

The paediatric 'floating arm' or segmental humerus fracture - a case report

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Abstract

Segmental upper limb fractures in children are extremely uncommon with the commonest injury described being the 'floating elbow'. In this report a case is described of a 'floating arm' – flexion-type Gartland grade III supracondylar fracture of the humerus and simultaneous ipsilateral Salter Harris type II proximal humerus fracture. The management, outcome and available literature on this rare combination of injuries are discussed.

Key words: segmental humerus fracture, floating arm

Introduction

Fractures of the proximal humerus are relatively uncommon in children accounting for less than five per cent of all paediatric fractures while combined injuries in the paediatric upper limb are even more rare.^{1,4} Flexion-type supracondylar fractures are also rare, accounting for less than two per cent of paediatric humerus fractures.⁴ These injuries require large amounts of energy for them to occur. Combinations of supracondylar humerus and forearm fractures have been described as 'floating elbow' injuries⁵ which are the commonest combination of upper limb fractures in children. Ring *et al* described 16 cases of 'floating elbow' injuries over a nine-year period at a busy North American referral hospital. They advocated percutaneous K-wire fixation of all fractures to allow non-circumferential immobilisation, thus reducing the risk of compartment syndrome.⁵ This report focuses on 'floating arm' injuries, namely the combination of a supracondylar flexion-type Gartland grade III fracture of the distal humerus with ipsilateral displaced Salter Harris type II fracture of the proximal humerus. To our knowledge only three similar cases have been reported in the literature – supracondylar humerus fracture in combination with a proximal humerus fracture. Of note is the fact that all the supracondylar fractures described were of the flexion type.^{1,3}

Case report

A three-year-old girl was run over by a taxi on her right upper extremity (*Figure 1*). She was managed according to Advanced Trauma Life Support principles and cleared of all life-threatening injuries at the emergency department. Her right upper extremity had abrasions, deformity, severe bruising and swelling. Neurovascular examination was normal. Radiographs revealed a 'floating arm' flexion-type Gartland grade III supracondylar humerus fracture with an ipsilateral displaced proximal humerus Salter Harris type II fracture (*Figure 2*). A temporary back-slab was applied in the emergency room, analgesia was given and the patient was prepared for operative management.

In theatre under general anaesthesia, and with the use of an image intensifier, in-line traction was used in assisting reduction of both fractures. After antero-posterior translation correction, the supracondylar fracture was pinned first with the elbow in extension using two 1.6 mm smooth crossed K-wires. The proximal humerus was then reduced using a thumb on the proximal fragment laterally and the forefingers on the medial surface of the humeral shaft. The fracture was then pinned with two 1.6 mm K-wires (*Figure 3*).

These injuries require large amounts of energy for them to occur



Figure 1a and 1b. Abrasion, bruising and swelling of the right upper extremity



Figure 2. X-ray showing a supracondylar flexion-type Gartland grade III fracture of the humerus with ipsilateral displaced Salter Harris (SH) type II fracture of the proximal humerus

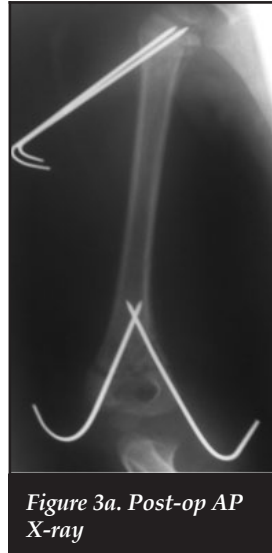


Figure 3a. Post-op AP X-ray

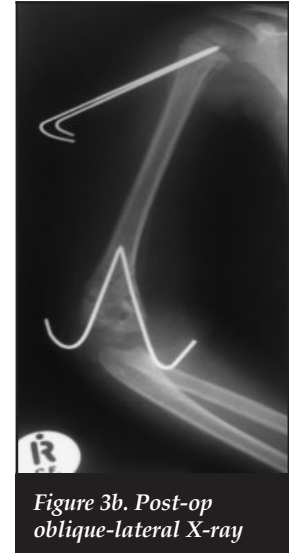


Figure 3b. Post-op oblique-lateral X-ray

The supracondylar fracture was pinned first with the elbow in extension using two 1.6 mm smooth crossed K-wires

A non-circumferential back slab was used to immobilise the right upper extremity. Post-operatively the child was neurologically intact, and was discharged home after two days. The K-wires were removed at three weeks in the out-patient department. At six-month follow-up, there was radiological union (Figure 4) and clinically full elbow and shoulder range of motion (Figure 5).

Discussion

The 'floating arm' injury is uncommon with the literature on the topic isolated to a small number of case reports.¹⁻³ The incidence of 'floating elbow' injury is three to 11 per cent⁵ while that of 'floating arm' is not reported.

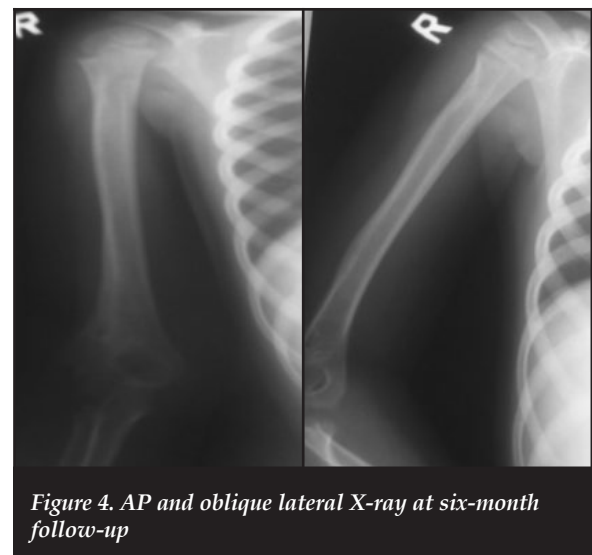


Figure 4. AP and oblique lateral X-ray at six-month follow-up



Figure 5. Clinically full range of motion at six-month follow-up

Flexion type supracondylar fractures are rare and result from a direct trauma to the posterior aspect of the elbow or a fall onto a flexed elbow.⁴ All reports of 'floating arm' are described in combination with flexion-type supracondylar humerus fractures – this may explain the reason for the associated proximal humerus fracture: the direct force sustained distally travels up the humerus from the elbow resulting in a second fracture more proximally. Long-term results following closed reduction and percutaneous pinning of flexion-type supracondylar fractures yielded good to excellent outcome in 86% of cases in a study by De Boeck where 29 children were followed up till a mean of 6.3 years.⁶ The combination of these specific injuries are extremely rare with only three cases reported.¹⁻³

Segmental fractures occur as a result of high-energy trauma and the treating surgeon should follow the routine orthopaedic tenets of examining and imaging the joint above and below the injury and be aware of the possibility of compartment syndrome. One must always remember to exclude other fractures as two of the 'floating arm' injuries also described an associated olecranon fracture.^{2,3}

The management of these complex injuries is challenging. The supracondylar fracture should be fixed first¹⁻³ followed by reduction and fixation, if required, of the proximal humerus. Due to swelling in the elbow and shoulder, closed reduction is not always possible and open reduction may be required. Good results can be expected after fixation of these fractures.^{1,3} Only one other case report describes the successful closed reduction of the supracondylar component. In the current case with marked elbow swelling, prolonged in-line traction was extremely useful in ensuring reduction of both fractures, especially as the supracondylar fracture was of the flexion type.

Conclusion

'Floating arm' injuries in children are extremely rare and only three cases have been described in the literature to date. All of the cases described were associated with a flexion type supracondylar fracture. Be vigilant to exclude this injury in children as the potential consequences of a missed injury are great, the commonest being compartment syndrome. The need for open reduction of the supracondylar fracture may be required but good outcomes can be expected with early closed reduction and K-wire fixation.

The content of this article is the sole work of the authors. No benefits of any form have been received from a commercial party related directly or indirectly to the subject of this article.

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