Technical Note

Surgical Treatment of Medial Gastrocnemius Tear

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Abstract: Medial gastrocnemius tears typically occur with forced dorsiflexion while the knee is extended. Myotendinous injuries occur most commonly, which are almost always treated without surgery. If a tendinous injury or avulsion occurs, nonoperative treatment should first be attempted. However, in patients where forceful plantar flexion is required for their desired activities or occupation, surgical fixation is an important treatment option. Postoperative bracing should be used to protect the repair with a graduated therapy progression, including range of motion followed by strengthening and return to activities. This technical note describes the technique for a safe and reliable medial gastrocnemius tendinous repair using two suture anchors.

Tears of the gastrocnemius muscle are relatively common injuries, occurring most frequently in tennis players and in fact are commonly referred to as "tennis leg."[1-4] These injuries typically occur at the musculotendinous junction of the medial head of the gastrocnemius and nearly always can be managed without surgery.[4-9] A separate and less-frequent injury pattern is an avulsion injury of the gastrocnemius tendon from the proximal insertion on the femur (Fig 1). This has been described in case reports and often presents as posterior knee pain and weakness with plantar flexion.[10-14] The most commonly reported mechanism of injury is forced ankle dorsiflexion with the knee in extension, which places the greatest strain at the medial gastrocnemius insertion.[11] While the majority of these tendinous injuries can be treated without surgery,[10-12,14] some patients are unable to regain the strength require for athletic performance after nonoperative care. In these cases, surgical repair may be considered; however, surgical technique or outcomes studies are scarce on this relatively uncommon injury. In active or athletic individuals, medial gastrocnemius avulsions can be quite debilitating and may prevent the patient's desired return to activities.

Surgical Technique

A narrated video with demonstration of the following surgical technique may be reviewed (Video 1). Appropriate diagnosis is confirmed with physical examination and MRI (magnetic resonance imaging) (Fig 1). After induction of regional and general anesthesia, the patient is positioned prone on the operative table with care to pad all boney prominences. A tourniquet is applied to the thigh of the operative extremity before turning the patient prone. Placing the tourniquet while the patient is supine is important because it facilitates higher placement to ensure it is well out of the operative field. The extremity is prepped and draped in a standard fashion. The incision is marked beginning 5 cm proximal to the popliteal fold on the medial side of the leg along the border of the palpable semitendinosus tendon. This is then carried distally and curved to cross the popliteal fossa in an oblique fashion (Fig 2). It is important to cross the popliteal fossa obliquely to avoid a possible skin contracture. It is also is important to avoid sharp angles when making the incision to prevent skin necrosis.

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Fig 1. Magnetic resonance imaging confirms a proximal medial gastrocnemius tendon avulsion (arrows).

Table 1. Pearls and pitfalls of the described surgical technique

Pearls
Start incision proximal to the popliteal crease medially to ensure access to the origin of the gastrocnemius tendon on the femur.
Take care to identify and protect the sural nerve and vein in the subcutaneous tissue in the lateral portion of the incision.
Retract the gastrocnemius muscle laterally to protect the neurovascular bundle.
Perform thorough release of scar tissue around the distally retracted injured tendon to ensure you are able to mobilize it proximally to its anatomic insertion.
Take the knee through a range of motion after repair to ensure no gapping or suture pull out.
Use the semitendinosus as a landmark for the most medial extent of the incision.
Pitfalls
A trial of nonoperative treatment should first be attempted before surgical repair is suggested.
Surgical treatment of myotendinous tears typically are tenuous repairs and are not suggested.
Inadequate postoperative immobilization can affect the safety of the repair.
Insufficient knowledge of local anatomy can lead to injury to the neurovascular structures in the region.

The incision is carried sharply through the skin with a knife. Metzenbaum scissors are then used to dissect in the subcutaneous tissue laterally to identify the sural nerve and vein (Table 1; Fig 3). Once identified and protected, dissection is carried down to the gastrocnemius fascia, which is incised in line with the incision for future closure. The neurovascular bundle is identified just lateral to the medial head of the gastrocnemius (Fig 4). A Richardson retractor is placed superiorly, then another medially to retract the medial head of the gastrocnemius laterally. From this position the small remnant of the gastrocnemius insertion is identified on the femur just beneath the semimembranosus. The injured and retracted segment of the tendon and muscle can then be identified distally (Fig 5).

It is important to closely evaluate for posterior capsular injuries at this point because the capsule is readily visible. The remnant of the ligamentous insertion on the femur is retracted proximally in this case. Bovie electrocautery is used to clear soft tissue to from a 1.5 cm—wide bed below the remnant. A high-speed burr is then used to decorticate this area to provide a tissue bed for healing. Care must be taken to protect the surrounding soft tissues and neurovascular structures. A combination of blunt dissection and careful sharp dissection with Metzenbaum scissors is used distally to free the retracted injured head of the gastrocnemius tendon.

The injured end of the tendon is sewn with a running locking stitch using a SutureTape (Arthrex, Naples, FL) laterally in the smaller fascial tissue and a FiberTape

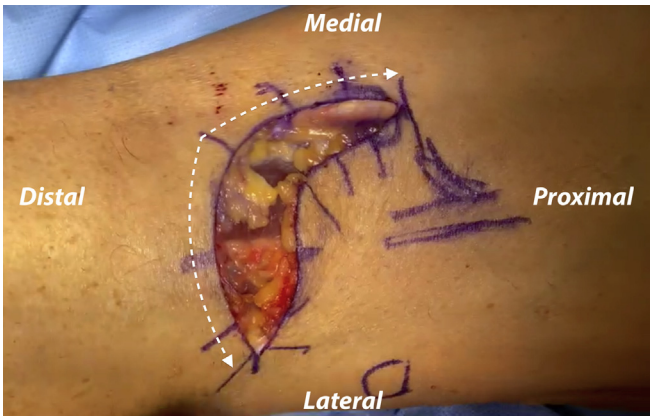

Fig 2. Right knee in the prone position. The incision is marked beginning 5 cm proximal to the popliteal fold along the semitendinosus tendon and is carried distal and curved to cross the popliteal fossa in an oblique fashion.

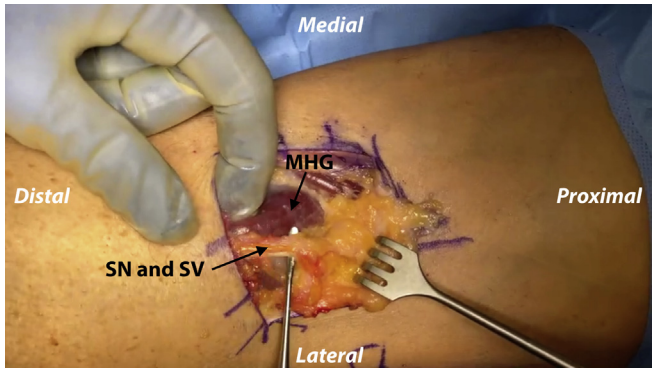

Fig 3. Right knee in the prone position. Metzenbaum scissors are used to dissect in the subcutaneous tissue laterally to identify the sural nerve and vein. SN, sural nerve; SV, sural vein; MHG, medial head of the gastrocnemius.

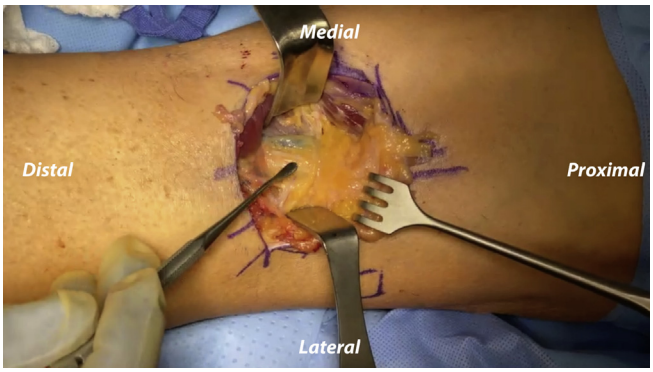

Fig 4. Right knee in the prone position. The instrument points to the neurovascular bundle is identified just lateral to the medial head of the gastrocnemius.

(Arthrex) medially in the more robust fascia with a large portion of the ligamentous fibers. The FiberTape suture is used medially because it is larger and provides excellent fixation in the better-quality more tendinous portion, whereas the more muscular portion is lateral, and therefore a smaller SutureTape is used to avoid shredding the tissue. The muscle tendon unit is tested for appropriate and adequate mobility to allow repair without tension. Further distal blunt mobilization can be done, if required. The medial border of the previously prepared bed is drilled with care to orient the drill 45° distal and lateral to ensure adequate boney fixation for a 4.75 mm BioComposite SwiveLock anchor (Arthrex). The hole is then tapped and the 4.75 mm BioComposite anchor is loaded with the FiberTape, which is appropriately tensioned and inserted in a knotless fashion. This process is repeated with a second anchor that is placed 1.5 cm laterally on the lateral edge of the previously prepared bed. A second BioComposite SwiveLock anchor is placed with the lateral SutureTape tensioned in a knotless fashion (Fig 6).

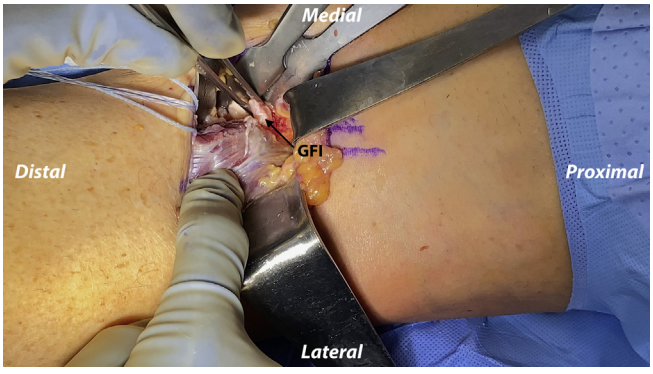

Fig 5. Right knee in the prone position. After incising the fascia, the small remnant of the gastrocnemius insertion can be identified on the femur just beneath the semimembranosus. The injured and retracted segment of the tendon and muscle can then be identified distally using blunt dissection. GFI, gastrocnemius femoral insertion.

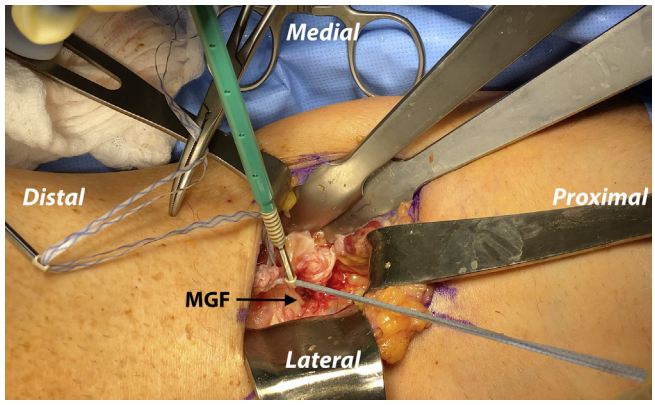

Fig 6. Right knee in the prone position. Two BioComposite SwiveLock anchors are placed in the medial gastrocnemius footprint, one medial and one lateral. The medial and lateral portions of the tendon stump are sewed with a FiberTape and SutureTape, respectively, and are secured in a knotless fashion with their respective anchors. MGF, medial gastrocnemius footprint.

A second SutureTape is then used to oversew the proximal remnant to the now appropriately tensioned approximated fascia of the ruptured tendon for additional structural support (Fig 7). This completes the repair; the knee is then taken through a full range of motion to ensure no gapping of the repair, appropriate tension, and no pullout of the sutures. The wound is then copiously irrigated, and the tourniquet is deflated to ensure complete hemostasis. The gastrocnemius fascia is repaired with a 0-Vicryl, followed by a 2-0 Monocryl for a deep dermal layer, and 3-0 nylons in a horizontal mattress fashion for the skin. The wound is dressed with xeroform, 4 × 4 gauze, an abdominal pad, and a lightly applied ACE bandage. A hinged knee brace is then applied and locked to prevent extension beyond 30° to avoid excessive tension on the repair.

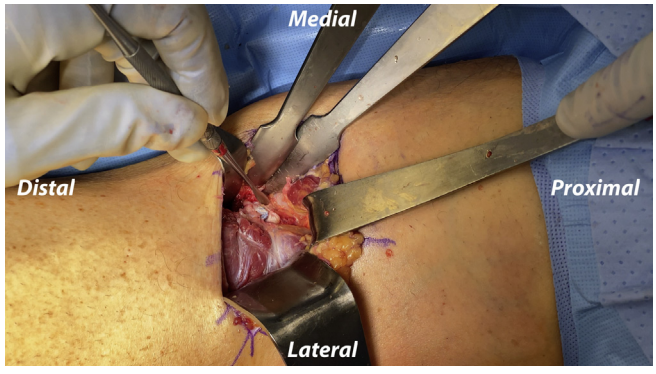

Fig 7. Right knee in the prone position. A second SutureTape is then used to oversew the proximal remnant to the now appropriately tensioned approximated fascia of the ruptured tendon for additional structural support.

Postoperative Rehabilitation

After the procedure, the patient uses crutches and is toe-touch weightbearing for 6 weeks. A hinged knee brace is used to prevent knee extension past 30°, with flexion limited to 90° for the first 3 weeks. Only passive motion is allowed at this time. After 3 weeks, extension is progressed by 15° each week. Full painless range of motion is obtained with physical therapy assistance including passive, active assist, and active motion. After full motion is achieved at 6 weeks, light strengthening is begun with progression to activities and return to full activities typically at 3 to 4 months. Pearls and pitfalls and advantages and disadvantage of this surgical technique are illustrated in Tables 1 and 2, respectively.

Discussion

Proximal injuries to the gastrocnemius muscle are relatively rare, but they can occur with extreme forces of ankle dorsiflexion typically with an extended knee. Although myotendinous junction injuries should be treated without surgery, if tendon avulsions fail nonoperative treatment, surgical treatment can be considered in active patients who are unable to return to their desired activities. The described technique provides a safe and effective means of treating this sometimes-difficult condition in active patients (Table 2).

Surgical treatment for proximal gastrocnemius injuries have rarely been reported. One study documented two cases, a 37-year-old man and a 43-year-old woman, who had musculotendinous junctions tears and were unable to regain full plantar flexion strength despite nonoperative treatment.[15] No cases, of which the authors are aware, have been reported of operative treatment of proximal avulsion injuries. Anecdotally, the senior author of the current study has surgically treated three National Football League athletes for this pathology who had a proximal tear from the femoral insertion. These three athletes presented with an inability to regain push-off strength with ankle plantar flexion despite nonoperative treatment and therefore underwent surgical repair as described here. These three professional athletes had excellent clinical results and returned to the same level of professional play in the National Football League without complications.

Table 2. Advantages and disadvantage of the described surgical technique

Advantages	
	Safe and reliable option for surgical management of gastrocnemius tendon ruptures if nonoperative measures fail.
	Allows for restoration of push-off strength, which is essential in activities ranging from walking to high-level sports.
Disadvantage	
	Lack of postoperative immobilization may increase stress on the repair and lead to higher risk for failure and inferior outcomes.

Although most of these tendinous injuries can be treated without surgery,[10-12,14] some patients are unable to regain the strength required for athletic performance after nonoperative care.

Although avulsion injuries are reported in the literature in small case reports, no surgical description or outcome studies are currently published. With appropriate anatomic knowledge and patient selection, medial gastrocnemius repair can allow return of push-off strength, which is essential in activities ranging from walking to high-level sports. The authors first recommend a trial of nonoperative treatments including modalities, range of motion, and strengthening. If after six weeks, patients still complain of weakness and inability to return to their desired activities, patients can be counseled regarding the possibility of gastrocnemius repair. Active patients who enjoy or rely on activities that include active forceful plantar flexion can benefit from surgical repair if the injury is tendinous. Appropriate postoperative immobilization to decrease stress on the repair followed by physical therapy is essential for a successful outcome.

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