Case Report

Conservative management of comminuted central tarsal bone fracture and joint instability in a horse

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Summary

A comminuted fracture of the central tarsal bone, fragmentation of the fourth tarsal bone and associated joint instability was diagnosed in a 14-year-old Sport Horse mare who presented for investigation of acute nonweightbearing hindlimb lameness. The mare responded well to conservative management and, unlike previously reported cases of similar injuries, returned to a similar level of athletic activity.

Introduction

Fractures of the small tarsal bones are a relatively rare cause of lameness in the horse. Slab fractures of the central and third tarsal bones, their treatment and prognosis are documented in racehorses including Standardbreds and Thoroughbreds (Tulamo et al. 1983; Winberg et al. 1993; Dabareiner et al. 2003). Reports of traumatic fractures of the small tarsal bones and their outcomes are sparse (Jakovljevic et al. 1982; Modransky et al. 1992). Management and in particular prognosis of these cases can therefore be challenging.

This case discusses the diagnosis and management of traumatic comminuted fractures of the central and fourth tarsal bones in a mare.

Case details

A 14-year-old Irish Sport Horse mare was usually used for riding club/eventing activities but, at the time of presentation to the University Veterinary Hospital, she had a foal at foot. The mare had been found in the field earlier the same day with marked swelling of the left tarsal region and a number of superficial skin wounds in this area suggesting a recent trauma. The referring veterinarian had examined the mare and suspected a fracture or joint instability and had applied a full limb Robert Jones bandage.

Clinical findings

At presentation the mare was bright, alert and responsive and in good body condition. Apart from mild tachycardia (44 beats/min) and tachypnoea (20 breaths/min), all other vital clinical parameters were within normal limits. The mare was reluctant to walk or to bear weight on the affected limb. Once sedated the mare rested the left hind toe on the ground and intermittently would take some weight on the limb during movement.

The left hindlimb exhibited severe periarticular swelling and tarsocrural effusion with associated dependent oedema distal to the tarsus. The skin wounds were superficial. The mare resented palpation of the left tarsal region or any attempts to manipulate or flex the limb. No crepitus, instability or subluxation of any of the tarsal joints was evident during palpation.

Diagnostic imaging

Radiographic examination (lateromedial, dorsoplantar, dorsolateral-plantaromedial oblique, plantarolateraldorsomedial oblique, and plantarproximal-plantarodistal skyline radiographic views) revealed gross soft tissue swelling and a comminuted fracture of the plantar aspect of the central tarsal bone. An approximately 5 mm sliver of mineral opacity was noted at the proximal plantar aspect of the fourth tarsal bone, consistent with an avulsion fracture. A focal pinpoint avulsion fragment of the distomedial aspect of the talus was also noted (Fig 1). The mare did not tolerate attempts to take stressed radiographs. Ultrasonographic examination of the soft tissue structures of the tarsus was made impossible by the mare’s strong resistance to any skin pressure of the ultrasound transducer.
Diagnosis

Based on the clinical and radiographic findings, a diagnosis of a comminuted fracture of the plantar aspect of the central tarsal bone, and avulsion fragments off the plantar aspect of the fourth tarsal bone possibly associated with avulsion of the long plantar ligament, was made.

Treatment

Given the degree of comminution present the fracture was not considered to be amenable to internal fixation and a poor prognosis was given for return to soundness and athletic function. Treatment options were discussed with the owners including external coaptation with a full limb cast, heavy bandaging accompanied by splints, partial tarsal arthrodesis and euthanasia. Based on financial considerations and the poor prognosis, the owners elected for conservative management. Due to the severe tarsal swelling cast application was deemed impractical and a 3-layer full-limb Robert Jones bandage was applied to the limb. A plantar splint was placed from the level of the foot to the proximal extremity of the calcaneus, and a second splint was applied laterally, from the level of the foot to the level of the proximal femur. With the limb thus supported.

Fig 1: Dorsomedial-plantarolateral oblique of tarsus on Day 1. A comminuted fracture of the plantar aspect of the central tarsal bone is visible. There is also an irregular outline to the plantar aspect of the fourth tarsal bone and a focal pinpoint avulsion fragment of the distomedial aspect of the talus may also be seen.

Fig 2a: Dorso-20°-medial-plantarolateral oblique 6 weeks post injury. The main fracture fragment off the plantar aspect of the central tarsal bone is displaced proximally and plantaromedially. There is periosteal new bone formation visible on the proximomedial central tarsal bone, the distolateral aspect of the calcaneus, the distomedial talus and the proximomedial aspect of the fourth metatarsal bone.

Fig 2b: Dorsomedial-plantarolateral oblique 6 weeks post injury. The fracture lines seen on Day 1 on the central tarsal bone are more obvious as is the displacement of the main fracture fragment.
the mare immediately became more comfortable and walked flat-footed taking almost full weight on the limb. Phenylbutazone was administered (3 mg/kg bwt initially i.v. followed by 2.2 mg/kg bwt per os b.i.d.).

**Follow-up**

The mare tolerated the splints extremely well and remained bright and well and weightbearing on the left hindlimb. Three days later the splint and bandage was removed. At this time the swelling in the tarsal region had reduced considerably. The mare, however, became quite agitated and painful when the limb was unsupported and required sedation to facilitate an ultrasound examination. The soft tissue structures surrounding the hock were examined ultrasonographically. Marked effusion of all 4 tarsal joints was observed. Normal fibre alignment of both the long plantar ligament and the long branch of the lateral collateral ligament as they approached their respective insertions onto the fourth tarsal and fourth metatarsal bones was seen. Disruption of the insertions of these ligaments onto the fourth tarsal bone in the nontared bone, but there was a small displaced fracture fragment off the plantar aspect of the fourth tarsal bone. The deep or short branch of the collateral ligament was unremarkable. On the medial aspect of the tarsus it was not possible to obtain a clear image of the long branch of the medial collateral ligament due to residual swelling and oedema in the area, and particularly due to the uncooperative nature of the animal.

The bandage and splints were applied as before. The mare remained comfortable and was discharged from the hospital the following day. The mare was strictly confined to a stall for 4 months in total. The bandage and splints were changed every 7–10 days under sedation by the referring veterinarian who reported that the mare continued to panic and carry the leg as soon as the limb was unsupported by the bandage and splint, despite being comfortable and fully weightbearing at all other times. The dose of phenylbutazone was gradually reduced and discontinued completely 14 days after the injury occurred.

The mare returned to the University Veterinary Hospital 6 weeks later for follow-up radiographs. The mare was comfortable and walking well on the bandaged and splinted limb, but once these were removed to facilitate radiography, the mare was nonweightbearing. Four standard views of the left tarsus were taken. At this time, periosteal new bone formation was present on the proximomedial central tarsal bone, the distolateral aspect of the calcaneus, the distomedial talus and the proximomedial aspect of the fourth metatarsal bone. The fracture lines seen previously on the central tarsal bone were more obvious and the main fracture fragment was displaced proximally and plantaromedially (Fig 2). The extensive periosteal new bone formation was suspicious of continued instability in the talocalcaneal-centroquatral joint, presumably due to severe strain of all the ligamentous attachments; therefore it was decided to continue with the bandage and splints for a further 6 weeks.

At the next visit, 6 weeks later, the mare was relaxed and did not react when the bandage and splints were removed. On the radiographs taken at this visit, the periosteal new bone formation was smoother and less active in appearance. At this stage narrowing of the talocalcaneal-centroquatral and the centroquatral joint spaces was noted. There was no evidence of bridging between the larger plantar fragment of the central tarsal bone and the body of the central tarsal bone, but instead it was incorporated into the extensive periosteal reaction surrounding it (Fig 3). Over the course of the following 6 weeks the referring veterinarian discontinued first the lateral and then the plantar splints and gradually decreased the bulk of the bandage. At the next visit, now 20 weeks post injury, the mare was fully weightbearing on the left hindlimb, with no external support. The mare was not obviously lame at the walk. Radiographs taken at this time showed no significant changes from the previous set taken 6 weeks earlier.

Subsequently the owners began to walk the mare in hand, and after 2 weeks turned the mare out in a small paddock for short periods. The mare was eventually on full turnout in the paddock approximately 6 weeks later. The owners reported that the mare remained comfortable and showed no overt signs of lameness. Nine months following the initial injury the owners introduced some light ridden

**Fig 3: Dorsomedial-plantarolateral oblique 12 weeks post injury.**
work, as they were concerned the mare had gained too much weight. The mare remained sound and was gradually returned successfully to her previous level of competition, approximately one year after the injury.

Sixteen months after the injury the mare was returned to the University Veterinary Hospital for re-evaluation. The mare was bright and alert and in good body condition. All clinical parameters were within normal limits. There was no obvious swelling or effusion in the left tarsal region. The mare was not noticeably lame when walked or trotted in a straight line on a hard surface. Radiographs of the tarsus revealed that the fracture lines were barely discernable and both the tarsometatarsal joint and the centroquatral joints were indistinct due to new bone formation. There was marked osteoarthritis of the talocalcaneal-centroquatral joint and the talocalcaneal joints. New bone formation was evident particularly on the distolateral calcaneus and the proximolateral fourth tarsal bone. Smooth settled periosteal reaction was seen on the distomedial talus and the proximomedial central tarsal bone. The plantar aspect of the fourth tarsal bone was irregular. New bone formation was also noted on the distolateral tibia (Fig 4).

Twenty months from the injury the mare was still in work and competition, with no lameness observed by the owners.

Discussion

Reports of traumatic fractures of the small tarsal bones are scarce. Jakovljevic et al. (1982) presented the outcome of 13 cases of traumatic fractures of the hock, and of these horses, only 2 had fractures involving the central tarsal bone, with concurrent injuries, and none had fractures involving the fourth tarsal bone. Of these 2 horses, one was subjected to euthanasia due to unresolving lameness, and one returned to a lower level of athletic activity. Both these fractures involved the dorsal aspects of the central tarsal bone. Modransky et al. (1992) reported successful management of a traumatic fracture of the fourth tarsal bone in a draught horse. In this case the horse returned to the same level of competition. To the best of the authors’ knowledge there are no previous reports of the outcome of traumatic comminuted fractures involving the plantar aspect of the central tarsal bone similar to the mare in this case report.

The outcome of this case - successful return to previous level of athletic activity - was unexpected and would appear to be at odds with much of the previously described literature regarding conservative management of small tarsal bone fractures. Many earlier reports of third and central tarsal bone fractures suggest an unfavourable prognosis of these fractures with conservative management (Lindsay et al. 1982; Tulamo et al. 1983). Murphey et al. (2000) suggest a favourable prognosis for third tarsal bone slab fractures with conservative management, but report that with central tarsal bone slab fractures a significantly smaller percentage of horses returned to racing. However, all the aforementioned reports pertain to exercise-induced slab fractures.

In addition to an uncertain prognosis for this type of injury, several other difficulties were encountered when managing this case. While radiographic evaluation was relatively easy once the mare was sedated, ultrasound evaluation of the affected limb proved challenging for a number of reasons. In the initial period, severe and extensive swelling in the region made it difficult to obtain a clear image, and the mare would not tolerate any pressure of the ultrasound transducer on the area. At the second attempt to evaluate the soft tissue structures, with the swelling subsided, a clear examination of most of the joints was possible. However, there was still considerable difficulty in evaluating the medial aspect of the joint especially with the animal nonweightbearing. Ultrasonography of the soft tissue attachments of the hock is challenging, and even when a systemic approach is undertaken, evaluation of certain structures especially the short or the deep branches of both the medial and lateral collateral ligaments is difficult (Whitcomb 2006). In this case the effusion and the residual swelling and oedema present in the area, and the mare’s intractable temperament made it difficult to ascertain accurately the disruption or injury of some of the ligamentous structures.

The treatment protocol in this case was determined mostly by practical considerations. While internal fixation may be the treatment of choice for most dorsal slab fracture, in this case it was felt that the degree of comminution, the plantar location and the size of the
fractures fragments excluded this as an option. Partial tarsal arthrodesis with 2 plates was financially not a viable choice. Of the nonsurgical treatment options available, external coaptation with a full-limb cast was considered. The initial reason for not placing a cast on Day 1 was the concern that the amount of swelling present would result in loosening of the cast as the swelling subsided and therefore require replacement of the cast. As the case progressed, however, it was decided not to place a cast even after the swelling subsided. The mare in this report was not inclined to stand still, even whilst heavily sedated, and for this reason a standing cast application was not considered feasible. The owners were concerned about the risks of general anaesthesia and, while a sling recovery would have been possible, again it was considered that the mare’s temperament was not suitable for this method and maintaining the mare in a sling in the initial period was ruled out completely. Besides the risks and costs of cast application in this case there was a further factor – it is the authors’ preference that animals in a full limb cast remain hospitalised, except where the animal is being discharged to specialised rehabilitation facilities with trained staff and close veterinary supervision. This mare had a young foal at foot and the owners neither wanted to leave the foal in a hospital environment for a prolonged period of time, nor to prematurely wean the foal. To facilitate early discharge of the mare it was decided to continue with bandaging and splinting. In the report by Modransky et al. (1992) no external support was provided. In the case reported herein, external support was necessary due to the severity of comminution and, in particular, due to the marked improvement in weightbearing and disposition of the animal with the limb supported.

The dramatic decrease in comfort level while the limb was unsupported was a consistent feature of this case for several months. This, in addition to the severity of the lameness at presentation and the dramatic new bone proliferation formed on the joints in the first 6 weeks following injury, led to suspicions of a concurrent joint instability. The instability was probably associated with the disruption of intertarsal ligaments between the central and fourth tarsal bones. Stressed radiographs may have facilitated diagnosis of this instability at the initial visit if this had been possible (Plisworth 2002). While there are relatively few reports of such osteoarthritis forming as a result of joint instability in horses, several experimental models have induced osteoarthritis by destabilising joints (Simmons et al. 1999; Baccarin et al. 2009). Periosteal new bone formation may also be enthesopathy resulting from damage to the various collateral ligaments of the joint (Dababreiner et al. 2003).

While the mare is currently performing successfully at the same level of competition as prior to injury, there are still concerns regarding the long-term outlook for this case. The osteoarthritis in the talocalcaneal-centroquatral and talocalcaneal joints may be limiting factors for future performance. In the report of Murphey et al. (2000), the prognosis for return to racing was decreased in those horses with dorsal central tarsal bone fractures and this was related to the disruption of the talocentral joint. In this case, with the degree of comminution of the central tarsal bone, there would have been significant articular disruption in the talocalcaneal joint. While osteoarthritis of the centrodistal and tarsometatarsal joints may be given a fair prognosis, the prognosis for osteoarthritis of the talocalcaneal joint is considered poor (Dababreiner et al. 2003; Smith et al. 2005). However, this case report illustrates that if it is possible to achieve an acceptable level of comfort with external coaptation, then it may be reasonable to pursue conservative management of such cases, with a guarded but not grave prognosis.

References


