Heterotopic Ossification of the Finger Following Closed Blunt Trauma

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Abstract A right hand dominant young ethnic Indian male developed heterotopic ossification (HO) of his right index finger after a contusion due to a fall. There were no open wounds clinically and no fractures noted on plain radiographs. Stiffness of the proximal interphalangeal joint and generalised swelling of the digit was present about three weeks after the injury. Radiographic investigations of the digit demonstrated soft tissue ossification volar to the proximal and middle phalanges. Non-operative management was instituted. This case report demonstrates that heterotopic ossification of digits can occur from closed, blunt trauma in the absence of bony injuries. Current literature on management of digital heterotopic ossification is minimal due to low incidence.

Keywords Heterotopic ossification (HO) Blunt trauma

Case Presentation

An otherwise healthy ethnic Indian manual labourer, 23 years of age and right hand dominant, presented to the Emergency Department in our hospital with right index finger pain following a fall at work; he was unsure of the exact mechanism of injury. There were no open wounds and the radiographs of the digit showed no bony injuries (Fig. 1a and b). Repeat radiographs of the digit, taken 2 weeks after the injury, during

a repeat visit to the Emergency Department again showed no bone and joint injuries (Fig. 1c and d). He was treated with analgesics and referred to our office for further reviews.

We reviewed the patient in our office about three weeks after the injury. He had no history of old injuries to the affected digit. In addition to his right index finger injury, our patient also sustained a back contusion which was treated symptomatically.

Clinical examination revealed that there was generalised swelling of the right index finger with tenderness along the volar aspect of the digit. There was a decreased range of motion of the proximal interphalangeal joint (PIPJ) of his right index finger with a fixed flexion contracture – the active range of motion was 30 to 80 degrees while passively the joint could be flexed to 100 degrees. The flexor tendons of the digit were tested and found to be in continuity. Elson's test for central slip injury was negative. There were no sensory deficits of the finger.

Our clinical diagnosis was that of a right index finger contusion with fixed flexion deformity secondary to prolonged immobilisation. Our initial management was pain control with oral analgesics and hand therapy for range of motion exercises with a resting PIPJ volar trough splint.

Radiographs of the digit, taken during another repeat visit to our Emergency Department, 4 weeks post injury, showed soft tissue heterotopic ossification on the volar aspect of the proximal and middle phalanges (Fig. 1e and f). When we reviewed him shortly after, he had persistent right index finger swelling and tenderness. Repeat clinical examination showed similar findings with limited range of motion of the PIPJ (Fig. 2a and b).

Our initial management of the heterotopic ossification of the right index finger was non-surgical – he was continued on intensive hand therapy and prescribed regular dosage of non-steroidal anti-inflammatory drugs in the form of diclofenac. As he was unable to perform strenuous manual labour due to

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◀ **Fig. 1** Radiograph of patient's *right* index finger. **a** Anterior-Posterior (AP) x-ray view taken immediately after the injury. **b** Lateral x-ray view taken immediately after the injury. **c** AP x-ray view taken 2 weeks post-injury. **d** Lateral view 2 weeks post-injury. **e** AP x-ray view taken 4 weeks post-injury. **f** Lateral view 4 weeks post-injury. Arrows point to zone of heterotopic ossification

the pain, he was also given medical leave of absence from work.

During his subsequent reviews, there was significant improvement in pain with complete resolution of tenderness. However, there was minimal improvement in the range of motion of the PIPJ. At 5 months post-injury, there was no more pain and tenderness but the active range of motion of the PIPJ of the index finger was restricted to 40 to 90 degrees. Our patient was subsequently lost to follow-up as he went overseas.

Discussion

Heterotopic ossification (HO) describes the formation of mature lamellar bone in soft tissue structures [1]. The precise pathophysiology of heterotopic ossification remains unclear, but it is certain that it increases with time. Factors required for formation of HO include a precipitating event such as local soft tissue trauma, inflammation and vasogenic edema. HO

Fig. 2 Clinical pictures taken 5 weeks post injury. **a** PIPJ of *right* index finger in full active extension. **b** PIPJ of *right* index finger in full active flexion

formation follows a process by which pluripotential mesenchymal stem cells differentiate into osteoblasts which produce osteoid [2] that mineralizes into bone [3]. This requires an inductive agent, usually a growth factor, a conducive environment, and osteogenic precursor cells [4]. HO bone subsequently develops into histologically identical native bone with the differences of being metabolically more active and the absence of a true periosteal layer [5].

Identified risk factors of HO include concomitant head trauma, spinal cord injury and hip arthroplasty [6], while frequently involved areas are large joints such as hips, knees, shoulders and elbows [7].

It has only rarely been described in the digits of the hand. Most case reports to date are HO in fingers after head injury or spinal cord injury [8–10]. Barlaan reported HO in a digit after surgical debridement of an open injury to the finger [11]. In our literature review, we did not encounter reported cases of HO in digits following closed, blunt trauma.

Radiographs are preferred as initial investigation tools for most musculoskeletal conditions and recommended in all patients with suspected HO. Anteroposterior and lateral radiographic views can confirm the presence of HO. However, the limitation is that it may take up to 6 weeks for HO to be evident on the radiograph [12]. In our case, it took 4 weeks from the injury for ossification to be evident on the radiograph.

Current management principles of digital HO are based mainly on HO in other larger joints due to its low incidence in digits and therefore little available literature.

Non-surgical management is usually implemented upon the initial presentation of HO. This includes therapy with the physical and occupational therapist and serial casting [13]. Additional therapy such as the use of non-steroidal anti-inflammatory drugs (NSAIDs) and low doses of radiation, targeted at pluripotent mesenchymal cells [14–16], may also be used. NSAIDs, particularly indomethacin, have been reported to successfully prevent heterotopic ossification. It is suggested that NSAIDs work by suppressing the migration and proliferation of inducible mesenchymal cells [17].

The recommended timing of surgical intervention for HO is based on its aetiology [18]. It is advised that surgical treatment should be considered 6 months following traumatic HO, 1 year for HO after a spinal cord injury, and 18 months following HO due to head injury [18]. Our patient was lost to follow-up within 5 months of his injury and was thus not yet an appropriate surgical candidate. The limited literature that is available [11], suggests good outcome with surgical excision.

The clinical presentation in our patient is atypical as there were no open wounds, no precipitating fractures, no concomitant head or spinal cord injuries. The blunt trauma alone has resulted in digital HO in our patient. In patients with no

osseous injuries of the digit, but with persistent stiffness, radiographs may be useful in ruling out HO. Initial management of HO in the digits should consist of hand therapy modalities and NSAIDs. When refractory to more conservative measures, there is some evidence supporting surgical debridement.

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