



## Fasciotomy Significantly Improves Symptoms in Chronic Exertional Compartment Syndrome

Mr. Luke Thornton\*, Mr. Calum Thomson, Mr. James Chapman, Mr. Siva Sirikonda

Broadgreen Hospital, Liverpool Foundation Trust, Thomas Drive, Liverpool, L14 3LB, United Kingdom

\*Corresponding Author: Mr. Luke Thornton, Broadgreen Hospital, Liverpool Foundation Trust, Thomas Drive, Liverpool, L14 3LB, United Kingdom.

### Abstract

**Introduction:** Chronic exertional compartment syndrome (CECS) is a rare cause of chronic exertional leg pain. Debate exists regarding whether or not patients benefit from compartmental decompression over conservative treatment. Further, whether fasciotomy or a minimally invasive approach is superior and all compartments vs selective compartment decompression.

**Objectives:** To assess outcomes following selective fasciotomy for chronic compartment syndrome over a 4 year period.

**Study Design & Methods:** We retrospectively reviewed patients undergoing fasciotomy over a 4 year period. Operative treatment was a selective fasciotomy with full visualization of neurovascular structures. We collected PROMS (MOXFQ) data pre-operatively and at 6- and 12-months post-operatively. Patient case notes were reviewed for potential post-operative complications.

**Results:** 30 patients were identified undergoing 48 operations. M:F was 23:7. Median age was 39. Pre-op MOXFQ score was 48. Post-op MOXFQ scores were 19 and 21 at 6- and 12-months, respectively ( $P < 0.005$ ). Two patients (4%) developed recurrence requiring revision fasciotomy and 1 patient had significant wound breakdown. Other complications included wound infection ( $n=5$ ), saphenous nerve injury ( $n=1$ ) and chronic pain ( $n=1$ ).

**Conclusions:** Selective compartment fasciotomy significantly improves symptoms in chronic compartment syndrome ( $p < 0.0005$ ). No superficial peroneal nerve injury and a low recurrence rate supports the use of open compartmental decompression. We report a similar complication rate compared to available literature, despite our patient cohort being older and more co-morbid. Research should focus on a randomized control trial (RCT) of operative vs conservative treatment and minimally invasive vs open approach.

**Keywords:** chronic compartment syndrome, fasciotomy, foot and ankle, surgery, orthopaedics

### 1. INTRODUCTION

Chronic exertional compartment syndrome (CECS) is a rare cause of chronic exertional leg pain. It commonly occurs in young patients, athletes, runners and military personnel [10]. There is no difference in incidence in males or females [10]. Whilst its pathophysiology is unclear, it most commonly occurs in the anterior and/or lateral compartments of the leg [1].

Presentation is typically with pain in the associated compartment with a 22 month delay in diagnosis [5]. Pain onset is at the same time, distance or intensity of exercise and typically worsens with continued activity. Symptoms are bilateral in approximately 70% of cases [2]. It has significant lifestyle implications for patients

due to restrictions in physical activity secondary to exertional pain, particularly given the potential for delay in diagnosis [5].

Fasciotomy is traditionally the gold standard treatment and this remains so in our unit. A trial of conservative management can sometimes be instituted, however this is associated with significant loss of earnings and delayed return to function if it fails [3]. It remains unclear objectively how much patients benefit from fasciotomy and how common potential complications are.

The gold standard investigation is with dynamic compartment pressure measurement. Not all units in the United Kingdom (UK) will have the facilities available to measure compartment

pressures and this may contribute to the delay in diagnosis. However, as with compartment pressures in acute compartment syndrome, their use and interpretation is controversial and the emphasis should be placed on the clinical history [9]. Other investigations include those to rule out other differentials, including vascular claudication, stress fractures, nerve entrapment syndromes and fascial herniation.

Definitive management is with fasciotomy. Traditionally, this is via open approach, with selective decompression of the affected compartment. Subcutaneous minimally invasive decompression with or without endoscopic assistance is also described, however this may be associated with an increased incidence of neurovascular injury and post-operative complications [6].

We retrospectively review patient reported outcome measures (PROMS) and any post-operative complications for all patients undergoing traditional fasciotomy for chronic compartment syndrome over a 4 year period at our large teaching hospital in the UK.

**2. METHOD**

We retrospectively reviewed all patients undergoing fasciotomy for chronic compartment syndrome from 2014 to 2018. Pre-operatively all patients underwent compartment pressure monitoring of all leg compartments using Stryker pressure monitors to support a clinical diagnosis. Readings were taken prior to exercise and at 1 and 5 minutes after the patient had exercised. Resting pressures of  $\geq 15$  mmHg and post-exercise pressures greater  $\geq 30$  mmHg at 1 minute or  $\geq 20$  mmHg at 5 minutes post exercise was deemed diagnostic [2].

Operative treatment was selective fasciotomy with full visualization of neurovascular structures. Patients undergoing bilateral fasciotomy were classed as undergoing two separate operations. No pre-operative antibiotics were given and a thigh tourniquet was used in all cases. Closure was routinely performed with 2-0 Vicryl to the subdermal plane and 3-0 Monocryl in the subcuticular plane. A simple Mepore dressing with wool and crepe bandages was used.

Patients were routinely followed up at 2 and 6 weeks and 6 months. Patients were asked to fill in PROMS at the 6 month review and by post at 12 months. PROMS used was the Manchester/Oxford Foot and Ankle

Questionnaire (MOXFQ). This produces a score from 0 (best) to 100 (worst) based on function, pain and appearance [7].

Electronic patient case notes and clinic letters were carefully reviewed retrospectively for potential post-operative complications.

**2.1. Statistical Analysis**

Unpaired T-tests were performed to assess for statistical significance. All analyses were undertaken on Microsoft Excel 2018. A P-value of  $<0.05$  was considered to indicate statistical significance.

**3. RESULTS**

30 patients were identified undergoing 48 operations. 16 patients (53%) had bilateral disease and 1 patient required revision of a bilateral fasciotomy. M:F was 23:7. Median age was 39.

29 operations were performed for decompression of the anterolateral compartments. 10 operations were performed for posterior compartment decompression. 5 operations were performed for decompression of all lower limb compartments. 4 operations were performed for isolated anterior compartment decompression; 2 of these were a revision case for recurrent symptoms.

**Table 1.** Number of Operations Performed by Compartment Decompressed.

Compartment(s) Decompressed	Number of Cases
Anterior only	4/48 (8%)
Anterolateral	29/48 (60%)
Posterior (deep and superficial)	10/48 (21%)
All	5/48 (10%)

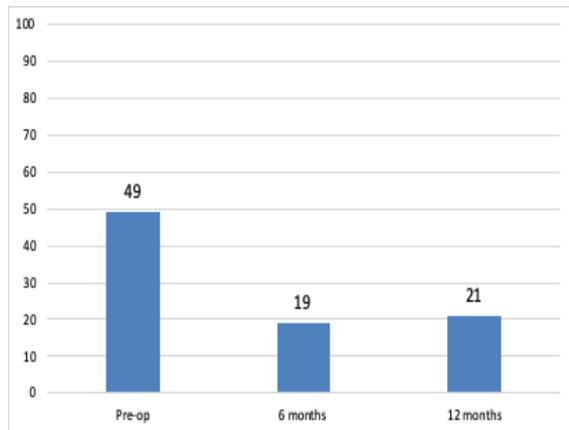
46 out of 48 cases appropriately returned the MOXFQ PROMS questionnaire pre-operatively. 31 patients returned the MOXFQ PROMS questionnaire at 6-months follow up post-operatively. 20 patients returned the MOXFQ PROMS questionnaire at 12-months post-operatively in person or via post.

Mean collated pre-op MOXFQ score was 48/100. This reduced to 19 and 21 at 6- and 12-months post-operatively, respectively (Figure 1;  $P = < 0.005$ ).

4 patients developed a wound infection, which settled without issue with outpatient oral antibiotics. 1 patient also required admission for intravenous antibiotics for cellulitis of their wound. 1 patient sustained a clinical saphenous

nerve injury following posterior compartment decompression. 1 patient was deemed to have developed complex regional pain syndrome and was promptly referred to the local pain team.

2 patients (4%) developed recurrence requiring revision fasciotomy. 1 patient unfortunately developed significant wound breakdown, which subsequently required a skin graft performed by the plastic surgery team.



**Figure 1.** Pre-op and Post-op MOXFQ Scores (6- and 12-months; /100)

#### 4. DISCUSSION

In our study 30 patients underwent 48 operations. M:F was 23:7. Median age was 39. The male preponderance observed was similar to other studies in the literature, however our average age was significantly higher [3]. We hypothesise our study is likely to be more representative of the general population compared to previous reports, which focus exclusively on young patients and military and athletic populations [3].

Operative treatment was selective fasciotomy with full visualization of neurovascular structures. Subcutaneous minimally invasive decompression with or without endoscopic assistance is also described, however may be associated with superficial peroneal nerve injury and a greater incidence of post-operative haematoma [4]. However, there is no current study directly comparing the two methods due to significant variability in practice, documented surgical technique and outcome measures used post-operatively [4,7].

46 out of 48 cases appropriately returned the MOXFQ PROMS questionnaire pre-operatively. 31 patients returned the MOXFQ PROMS questionnaire at 6-months and 20 patients returned the MOXFQ PROMS questionnaire at 12-months post-operatively in person or via post. We believe it is important to note that a

large proportion of those patients not returning questionnaires were discharged due to complete resolution of symptoms prior to 6- and 12-months.

We demonstrated significant improvement in symptoms following fasciotomy ( $P < 0.005$ ). Mean pre-op MOXFQ score was 48/100. The main improvement was within 6-months of surgery, with a mean MOXFQ score of 19/100. This was maintained at 12-months with no further improvement, with a mean MOXFQ score 21/100. This observed effect may be negatively skewed secondary to early discharge of patients with uncomplicated post-operative courses and complete resolution of symptoms. This compares to other reports in the literature, with a recent meta-analysis suggesting an overall satisfaction rate of 84% in surgically managed patients, although comparison is difficult due to difference in efficacy measures and surgical technique [3].

Complications reported were also comparable with current literature [3]. The majority of complications settled promptly without significant sequelae for the patient. Using our approach, there was no superficial peroneal nerve injury in any patient. Recurrence was similar to current literature, with a recurrence rate requiring revision fasciotomy of 4% [3].

#### 5. CONCLUSION

Fasciotomy significantly improves symptoms in chronic compartment syndrome. No superficial peroneal nerve injury and a low recurrence rate supports the use of selective open compartmental decompression. We report a similar complication rate compared to available literature, despite our patient cohort being older and more co-morbid. Further research should focus on the development of a randomized control trial (RCT) of operative vs conservative treatment and minimally invasive vs open surgical approach.

#### Funding or Conflicting of Interests

None

#### REFERENCES

- [1] Brennan F, Kane S. Diagnosis, treatment options, and rehabilitation of chronic lower leg exertional compartment syndrome. *Curr Sport Med Rep.* 2003;2:247–250.
- [2] Canale S. *Campbell's operative orthopaedics.* 9. Philadelphia: Elsevier; 1998. pp. 405–1411.
- [3] Campano D. *et al.* Surgical Management for Chronic Exertional Compartment Syndrome of

- the Leg: A Systematic Review of the Literature. *Arthroscopy*. 2016 Jul;32(7):1478-86.
- [4] De Fijter WM. *et al.* Minimally invasive fasciotomy in chronic exertional compartment syndrome and fascial hernias of the anterior lower leg: short- and long-term results. *Mil Med*. 2006 May;171(5):399-403.
- [5] Frontera W. *Essentials of physical medicine and rehabilitation*. Canada: Hanley and Belfus; 2002. pp. 256–261.
- [6] Leversedge F, Casey P, Seiler J, Xerogeanes J. Endoscopically assisted fasciotomy: description of technique and in vitro assessment of lower-leg compartment decompression. *Am J Sports Med*. 2002;30(2):272–278.
- [7] Maffulli, N. Single minimal incision fasciotomy for chronic exertional compartment syndrome of the lower leg. *J OrthopSurg Res*. 2016; 11: 61.
- [8] MorleyD. *et al.* The Manchester–Oxford Foot Questionnaire (MOXFQ). *Bone Joint Res*. 2013 Apr; 2(4): 66–69.
- [9] Padhiar N *et al.* Systematic review and recommendations for intracompartmental pressure monitoring in diagnosing chronic exertional compartment syndrome of the leg. *Clin J Sport Med*. 2012 Jul;22(4):356-70.
- [10] Shah S, Miller B, Kuhn J. Chronic exertional compartment syndrome. *Am J Orthop*. 2004;33(7):335–341.

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