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CASE REPORT

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Clinical-surgical approach to uroperitoneum in a filly - case report

Abordagem clínico-cirúrgica do uroperitônio em potra - relato de caso

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ABSTRACT: Uroperitoneum is the accumulation of urine in the abdominal cavity resulting from a defect in any part of the urinary tract, which generally affects male foals. This study aimed to report a case of uroperitoneum in a five-day-old Quarter Horse filly referred to a clinic specializing in horses, located in Lagoa Seca - PB, with suspected colic. The diagnosis was based on clinical signs, transabdominal ultrasound and abdominocentesis with fluorescein injection via the urethra. Subsequently, the animal underwent exploratory laparotomy and cystorrhaphy, with subsequent clinical, hematological, and biochemical monitoring during the post-surgical protocol. After 28 days the surgical wound had healed, serum levels and clinical status were ideal, and the animal was discharged. Rapid referral together with early clinical-surgical intervention was crucial to reduce the complications of this disease in the patient because, when left untreated, cases of uroperitoneum can lead to severe metabolic and electrolyte disorders, peritonitis, sepsis, and death.

Keywords: bladder rupture; cystorrhaphy; filly.

RESUMO: Uroperitônio é o acúmulo de urina na cavidade abdominal, resultante de um defeito em qualquer parte do trato urinário, que geralmente acomete potros machos. Este estudo teve como objetivo relatar um caso de uroperitônio em uma potra da raça Quarto de Milha, com cinco dias de idade, encaminhada a uma clínica especializada em equinos, localizada em Lagoa Seca - PB, com suspeita de cólica. O diagnóstico foi baseado nos sinais clínicos, ultrassonografia transabdominal e abdominocentese com injeção de fluoresceína pela uretra. Posteriormente, o animal foi submetido à laparotomia exploradora e cistorrafia, com posterior acompanhamento clínico, hematológico e bioquímico durante o protocolo pós-cirúrgico. Após 28 dias, a ferida cirúrgica estava cicatrizada, com níveis séricos e estado clínico ideais, momento em que o animal recebeu alta. O encaminhamento rápido, juntamente com a intervenção clínico-cirúrgica precoce, foi crucial para reduzir as complicações desta doença no paciente, pois, quando não tratados, os casos de uroperitônio podem levar a distúrbios metabólicos e eletrolíticos graves, peritonite, sepse e morte.

Palavras-chave: ruptura da bexiga; cistorrafia; potra.

INTRODUCTION

Uroperitoneum is a rare disease, and its occurrence is most regularly reported in newborn male foals between the first 24 and 36 hours of life. It can be caused by a congenital or acquired defect in the urinary tract and results in the accumulation of urine in the abdominal cavity (Bernick; Dematttio; Wehrend, 2024). Regardless of the cause, this disease is always considered an emergency due to metabolic dysfunction and electrolyte imbalances, requiring rapid diagnosis and immediate treatment to increase the animal chances of survival (Bernick; Nieth; Wehrend, 2021).

Clinical signs usually begin 2–5 days after birth and depend on the size and location of the urinary tract defect. The main clinical sign observed is non-physiological urination behavior that includes tenesmus, stranguria, pollakiuria, or anuria. Other frequently observed signs such as inappetence (interruption of sucking) and a reduced general condition, followed by an enlarged abdomen due to urine accumulation and mild symptoms of colic (Hopster; Hopster-Iversen, 2012).

For diagnosing the disease, transabdominal ultrasonography is one of the most important tools cited in the literature (Bernick; Nieth; Wehrend, 2021). This is associated with abdominocentesis, where large volumes of urine can often be removed, but if the diagnosis is not clear, cystography with positive contrast is recommended (Wehrend, 2017).

The first step in treatment is to stabilize the animal by correcting metabolic and electrolyte imbalances. Then, in cases of bladder rupture, surgical correction is the first choice to repair this organ, even if complications are described (Ford *et al.*, 2022).

Given the scarcity of cases described in the literature, the difficulties in diagnosis, and the complexity of treatment, this study aimed to report a case of uroperitoneum in a Quarter Horse filly resulting from rupture of the dorsal wall of the bladder, addressing the clinical-surgical aspects of this disease.

CASE REPORT

A five-day-old Quarter Horse filly was treated at a private clinic specializing in horses, located in the city of Lagoa Seca - PB, with suspected colic syndrome. On physical examination, the animal had a heart rate of 100 bpm, respiratory rate of 40 bpm, pink mucous membranes, a capillary refill time of 2 s, normal motility

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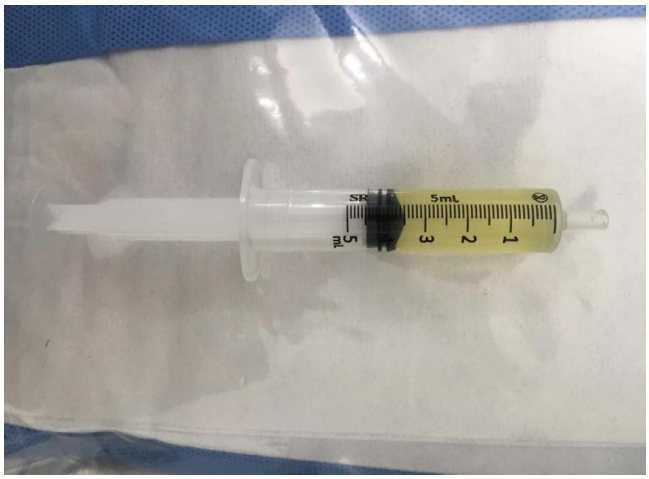
in all four quadrants, a normal temperature, distension with a pear-shaped abdominal bulge, mild pain on palpation, and absence of urination. A transabdominal ultrasound examination and abdominocentesis were requested.

An ultrasound examination was performed using a Sonoscape S2V device, with convex and linear probes, at frequencies of 2–3 MHz and 5–10, respectively, where empty intestinal loops and a large amount of liquid were observed inside the abdominal cavity. Subsequently, abdominocentesis was performed 8 cm from the xiphoid cartilage,removing 4 mL of liquid content, which had a yellowish color, an odor suggestive of urine, and lactate at a concentration of 4.3 mmol/dL (Figure 1). Using a no. 4 urethral probe, 20 mL of fluorescein (ophthalmic eye drops) diluted in saline were injected via the urethra. After five minutes, a new abdominocentesis was performed, and the presence of the reagent liquid was observed by means of the reflection of the black light, confirming the suspicion of uroperitoneum.

Figure 1 – Free fluid in the abdominal cavity after abdominocentesis.



Source: personal collection.

In view of the above, the animal underwent exploratory laparotomy and cystorrhaphy surgery, using the techniques described by Auer and Stick (2019). The anesthetic protocol was established with the use of Xylazine 10% (1 mg/kg) in pre-anesthetic medication, induction with a bolus of Ketamine (2.2 mg/kg) and Diazepam (0.05 mg/kg), and maintenance in a continuous infusion of triple dip (saline NaCl 0.9%, diluted with EGG 5%, ketamine 1.1 mg/kg, and xylazine 0.5 mg/kg).

After the animal was positioned in the dorsal decubitus position and surgical antisepsis was performed, an incision was made along the caudal midline, passing through the skin, subcutaneous tissue, and linea alba. Once the abdominal cavity was accessed, 5 liters of free fluid were aspirated. The urachus was pulled together with the bladder for inspection, and a 0.9% NaCl solution was injected to determine whether there was urethral obstruction, as well as to identify the correct location of the rupture in the urinary bladder region, confirming the rupture in the dorsal portion (Figure 2). Next, cystorrhaphy was performed in a "Double Cushing" pattern with absorbable monofilament polyglactin 2-0 suture. The organ was filled with 0.9% NaCl solution for evaluation, no extravasation was observed, and subsequently, the urachus was resected.Afterward, the abdominal cavity was washed with saline solution and subsequently drained. The abdomen was sutured in the linea alba in a simple isolated pattern with 0.60 nylon thread, subcutaneously in an intradermal pattern with 2-0 polyglactin thread, and in the skin with a Wolf pattern and 2-0 nylon thread.

Figure 2 – Identification of the rupture in the dorsal portion of the bladder.

Source: personal collection.

In the post-surgical treatment, a therapeutic protocol was established with DMSO (1 g/kg, IV, 5 days, SID), Ketoprofen (1 mL/45 kg, IM, 5 days, SID), Gentamicin Sulfate (4.4 mg/kg/day, IM, 5 days, SID), Ceftiofur Hydrochloride (1.1 mg/kg, IM, 5 days, SID), 0.9% NaCl Serum (4 mL/kg/hour), Dexamethasone Sodium Phosphate (2 mL/animal, IM, single dose), Antitetanic Serum (5,000IU/animal), daily cleaning of the surgical wound with 2% Chlorhexidine and instillation of spray based on Oxytetracycline Hydrochloride and Hydrocortisone topically.

During post-surgical follow-up, the patient was monitored through hematological and biochemical methods. The first hematology results showed a slight anisocytosis and normochromia in the red series and a leukocytosis due to absolute neutrophilia in the white series (Table 1). In the biochemical analysis, creatinine values were below and GGT values were above the reference values, while the other enzymes did not show any changes (Table 2).

During clinical monitoring, a significant improvement in the initial clinical picture of the pathology was observed, with the removal of the stitches 10 days after surgery and new hematological and biochemical tests performed. In these, an increase in leukocytosis due to relative and absolute neutrophilia was observed, for which a protocol with Amikacin (21 mg/kg/IV, 4 days, SID) combined with Ceftiofur Hydrochloride (1.1 mg/kg/IM, 4 days, SID) was chosen, and the persistent increase in the GGT value was observed, thus initiating a protocol with the vitamin supplement Hepvet® (6.5 g/day), aiming at recovery from the metabolic stress suffered by the animal.

After 28 days the animal entered the clinic, the surgical wound was completely healed, clinical evaluation, hematological and biochemical values were within normal limits, and the patient was discharged and returned to her property.

Table 1 – Hematological parameters 72 hours after the surgical procedure.

Erythogram	Results	Units	Reference values
Red Blood Cells	7.64	mill/mm^3	6.8–12.9 mill/mm^3
Hematocrit	33	%	32%–53%
M.V.C.	43	Fl	37–58 Fl
M.H.C.	15	Pg	19–23 Pg
M.C.H.C.	34	%	31%–36%
Thrombogram			
Total proteins	6.0	g/dL	5.8–8.7 g/dL
Fibrinogen	3	g/L	1–4 g/L
Leukogram	Absolute results		Absolute results (mm^3)
Leukocytes	16.000		5.400–14.300
Segmented	12.800		2.260–8.580
Basophils	0		0–290
Eosinophils	0		0–1.000
Lymphocytes	2.880		1.500–7.700
Monocytes	320		0–1.000

Reference values: Thrall *et al.* (2015).

Table 2 – Biochemical profile 72 hours after the surgical procedure.

Biochemical	Results	Reference values
Creatinine	0.9 mg/dL	1.20–1.90 mg/dL
Urea	11.1 mg/dL	10–37 mg/dL
GOT (AST)	281.1 U.I./L	226–366 U.I./L
GGT	38 U.I./L	4.3–13.4 U.I./L

Reference values: Thrall *et al.* (2015).

DISCUSSION

Cases of uroperitoneum are described in the literature with an occurrence rate ranging from 0.2% to 2.5% of foals presenting to equine hospitals (Dunkel *et al.*, 2005). The prevalence is higher in male foals due to the more elongated urethra, but it can occur in females as in the case described by Scarpioni, Lima and Celotti (2024) and in the present report.

Trauma during or after foaling, focal necrotic cystitis, or congenital defects are causes that can lead to uroperitoneum (Schott; Woodie, 2019). The probable etiology for the patient described was of traumatic origin because the foal was larger than the pelvic canal of the mare, which presented difficulties during birth, causing a rupture in the dorsal wall of the bladder. Defects 2–5 cm in length are usually found in this location due to the reduced thickness of this area, and defects in its ventral portion are rare (Fubini; Delco, 2022).

The animal´s age and the onset of clinical signs coincided with the cases of uroperitoneum described in the literature, which, according to Bernick, Nieth and Wehrend (2021), are most frequently observed in the first week of life, but morbidity can vary from 1 to 60 days after birth. Jeong *et al.* (2021), reporting a case of uroperitoneum in a Thoroughbred filly, observed depression, generalized weakness, tachycardia, and labored breathing, in addition to the same clinical signs as in the present report. Clinical signs can vary in intensity, which will depend on the size of the defect and timing of initiation of the intervention; therefore, there is no pathognomonic sign for this disease.

The animal´s history and clinical signs associated with ultrasound examination and abdominocentesis are the basis for diagnosing cases of uroperitoneum. DeNotta (2022) emphasizes the need to perform a transabdominal ultrasound for rapid confirmation of hypoechoic free peritoneal fluid. Bernick, Dematttio and Wehrend (2024) conducted a study on 34 foals with uroperitoneum, demonstrating that the main finding was a large amount of free and anechoic fluid in the peritoneal cavity, and only in one case was a low amount of free fluid detected. In addition, the urinary bladder was visualized in 50% (n=17/34) of the cases, and discontinuity in the urinary bladder wall was only observed in 18% (n=6/34). To confirm the diagnosis, this test must be performed in conjunction with abdominal examination or cystography with positive contrast, comparing creatinine concentrations in serum and peritoneal fluid whenever possible.

This ratio in cases of uroperitoneum should be equal to or greater than 2:1, and classic serum electrolyte derangements in foals with this disorder include hyperkalemia, hyponatremia, and hypochloremia (DeNotta, 2022). Therefore, the initial goals of treatment include stabilizing the patient by correcting metabolic derangements. Hyperkalemia is the most important abnormality that must be at least partially corrected before surgery. Potassium-free fluids (0.9% saline) are administered along with dextrose to drive potassium intracellularly, and calcium is often administered to antagonize the negative cardiac effects of hyperkalemia (Peitzmeier; Slone, 2019). In this case, electrolyte analyses were not performed because absence of specific equipment for this porpuse.

If time permits, fluid should be drained from the abdomen by puncture under ultrasound guidance prior to the surgical procedure to improve cardiovascular status and reduce azotemia and hyperkalemia (Hopster; Hopster-Iversen, 2012). After stabilization, exploratory laparotomy should be performed subsequently, which is considered the treatment of choice when it comes to dorsal bladder rupture, since according to Montano *et al.* (2023), access to the ventral portion is often unsuccessful. The most reported post-surgical complications are recurrence of the uroperitoneum due to suture dehiscence or failure to completely suture the rupture site, incontinence, infection, burns caused by the acidic pH of the urine, and fistulas (Steward; Rubio-Martinez, 2021). Bladder atony, renal failure, intestinal adhesions, peritonitis, and pleural effusion are less frequently reported sequelae (Ford *et al.*, 2022). Induction and maintenance of anesthesia, the surgical procedure, and recovery were uneventful and uncomplicated. Joeng *et al.* (2021), reporting a similar case in a filly, used the same techniques as the reported case, obtaining the

same observations during and after the procedure.

Patients with uroperitoneum may manifest leukocytosis with neutrophilia and changes in the biochemical profile; therefore, hematological monitoring along with liver and kidney enzymes is necessary. In a retrospective study by Kablack *et al.* (2000), all 17 foals with values that did not indicate sepsis in the hematological examination survived, while only 8 of the 14 foals with indications of sepsis survived. Early observation of leukocytosis with subsequent monitoring of the patient allowed appropriate drug intervention for the case in question. The creatinine value observed below the reference value was considered to have no clinical importance, since its concentration is variable in the first 24 hours of life, falling to less than 1.0 mg/dL at 1 to 2 weeks of age (Barton; Hart, 2020). The elevated GGT value was probably the result of liver injury and irritation caused by free urine in the cavity, which was normalized with drug therapy.

CONCLUSIONS

The early referral of the foal for clinical evaluation, the definitive diagnosis of uroperitoneum and the subsequent rapid surgical intervention in this case were imperative to reduce the severity of pre- and post-operative complications, including metabolic and electrolyte disorders, peritonitis and sepsis, which are potential factors for the risk of death in cases of uroperitoneum.

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