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Case Report

Thrower's Fracture in a Young Boy: A Case Report

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Abstract

We describe a case report of a young amateur softball player with a spiral midshaft humerus fracture. A thrower's fractures are spiral fractures of the humerus caused by forceful throwing of a ball. Although these fractures have been cited in the literature, little research exists regarding the significance of stress fractures and fatigue injuries that may precede these injuries. We treated this fracture with an unlocked elastic intramedullary nail. Thrower's fractures are less frequent than fractures related to direct trauma. In this paper we analyze the risk factors and the biomechanism behind this fracture. Knowledge of this fracture can help find the correct diagnosis without secondary images or biopsy, and the knowledge of the risk factors and injury's mechanism in the population can help reduce the risk they will occur in the future.

Keywords: Humerus; Fracture; Spiral; Throw; Throwers; Pitch; Muscular

Introduction

Thrower's fracture is a particular fracture caused by severe muscular pulling during throwing motions. Non traumatic upper extremity fracture is less frequent than fracture related to direct trauma [1]. Some authors stated that the humerus is the most commonly fractured bone by purely muscular action [2-7]. In pediatric patients with immature bones, humerus fracture frequently occurs at physis [8-13]. In adolescents the injury frequently occurs to the grown center because it represents a weaker point than ligaments, tendons and bone. Thrower's fracture usually occurs in adult patient, because they don't have weak points such us the physis and grown center. The fracture can occur during the throwing of several objects such us javelins, cricket balls, snowballs and grenades; the last one was more frequent during the second world war. In baseball players this fracture occurs more frequently than other people according to their throwing actions [14], so thrower's fracture is more frequent in USA than in the rest of the world because baseball is a very popular sport in United States. Spiral fracture of the 1/3 middle-distal humeral shaft is the characteristic pattern of fracture [2,3,7,15-20].

Case Report

A 11 year old left-hand-dominant boy presented in our emergency department (ED) with acute arm pain started during the pitch of a ball. He was a recreational player, he had been playing softball 2-3 times a week for 3 months and he had been complain-

ing of pain at right arm for a week before the fracture occurred.At physician examination the right arm was painful and swollen and the range of motion was severely limited; he had no numbness and neurological motor deficit in right upper limb, the patient's skin was intact in all areas. The x-ray showed a displaced spiral fracture in the 1/3 midshaft humerus (Figure 1).

Figure 1: AP x-ray at ED.

Upper right limb was promptly locked with desault bandage to reduce pain and he was admitted to Orthopaedic Department. He underwent surgical treatment two days later. To avoid the associated morbidity of plate osteosynthesis and rigid intramedullary nailing, closed reduction and unlocked flexible intramedullary nailing was implemented. This technique has been described in the pediatric population and in select adult cases. The history, physical exam and imaging studies led to the diagnosis of a humeral shaft stress fracture due to repetitive stress. In the supine position, with closed reduction, we made a minimal incision on the lateral side of the distal humerus, just above lateral epicondyle. We reached the intramedullary canal. The correct position of the holes was confirmed by fluoroscopy views. A 2.5 mm unlocked intramedullary nail was pre-bent. It was contoured in a C-shape and it was introduced under fluoroscopy guide until humeral proximal growth physis. We made another minimal incision on the medial side, just above medial epicondyle,. Another 2.5 mm unlocked intramedullary nail was pre-bent. It was also contoured in C shape and it was introduced in the humerus with the same procedure. (Figure 2,3). We applied two nails of the same diameter. To choose the size we used the formula proposed by Kasser and Beaty [34], (internal diameter/2-0.5 mm), in order to obtain approximately 70-80% filling of the canal and this guarantees sufficient fracture stability.

Upper limb was locked with splint. The nails were cut very long and left out of the skin. The boy was followed weekly for dressing and physical examination. The first x-ray follow-up was made the day after surgery.

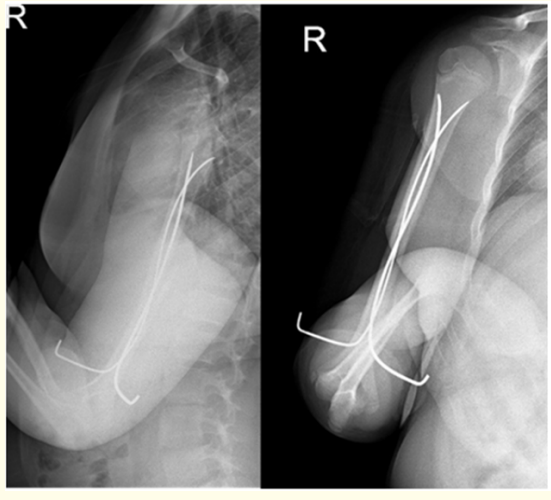

Figure 2: Lateral and A-P xray at the time of surgery treatment.

The next follow up was made after one month

Three months later we made another x-ray control of the injured humerus. It showed healing of the fracture and the presence of bone callus. Under deep sedation, the two intramedullary nails were removed. Another x-ray as control showed the healing of the fracture, the presence of bone callus and the absence of iatrogenic injury after the removing of the intramedullary nails. Afterwards the patient was clinically evaluated: the range of movement was about 120° of flexion and -5° total extension. Range of movement of pronation and supination was complete.

At 6 months follow up the range of movement of flexion, extension, supination and pronation was complete as showed in the images to follow.

The x-ray control 6 months after the trauma showed the full healing of the fracture as showed in the images to follow.

Figure 3

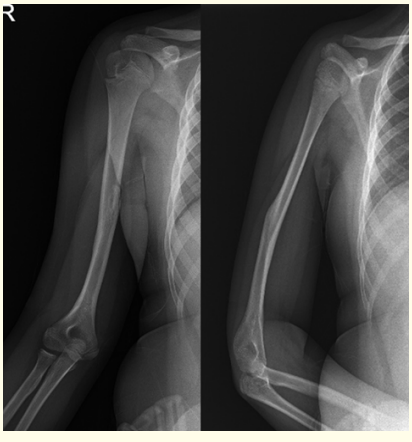

Figure 4

Discussion

Chao et al. in 1971 described about 129 humeral spiral fractures following throweng of hand grenades [17].

Ogawa and Yoshida described a series of 90 patients older than 18 years with humeral spiral fractures that occurred during recreational Japanese baseball league [20].

In 1974 Allen reported the case of a 13 old male thrower with humeral spiral stress fracture with history of prodromal pain symptoms [21].

Branch reported prodromal pain of the upper limb before the fracture in several patients [16].

R. F. Hall jr and Pankovich performed a prospective study on 89 humeral shaft fractures treated with closed reduction and percutaneous non-locked flexible intramedullary nailing. In this series they found nonunion only in a case and no cases of malunion or infection [22].

We believe that it is important to know the biomechanism, the forces and muscular performance that are at the base of the thrower's action. The throwing mechanism is particularly complex: it involves shoulder and elbow joints and several muscles.

To better understand the biomechanism of the overhead throw, we can divide it into 6 moments: 1) wind up, stride, arm cocking, arm acceleration, arm deceleration, follow through [23]. 2). During cocking phase, the deltoid abduces the humerus and the rotator cuff leads the humerus in the highest external rotation. Later, during acceleration arm phase the pectoralis major, teres major, latissimus dorsi, coracobrachialis and subscapularis bring the arm in flexion and internal rotation [24]. Lack of coordination between internal rotators such as subscapularis (that is the most important), latissimus dorsi and pectoral major, and the external rotators of the shoulder and the proximal humerus such as deltoid and rotator cuff muscles may create a midshaft torque which causes the fracture [1,2,7,25,26] when exceeding bone resistance.

Branch., *et al*. [16], in a study about humeral fractures in baseball pitchers, enumerated some risk factors:

- Age >30 years
- Long period of break from throwing
- Lack of regular exercise and training
- Prodromal arm pain.

Thrower's fractures are more common in amateur throwers due to lack of synchronized muscle activity (between internal and external rotators) and lack of proper throwing technique: they apply a torsional force around the long axis of the bone that causes the fracture [1-3,7,15,19,20,24,26-28]. Moreover, recreational players active all the rotator muscles and the biceps with more power and with unsynchronized movement [24,26].

We sustain that unsynchronized muscular activity and uncoordinated throwing styles may cause functional overuse, which is the main cause of stress fractures. In literature a correlation between the fracture of the thrower and the palsy of the radial nerve is described with a mean incidence of 10%; the probability increases with more distal and spiral fractures [1,30]. This injury with thrower's fracture and neuropraxia of the radial nerve is called Holtein-Lewis fracture [31].

We cut the extraosseous nail very long because as Lieber., *et al*. [32] stated, some problems may present when the extraosseous nail is short

- Increase of surgery time for removing the nails;
- Use of additional Xray for locating the implants.

We cut the extraosseous nails very long because reducing the surgery time may reduce the risk of deep infection and we want to minimize the exposition of pediatric patients to x-Ray.

We considered the extraosseous nails as k-wires, with the same risk of infection of the pin site.

DI Lu., *et al.* [33] stated that there is no difference in severity and frequency of infection rate with the daily, alternate days or weekly pin care. They stated that there was more anxiety in patients and parents dressing daily.

Conclusion

Throwing fractures are less frequent than fractures related to a direct trauma; moreover, these fractures are very infrequent in pediatric population for the reasons described above. We think that it was important to present this case report for two principal reasons

- This fracture, in young and healthy active adults with minimal trauma may suggest a pathological fracture with the need of secondary images or biopsy to rule out this diagnosis; so, the knowledge of this fracture can help to find the correct diagnosis without secondary images or biopsy [2].
- The knowledge of this fracture, of the risk factors and injury's mechanism in the population, can help to reduce the risk they will occur in the future.

Conflict of Interest

Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

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