Endoscopic treatment of a ureteral inflammatory polyp in a 15-year-old Warmblood gelding

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Abstract

A 15-year-old Warmblood gelding was presented with macroscopic hematuria and stranguria symptoms for two months. Cystoscopy revealed a pedunculated cauliflower-like mass, flowing from the right ureteral orifice into the bladder. Ureteroscopy showed a right dilated ureter (2.3 mm). The ureteral lumen mucosa was smooth and the mass had its origin approximately 10 cm cranial from the orifice. The right kidney was macroscopically on ultrasound within normal range. The mass was removed transendoscopically by means of a cautery snare leaving a small part at the base. Histopathological analysis identified it as a mucosal polyp. Recovery was uncomplicated and the gelding was discharged three days after surgery. A follow up 5 months later showed no signs of inflammation and the remaining small stalk in the right ureter.

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SUMMARY

A 15-year-old Warmblood gelding was presented with macroscopic hematuria and stranguria symptoms for two months. Cystoscopy revealed a pedunculated cauliflower-like mass, flowing from the right ureteral orifice into the bladder. Ureteroscopy showed a right dilated ureter (2.3 mm). The ureteral lumen mucosa was smooth and the mass had its origin approximately 10 cm cranial from the orifice. The right kidney was macroscopically on ultrasound within normal range. The mass was removed transendoscopically by means of a cautery snare leaving a small part at the base. Histopathological analysis identified it as a mucosal polyp. Recovery was uncomplicated and the gelding was discharged three days after surgery. A follow up 5 months later showed no signs of inflammation and the remaining small stalk in the right ureter.

KEYWORDS:

Horse; hematuria; ureteral polyp; benign tumor; ureter

INTRODUCTION

Fibroepithelial polyps (FP) are rare benign tumors of mesodermal origin and occurring in human with a ureter incidence of 85% (Williams et al. 2002, Ludwig et al. 2015). Most of the human patients show one polyp and, in several cases, both ureters are affected (Ludwig et al. 2015). FP typically present as smooth, mobile, and pedunculated masses in the ureter (Lam et al. 2003). They cause ureteral obstruction with consequent clinical symptoms: flank or lower abdominal pain, macroscopic hematuria, irritating bladder

symptoms, including frequency and urgency when it protrudes into the bladder (Lam et al. 2003, Ludwig et al. 2015, Kumar et al. 2022, Kim et al. 2022). Cases of FP have been described in cats and dogs (Reichle et al. 2003, Grant & Troy 2014, Etzioni et al. 2020) and in a 4-month-old foal as well (Jones et al. 1994).

As far as the authors are aware there are no case reports of ureteral fibroepithelial polyps in adult horses. Only a description of a chronic polypoid cystitis in a mare was found, where the clinical symptoms were similar (Rosales et al. 2017).

In this article, the authors present hematuria related to a right sided ureteral inflammatory polyp and the endoscopic polypectomy in a gelding.

CASE HISTORY

A 15-year-old Warmblood gelding was presented with a history of macroscopic hematuria, stranguria and polyuria for two months. The hematuria was not exercise related and appeared at the end of urination.

The same symptoms occurred two years prior. Initially the practitioner performed transrectal palpation and ultrasonography which demonstrated a dilated right ureter and hydronephrosis of the kidney. The horse was referred to a clinic and cystoscopy revealed a mass in the area of the right ureteral orifice. After treatment with trimethoprim sulfonamide (25mg/kg//5mg/kg twice daily orally) for four weeks, symptoms fully regressed and the mass could no longer be seen in cystoscopy.

When the symptoms reoccurred two years later, a cystoscopy revealed again a mass protruding through the ureteral orifice. Antibiotic treatment for 2 weeks was initiated, however, no improvement of the clinical symptoms occurred and the horse was referred to Pferdeklinik Leichlingen.

CLINICAL FINDINGS

The physical examination revealed a bright, alert, responsive horse. The rectal temperature was 37.5°C, heart and respiratory rate were within normal limits. Body condition score was 5/9. Complete blood count (CBC) including leucocyte differential count (LDC), serum creatinine and urea as well as symmetric dimethylarginine (SDMA) were within the normal range on venous blood.

During hospitalisation no polyuria and stranguria could be observed.

Transabdominal ultrasonography (5 Mhz curved array probe, Fa. GE Health Care, Vivid iq) showed both kidneys to be of physiologic size, shape, and echogenicity. The ureter could not be seen from this view.

Upon transrectal palpation the bladder was of physiologic size and no urinary calculus could be palpated. The cranial 15 cm of the right ureter were palpable and had an extended diameter of about 2-3 cm. The left kidney could be reached butright kidney could not be palpated.

Transrectal ultrasonography (5 MHz rectal transducer, Fa. GE Health Care, Vivid iq) demonstrated an approximately 3-4 cm large inhomogeneous hyperechogenic structure in the area of the caudal pole of the urinary bladder, which could be traced to the right ureter. The right ureter had a maximum diameter of 2.3 cm in the orifice area and the lumen was filled by this hyperechogenic structure in the caudal 10-15 cm. (Fig. 1)

The horse was sedated with detomidine hydrochloride[1](0.01 mg/kg bwt intravenously (iv)), butorphanol tartrate[2] (0.025 mg/kg bwt, iv) and azepromazin[3] (10 mg/kg bwt, iv), and a urine sample was obtained by means of a urinary catheter. The urine showed physiological characteristics.

Urinalysis revealed a specific gravity of 1026 (reference range[rr]: > 1024), haemoglobinuria, proteinuria and crystalluria consisting mostly of calcium carbonates and calcium oxalate monohydrates. No bacteria were cultured from the urine.

A cystoscopy (180 cm long, 10.4 mm diameter flexible endoscope, Fa. Storz) revealed the urethra and bladder had no signs of inflammation. Low-grade sediment deposits were visible on the bladder floor. A pedunculated cauliflower-like mass measuring approximately 2-3 cm was protruding in the bladder from the right ureteral

orifice with periodic movement (ureteric peristalsis) (Fig.2). The surface was bulging, partly bloody, smoothly moist and reddend. During the endoscopy the mass sometimes retracted inside the orifice, coming back into the bladder vision immediately after. The urine outflow from the ureter was normal and no mucosal swelling was present around the right ureteral orifice. At ureteroscopy the mucosa of the right ureter showed no signs of inflammation, and the small base of the mass could be located approximately 10 cm cranial of the ureteral orifice (Fig. 3). Urine was collected from the right and the left ureter. The urine GGT:creatinine ratio of the left ureter was 19 IU/gKr (rr < 25 IU/gKr) and it was 25 IU/gKr for the right ureter. Fractional electrolyte excretion showed slightly increased sodium-, potassium- and chloride-excretion from both kidneys.

Based on these findings, polypectomy via endoscopic resection utilizing a snare was performed the next day as an elective procedure to restore the restricted volume of the ureter and to prevent backflow into the renal pelvis.

SURGERY

Surgery was performed under sedation (detomidine hydrochloride[1] (0.01 mg /kg bwt, iv), butorphanol tartrate[2] (0.025 mg/kg bwt, iv) and azepromazin[3] (10 mg /kg, iv)).

First the bladder was emptied and flushed with sterile 0.9% saline solution via catheterisation. Under cystoscopic guidance, the ureteral tumor was identified. A lasercautery snare (200 cm long, 25 mm diameter, Fa. Storz) was advanced through the scope's working port and into the bladder. Under cystoscopic vision, the cautery snareloop was opened and lassoed around the mass and manipulate down to the orifice of the ureter. A 15-watt medical diode laser (Model Elli, Fa. Wuhan Gigaa Optronics Technology Co., Ltd.) was applied briefly, while the snare was gently closed under slight tension. The mass fell on the bladder floor. The thin remnant stalk was then observed to assess for bleeding and retracted within the ureter. Due to the reactive intraoperative swelling of the mucosa, it was not possible to enter the ureter endoscopically at the end of the surgery.

The resected mass was retrieved by flashing the bladder with sterile 0.9% saline solution via catheterisation and was fixed in a 10% neutral buffered formalin.

Histopathology results

Histological examination of the mass identified a mucosal polyp with high-grade superficial ulcerative ureteritis with reactive mucosal hyperplasia and partial formation of granulation tissue.

In context of the history of the horse, these findings tended to suggest the presence of a mechanically traumatized mucosal polyp with reactive mucosal hyperplasia. Clear indications of a malignant progression in the sense of a transitional cell carcinoma were not found on the basis of the tissue samples, despite clear proliferation activation of the epithelium.

Based on the histological findings the neoplasm was identified as a mucosal polyp.

FOLLOW UP

The horse was medicated with flunixin-meglumin[3](1.1mg/kg bwt, iv) for 3 days postoperatively.

24 hours after surgery a cystoscopy was performed, to check the resection site. The swelling of the mucosa in the ureteral orifice had regressed and via ureteroscopy the base of the polyp could be located and was unchanged to the preoperative view. The idea of removal of the remnant of the stalk in the ureter using laser surgery via ureteroscopy was abandoned due to the risk of injury to the ureteral mucosa.

Post-operatively the patient remained asymptomatic and was discharged from the clinic three days later.

Follow-up cystoscopy 5 months later showed the urethra, bladder, and right ureter with no signs of inflammation. The remnant of the stalk within the ureter was unchanged without any surrounding inflammatory reaction (Fig. 4). In transrectal ultrasonography the right ureter was still dilated (maximum 1.8 centimetres)

in the caudal 10 cm. Transabdominal ultrasonography showed both kidneys from normal shape and size. According to the owner, all clinical signs resolved.

Urine analysis, including fractional electrolyte excretion and GGT/Creatinine ratio, were in the physiological range.

DISCUSSION

Causes of hematuria in the gelding may be found in various sections of the urogenitaltract, e.g. urethra, bladder, ureter, kidney or bulbourethral glands. A distinction must be made between hematuria, haemoglobinuria and myoglobinuria. Frequently, centrifugation of the urine is helpful, since erythrocytes will form a sediment, leaving a clear supernatant, whereas myoglobin and haemoglobin will not (Schumacher 2007, Schumacher & Schumacher 2017, Rosales et al. 2017, Ingelfinger 2021). The basic investigation includes a detailed history with clinical examination and laboratory tests in the form of bloodwork and urinalysis (inflammation parameters, renal retention values) together with renal / bladder ultrasonography, urethroscopy and cystoscopy (Cercone 2022). Further investigations like biopsy, ureteroscopy, laparoscopy or contrast studies can be performed if necessary (Schumacher et al. 2010, Cercone 2022). In foals it is possible to visualize ureters, bladder and urethra in (contrast) radiography and computed tomography (Cercone 2022). In adult horses these investigations are less accurate due to their body size (Cercone 2022).

Common causes of hematuria are cystitis, urethritis, pyelonephritis, urethral rent, urolithiasis, idiopathic haematuria, renal and vesicular neoplasia, intoxication, administration of nonsteroidal anti-inflammatory drugs, cantharidin toxicosis, exercise induced hematuria or vascular anomalies (Glass et al. 2016, Larsdotter et al. 2009, Savage 2008, Schumacher & Schumacher 2017, Barton et al. 2019). The timing of bleeding during urination may indicate the anatomical area from which the bleeding originates (Schumacher & Schumacher 2017).

Diagnosis of a ureteral fibroepithelial polyp is a unique challenge due to their variable size, shape and the inability to visualize it. If the full size of the polyp cannot be seen via endoscopy, ultrasonography including colour Doppler examination might help with further investigation (Reichle et al. 2003). In human literature abdominal radiographs, computerized tomography and magnetic resonance imaging with or without contrast are described to visualize the shape of ureteral masses, but are often unreliable (Kumar et al. 2022). Anterograde or retrograde ureteropyelography can be used to reveal a filling defect that might indicate the presence of a polyp or other obstruction (Lam et al. 2003, Reichle et al. 2003, Li et al. 2015). In equine a retrograde pyelogram might be only possible in foals and small horses.

Differential considerations for ureteral masses include malignant tumor, e.g.transitional cell carcinomas, ureteric carcinomas, and benign tumors e.g. granulomas, leiomyomas, hemangiomas, blood clots or radiolucent calculi (Williams et al. 2002, Lam et al. 2003). Distinguishing a polyp on clinical and imaging findings may be difficult, and a definitive diagnosis is based on the pathological findings.

In this specific case it can be imagined that initially the polyp was inside the ureter, causing intermittent occlusion. During time the stalk lengthened due to ureteral peristalsis and the pressure of the urine. The proliferated mass was moved caudally to the bladder. At the moment it entered the bladder cavity it could be visualised. Whereas the polyp in our case was visualized by endoscopy having had retracted in the ureter, it was hypothesized that during earlier examination the polyp could only occasionally be seen extending through the orifice and could have been missed during endoscopy.

Due the size of the polyp moving forwards and backwards, sometimes occluding the ureteral lumen, a hydroureter developed. This could be detected by transrectal examination as well as transrectal ultrasonography. The dilatation of the ureter can be the consequence of intermittent occlusion or by vesicoureteral reflux. In human, children with urinary tract infections tend to develop vesicoureteral reflux which can cause chronic renal failure and hydronephrosis (Greenbaum & Mesrobian 2006). In most patients it resolves spontaneously, except for higher grade reflux (Edwards et al. 1977).

In the history of this patient two years ago the obstruction caused hydronephrosis. Antimicrobial treatment

resulted in regression of the clinical signs. It is probable that the polyp showed secondary swelling due to microbiological infection at this time. Whereas the polyp was not resected recurrence of the problem occurred.

Fibroepithelial polyps might have several causes such as trauma, obstruction, inflammation, chronic irritation from calculi or allergies (Kara et al. 2010, Ludwig et al. 2015).

Jones et al. (1994) described a case of a 4-month-old foal with a history of hematuria and clinically unilateral hydronephrosis and hydroureter following occlusion of the ureter by polyps. The polyps were considered to be congenital, but the etiopathogenesis was not known.

In this case, the polyp was considered to be secondary to a ureteral calculi obstruction with consequent ureteral mucosal proliferation. Physical irritation caused by the ureteral calculus might have induced mucosal oedema and epithelial proliferation leading to the development of the mucosal polyps. At the moment of presentation, no calculi were found although sediment covered the urinary bladder and urinalysis showed formations of calcium carbonates and calcium oxalate monohydrates. Therefore, it seems likely that there is a connection with increased crystalluria and fibroepithelial polyps. It seems necessary to exclude the possibility of ureteral calculi to better assess the prognosis for the patient and to choose the method of surgical therapy. The proteinuria in this case might be caused by the inflammation of the soft tissue in the area of the polyp. Other causes for proteinuria in horses include renal insult, inflammation in other regions or exercise (Savage 2008). Delayed surgical intervention may finally affect renal function and even hydronephrosis with consequently clinical signs like pain, fever, and persistent urinary tract infections (Ludwig et al 2015). At the moment of referral, no sign of hydronephrosis was present and only the caudal 10 cm of the ureter showed a hydroureter and no explanation could be given for the occurrence of the hydronephrosis diagnosed earlier and it was difficult to confirm the diagnosis as obstructive hydronephrosis caused by ureteral polyps 2 years ago.

Current practice in human medicine is to endoscopically resect the ureteral tumor using electrocautery (Abdessater et al. 2019), holmium (12 cases) or thulium laser (Sheng et al. 2016) and a temporary stent can be placed to prevent constriction (Sun et al. 2021, Kumar et al. 2022, Buckland & Blatt 2023). If the size of the polyp is too large and the entire lumen of the ureter is blocked or the polyp is located far cranial in the ureter or in the renal pelvis percutaneous resection is performed (Lam et al. 2003). When malignancy is suspected or percutaneous resection is not possible, laparoscopy following nephroureterectomy is recommended (Lam et al. 2003, Kijvikai et al. 2007).

In this case the authors opted for transendoscopic resection, because the polyp was easily accessible within the ureteral orifice and the peri- and postoperative risks were the lowest. If the polyp is not accessible endoscopically because of intraureteral retraction and inability of inserting the endoscope, balloon dilation of the ureteral orifice as well as the caudal part of the ureter might be an option to increase the size of the ureter so that the endoscope can be inserted (Kara et al. 2010). Otherwise, laparoscopic ureterotomy to resect the polyp might be optional being aware that the dilated ureter is retroperitoneally as described in human (Gao et al. 2021).

After resection the tumor was flushed out of the bladder, alternatively a stone retrieval basket advanced through the scope's working port could have been used. The mass is then captured in the net and withdrawn from the bladder together with the endoscope. Grasping the tumor with an endoscopic forceps was another option.

In addition, if the polyps are removed ureterscopically, close follow-up is recommended because of possible recurrence, especially in case of an incomplete excision (Williams et al. 2002). In human recurrence is rare (Ludwig et al 2015). Whereas human ureteral polyps have a fibrous pedicle covered with normal transitional epithelium (Tsuzuki & Epstein 2005), we considered to have excised enough material. Resection of the base may pose potential risks, causing irritation of the ureteral mucosa with subsequent ureteral stricture.

Although the tumor is benign, still close follow up is recommended. In human in rare cases, fibroepithelial

polyps can develop into malignant transitional cell carcinomas. Therefore, a histopathological investigation of each resected polyp should be performed, to better asses the follow-up treatment and the long-term prognosis for the patient (Min et al. 2012, Xu et al. 2013).

CONCLUSION

Although fibroepithelial polyps of the urinary tract are rare in horses, they should be considered in case of hematuria in the absence of urinary calculi and in the presence of a ureteral dilation. Transrectal ultrasonography can be used to diagnose, but urethrocystoscopy is required for conclusive diagnosis. Endoscopic guided resection by performing electrocautery is a safe and effective method for treating fibroepithelial polyps of the ureter.

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LEGEND

Figure 1: Transrectal ultrasonographic image of the dilated right ureter. Maximum diameter is 2.3 cm. Blue arrow points towards the wall of the ureter.

Figure 2: Endoscopic view of the ureteral polyp protruding from the right ureteral orifice in the bladder. The ureteral orifice is dilated.

Figure 3: Endoscopic view one day postoperative of the base of the polyp inside the ureter. The mucosa is swollen and slightly inflamed. Blue arrow points towards the stalk of the polyp. The ureteral lumen is dilated.

Figure 4: Endoscopic view of the remaining stalk of the polyp (blue arrow) inside the ureter five months postoperative. The surrounding area shows no signs of inflammation. The ureteral lumen is still dilated.