Technical Note

Primary Repair of Peroneus Longus Myofascial Herniation With Symptomatic Superficial Peroneal Nerve Compression

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Abstract: Symptomatic myofascial herniations of the extremities occur infrequently; however, they can contribute to significant pain, weakness, and neuropathy with activity. Muscle herniation typically occurs through either a traumatic or congenital focal defect in the deep overlying fascia. Patients may present with an intermittently palpable subcutaneous mass and may have neuropathic symptoms, depending on the degree of nerve involvement. Patients are initially treated with conservative modalities, whereas surgery is reserved for patients who demonstrate persistent functional limitations and neurologic symptoms. Here, we demonstrate a technique for primary repair of a symptomatic lower-leg fascial defect.

Myofascial herniations of the extremities are an infrequent source of extremity pain that occur as a result of a defect in the fascial sheath of a muscle. Myofascial herniations occur most frequently in the lower leg and often involve the tibialis anterior because of its superficial location in the anterior compartment.[1] However, there are also published cases of muscle herniations involving the extensor digitorum longus, peroneals, soleus, and gastrocnemius.[1-4] The fascial defect may be congenital or secondary to trauma. Congenital cases may be due to a weakness in the fascia, or they can occur at sites at which there is a fascial opening to accommodate perforating nerves and vessels, whereas penetrating trauma and long bone fractures may induce fascial disruptions that predispose to this injury.[5] The herniations occur most frequently with physical activity due to increases in muscle volume and intracompartmental pressures. The true incidence of this condition is unclear, because many herniations are asymptomatic and patients may be misdiagnosed as having a variety of different soft-tissue masses.

When symptomatic, patients often present with a palpable, subcutaneous mass that is tender to palpation. There is frequently intermittent pain and cramping localized to this region that often worsens with physical activity. Less frequently, there may also be paresthesia in this region secondary to nerve entrapment through the fascial defect. Magnetic resonance imaging (MRI) findings are often nonspecific and, therefore, dynamic ultrasonography may prove helpful in establishing the diagnosis.[6,7] Conservative treatment modalities such as rest, activity restriction, and compression stockings are the first-line treatment for myofascial herniations. Numerous surgical techniques have been described for patients who are unresponsive to conservative treatment, including decompressive fasciotomy, primary

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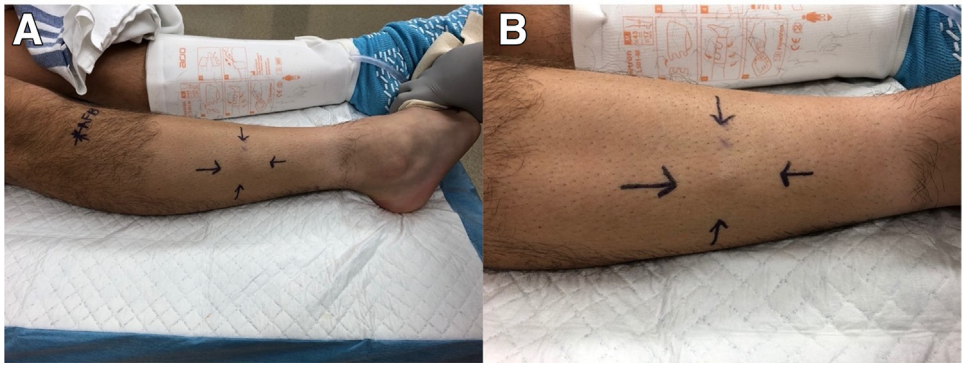

Fig 1. Clinical images of a right leg demonstrating a myofascial herniation of the peroneus longus with the foot in plantarflexion (A), and the palpable mass more evident with the ankle dorsiflexion (B). The 4 blue arrows demonstrate the location of the herniation.

repair of the defect, autologous fascial grafting, and synthetic mesh repairs.[8,9]

The peroneus longus muscle is a superficial muscle in the lateral compartment of the leg that functions primarily as an ankle evertor. It originates at the lateral condyle of the tibia and proximal fibula and inserts on the lateral base of the first metatarsal and medial cuneiform. The superficial peroneal nerve courses along the peroneal longus muscle before piercing through the crural fascia and heading into the anterior compartment approximately 12 cm above the ankle joint. This defect in the crural fascia may ultimately function as a site of potential myofascial herniation.

Surgical Technique (With Video Illustration)

Patient Evaluation

Patients with a peroneus longus myofascial herniation may present with a small, intermittently palpable mass present on the lateral aspect of the lower leg (Fig 1). This area may become enlarged with any significant activity such as running. If there is involvement of the superficial peroneal nerve, patients may present with paresthesia down the lateral leg and foot with activity. It is expected that these symptoms would resolve following resolution of the physical activity.

Imaging

MRI is often the first step in the evaluation of this condition. However, because myofascial herniations are dynamic, the pathology may be difficult to identify on a static MRI. In these instances, a dynamic ultrasound may offer diagnostic utility. On ultrasound, there may be evidence of herniation of the peroneus longus musculature through a fascia defect during muscle activation (Fig 2). In this instance, the muscle herniation measures 1.5 cm × 1.9 cm and is immediately lateral to the superficial peroneal nerve as it exits the crural fascia.

Indications

Before considering surgical intervention, patients with myofascial herniations should trial modalities such as rest, activity restriction, and compression stockings. If these fail to provide symptom relief and the patient desires a return to activity, surgical intervention should

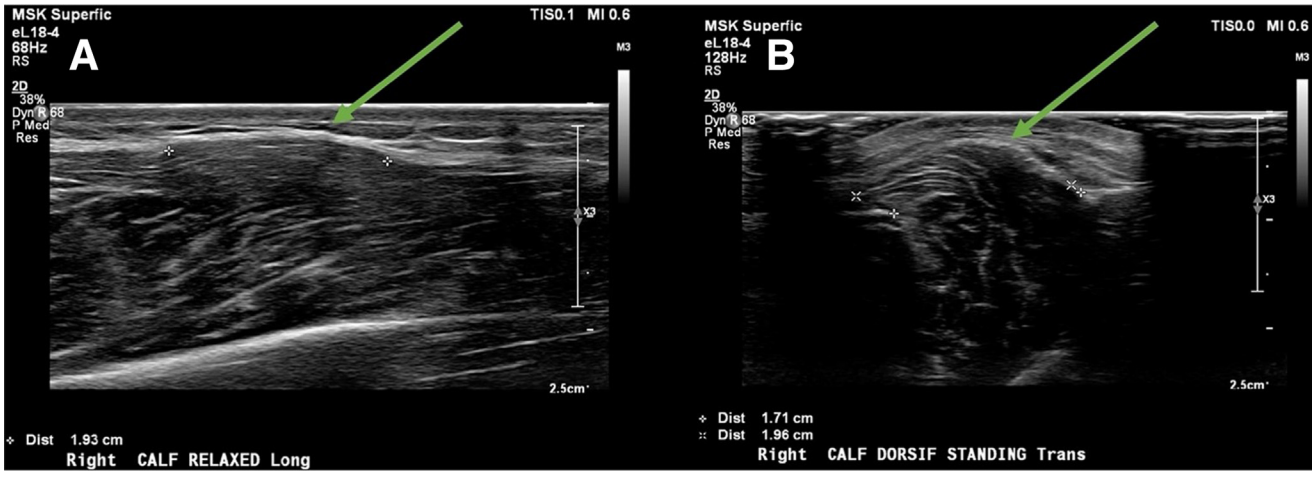

Fig 2. Dynamic ultrasound of a right lower leg demonstrating a fascial defect (green arrow) at rest without evidence of herniation (A) and muscle herniation through the fascial defect with active patient ankle dorsiflexion (B).

Table 1. Primary Myofascial Repair Surgical Technique

Preoperatively, Identify, and Mark the Location of the myofascial Herniation.
Patient is positioned supine, with a thigh tourniquet as well as a ramp under the operative extremity.
A longitudinal incision is made with a #15 blade scalpel directly over the area at which the fascial defect is noted.
Gentle dissection is taken down to the level of the fascia with tenotomy scissors.
Fascial defect is identified with associated herniation of the superficial peroneal nerve and peroneus longus.
The muscle and nerve are gently reduced within the fascia.
The peroneal nerve is protected by being held underneath the freer during the entirety of the primary repair.
A #2 nonabsorbable suture is then used to close the fascial defect primarily using 3 figure-of-eight sutures.
Following the repair, the muscle will demonstrate gliding smoothly during passive ankle flexion and extension without further muscular herniation.

be discussed. There are multiple different surgical techniques that may be used to treat myofascial herniations. Primary fascial closure offers a low-cost option.

Surgical Procedure

On the day of surgery, the patient is identified in preoperative holding, surgical consent is verified, and the appropriate limb is marked for the procedure. The location of the myofascial herniation should be identified and marked before the procedure. In the operative suite, the patient is positioned supine with a black ramp under the operative extremity. A thigh tourniquet is placed, and the leg is prepped in usual sterile fashion.

A 3-cm longitudinal incision is made with a #15 blade scalpel directly over the area where the fascial defect is noted to be on ultrasound (Table 1). Gentle dissection is taken down to the level of the fascia with tenotomy scissors. The defect in the fascia is apparent (Fig 3A). The superficial peroneal nerve is present on top of the muscle at the base of the defect exiting the area of the fascia (Fig 3B). The peroneal nerve is gently pushed deep to the fascial defect with a freer elevator to be kept out of the way of the repair as shown in the video (Video 1). The peroneal nerve is protected by being held underneath the freer during the entirety of the primary repair. A #2 nonabsorbable suture (Arthrex, Naples, FL) is then used to close the fascial defect primarily using 3 figure-of-eight stitches (Fig 4). A nonabsorbable suture is used so that the fascia will remain closed and will not have an opportunity to retear. Following the repair, the muscle demonstrates gliding smoothly during passive ankle flexion and extension with no further muscular herniation. The wound is then irrigated with sterile normal saline, and the subcutaneous tissue is closed in an interrupted fashion followed by a running subcuticular stitch for the skin. Following closure, there is no evidence of residual herniation. The patient is placed in a short leg splint to protect the primary repair after surgery (Table 2).

Rehabilitation

The patient will be seen for routine follow up appointments in the clinic at 2 weeks, 6 weeks, 3 months, 6 months, and 1 year. The patient is immobilized for 2 weeks and subsequently transitioned to a boot at the 2-week postoperative appointment. By the 6-week

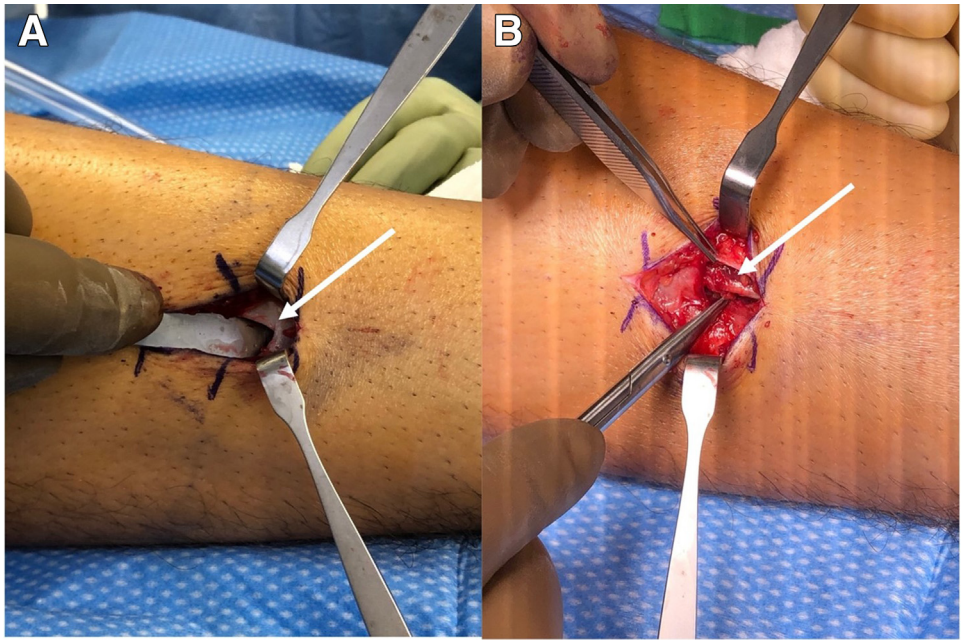

Fig 3. Intraoperative image of a right lower leg demonstrating placement of forceps within a fascial defect (A). Evidence of the superficial peroneal nerve within the lower-extremity fascial defect (B).

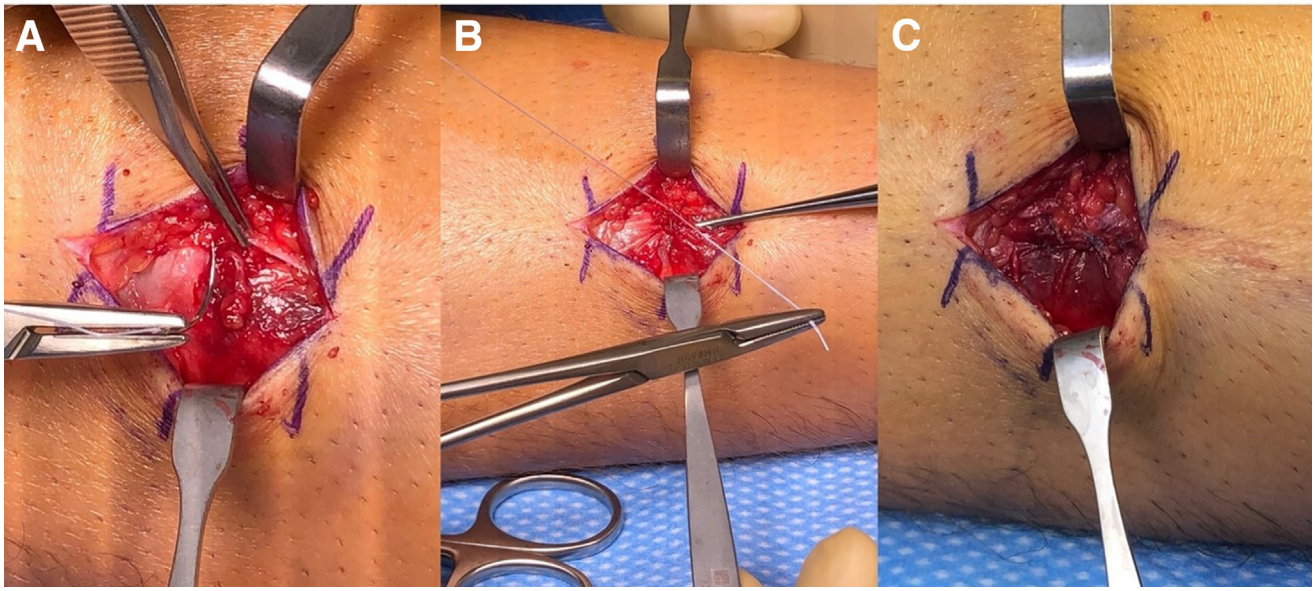

Fig 4. Intraoperative image of a right lower leg demonstrating primary closure of the crural fascial defect with suture placement through the fascial layer (A), suture knot-tying (B), and the completed primary repair (C).

postoperative visit, patients may report resolution of their pain, numbness, and tingling symptoms (Fig 5). At this visit, they can be weaned out of a boot with and slowly return to running. Return to all activities is expected by the 3-month follow-up visit.

Discussion

Symptomatic myofascial herniations in the leg are relatively rare but may cause symptoms of compressive neuropathy.[10] These symptoms appear to be a distinct clinical entity from chronic exercise-induced compartment syndrome, as demonstrated in this case presentation, where the patient had symptoms without significant physical exertion and had a palpable mass at the lateral aspect of the leg consistent with a myofascial herniation. Most lower-extremity muscle herniations are asymptomatic and can be treated nonoperatively. However, with symptoms of persistent pain or ongoing nerve involvement, timely diagnosis and operative intervention are indicated.

There are a variety of presentations of lower-extremity nodules that are not limited to hemangiomas, sarcomas, lipomas, fibromas, and angiolipomas. History and physical examination are key to differentiating this mass from the various other potential lower-extremity masses. Myofascial herniations are unique in that they often decrease in size or disappear at rest and increase in size with activity. Clinical examination maneuvers that increase intracompartmental pressures (i.e. forced dorsiflexion) may help make the mass more apparent.

An important diagnostic step that may aid in both accurate diagnosis and guide surgical treatment is dynamic ultrasound. Dynamic ultrasound can better

Table 2. Pearls and Pitfalls of Primary Closure of Symptomatic Myofascial Herniation

Pearls	Pitfalls
Preoperatively, dynamic ultrasound is a powerful tool that can confirm the diagnosis.	Failure to adequately protect the peroneal nerve during the fascial repair may lead to nerve injury.
Identify the herniation while the patient is awake and able to confirm the correct location.	Overtensioning the fascial repair may contribute to the develop of chronic compartment syndrome.
Nonabsorbable suture should be used to minimize the likelihood of recurrence.	Failure to immobilize the patient postoperatively increases the probability of repair failure.
Provocative physical examination maneuvers should be performed following the fascial repair but before skin closure to visualize muscle gliding and resolution of the herniation.	

Fig 5. A 6-week postoperative image demonstrating the healed surgical incision and resolution of the herniation.

Table 3. Advantages and Disadvantages of Primary Closure of Symptomatic Myofascial Herniation

Advantages	Disadvantages
Primary fascial closure allows for an anatomic fascial repair with direct visualization of the nerve.	Potential hernia recurrence through the fascial defect.
There is an avoidance of additional soft-tissue disruption that is seen in alternative techniques (i.e. fasciotomy)	Progression to a chronic compartment syndrome due to the increased intracompartment pressure associated with fascia closure.
Avoidance of costly implants which may not be available at some centers.	Primary repair may not be possible in patients with larger fascial defects.
Avoidance of synthetic materials, which may potentially stimulate inflammatory reactions.	Integrity of the repair is dependent on native tissue quality which may be compromised in some instances.
Theoretically decreased risk of infection due to avoidance of synthetic materials.	
Relative ease and reproducibility.	

illustrate the nature of this pathology by demonstrating peroneus longus muscle herniation with muscle contraction. Because MRI is a static imaging modality, certain patients may present with false-negative findings on MRI. In these instances, dynamic ultrasound offers significant utility.

Multiple surgical techniques have been proposed to treat symptomatic myofascial herniations in the leg, including primary fascial closure, decompressive fasciotomy, closure with synthetic mesh, and others.[1] To date, there is no consensus with respect to the optimal surgical technique. The advantages of the chosen surgical technique of primary fascial closure include anatomic repair, avoidance of additional soft-tissue disruption by fasciotomy—which could contribute to continued muscle herniation and incomplete resolution of symptoms, avoidance of cost associated with synthetic materials, and ability to visualize and protect the superficial peroneal nerve throughout the repair (Table 3). The disadvantages of a primary fascial closure may include hernia recurrence and the development of chronic compartment syndrome.

Myofascial herniations occur infrequently; however, they can present as a persistent source of activity-related pain with associated paresthesia. This is a rare diagnosis that is clinically distinct from exertional compartment syndrome. Dynamic ultrasound may be helpful in confirming the diagnosis, especially in cases in which other imaging studies are nonconfirmatory. While there are numerous surgical techniques that can be used to address this pathology, primary fascial closure offers a multitude of benefits not seen with some of the other techniques.

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