

Ultrasound of the Collateral Ligaments of the Equine Tarsus

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Tarsal collateral ligament injuries are not uncommon and should be considered when evaluating hock pain or swelling. Desmitis and enthesitis (injury at the site of attachment to the bone) of the collateral ligaments or avulsion fractures at sites of origin or insertion can occur.^{1,2,3,4} Severe injuries to the collateral ligaments are often caused by trauma, but mild or subclinical injuries could contribute to hock pain and/or distal tarsal joint degenerative joint disease (DJD) due to a lack of medial to lateral stability. It has been reported that injury to the medial collateral ligament resulted in DJD of the distal tarsal joints secondary to instability.⁴

The collateral ligaments are easy to palpate and identify with ultrasound. Injuries to these ligaments, as with other ligaments in the body, are characterized by enlargement, hypochoic areas and disruption of fiber pattern. Calcification within the ligaments may also be present and identified with ultrasound. The anatomy and normal ultrasonographic appearance of the medial and lateral collateral ligaments of the hock will be reviewed here. There are several excellent references which provide a comprehensive review of the anatomy and ultrasonography of the tarsus.^{1,6,7}

Anatomy of the collateral ligaments of the tarsus:

Lateral Collateral Ligament

The lateral collateral ligament (LCL) of the hock has two basic components, the long (or superficial) LCL and the short (or deep) LCL.

The **long** LCL is the larger component and originates from the plantar aspect of the lateral malleolus of the tibia and inserts on the distolateral aspect of the calcaneus. Some fibers extend to the third and fourth tarsal and to the fourth metatarsal bones. It is located plantar and adjacent to the lateral digital extensor tendon. The lateral digital extensor tendon is located in the sulcus between the origin of the short LCL and the long LCL.

The primary origin of the **short** LCL is located dorsal to the origin of the long LCL on the lateral malleolus of the tibia and inserts on the mid portion of the calcaneus and talus. The short LCL has been described as having three components which are represented by fibers in differing orientations inserting on the calcaneus and talus giving the short LCL a "bowtie" appearance when the hock is in flexion. Detailed descriptions of the components of the short LCL can be found,^{7,8} but for practical considerations it will be treated as one ligament on ultrasound. Note the mostly horizontal orientation of the short LCL.

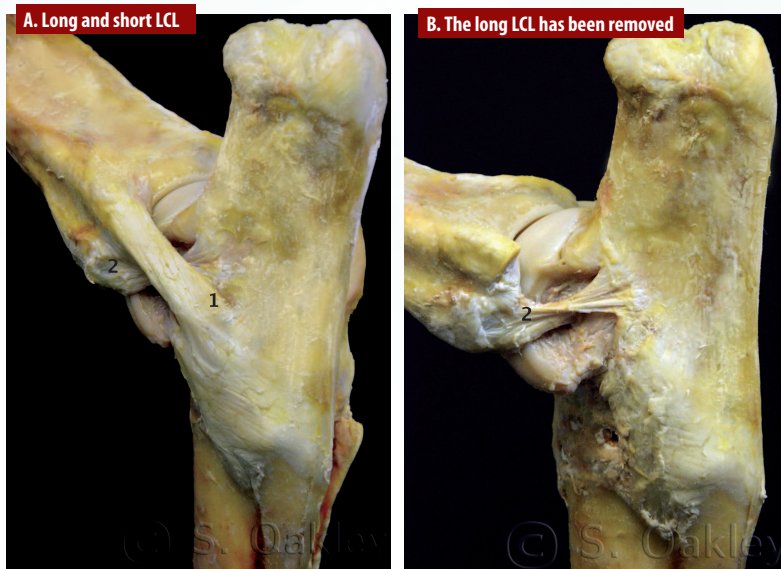


Fig 1. Dissected specimen showing the lateral aspect of the hock with the long and short lateral collateral ligaments. (1) long LCL (2) short LCL

Medial Collateral Ligament

The medial collateral ligament also consists of a long (superficial) component and three short (deep) components.^{7,8} The components of the short MCL are referred to as superficial, middle and deep^{7,8} or alternately the talean and calcanean fasciculi.² The major portion of the short MCL is the middle component or calcanean fasciculus. The superficial and deep components are the talean fasciculi. For the purpose of clarity in this article, the components of the short MCL will be referred to as the calcanean and talean fasciculi.

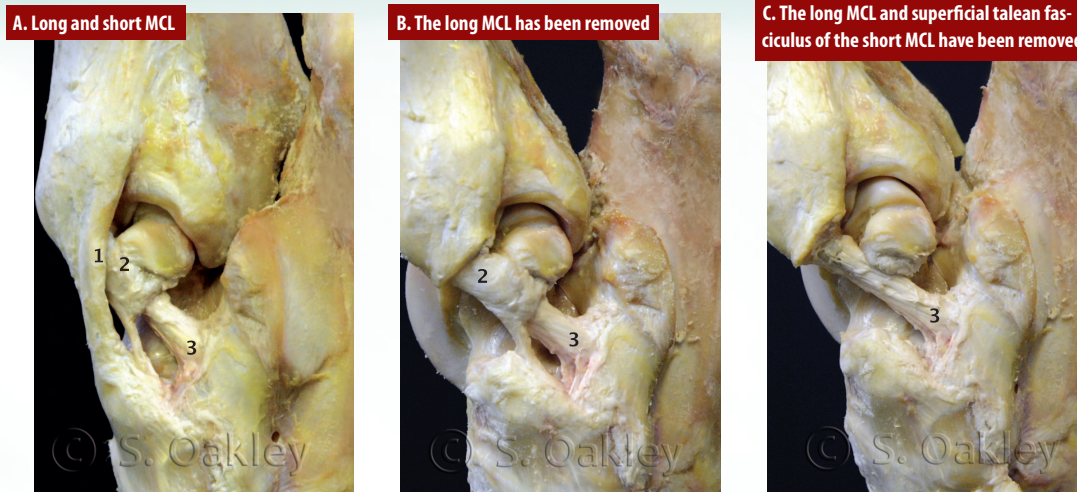
The **long** MCL originates on the caudomedial surface of the medial malleolus of the tibia and extends to its primary insertion on the distal tuberosity of the talus, with some fibers continuing to the central tarsal, third tarsal and third metatarsal bones. This ligament is large and is easily imaged.

The **short** MCL originates slightly dorsal and distal to the origin of the long MCL on the medial malleolus of the tibia.

- The calcanean fasciculus inserts on the distomedial surface of the sustentaculum tali and the plantaromedial surface of the central tarsal bone.
- The superficial talean fasciculus inserts on the proximal and distal tuberosities of the talus, with its distal insertion adjacent to the distal insertion of the long MCL.
- The deep talean fasciculus is deep to the calcanean fasciculus and inserts just distal to the proximal tuberosity of the talus.

The calcanean fasciculus of the short MCL is the largest of the three components and the easiest to image.

Fig 2. Dissected specimen showing the medial aspect of the hock. (1) long MCL (2) talean fasciculus of the short MCL (3) calcanean fasciculus of the short MCL



Functional Anatomy

The complex anatomy of the tarsal collateral ligaments should be considered when doing an ultrasound exam of these structures. As with collateral ligaments in other joints, the fibers are arranged in a spiral pattern so the linear fiber pattern is not as distinct as in most tendons. Eccentric attachment of the various collateral ligaments and the spiral pattern of the ligaments may explain the "snapping" phenomenon that is seen in the hock. The hock forcefully snaps into and out of extension 1/3 of the way between extension and flexion with no muscular assistance. This action is thought to conserve energy and is primarily caused by the calcanean fasciculus of the short MCL which is at its maximum tension when the hock snaps into or out of flexion.⁸

The long collateral ligaments are in tension when the hock is in an extended (or standing) position, while the short collateral ligaments are mostly in tension when the hock is flexed.⁸ Optimal images of the short collateral ligaments may therefore be obtained when the hock is in a flexed position.

Ultrasound Technique

The best images will be obtained when the horse is clipped with a #40 blade and washed with soap before scanning. A high-frequency ultrasound transducer (7 to 15 MHz) is usually appropriate, but diagnostic images may be obtained with a rectal probe. A standoff pad may be required to provide adequate contact when evaluating bony prominences.

The ligaments should be systematically evaluated in both the long and short axis from origin to insertion. It is important to remember the orientation of the ligaments when scanning and align your probe parallel or perpendicular to the long axis of the structure you are examining.

Imaging Tips and Landmarks:

- When imaging the long lateral collateral ligament, look for the lateral digital extensor tendon just dorsal to the long LCL. The lateral digital extensor tendon has a more linear fiber pattern than the long LCL and it continues proximally and distally beyond the LCL.
- To get the best image of the short LCL, have the limb in flexion. Due to the differing orientation of the fibers of the short LCL, it may be necessary to change the angle of the transducer to evaluate all sections of this ligament.
- Remember that the long CLs have a near vertical orientation, while the short LCL is almost horizontal when the hock is flexed. The calcanean fasciculus of the short MCL runs obliquely from its origin dorsal to the long LCL to its insertion on the calcaneus.

Ultrasound Images – LCL

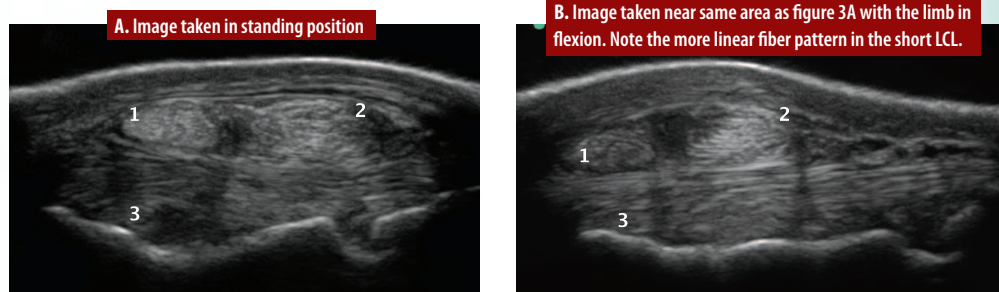


Fig 3. Transverse ultrasound image of the long component of the LCL just below its origin. (1) lateral digital extensor tendon (2) long LCL (3) short LCL

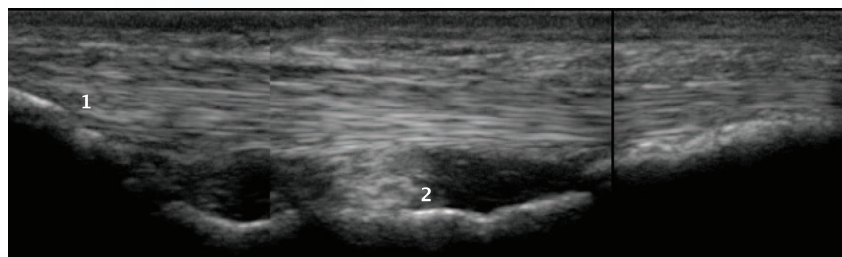


Fig 4. Composite longitudinal ultrasound image of the long LCL shown from its origin on the lateral malleolus of the tibia to near its insertion on the calcaneus. (1) long LCL (2) short LCL

Ultrasound Images – MCL

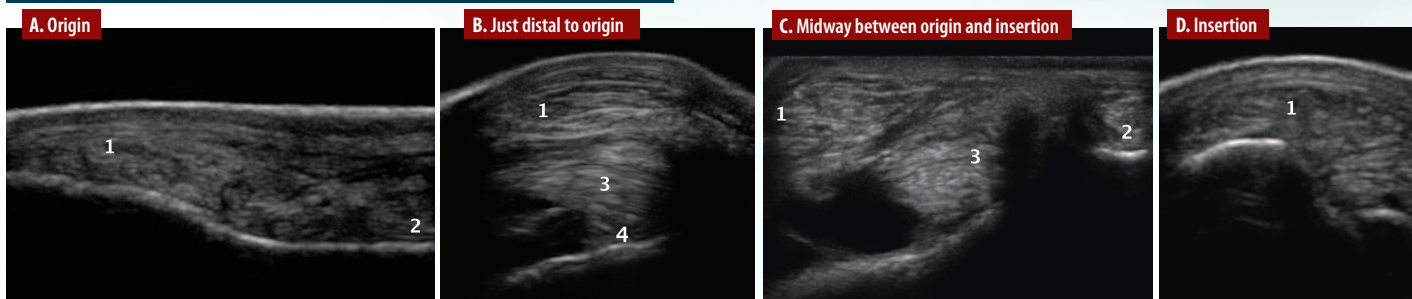


Fig 5. Transverse sections of the long MCL from its origin on the medial malleolus of the tibia to its insertion on the talus. (1) long MCL (2) medial digital flexor tendon (MDF) (3) calcanean fasciculus of the short MCL (4) fibers from the deep talian fasciculus of the short MCL inserting on the talus.

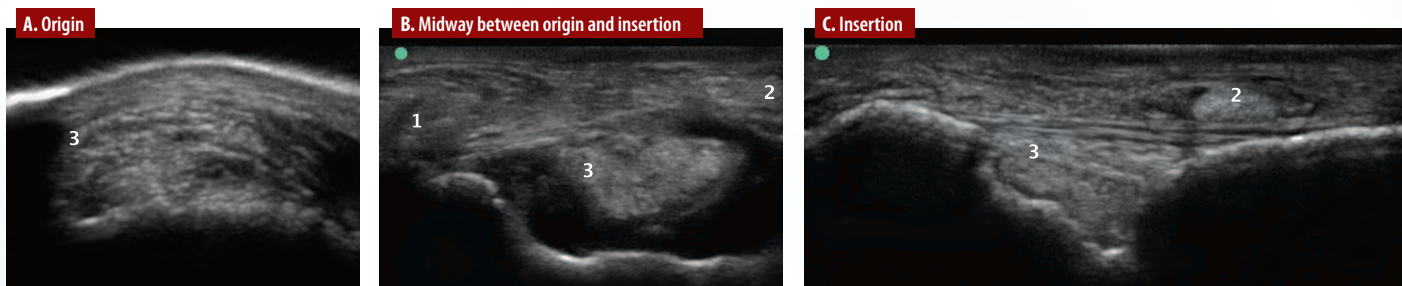
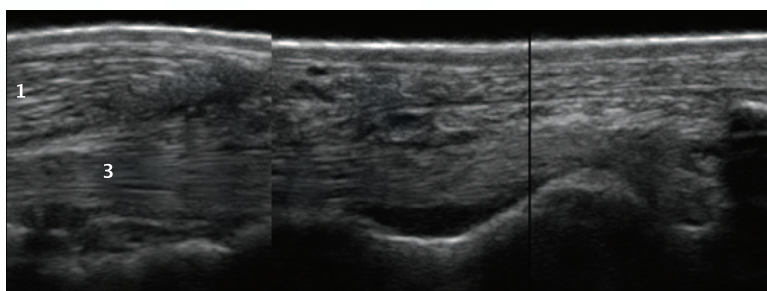


Fig 6. Transverse section of the calcanean fasciculus of the short MCL from its origin on the medial malleolus of the tibia to its insertion on the calcaneus. (1) long MCL (2) medial digital flexor tendon (MDF) (3) calcanean fasciculus of the short MCL.

Fig 7. Composite longitudinal ultrasound image of the calcanean fasciculus of the short MCL shown from the middle portion to its insertion on the calcaneus. This image was taken in a standing position. Note the relaxation artifact (decrease in linear fiber pattern) in the distal portion of the ligament. (1) long MCL (3) calcanean fasciculus of the short MCL.



**Dorsal or proximal are to the left in all ultrasound images.*

Practical Tips:

1. Locate the long CLs by palpation before imaging.
2. Use a second hand to stabilize the probe on the leg if necessary.
3. Compare images with the opposite limb.
4. If you are having trouble following the fiber pattern in long axis, go back to short axis, locate the structure and reposition into long axis again.
5. If the linear fiber pattern extends from one side of your ultrasound screen to the other then your probe is in parallel alignment with the long axis of the structure. 🔄

References:

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