Fracture of the left hind lateral malleolus of the tibia in a 9-year-old polo pony

Introduction:

Fractures of the tarsus rarely occur as it is protected by dense surrounding structures.[1] Within the tarsocrural joint, the tibial malleoli are more commonly fractured, and the lateral malleolus has a higher incidence.[3] Fractures usually occur due to a significant trauma such as a kick or a fall.[1-3] In cases of fracture of the lateral malleolus, these can also take place as avulsions and they commonly involve the short collateral ligament.[1] Moreover, external forces such as twisting and shearing of the tarsus can lead to collateral and periarticular ligament disruption, which at the same time can result in a fracture.[1]

Horses mainly present moderate swelling and sudden onset lameness.[2] Thus, effusion of the tarsocrural joint and edema of the soft tissue of the tarsal region can also be encountered.[3] During examination, manipulation of the limb such as flexion of the hock and applying pressure over the malleolus will elicit pain.[2] Different injuries of this region can cause the same presentation and clinical signs, these include fractures of the distal tibia, talus, calcaneus, and small tarsal bones; luxation or subluxation of the tarsal joints; and tears and avulsions of the collateral ligaments.[1]

Diagnosis is reached by radiographic examination with the dorsoplantar and the dorsal(10º)medial-plantarolateral oblique projections being the best views to better highlight the fracture conformation.[2,3] Computed tomography can be helpful in cases where the integrity and size of the lateral malleolus fracture are not clear.[2]

Ultrasonography allows a proper assessment of the periarticular soft tissue and the severity of its injury. Furthermore, it can aid in identifying and localizing loose fragments as these could be positioned intra-articularly or extra-articularly.[3]

Treatment/Management/Prognosis:

Surgical treatment is considered the main elective treatment where fragments are either extracted or reattached.[2] In cases in which the fracture of the lateral malleolus is small, chronic, and distracted, the fragment should be removed.[2] Lateral malleolus fractures are usually small with less than 2cm in craniocaudal width and, therefore, can be removed arthroscopically.[2] However, arthroscopic removal of these fragments requires good technical skills due to the complexity of the region which is surrounded by soft tissue and its association with the joint capsule or collateral ligaments.[1] Therefore, arthrotomy might be the approach of election for removal of some fragments; arthroscopic guidance during this procedure is recommended.[1]

When a lateral malleolus fracture involves an acute and extensive fragment larger than 3cm, reattachment with cortex screws in a lag fashion is described.[1] Small intra-articular fragments can often be present concurrently with larger malleolus fractures and arthroscopic removal would be necessary. Therefore, it is of great importance to have good imaging evaluation with radiographs or even computed tomography in order to decide if an arthroscopic assessment is needed.[2]

Nondisplaced malleolar fractures can be treated conservatively and with rest between 3 to 9 months.[1]

The prognosis could vary depending on the lesion and the surgical or conservative approach. Conservative treatment and rest have been reported with 75% success, however, no data on resuming athletic performance was recorded.[3] It has been reported that around 50% of horses undergoing internal fixation of a single large fragment of the lateral malleolus returned to their previous level of athletic activity.[3] Arthrotomy and arthroscopic fragment removal have the best success rates in returning to the previous level of performance with 81% and 91.6% respectively.[3]

Overall, arthroscopic surgery is preferred over arthrotomy and conservative treatment, despite the latest also having a good prognosis. This is due to the excellent published results as well as for additional advantages which include: detailed examination, thorough lavage of the joint, and close examination of the fracture site.[3]

Case history and presentation:

A 9-year-old polo pony gelding (426 kg) had fallen on the concrete the day before examination and immediately could not bear weight on the left hind limb. The trainer decided to administer phenylbutazone orally after the injury and as 24 hours later the horse did not improve, an examination was requested.

Upon examination at the stable, the vital parameters were as follows: temperature (37.7°C), pink mucous membranes with a normal capillary refill time, tachycardia (50 beats per minute), normal respiratory rate (12 breaths per minute), presence of borborygmi in all four abdominal quadrants. No digital pulsation was noticed in any of the four limbs.

The horse presented a severe lameness of the left hind limb, non-weight bearing even when standing (5/5 lameness AAEP scale). Moderate swelling was localized over the tarsal region which also appeared hot and painful at palpation. Superficial abrasions were limited to the left side of the horse (lateral aspect of the carpus, tuber coxae, and lateral to the hind fetlock); however, no wound was seen around the left hind tarsus. Distention of the dorsomedial and dorsolateral tarsocrural joint pouches was noticed as well as edema around the tarsus, more prominent on the lateral side. Manipulation of the left limb (flexion and extension of the tarsus) elicited severe pain.

Case management and outcome:

Due to the severe pain of the horse, to fulfill the examination, sedation was administered intravenously with a combination of detomidine[a] (0.01mg/kg) and butorphanol[b] (0.01mg/kg).

As the horse was severely lame and presented a marked swelling around the tarsal region, a radiographic[c] evaluation was elected as the first diagnostic approach. At first, the main 4 tarsal standard projections were taken, which included the lateromedial, dorsoplantar, dorso45°lateral-plantaromedial oblique, and dorso45°medial-plantarolateral oblique views. Then a dorso10°medial-plantarolateral oblique view was performed for a more optimal assessment (Figure 1) since a complete displaced fracture of the lateral malleolus of the tibia was noticed in the dorsoplantar projection. During the radiographic examination, the tarsus remained flexed due to the pain, despite the sedation.

Ultrasonographic[d] examination was also performed to assess the soft tissue structures. This revealed disruption of the short lateral collateral ligament with altered echogenicity of the fibers. However, the long lateral collateral ligament remained intact with normal integrity of the fiber pattern. The tarsocrural joint was also assessed and presented a moderate amount of synovial effusion with a heterogeneous hyperechoic appearance.

A diagnosis of a complete displaced fracture of the lateral malleolus of the tibia with concurrent disruption of the short lateral collateral ligament of traumatic origin was made.

Surgical removal of the fragment was recommended due to the clinical findings. Since the owner preferred to discuss the treatment option with the trainer before making any decisions, a full limb Robert Jones bandage was placed to increase stabilization of the joint and comfort of the horse until the day of the surgery. Administration of phenylbutazone[e] (1gr PO BID) was also recommended during the decision-making period.

Surgical treatment was accepted 3 days after the examination and therefore was referred to the hospital. Upon arrival, the horse was examined and he presented normal vital parameters, as follows: rectal temperature 37.6ºC, pink and moist mucous membranes, normal heart rate

(40 beats per minute), normal respiratory rate (18 breaths per minute), and no digital pulsation. The horse appeared more comfortable with a 4/5 lameness (AAEP scale). A general blood profile[f,g] was performed (Table 1).

Pre-operative medical treatment consisted of procaine penicillin[h] (22000 IU/kg IM) and phenylbutazone[i] (2.2 mg/kg IV). The surgical procedure was performed under general anesthesia. The horse was first sedated with romifidine[j] (0.08 mg/kg IV) combined with butorphanol (0,01 mg/kg IV) and then induced with a combination of midazolam[k] (0.06 mg/kg IV) and ketamine[l] (2.2 mg/kg IV). The anesthesia was then maintained with inhalation anesthesia using isofluorane[m]. The horse was positioned in dorsal recumbency with the left hind limb hanging from the crane. After the limb was aseptically prepared and draped, the tarsocrural joint was accessed arthroscopically[n] through the dorsolateral pouch. The joint was inspected and it initially revealed hemorrhagic synovial fluid. Synovial proliferations and fibrous tissue were resected in the area of the lateral malleolus but the fragment was not easily identified. Therefore, an arthrotomy approach was elected. The fragment was localized with ultrasonography and a needle was placed at the level of the fragment for guidance for the arthrotomy access. A vertical incision was made to expose the fragment. To remove the fragment, a combination of sharp and blunt dissection was carried out. Control X-rays were taken to confirm the complete removal of the fragment. The arthroscopic portals and arthrotomy incision were closed by 1st intention using absorbable sutures[o]. A Robert-Jones bandage was also applied for the assisted recovery (head and tail ropes), which was uneventful.

Post-operative treatment consisted of procaine penicillin for 3 days (22000 IU/kg IM BID) and phenylbutazone for 8 days (1gr PO BID for 3 days and SID for 5 more days).

The sutures were removed 14 days post-surgery, meanwhile, the bandage was changed every 2-3 days depending on the status of the bandage. Three days after surgery, the horse was discharged from the hospital.

An exercise restriction schedule had to be followed. This consisted of complete box rest for 6 weeks followed by 15 minutes of hand walk once a day and box rest for the following 6 weeks. Then, after these 12 weeks, the horse was allowed in a small paddock as well as 15 minutes of hand walk twice daily for another 6 weeks. Finally, trot exercise could be resumed and increased very progressively during the next month.

A follow-up 5 months after surgery was made and the horse was doing well. He was sound and he was gradually increasing the daily exercise.

End notes:

[a] Equidor (detomidine hydrochloride), Vetcare OY, Muurla, Finland.

[b] Butorgesic (butorphanol as tartrate), ilium, troy laboratories, New Zealand.

[c] Digital x-ray machine, Clio DR EQ, Medical Plus, Dubai, UAE.

[d] Digital ultrasound machine, MyLab™Seven, esaote, Genoa, Italy.

[e] Equipalazone original 1g (Phenylbutazone oral powder), Dechra, North Yorkshire, UK.

[f] ProCyte Dx, IDEXX Laboratories, Westbrook, Maine 04092, USA.

[g] Catalyst One, IDEXX Laboratories, Westbrook, Maine 04092, United States.

[h]Penikel 300 (Procaine benzylpenicillin), Kela, Al Ain city, UAE.

[i]Nabudone P (Phenylbutazone sodium), ilium, troy laboratories, Smithfield, Australia.

[j] Sedivet (romifidine hydrochloride), Boehringer Ingelheim, St. Joseph, MO 64506, USA.

[k]Dormicum (midazolam); Cheplapharm Arzneimittel GmbH, Greifswald, Germany.

[l]Ketamil (ketamine hydrochloride), Ilium, Glendenning, Australia.

[m]Isoflurane-Vet, Piramal, Telangana state, India.

[n]Arthrex GmbH, Munich, Germany.

[o]Monocryl™ (2-0 poliglecaprone 25 monofilament absorbable suture), Ethicon, Guaynabo, Puerto Rico 00969, USA.

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Lab data/imaging

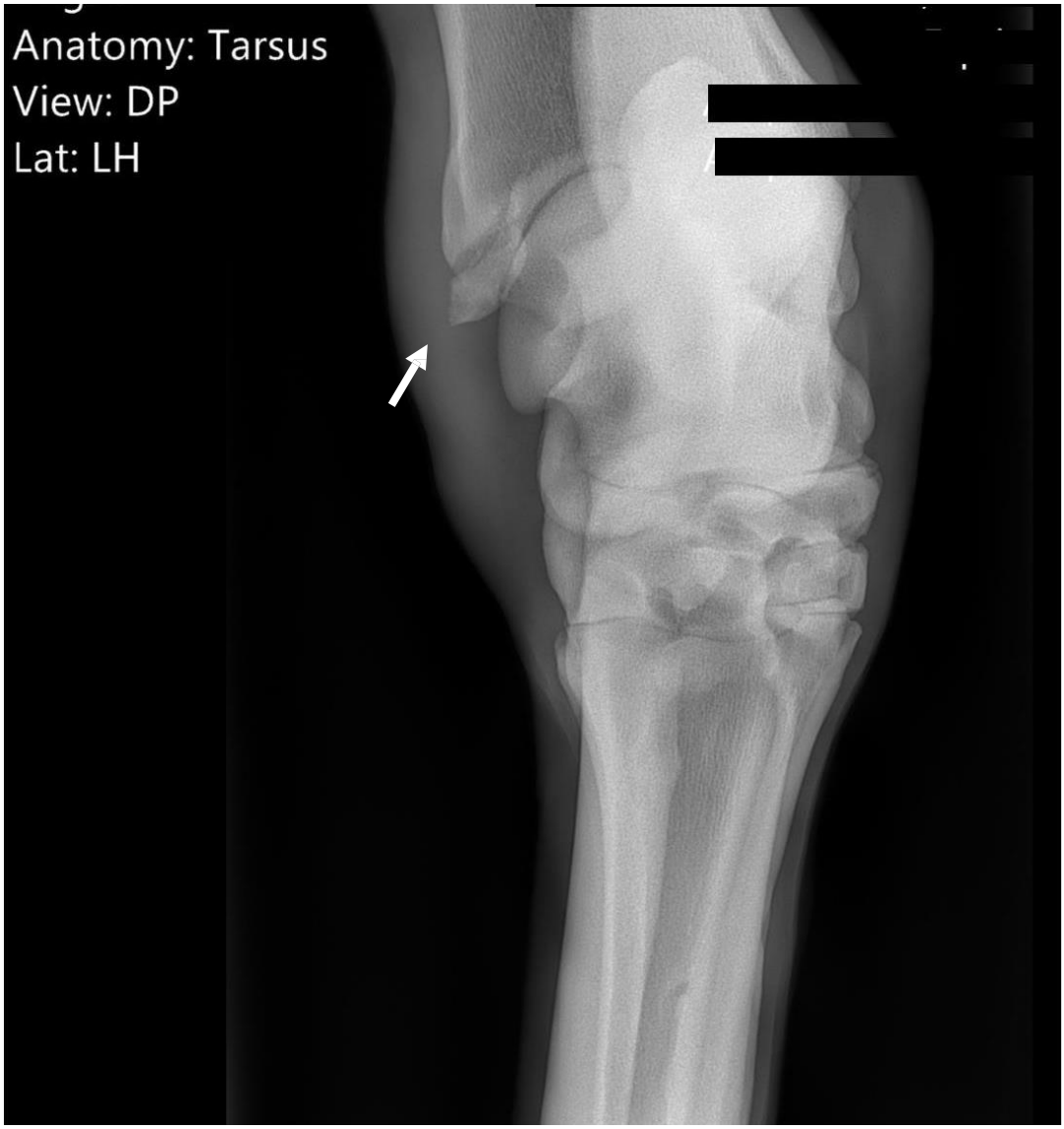

Figure 1. Radiographic image of a Dorso10°medial-plantarolateral oblique view. This projection highlighted the fracture fragment of the lateral malleolus (arrow).

Table 1. General blood profile (hematology and biochemistry) the previous day of the surgical intervention.

Value	Results	Units	Normal range
Hematology			
RBC	6.7	*10^6 cells/µl	6.4-10.4
HCT	28.6	%	30-47
HGB	10.9	g/dl	10.7-16.5
MCV	42.7	fL	41.1-52.4
MCH	16.3	pg	14.1-18.6
MCHC	38.1	g/dl	32.8-38.6
RDW	26.9	%	24.6-33.3
WBC	5.22	*10^3 cells/µl	4.9-11.1
NEUT	63.7	%	
LYMPH	28.7	%	
MONO	5.9	%	
EOS	1.5	%	
BASO	0.2	%	
NEUT	3.32	*10^3 cells/µl	2.5-6.9
LYMPH	1.5	*10^3 cells/µl	1.5-5.10
MONO	0.31	*10^3 cells/µl	0.2-0.6
EOS	0.08	*10^3 cells/µl	0-0.8
BASO	0.01	*10^3 cells/µl	0-0.1
PLT	128	*10^3 cells/µl	100-250
Fibrinogen	390	mg/dl	200-450
Chemistry Profile			
Albumin	3.37	g/dl	2.5-3.9

ALP	72	U/l	40-216
AST (GOT)	248	U/l	50-400
BUN	14.7	mg/dl	10-23
Calcium	11.4	mg/dl	10.2-13.4
CK	119	U/l	30-330
Creatinine	1.2	mg/dl	0.4-2.2
GGT	11	U/l	8-30
Glucose	100	mg/dl	60-120
LDH	255	U/l	112-456
Total bilirubin	2.8	mg/dl	0.2-3.5
Total protein	6.3	g/dl	5.6-7.9
Globulin	3	g/dl	3-4.7

Table 1. (continuation)