Acute lower leg compartment syndrome

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Acute compartment syndromes in the lower leg are well recognized following major trauma. However, although rare, they may occur following seemingly minor sporting injury. A case of acute compartment syndrome, following a football game and affecting the peroneal or lateral compartment, is described, in which prompt diagnosis and treatment led to a satisfactory outcome. The diagnosis and surgical management of acute compartment syndromes are discussed. Early recognition and treatment are important in the prevention of long-term disability.

Keywords: Compartment syndrome

A compartment syndrome is said to exist when the pressure within a fixed fascial compartment is raised sufficiently to result in tissue ischaemia leading to neuromuscular compromise. This compromise may be spontaneously reversible on rest with no permanent sequelae, as in the chronic compartment syndrome seen in athletes. The pressure may, however, be sufficiently high to cause potentially permanent damage unless urgent measures are introduced to reduce the intracompartment pressure – acute compartment syndrome.

Acute lower leg compartment syndrome is most often seen following severe trauma to the lower leg, commonly a closed tibial fracture or severe muscle contusion, but a wide variety of causes has been identified¹.

Chronic compartment syndrome is a common problem among athletes. Acute compartment syndrome in the absence of a major injury may also occur, and the consequences of failure to make the diagnosis and institute urgent treatment may be disastrous both for the patient and the attending doctor². Prompt diagnosis and treatment should lead to a full recovery.

Case history

A 28-year-old man presented to the Accident and Emergency Department complaining of severe pain over the lateral aspect of the left lower leg following an amateur game of football. Although sustaining several minor knocks he could recall no specific significant injury and had had no previous episodes of leg pain. On direct questioning he admitted to paraesthesia over the dorsum of the foot.

On examination he was noted to have a tense, exquisitely tender peroneal compartment. There was reduced light touch and pin-prick sensation in the distribution of both deep and superficial peroneal nerves. There was objective motor weakness, Medical Research Council grade 2, of the foot evertors.

A clinical diagnosis of acute compartment syndrome was made. Before surgical decompression the compartment pressure was measured and found to be raised to 60 mmHg.

A complete open fasciotomy was performed. The peroneal musculature was found to be oedematous with multiple areas of intramuscular haemorrhage. No focal bleeding point was found. The wound was dressed and the leg elevated for 3 days, after which delayed primary closure of the skin was performed without tension. A coagulation screen revealed no evidence of a bleeding diathesis.

After a period of outpatient physiotherapy the patient made a full and uneventful recovery with no subsequent neuromuscular deficit.

Discussion

Diagnosis

The musculature of the lower leg is enclosed within four fascial compartments – anterior, lateral or peroneal, superficial and deep posterior. The anterior compartment is most commonly involved but acute compartment syndrome affecting the posterior and peroneal compartments (as in the case described) have also been reported³⁻⁹.

The history usually consists of severe unremitting pain in the affected compartment, associated with sensory changes in the distribution of nerves passing through the affected compartment. There may be motor weakness of the affected musculature and pain may be exacerbated by passive muscle stretching. Peripheral pulses and capillary refill are often not affected.

Measurement of intracompartmental pressure provides an adjunct to the clinical diagnosis and the decision to intervene surgically should be based largely on clinical grounds. Whitesides *et al.*¹⁰ described a simple system for compartment pressure measurement. We have used a modification of this system using a slit needle (*Figure 1* inset), a disposable pressure transducer (T150 AD Viggo-Spectramed, Swindon, UK) and a pressure recorder (Hewlett Packard 7834A, Wokingham, UK) available in most anaesthetic departments. The equipment is pictured in *Figure 1* and outlined in *Figure 2*. A wick

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Figure 1. a Insertion of slit needle into anterior compartment, and b equipment required for compartment pressure measurement including slit needle (inset)

catheter has been preferred by some authors¹¹; however, a slit catheter has been shown to be equally effective¹².

A compartment pressure above 30 mmHg is the threshold chosen by most authors^{13, 14} as indicative of a compartment syndrome but it may greatly exceed that level.

Treatment

Surgical intervention is the only effective treatment for acute compartment syndrome. If only a single compartment is affected, only that compartment need be decompressed. A complete open fasciotomy is recommended by most authors to ensure adequate fascial release as skin bridges left between stab incisions have been shown to contribute to raised compartment pressure¹⁵.

If all four compartments require decompression the double-incision technique described by Mubarak and Owen¹⁶ is to be preferred to the single-incision fibulectomy technique¹⁷ as it is less demanding, gives

Figure 2. Diagrammatic display of compartment pressure measurement system

better exposure and is associated with fewer complications.

Skin retraction can be reduced by either insertion of loose sutures or the use of rubber bands and skin staples. The skin can usually be closed 3–5 days after fasciotomy. On rare occasions a split-skin graft may be required to cover a defect.

If surgical decompression has been performed promptly a full recovery can be expected.

To summarize:

1. Acute lower leg compartment syndrome in the absence of major trauma is rare but may occur as a result of overexertion or a relatively trivial sporting injury.
2. The diagnosis is primarily clinical; however, measurement of compartment pressure is relatively simple and adds supportive evidence.
3. The treatment of acute compartment syndrome is urgent and requires complete open fasciotomy.
4. Complete recovery can be expected following timely surgical intervention; however, failure to make the diagnosis may lead to long-term disability.

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