Acute Compartment Syndrome - presenting as severe pain in an extremity out of proportion with the injury.

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SUMMARY: A 24 year old combat medic was admitted to the field hospital at Tomislavgrad in Bosnia, with a suspected forearm fracture. Radiographs did not show any bony injury. Clinical examination showed marked swelling and tenderness over the extensor compartment. The pain became more severe over the following 12 hours with the pain becoming most intensely felt in the extensors on passive extension. Fasciotomy for suspected acute compartment syndrome was carried out. Acute compartment syndrome is a common complication of extremity injury, and is a clinical diagnosis which should be suspected in all injuries with marked swelling and severe pain.

Case report

A 24 year old combat medic fell and injured his right, dominant hand some 12 hours before presentation at the field hospital. What particularly concerned him was the swelling and extreme pain. On examination there was marked swelling over the extensor aspect of his forearm giving the impression of a probable fracture (Fig 1). Neurovascular examination was normal. Movement of all fingers particularly the thumb and forefinger was reduced with discomfort on passive extension which radiated to the forearm. Radiographs did not show any forearm fracture. The patient was admitted for observation. The arm was elevated in a Bradford sling and analgesics started. Over the next 12 hours the patients condition improved the pain reduced and finger movement became easier. However there was still pain on passive extension of both the thumb and forefinger. During the following morning, whilst washing, the patient slipped and fell onto the same arm. On re-

examination there was further swelling, associated with an increase in pain, and the patient became tachycardic. Decision was made to carry out a decompressive fasciotomy. This was carried out making a long incision over the extensor compartment; inspection showed marked tissue oedema and a large contusion on the underbelly of extensor carpi radialis longus. The fascial compartments were then separated. All muscle bellies in the extensor compartment were seen to be pink and viable. The wound was left open and a saline-soaked gauze placed on the surface of the wound. Postoperative instructions included arm elevation with physiotherapy to ensure both active and passive hand movements as soon as awake (Fig 3).

Reinspection of the muscles and tissues carried out in theatre 48 hours later. This showed viable muscle without no evidence of tissue necrosis. The edges of the wound were closed and a new dressing applied. The patient was then casevaced home for application of a split thickness skin graft.

Discussion

We have recorded a case of Acute Compartment Syndrome (ACS) presenting as tissue swelling and tenderness resulting from a crush injury of the forearm following a fall. Swelling and tenderness in an extremity are a common presentation of ACS.

The pathognomic sign is pain caused by passive extension of the extremity. In this case severe forearm pain was associated with passive extension of the digits. Compartment syndrome can occur in any injured area of the limbs involving closed compartments, but most common in the lower leg (anterior tibial compartment). It has also been reported in the thigh (1), feet (2), and the extensor, flexor compartment of the upper limb and the interosseous compartment of the hand (3). The lower limb is more common than the upper, and the flexor compartment is more

Fig 1. Obvious arm swelling in affected arm.

Fig 2. Patient being operated on by authors.

common than the extensor compartment (4).

Arterial pressure is usually adequate to maintain large vessel flow despite an increase compartment pressure and a diminished microvascular perfusion. The presence therefore of palpable distal pulses does not rule out ACS.

Aetiology can be divided into 2 main groups (5,6,7):

1. ACS is caused by an increase in volume of intracompartmental contents. The most common cause involve fractures followed by soft tissue injuries, burns, snakebites and post ischaemic swelling.
2. The condition may also be caused by an extrinsic or intrinsic constriction of compartment boundaries. The extrinsic form resulting from a tight bandage or eschar formation following a severe burn. Intrinsic constriction may be caused by surgical closure of fascial defects which may represent an autofasciotomy as a response to increased compartment pressure.

Diagnosis

The mainstay of ACS is prompt awareness and the diagnosis made on assessment of the severity of pain with the degree of movement restriction, the pathognomonic sign being severe pain. Intracompartmental pressure measurements using transducers are a useful technique in assessment of compartmental pressure rises but is dependant on the availability of adequate equipment in the field setting, and is affected by the position of the limb, the position of adjacent joints, the depth of catheter insertion and by resting muscle tension.

Treatment involves the removal of extrinsic and intrinsic constrictions with the release of raised intracompartmental pressure. A fasciotomy can involve one or more compartments and the incision should be along the entire length of the compartment. There is no place for keyhole surgery. Care must be taken to avoid damage to the neurovascular structures and exposure should be optimum and the wound left open. Early closure of the wound may precipitate a rapid build up of tissue pressure as the skin would then become a constricting structure. A loose wool and crepe dressing should be applied after the procedure followed by elevation and analgesia. After a week of elevation, most wound swelling has decreased sufficiently to allow closure by delayed primary suture. Some however

Fig 3. Postoperative care.

may need split skin graft. By this stage, however, a patient is usually well enough for transfer and treatment back in a tertiary centre.

Conclusion

Acute pain in an extremity following any injury should alert the clinician to the presence of a developing acute compartment syndrome. Although ACS is usually associated with fractures, simple crush injuries involving extremities as described above should always be observed for developing ACS. It is important to realise that this is a clinical diagnosis and careful, regular clinical evaluation is essential and any delay in recognition can have disastrous consequences for the patient. It is therefore very important to understand that if ACS is present then for the extremity to be saved early fasciotomy and decompression are essential.

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