# Sports Tips and Tricks: Endoscopic Fasciotomy for Exertional Compartment Syndrome

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## Introduction

Exertional Compartment syndrome is a condition characterized by reversible ischemia of the muscles of compartment due to exercise. The cause of exertional compartment syndrome has not been definitively identified, but fascial herniations and decreased capillary density have been implicated (1). Second to medial tibial stress syndrome, exertional compartment syndrome is the second most common exercise induced leg syndrome, and it is estimated that one out of eight young patients with exercised-provoked leg pain suffers from chronic exertional compartment syndrome (2). The syndrome is characterized by severe aching or burning pain and a feeling of tightness that is located in the leg compartments with exercise (3). Symptoms are reproduced by exercise and patients can often predict how long the symptoms will last. The pain can also be associated with paresthesias of the dorsum of the foot or first webspace. The results of invasive dynamic compartment pressure measurement are essential to the diagnosis of exertional compartment syndrome (4). Pathologically elevated muscle compartment pressures are defined as resting (pre-exercise) compartment pressure >15 mmHg, immediate (1 minute) post-exercise pressure >30, 5 minutes >20, or 15 minutes >15 (5). If conservative therapies including rest, anti-inflammatory medications, activity modification, alteration of running technique, and physical therapy fail then fasciotomy is considered the therapy of choice (5).

It is important to review the risks and benefits of surgery so that the patient can make an informed decision before proceeding with surgery. For some patients, activity modification may be preferable to surgery when weighed against the expected outcomes and the risks inherent to surgery. For example, scarring is important to many patients, and some recreational athletes may prefer to change their sporting activities rather than sustain permanent visible scars on their legs. Using an endoscopic approach scarring and the risk of wound problems can be minimized, but the small incisions are still necessary.

## Case Example

In this case, the patient is a 20 year old male collegiate squash player who experienced bilateral leg pain with exercise and competition. Compartment syndrome pressure measurements were obtained pre-operatively and revealed elevated pressures consistent with exertional compartment syndrome in the anterior and lateral compartments of both legs. Due to the patient's active lifestyle and lack of improvement with a conservative approach it was recommended that he proceed with fasciotomies of the affected compartments.

The description of endoscopic fasciotomies is as follows and was utilized in the care of this patient.

The patient is positioned supine. Following satisfactory induction of general anesthesia, both legs are prepped and draped in the usual sterile fashion. A conforming gauze bandage soaked in betadine can be used to create a luggage tag to suspend the legs by the great toes and second toes from a candy cane stirrup positioner during surgical skin preparation. Following prepping and draping, the leg is exsanguinated using an Esmarch rubber bandage. The tourniquet is then inflated to 325 mm Hg.

With respect to surgical incisions, the tibial crest is marked along its length and the lateral malleolus is outlined. To access the anterior and lateral compartments two 3cm longitudinal incisions are created on the anterolateral leg. The distal is centered 12.5 cm proximal to the lateral malleolus and 5cm lateral to the tibial crest. The proximal incision is made 12 cm proximal to the first and 6cm lateral to the tibial crest. The incisions are made in line with each other to improve cosmesis (Figure 1).

The superficial peroneal nerve emerges from the lateral compartment at approximately the level of this distal incision. Through this incision the superficial peroneal nerve can be readily identified and protected. Using a scalpel the skin is incised and the dissection is carefully continued to the level of the fascia using Metzenbaum scissors. Care is taken to avoid injury to the superficial peroneal nerve. At this level the intermuscular septum that divides the anterior compartment from the lateral compartment is often visible. The Metzenbaum scissors are used to raise flaps superficial to the fascia.These full-thickness flaps are created large enough for sufficient visualization of the anterior and lateral compartments, but their size is limited to minimize the creation of subcutaneous dead

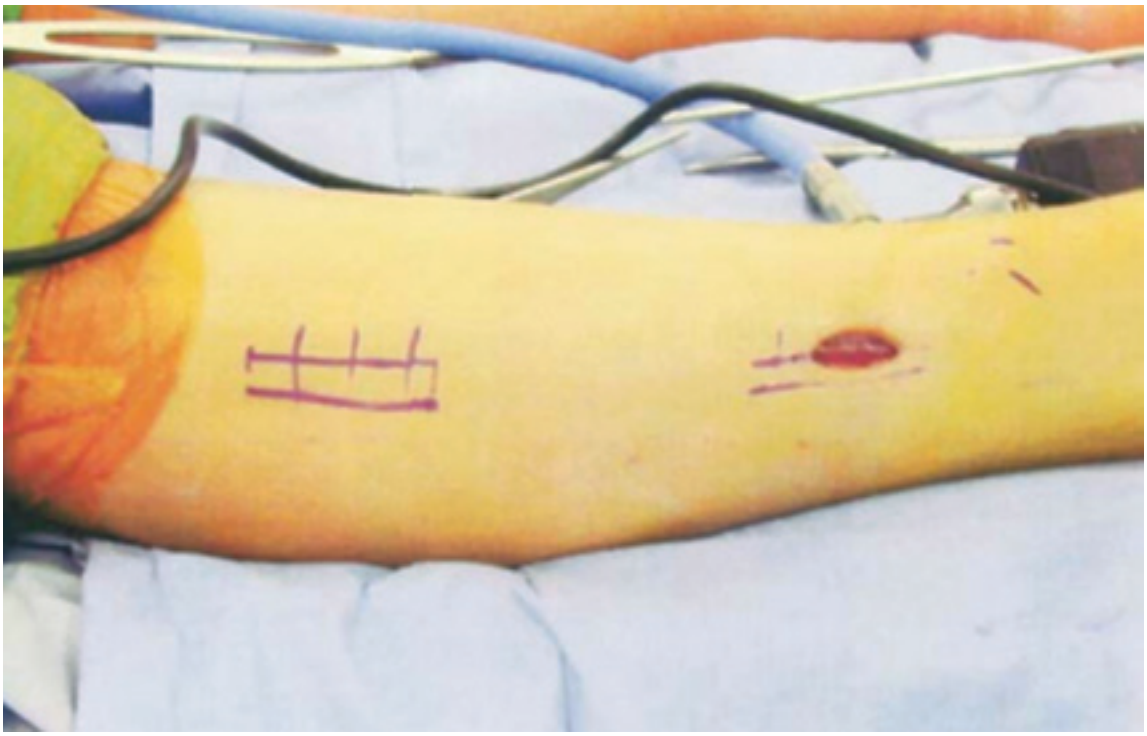

**Figure 1.** The distal incision is centered 12.5 cm proximal to the lateral malleolus and 5cm lateral to the tibial crest. The proximal incision is made 12 cm proximal to the first and 6cm lateral to the tibial crest. The incisions are made in line with each other to improve cosmesis.

space. Using a scalpel, a longitudinal rent of approximately 1 cm in length is created in in each compartment.

The endoscope will then be introduced to continue the dissection subcutaneously. A plastic Yankauer suction device is manually straightened. The Yankauer will be used to elevate tunneled flaps in the line of intended subcutaneous fasciotomies. The long blade of an Army/Navy retractor is introduced deep to the flap with the blade directed distally and centered over the rent in the fascia of the anterior compartment. The Yankauer is introduced deep to the blade of the retractor and a tunneled subcutaneous flap is created directly over the anterior compartment. The fasciotomy is continued distally with Metzenbaum scissors until it can no longer be directly visualized. Then an assistant holds the retractor while the endooscope is introduced deep to the blade of the retractor and the Metzenbaum scissors are used to carefully continue the fasciotomy under endoscopic visualization (Figure 2).

Superficial vessels and nerve branches are often encountered and in most cases they can be elevated, isolated, and avoided while continuing the fasciotomy. This preserves cutaneous sensation and limits postoperative hematoma. The light source is visible through the skin and dissection is not continued past the lateral malleolus. In a similar fashion, the Yankauer is used to create a subcutaneous tunnel and under endoscopic visualization the proximal aspect of the anterior compartment fasciotomy is extended proximally. The distal and proximal aspects of the lateral compartment fasciotomy are also carefully extended. During release of the anterior to lateral compartment, the superficial peroneal nerve can often be visualized with the endoscope. The endoscope light source is visible through the skin. Approximately 6 cm proximal to the distal incision the marker is used to mark spots to indicate the proximal extents of the anterior and lateral compartment fasciotomies created through the distal incision.

The proximal skin incision is created in a similar manner as the distal incision. Through the proximal skin incision rents are created over the anterior and lateral compartments and subcutaneous tunnels are created with the Yankauer and directed toward the marks that indicate the proximal extent of the fasciotomies. The proximal fasciotomies can then be created and connected with the proximal extents of the distal

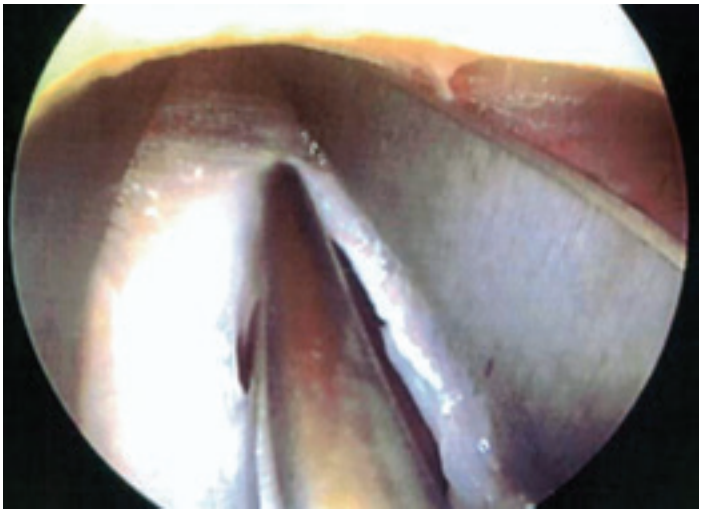

**Figure 2.** The fasciotomy is continued with Metzenbaum scissors until it can no longer be directly visualized. Then an assistant holds the retractor while the endoscope is introduced and the Metzenbaum scissors are used to carefully continue the fasciotomy under endoscopic visualization. Here a long forceps is used to retract while the fascia over the anterior compartment is incised with Metzenbaum scissors.

fasciotomies to create complete fasciotomies of the anterior and lateral compartments. The proximal fascia is often more robust than the distal fascia and superficially an oblique fibrous layer is often appreciated in the proximal third of the leg. On the deep aspect of the fascia a translucent layer of fascia is sometimes encountered and if it is not appreciated and incised it may result in incomplete fasciotomy and persistent symptoms. Oftentimes muscle under pressure will bulge through the completely incised fascia (Figure 3). This bulging appearance is not always apparent and may be more common in patients with elevated resting and pre-exercise compartment pressures. When this muscle bulging is visualized, however, it is indicative of complete fasciotomy. A single-incision endoscopic fasciotomy technique has also been described (6). A cadaver study compared single-incision endoscopic technique to double incision technique and found 83% and 81% release of the anterior and lateral compartments via single incision compared to 99% and 96% release via dual incision technique (7).

Although exertional compartment syndrome of the posterior compartments is much less common than compartment syndrome of the anterior and lateral compartments, the posterior compartments can be released through a separate incision along the medial border of the anterior aspect of the tibia. A 5 cm incision is created just medial to the palpable medial border of the tibia and the fascia of the superficial posterior compartment is incised under direct visualization. The proximal aspect of this incision is located even with the distal aspect of the lateral proximal incision. The fasciotomy of the superficial posterior compartment is then extended under endoscopic visualization in both a posteroproximal direction and posterodistal direction. to create and trapezoidal shaped fasciotomy. The deep posterior compartment is then released with access through the superficial compartment adjacent to the medial tibia. Care is taken to protect the saphenous vein as it is located just medial to the incision.

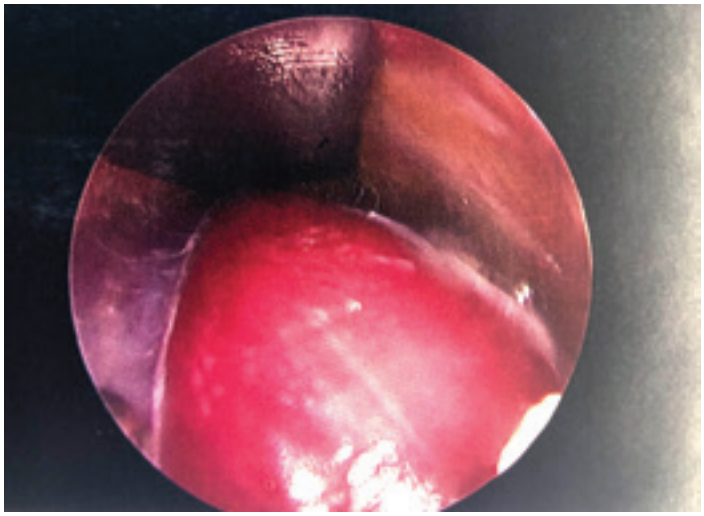

**Figure 3.** At times, muscle under pressure will bulge through the completely incised fascia. This bulging appearance is not always apparent and may be more common in patients with elevated resting and pre-exercise compartment pressures. When this muscle bulging is visualized, however, it is indicative of complete fasciotomy of a compartment with an elevated resting pressure.

After complete fasciotomies of all involved compartments are completed, the tourniquet is deflated and hemostasis is achieved. The incisions are closed with 3-0 nylon sutures. Horizontal mattress sutures are utilized to minimize skin tension while preserving perfusion. Finally, sterile dressing are applied. The patient may bear weight as tolerated and follows up in 1-2 weeks for wound check and suture removal. Physical therapy is initiated two weeks following surgery with gradual progression back to athletic activities.

## References

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