Laparoscopic-assisted urinary bladder marsupialization in a goat that developed recurrent urethral obstruction following perineal urethrostomy

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Case Description—A 5-year-old castrated male Nigerian Dwarf goat with recurrent urethral obstruction after perineal urethrostomy.

Clinical Findings—The wether goat was referred for evaluation of a perineal urethrostomy site; perineal urethrostomy had been performed 1.5 years earlier. The site was patent, but a moderate stricture was found just cranial to the perineal urethrostomy site. The goat had obstructed urine flow at the stricture site repeatedly in the previous few months.

Treatment and Outcome—Laparoscopically assisted urinary bladder marsupialization was recommended. The procedure was performed with the patient under general anesthesia in dorsal recumbency; food had been withheld for 36 hours prior to anesthesia. Ventral midline and left caudal paramedian portals were made for the laparoscopic camera and instruments. A larger incision in the right caudal paramedian portion of the abdomen was used to create the marsupialization site. Laparoscopic observation of anatomic structures within the abdomen was excellent. The goat recovered well from surgery and was discharged the day following surgery. Follow-up examinations were done every few months after surgery, and dermatitis of the abdominal skin secondary to urine scald was the only postoperative complication. At 9 months of follow-up, the goat continued to pass urine through the marsupialization site comfortably.

Clinical Relevance—In the goat of this report, laparoscopic urinary bladder marsupialization was a minimally invasive procedure with minimal signs of postoperative pain. The procedure was simple to perform and should be considered as an alternative to marsupialization via laparotomy. (J Am Vet Med Assoc 2012;241:778–781)

A 5-year-old castrated male Nigerian Dwarf goat was referred to the Oregon State University Veterinary Teaching Hospital with a history of recurrent urethral obstruction. The goat had undergone a perineal urethrostomy 1.5 years earlier for urethral obstruction. The goat had urinated normally through the perineal urethrostomy site for 1 year after surgery, and then urethral obstruction occurred just cranial to the perineal urethrostomy site. This obstruction had been relieved by passing a urethral catheter through the perineal urethrostomy site, which the referring veterinarian noted was strictured. Urethral obstruction occurred 2 more times within a 3-month interval; each episode of urethral obstruction had been temporarily relieved by the passage of a urethral catheter. Because of the recurrent nature of the urethral obstruction, the owner elected to pursue a longer-term solution.

At the time of referral, the goat was bright and alert. The rectal temperature (39.1°C [102.3°F]; reference range, 38.6° to 40°C [101.5° to 104.0°F]) and respiratory rate (30 breaths/min; reference range, 10 to 30 breaths/min) were within reference range, whereas the heart rate was slightly high at 96 beats/min (reference range, 70 to 90 beats/min). Urine was observed passing from the perineal urethrostomy site. The goat was overweight with a body condition score of 4.5 of 5.2 The owner described the goat’s regular diet to be a combination of grass hay and pellets formulated for goats with constant access to pasture. Aside from obesity, no abnormalities were found on results of a physical examination.

Abdominal radiography was performed; no radiopaque uroliths were evident within the urinary bladder or urethra on radiographic evaluation. Because the most common uroliths found in goats evaluated at the Oregon State University Veterinary Teaching Hospital are radiopaque calcium carbonate uroliths, positive-contrast urethrography was not performed to aid in the identification of radiolucent uroliths.3 A CBC and serum biochemical analysis were performed. A slight neutrophilia (8,858 cells/µL; reference range, 1,200 to 7,000 cells/µL) and mild monocytesis (838 cells/µL; reference range, < 500 cells/µL) consistent with low-grade chronic inflammation were found. Serum biochemical analysis revealed moderate hyperglycemia (219 mg/dL; reference range, 50 to 75 mg/dL), consistent with stress. Hypophosphatemia (2.9 mg/dL; reference range, 3.6 to 9.0 mg/dL) and hypomagnesemia (1.83 mg/dL; reference range, 2.8 to 3.9 mg/dL) were present and attributed to dietary deficiencies. γ-Glutamyltransferase activity was high (38 U/L; reference range, 5 to 15 U/L), and sorbitol dehydrogenase was slightly high (26 U/L; reference range, 14 to 24 U/L).3

The goat had a perineal urethrostomy site that was functional, but urine outflow was intermittently obstructed. Although the exact cause of obstruction was not determined, it was apparent on examination...
that the stoma opening had narrowed to a few millimeters in diameter. Options for resolving the recurrent urethral obstruction included revision of the current perineal urethrostomy site, placement of a new perineal urethrostomy site, or urinary bladder marsupialization. Urinary bladder marsupialization was recommended instead of a repeat perineal urethrostomy because of the unacceptable risk for continued stricture formation. In an effort to minimize postoperative pain and healing time, a laparoscopic approach was chosen instead of a traditional laparotomy. The patient was not given food for 36 hours prior to surgery. A catheter was placed into the jugular vein, and the goat was treated with cefiofur (2.2 mg/kg [1.0 mg/lb], IV) and flunixin meglumine (0.5 mg/kg [0.22 mg/lb], IV) before surgery.

Anesthesia was induced in the goat by administration of a tiletamine-zolazepam combination (2.2 mg/kg, IV) and placed in dorsal recumbency. General anesthesia was maintained with inhalant isoflurane delivered in oxygen. The hair was clipped from the ventral aspect of the abdomen from the xiphoid process to the pubis. The area was prepared for aseptic surgery. A 2-cm-long skin incision was made on the midline, just cranial to the umbilicus, and a teat cannula was used to puncture skin incision was made on the midline, just cranial to the umbilicus, and a teat cannula was used to puncture the skin with 2-0 monofilament polypropylene. The patient was not given food for 36 hours prior to surgery. A catheter was placed into the jugular vein, and the goat was treated with cefiofur (2.2 mg/kg, q 12 h, SC) for 4 days after surgery and with flunixin meglumine (0.5 mg/kg, IV) once after surgery. The owner was advised to place petroleum jelly on the abdomen to protect the skin cranial to the marsupialization site from urine scald. At suture removal 2 weeks later, the surgical site was in excellent condition. The stoma was draining urine well, and the owner reported that the goat had been eating well and appeared comfortable during the recovery period. The goat’s level of activity and interactive nature were similar to what they had been prior to the episodes of recurrent urethral obstruction.

The goat returned 3 months later because the owner was concerned about pink tissue protruding from the stoma. Physical examination revealed that the stoma was patent. The bladder mucosa was normal on palpation. The so-called dog-ear created with skin at the time of surgery to funnel urine away from the abdomen had flattened out, and the goat had notable dermatitis of the ventral aspect of the abdomen secondary to urine scald. The pink tissue concerning the owner was associated with this dermatitis. The skin was cleaned, and an antibiotic ointment was applied. The goat was discharged from the hospital with instructions for the owner to clean the abdomen and apply the antibiotic ointment daily, and the dermatitis resolved shortly thereafter. At the time of this writing, the goat has returned to the veterinary teaching hospital every 2 to 3 months for the 9 months following the marsupialization. At each of these visits, the marsupialization site was patent, and there were no signs of bladder mucosa prolapse or stoma stricture.

Discussion

Laparoscopic surgery is well established in equine and bovine practice, but its reported use in small ruminants is limited. It has been used for several years to assist embryo transfer and oocyte recovery in goats. Recently, a study by Kassem et al. showed laparoscopy to be an effective method of obtaining liver biopsy specimens in goats. That same study outlined the abdominal laparoscopic anatomy of goats and demonstrated the usefulness of laparoscopy as a teaching tool. In sheep, laparoscopy has been successfully used to assist implantation of urinary catheters for tube cystotomies. A technique for laparoscopic-assisted bladder marsupialization, however, has yet to be reported.

Recurrent obstructive urolithiasis is a familiar problem in male goats. Young wether goats, particularly those fed a high-grain diet, are most commonly affected. When a male goat is initially examined for urinary
obstruction, typically the first course of action is to exteriorize the penis and amputate the urethral process. The sudden narrowing in lumen diameter at the urethral process provides a bottleneck effect that easily traps urinary calculi and prevents further urine expulsion. The relief afforded with process amputation is often temporary.\textsuperscript{16,17} Urethral catheterization with retrograde flushing of the distal urethra can occasionally dislodge uroliths; however, recurrence is common. Some success in dissolving uroliths with percutaneous infusions of Walpole’s solution into the bladder has been reported,\textsuperscript{8,22} but the need for surgical intervention remains common. Perineal urethrostomy or urethrotomy with penectomy has been used to relieve obstructions, but stricture formation associated with these sites has limited the usefulness of these procedures for long-term management of recurrent obstructive urolithiasis.\textsuperscript{19}

The 2 common long-term surgical solutions for recurrent obstructive urolithiasis in goats are tube cystostomy, either percutaneous or surgical, and bladder marsupialization. Tube cystostomies are successful in instances where the patency of the urethra is reestablished following dissipation of the inflammation associated with obstruction.\textsuperscript{17,20} They are the treatment of choice in breeding goats, where patency of the urethra is vital. If patency of the urethra is compromised by stricture, as was the case with the goat in the present report, bladder marsupialization is the only viable option for long-term surgical solution.

Bladder marsupialization for the management of recurrent obstructive urolithiasis in goats has been reported to have a notably better prognosis than in other ruminants.\textsuperscript{7} On postoperative clinical assessment, many of the goats appear healthy. Urine scald on the ventral aspect of the abdomen is the most common complication associated with the procedure. Owners should be prepared to invest substantial time for the duration of the goat’s life in the administration of preventative treatment to minimize urine-associated dermatitis. More catastrophic complications, such as bladder mucosal prolapse and stoma stricture, have also been reported.\textsuperscript{7,21} Exposure of the urinary tract to the environment predisposes it to ascending infections. Although goats may not have overt clinical signs of a urinary tract infection, low-grade chronic cystitis and pyelitis on postmortem assessment have been reported for clinically normal goats.\textsuperscript{21}

In the past, at our veterinary teaching hospital, bladder marsupialization has been performed through a primary incision or through a primary laparotomy incision with a secondary incision for marsupialization, similar to the technique described by May et al.\textsuperscript{21} Laparoscopy offers several advantages over the traditional approach. Small portal incisions minimize the tissue trauma associated with abdominal surgery. The less invasive approach is reported to correlate with fewer signs of postoperative pain, shorter recovery periods, and decreased incidence of incision dehiscence.\textsuperscript{6,22} Once recovered from anesthesia, the goat of the present report returned to having presurgical vital parameters, appetite, and activity level. Potential complications that can occur with laparoscopy include damage to the viscera on introduction of the insufflation cannula or laparoscope trocar and cannula.\textsuperscript{23} Insufflation of the subcutaneous, bowel, or retroperitoneal space can occur with incorrect placement of the insufflation device, particularly if insufflation is performed with a needle rather than a teat cannula. Also, damage to abdominal wall blood vessels can occur with introduction of trocars, resulting in varying degrees of hemobadenom.

For the goat of the present report, performance of the surgical procedure was complication free, and the goat appeared comfortable and had an excellent appetite after surgery with only a low level of pain management. Overall, the laparoscopic approach resulted in decreased hospitalization time, decreased cost to the owner, and, in comparison with goats marsupialized via an open approach at our hospital, a patient that appeared more comfortable after surgery. The technical aspects of the surgery were simple, and total surgical time was similar to the time necessary for a standard ventral midline laparotomy. Because this was the first laparoscopically assisted bladder marsupialization in a goat that we have performed, we believe surgical time will decrease as we develop more experience and refine the technique. Although the cost of laparoscopic equipment may preclude this technique from becoming the standard of care in general practice, at our hospital, where the cost of this equipment is offset by its use in multiple large animal species, surgical cost is primarily based on surgeon time, laparoscopic surgical pack fees, and disposable-item costs. The cost of a laparoscopic surgical pack was offset by decreases in the number of drapes and suture packs used in the goat of the present report. Shorter hospitalization duration decreased the overall cost to the owner. As laparoscopic urinary catheter insertion in sheep has been previously shown to result in fewer signs of postoperative pain and more rapid recoveries,\textsuperscript{6} we anticipate that bladder marsupialization performed in a minimally invasive manner will follow a similar course. Although signs of pain were not objectively scored in the goat of this report, goats marsupialized via an open approach at our hospital have required more prolonged pain management to be subjectively comfortable.

References