Laparoscopic-Assisted Cystotomy and Cystostomy for Treatment of Cystic Calculus in a Gelding

Paola Straticò¹, DVM, Riccardo Suriano¹, DVM, Chiara Sciarrini¹, DVM, PhD, Vincenzo Varasano¹, DVM, and Lucio Petrizzi¹, DVM, Diplomate ECVS

¹Department of Veterinary Clinical Science, University of Teramo, Teramo Italy

Objective: To report laparoscopic-assisted cystotomy and inguinal cystostomy for treating bladder urolithiasis in a gelding.

Study Design: Clinical report.

Animals: Twelve-year-old Appaloosa gelding.

Methods: A laparoscopic approach was used to locate and grasp the bladder, which was exteriorized through an enlarged instrument portal for cystotomy to remove the calculus. During withdrawal, the calculus fragmented into multiple pieces. To avoid urethral occlusion and facilitate elimination of these fragments, an inguinal cystostomy was created. The seromuscular layer of the bladder was circumferentially secured to the abdominal fascia and bladder mucosa margins were sutured to the skin.

Results: At 2-year follow-up, the gelding was in good condition with mild urine scald of the left ventral abdomen.

Conclusion: Laparoscopic-assisted cystotomy was used for calculus removal and inguinal cystostomy for successful fragment elimination.

Urolithiasis has an overall prevalence of 0.11% in horses and accounts for 8% of urinary tract disorders. Uroliths occur in the bladder (60%), urethra (24%), ureter (4%), and renal pelvis (12%).¹ No breed predisposition has been reported and mean age of affected horses is 10 years. Cystic calculi occur more commonly in stallions and geldings (76%) than in mares (24%).¹ The long narrow male urethra makes elimination of calculi more difficult than in mares.¹,² Geldings are more frequently affected than stallions,¹ although the reason is not known. Castration results in smaller urethral diameter in cattle,³ but it is unknown if similar changes in urethral diameter occur in geldings.¹

Clinical signs depend on the site and degree of obstruction. Affected horses commonly have moderate-to-severe signs of abdominal pain, stranguria or dysuria, and posture frequently to urinate. Diagnosis can be confirmed by rectal palpation or urethrocytoscop.⁵

Laparoscopystomy is the treatment of choice for removal of cystic calculus after cleansing and evacuation of the bladder.⁶,⁷ In males, laparoscopystomy can be performed through a ventral median celiotomy or by a paringuinal approach.⁸ Standing pararectal cystotomy has been reported for removal of large cystic calculi without need for fragmentation,⁹ but surgical and postoperative complications are reported.¹⁰,¹¹ Electrohydrodynamic lithotripsy and mechanical crushing¹²,¹³ can be performed through a standing perineal urethrostomy. Complications include perioperative risk of rectal tear, perforation of the pelvic urethra, orchitis, peritonitis, and tenesmus that can all result from excessive surgical trauma¹ and longer term, stricture and urethral diverticula formation.³ In mares, cystic calculi can be removed through the urethral sphincter or after sphincterectomy. Other techniques include shockwave, dye-pulse and holmium–Yttrium Aluminum Garnet (YAG) laser lithotripsy,¹⁴,¹⁵ which are expensive but can minimize surgical trauma and provide surgical resolution of clinical signs with few complications.

Laparoscopic techniques can be performed under general anesthesia using an umbilical portal and 5 instruments portals.¹⁶ Peritoneal contamination with septic urine cannot be reliably avoided when uroliths are removed intraabdominally.¹⁷ Röcken et al described laparoscopic-assisted cystotomy to remove bladder uroliths through an inguinal minilaparotomy.¹⁷

We report a modified surgical technique for the removal of a large cystic calculus in a 12-year-old gelding where laparoscopic-assisted cystotomy¹⁷ and inguinal cystostomy as described in small ruminant surgery¹⁸ were used to remove calculus fragments.

CLINICAL REPORT

A 12-year-old Appaloosa gelding was referred with a 7-month history of hematuria and stranguria. After treatment with enrofloxacin and stall rest, clinical signs returned. A hard mass with an irregular surface was identified in the bladder.
Clinical Findings

On admission, the horse was in poor body condition (body condition score [BCS] = 4/9), slightly depressed, and had hematuria, stranguria, and pollakiuria. On transrectal ultrasonographic examination, a spherical mass (~14 cm diameter) with hyperechoic surface was identified. Urethrocytostoscopy revealed acute, diffuse mucosal hyperemia and a cystic calculus. Hypercreatinemia (3.5 mg/dL) was the only abnormal hematologic finding. No bacteria were identified on urinalysis, however there was proteinuria with erythrocytes and leucocytes.

Surgical Technique

Laparoscopic-assisted cystotomy as described by Röcken was chosen for calculus removal. Food was withheld for 36 hours and water for 6 hours before surgery. Ampicillin (20 mg/kg intravenously [IV]), gentamicin (8 mg/kg IV), and phenylbutazone (2.2 mg/kg IV) were administered preoperatively. After premedication with acepromazine (0.05 mg/kg IV) and xylazine (1.1 mg/kg IV), general anesthesia was induced with ketamine (2.2 mg/kg IV) and diazepam (0.05 mg/kg IV). The gelding was positioned in dorsal recumbency, the bladder catheterized, and the ventral abdomen and inguinal region aseptically prepared for surgery.

A 1-cm stab incision was made 5 cm caudal and 3 cm lateral to the umbilicus to introduce a teat cannula and create CO₂ pneumoperitoneum (intraabdominal pressure, 15 mmHg). The teat cannula was replaced by a cannula-trocar unit. After abdominal wall penetration, the trocar was removed and the laparoscope inserted through the cannula. The surgery table was tilted into Trendelenburg position to improve observation of the bladder. A 2nd portal for instruments was created 2–3 cm cranio medial to the left external inguinal ring (Fig 1). Babcock laparoscopic forceps introduced through this portal were used to grasp the apex of the bladder and retract it toward the abdominal wall. The portal was enlarged in a cranial to caudal direction to allow exteriorization of the cranial aspect of the bladder and to accommodate the size of the urolith. Two stay sutures were placed to hold the bladder in position. The abdomen was deflated and the table returned to neutral position.

A 15-cm cystotomy was performed between the stay sutures. The calculus fragmented into multiple pieces during attempts to separate it from the mucosa. Despite manual and instrument approaches, flushing with sterile saline solution and consequent aspiration with a large cannula, not all fragments could be removed, particularly those engaging the neck of the bladder. To avoid urethral occlusion and facilitate progressive elimination of these fragments, inguinal cystostomy was performed using the cystotomy, according to the technique described by May et al. After anchoring the most cranial, caudal, lateral, and medial aspects of the bladder to the body wall, the seromuscular layer of the bladder was circumferentially secured to the abdominal fascia at the level of the fascial incision with interrupted horizontal mattress sutures of 2–0 monofilament absorbable suture. Then the bladder mucosa was sutured to the skin with 2–0 absorbable suture in a single interrupted pattern (Fig 2A). The umbilical portal was sutured with simple interrupted sutures of 2–0 nonabsorbable synthetic suture.

Ampicillin (20 mg/kg IV twice daily) and gentamicin (8 mg/kg IV once daily) were administered for 5 days. Every other day until discharge, the bladder was flushed with saline solution through a urethral catheter and through the cystostomy to enhance elimination of urolith fragments. Two days after surgery, ascending cystoscopy revealed sandy material and small fragments mostly localized within the cranial aspect of the bladder, immediately proximal to the cystostomy. Fibrin clots were adherent to the mucosa where the urolith was originally localized. On transrectal ultrasonography (5 MHz linear probe) there was particulate hyperechoic material in the bladder close to the cystostomy.

After surgery, hematuria resolved immediately; however, stranguria and pollakiuria persisted for several days. Nonabsorbable skin sutures were removed after 12 days, and 2 weeks after surgery the horse was discharged. To avoid recurrence, administration of 175 mg/kg ammonium sulfate orally once daily to acidify the urine pH and 70 g NaCl daily in the diet to improve water consumption and urine production was recommended. Stall rest was recommended for 4 weeks.

At 8 weeks, the horse had a BCS of 5/9 and normal urinary function; the cystostomy appeared healed. Urethrocytostoscopy revealed a small amount of sandy material in the bladder close to the cystostomy; the overall appearance of the mucosa was normal. Urinalysis showed some leucocytes and a trace of protein and exfoliation cells likely derived from iatrogenic manipulation of the urinary tract.

At 2 years, the gelding was in good condition and being ridden. There was mild urine scalding of the left ventral abdomen (grade 2 scalding: localized erythema; Fig 2B). Occasional urine incontinence from the cystostomy reportedly occurred in the hot season. No signs of dysuria or fever referable to ascending urinary tract infection were
Laparoscopic-Assisted Cystostomy for Treatment of Cystic Calculus Stratic

Figure 2  (A) The cystostomy margins were circumferentially sutured to the skin with 2–0 absorbable suture in a single interrupted pattern; (B) Mild urine scalding of the left inguinal region at the cystostomy site, 2 years after surgery.

described. Serum creatinine concentration was 1.51 mg/dL. Surgical closure of the cystostomy was declined.

DISCUSSION

Surgical removal of a large cystic calculus using a laparoscopic-assisted approach was complicated by fragmentation of the urolith. We created an inguinal cystostomy incorporating the cystotomy to allow free urine flow and voiding of the fragments. No postoperative complications occurred and long-term outcome was favorable. We are unaware of reports of cystostomy in horses although this approach is commonly used in small ruminants with urolithiasis.

Removal of cystic calculi using laparoscopic-assisted cystotomy is performed under anesthesia in dorsal recumbency through a paramedian, median, or parainguinal incision. The procedure is considered difficult because of the considerable tension placed on the bladder to achieve acceptable exposure. Reported complications are septic peritonitis, dehiscence of the cystorrhaphy, leakage of urine, and infection of the laparotomy incision.

Compared with celiotomy approaches, Röcken’s laparoscopic-assisted technique decreases the size of laparotomy needed to identify the bladder and obviates the need for extensive manual traction on the bladder. It provides rapid, excellent viewing of the bladder, and compared with pure laparoscopic techniques avoids the need of intraabdominal suturing and tissue manipulation, which can be particularly challenging when the bladder is inflamed, thickened from chronic cystitis and fragile. Risk of peritoneal contamination from urine leakage during urolith removal is lower because of extracorporeal cystotomy and calculus retrieval.

Postoperative lavage via a urethral catheter or a temporary perineal urethrostomy could have been used to facilitate fragment removal. Urethral lavage or urethral obstruction from fragments proximal to the urethrostomy can cause bladder distension, which may increase the risk of suture dehiscence and bladder rupture. Postoperative complications associated with perineal urethrostomy include development of urethral diverticulum, dysuria, fibrosis, stricture of the stoma, and partial dehiscence of urethrostomy incision. In stallions, the prognosis for reproductive function is guarded to poor after urethral surgery. By comparison, bladder marsupialization may result in resolution of urinary outflow obstruction and preservation of breeding soundness.

Despite the simplicity of the procedure, shorter hospitalization, and reduced recurrence of urinary obstruction, several short- and long-term complications are reported for cystostomy including mucosal prolapse, urinary incontinence, ascending urinary tract infection, fibrotic stomal closure, and variable skin scalding. Postoperative complications associated with perineal urethrostomy include development of urethral diverticulum, dysuria, fibrosis, stricture of the stoma, and partial dehiscence of urethrostomy incision. In stallions, the prognosis for reproductive function is guarded to poor after urethral surgery. By comparison, bladder marsupialization may result in resolution of urinary outflow obstruction and preservation of breeding soundness. The owners declined to close the cystostomy.

Primary closure of the stoma can be accomplished after obstruction is relieved, if urethral patency is adequate. Advantages of reversal may include reestablishment of normal bladder anatomy and urine outflow, minimization of postoperative care, and reduction of peristomal dermatitis. Potential disadvantages include recurrence of urinary obstruction (because of formation of additional calculi), ascending urinary tract infection, and the need for general anesthesia. The owners declined to close the cystostomy.

Long-term antibiotic therapy is not recommended after bladder marsupialization because continued antibiotic administration favors the selection of resistant and potentially more virulent bacterial strains. On recheck examination, persistence of an alkaline urine pH resulted in a recommendation to continue the medical therapy to acidify urine pH and prevent the deposition of calcium carbonates.

In this gelding, a combination of laparoscopic-assisted cystotomy for calculus removal and subsequent inguinal cystostomy was used to facilitate urolith fragment removal. Outcome was favorable with only minimal urine scalding of the ventral abdomen.

REFERENCES


---

**Veterinary Surgery** 41 (2012) 634–637 © Copyright 2012 by The American College of Veterinary Surgeons