology for acquired cases (Huffman 1948) but trauma may also play an important role (Reeves *et al.* 2014). Most of the diverticula reported in human medicine are located in the mid-to-distal third of the urethra. This location reinforces the theory of ruptured periurethral glands, since these are draining in the distal one-third of the urethra (Lang *et al.*; MacKinnon *et al.*).

Reported clinical signs in humans are non-specific and include dysuria, dyspareunia, incontinency and/or discharge (Romanzi *et al.* 2000). They have also been reported to be incidental findings (Crescenze *et al.* 2015; El-Nashar *et al.* 2014). One-third of the patients have recurrent urinary tract infections (Ganabathi *et al.* 1994; Davis and Robinson 1970). To our knowledge only 4 cases have been described in small animals and clinical signs included: perineal swelling, dysuria, stranguria, urinary incontinence and urinary tract infections (Henry *et al.* 2018; Foster *et al.* 1999; Atilla 2018; Watanabe *et al.* 2015). Distal/penile urethral diverticula have been reported in goat kids and calves and are frequently associated with hypospadias (Simon *et al.* 2010; Temizsoylu 2005; Bokhari 2013; Sylla *et al.* 2019; Abd-El-Hady 2014; Maiti *et al.* 2018). The only case described in a stallion by Diel de Amorim *et al.* showed blood dripping from the penis after a breeding attempt. The stallion had a history of a previous history of breeding injury with a surgical repair of the urethra.

Diagnosis can be made in other species using cystourethroscopy, double balloon positive pressure urethrography, voiding cystourethrogram, Magnetic Resonance Imaging, computed tomography scan and transperineal and transvaginal ultrasound (Crescenze *et al.* 2015; Stav *et al.* 2008; Gugliotta *et al.* 2015; Romanzi *et al.* 2000; Kim *et al.* 1993; Ljungqvist *et al.* 2017; Ockrim *et al.* 2009; Pathi *et al.* 2013; Dwarkasing *et al.* 2011; Blander *et al.* 2001). Various surgical techniques have been described in human medicine (Greiman *et al.* 2019) and successful surgical therapy has been reported in other species (Henry *et al.* 2018; Foster *et al.* 1999; Atilla 2018; Watanabe *et al.* 2015; Simon *et al.* 2010; Temizsoylu 2005; Bokhari 2013; Sylla *et al.* 2019; Abd-El-Hady 2014; Maiti *et al.* 2018). Conservative therapy has also been described (Lee and Fines 2005; Ellik 1957; Mizrahi and Bitterman 1988). This case report describes a unique case of 2 urethral diverticula in a 26-year-old gelding.

Case history:

A 26-year-old gelding presented signs of dysuria and a few hours later, signs of abdominal pain, not responding to the administration of metamizole. The gelding had a history of urinary incontinence in the last 6 years and also had a history of urolithiasis. There was no previous history of colic. He was referred to the hospital for further investigation of the colic with associated dysuria.

Clinical findings:

Upon presentation at the clinique of the Vetagro Sup Lyon, the gelding was bright and alert, weighed 518 kg and his body condition score was estimated at 6/9. The mucous membranes were slightly icteric and the capillary refill time was slightly elevated at 3 seconds. The gastrointestinal borborygmi were decreased in the upper left part of the abdomen. His rectal temperature was within normal limits (37,3°C). His heart rate and respiratory rate were within normal limits (48 beats per minute and 20 breaths per minute) and auscultation was normal. He showed signs of dysuria and a urinary catheter was placed. A distal obstruction with sediment was present and urine was taken by catheterization for bacteriology and cytology. Urine cytology showed an increased white blood cell count (20-30 per chamber) and the presence of multiple bacteria and carbonates. Bacterial culture however remained sterile. On rectal palpation, a distended bladder was present that could be voided by manipulation. Abdominal ultrasound showed no abnormalities. A complete blood count revealed a mild neutrophilic leukocytosis (WBC: $12,83 \times 10^9/L$; neutrophils: $9,39 \times 10^9/L$). Biochemistry revealed no abnormalities. The venous blood gas revealed a slight hypokalemia (2,7 mmol/L).

Treatment and additional findings:

The gelding was hospitalized for observation and during the night no dysuria was observed. Rectal palpation was repeated next day and revealed no abnormalities. A cystoscopy was performed which revealed the presence of 2 urethral diverticula dorsal to the entrance of the bladder, lined with normal epithelium (figure 1 and 2). The mucosa of the bladder, the urethra and the two diverticula were hyperaemic with evidence of urine accumulation in both diverticula. No ectopic ureter was identified. There was normal voiding of urine from the ureters and presence of sediment in the bladder. After cystoscopy, the rectal palpation was repeated and revealed a gas distended structure dorsal to the bladder. Transrectal ultrasound showed a gas distended structure and a diffuse thickening of the bladder wall. The gas distended structure was suspected to be the urethral diverticula filled with gas, however, the extent of the diverticula could not be estimated. The complete blood count was repeated and showed a moderate neutrophilic leucocytosis (WBC: $14,14 \times 10^9/L$; neutrophils: $11,2 \times 10^9/L$) and the blood gas analysis confirmed the slight hypokalaemia (2,8 mmol/L). Treatment was initiated with broad spectrum antibiotics (trimethoprim-sulfamides, 25 mg/kg PO BID) and anti-inflammatories (meloxicam, 0,6 mg/kg PO SID) to treat the present urinary infection. No further dysuria was observed and next day the repeat transrectal palpation and transrectal ultrasound didn't allow identification of the diverticula. No abnormalities of both kidneys were identified during transabdominal ultrasound. On day 2 of hospitalisation, the cystoscopy was repeated. The mucosa of the bladder, the urethra and the two diverticula were less hyperaemic (figure 3 and 4) but urine accumulation in the diverticula was still present. Sediment in the bladder was also still present and a lavage with an isotonic polyionic solution (lactated Ringer) was performed. Surgical exploration of the diverticula was declined by the owner due to financial restraints. One day later, the gelding was discharged from the hospital with systemic treatment.

Outcome:

Follow-up examination was not performed but a telephone call 2 weeks after discharge revealed a complete resolution of the clinical signs, including resolution of the permanent urine dribbling, according to the owner.

Discussion:

This case report describes a case of 2 urethral diverticula in a 26-year-old gelding. There is one other case that reports a urethral diverticulum in a breeding stallion (Diel de Amorim *et al.* 2014) and one report that describes a vesical diverticulum in a 6-year-old gelding (Odenkirchen *et al.* 1994).

The origin of the diverticula in the present case could not been determined but a congenital origin was strongly suspected. The horse was owned since the age of 2 years by the owner and no previous catheterization or trauma, except for the urine dribbling, were reported. Also, the diverticula were symmetrical, which made an acquired origin less likely.

However, in human medicine, in males, acquired diverticula are more frequently reported than congenital (Cinman *et al.* 2012; Popoola *et al.* 2009; El Ammari *et al.* 2012; Mohanty *et al.* 2014). The case described by Diel de Amorim *et al.* (2014) was suspected to have an acquired urethral diverticulum due to a breeding

injury.

Congenital anomalies of the urinary tract in horses are rare although some are reported such as ureteral ectopia, ureteral defects, renal dys-/hypoplasia, polycystic kidney disease and rectovaginal or rectourethral fistula (Chaney 2007). If the lesion in this case was congenital, the reason why the horse did not show clinical signs before is unknown. In women however, it has also been described that a urethral diverticulum can be asymptomatic and an incidental finding (Crescenze *et al.* 2015; El-Nashar *et al.* 2014).

The main hypothesis in order to explain the permanent dribbling of the urine is that, during voiding of the bladder, the diverticula fill up with urine and that there is a slow emptying caused by gravity afterwards. This was also a hypothesis in the case report of Henry *et al.* in a cat with urinary incontinence. The stagnation of the urine in the diverticula was also thought to have caused the urinary tract inflammation. Another hypothesis is that the urinary tract inflammation was responsible for the permanent dribbling of the urine but this theory seems less likely because the horse showed signs of urinary incontinence for 6 years and the signs of urinary tract infection were recent. Dysuria was probably caused by the urinary tract infection, which could have also been responsible for the reported signs of colic. Another hypothesis for the colic could have been pain, caused by urine accumulation but other none identified causes could not be excluded.

In human medicine, described techniques for diagnoses are cystourethroscopy, voiding cystourethrogram, MRI, CT and transperineal and transvaginal ultrasound.

Different reports in humans demonstrate a variable ability, 15-89%, to visualize the ostium with cystourethroscopy (Crescenze *et al.* 2015; Romanzi *et al.* 2000; Kim *et al.* 1993; Ljungqvist *et al.* 2017). Diagnosis in this case was purely based on cystourethroscopy, as in the described case of a breeding stallion (Diel de Amorim *et al.* 2014).

Another modality often used in human medicine is ultrasound. Some studies however have shown that the sensitivity is depending on the skills of the sonographer, some studies even report that the sensitivity is lower than 50% when evaluating cases with confirmed urethral diverticulum (Crescenze *et al.* 2015; Reeves *et al.* 2014). Other studies showed a sensitivity of transvaginal and transperineal ultrasound of 95-100% (Crescenze *et al.* 2015; Stav *et al.* 2008; Gugliotta *et al.* 2015). In the here reported case, we were however unable to identify the urethral diverticula with transrectal and transabdominal ultrasound. Visualization of the urinary tract by transperineal ultrasound in horses is not possible due to the pronounced muscle mass in this region. In one of the previous described cases in a kitten, transabdominal ultrasound did not reveal any abnormalities and also in this case, no transvaginal or transperineal ultrasound were performed (Henry *et al.*). In the stallion described by Diel de Amorim *et al.* (2014), the authors were able to identify the diverticulum with penile ultrasound, in our case the diverticula were localized too high for this technique.

Voiding cystourethrogram is another described imaging modality with a reported sensitivity of 67-95% (Crescenze *et al.* 2015; Ockrim *et al.* 2009). This technique and retrograde contrast cystourethrogram were used successfully in small animals (Henry *et al.* 2018; Foster *et al.* 1999; Atilla 2018; Watanabe *et al.* 2015). In this case, the use of a contrast cystourethrogram could have helped to determine the extent of the diverticula. However, the use of abdominal radiographs in adult horses is limited to the ventral part of the abdomen to identify sand impaction and enteroliths.

The “gold standard” for diagnosis of urethral diverticula in humans is MRI (Pathi *et al.* 2013; Dwarkasing *et al.* 2011; Blander *et al.* 2001). In none of the described cases in small animals, this technique was used and neither in this case. In one case of a dog, CT was successfully used to identify the diverticulum.

In this case, due to financial restraint and the age of the horse, a medical treatment with large spectrum antibiotics and anti-inflammatory drugs was attempted with resolution of the clinical signs according to the owner.

Treatment in human medicine consists mainly of surgical excision and reconstruction in symptomatic patients with high success rate of 84% to 98%. Re-operation rate has been reported to be 2% to 13% (Crescenze *et al.* 2015; Reeves *et al.* 2014; Nickles *et al.* 2014; Stav *et al.* 2008).

In asymptomatic patients, conservative treatment with prophylactic antibiotics can be attempted (Greimann *et al.* 2019). Surgical treatment was successfully performed in the 4 described cases in small animals (Henry *et al.* 2018; Foster *et al.* 1999; Atila 2018; Watanabe *et al.* 2015). Diverticulectomy has also been described to be successful in goats and calves (Temizsoylu 2005; Bokhari 2013; Sylla *et al.* 2019; Abd-El-Hady 2014; Maiti *et al.* 2018). Surgical treatment by perineal urethrostomy and distal urethrostomy over the diverticulum was performed in the stallion described by Diel de Amorim *et al.* (2014).

To conclude, urethral diverticula are a rare condition in equids and should be considered in cases of colic with urinary incontinence and urinary tract infection. We were unable to identify the origin in this case but a congenital defect was strongly suspected.

Author's declaration of interest

No conflicts of interest to declare.

Ethical animal research

Not applicable.

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None.

Authorship

L.M. Hermans, L. Borde-Dore and J.L. Cadore performed diagnostics, case evaluation and contributed to the preparation of the manuscript. B. Drumond performed the diagnostic imaging and contributed to the preparation of the manuscript.

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Figure legends

Figure 1: Urethral mucosa with view on the entrances of the bladder and the 2 diverticula. The mucosa is hyperaemic and there is presence of some swelling.

Figure 2: Normal epithelial lining on the inside of the diverticula. The mucosa is hyperaemic.

Figure 3: Urethra with view on the entrances of the bladder and the 2 diverticula after treatment with anti-inflammatories. Reduction of hyperaemia and swelling.

Figure 4: Reduction of mucosal hyperaemia in one of the diverticula, persistence of urine accumulation with sediment.





