



## ORTHOPAEDICS

## PROSPECTIVE RANDOMISED COMPARISON STUDY OF 60 CASES OF TYPE 2 AND TYPE 3 SUPRACONDYLAR FRACTURES OF HUMERUS IN CHILDREN USING CONVENTIONAL CROSS K WIRE FIXATION VS DORGAN'S LATERAL FIXATION

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### ABSTRACT

The Aim of this study was to compare the efficacy in terms of cosmetic and functional outcome (FLYNN's CRITERIA) and ulnar nerve injury between conventional cross pinning (medial and lateral) method and Dorgan's lateral pinning in type 2 and 3 supracondylar fractures.

**Material and Methods .** This was a prospective randomized study of 60 patients who presented at Maharishi Markandeshwar Medical College and Hospital , Kumarhatti , Solan. Patients were divided into two groups of 30 each and fixed by two different methods as described above. The study was done from year 2017 to 2018.

**Results.** All 60 patients were followed up from 2 to 12 months. According to criteria of Flynn et al. clinical cosmetic outcome was satisfactory in 90%(crossed pinning) and 96.66%(Dorgan's lateral pinning ).Functional outcome was satisfactory in 90% (crossed pinning) and 96.66%( in Dorgan's method).The differences were not statistically significant. Iatrogenic post operative ulnar nerve injuries occurred in 4 patients of crossed pinning method but none in those fixed by Dorgan's method

**Conclusion.** Both Dorgan's and crossed pinning method are good methods of fixation .

**KEYWORDS :** Supracondylar Fractures ,flynn Criteria ,dorgan's Technique

### INTRODUCTION

Supracondylar fractures are one of the most common elbow injuries in children(1,2). Standard method of treatment in children is closed reduction and internal fixation with k wires. There is controversy regarding best method in fixing these fractures from different techniques of pinning mentioned in literature. The aim of this study was to evaluate the two methods of treatment –crossed k wire pinning and Dorgan's lateral pinning method and compare their cosmetic and functional outcomes(using FLYNN's criteria) and the complications arising due to these procedures.

### MATERIAL AND METHODS

60 patients with Gartland type 2 and type3 supracondylar fractures were treated in our institution between 2017 and 2018 by closed reduction and percutaneous pinning.

Exclusion criteria included flexion type fractures, open fractures, fractures with vascular deficit and fractures requiring open reduction. In the first method 30 patients selected at random underwent standard cross-k wiring under image intensifier. Closed reduction of fracture was done by gentle traction , side to side elbow deformity correction, hyperflexion of elbow and pushing the distal fragment with opposite hand thumb, keeping forearm in pronation to prevent displacement. After confirming closed reduction on image intensifier, the lateral pin was always inserted first (k wire of 1.5 mm) from lateral epicondyle through a stab wound. Direction of pins was upward and medially at an angle of 35 to 40 degrees to the sagittal plane of the humerus. The pin was thus be passed through the distal fragment and medullary cavity of proximal fragment to engage the cortex of proximal fragment about 3cm above the fracture line. Before the insertion of medial pin the elbow was extended and assessed for the bowmann's angle and anterior humeral line. If acceptable then only the medial pin was inserted through the center of medial epicondyle in a similar manner. Medial wire was passed under direct vision after giving a stab incision on the medial epicondyle in order to avoid injury to ulnar nerve. The pins should cross each other 1.5 to 2 cm above the fracture line.

In the second method (DORGAN'S) first pin is inserted exactly in the same way as in the crossed pinning method and then second pin is inserted in the lateral epicondyle in a superior to inferior direction so as to engage the medial condyle. Radial pulse was assessed and final reduction and pin placement checked under image intensifier.

### RESULTS AND ANALYSIS

Our study included 60 patients (Gartland type2 and3) of supracondylar fractures. Patient's age ranged from 1 year to 12 years with a mean age of 6.73 years. There were 38(63.3%) males and 22(36.6%) females in

the study. In 40(66.6%) patients' right and in 20(33.3%) patients' left side was affected.41(68.3%) patients had Gartland type 3 fracture and 19(31.7%) had type2 fracture. Patients were followed up from 2 months to 12 months .No patients developed pin tract infections .k wires were removed 6 weeks after surgery.

For comparison of results of both these procedures (crossed pinning vs DORGAN's lateral pinning) we used universally accepted FLYNN'S CRITERIA (3). To avoid statistical problem during comparison of these two groups we made two groups. One with both EXCELLENT and GOOD results and another with FAIR and POOR results combined together. We obtained two by two contingency table and applied statistical test to it. We used FISHER'S EXACT TEST to analyse the data.

According to Flynn et al.'s criteria (3),the cosmetic outcome was satisfactory in 90% and fair in 10% in crossed pinning method and satisfactory in 96.66% and fair in 3.33% in dorgan's lateral pinning method (table 2).As can be seen from table (p value>0.05) statistical analysis showed no significant difference.

The functional outcome was satisfactory in 90% and fair in 10% in crossed pinning method and satisfactory in 96.66% and fair in 3.33% in patients treated by Dorgan's method. Again p value was not found to be significant (table3).

Pre-operative nerve injuries were present in three patients- radial nerve in one and median nerve in two. Iatrogenic post-operative ulnar nerve injuries occurred in three patients in crossed pinning group but none in Dorgan's lateral pinning group. The p value was found to be 0.237 (table4) which was statistically not significant. All cases recovered completely with conservative treatment.

Results	Cosmetic factor loss of carrying angle	Functional factor loss of motion
Excellent	0-5	0-5
Good	6-10	6-10
Fair	11-15	11-15
Poor	>15	>15

**Flynn's criteria Table 1  
Cosmetic outcome**

Results	Crossed pinning n=30	Dorgan method n=30	P value
Excellent	14	16	0.603
Good	13	13	1
Fair	3	1	0.6119
Poor	0	0	

**Table 2**  
**Functional outcome**

Results	Crossed pinning	Dorgan method n=30	P value
Excellent	14	15	1
Good	13	14	1
Fair	3	1	0.6119
Poor	0	0	

**Table 3**  
**Nerve injury**

Nerve injury	Crossed pinning n=30	Dorgan method n=30	Total n=60	p value
Pre-operative	1	2	3	1
Post-operative	3	0	3	0.237

**Table 4**  
**DISCUSSION**

Supracondylar fracture is one of the most common elbow injuries in children(1,2,4).While closed reduction and percutaneous k wire fixation is currently accepted treatment of displaced supracondylar fractures of the humerus in children ,there is still argument on the optimal configuration of those k-wires as regards fracture stability and ulnar nerve safety( 4,6 ).

In our series, comparing the two groups of crossed (medial –lateral pinning) and Dorgan's technique the clinical cosmetic outcome was satisfactory in 90% and 96.66% respectively. Functionally it was satisfactory in 90% and 96.66% respectively. The differences were not statistically significant.(table-2)

Our results compare favourably with others .In the series of Foead et al.,(7 )comparing two groups of medial – lateral pinning and dorgan's pinning method, cosmetically ,the outcome was satisfactory in 89.28% and 88.89% respectively. Functionally it was satisfactory in 75% and 81.48%respectively.Both cosmetic and functional results were statistically insignificant. In the study of Sahu (8)comparing medial –lateral crossed pins and Dorgan's method , not much difference between both methods in terms of stability was found. In a similar study conducted by Sudheendra and Nazareth (9 )in 45 children cosmetic and functional results were satisfactory in all cases.The differences between the two groups were statistically insignificant. In a study by Eberhardt et al (10 )using Dorgan's lateral cross wiring excellent to good functional results were achieved in 93%.Their cosmetic results were 93% excellent and 7% good results with no poor result.

By contrast, Zamzam and Bakarman (11),compared crossed versus lateral non crossed pinning in 108 type 2 and 3 fractures. Type3 fractures fixed by lateral two pins were found significantly prone to postoperative instability,late complications and need for medial pin fixation.

In our study iatrogenic ulnar nerve injury occurred in 3 patients treated by crossed pinning method.But no cases of iatrogenic nerve injury were seen in cases treated by Dorgan's method.This difference was not found to be stastically significant (table 4).We need a larger sample for bringing certainty in this issue. There were no cases of nerve injuries in patients treated by Dorgan's method. All cases recovered completely subsequently.

Skaggs et al. (6) reported 17 ulnar nerve injuries in 220 of their patients (7.7%) with crossed pinning but nothing in 125 of their patients with lateral pins. Shannon et. al. (12 ),Lee et al. (13)and Sudheendra and Nazareth (9 ) did not report any case of ulnar nerve injury after lateral pinning. However ,Foead et al . (7)reported two cases of ulnar nerve injury when fracture fixation was performed by lateral pinning and suggested that manipulation was the cause.

The incidence of reported iatrogenic ulnar nerve injury with a medial pin ranges from 1.4% to 15.6%( 11,14,15,16 )

Different techniques are performed to decrease the rate of ulnar nerve injury associated with medial pin. (a)The lateral pin is inserted first to allow elbow extension to less than 90 degrees position to allow ulnar nerve to be displaced posteriorly before inserting the medial pin. (b)the

ulnar nerve is palpated and pushed posteriorly with thumb before inserting the medial pin . (c) a separate small incision over the medial epicondyle to explore the ulnar nerve is required ,if there is gross swelling ( 11,14,17).

Iatrogenic nerve injuries could be due to local irritation, pressure ,kinking or penetration by a misdirected medial pin.The prognosis was favourable as most cases recovered with time.

**CONCLUSION**

From this study, we can conclude that both methods provide good stability with negligible chance of nerve injury which has no statistical significance. However, further studies with a larger number of patients is required to bring certainty in this dilemma.

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