

Standing Surgical Repair of Cystorrhexis in Two Mares

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Two surgical techniques were used to evert the bladder into the vagina for observation and repair of bladder tears that were associated with parturition. One technique involved an incision through the vaginal floor into the peritoneal cavity just caudal to the cervix, and prolapse of the bladder into the vagina. The second technique involved a 3-cm incision through the urethra, 5 cm cranial to the urethral orifice, and digital exploration of the tear and finger traction to evert the bladder through the urethral incision. In both mares, the bladder defects were repaired in two layers, with use of 2-0 polyglycolic acid in a simple continuous pattern. After repositioning, the vaginal and urethral incisions were closed in single layers using absorbable suture material. A standing vaginal approach eliminates the need for general anesthesia and allows excellent observation and repair of bladder tears in adult mares.

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ALTHOUGH UNCOMMON, rupture of the urinary bladder can occur in adult horses as a result of urolithiasis,¹ trauma,² or during parturition.³⁻⁵ Systemic deterioration can occur if the defect is large or is not repaired. In mares, surgical repair of bladder rupture has traditionally been accomplished by using general anesthesia with a caudal ventral median approach, however, exteriorization of the bladder and observation of tears involving the neck of the bladder can be difficult.⁴ Repair by a vaginal approach has been described in anesthetized and standing mares.^{3,5} In previously reported vaginal approaches, the defect was closed by passing a hand through the urethra and into the bladder to guide suture placement with long-handled instruments. The purpose of this report is to describe two different techniques that use a vaginal approach in the standing mare, and to observe and surgically repair defects of the bladder.

CASE REPORTS

Mare 1

A 16-year-old, multiparous, 11-month pregnant, Thoroughbred mare was admitted for signs of abdominal dis-

comfort. The mare was mildly uncomfortable with a heart rate of 54 beats/min and respiratory rate of 48 breaths/min. Rectal temperature, borborygmi, rectal examination findings, hematocrit, and total serum protein concentration were normal. The abdominal discomfort resolved after the administration of flunixin meglumine (1 mg/kg intravenously [IV]). The next day, the mare had occasional signs of mild abdominal discomfort and total serum protein (8 g/dL), potassium (5 mEq/L), and creatinine (3.9 mg/dL) concentrations were elevated. Flunixin meglumine (1 mg/kg IV) and 20 L of lactated Ringer's solution were administered.

A total of 36 hours later, signs of parturition occurred. Difficulty occurred in the second stage of parturition and on rectal examination, the foal was not within the pelvic cavity. On vaginal examination, the foal was in a cranial presentation with both front feet and head angled cranially. Under general anesthesia with the mare's hind quarters elevated, the foal was repositioned and pulled without difficulty, but attempts to resuscitate the foal were unsuccessful. After recovery from anesthesia, mild signs of abdominal discomfort were observed. Hematocrit (50.2%) and total serum protein concentration (7.1 g/dL) remained elevated; serum potassium (5.4 mEq/L), blood urea nitrogen (54 mg/dL), creatinine (3.9 mg/dL), and blood glucose (270 mg/dL)

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concentrations were also elevated. Cloudy yellow peritoneal fluid with an increased creatinine concentration (26.6 mg/dL) was obtained by abdominocentesis. Rupture of the bladder was suspected as the cause of uroperitoneum.

On exploratory ventral median celiotomy, a tear in the ventral aspect of the bladder was identified by digital palpation, but could not be exteriorized for closure. The linea alba and skin were closed with polyglycolic acid in a simple continuous pattern and simple continuous horizontal pattern, respectively. The mare recovered from anesthesia without problems.

After administration of detomidine hydrochloride (0.5 $\mu\text{g}/\text{kg}$ IV) and restraint in an equine stocks, epidural anesthesia was administered, using a combination of 100 mg of xylazine hydrochloride and 2 mL of 2% mepivacaine hydrochloride diluted in 8 mL of sterile water. The tail was secured dorsally, feces were evacuated from the rectum, and the perineum was prepared with povidone-iodine solution. To provide dorsal retraction of the vulva, umbilical tape was passed through the perineum between the vulva and the rectum and secured to the tail head. The vulva was retracted laterally by placement of towel clamps in the vulvar margins, and the dorsal vaginal wall was retracted dorsally by using a mare speculum.

The vaginal cavity was examined with use of a headlight, and the urethral orifice and cervix were identified. A Chamber's catheter was inserted through the urethra into the urinary bladder. The catheter tip was passed through the defect in the bladder wall and gently rotated dorsally to contact the peritoneal surface of the cranioventral aspect of the vagina. Visual and digital examination of the vaginal floor identified the location of the catheter, and a 1 to 2 cm incision was made in the vaginal floor approximately 5 to 10 cm caudal to the cervix. This incision was enlarged by blunt dissection, the peritoneal cavity was entered, and by digital examination the bladder was identified and then everted through the incision by using long-handled forceps until the tear was identified.

To keep the bladder everted and elevated, a stay suture was passed through the bladder apex. The ends of the stay suture were passed over the dorsal blade of the vaginal speculum, and with gentle traction on the suture, an assistant was able to keep the bladder elevated and the defect exposed for closure. The tear was debrided and then repaired in two layers by using 2-0 polyglycolic acid in a simple continuous pattern. After repositioning the bladder in the abdomen, the vaginal incision was closed in a single layer by using 2-0 polyglycolic acid in a simple continuous pattern.

Mare 2

An 11-year-old multiparous Thoroughbred mare was admitted for signs of depression and abdominal discomfort.

The mare had delivered a dead foal 24 hours earlier. On admission, the mare was dehydrated, had a heart rate of 70 beats/min, and a respiratory rate of 28 breaths/min. Rectal temperature, borborygmi, and rectal examination findings were normal. Hematocrit (56.1%) and total serum protein concentration (8.6 g/dL) were elevated, and there was a leukocytosis (16,000/ μL). Serum chloride (82 mEq/L), sodium (124 mEq/L), and creatinine (5.2 mg/dL) concentrations were elevated and serum potassium concentration (3.3 mEq/L) was decreased.

On transabdominal ultrasonography, there was increased hypochoic fluid within the peritoneal cavity. Cloudy yellow peritoneal fluid with a distinct ammonia odor similar to urine and a creatinine concentration of 5.2 mg/dL was obtained by abdominocentesis. A ruptured bladder was suspected as the cause of uroperitoneum. By digital examination through the urethral orifice, a tear was identified in the ventral aspect of the bladder.

After sedation, restraint, epidural anesthesia, and preparation as previously described for mare 1, a 24-F Foley catheter was passed through the urethra into the bladder. By digital palpation, the catheter was used as a guide to make a 3-cm incision into the vaginal floor approximately 5 cm cranial to the urethral orifice. The incision was continued through the dorsal urethral wall and the urethral catheter was removed. On digital examination through the urethral incision, the bladder defect was identified, and with an index finger through the defect, the surgeon used gentle traction to prolapse the bladder through the urethral incision. A stay suture was placed through the bladder apex to keep it everted and elevated within the vagina. The tear was debrided and then closed in two layers by using 2-0 polyglycolic acid in a simple continuous pattern. The stay suture was removed and the bladder was repositioned into the abdomen through the urethral incision. The dorsal urethral wall and vaginal floor were closed separately by using 2-0 polyglycolic acid in a simple continuous pattern.

Postoperatively, both mares were administered potassium penicillin (20,000 IU/kg IV every 8 hours) and gentamicin sulfate (2.2 mg/kg IV every 8 hours) for 5 days, and flunixin meglumine (1.1 mg/kg IV every 12 hours) for 2 days. Lactated Ringer's solution was administered IV at maintenance levels and discontinued after return of normal hydration and normal serum creatinine and urea nitrogen concentrations. A 24-F Foley catheter was placed in the urethra of both mares after surgery to facilitate evacuation of the bladder. The catheter was flushed twice daily with sterile saline solution to prevent obstruction with mucus and was removed after 5 days. Both mares improved clinically after closure of the defect and were discharged 5 days after surgery. In the 4 years after surgery, mare 1 has had two foals; Mare 2 has had

one foal without complication in the 2 years since her surgery.

DISCUSSION

In mares, surgical repair of tears involving the bladder has traditionally been approached through a caudal median celiotomy.⁴ However, exteriorization of the bladder in mares with a deep abdomen or closure of a defect that extends to the trigone maybe difficult through a caudal median celiotomy (P.E. Thorpe, personal communication, 1996). Also, the risk of anesthesia and the length of surgery may be increased because of difficulties encountered exteriorizing and repairing the urinary bladder.

Use of a vaginal approach to repair a ruptured bladder has been previously described in two mares.^{3,5} In one report, a urethral sphincterotomy under general anesthesia was used to facilitate bladder repair.³ A 4-cm incision through the dorsum of the urethra was made cranially from the urethral orifice. The defect was palpated through the urethra, and closure of the defect was accomplished by using long-handled needle holders. During manipulation of the needle holders, one hand was inserted into the urethra to guard and guide the needle holders and to stabilize the defect for closure.³ The bladder tear and urethral incision were closed separately by using a single layer closure. Another report described a standing approach through the vagina in which the surgeon's hand was passed through the urethral orifice into the bladder to guide the placement of sutures using long-handled instruments.⁵ One potential complication of blind closure of a bladder tear is the possibility of inadvertent intestinal incarceration. The urethral sphincterotomy approach may also be associated with postoperative urine dribbling and urine pooling.³

The standing approach described in this report eliminates the risks of anesthesia, provides excellent exposure of the urinary bladder, and allows for easy debridement and secure two-layer closure of the defect. Both techniques were performed quickly and without any technical difficulties. The second technique, which everted the urinary bladder through the urethra, allowed observation of the mucosal surface of the urinary bladder and bladder trigone. No problems were associated with prolapsing the urinary bladder through the urethra or through the cranial vaginal vault.

Conservative management has been used to treat urinary bladder ruptures,^{6,7} and may be considered an option in certain cases. As with surgical repair, an indwelling urinary catheter should be placed within the bladder to prevent distension. Because of continued urine leakage into the peritoneal cavity and the potential risk of peritonitis, it is the authors' opinion that surgical repair of a ruptured bladders must still be considered the preferred method of treatment.⁷

In mares, bladder rupture has been suggested to occur as a result of impingement of the bladder between the pelvic brim and a bony prominence of the foal during the forced expulsions of parturition.⁴ The bladder may rupture during parturition or later from necrosis of the injured bladder wall.⁴ It has also been suggested that during dystocia, with the foal firmly positioned within the pelvic canal, the outlet for maternal intravesicular pressure through the urethra is eliminated, and the tremendous intra-abdominal pressure occurring during parturition can potentially rupture the bladder.⁴ In postpartum mares, the location of the tear in the bladder of reported cases (four mares)³⁻⁵ plus the two mares in this report have been in the ventral (4 mares), lateral (1 mare), and cranial aspects (1 mare) of the bladder. During parturition, the ventral and lateral regions of the urinary bladder may be more susceptible to tearing because the fetus may possibly dampen dorsally directed pressures.

Excellent exposure along with a secure closure of the defect was possible with a standing vaginal approach in both mares. Both methods allowed easy closure of the defect, but the second technique improved exposure of the trigone. The standing approach eliminated the risks associated with general anesthesia, and closure of the defect was technically easier and faster than approaches through caudal celiotomy incisions (P.E. Thorpe, personal communication, 1996). Urine pooling, urine dribbling, or cystitis were not encountered after either technique. Both mares had appreciable clinical improvement after surgery and have successfully delivered foals without further complications.

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