Acute Compartment Syndrome after Lower Leg Fracture

Long-Term Results of Prophylactic and Therapeutic Fasciotomy

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Abstract

Background: In acute situations, fasciotomy can be done prophylactically or as early therapeutic decompression, the latter being performed as soon as the first symptoms of compartment syndrome are present. Patients and Methods: Results of fasciotomy after lower leg fracture performed between 1992 and 2001 were reviewed with emphasis on the efficacy of treatment and morbidity of the procedure sec. Patients, divided into a prophylactic group (A) and a therapeutic fasciotomy group (B), were interviewed and examined, focusing on late sequelae of compartment syndrome and of the fasciotomy sec.

Results: 52 patients were followed up after a median period of 40 months, 18 in group A and 34 in group B. All fractures in group A were operated within 24 h, one third of patients in group B underwent surgery later. In group A, one short foot syndrome was found. In group B, five amputations were performed for ischemic muscle necrosis, two short foot syndromes were observed, and five legs showed other late compelling signs of manifest compartment syndrome. In the 31 legs without sustained compartment syndrome, only seven had no fasciotomy-related abnormalities besides a scar; reduced endurance and swelling were most frequently found. An iatrogenic superficial peroneal nerve lesion was diagnosed in seven legs.

Conclusion: Outcome after prophylactic fasciotomy seems to be superior to that after early therapeutic decompression. Though prophylactic fasciotomy is effective, its morbidity is quite high, with long-term consequences in three quarters of patients.

Key Words

Acute compartment syndrome · Fasciotomy · Tibial fracture · Long-term results

Introduction

Acute compartment syndrome occurs when fluid accumulates within a muscle compartment enclosed by tight osteofascial envelopes. This results in elevated tissue pressures with reduced capillary circulation leading to ischemia and irreversible damage to muscles and nerves [1]. Early decompressive fasciotomy prevents this neuromuscular damage [2]. Ischemia tolerance of muscle tissue without irreversible damage is generally agreed to be 4–6 h [2, 3]. Most compartment syndromes occur in the lower leg, generally after a tibial fracture [3–5]. Fasciotomies in acute situations can be divided into two groups: early prophylactic decompression and therapeutic fasciotomy, which is performed when the first symptoms of compartment syndrome are present. Generally accepted clinical signs include tenseness on palpation, disproportional pain, paresthesia, present pulses, decreased range of motion at the ankle joint, and pain on passive muscle stretch.

In this study, we retrospectively reviewed the results of patients after lower leg fracture with either prophylactic or early therapeutic fasciotomy with emphasis on the efficacy of early treatment and the morbidity of the fasciotomy sec.
Patients and Methods

All patients with lower leg fracture who underwent fasciotomy at our center from 1992 to 2001 were included in this study. Compartment syndrome was diagnosed by the consulting surgeon. As this is a retrospective study, no strictly defined set of signs for compartment syndrome was made available or used. The consulting surgeon was free to use intracompartmental pressure measurements to confirm his diagnosis. Immediately after diagnosis, fasciotomy was performed; all four compartments were opened by a perifibular approach via one lateral incision [1, 5]. The skin was left open, and the preferred method of secondary wound closure was the vessel loop shoelace technique [6].

Personal data were extracted from the medical records, including trauma mechanism, fracture type (classified according to the AO) and severity of soft tissue injury [7–9]. Initial treatment, related complications and subsequent operations were scored. If patients had a bilateral lower leg fracture and fasciotomy, they were only analyzed for the leg that had been operated first. At follow-up, patients were interviewed on social functioning and satisfaction. The affected limb was examined, focusing on the possible sequelae of compartment syndrome or fasciotomy.

For the purposes of analysis, patients were divided into two groups. Group A, the prophylactic fasciotomy group, included patients who underwent immediate decompression as part of the initial fracture treatment before clinical signs of a compartment syndrome were present. Group B, the therapeutic fasciotomy group, included those in whom decompression was carried out as soon as the first signs of compartment syndrome were observed by the attending medical staff.

If amputation because of ischemic muscle necrosis had been performed or a short foot syndrome was seen at follow-up, patients were considered to have had compartment syndrome that was treated too late. Other sequelae of a fasciotomy that was performed too late were defined as equine position of the foot, sensory deficit at the foot sole or at the first web space, or discrete claw toes (without short foot syndrome). If patients had two or more of these minor signs upon physical examination, they were arbitrarily considered to have had compartment syndrome.

All nonamputated patients were invited for long-term follow-up examination. They were asked to appoint a final score to their fasciotomy scar and to the “overall function” of their leg on a visual analog scale (VAS): 100 points was the optimal and 0 the worst outcome.

Finally, group C was comprised of patients from both groups A and B who had no sequelae of compartment syndrome at follow-up, in other words in whom fasciotomy had been performed in a timely manner. This group was studied for possible side effects of the fasciotomy sec: lower muscle strength, an anamnestic reduction in endurance, swelling of the lower leg (circumference increased by $\geq 10$ mm in comparison to the

![Figure 1. Patient enrollment. CS: compartment syndrome; FU: follow-up.](image-url)