ORIGINAL ARTICLE

OUTCOME OF CLOSED REDUCTION AND PERCUTANEOUS PINNING IN SUPRACONDYLAR TYPE II AND III FRACTURES IN CHILDREN

Dilawar Khan[1], Asghar Khan[1], Amir Amanullah[2]

[1]Orthopedic Department, Saidu Medical College, Swat, Pakistan

[2]Anatomy Department, Gomal Medical College, DI Khan, Pakistan

ABSTRACT

Background: Supracondylar fracture of humerus in children is distinct from that of adults. Percutaneous pinning for treatment of displaced supracondylar fractures is one of the modality. This study was conducted to determine outcome of closed reduction and percutaneous pinning in supracondylar type II and III fractures in children.

Material & Methods: This cross-sectional study was conducted in children presented with type II and III supracondylar fracture in Orthopedic Department, Saidu Teaching Hospital Swat from November 2013 to April 2015. A total number of 114 children below 12 years of either gender who presented with type II and III fractures were included while those who had open fracture, compartment syndrome or associated neurovascular injuries were excluded. Fracture was closely reduced and percutaneous pinning was done under image intensifier. At 6 months follow-up, humero-ulnar angle and range of motions was compared to the opposite elbow. All the information was recorded in a proforma. Data was analyzed via SPSS (version 10).

Results: At the final follow-up, out of 114 patients undergoing percutaneous pinning of supracondylar fractures, 102 had normal humero-ulnar angle and full range of motion when compared to the opposite elbow. In the remaining 12 patients, 8 had an average of 6° to 8° valgus change in humero-ulnar angle when compared to the opposite elbow, while 4 patients had 2° to 4° valgus change. Average flexion deficiency was 5° and average extension lag was 3°. Functional results were satisfactory in up to 100% of patients. Cosmetic results were satisfactory in up to 92.98%.

Conclusion: The outcome of closed reduction and percutaneous pinning in supracondylar type II and III fractures in our study was excellent. It was due to proper reduction under image intensifier and adequate fixation with cross K wires.

KEY WORDS: Close reduction; Percutaneous pinning; Supracondylar fracture; Children.

This article may be cited as: Khan D, Khan A, Amanullah A. Outcome of closed reduction and percutaneous pinning in supracondylar type II and III fractures in children. Gomal J Med Sci 2016; 14:67-70.

INTRODUCTION

Fractures around the elbow especially supracondylar fracture have remained a diagnostic and therapeutic problem since the time of Hippocrates. Presently, as it has been described by Gillingham and Rang, the surgeon has been prepared for these challenges by research and education.[1] The supracondylar humerus fracture is a difficult fracture which even today can cause disability, impairment and treatment choices are controversial.

Corresponding Author:
Dr. Dilawar Khan
Orthopaedic Department, Saidu Medical College, Swat, Pakistan
E-mail: drdkhan73@gmail.com

Date Submitted: 17-6-2016
Date Revised: 17-6-2016
Date Accepted: 17-6-2016

Supracondylar fracture of humerus in children is entirely a distinct clinical entity from supracondylar fracture in adults. In children the distal humeral physis, cortical remodeling and the relative strength of ligaments all combine to produce a specific injury pattern.

The configuration of fracture predisposes to neurovascular injury, exacerbated by poor or incorrect treatment often leading to lifelong disability. Although physeal injury is not a usual component of the supracondylar fracture of humerus in children, inappropriate treatment can cause this also.

The earliest description of elbow fracture was found by Wilkins[2] in a book "Senex Divinus" written by Hippocrates in the 3rd century. There was no significant work done on elbow fractures till 17th century, after that better understanding of this injury

developed, and different modes of treatment evolved including the simple use of collar and cuff, open reduction and internal fixation and thirdly closed reduction and percutaneous pinning.

Completely displaced Type III supracondylar fractures of the distal humerus are difficult to treat.[3] There are different techniques for treating such types of fractures, showing that no single technique is preferred for all types of fractures.[4,5] As maintenance of an adequate reduction with cast immobilization is very difficult, the preferred technique for stabilization of reduced fracture is with pins fixation.[6,7]

In 1991, Umar and D'Sousa gave a detailed analysis of supracondylar fracture management in children till then.[8] They came to the conclusion that closed reduction and percutaneous pinning had given the best results and the least complications. Since then this technique of minimal invasion was slowly adopted as the best treatment choice by surgeons at AKUH and other parts of the country.

In Pakistan this technique is still not acceptable by all orthopedic surgeons. At Saidu Teaching Hospital Swat, technique of closed reduction and casting, open reduction and internal fixation was used for treating type II and III supracondylar fractures in children. We introduced this modality of percutaneous pinning for treatment of displaced supracondylar fractures in children.

This study was conducted to determine outcome of closed reduction and percutaneous pinning in supracondylar type II and III fractures in children.

MATERIAL AND METHODS

This cross-sectional, descriptive study was conducted in children with supracondylar type II and III fractures in Orthopedic Department, Saidu Teaching Hospital for about one and half year from November 2013 to April 2015.

The sample size was 114. 102 (89.47%) were Gartland type III and 12 (10.53) were type II. All children with supracondylar type II and III fractures below twelve years of either gender were included. The following patients were excluded: who had open supracondylar fracture, compartment syndrome, associated neurovascular injuries and old neglected type III fractures.

The patients were admitted in orthopedic ward and preoperative workup was done. An informed written consent was taken from the parents/guardian and patients were enrolled in ward register. Under general anesthesia, cleaning and draping was done. The fracture was reduced and two cross k wires were passed under image intensifier guidance. Per operative reduction was checked by assessing humeroulnar angle and range of motion.

The patients were followed up at 6 months. Humero-ulnar angle and range of motions was compared to the opposite elbow. The data was noted in proformas and statistical analysis was done via SPSS (version 10).

RESULTS

A total of 130 patients with supra condylar fracture were received during study period. Out of these, 114 subjects satisfied the inclusion criteria and were treated by close reduction and percutaneous

Figure 1: Pre-operative x-rays of supracondylar fracture.

Figure 2: Post-operative x-rays of percutaneous pinning.

Figure 3: Post-operative PCP.

Table 1: Results according to Flynn criteria.

Result	Cosmetic Factor Loss of carrying angle	Functional factor Loss of motion
Excellent	0-5° = 106 Pts	0-5° = 114Pts
Good	6-10° = 8 Pts	6-10° = 0 Pts
Fair	11-15° = 0 Pts	11-15°| = 0 Pts
Poor	+15° = 0 Pts	+15° = 0 Pts

pinning. Male to female ratio was 72:42, and the age range was 2 to 11 years. Out of 114 patients one patient was a poly trauma patient with associated head injury who had road traffic accident. The remaining were having history of fall at home or during play outside. 98 patients presented after few hours, while 16 presented after a day or two.

Two patients had neurovascular compromise, one having absent radial pulse and one having ulnar nerve deficit at presentation. Both of which recovered completely later on.

Fractures were classified according to the direction of displacement of distal fragment. Out of 114, ninety-seven (85.09%) were extention type and 17 (14.91%) were flexion type. 102 (89.47%) were Gartland type III and 12 (10.53) were type II. Out of 114 cases of percutaneus fixation, 108 (94.74%) were fixed with crossed k wire and 6(5.26%) were fixed with two lateral k wires. Two patients developed ulnar nerve palsy post operatively. Both of them recovered completely at six months follow up. At the 6 months follow-up, 102 patients had normal humero-ulnar angle and full range of motion when compared to the opposite elbow. In the remaining 12 patients, 8 had an average of 6° to 8° valgus change while 4 patients had 2° to 4° valgus change in humero-ulnar angle when compared to the opposite elbow. Average flexion deficiency was 5°and average extension lag was 3°. Functional results were satisfactory in 100% of patients. Cosmetic results were satisfactory in up to 92.98%.

DISCUSSION

Pediatric elbow fractures make up approximately 65% of all fractures and dislocations in children. Supracondylar fractures constitute the most common pediatric elbow fracture. Five methods of treatment have been described for the treatment of displaced supracondylar fractures. These are closed reduction and above elbow casting, Blount's technique[9] (in which reduction is maintained by a flexed position of the elbow in a collar and cuff sling), skeletal traction, closed reduction with percutaneous pinning and lastly open reduction and internal fixation. Treatment of choice of displaced supracondylar fractures is closed reduction and percutaneous pinning. The technique of percutaneous pinning in supra condylar fracture management was first described by Swenson in 1948[10] and others.[11-13] Pinning was first described by fixation with medial and lateral pins. His work was not acknowledged by orthopedic surgeons till 1974, when a paper was published by Flynn on this technique.[14] An alternative to medial and lateral Kirschner wires is two lateral pins that could be either crossed or parallel.[15]This method is free from possible ulnar nerve injury, but may not provide adequate fixation for comminuted or unstable fractures. Percutaneus cross pinning is theoretically the most stable biomechanical construct.[16,17] The aim of doing percutaneous pinning in supracondylar fracture of humerus in children was to provide the best treatment with minimal invasive methods and to achieve best functional and cosmetic results with minimal complications.

To evaluate, we used Flynn's modified overall rating (Table I). This is the most widely used classification as cubitus varus deformity is considered to be a poor prognostic factor. Our treatment of percutaneous pinning gave excellent functional and cosmetic results.

CONCLUSION

The outcome of close reduction and percutaneous pinning in supracondylar type III fracture in our study was excellent. Factors of excellent results were proper reduction under image intensifier and adequate fixation with cross k wires.

REFERENCES

1. Gillingham BL, Rang M. Advances in children's elbow fractures. J Paediatr Orthop 1995; 15:419-21. Editorial
2. Wilkins KE. Fracture and dislocation of elbow region in "Fractures in children" Editted by Rockwood CA, Wikins KE, King RE. 1991 J B lipincott and company.
3. Omid R, Choi PD, Skaggs DL. Supracondylar humeral fractures in children. J Bone Joint Surg Am 2008;90:1121-32.
4. Oh CW, Park BC, Kim PT, Park IH, Kyung HS, Ihn JC. Completely displaced supracondylar humerus fractures in children: results of open reduction versus closed reduction. J Orthop Sci 2003; 8: 137–41.
5. Farley FA, Patel P, Craig CL, Blakemore LC, Hensinger RN, Zhang L, et al. Pediatric supracondylar humerus fractures: treatment by type of orthopedic surgeon. J Child Orthop 2008; 2: 91–5.
6. Skaggs DL, Sankar WN, Albrektson J, Vaishnav S, Choi PD, Kay RM. How safe is the operative treatment of Gartland type 2 supracondylar humerus fractures in children? J Pediatr Orthop 2008; 28: 139-41.
7. Pretell Mazzini J, Rodriguez Martin J, Andres Esteban EM. Surgical approaches for open reduction and pinning in severely displaced supracondylar humerus fractures in children: a systematic re-

view. J Child Orthop 2010: 4:52–143.

8. Umar M, D'Sousa P. Supracondylar of humerus in children: An analysis of different treatment modalities at Agha Khan University Hospital. Pak J Surg 1991; 7:16-22.
9. Arino VC, Lluch EE, Ramirez AM, Ferrer, J, Rodriguez, L, Baixauli, F. Percutaneous fixation of supracondylar fractures of the humerus in children. J Bone Joint Surg 1977; 59A:914-6.
10. Swenson AL. The treatment of supracondylar fractures of the humerus by Kirshner wire transfixation. J Bone Joint Surg Am 1948; 30:993-7.
11. Webb AJ, Sherman FC. Supracondylar fractures of the humerus in children. J Pediatr Orthop 1989; 9:315-25.
12. Boyd DW, Aronson DD. Supracondylar fractures of the humerus: a prospective study of percutaneous pinning. J Pediatr Orthop 1992; 12:789-94.
13. Mehserle WL, Meehan PL. Treatment of the displaced supracondylar fracture of the humerus (type III) with closed reduction and percutaneous cross-pin fixation. J Pediatr Orthop 1991; 11:705-11.
14. Flynn JC, Mathews JG, Bariot RL. Blind pinning of displaced supracondylar fracture of the humerus in children. J.B.J.S. 1974; 56A: 263-72.
15. Pirone AM, Graham HK, Krajbich JI. Management of displaced extension type fracture of the humerus in children. J B J S 1988; A70:641-50.
16. Herzenberg JE, Koreska J, Carroll NC, Rang M. Biomechanical testing of pin fixation techniques for pediatric supracondylar elbow fractures. Orthop Trans 1988; 12:678-9.
17. Zionts LE, McKellop HA, Hathaway R. Torsional strength of pin configurations used to fix supracondylar fractures of the humerus in children. J Bone Joint Surg [Am] 1994; 76:253-6.

CONFLICT OF INTEREST
Authors declare no conflict of interest.
GRANT SUPPORT AND FINANCIAL DISCLOSURE
None declared.

AUTHORS' CONTRIBUTION

Conception and Design:	DK, AK
Data collection, analysis & interpretation:	DK, AK
Manuscript writing:	DK, AK, AA