

Case Report

A displaced T type intercondylar distal humerus fracture with radial nerve palsy in a 10-year-old treated by closed reduction and K wire fixation

Nikhilesh Nair*, Mohamed Sameer, J. K. Giriraj, Ghantasala Navaneeth

Department of Orthopaedics, Sri Ramachandra Institute of Higher Education and Research Chennai, Tamil Nadu, India

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*Correspondence:

Dr. Nikhilesh Nair,

E-mail: drnikhileshnair@gmail.com

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ABSTRACT

T type intercondylar fractures of the distal humerus in the pediatric age group is an extremely rare injury. These fractures are difficult to diagnosed as they can be mistaken for extension type injuries. The few clinical trials on the management of the fracture, it is widely regarded that the accepted method of treatment is open reduction and rigid internal fixation. It is easier to ensure stable articular reconstruction of the intra articular fragments by this method. Open reduction and internal fixation of these fractures are associated with high complication rate, which include wound site problems, non-union due to periosteal stripping, heterotrophic ossification and iatrogenic nerve injury. Large soft tissue dissection can also lead to vascular compromise and significant scar tissue which is associated with a stiff elbow. We present a case of a 10-year-old boy who sustained an intercondylar fracture with radial nerve palsy which was treated by closed reduction and Kirshner wire fixation with excellent results at 1 year follow up.

Keywords: Pediatric, Fracture, Elbow, Intercondylar, Closed reduction, K wire, Trauma

INTRODUCTION

T type intercondylar fractures of the distal humerus in children and young adolescent are rare injuries. Maylahn and Fahey reported in 1958 that among three hundred elbow injuries in children, only 2% of all distal humerus fractures had an intercondylar extension.¹ The primary mechanism of this injury is the articular surface of the olecranon giving an axial thrust on the trochlear causing it to split condyles.^{2,6} The few clinical trials on management of the fracture, it is widely regarded that the accepted method of treatment is open reduction and rigid internal fixation. It is easier to ensure stable articular reconstruction of intra articular fragments by this method.^{3,16}

Studies show that open reduction and internal fixation of these fractures are associated with a complication rate which is as high as 22% which include wound site problems, non-union due to periosteal stripping,

heterotrophic ossification and iatrogenic nerve injury. Large soft tissue dissection can also lead to vascular compromise and significant scar tissue which is associated with a stiff elbow.^{4,6} It has been shown that the posterior periosteal stripping which is done during both the triceps-splitting and triceps-sparing techniques may result in the devascularization of the fractured bone fragments and may compromise fracture union.^{7,8}

We report the case of a ten-year-old boy with a T type intercondylar fracture treated by closed reduction and Kirsner wire fixation of an intercondylar fracture of the distal humerus with an excellent functional and radiological outcome.

CASE REPORT

A ten-year-old boy presented to us one day after falling off his bicycle on to his outstretched hand and suffering a

closed injury to his left elbow. The child complained of sudden onset pain and swelling around the left elbow which was aggravated on movement of the affected limb. He was taken to a nearby hospital where a plain radiograph was taken and he was diagnosed to have a fracture around the left elbow. The patient's limb was placed in an above elbow plaster of Paris slab without any attempt at reducing the fracture. He was referred to our centre for further management. On arrival he was diagnosed to have a T type intercondylar fracture of the distal humerus with radial nerve palsy. After obtaining informed consent from the parents the patient was taken up for emergency surgery and underwent closed reduction and Kirshner wire fixation.

On a hand table under C-arm guidance closed reduction of the fracture was attempted by first 'milking the fracture site' and applying longitudinal traction followed by flexing the elbow and hyper pronating the forearm. Articular reduction was achieved using a single Kirshner wire as a joystick in each condyle and holding temporarily after reduction. A total of 5 Kirshner wires were used to stabilise the fracture- 2 from the medial epicondyle, 2 from the lateral epicondyle and one wire passed from lateral to medial parallel to the joint line with a purchase in 3 cortices.)

The upper limb was put in an above elbow cast with the arm in mid prone position and elbow in 90 degrees of flexion. The hand and wrist were placed in a cock-up splint to prevent contractors as a result of the wrist drop. The Kirshner wires were removed at 3 weeks and the splint was maintained for a total of 4 weeks. Following which active range of movement exercises were commenced under supervision.

The patient additionally developed ulnar nerve palsy following the procedure and had weakness of the flexor carpi ulnas and reduced sensation over the autonomous zone of the ulnar nerve.



Figure 1: Pre-operative X ray.

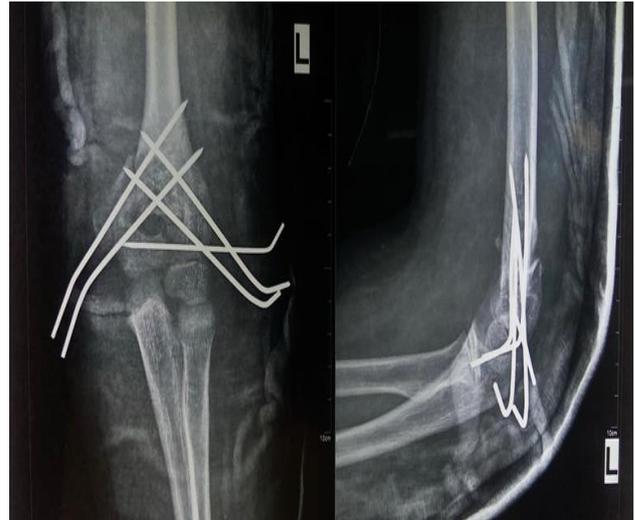


Figure 2: Post operative X ray.

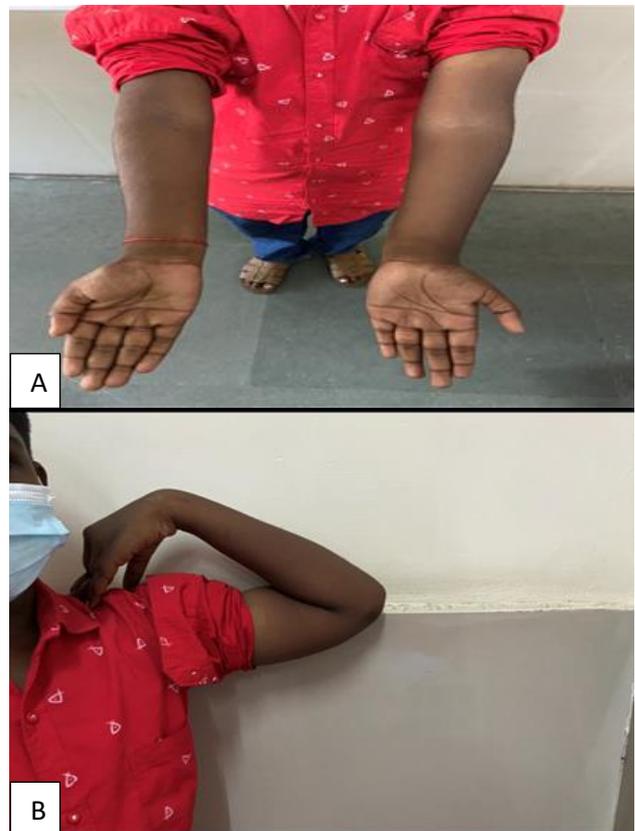


Figure 3 (A and B): Functional outcome.

Serial radiographs were taken at 2 weeks, 1 month, 3 months and 6 months and showed no loss of reduction. The ulnar nerve palsy resolved at 8 weeks. The radial nerve palsy identified preoperatively completely resolved at 15 weeks following the trauma and the patient has achieved ROM of 5-135* at 1 year along with a forearm rotation arc of 170*.

When using Flynn's criteria it is considered to be an excellent result.

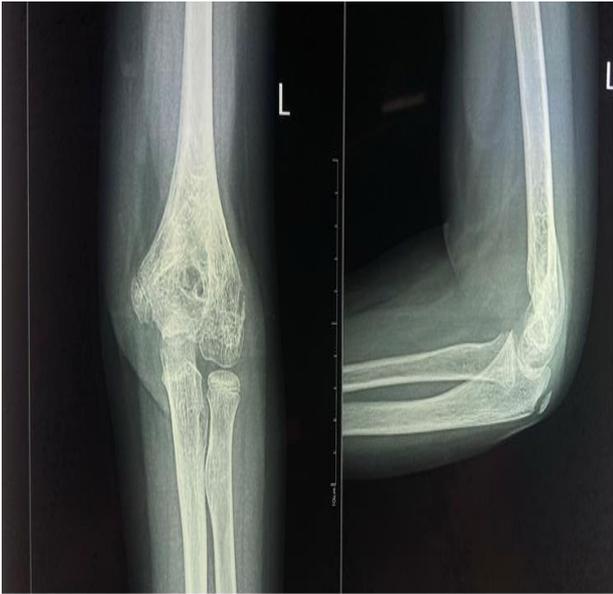


Figure 4: One year post op X-ray.

DISCUSSION

A T or Y shaped intercondylar fracture of the distal humerus is a rare occurrence in skeletally immature patient and is more commonly seen in an adolescent near skeletal maturity.^{1-4,6,15} To the best of our knowledge on 55 cases have been reported in English literature in children who are less than twelve years of age. The primary mechanism of this injury is the articular surface of the olecranon giving an axial thrust on the trochlear causing it to split the condyles.^{2,6} This Flexion and extension types of this injury have been reported based on the position of the distal fragments in relation to the anterior humeral line. Usually, the distal fragments lie anterior and are flexion type injuries, however in the case being discussed is an extension type.

Classifications have been proposed for various T type intercondylar fractures for adults, however there are problems when applying this classification to children's fractures, due to the number of children with this fracture being so small that a single clinician cannot have enough experience treating all these fracture types. The Arbeitsgemeinschaft für Osteosynthesefragen/Orthopaedic trauma association (AO/OTA) even though application to adult fractures can be used in children. Toniolo and Wilkins proposed a classification based on displacement and comminution of the fracture. According to classifications by Toniolo and Wilkinson, there are 3 major types of intercondylar fractures: minimally displaced (type I), displaced but not comminuted (type II), and comminuted (type III).³

There are only a few published articles about various treatment modalities for T condylar fractures of the distal humerus. It is based on fracture type, age of the patient, time between injury and treatment and the surgeon's experience. Since these fractures are exceedingly rare,

treatment recommendations cannot be standardized due to a lack of multiple case experiences. We have identified only nine institutional reports, comprising a total of 135 children and adolescents in the period between 1984 and 2015 in the existing literature. Nonsurgical treatment is the method of choice for the treatment of the paediatric fractures however closed reduction and casting play a minimal role in of the treatment of T-condylar fractures.⁹

Due to the rarity and limited number of cases of such fractures being reported in literature the guide lines of treatment are usually based of the algorithm set for treatment of adult fractures. The commonly used approaches are the triceps splitting, olecranon osteotomy and the triceps sliding approach. These approaches are associated with significant soft tissue trauma and complications such post operative elbow stiffness. In addition, Gruber and Hudson reported an association between a posterior approach to the elbow joint and elbow joint contracture after surgery for supracondylar fractures in children.⁵ This is thought to be secondary to scar formation in the olecranon fossa that may limit extension as well as triceps muscle adhesions that may limit flexion. Yamaguchi et al reported that the extraosseous blood supply of the lateral structures, including the capitellum and the lateral aspect of the trochlea, depends on the posterior perforating vessels, which are frequently dissected with a posterior approach.⁸ Therefore, the posterior approach might result in vascular insufficiency of the distal humerus and subsequent postoperative complications, such as aseptic necrosis and growth disorder of the humerus when ORIF is performed for articular fractures. In a randomized controlled study by Kocher et al the medial crossed pinning technique demonstrated a decrease in risk in loss of reduction when compared to lateral pins only 4% compared to 21%. But there is a risk of iatrogenic ulnar nerve palsy following medial to lateral pin insertion up to 3.3%.¹⁰ The immature joint and significant post traumatic swelling around the elbow following an injury can make delineating bony landmarks around the elbow difficult. Pins have been rarely found to cause direct injury to the ulnar nerve by impaling it but it can commonly cause restriction of movement within the cubital tunnel by tethering soft tissue.¹¹⁻¹³

A routine surgical exploration of the nerve is not recommended, but an incision over the medial epicondyle may to be useful in order to detect the ulnar groove along with passing the medial pins with the elbow in extension can facilitate correct pin placement Yi-Meng et al.¹⁴ In pre adolescents the periosteum is thick and the use of percutaneous methods of fixation of the fracture may be appropriate This minimally invasive technique can be used to circumvent the need for and second surgery for implant removal as the pins can be moved on an outpatient bases

In the reported cases only 10 % have been treated by closed reduction and percutaneous pinning. In our patient we achieved a reasonable reduction by percutaneous joystick

technique. The articular fragment was stabilized by a transverse wire. The medial and lateral pillars were stabilized with two wires each passed from distal to proximal. Post-operatively patient had an ulnar nerve palsy which could have been avoided if probably a larger incision was used to retract the nerve and insert the wire. The K wires were removed at 3 weeks. Even though the elbow was immobilized for 4 weeks, child gradually regained a good functional range of motion.

CONCLUSION

T type distal radius fractures in the pediatric population are exceedingly rare. These fractures are difficult to diagnosed as they can be mistaken for extension type injuries. Identification of these injuries is of paramount importance as prognosis of these fractures are poorer compared to isolated supracondylar fractures of the humerus. Open reduction is the mainstay of treatment of these fractures as per the literature but closed reduction and Kirschner wires fixation of this fracture have yielded excellent clinical and radiological results in our patient. Further studies are needed to evaluate the effectiveness of this approach in the management of these fractures.

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