

Original Research Article

To Compare Functional Outcome of Close and Open Cross Pinning in Treatment of Gartland Type 3 Supracondylar Humerus Fracture in Children.

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Abstract:

Background & Method: The aim of this study to compare functional outcome of close and open cross pinning in treatment of Gartland type 3 supracondylar humerus fracture in children. All patients operated with mediolateral cross pinning were included in this study. The age range was 3-12 years at the time of surgery. All patients were followed till the fracture united radiologically. The diagnosis was based on conventional X-ray imaging.

Result: Loss of motion was more in Group B (loss of motion more than 15 degrees in 12.12% of patients) than in Group A (none).

Conclusion: In our study after comparison of two groups one by closed pinning and other by open pinning we have found that closed pinning is associated with better functional outcome and is the procedure of choice and should be the preferred initial treatment in fresh cases of fracture supracondylar humerus. This is because of minimal invasiveness, preservation of fracture haematoma which aids in fracture healing and preservation of soft tissues around joint. While loss of motion was more in Group B (loss of motion more than 15 degrees in 12.12% of patients) than in Group A (none) this was due to soft tissue dissection and was poorly tolerated by patients, complications associated with closed procedure being cosmetic (cubitus varus) and reversible (nerve injury) are well tolerated by patients than complications (stiffness) in open procedure.

Keywords: pinning, treatment, gartland, supracondylar, humerus, fracture & children.

Study Designed: Observational Study.

1. INTRODUCTION

The anatomy of the distal humerus is complex and, for clarity, may be thought of as a triangle. There is a very thin portion of bone in the middle of the triangle that is the olecranon fossa[1]. Although the bone here is usually approximately 1 mm in thickness, a normal variation in children is to have no bone at all in this area; this may be seen as “hole” on radiographs. The base of the triangle is articular surface consisting of the trochlea, which

articulates with the ulna, and the capitellum, which articulate with the radius[2]. The two side of the triangle are the medial and lateral columns of the distal humerus, which may be thought of as strong columns of predominantly cortical bone supporting any forces that occur across the elbow[3]. The medial and lateral columns begin to flatten and joint at the apex of the triangle, which is quite flat, as they proceed from the base of the triangle to the top. Supracondylar fractures occur at the level of the olecranon fossa, where the medial and lateral columns begin to flatten. It is helpful to think of the condyles as the bottom of the triangle, where the medial and lateral columns join the articular surface at the base of the triangle. Thus, the term supracondylar humerus fracture describes a fracture that occur above, or "supra" to the condyles[4].

The elbow joint is a pivot joint. The trochlea of the humerus is gotten into the semilunar score of the ulna, and the capitellum of the humerus articulate with the fovea on the top of the span. These thickened segments are generally depicted as unmistakable tendons under the accompanying names. The foremost, the back, the ulnar guarantee and the outspread security ligaments[5]. The foremost tendon is an expansive and flimsy stringy layer covering the front surface of the joint. It is connected to the front of the average epicondyle and to the front of the humerus quickly over the coronoid and outspread fossae beneath, to the foremost surface of the coronoid cycle of the ulna and to the annular tendon, being constant on one or the other side with the insurance tendons. This tendon is in brachialis, besides at its most parallel part[6].

2. MATERIAL & METHOD

This prospective study was conducted in the Department of Orthopaedics at Amaltas Institute of Medical Sciences, Dewas from Aug 2020 to Sep 2021. All patients operated with mediolateral cross pinning were included in this study. The age range was 3-12 years at the time of surgery. All patients were followed till the fracture united radiologically. The diagnosis was based on conventional X-ray imaging.

65 cases with displaced supracondylar humerus fractures (Gartland type-3) admitted and treated by close and open medio-lateral cross pinning were included in the study. These cases were selected on the basis of following criterion.

Inclusion Criterion:-

1. All cases of displaced supracondylar fractures in patients
2. More than 3 yrs and less than 13 years of age
3. Those presenting within 7 days of injury
4. No previous fracture in either elbow

Exclusion Criterion:-

1. Pre-existing nerve lesion
2. Pre- existing deformity at the elbow
3. Cases having history of similar injury previously (re- fracture)
4. History of previous surgery of the involved elbow due to any reason.
5. Compound fractures
6. Patient's unwillingness

3. RESULTS

Table 1: Age and Sex Incidence in both groups

Age (in years)	Male		Female	
	Group A	Group B	Group A	Group B
03-06	16	18	16	12
06-09	08	14	10	08
09-12	04	08	10	06
Total	28	40	36	26

Table 2: Outcome as per Flynn's criteria

	Satisfactory					
	Carrying angle			Loss of motion		
	Excellent	Good	Fair	Excellent	Good	Fair
Group A	47.87%	32.25%	16.62%	63.05%	27.12%	10.37%
Group B	68.69%	19.18%	04.03%	38.39%	31.30%	16.15%

Table 3: Outcome as per Flynn's criteria

	Unsatisfactory	
	Carrying angle	Loss of motion
	Poor	Poor
Group A	06.25%	00.00%
Group B	00.00%	12.12%

Loss of motion was more in Group B (loss of motion more than 15 degrees in 12.12% of patients) than in Group A (none).

4. DISCUSSION

Gordon J Eric, Patton Cristopher M, Luhmann Scott J, Bassett, George S.; Schoenecker, Perry L.[7] In an article revealed their discoveries that on the off chance that ulnar nerve can't be recognized by palpation, a little cut ought to be made and the pin put under direct vision. Biomechanical investigations of the ulnar nerve during flexion and expansion of the elbow have been displayed to cause specific unique changes in the limit of the cubital passage (ulnar score, post-condylar furrow). With the elbow in the flexion, the aponeurosis overlying the ulnar nerve (cubital passage retinaculum) is extended, in this manner diminishing the limit of the cubital passage. Early investigation instead of basic pin expulsion is more secure and analytic of the component of injury[8].

Iatrogenic injury to the ulnar nerve might happen in any event, when the average epicondyle is tangible. Clinically it is unimaginable to precisely foresee the area of the ulnar nerve before blind percutaneous crossed k-wire obsession of supracondylar crack of humerus, so presently

there is conversation in regards to the utilization of intraoperative nerve excitement to confine the ulnar nerve preceding situation of the average pin. In 2002, Wind William M., Schwend RM, Richard M; Armstrong DG[9]. detailed the consequences of their review which pointed toward deciding whether the ulnar nerve could be securely found pre-operatively by the specialist in question. They likewise provided details regarding a nerve feeling procedure to help with deciding the area of the nerve preceding visually impaired sticking of the average epicondyle. A line is then attracted on the arm to give the viewable signal, and the line is reached out to cut up the line recently drawn along the long hub of the arm) The sidelong pin is put with the section point being where the two line separate and is embedded in a plane lined up with the lines[10]. Opposition ought to be felt. Position is checked with the picture intensifier. A subsequent equal pin can be put utilizing a similar method.

5. CONCLUSION

In our study after comparison of two groups one by closed pinning and other by open pinning we have found that closed pinning is associated with better functional outcome and is the procedure of choice and should be the preferred initial treatment in fresh cases of fracture supracondylar humerus. This is because of minimal invasiveness, preservation of fracture haematoma which aids in fracture healing and preservation of soft tissues around joint. While loss of motion was more in Group B (loss of motion more than 15 degrees in 12.12% of patients) than in Group A (none) this was due to soft tissue dissection and was poorly tolerated by patients, complications associated with closed procedure being cosmetic (cubitus varus) and reversible (nerve injury) are well tolerated by patients than complications (stiffness) in open procedure.

6. REFERENCES

1. Reynolds, Richards AK, Mirzayan, Raffy: A technique to determine proper pin placement of crossed pins in supracondylar fracture of the humerus in children: J Pediatr Orthop Jul 2000;20(4);485-489.
2. Barton, Kelly L , Kaminsky, Cornelia K, Green, Daniel W: Reliability of a modified Gartland classification of supracondylar fractures of humerus in children; J Pediatr Orthop, Jan 2001;21(1):27-30.
3. Gordon JE, Patton CM, Luhmann SJ, et al. Fracture stability after pinning of displaced supracondylar fracture of humerus in children. J Pediatr Orthop 2001;21(3):313-318.
4. Skaggs DL, Hale JM, Basett J, et al. Operative treatment of supracondylar fracture of humerus in children. The consequences of pin placement. JBJS (Am) 2001;83A(5):735-740
5. Lee SS, Mahar AT, Missen D, et al. Displaced pediatric supracondylar fracture of humerus in children : biomechanical analysis of percutaneous pinning techniques. J Pediatr Orthop 2002;22(4)440-443.
6. Wind WM, Schwend RM, Armstrong DG. Predicting ulnar nerve during percutaneous wiring of supracondylar fracture of humerus in children. J Pediatr Othop 2002;22(4):444-447.
7. Skaggs, David L, Cluck, Micheal W: Lateral entry pin fixation in the management of supracondylar fracture of humerus in children. JBJS(Am)2004;86:702-707.
8. Heras, Jorge. Duran, de la Cerda. Jaun: supracondylar fracture of humerus in children. Clin Orthop Relat Res; 2005;(432)57-64.

9. Ozcelik, Abdurrahaman, Tekcan: Correlation between iatrogenic ulnar nerve injury and angular insertion of the medial pin in supracondylar fracture of humerus in children. *J Padiatr Orthop* 2006;15(1)58-61.
10. Larson, Loren, Firoozbaksh, Keikhosrow: Biomechanical analysis of pinning techniques for pediatric supracondylar fracture of humerus. *J Padiatr Orthop* 2006;26(5):573-578.