

PII: S0020-1383(97)00023-5

Compartment syndrome of the hand – a case report

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Injury, Vol. 28, No. 5-6, 411-412, 1997

Introduction

The development of a compartment syndrome is a well-recognized clinical entity. However, a compartment syndrome of the interossei muscles of the hand is an unusual development unless associated with a crush injury, a severe burn or following an injection of drugs in the anatomical snuffbox¹.

I report a case of compartment syndrome of the hand in a child following fracture of the base of II and III Metacarpal bone.

Case report

A 5-year-old boy was seen in the Emergency room with an injury to the right hand following a fall from a truck. Physical examination revealed marked swelling over the dorsum of the right hand with some swelling over the palmar aspect. There was only minimal swelling in the fingers, which were held in a neutral position at the metacarpophalangeal joint and with 10 degree flexion at the proximal and distal interphalangeal joint. The forearm muscles felt normal. The index finger appeared short, rotated and deviated ulnarwards with an increase in the first web space angle. There was a laceration about 4 cm long at the base of the thumb over the volar aspect. Movement of the small joints of the fingers was severely limited because of pain. Sensation of the fingers was normal and Doppler studies did not reveal any distal circulatory problem. At the time of admission, the blood pressure was 110/70 mmHg. The pulse remained between 100 and 120 beats per minute. Radiological assessment revealed a displaced fracture of the base of the second metacarpal and an undisplaced fracture of the base of the third metacarpal bone (Figure 1). In view of the progressive increase in swelling and pain, a compartment syndrome of the interosseous muscles was suspected. This was confirmed with tissue pressure measurement.

Examination under anaesthesia revealed firm resistance on passive flexion of the interphalangeal joints with the metacarpophalangeal joint in extension. The interossei

muscle compartments and the adductor compartment to the thumb were released through two longitudinal incisions on the dorsum of the hand over the second and fourth metacarpals as described in the literature². Exploration of the interossei spaces showed gross swelling of the first and second interossei space and moderate swelling of the third and fourth space. About 30 ml of blood was evacuated from the first web space.

There was active arterial bleeding from a digital branch of the radial artery (art. dorsal indices) and this was ligated. The thenar muscles were explored by extending the lacer-



Figure 1. Anteroposterior view showing the fractured base of the second and third metacarpal. There is a gross displacement of the second bone.

ated wound over the base of the thumb, and were found to be normal. Although the muscles were haemorrhagic, they were contractile to stimulation, so no muscle debridement was performed. The fracture of the second metacarpal bone was reduced and fixed with two cross K-wires. Adequate compartment release was demonstrated by an increase in movement on passive flexion of the fingers.

The following day, there was rapid return of finger movement. Surgical wounds were left open and were secondarily closed 6 days following the original surgery. At the last follow-up, the patient had regained full motor control and there was no deformity. There was full range of movements in the small joints of the fingers and full return of hand function.

Discussion

Various mechanisms of compartment syndrome of the forearm and hand in children have been described in two large series^{3,4}. There was no discussion in these series of compartment syndrome of the interosseous muscles. This syndrome in the hand is rare and has been reported before^{1,2,5}. Spinner et al.⁵ reported a series of 14 cases and emphasized the importance of early diagnosis and management. Halpern et al.¹ reported this syndrome in a 31-year-old man who developed a compartment syndrome of the first, second, and third dorsal interosseous muscles following an injection of heroin into the 'snuffbox' area.

Metacarpal fractures are common but compartment syndrome secondary to this injury is extremely uncommon. In this patient, compartment syndrome was caused by bleeding from a severed dorsalis indicis artery (branch of radial artery) due to gross displacement of the distal fragment of fractured second metacarpal bone.

Each of the interosseous muscles is surrounded by a tough investing fascial layer which is inelastic. The circulation to the intermetacarpal spaces varies from the radial to the ulnar side of the hand³. The first interspace is supplied mostly from the first or second volar metacarpal arteries (deep arch); the second interspace is supplied equally from the second volar metacarpal artery (deep arch) and the second common volar digital artery (superficial arch); and the third and fourth interspaces tend to have a superficial arch predominance via the common volar digital branches. It has been suggested that the more radially situated muscles tend to be susceptible to ischaemia as the volar metacarpal arteries tend to be end arteries^{1,5}. This factor may be contributory with

the concurrent haematoma to the precipitation of compartment syndrome in the present report.

A compartment syndrome is best described by the four 'S's: *Severe pain* (out of proportion to the clinical situation), *Stretch pain*, *Sensory abnormalities* and *Swollen and tense muscle*^{3,6}. This syndrome in the interosseous muscle exhibits all but sensory dysfunction. In addition, the attitude of the hand may be helpful in diagnosing this syndrome. The metacarpophalangeal joints are extended, with the interphalangeal joints slightly flexed in the 'intrinsic minus' posture. Stretch pain in the interossei can be elicited by increasing flexion of the interphalangeal joint with the metacarpophalangeal joint held in an extended position. In the present case this was not possible, even under general anaesthesia, until the decompression was carried out. Early recognition and prompt surgical decompression is necessary to prevent irreversible damage.

Acknowledgements

The author is grateful to Dr Peter Lloyd for his help in preparing the manuscript and Mr Wayne Blair, medical photographer, Memorial Hospital. No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

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Paper accepted 5 February 1997.

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