

# Injury of the medial head of the gastrocnemius muscle in a 11-month-old Arabian horse – a case report

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**Summary:** An 11-month-old Arabian horse had a traumatic rupture in the medial head of the gastrocnemius muscle of the right hind limb. A full limb cast combined with a Thomas splint, which was applied under general anaesthesia, was placed to prevent further disruption. The Thomas splint was removed after 7 days due to the development of pressure sores and the full limb cast after 6 weeks. The horse was discharged 8 weeks after referral and advised stall rest with hand walking for two months gradually increasing from 20 minutes to one hour. Two years later the owner reported that the horse was without lameness and was being used at shows.

**Keywords:** horse, M. gastrocnemius, rupture

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## Introduction

Ruptures of the gastrocnemius muscles are commonly caused by external trauma, or during jumping or sprinting activities (Pascoe 1975, Sprinkle et al 1985, Sato et al 2014). In foals, it can occur during parturition (dystocia, and assisted delivery) or following hyperextension of the gastrocnemius muscle when the foals fall backwards during their attempts to stand up after parturition (Jesty et al. 2005, Tull et al. 2009, Sato et al. 2014). The gastrocnemius muscle has two muscle heads with their origin at the caudodistal side of the femur (Fossa supracondylaris). The heads form together the gastrocnemius tendon (GT) (including the tendon of the soleus muscle), which initially runs caudal to the superficial flexor tendon (SFT), then courses laterally around it to insert at the tuber calcanei cranially of the SFT. The GT inserts on the plantar aspect of the tuber calcaneus (Budras et al. 2004). The primary role of the gastrocnemius muscle is extending the hock and flexing the knee joint.

Rupture can occur in the tendon; most of the time at its insertion, and can include an avulsion fracture of the tuber calcanei. The rupture may also be localised at the musculotendinous junction within the supracondylar fossa of the femur, in the muscular part, which usually results in a large haematoma, or more proximal at its origin on the femur (Valdez et al. 1985, Dyson and Kidd 1992, Swor et al. 2001). In foals the development of a haematoma, due to rupture of the femoral artery, can be life threatening (Pascoe 1975, Sprinkle et al. 1975, Tull et al. 2009). The initial rupture can be incomplete or complete and an initial incomplete rupture can result in a complete rupture (Toppin and Lori 2006). Whereas the gastrocnemius muscle is a part of the reciprocal apparatus,

the clinical signs of a (partial) rupture are a dropped hock combined with extension of the stifle joint. With a complete rupture the horse is unable to bear weight on the affected limb, whereas with a partial rupture the horse shows a characteristic appearance seen at rest and walk: a lateral rotation of the calcaneus and medial rotation of the toe combined with a partially dropped hyperflexed tarsus (Pascoe 1975, Reeves and Trotter 1991, Shoemaker et al. 1991, Lescun et al. 1998, Swor et al. 2001).

The diagnosis of a rupture is usually apparent from the history and the clinical setting. Sudden onset of pain, tenderness localized to the musculotendinous junction of the medial head of the gastrocnemius muscle, soft tissue swelling of the thigh (haematoma formation) and/or a palpable defect in the medial belly of the gastrocnemius muscle just above the musculotendinous junction are pathognomonic for a gastrocnemius tear. Radiography and ultrasonography support to localise the lesion (Swor et al. 2001, Tull et al. 2009).

This article reports the typical clinical appearance and successful treatment of an 11-month-old Arabian Horse with a partial rupture of the medial head of the gastrocnemius muscle.

## Case details

### History

An 11-month-old Arabian mare was found at pasture with a grade 4 out of 5 lameness (AAEP lameness score 1991) and a swollen right hind limb. The horse was referred to

the clinic. At admission the mare was alert, could bear weight only on the toe of the affected hind limb with severe swelling the caudal aspect of the thigh (Fig. 1 and 2). The swelling was located medial and caudoproximal of the stifle and distended distally to the tarsal joints. The hock was held in a dropped and hyperflexed position. During attempts to bear weight on the limb, the calcaneus dropped distally and the knee joint extended. At walk protraction of the limb was delayed and reduced. The swelling was warm and painful at palpation, no fluctuation was apparent. No instability or crepitation was detected at rest and limb manipulation. No joint distension of the talocrural and knee joint was observed. The calcaneus was not painful. Tension on the SFT and GT was present as well as the muscle tonus, but less compared to the right limb. Failure of the reciprocal system was noticed, although the fetlock joint could withstand pressure. Radiography of the right stifle and talocrural joint (anterioposterior, lateromedial and caudolateral-craniomedial oblique views) revealed soft tissue swelling and there was no evidence of a fracture or other abnormality. Ultrasonography was not performed due to the enormous swelling. Based on the history, the characteristic gait and position of the limb a tentative diagnosis of a partial rupture of the gastrocnemius muscle with haematoma formation was made. At that moment it was not clear whether the rupture was in the muscular part or at its origin. It was decided to immobilize the limb under general anaesthesia to prevent any further rupture.

Clinical examination and blood analysis were within normal limits. The mare was positioned in lateral recumbency with the affected limb uppermost. Initially a full limb cast with a



Fig. 1



Fig. 2

**Fig. 1** Posterior view of the Arabian mare showing the thickened right thigh and dropped hyperflexed tarsus. | *Araber Stute: Ansicht von hinten mit Darstellung des verdickten rechten Oberschenkels und hyperflexierten Tarsus.*

**Fig. 2** Lateral view of the Arabian mare showing the thickened right thigh and dropped hyperflexed tarsus. | *Araber Stute: Ansicht von lateral mit Darstellung des verdickten rechten Oberschenkels und hyperflexierten Tarsus.*

Thomas splint was applied with the limb in a slight extended position. Assisted recovery was uneventful. The contralateral hind limb was bandaged for support for 2 weeks. Post-operative NSAID's were administered (meloxicam, 0.6 mg/BTW orally, once daily, Metacam®) for 2 weeks.

With the splint in place the mare could put weight on the limb and walked around in the box. Unfortunately, pressure sores on the medial side of the thigh developed within a week due to the Thomas splint. The Thomas splint was removed under general anesthesia, the pressure sores were cleaned and treated with honey wound ointment (Vetramil®). Wound management was continued for 3 weeks until they had healed per secundam.

The cast was maintained for 6 weeks, and daily checked for pressure sores (Fig. 3). Already after two weeks the size of the swelling had reduced to a normal appearance. After 6 weeks the cast was removed and replaced by a Robert Jones bandage. The limb was full weight bearing and the reciprocal apparatus appeared to function normally. The control radiographs of the stifle (anterioposterior, lateromedial and caudolateral-craniomedial oblique views) revealed a proliferative bone reaction on the caudodistal aspect of the cortex of the femur (medial), at the level of the origin of the gastrocnemius muscle (Fig. 4). Ultrasonography of the right thigh showed a remnant of a rupture of the gastrocnemius muscle in the medial head near its origin, haematoma organization and fibrous tissue were noticed, whereas the lateral head of the gastrocnemius muscle revealed an unchanged muscular structure. The distolateral cortex of the femur was roughened. The GT as well as the SFT revealed no abnormalities. A proliferative bone reaction could be found surrounded by echogenic areas, which were considered to be scar tissue (myositis ossificans).

The mare was discharged 8 weeks after referral and advised stall rest with hand walking exercise for two months gradually increasing from 20 minutes to one hour. Two years later the owner reported that the mare was without lameness and was being used at shows.



**Fig. 3** Lateral view of the Arabian mare showing the full limb cast. | *Araber Stute mit „full limb cast“: Ansicht von lateral.*

## Discussion

Rupture of the gastrocnemius muscle in the adult horse is quite unusual and is clinical manifest as a dysfunction of the reciprocal apparatus. These injuries are often due to trauma and usually characterized by an acute onset of lameness (Toppin and Lori 2006). In human, the mature athlete experience gastrocnemius muscle tears while performing manoeuvres that require sudden and swift changes in direction leading to overstretching of the muscle. The injury probably occurs during full extension of the knee with simultaneous flexion of the tarsus, causing sudden and maximal overstretching of the gastrocnemius muscle. The gastrocnemius muscle is at risk for injuries because it traverses two joints (the knee and tarsus) and possesses a high proportion of type two fast twitch muscle fibers, reflective of its function in rapid locomotion such as jumping and running (Delgado et al. 2002). Although no reason was known for the trauma in the mare, a sudden unexpected movement was considered to be the cause, as no signs of external trauma were noticed. Most common the medial head of the gastrocnemius muscle is involved, as in human (Kwak et al. 2006). The lateral head of the gastrocnemius muscle can also be involved, although, rarely and mostly when the medial head is ruptured.

Diagnosis is based on the clinical appearance. The GT should be carefully palpated to exclude a rupture. Radiography is necessary to exclude fractures of the femur and calcaneus or lesions at the origin of the gastrocnemius muscle. Because of the acute onset of the lameness and the swelling of the thigh an abscessation could be excluded. An additional lesion of the SFT could occur as well, but then the tarsus would have been held in a further dropped position and no tension would have been present on the tendon at palpation. Generally the



**Fig. 4** Lateromedial radiograph of the right femur revealed a proliferative bone reaction on the caudodistal aspect of the cortex of the femur (medial), at the level of the origin of the gastrocnemius muscle (arrowhead); mineralisation within the soft tissue. | Die latero-mediale Röntgenaufnahme des rechten Femur zeigt eine proliferative Knochenreaktion auf der kaudodistalen Seite der Femur (medial) in Höhe des Ursprungs des M. gastrocnemius. Mineralisierung im Weichgewebe.

gastrocnemius muscle appears to fail before rupture of the SFT (McIlwraith 2002, Stashak 2002). Ruptures at the site of the origin can occur in combination with an avulsion fracture of the calcaneus, which can be recognized by radiography (Jesty et al. 2005). In this specific case no avulsion fracture occurred and control radiography 7 weeks later revealed proliferative bone formation, pointing out the stress at the moment of trauma at the origin of the muscle. Ultrasound assessment can be a useful adjunct to clinical examination when the diagnosis is in doubt (Sato et al. 2014), although the haematoma in this specific case was so severe that it was considered useless in the acute phase. In specific cases it can be helpful to differentiate between partial tears from complete tears of the muscle rupture, and detect the size of the defect. The presence of the haematoma is suggestive for that the tear is located at the muscular head of the gastrocnemius muscle or musculotendinous junction as opposed to the tendon which is a less vascular structure. Conservative treatment in the form of strict stall rest has been recommended with success; however, the chance on further disruption has been published (Reeves and Trotter 1991, Toppin and Lori 2006). To exclude this risk immobilization to stabilize the limb was recommended. Whereas the injury had occurred at its origin and the caudal reciprocal apparatus showed dysfunction, the author thought an additional external fixation by the use of a Thomas splint might reduce the risk even further. Acute treatment is aimed at limiting hemorrhage and pain, as well as preventing complications. Furthermore, immobilizing the limb can help control hemorrhaging and pain. Unfortunately pressure sores occurred already within the first week and removal of the splint was decided on, leaving the full limb cast in place. To reduce the swelling and pain NSAID's were administered. Ultrasonographic monitoring of the muscle healing would have been possible, however, increases costs and the mare was clinically doing well. Scar formation after muscle injury is characterized by a hyperechoic area with or without acoustic shadowing located between areas of relatively normal muscle tissue, depending on the extent of muscle fibre rupture (Lideo and Milan 2013). After removal of the cast ultrasonographic evaluation revealed haematoma organisation and formation of scar tissue inclusive intramuscular calcification. Myositis ossificans as a result from the ossification of a muscle haematoma, could complicate healing and cause persistent lameness (Parikh et al. 2002), which fortunately was not in our case.

In human, although the appropriate management of acute gastrocnemius muscle rupture continues to be a controversial issue in the orthopaedic literature, surgical treatment is advised in case of a complete rupture to reduce re-rupture rate (Cheng et al. 2012). After evacuation of haematoma the retracted proximal muscle fibres are loosened and reattached to the distal end with the foot held in plantar flexion. Less scar tissue would reduce re-injury. This procedure would be feasible in horses; however, the recovery will put a lot of strain on the sutures and it would be unlikely to withstand all the forces during the attempts to stand, even with the support of a full limb cast.

There are no guidelines on how to manage gastrocnemius muscle/tendon ruptures; however, treatment is based on the clinical presentation and the location of the lesion. In this case the rupture was in the medial head of the gastrocnemius

muscle with secondary a large haematoma, which responded well on the immobilisation cast and resulted in full functioning of the limb without any restriction. Conservative treatment proved to be successful in our reported case.

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