CASE REPORT

A delayed presentation of bilateral leg compartment syndrome following non-stop dancing

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SUMMARY

We present the case of a young man with a 48 h delayed presentation of bilateral lower limb acute compartment syndrome (ACS) affecting the anterior compartments following an extended period of dancing at a music festival. On making the diagnosis of ACS, the patient was immediately taken to theatre for fasciotomies and compartmental decompression. Repeat look fasciotomies revealed further necrosis to the muscles of the anterior compartments bilaterally and, effectively, all the muscle bellies within the anterior compartments were excised. The patient has been left with a significant functional deficit and disability. This case highlights the importance of timely diagnosis of ACS as delay in presentation can impact significantly on subsequent functional outcome and quality of life.

BACKGROUND

Acute compartment syndrome (ACS) is a potentially limb and life-threatening orthopaedic emergency. It is defined by a critical pressure increase within a confined compartmental space, leading to a reduction in perfusion pressure to the compartmental tissue.^{1–7}

It can be rapidly progressive; urgent diagnosis and treatment is necessary to prevent subsequent tissue ischaemia and necrosis.^{6–9} Management is with urgent fasciotomies and decompression of the tissue in the affected compartments.^{10–12}

ACS has an incidence quoted as 3.1/100 000 population and is 10 times more common in male patients.^{13 14} Other risk factors include diaphyseal fractures, mainly of the tibia, and young age.⁷ However, not all compartment syndromes are associated with an underlying fracture. Other causes include burns, crush injuries, severe soft tissue injuries, bleeding diatheses and sporting activity.^{13 15 16}

To the best of our knowledge, there are no cases of ACS from prolonged dancing documented in the literature. Furthermore, this case serves to emphasise the point that a delay in presentation can have disastrous outcomes for the patient, including infection, muscle contractures, chronic pain, long-term disability and even death.^{17 18}

CASE PRESENTATION

A 22-year-old Caucasian man presented to the Emergency Department 48 h after returning from an all-day dance festival where he reportedly danced non-stop for approximately 12 h. His primary symptom was intractable, severe bilateral lower leg pain affecting the anterior and lateral

aspects of his legs. He described being unable to walk for the preceding 24 h due to this persistent and severe cramping pain. He had no significant medical history and took no regular medications. He denied taking any recreational drugs but admitted to binge drinking alcohol during the festival. He was a non-smoker and was unemployed at the time of his presentation.

On the admitting examination the patient was overweight with a body mass index of 33 kg/m². There was no evidence of direct trauma to his lower limbs, with no ecchymosis, wounds or skin changes. He had pain on direct palpation over his anterior and anterolateral compartments bilaterally, worse on the right. His calf muscles were soft and non-tender bilaterally. Passive movements of his ankles and toes did not elicit pain. Motor examination was normal apart from a reduction in active dorsiflexion of his right ankle with grade 3/5 power. He had strong pulses bilaterally and sensory assessment was initially unremarkable.

INVESTIGATIONS

Bilateral anteroposterior and lateral radiographs of the legs were normal. Blood tests showed a creatine kinase (CK) value of 32 000 U/L, normal renal function and borderline raised bilirubin and alanine transaminase of 24 µmol/L and 160 U/L, respectively. The patient's urine contained ketones and haemolysed blood.

On repeat examination 5 h after admission, the patient had developed new paraesthesia in the distribution of the deep peroneal nerve, more so on the right foot. Intracompartmental pressure monitoring was performed within the anterior compartments only. A slit catheter was introduced under local anaesthetic and was attached to a transducer and pressure manometry tubing in order to evaluate intracompartmental pressures.

This yielded sustained pressures of 70–80 mm Hg in the right leg and 70–90 mm Hg in the left, with a diastolic blood pressure of 77 mm Hg. This gave bilateral δ pressures of less than 30 mm Hg (δ p = diastolic blood pressure – intracompartmental pressure). This lies within the indicatory range for a diagnosis of ACS to be made, in accordance with current British Orthopaedic Association Standards in Trauma (BOAST) guidelines.¹⁹

With such a positive rise in anterior compartment pressures, monitoring of other compartment pressures was not necessary to make a diagnosis. It was felt additional imaging modalities including ultrasound and MRI would have further delayed the patient's expedience to theatre.

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DIFFERENTIAL DIAGNOSIS

In this clinical scenario, a number of differential diagnoses should be considered. These include:

- ▶ Post-traumatic haematoma;
- ▶ Chronic exertional compartment syndrome;
- ▶ Deep vein thrombosis;
- ▶ Peripheral vascular injury and embolic events.

In these scenarios, ultrasound investigation and selective vascular studies would be pertinent to establish the correct diagnosis.

TREATMENT

A diagnosis of ACS was established 7 h after presentation and 2 h following the onset of deteriorating symptoms. The patient was taken to the theatre immediately for urgent bilateral two-incision technique fasciotomies to decompress all four compartments of both legs as recommended in current BOAST guidelines.¹⁹

The musculature of the lateral, posterior and deep posterior compartments was pristine bilaterally. There were visual abnormalities within the anterior compartment muscles bilaterally, which were markedly oedematous and dusky in appearance. The surface of all the anterior compartment muscles regained a dusky pink colour following fascial release with brisk capillary bleeding throughout each muscle belly, and it was considered possible that at least some of the anterior compartment muscle might prove viable. Therefore no excision was performed and the fasciotomies were left open and were temporarily dressed with paraffin gauze, fluffed swabs and crepe bandages.

Supportive measures included intravenous antibiotics, urinary catheterisation, intravenous fluid therapy, and serial checks of renal function and serum CK.

The patient returned to the theatre 48 h later for a second look, at which point widespread tissue necrosis was clear. Radical debridement of all the muscles of both anterior compartments was required. After a third look 48 h later, the fasciotomies were directly closed with no requirement for split skin grafts or vacuum assisted dressings.

OUTCOME AND FOLLOW-UP

Loss of the anterior compartment muscles resulted in permanent loss of active dorsiflexion of the feet or toes. The patient made slow progress in mobilising during his inpatient stay and was discharged 12 days after his admission with custom made foot-drop orthoses. His CK normalised and his renal function was within normal limits at all times.

He was referred to the local plastic surgery service for consideration of reconstructive surgery. Potential treatment methods include bilateral posterior tibial tendon transfers or free flap innervated muscle transfers. The patient currently awaits further discussion with his family and the plastic surgeons before the most suitable management option is agreed on. Regardless of choice, he faces a demanding recovery process in an attempt to regain his premorbid level of function.

DISCUSSION

Up to a quarter of ACS presentations arise in the absence of a fracture, with recognised aetiologies including burns, crush injuries and soft tissue injuries.^{14–20} However, atraumatic ACS following repetitive microtrauma has been described in a number of activities including football and running.^{15–16} Stollsteimer and Shelton²¹ presented the case of a previously fit, young college American football player who developed ACS of

an anterior leg compartment following 2 days of intense pre-season training. Archbold *et al*²² reported two cases of soldiers developing atraumatic ACS following a 6 and 8 mile run, respectively, at the end of a physical training week. These cases link ACS with prolonged exertional activity as demonstrated in the case of this patient. The other possible differential diagnosis in this case, exertional compartment syndrome, is distinguished in that the pain settles with cessation of activity and is associated with an abrupt decline in objectively measured intracompartmental pressures. Emergency surgery is not required, although elective subcutaneous fasciotomy is often indicated.^{23–24} In ACS, the pain does not settle quickly with cessation of activity and the ongoing cycle of ischaemia, oedema and further rises in pressure result in poor capillary perfusion and eventually muscle necrosis. This pathophysiological mechanism is applicable to the case and we believe this to be the first reported case of ACS caused by the microtrauma experienced during a prolonged period of dancing.

Finally, delay to diagnosis is the critical determining factor for a poor outcome from ACS.¹³ Classically, ACS in the absence of fractures is associated with a delayed diagnosis and, ultimately, fasciotomy. Thus patients in this group are more likely to suffer the devastating consequences of ACS, which could have otherwise been prevented by prompt decompression.²⁰ Altered mental state in patients who have consumed alcohol may also be a risk factor for delayed presentation and should be carefully considered when assessing patients.

Learning points

- ▶ Acute compartment syndrome (ACS) is a potentially limb-threatening and life-threatening emergency.
- ▶ Delayed presentation or recognition of ACS can lead to disastrous functional outcomes and impairment for patients.
- ▶ A significant proportion (25%) of ACS presentations is not associated with an underlying fracture and this can lead to detrimental diagnostic and therapeutic delays.
- ▶ ACS should be considered in patients presenting after activities that promote muscle microtrauma, such as dancing.

Competing interests None.

Patient consent Obtained.

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