



Role of Closed Reduction & Internal Fixation in Supracondylar Fractures of the Humerus (Original Article)

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Abstract

Background: Displaced supracondylar fractures have a high rate of displacement and if not reduced and stabilized in optimal position may lead to serious residual deformity. No general agreement on the treatment is evident with controversy prevailing regarding the ideal timing of surgery, method of maintenance of reduction and configuration of the pin fixation.

Materials And Methods: Twenty Four males and Eight females with ages ranging from 3-12 years who required closed reduction and internal fixation using percutaneous Kirschner wire for fresh displaced supracondylar fractures of humerus between March 2012 -Dec 2015 were selected. The Kirschner wires were passed percutaneously under C-Arm control from the lateral epicondyle in varying geometry or configuration to achieve fracture stability. Each patient was followed up for at least one year and results were graded using the Flynn's criteria. They were graded as excellent in 28 (87.50%) cases, good in 03 (9.38%) cases and only 01 (3.12%) case had a poor result, there were no fair results at the end of final follow up.

Conclusion: Treatment of the supracondylar humeral fracture in children by closed reduction and internal fixation is a safe approach with predictable good clinical and radiographical results.

Key-words: Anatomical reduction, Percutaneous Fixation, Baumann's angle, Humerus supracondylar fracture and closed reduction.

Introduction

Supracondylar fracture of the humerus is almost exclusively a fracture of the immature skeleton, seen in children and young teenagers¹. Supracondylar fractures of the humerus in children are difficult to treat. Closed reduction is both difficult to achieve and maintain, because of

the thinness of bone at the distal third between the coronoid and olecranon, where most supracondylar fractures tend to occur. Various methods have been described for the reduction of the fracture, such as reduction of the fracture by manipulation in flexion², milking maneuver to disengage the proximal fragment from the soft

tissue^{3,4}, and manipulation reduction immobilization and fixation using a U-shaped slab with elbow in full extension⁵. The most popular method of reduction is longitudinal traction with elbow in extension and forearm in supination⁶. Two lateral Kirschner wires provide an adequately rigid biomechanical construct for maintaining the reduction.

Materials and Methods

In a prospective study closed reduction and percutaneous Kirschner wire fixation for displaced supracondylar fractures of the humerus, was done. The inclusion criteria were open humeral growth plate and grade II and III displaced fractures. In the presence of a gross swelling, Dunlop traction was applied and surgery was done after the swelling subsided. Traction was given under general anaesthesia with the elbow in extension

and forearm in supination, longitudinal traction was given with an assistant applying counter traction. The fracture was thus disimpacted and then the medial or lateral displacement was corrected by applying a varus or valgus force. The angulations were corrected by flexing the elbow with continued traction. During the entire procedure, the radial pulse was observed at regular intervals. X-rays were then taken in antero-posterior (shoot through) and lateral views and the reduction was assessed. While taking the lateral views, special attention was given to rotate the X-ray tube rather than rotating the arm. The assessment of reduction was done clinically by assessing the extent of flexion and by assessing the carrying angle prior to flexion of the elbow. Radiological assessment of reduction was done by calculation of Baumann's angle.



Fig 1. X-Rays showing a grade III displaced supracondylar fracture humerus.



Fig 2. X-Rays Showing Postop fracture fixation with 2 Kirschner wires from lateral side.

Results

The age of patients ranged from 3-12 years with a mean age of 6 years. There were 24 males and 8 females. The left elbow was involved in 22 cases and right in 10. The usual cause was a fall on the outstretched hand. Thirty One cases had simple fractures and only one case had a compound injury following a vehicular accident. All the patients had pain and swelling around the joint and movements of the affected elbow were grossly restricted and painful. Eight patients presented with a feeble radial pulse and huge swelling of the arm and elbow. All these patients were put on the Dunlop traction and were operated after the swelling subsided and vascularity was good. Colour Doppler studies were done in these patients and revealed spasm of brachial artery in the adjacent area of fracture. Adequate blood flow was restored after reduction and no exploration was required. The time

required for clinico-radiological union ranged from 3 - 6 weeks with an average of 4 weeks. The carrying angles on follow up were measured and compared with that of the normal. The average carrying angle was 10.65° (range 4- 15) on the affected side and 12.62° (range 8 - 18) on the normal side. All patients had a Closed reduction and percutaneous Kirschner wire fixation of displaced supracondylar fractures of humerus in children loss of range of flexion within 5° of the normal side and only two had a loss of range of flexion within $5-10^{\circ}$ of the normal side. Each patient was followed up for at least one year and results were graded using the Flynn's criteria (Table I). We had excellent results in 28 (87.50%) cases, good in 3 cases (9.38%) and only 01 (3.12%) case had a poor result at the final follow up. The poor result was due to technical error in pinning resulting in cubitus varus of 15°

Table I. Grading of results (Flynn et al 1974)¹²

Excellent	Good	Fair	Poor
Loss in carrying angle $< 5^{\circ}$ or Limitation of elbow movements $< 5^{\circ}$	Loss in carrying angle $6^{\circ}-10^{\circ}$ or Limitation of elbow movements from $6-10^{\circ}$	Loss in carrying angle $10^{\circ}-15^{\circ}$ or Limitation of elbow movements from $10-15^{\circ}$	Loss in carrying angle $> 15^{\circ}$ or Limitation of elbow movements $> 15^{\circ}$

Discussion

Anatomical reduction and its maintenance is essential for obtaining excellent results. Its management poses a number of problems like cubitus varus, nerve palsies and Volkmann's ischemic contracture. Various methods of treatment have been advocated in the form of closed reduction and above elbow plaster cast application, skin / skeletal traction, primary closed reduction and percutaneous pinning and open reduction and internal fixation by Kirschner wires. Of these methods used, traction requires a longer period of hospital stay but is less reliable in children and has no added advantage over immediate closed reduction and percutaneous pinning except in cases who has gross swelling. Infection and joint stiffness usually are the problems in open reduction. Hence closed

reduction and percutaneous pinning is the preferred treatment in grade II and grade III displaced supracondylar fractures. Equally stable construct is lateral pinning, provided the lateral wires are at least 10 mm apart and they cross over in the proximal fragment and have purchase in the far cortex⁹. Otherwise these lateral wires act as a single wire and allow rotation of the distal fragment. Aronson and Prager emphasized the importance of Baumann's angle for accepting the reduction and showed excellent results¹⁰. They reported that if Baumann's angle of the injured extremity is within 4° of the normal side, then there will be no cubitus varus deformity. Many studies have recommended Kirschner wire from the lateral condyle in either parallel or crossed or divergent configurations to minimize iatrogenic ulnar nerve injury.¹¹ Immobilization of the

involved extremity, after closed reduction and percutaneous pin fixation with above elbow plaster slab immobilization with arm to chest strapping gives additional rotational stability at the fracture site and prevent redisplacement⁹.

Conclusion

We have found that it is a safe method even in the presence of swelling and displacement, resulting in a shorter hospital stay and a consistently satisfactory functional outcome and cosmesis even in less experienced hands.

Source of Support: Nil

Conflict of Interest: None Declared

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