

# Osteolytic lesions of the tuber calcanei in two horses

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- ▶ Horses with signs of chronic calcanean bursitis should be evaluated for osteolytic lesions of the tuber calcanei at the insertion of the gastrocnemius tendon ("gastrocnemius enthesitis").
- ▶ A flexed, proximoplantar-to-distoplantar tangential (skyline) radiographic view of the calcaneus is advantageous for identifying this lesion and is recommended for all horses with calcanean bursitis.
- ▶ The prognosis for athletic soundness in horses with chronic calcanean bursitis and associated osteolytic lesions of the tuber calcanei should be considered guarded.

A 9-year-old 655-kg (1,441-lb) Thoroughbred-Clydesdale cross gelding (horse 1), used as a law enforcement mount, was admitted to the New England Veterinary Medical Center—Hospital for Large Animals for evaluation of chronic lameness of the left hind limb. The horse had been kicked in the left tarsal region approximately 4 weeks prior to admission with a resulting lameness that had progressed from moderate to severe. Physical examination at the time of admission revealed moderate effusion of the calcanean bursa of the left hind limb. Palpation of the bursa did not elicit signs of pain, and there were no signs of external wounds or soft tissue swelling in the area. The horse had a grade 3 to 4 (out of 5)<sup>1</sup> lameness of the left hind limb.

Radiographs of the left tarsus, including a flexed proximoplantar-to-distoplantar tangential (skyline) view, revealed subtle radiolucencies in the tuber calcanei that at that time were considered equivocal in terms of clinical importance. A sonogram of the affected area revealed thickening of the walls and synovium of the calcanean bursa, which was distended with primarily anechoic fluid that was loculated with a few strands of echogenic material consistent with fibrin. The superficial digital flexor and gastrocnemius tendons (common calcanean tendon) appeared normal ultrasonographically.

On the basis of these findings, a diagnosis of moderate-to-severe, possibly septic, calcanean bursitis was made, and lavage of the bursa was recommended. A sample of fluid from the left calcanean bursa was collected aseptically by synoviocentesis and submitted for cytologic analysis and bacteriologic culture. The bursa was lavaged percutaneously with sterile lactated Ringer's solution, after which 500 mg of amikacin was

administered intrathecally. Following lavage, the horse was treated with potassium penicillin G (22,000 U/kg [10,000 U/lb] of body weight, IV, q 6 h) and gentamicin (6.6 mg/kg [3.0 mg/lb], IV, q 24 h).

One day after initiation of treatment, the lameness had improved approximately 30 to 50% (grade 2 to 3). Intrathecal injection (left calcanean bursa) of 2% mepivacaine solution (15 ml) abolished the lameness, thereby confirming that this was the single source of pain contributing to the lameness. Results of cytologic analysis of synovial fluid from the bursa were compatible with chronic nonseptic inflammation (total protein concentration, 3.5 gm/dl; total nucleated cell count, 1,200/ $\mu$ l; differential cell count: 90% macrophages, 10% lymphocytes, rare neutrophils and RBC; no bacteria seen). Aerobic and anaerobic bacteriologic cultures of the fluid were negative.

A definitive diagnosis of chronic nonseptic calcanean bursitis was made. As such, treatment with antibiotics was discontinued, and the bursa was injected with 80 mg of methylprednisolone acetate solution<sup>a</sup> and 20 mg of sodium hyaluronate solution<sup>b</sup> to decrease inflammation. The horse was discharged from the hospital with instructions to the owner to administer phenylbutazone (2.2 mg/kg [1.0 mg/lb], PO, q 12 h) for 7 days and restrict exercise to 3 days of in-hand walking followed by walking and trotting under saddle for 10 to 15 minutes daily for 4 weeks if the lameness remained only mild-to-moderate or improved. Light exercise was recommended, despite the presence of mild lameness, to reduce the potential for intrathecal adhesion formation.

The horse was reexamined 10 weeks later. The owner reported that the lameness had persisted as mild-to-moderate but had become considerably worse (mild lameness apparent at a walk) during the previous 2 weeks, which corresponded with cessation of light exercise under saddle and an increase in stall confinement. Physical examination revealed a 50% reduction in size of the left calcanean bursa, compared with our initial examination, which was attributed to decreased effusion. Palpation of the bursa and surrounding structures did not elicit signs of pain. A lameness examination revealed a grade 2 to 3 (out of 5) lameness of the left hind limb. An upper-limb flexion test exacerbated the lameness. Except for a mild increase in thickness of the bursal walls, results of ultrasonography were similar to those of the first examination. Arthroscopic examination was recommended to further assess the bursa and associated tendons and to allow debridement of any fibrin, proliferative synovium, fibrous tissue, or restrictive adhesions that may have been present and contributing to the lameness.

Results of CBC and serum biochemical analysis

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were within reference ranges. Perioperatively, the horse was treated with potassium penicillin G (22,000 U/kg [10,000 U/lb], IV, q 6 h), gentamicin (6.6 mg/kg [3.0 mg/lb], IV, q 24 h), and phenylbutazone (4.4 mg/kg [2.0 mg/lb], IV, q 12 h). Following sedation with detomidine (0.01 mg/kg [0.0045 mg/lb], IV), anesthesia was induced with a combination of ketamine (2.2 mg/kg [1.0 mg/lb], IV) and 5% guaifenesin (1.2 ml/kg [0.55 ml/lb], IV) solution. Anesthesia was maintained with isoflurane in oxygen in a semiclosed circle system. The horse was positioned in right lateral recumbency, and the left tarsus was prepared aseptically for surgery.

The left calcanean bursa was distended with sterile saline (0.9% NaCl) solution, a 0.5-cm incision was made in the proximolateral aspect of the bursa, and a 4-mm 30-degree forward-viewing arthroscope was inserted into the bursa. Arthroscopic examination revealed mild-to-moderate hyperemia of the synovium, but no fibrin deposition or adhesions were detected. The gastrocnemius and superficial digital flexor tendons appeared normal. Two similar incisions were made to allow evaluation of the more distal aspect of the bursa; one in the proximomedial aspect, and one in the distolateral aspect of the bursa (distal to the tuber calcanei). No other abnormalities were seen, and the bursa was lavaged with several liters of sterile saline solution. Skin incisions were closed with 2-0 nylon

suture<sup>c</sup> in a simple interrupted pattern, a padded bandage was applied over the left tarsus, and the horse was recovered from anesthesia.

Considering the mild abnormalities seen during arthroscopic exploration of the bursa in contrast to the degree of lameness, follow-up radiographs of the left tarsus were taken the next day. These revealed a distinct, well-circumscribed osteolytic or osseous cyst-like lesion on the tuber calcanei (Fig 1) at the insertion of the gastrocnemius tendon,<sup>2,3</sup> which was interpreted as evidence of an enthesopathy or enthesitis and calcaneal osteitis. Because of the osseous lesion, as well as the progression of lameness, the owner was given a guarded prognosis for the horse to return to athletic soundness. The horse was discharged 3 days after the arthroscopy procedure, with instructions to the owner to administer phenylbutazone (2.2 mg/kg [1.0 mg/lb], PO, q 12 h, for 3 days, then q 24 h, for 7 days), along with stall confinement and hand walking exercise (5 to 10 minutes twice a day) followed by reexamination in 6 weeks.

Findings on physical examination 8 weeks after surgery were unchanged from those of the previous examination. The horse had only a mild left hind limb lameness (grade 2), but an upper-limb flexion test resulted in a considerable lameness at a trot in-hand. Radiographs of the left tarsus revealed no change in the appearance of the osteolytic lesion on the tuber cal-

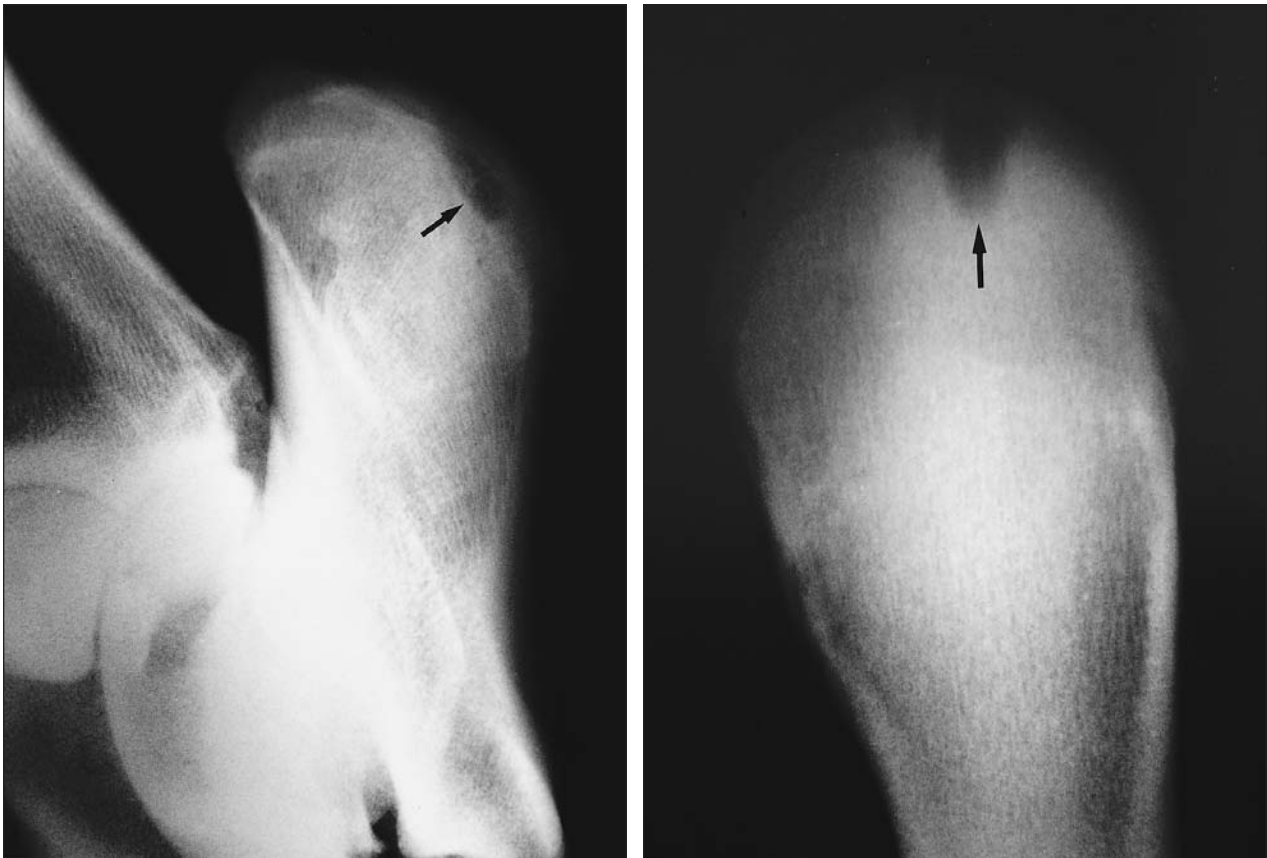


Figure 1—Dorsolateral-to-plantaromedial oblique (left) and flexed proximoplantar-to-distoplantar tangential (right) radiographic views of the left calcaneus of horse 1, obtained 3 months after the initial evaluation and diagnosis of calcanean bursitis and 1 day after arthroscopic examination of the calcanean bursa. Notice the osteolytic lesion of the tuber calcanei at the point of insertion of the gastrocnemius tendon (arrow).

canai. The owner was given a poor prognosis for the horse to resume law enforcement service in the near future, and a guarded prognosis for it to achieve athletic soundness long-term. Options for treatment were discussed with the owners and included surgical debridement of the lesion on the tuber calcanei or further medical treatment (using anti-inflammatory medications); neither option was pursued. An extended period of rest consisting of paddock or small pasture turnout for 6 to 12 months was recommended.

The horse was reexamined 11 months later. It had resumed limited work for approximately 2 months, which consisted of 2 to 3 days of patrol duty per week. The owner's primary concern at that time was that the horse had an intermittent forelimb lameness that had been responding to routine shoeing and medical treatment for navicular syndrome. Physical examination revealed only mild distension of the left calcanean bursa. During a lameness examination, the horse had a grade 3 lameness on the right forelimb and a mild left hind limb lameness (grade 1 to 2). An upper-limb flexion test of the left hind limb only mildly exacerbated the lameness. Radiographs of the left tarsus revealed a more sclerotic margin to the osteolytic lesion on the tuber calcanei than that observed previously, as well as a mild increase in radiopacity within the lesion itself (Fig 2). It was recommended that the owner medically manage the horse's forelimb lameness (diagnosed as navicular syndrome) and continue to monitor the left hind limb for signs of an increase in lameness or swelling of the calcanean bursa and other structures at the point of the left hock. At that time, the owner considered the forelimb problems to be the limiting factor in the horse's usefulness.

An 8-year-old 485-kg (1,067-lb) Thoroughbred

mare (horse 2) used as a show hunter was admitted to the New England Veterinary Medical Center Hospital for Large Animals for evaluation of left hind limb lameness of approximately 10 months duration that became apparent shortly after the mare had slipped and fallen while walking on ice. The owner reported that at the time of injury no open wounds were evident, but mild swelling was present along the medial aspect of the left tarsus and gaskin. Several veterinary examinations had been performed, but a definitive diagnosis for the lameness had not been made.

Physical examination revealed moderate effusion of the left calcanean bursa and mild atrophy of the left gluteal muscles. Lameness examination revealed a grade-3 lameness of the left hind limb. Intra-articular injection (left calcanean bursa) of 2% mepivacaine solution (15 ml) resulted in considerable improvement of the lameness (70 to 75% improvement within 5 minutes of the injection and 90 to 95% improvement within 15 minutes).

Radiographs of the mare's left tarsus revealed an osteolytic or osseous cyst-like lesion of the tuber calcanei at the point of insertion of the gastrocnemius tendon (Fig 3). A sonogram revealed mild thickening of the wall of the calcanean bursa, which was distended with primarily anechoic fluid. The bony defect of the tuber calcanei was easily imaged ultrasonographically at the point of insertion of the gastrocnemius tendon (Fig 4). The gastrocnemius and superficial digital flexor tendons and the deep digital flexor tendon and sheath (tarsal sheath) appeared normal on ultrasound. Results of cytologic analysis of a sample of synovial fluid collected by synoviocentesis prior to local anesthetic injection were within reference ranges (total protein concentration, < 2.0 g/dl; total nucleated cell



Figure 2—Dorsolateral-to-plantaromedial oblique (left) and flexed proximoplantar-to-distoplantar tangential (right) radiographic views of the left calcaneus of the horse in Figure 1, obtained 11 months after arthroscopic examination of the calcanean bursa. Notice the increased sclerosis around the margins of the osteolytic lesion (arrows) and the increased radiopacity (arrowheads) within the lesion.





Figure 3—Dorsolateral-to-plantaromedial oblique (left) and flexed proximoplantar-to-distoplantar tangential (right) radiographic views of the left calcaneus of horse 2, obtained during the initial evaluation of chronic left hind limb lameness. Notice the osteolytic lesion of the tuber calcanei at the point of insertion of the gastrocnemius tendon (arrow).

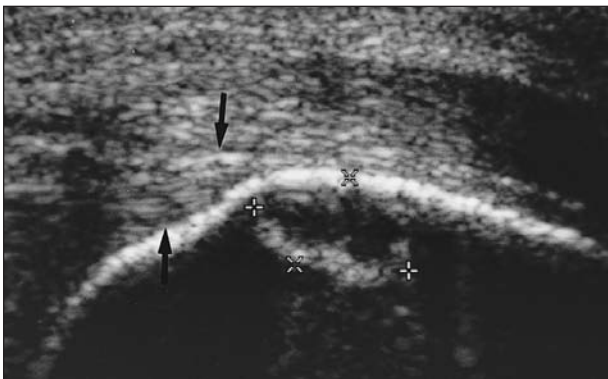


Figure 4—Longitudinal ultrasonographic image (7.5 MHz probe) of the left tuber calcanei and surrounding soft tissues of the horse mentioned in Figure 3 taken during the initial evaluation of chronic left hind limb lameness. Plantar is to the top and distal is to the right of the image. Notice the osteolytic lesion of the tuber calcanei (+ markers) and the fibers of the gastrocnemius tendon near the point of insertion on the tuber calcanei (arrows).

count, 200/ $\mu$ l; differential cell count: 80% monocytes, 12% lymphocytes, 8% nondegenerate neutrophils). Results of an aerobic bacteriologic culture of synovial fluid were negative.

On the basis of results of the diagnostic workup, the primary cause of the mare's lameness was attributed to an active enthesitis and osteitis at the insertion of the gastrocnemius tendon, with a secondary component of chronic low-grade calcanean bursitis. Although the synovial fluid analysis was considered normal, the severe effusion and thickening of the wall of the cal-

canean bursa supported an assumption of previous inflammation that was resolving or had resolved. In light of the duration and severity of lameness, arthroscopic evaluation of the bursa and surgical debridement of the osteolytic lesion of the tuber calcanei were recommended to improve the mare's prognosis to return to soundness as a show hunter. This decision was also based in part on the less than satisfactory response of horse 1 to conservative treatment of the tuber calcanei lesion.

Anesthesia and perioperative antibiotic and anti-inflammatory treatment were identical to those used for horse 1. The mare was positioned in right lateral recumbency on the operating table, and a similar arthroscopic approach (as for horse 1) was used to evaluate the left calcanean bursa. No abnormalities were seen within the bursa, including the appearance of the visible aspects of the insertion of the gastrocnemius tendon. An 18-gauge needle was inserted percutaneously in the osteolytic lesion of the tuber calcanei, and a fluoroscopic image intensifier was used to confirm this location. A 3.0-cm vertical skin incision was made along the plantar aspect of the tuber calcanei centered over the lesion. The incision was extended through the subcutaneous tissue, deep fascia, and fibers of the superficial digital flexor and gastrocnemius tendons to the bone. Degenerate bone and fibrous tissue were debrided from the cyst-like cavity by curettage, after which the lesion was lavaged with sterile saline solution. The deep fascia and fibers of the superficial digital flexor tendon were apposed with simple

interrupted sutures of 0 polydioxanone,<sup>d</sup> the subcutaneous fascia was apposed with 2-0 polydioxanone<sup>d</sup> in a simple continuous pattern, and the skin was closed with 0 polypropylene<sup>e</sup> using a vertical mattress pattern with segments of plastic tubing as stents. Skin incisions were closed with 2-0 nylon<sup>e</sup> in a simple interrupted pattern. A padded bandage was applied over the left tarsus, and the mare was recovered from anesthesia.

Antibiotics were continued for 24 hours, and treatment with phenylbutazone was continued for 10 days (4.4 mg/kg [2.0 mg/lb], IV, q 12 h, for 2 days; then 2.2 mg/kg [1.0 mg/lb], PO, q 12 h, for 7 days). Postoperative radiographs of the left tuber calcanei revealed slight enlargement of the osteolytic defect consistent with surgical debridement (Fig 5). Results of bacteriologic cultures of the material removed from the lesion during debridement were negative. The mare was discharged from the hospital 3 days after surgery. Initial recommendations for exercise were 2 to 3 months of stall rest with daily hand walking followed by reevaluation, with limited turnout in a paddock to begin once the mare was sound at a trot in-hand. The owner was advised to allow the horse a minimum of 6 months convalescence before resuming formal exercise under saddle.

Follow-up information was obtained by telephone conversations with the owner and attending veterinarian 13 months after surgery. At that time the mare had a mild lameness of her left hind leg at a trot in-hand



Figure 5—Flexed proximoplantar-to-distoplantar tangential radiographic view of the left calcaneus of the horse mentioned in Figure 3, obtained 1 day after surgical debridement of the osteolytic lesion. Notice that the defect (arrow) is slightly larger with smoother margins, compared with the defect depicted in Figure 3.

(reported to be a grade 1 to 2 lameness), but following an upper-limb flexion test she was noticeably lame at a walk, and this persisted for > 15 to 20 minutes. The mare's exercise during the previous 6 months had consisted of a combination of stall confinement with in-hand walking, paddock or small pasture turnout for several hours daily, and occasional walking under saddle. Heat, soft tissue swelling, or signs of pain on palpation were not evident near the point of the left hock, and the cosmetic appearance of this area was reported to be good. Follow-up radiographs of the left tarsus taken by the attending veterinarian revealed persistence, and perhaps enlargement, of the osteolytic lesion (Fig 6). A flexed proximoplantar-to-distoplantar tangential view had not been taken. At the time of this report, the mare was considered unsound for athletic use other than walking under saddle.

In horses, lesions of the calcaneus have been reported in association with, or as sequelae to, septic and nonseptic tenosynovitis of the tendon sheath of the deep digital flexor muscle at the level of the tarsus,<sup>2,4-8</sup> septic calcanean bursitis,<sup>2,7,9</sup> long plantar ligament desmitis or avulsion,<sup>9</sup> and osteomyelitis associated with open wounds.<sup>2,7</sup>



Figure 6—Dorsomedial-to-plantarolateral oblique radiographic view of the left tarsus of the horse mentioned in Figure 3, obtained 13 months after surgical debridement of the osteolytic lesion. Notice that the lesion (arrow) appears more extensive and irregular than in Figure 3.

To the authors' knowledge, the specific osteolytic lesion of the tuber calcanei as seen in these 2 horses has not been reported. We classified this lesion as an enthesitis or enthesopathy, because it was located at the point of insertion of the gastrocnemius tendon, and we suspect that a component of focal nonseptic osteitis was also present. Whether the osseous lesion in each horse represented a true sequela to the associated bursitis (or vice versa), or if the 2 problems are simply coincident from the same underlying trauma, is unclear. However, in horse 1, signs of bursitis appeared to have preceded the changes detected radiographically (although careful reexamination of the initial radiographs suggested that subtle or early lytic changes were present at that time). In horse 2, definitive cytologic or arthroscopic evidence of active bursitis was not present at the time of our examination, but the considerable enlargement of the bursa suggested a previous episode of inflammation and effusion with subsequent adaptation of the fibrous capsule of the bursa, which resulted in persistent distension. In support of this hypothesis, other investigators have reported an association between calcanean bursal effusion and gastrocnemius tendinitis,<sup>10-12</sup> and we suspect the same could develop in association with a gastrocnemius enthesitis.

The history of trauma in both horses warranted concern that the osteolytic lesions may have been associated with sepsis; however, the lack of any apparent open wounds, signs of localized infection (ie, heat, soft-tissue swelling, or drainage), and negative results of bacteriologic culture and cytologic analyses of the synovial fluid were all supportive of nonseptic inflammation. Albeit speculative, we believe that trauma to the tuber calcanei, followed by repeated strain at the point of insertion of the gastrocnemius, could result in chronic inflammation, enthesitis, or osteitis with subsequent development of osteolytic lesions. Although not used in either horse, a nuclear scintigraphic scan of the tarsi would have been helpful to assess the degree of active bone remodeling associated with inflammation.

It has been reported that the flexed proximal-tar-to-distal-tar tangential radiographic view is beneficial for thorough evaluation of the calcaneus.<sup>2,13</sup> This view was essential in ascertaining a diagnosis and pinpointing the location of the osteolytic lesions in the horses reported here, and we recommend it be included in the diagnostic workup of all cases of calcanean bursitis and gastrocnemius tendinitis. In hindsight, careful reevaluation of the initial flexed tangential radiograph taken of horse 1 revealed what we now suspect were subtle lytic changes that were initially overlooked. Similarly, failure to repeat radiographs of the tarsus of horse 1 prior to arthroscopy potentially resulted in a lost opportunity to surgically debride the osseous lesion during a single anesthetic procedure.

An endoscopic approach to the calcanean bursa of horses has been described,<sup>9</sup> but information on the usefulness of the technique in clinical cases is limited. We used a similar approach and found that it provided an excellent view of the limits of the bursa and all intrabursal structures. Unlike one case in the aforementioned report,<sup>9</sup> we were unable to see any evidence of the osseous lesion and, therefore, had to rely on a

nonendoscopic approach for debridement. This is understandable if the location of the lesion is considered, because there was no avulsion or disruption of gastrocnemius fibers at the point of insertion; therefore, the underlying lesion remained covered.

The ultrasonographic findings in our horses were typical of those seen with calcanean bursitis in horses as reported by others.<sup>14</sup> The discrepancy between the arthroscopic and ultrasonographic findings in horse 1 demonstrates what has been one author's (LHB) observation that ultrasonographic findings may exaggerate the amount of inflammation and fibrin deposition in instances of synovitis and, therefore, should be interpreted with some caution. In general, however, we feel ultrasonography was quite beneficial and obviously should be considered an important component of the diagnostic workup of horses with suspected calcanean bursitis. Further, in horse 2, the sonogram clearly depicted the osteolytic lesion and was important in confirming the location to be at the point of insertion of the gastrocnemius tendon.

Treatment recommendations for acute, nonseptic bursitis in horses include rest, treatment with cold packs, and restricted exercise, as well as administration of anti-inflammatory medications.<sup>15,16</sup> This includes intrabursal injection of corticosteroids or sodium hyaluronate<sup>15,16</sup> as used in horse 1. Overall, reports in the veterinary literature of the outcome of cases of nonseptic bursitis in horses are limited, with most information derived from patients with bicipital bursitis or tendinitis. In general, the prognosis for horses with acute bicipital bursitis is favorable; however, the prognosis for chronic bursitis, particularly with associated humeral osteitis, is guarded-to-poor.<sup>15-20</sup> On the basis of the outcome of the 2 horses of this report, the same appears to be true for chronic calcanean bursitis with associated osseous lesions of the calcaneus.

Surgical exploration and debridement of osseous lesions of the humerus have been reported to be successful in a limited number of horses with chronic bicipital bursitis.<sup>17,18</sup> Similarly, a treatment option for refractory chronic retrocalcaneal bursitis in humans involves surgical exploration and partial calcaneal ostectomy, with the majority of patients reported to respond favorably.<sup>21-23</sup> Our decision to pursue surgical debridement of the osseous lesion in horse 2 was based on the duration and severity of the clinical signs and the less than satisfactory response of horse 1 to non-surgical treatment, with the goal being removal of degenerate tissue at the focus of inflammation to facilitate healing. Although considered but not used in horse 2, packing the osseous defect with a cancellous bone graft may have enhanced the quality of healing and improved the outcome.<sup>24,25</sup> Further, it is possible that a more aggressive medical approach (either as the primary treatment modality or as part of the postoperative regimen), including extended treatment with anti-inflammatory drugs and physical therapy such as controlled exercise and passive flexion and extension of the affected tarsus, may also have improved the outcome of the 2 horses reported here.

On the basis of long-term results observed in the 2 horses of this report, the prognosis for athletic sound-

ness for horses with nonseptic calcaneal bursitis with associated gastrocnemius enthesitis or calcaneal osteitis involving osteolytic lesions of the tuber calcanei appears to be guarded-to-poor. Until more cases can be evaluated, we recommend surgical debridement of these lesions only with caution and after exhausting all nonsurgical options.

<sup>a</sup>Depo-medrol, Pharmacia & Upjohn Animal Health, Kalamazoo, Mich.

<sup>b</sup>Hylartin-V, Pharmacia & Upjohn Animal Health, Kalamazoo, Mich.

<sup>c</sup>Ethilon, Ethicon, Inc, Somerville, NJ.

<sup>d</sup>PDS II, Ethicon, Inc, Somerville, NJ.

<sup>e</sup>Prolene, Ethicon, Inc, Somerville, NJ.

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