

Case Report

Ipsilateral fractures of both the proximal and distal humerus; the ‘floating arm injury’ in children

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ABSTRACT

Proximal humerus fractures are usually associated with other injuries in and around the shoulder joint like clavicle fracture, acromion process fracture, coracoid process fracture, and dislocation of the shoulder joint or acromion-clavicular joint. Similarly, distal humerus fractures are normally associated with fractures of olecranon, radial head or dislocation of the elbow joint itself. However, simultaneous fracture of both the ends of humerus is rarely encountered. Literature search does reveal only a few cases of such type. This variety is also termed as floating arm. We are presenting here two cases of fracture of both the proximal and distal end of same humerus following fall from height, one of which the proximal humeral fracture was Gustillo-Anderson type II open fracture. The patient was managed by wound debridement and open reduction and fixation of the proximal fracture followed by closed manipulation and K wire fixation of the distal fracture. The second case was also managed by closed reduction and K wire fixation of both the fractures.

Keywords: Floating arm, Proximal humerus fracture, Supracondylar fracture humerus, Ipsilateral, Bipolar

INTRODUCTION

Humerus fracture in children is not uncommon. In fact, distal humerus or Supracondylar humerus fracture is one of the most frequently occurring fractures in the childhood. The Shaft of the humerus fracture can also occur fairly commonly.¹ However, Proximal humeral fractures are not so common as its distal counterparts. The usual mechanisms of these fractures are fall on outstretched hand and direct landing on the elbow or shoulder from heights. The combination of distal and proximal end of humerus fractures in the same bone is extremely rare. Such fractures are termed as “floating arm injury” or “bipolar fracture of humerus”. The probable mechanism for such fractures is also poorly understood. “Floating elbow” was a term used to describe fracture of both bone forearm combined with fracture shaft of humerus of the same

limb.² Similarly, scapular neck fracture and clavicular fracture combined with fracture shaft of humerus of the same limb is termed “floating shoulder”.³ However, compared to these the occurrence of so-called “floating arm” fractures where both the ends of humerus got fractured is very less. Literature search yield only few cases of such type. Guven et al first described such a case and used the term “Floating arm injury” while reporting his case.⁴

We are presenting two cases of “floating arm injury” or “bipolar fractures of humerus” arising from a single event of fall from sufficient height. The first child sustained injury to his left arm following fall from significant height resulting Gustillo-Anderson type II open fracture of proximal metaphysis-diaphyseal area and comminuted fracture of the distal humerus. The second child also fell

from height and landed on his elbow resulting fracture of the both ends of the humerus. The cases were managed accordingly and we felt it worth reporting considering the rarity of such combinations in the same bone.

CASE REPORT

Case 1

A 12 years boy attended our emergency department following fall from a betel nut tree about 20 feet high with an injury to his left arm. He did not have any injury to head and neck area, cervical spine or thoraco-abdominal area. On examination his vitals were found stable except tachycardia and tachypnea. Left arm was found deformed with a wound over the outer aspect of proximal arm with visible fractured end and a grossly swollen elbow. The limb was extremely painful on movement. However distal radial and ulnar pulsations were normal as well as there was no neural deficiency distal to the elbow.

X-ray of the arm showed a very unusual picture (Figure 1). The humerus has got a fracture at the proximal metaphyseal-diaphyseal junction along with a comminuted fracture at the distal supracondylar area. Both the shoulder and elbow joints were seemed intact. In orthopedic terms it has got a floating arm; one rare kind of combinations of fracture caused by accidental fall. The left upper limb was immobilized and investigated for pre-operative evaluation; all came out to be within normal limits. The patient was taken for wound debridement and fixation of the fractures under general anesthesia.

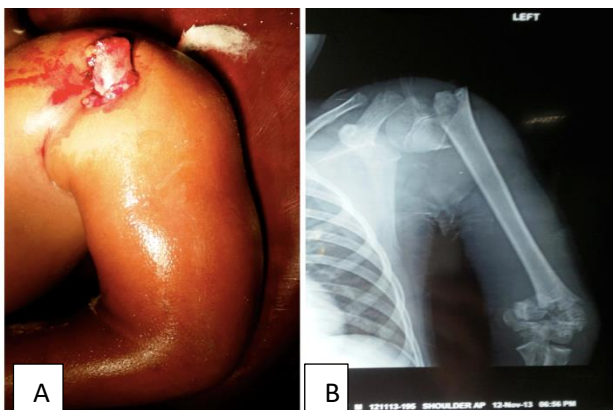


Figure 1: Pre-operative appearance and X-ray.

Since these combinations were rare for any trauma team, we also had little confusion regarding which of the fracture should be fixed first. Upon literature search for similar cases, we found that usually the distal supracondylar fracture first taking the help of one K-wire through the middle fragment for traction and then went for the fixation of the proximal fracture. But in our case since it was associated with one open fracture, we preferred to fix that one first. We debrided the wound over the outer aspect of proximal arm, extended it and thoroughly washed it. The fracture was reduced and fixed with percutaneous K-wires.

The distal supracondylar fracture was then fixed by usual method by percutaneous K-wires from the lateral side. In our case we were lucky in the sense that the arm was not that swollen for a grip for traction to reduce it.

Post-operative X-rays confirmed acceptable reduction of both the fractures (Figure 2). Immobilization of the arm was continued for three weeks on a plaster slab and then gentle elbow and shoulder movement allowed with the K-wires on. At eight weeks, the K-wires were removed and mobilization of the elbow and the shoulder started under guidance of a physiotherapist. The open wound healed well and there was no pin tract infection. The fractures united clinically with good range of movement of both the elbow and shoulder.

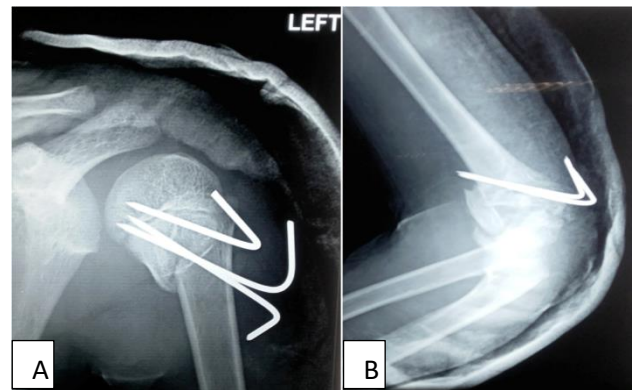


Figure 2: Post-operative X-rays.

Case 2

The child aged 10 years, fell down from a tree of about 10 feet and landed on his left elbow and sustained injury to both the shoulder and elbow. The left Elbow swollen, deformed and extremely painful. There was a small wound over the medial aspect of elbow. The left shoulder was also swollen with pain. Luckily enough, there was no injury to chest and head and neck regions.

Upon receiving at the A and E, the patient was evaluated as per ATLS protocol and ruled out any serious injury to the vital organs. Left shoulder and elbow were found swollen and extremely painful on movement. Radial pulse was palpable and no sensory or motor deficits were noted. X-ray showed fractures at both the ends; proximally at the metaphyseal area and distally at the supracondylar region (Figure 3). The fractures were not grossly displaced though. The supracondylar fracture was extension type. The patient was then evaluated for fitness for surgical intervention. Under general anesthesia, we were able to reduce the fractures in closed method. We first reduced the supracondylar fracture and put three K wires, two laterally and one medially. The small medial wound irrigated copiously with normal saline, debrided and closed primarily. Then we moved to reduce the proximal fracture and after acceptable reduction we fixed it with two K wires (Figure 4). Post-operatively, we continued the plaster slab

for three weeks and the started gradual movement of the elbow and shoulder. At eight weeks, we removed the K wires from both the fractures. The fractures healed uneventfully with good range of movement of both shoulder and elbow.

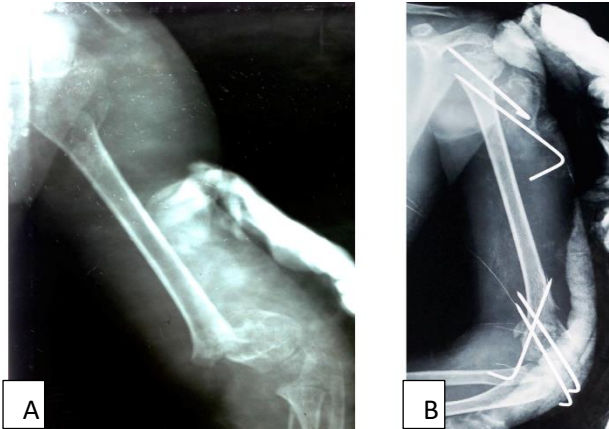


Figure 3: Pre-operative and post-operative X-rays.



Figure 4: Post-operative appearance.

DISCUSSION

Proximal humerus fracture may be associated with injuries around the shoulder like fractures of acromion, coracoid, clavicle, acromio-clavicular dislocation or dislocation of the shoulder joint itself.¹ Similarly distal humeral fractures or supracondylar fractures may be associated with injuries about the elbow such as fractures of olecranon or radial head or dislocation of the elbow joint.

The term “floating” refers to combinations of fractures in long bones where there may either fractures at both the ends of a long bone or there are fractures both proximal and distal to a limb joint. Stanitski et al first used the term “floating elbow” for the combination of ipsilateral fracture of the humerus and forearm.² Guven et al first described the term “floating arm injury” for the combination of supracondylar humeral and proximal humeral fractures in same arm.⁴ Gausepohl et al used the term “floating forearm” for a case with fracture dislocation of the elbow combined with ipsilateral unstable distal forearm fracture.⁵ The term “double floating arm injury” was used for two

fractured diaphyseal part of humerus, which do not have continuation with the proximal and distal ends.⁶ There are only few cases of floating arm injury were reported in the literature.⁷⁻⁹

Regarding the mechanism of injury, the extension types of supracondylar humerus fractures in children are due to a hyperextension injury caused by a fall on an outstretched hand with hyperextension of the elbow while the flexion types are mostly due to direct landing on the elbow.¹ Proximal humerus fractures in children are caused by a direct blow to the shoulder area or indirectly by fall on an outstretched hand.

From the similar mode of injury i.e., fall from height and landing on the elbow we can think of a common possible mechanism. To us it seems that the distal fracture is because of direct trauma from landing which takes the brunt of the initial force resulting in comminuted supracondylar fracture. Comminution is otherwise not so common in supracondylar fractures in children resulting from fall on an outstretched hand. Moreover, this fracture tends to be more of a flexion type rather than the more common extension type. The proximal fracture may be result of an indirect combined bending and rotational force, which was generated from the momentum of the falling body on the fixed elbow. The free middle fragment can move in either direction as the compression force continues and injure the soft tissue as well as skin. This explains the presence of open wounds found in either ends in these two cases. Undoubtedly this group of fractures has very low occurrence and hence it has got a lot to be studied in details.

In most of the reported cases, the authors suggested to reduce and fix the supracondylar fracture first.^{4,7,8} Because of the swelling and difficulty to give counter traction, they pose a great problem. Parmaksizoglu et al described an alternative method where they used K wire in the diaphyseal segment as a joystick for reduction of the supracondylar humerus fractures.¹⁰ Few others also found this method useful to avoid open reduction. However, we did not use this method in our cases.

Another peculiarity that we have noticed that these fractures are more common in children but extremely rare in adults. May be there is some difference of body posture or attitude while falling from height between adults and children. In both this case and another one reported they landed on their elbows. Apart from calling them ‘floating arm’ we would like to term these fractures as ‘bipolar fractures of humerus’ because of its affection of both the poles of humerus.

CONCLUSION

These fractures are fairly uncommon and occurrence of such fractures emphasizes the importance of visualization of both the joints of a fractured bone. We feel that in presence of unusual supracondylar fractures in children,

they should always be evaluated for concomitant fracture in the same limb. They can be reduced closed and considering the remodeling potential in children, a good functional recovery is achievable.

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