

# Bilateral non-traumatic lower leg fascial defects causing peroneal muscle herniation and novel use of a GraftJacket to repair the fascial defect

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## ABSTRACT

Constitutional bilateral defects in the peroneal fascial compartment leading to muscle herniation are extremely rare. We present the case of a twenty-nine year old male carpenter with non-traumatic bilateral peroneal fascial defects, in which the symptomatic right side was successfully repaired using a GraftJacket®. This case report highlights the need for clinicians to remain aware of the diagnosis of muscle herniation as a cause of a painful mass in the lower limbs, especially when related to exercise. The judicious use of further imaging such as ultrasound in combination with MRI can be useful in differentiating a muscle hernia from other more sinister causes, such as malignancy.

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## 1. Introduction

Peroneal muscle hernias are an incredibly rare occurrence with very little in the literature about their diagnosis, investigations and management. Whilst it is a rare occurrence, the true incidence remains unknown.<sup>1</sup> Tibialis anterior is the most commonly documented muscle herniation but there are cases of other upper and lower limb herniations such as peroneus longus and brevis, and the forearm flexors.<sup>2</sup> The choice between using dynamic ultrasound or MRI remains debatable as to the best imaging modality to diagnose muscle herniation. Management depends on the clinical presentation. Asymptomatic patients are usually treated conservatively. The indications for surgery include pain, dysfunction or neurovascular compromise. Surgical options include fascial repair, fasciotomy or repair of the defect using an autologous fascia of mesh to provide a satisfactory outcome for the patient.<sup>3,4</sup>

## 2. Background

Lower leg muscle herniations can occur either as a result of

direct trauma or more rarely, due to constitutional defects in the fascia. This was first classified by Ihde in 1929.<sup>5</sup> Such defects are thought to occur as a result of venous fenestrations in the fascia that allow perforating veins to enter the muscle.<sup>6</sup> Under constant stress, this can eventually lead to muscle herniation through these fenestrations. The tibialis anterior muscle is most commonly affected<sup>1,2</sup> whilst peroneal muscle herniation is a rare phenomenon,<sup>7</sup> especially in the absence of trauma. We report a case of non-traumatic bilateral peroneal fascial defects in which the symptomatic side was successfully repaired surgically using a GraftJacket® (Wright Medical UK Ltd, Hertfordshire, UK) construct. GraftJacket® is a human dermal collagen template that becomes incorporated into the human body and can act as a scaffold or patch over tendons, ligaments and periosteum.

## 3. Case report

A 29-year-old carpenter presented to his General Practitioner (GP) with a six-month history of an increasingly painful lump in the distal peroneal compartment of his right leg. There was no preceding history of trauma. The patient was a keen golfer and cricketer but was struggling to play sports because of the pain in his right lower leg. He was also unable to kneel at work because of his symptoms. The patient had no other significant medical comorbidities.

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On physical examination, there was a 4cm lump in the deep peroneal compartment, 10cm above the tip of the lateral malleolus, on the right leg. The peroneal musculature was intact throughout a range of motion, against resistance. There was pain on deep palpation. Tinel's sign was negative for the clinical signs of a neuroma. He walked with a normal gait and had no neurological deficit in his lower limbs.

An ultrasound scan of the right distal peroneal compartment, revealed a  $1.9 \times 0.3$ cm oval lesion on the surface of the muscle with echotexture suggestive of a lipoma (Fig. 1). It did not, however, exclude the differential of muscle herniation so an MRI was arranged. The MRI showed that this was not a lipoma and that muscle herniation was more likely.

The patient was referred to a Foot & Ankle orthopaedic surgeon and the patient's case discussed at a radiology musculoskeletal multidisciplinary meeting. The diagnosis of bilateral non-traumatic peroneal fascial defects was confirmed and a number of treatment options were discussed with the patient. This included adopting a "watchful wait" policy with regular reviews of the patient or surgical intervention using a synthetic mesh or GraftJacket® (Wright Medical UK Ltd, Hertfordshire, UK) to repair the symptomatic defect. The left leg was asymptomatic and clinically did not require subsequent intervention.

### 3.1. Treatment

The patient decided on surgical intervention using the GraftJacket® and gave his consent for the operation. The operation was carried out under a spinal anaesthetic with the patient positioned supine on the operating theatre table. A thigh tourniquet was applied and inflated to 300 mmHg for the duration of the operation. A longitudinal 6cm skin incision over the distal fibula area was made over the swelling (Fig. 2). The deep fascia was exposed and the fascial defect inspected (Fig. 3). The fascial defect measured  $2 \times 3$ cm (Fig. 4). The superficial peroneal nerve was identified and protected throughout (Fig. 5). The superficial peroneal nerve appeared to be compressed, especially proximally so decompression of the nerve was performed. A  $3 \times 4$ cm size GraftJacket® was

prepared and sutured loosely to cover the defect (Fig. 6) using a No.1 Vicryl™ suture. After thorough wound irrigation, the soft tissue layers were closed. A 3/0 monocryl™ subcuticular skin suture was used for skin closure and 0.25% Chirocaine local anaesthetic infiltrated locally. A below knee back-slab was applied to rest the soft tissues for a period of 2 weeks.

Post-operatively the patient mobilised non-weight bearing using crutches for two weeks. At two weeks, the plaster was removed. There was no evidence of a wound or graft infection and the patient had no neurovascular deficit. It was redressed with a Softpore™ dressing and the patient placed into a VACoped™ walking boot. At six weeks postoperatively, the patient was back at work and playing sport. At this point, he started experiencing some pain at night over the surgical incision site when the skin became tight, especially when rolling over in bed when sleeping. This was thought to be due to the graft sitting over the nerve and the patient was carefully monitored for a further eight weeks. There was no clinical evidence of a surgical site infection. The patient also started a course of physiotherapy for eight weeks.

At the final review, 14 weeks post-operatively, the patient was very pleased with the outcome; he had returned to work and was able to go to the gym. The pain he initially experienced at night resolved spontaneously without any residual problems. Clinical examination was unremarkable with no evidence of a palpable mass and no neurovascular deficit. The patient was subsequently discharged back to the care of his GP.

## 4. Discussion

Muscle hernias in the lower leg can present as a lump or generalised swelling with or without a history of trauma. They may cause pain, especially during exercise, as well as a loss of function. They can also cause nerve compression due to their proximity to peripheral nerves such as the common peroneal nerve.

Risk factors for muscle hernias include trauma, previous fasciotomy, chronic compartment syndrome or they may be congenital.<sup>2</sup> Differential diagnosis for such a presentation may include infection, neoplasia, muscle hernia, varicosity or a vascular

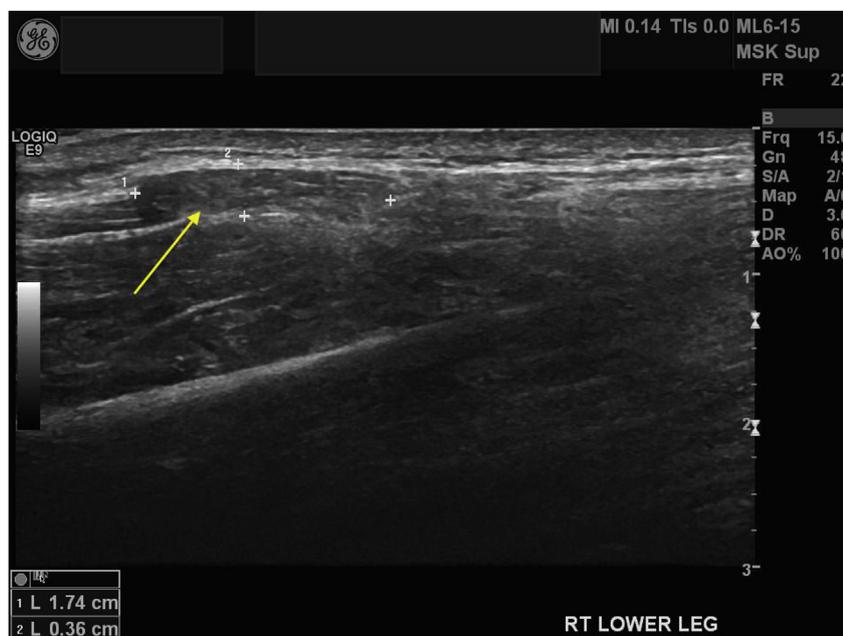


Fig. 1. Ultrasound scan showing hypoechoic area (yellow arrow, with area outlined using crosses 1 and 2).



Fig. 2. Palpable gap in fascia.

malformation.<sup>3</sup>

Because muscle herniations are rare, their diagnosis may be missed due to a lack of knowledge regarding muscle hernias amongst clinicians. This can lead to unnecessary referrals and investigations such as radiographs, bone scans and electromyography.<sup>8</sup> This can have a detrimental effect on the patient, as their diagnosis and treatment is delayed.

One difficulty with investigating muscle hernias is the lack of a gold standard for imaging, although many papers do suggest the use of dynamic ultrasound scanning as a first line investigation.<sup>8–14</sup> This is cheap, readily available, dynamic and non-invasive. There is limited literature to support the first line use of MRI; however it

may be useful if the USS is inconclusive.<sup>9</sup> MRI can measure the degree of fascial splitting and the size of herniation.<sup>14</sup> Unfortunately MRI has limitations, as patients may not be able to maintain muscle flexion throughout the longer imaging process,<sup>15</sup> is more difficult to access and is more expensive. For these reasons, MRI is rarely indicated.

Once a diagnosis of muscle herniation is made, there are conservative or surgical treatment options available. Kramer et al. described different conservative measures such as activity modification, compression stockings or bandaging, physiotherapy and the use of anti-inflammatory drugs.<sup>8</sup> Nguyen & Wheatley<sup>1</sup> described the case study of a war veteran suffering from a muscle herniation



Fig. 3. Deep dissection of soft tissues.



**Fig. 4.** Fascial defect measuring 2 × 3cm in size.

in which compressive leg wraps were used which helped reduce the size of the lump but his symptoms worsened. If conservative measures are unsuccessful or there is evidence of neurovascular compromise or compartment syndrome, then surgical intervention is required.

Surgical management includes fasciotomy or fascial patch grafting, using an autologous or synthetic mesh. GraftJacket<sup>®</sup> is denatured human cadaveric skin, which is rendered acellular. It is then freeze dried in such a way as to preserve the original matrix and its vascular channels. Once inserted, the graft will allow host cell repopulation, revascularization and conversion to host tissue. This makes it suitable for primary soft tissue repairs throughout the body. GraftJacket<sup>®</sup> has been used in the repair of large rotator cuff tears in the shoulder but to our knowledge, this is the first time it has been used to repair a fascial defect in the peroneal muscle compartment of the lower leg.

To our knowledge, there are no comparative studies on graft jacket versus other treatment options, although a variety of surgical treatments have been described, ranging from fasciotomy to anatomical repair of the fascial defect.

#### 4.1. Learning points

This case highlights the importance of considering muscle herniation as part of the differential diagnosis for a painful lump in the leg whilst excluding malignancy or infection as a cause. The use of MRI to diagnose a muscle hernia is supported by our case report. The fascial defect can then be repaired using the GraftJacket<sup>®</sup> with a successful outcome for the patient.

#### 4.2. Learning points

1. Muscle herniations (especially bilateral) are rare but clinicians should be aware that this is part of the differential diagnosis of a painful lump in the limb extremities.
2. Ultrasound scan is a useful first line investigation for such a lump but a MRI scan can help differentiate muscle herniation from other causes such as a lipoma.
3. Surgical repair of a symptomatic muscle herniation using GraftJacket<sup>®</sup> can successfully treat this condition.



Fig. 5. Superficial peroneal nerve identified and protected.



Fig. 6. GraftJacket® repair of fascial defect.

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