Clinical Case Conference

Perineal urethrotomy for removal of cystic calculi in a gelding

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A 10-year-old 575-kg Thoroughbred gelding was admitted to the equine hospital because of a 4-month history of intermittent hematuria. Brownish-red urine was noticed after the horse was ridden. The history suggested that the urine discoloration might be related to exercise-induced myositis and associated myoglobinuria. Intravenous fluid therapy, nonsteroidal anti-inflammatory agents, and reduction of the grain diet did not alter the clinical signs. Muscle enzymes were not measured. Further examination of the urine examined at the farm revealed a pH of 8.5, and the urine contained calcium carbonate crystals. Examination per rectum indicated a 6 × 2.5 × 4-cm mass within the bladder lumen. Although the mass was moveable, it was believed to be adherent to the bladder wall mucosa. Differential diagnosis included calculus formation, dystrophic calcification of the bladder mucosa, or neoplasia.

Physical examination at this clinic revealed an alert horse in good body condition. The horse's rectal temperature was 38 C, pulse rate was 36 beats/min, and respiratory rate was 18 breaths/min. Transrectal ultrasonography of the bladder by use of a 5.0-MHz linear transducer confirmed the location of the mineralized mass (Fig 1). The differential diagnosis for neoplasia was not ruled out. Percutaneous ultrasonographic appearance of the kidneys was normal.

The CBC, hemoglobin content, platelet count, serum electrolyte concentrations, BUN concentration, creatinine concentration, and serum biochemical values were all within reference ranges. Results of urinalysis were indicative of hematuria (30 to 40 RBC/100× field). No bacteria were isolated from urine by aerobic culture. A tentative diagnosis of hematuria secondary to a cystic calculus was made. Options for treatment included subischial urethrotomy, laparocystotomy, pararectal cystotomy and electrohydraulic lithotripsy.[1-10]

Subischial urethrotomy was selected because it is easily performed, does not require general anesthesia, and complications are minimal.[1,4,8-10] Large cystic calculi can be fragmented manually with whelping forceps or a lithotrite, and urethral calculi may be removed through the same approach. Some of the disadvantages of this technique, as compared with laparocystotomy, are increased recurrence of calculi and the potential for urethral stricture formation attributable to the increased risk of damage to the urethral mucosa.[5,11] This complication is greatly reduced by instilling 200 to 400 ml of sterile lubrication jelly into the bladder to minimize trauma to the mucosa and copiously lavaging the bladder to facilitate complete removal of calculi fragments.[7] The cause of calculus formation often remains undetermined. Urolithiasis secondary to neural atony of the bladder, or secondary to renal disease, has a higher risk for recurrence or further urinary complications.[4] When there is no evidence of neurologic or renal disease, most horses with urolithiasis recover well after surgical removal of the calculus and do not form additional calculi. Recurrence of the calculi is rare even without urinary acidification.[1,2] The horse of this report had no evidence of associated disease and, thus, the likelihood for recurrence of calculi was considered low.

Before surgery, procaine penicillin G (20,000 U/kg of body weight, IM) and trimethoprim sulfamethoxazole (25 mg/kg, PO) were administered. Anesthesia of the perineum was achieved by injecting 6 ml of 2% mepivacaine hydrochloride into the epidural space between the first and second caudal vertebrae. Detomidine hydrochloride[a] (0.01 mg/kg) and butorphanol tartrate[b] (0.02 mg/kg) were administered IV to induce sedation.

A Foley catheter was inserted at the glans penis and

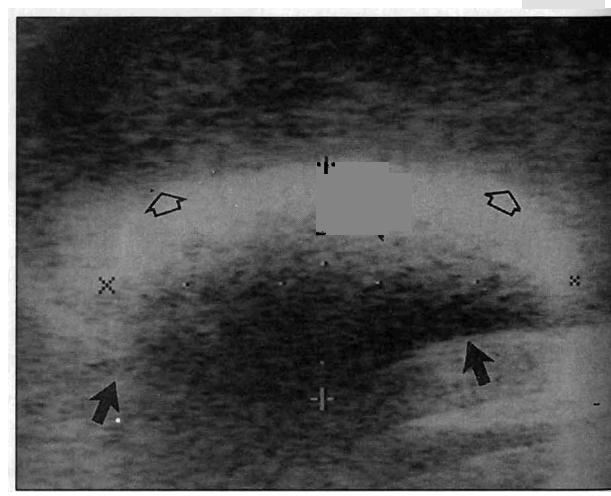

Figure 1—Transrectal ultrasonographic appearance of a cystic calculus in a horse with intermittent hematuria prior to perineal urethrotomy. The calculus (open arrows) is associated with the ventral aspect of the bladder wall (closed arrows). The area at the top of the figure is urine in the bladder.

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into the urinary bladder to delineate the urethra. A 6-cm vertical incision was made along the median raphe of the perineum 3 cm ventral to the anus. Deep dissection was continued along the midline until the urethra was identified as outlined by the urethral catheter. A 3-cm incision was made into the urethra where it proceeds rostrally to pass into the trigone of the bladder. The bladder was then distended with 300 ml of sterile lubrication jelly, and the cystic calculus was manipulated transrectally into the trigone of the bladder. A canine whelping forcep was used to grasp and remove the calculus from the bladder. The calculus weighed 64 g and measured 6.3 × 2.5 × 1.8 cm. The bladder and urethra were lavaged with 15 L of warm 0.9% NaCl (saline) solution. The surgical wound was then lavaged with 1 L of saline solution containing 5 MU of potassium penicillin. The urethrotomy was allowed to heal by second intention.

Treatment with trimethoprim sulfamethoxazole was continued for 10 days. Sodium chloride powder (60 g, PO, q 12 h) was administered to increase water intake. The wound was cleansed twice daily, and furacin ointment and petrolatum were applied on and around the wound, respectively. The horse was confined to a stall and allowed exercise in a small paddock for 14 days. Ammonium chloride (200 mg/kg, PO, q 12 h) was administered and the dosage was decreased at biweekly intervals until a dosage of 60 mg/kg maintained the pH of the urine below 7.0. Urinary acidification may be useful as a preventive measure to decrease the crystallization and precipitation of calcium carbonate crystals in urine.[1,4,5,8] The owner may use urine dipsticks to easily check whether the urine pH is adequately low (< 7.0). The smallest amount of ammonium chloride needed to maintain aciduria should be determined by progressively reducing the daily dose after 2 weeks to that needed to maintain urine pH below 7.0.[1,4,5,8]

Ten days after surgery the urethrotomy had healed sufficiently to prevent urine passage, and urination appeared normal. Results of follow-up ultrasonography of the bladder, urinalysis, hematologic evaluation, and serum biochemical analyses revealed no abnormalities 30 days after surgery. The horse performed well as a hunter for 38 months until clinical signs reappeared. The client had discontinued giving the horse ammonium chloride 32 months earlier. Hematuria and poikiluria were associated with a cystic calculus palpable transrectally within the bladder lumen. Ultrasonography confirmed the location of the calculus, and the kidneys appeared normal. Results of all hematologic, biochemical, and urine tests were within reference ranges, and no bacteria were isolated from the urine. A tentative diagnosis of hematuria secondary to a cystic calculus was made.

Another subischial urethrotomy was performed by the second author at another hospital. The calculus (5.9 cm × 3.8 cm × 2.5 cm; 55.1 g) was dark greenish-gold in color, and had a rough surface with coarse granular digitate nodules. Cracked section revealed a surface layer of crystals over an outer layer of coarse to finely granular, partially radially striated, greenish-gold crystals, and a central core of finely granular, dark golden, randomly oriented crystals. Analysis of the calculus via x-ray diffractometry indicated it to be composed of calcium carbonate in the mineral form of calcite. Postoperative care was similar to that used after the first surgery, and no complications were encountered. Normal wound closure and urination were evident 28 days after surgery. Thirty days after surgery, ultrasonography of the bladder, urinalysis, hematologic evaluation, and serum biochemical analyses revealed no abnormalities. Because the horse had been on a clover and grass pasture with no grain supplementation, the diet was changed to reduce calcium intake. Two kilograms of a 10% protein complete feed was given twice daily. The horse received no alfalfa or clover hay and was removed from the pasture with a high clover content. The horse has had no abnormal clinical signs, and transrectal palpation has not revealed any calculi within the bladder lumen for 30 months.

[a]Dormosedan, Smith Kline Beecham Animal Health, Westchester, Pa.

[b]Torbugesic, Fort Dodge Laboratories Inc, Fort Dodge, Iowa.

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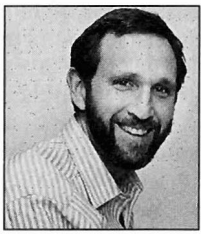

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Cystic calculi in horses are most common in adult males. Hematuria is the most common, and often the only, clinical sign associated with cystic calculi in horses. Hematuria following exercise is virtually diagnostic for cystic calculi; however, exercise-induced hematuria may infrequently be caused by a nephrolith. Hematuria caused by cystic calculi often is observed to be more pronounced at the end of urination. Urethral hemorrhage also should be considered as a cause of bleeding at the end of urination in an otherwise healthy gelding or stallion.[1] Hemorrhage caused by cystic calculi can usually be differentiated from urethral hemorrhage because the latter occurs immediately after urination, rather than during urination, and the hemorrhage may appear red-brown rather than the brighter red usually associated with hematuria from cystic calculi. Palpation per rectum is the most important diagnostic technique for confirming cystic calculi. Most commonly, the calculus is palpated after only the hand and wrist are placed in the rectum; the diagnosis may be missed if the caudal pelvic area is not carefully examined. If there is a large amount of urine in the bladder, it may be difficult to feel the stone, and transrectal ultrasonography of the bladder, using a 7.5-MHz linear transducer, may be required to confirm the diagnosis.

In the case reported, the authors have used a popular technique for removal of cystic calculi in male horses. Experience with urethrotomy is important if the stone is to be safely and completely removed. Recurrence rates for equine cystic calculi have not been adequately determined. It is my opinion that the recurrence rate in uncomplicated cases is low after complete removal of the stone. I agree with the authors that cystic calculi associated with atony of the bladder or renal disease (eg, renal calculi) have a high recurrence rate and should be approached cautiously. Most concretions associated with an atonic bladder are not single stones (although they may feel like such on transrectal palpation), but are, instead, a sludge of calcium carbonate crystals. These sand-like deposits develop when a horse does not completely empty its bladder. The inability to properly empty the bladder may be a result of a neurologic disorder or may occur in association with spondylitis and the associated vertebral pain in male horses. Surgery should not be attempted on these horses. The sediment can usually be removed by catheterization and lavage of the bladder. Unfortunately, the sediment almost always recurs, urinary infection develops, and the prognosis for complete recovery is poor. Horses with cystic calculi in conjunction with renal calculi have not only an increased recurrence rate, but a guarded prognosis for long-term survival. Nephroliths are frequently bilateral in horses and may result in progressive nephron loss and signs of renal failure. Ultrasonographic equipment is routinely used in most equine practices, and I would recommend that all horses with cystic calculi have ultrasonography of the kidneys performed prior to surgery. The finding would be helpful in providing the owners a more accurate prediction of the horse's prognosis and the likelihood of recurrence.

Acidification of the horse's urine, as was performed in this case, may be helpful in decreasing the recurrence of cystic calculi. Calcium carbonate, a normal component of equine urine and the predominant crystal in most equine uroliths, is more soluble in acidic urine. Several products, including ammonium chloride, methionine, and ascorbic acid have been used in an attempt to acidify horse urine.[2] I also have evaluated vinegar (acetic acid), and found that it will not decrease urine pH, even when administered orally to horses in large amounts (2 ml/kg of body weight, q 12 h). Likewise, I could not demonstrate a decrease in the urine pH of horses fed ascorbic acid (0.5 g/kg, q 12 h) for 1 week. Higher dosages of ascorbic acid will cause a reduction in the urine pH, but this may not be practical because of expense, poor palatability, and unproven safety when administered at high doses for prolonged periods. Ammonium chloride is, to my knowledge, the most commonly used product for acidifying equine urine and, as reported in this case, will decrease the pH of equine urine. Its practical use may be limited, however, by its poor palatability. The ability of ammonium chloride to lower urine pH is probably a result of a relative increase in strong anions in the feed.[3] The safety of feeding a relatively high anionic diet to horses for an extended period has also not, to my knowledge, been demonstrated. It is apparent that further work is needed to determine a practical, safe, and inexpensive method for acidifying equine urine.

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