Reminder of important clinical lesson

Heterotopic ossification of the elbows in a major petrol burn

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Correspondence to Dr Shahriar Raj Zaman, raj.zaman@health.wa.gov.au**Summary**

A case of a young man who developed heterotopic ossification (HO) in his elbows following an accident where he sustained petrol burns to over 60% of his body. His injuries necessitated intubation, escharotomies and a protracted intensive care unit stay that was complicated by septicaemia. Several weeks after the injury, he was diagnosed with HO in his right elbow, followed by the left elbow a week later. He was commenced on a non-steroidal anti-inflammatory drug, a long-term course of a bisphosphonate and regular physiotherapy. He is now waiting for the HO bone to mature before having definitive excision of his lesions in 12-18 months time.

BACKGROUND

Heterotopic ossification (HO) in major burns is not well described in the current literature. In major burns, the incidence of HO is rare and currently no definitive management principles have been established. This case report is an addition to the existing few and refreshes important pointers regarding its diagnosis and management.

CASE PRESENTATION

A 19-year-old man previously fit and well sustained major burns to his body after an engine exploded while he was pouring petrol into it. Upon presentation to the emergency department, first aid was applied and the primary survey found vocal cord oedema resulting in him being immediately intubated. The burns were cooled with regular cold compresses, commenced on fluid resuscitation and transferred to a tertiary centre for specialist management.

He was found to have 61% total body surface area burns of mixed thickness (partial/deep and full thickness) to his face, torso, bilateral arms, hands and bilateral thighs. On arrival his arms and abdominal compartments appeared tight and subsequently escharotomies was performed. His burns required several surgeries for debridement, skin

grafting and the application of Integra (bi-layer skin replacement system) over the following week. His postoperative intensive care unit (ICU) course was complicated by sepsis and treated with tazocin for several days. He eventually was extubated, stabilised in ICU and transferred to the Burns Unit for ongoing management.

Approximately 5 weeks postinjury, during his physiotherapy rehabilitation sessions he noticed significant stiffness and pain with movement in his right elbow (figures 1 and 2). Over the next few physiotherapy sessions the pain and stiffness became worse and now also was describing of similar pain in his left elbow.

INVESTIGATIONS

The initial x-ray of the right elbow showed multiple foci of HO involving the soft tissues anterior to the right elbow joint. Subsequent x-rays of the right elbow 2 weeks after the initial x-ray showed HO now involving the posterior tissues. The limited range of motion and pain in the left elbow prompted an x-ray, which also confirmed HO in the anterior and posterior soft tissues around the left elbow. Calcium levels throughout the admission were unremarkable and alkaline phosphatase also appeared within normal limits.

Figure 1 The x-rays of the right elbow approximately 5 weeks postinjury. The HO is shown with the arrows.

Figure 2 The x-rays of the left elbow approximately 5 weeks postinjury. The HO is shown with the arrows. The pain/stiffness first began in the right elbow.

TREATMENT

The pain was managed with celecoxib 100 mg twice a day, with good control. Upon the recommendation of the specialist, etidronate (bisphosphonate) 1800 mg daily was commenced for a 3 month course.

OUTCOME AND FOLLOW-UP

He is progressing well with his regular physiotherapy. The reduced range of motion in the elbows appears to be now the predominant hindrance. He will be reviewed by the orthopaedic surgeons in 12–18 months for possible surgical resection of the lesions. He is currently being followed up on a regular basis in the burns outpatient clinic concurrently with the clinical psychology team.

DISCUSSION

HO has been described as the ‘formation of lamellar bone inside soft-tissue structures where bone normally does not exist’.¹ Various terms such as myositis ossificans, ectopic ossification and neurogenic ossifying fibromyopathy have been used to denote this condition. However, as yet no consensus on the definition and classification of HO has been established.

The history of HO dates back to 1692 when Patin described it in children. Further descriptions were made in the 19th and 20th centuries and it was in 1957 that Johnson first described HO in patients with burn injuries.² He hypothesised that prolonged immobility during the course of the illness may contribute to the formation of HO. He also emphasised the significance of avoiding passive joint motion but not normal activity.³

HO has been found to occur after traumatic injuries such as acetabular fractures, closed head injuries, spinal cord trauma, burns and after hip arthroplasty.¹ In burn victims, a rare complication, the prevalence appears to range from 1 to 3%. The most commonly affected joint appears to be the elbow, followed by the shoulder and hip joints.³

The principal signs and symptoms of HO include decreased range of motion with associated joint stiffness, a painful joint, localised swelling and possible nerve palsies

associated with the joint.⁴ With the elbow in particular, ulnar nerve palsy with intrinsic muscle weakness is a helpful sign. HO has been observed as early as 20 days after the burn injury. HO is encountered in all ranges of total body surface area burned and deeper, larger burns are associated with higher incidence of HO.^{3 4}

The aetiology of HO remains poorly understood. Research into associations between HO and HLA types and other bone proteins have yielded little or no information. At this stage, a genetic or racial predisposition has not yet been established, though men are at higher risk of developing HO than women.¹ Michelsson *et al* hypothesised that immobilisation and forcible mobilisation are the most important factors for heterotopic bone formation.⁵ In addition, patients who require longer time to definitive wound closure (>3 weeks) tend to demonstrate a greater incidence HO compared with early excision and grafting.⁶

The pathogenesis following burns is still unclear. It has been postulated that HO results from the presence of osteoprogenitor cells induced by the imbalance in local or systemic milieu that is, trauma or burn injury.⁴

Non-steroidal anti-inflammatory drug (NSAID)’s are commonly used to prevent HO in orthopaedic injuries, in particular the use of COX-2 selective NSAID’s such as celecoxib has been deemed effective.⁷ To date no trials of NSAID use in burn injuries have been conducted. The use of radiotherapy has also been shown to be effective post-orthopaedic injury for prevention of HO, though again no data available for burns injuries. Definitive evidence still eludes HO regarding the use of range of motion exercises. Michelsson *et al*’s conclusions were based on studies performed on rabbits and at this stage no human studies are ongoing. Nevertheless, it appears that more gentle exercises below the pain threshold maintains and perhaps even improves joint mobility with no consequences on bone formation.³

The mainstay of HO treatment is surgical excision in combination with rehabilitation and drug therapy. The timing of the surgical excision is controversial. However for the most part, literature suggests that the optimal timing of surgery is 12–18 months postinjury when there is

radiographic evidence of HO maturation.^{3–8} Drug treatment with bisphosphonates, specifically etidronate, has been found to be effective in treating HO in orthopaedic injuries however, only anecdotal evidence of its use is available in burns cases.^{1–6} The use of prophylactic external beam radiotherapy has been reported to be effective in orthopaedic procedures, but again no evidence available in patients with burns.^{9–10}

Learning points

- ▶ Consider the diagnosis of HO in patients with burn complaining of joint stiffness and decreased range of motion.
- ▶ Aim for early wound closure to reduce the incidence of HO.
- ▶ Time to surgical excision is controversial but suggested for 12–18 months postburn injury.
- ▶ Currently no definitive literature available regarding treatment options such bisphosphonates, radiation therapy and NSAID use in HO burns cases.
- ▶ Definitive research of HO in burns victims is needed.

Competing interests None.

Patient consent Obtained.

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