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CROSSED LATERAL ASCENDING AND DESCENDING PINNING IN PEDIATRIC SUPRACONDYLAR FRACTURE OF HUMERUS

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ABSTRACT

Background: Extra-articular supracondylar fracture of the humerus is 3% in children and 60% in all elbow fractures. The highest incidence of ligament laxity and the weakening of distal humerus at this era are at present in the first decade of existence. The aim of the present study was to assess the results of cross lateral ascending and descending pinning in pediatric supracondylar fractures humerus. **Patients and methods:** This study consisted of 18 children with supracondylar humerous fractures who underwent lateral pinning in the Zagazig University, and Ibnsina hospitals. **Results:** The age of the studied group was (6.6±2.1) years ranged from 6 to 10 years, half of the group (50 %) had aged less than 6.5 years and (50%) from 6.5 to 11 years. More than half of the studied group (61.1%) were males and (38.9%) of them were females. Regarding side affected, 55.6%) of the studied group were right sided affected and (44.4%) of them were left sided**.** The commonest mechanism of injury was FD among (83.3%) of the studied group followed by RTA was among (16.7%) of the studied group. Regarding displacement, postero-medial was the commonest displacement among (61.1%) of the studied group followed by postero-lateral was among (22.2%) of the studied group and lastly posterior one (16.7%). More than half of the studied group (55.6%) had excellent cosmetic score, (27.7%) of them had good cosmetic score and (11.1%& 5.6%) had fair and poor cosmetic score respectively. More than half of the studied group (55.6%) had excellent functional outcome, (27.7%) of them had good functional outcome and (11.1%& 5.6%) had fair and poor functional outcome respectively. **Conclusion:** Possibly the best mechanical stability is provided by a cross pin fixation. The lateral cross-pinning technique has been found to be excellent for stability with crossed pins and to prevent damage to the ulnar nerve.

Keywords: Pinning, Supracondylar Fracture; Humerus

INTRODUCTION

Fractures around the elbow joint account for 10% and supracondyl fracture constitutes 50 to 70% of all pediatric orthopedic injuries **(1)**.

At present, operating decrease and pinning is the preferred treatment for Gartland type II fractures rather than cast. The operational decrease and pinning are required in most cases of type III fractures. The outcomes of the fractures of Gartland type 2 are not as strong as those treated with closed reduction and cast immobilization **(2)**.

Closed decrease with the percutaneous pin fixation is now generally accepted and is the option of care for displaced pediatric supracondylar fractures **(3)**. The optimal K-wire configuration in repairing the forms of fractures of Gartland II and III is controversial **(4)**. The literature has two main configurations: crossed pins (medial and side) and two lateral pins **(5)**.

The classical medium-lateral cross-wire technology involves placing two ascending K-wires, one inserted by the side condyle and the other by the media condyle **(6)**.The ulnar nerve, when it passes through the medial condyle, is injured by this procedure. Ulnar injury rates were recorded up to 6–8 percent **(7)**.

Two parallel K-wires may be mounted through lateral cortex as an alternate method of fastening in order to prevent ulnar nerve injury. The ulnar nerve is covered from putting the medial K-wire. This configuration however is known to be less robust biomechanically than the crosswire setup **(8)**.

A modified variant of the cross-wire technique, crossed lateral pin fixation with ascending and descending K-wires (Dorgan's side cross wiring), to achieve stability and prevent ulnar nerve injury.It is proposed to achieve cross-wire fixation on the lateral side only **(4)**.

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Therefore, this study aimed to assess the results of cross lateral ascending and descending pinning in pediatric supracondylar fractures humerus.

PATIENTS AND METHODS

This study included 18 children have been studied in the Trauma Unit in the of Orthopedic Department, the University Hospital Zagazig and Ibn-Sina Hospital (Sirt –Libya), with a possible clinical trial. Type II fracture for extension: 12 (66.7 percent) / Type III fracture for extension: 6 cases (33.3 percent).

Inclusion criteria:

Children with unstable displaced or irreducible (Gartlandtype II and type III) supracondylar humeral fractures in below age of maturity. Closed injuries except cases that had Gustilo type I open fractures. The patient could tolerate general anesthesia. Absence of associated neurovascular injuries.

Exclusion criteria:

Gustilo type II or III open fractures, injuries that required open reduction and internal fixation (ORIF), associated neurovascular injuries, neglected cases, presence of infection and failed previous fixation.

Pre-operative assessment:

The patients were reviewed to determine their general health and local injury. Careful tracking of patients and/or caregivers of injury, and the seriousness of trauma. Patient's general health and the monitoring of vital signs. Local inspection for swelling, deformations and loss of function of the damaged elbow is carried out. A neuro-vascular preoperative evaluation was conducted. AP and lateral x-rays are collected.

All children separated into 70o-90° flexion by the top elbow plate.The patient then will be taken for surgery after routine investigation. In addition, the consent for surgery was taken from the parents and attendants after explaining the procedure and possible complications.

Technique:

The patient was placed supine on the operating table under general anesthesia with the affected limb on a hand table, without a tourniquet, followed by scrubbing and drapping of the limb. Closed reduction and Crossed lateral (Dorgan) were performed.

Postoperative care and follow-up

In an over-elbow backstage, patients were immobilisated for 3 weeks. Immediate neurovascular postoperative evaluation will be carried out. AP and lateral X-rays are collected in order to evaluate reduction of the fracture. Patients visit the outpatient clinic after 3-4 weeks postoperatively for K-wires removal after AP, with lateral radiographs indicating an appropriate radiological union.

Statistical analysis:

Data analyzed using SPSS version 23 for data processing. The following statistical methods were used for analysis of results of the present study. Data were expressed as number and percentage for qualitative variables and mean + standard deviation (SD) for quantitative one. Chi-square test (X2) used to find the association between row and column variables. For all above-mentioned statistical tests done, the threshold of significance was fixed at 5% level (P-value). P value of > 0.05 indicates non-significant results. P value of < 0.05 indicates significant results The smaller the P value obtained the more significant are the results.

RESULTS

This study included 18 children with supracondylar fracture of humerus underwent crossed lateral ascending and descending pinning at orthopedic department, Zagazig University Hospitals and IbnSina teaching hospital. The age of the studied group was (6.6±2.1) years ranged from 6 to 10 years, half of the group (50 %) had aged less than 6.5 years and (50%) from 6.5 to 11 years **(Table 1)**. More than half of the studied group (61.1%) were males and (38.9%) of them were females **(Figure 1)**.

Regarding side affected, 55.6%) of the studied group were right sided affected and (44.4%) of them were left sided **(Figure 2)**. The commonest mechanism of injury was FD among (83.3%) of the studied group followed by RTA was among (16.7%) of the studied group **(Table 2)**.

Regarding displacement, postero-medial was the commonest displacement among (61.1%) of the studied group followed by postero-lateral was among (22.2%) of the studied group and lastly posterior one (16.7%) **(Figure 3)**.

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More than half of the studied group (55.6%) had excellent cosmetic score, (27.7%) of them had good cosmetic score and (11.1%& 5.6%) had fair and poor cosmetic score respectively **(Table 3)**.

More than half of the studied group (55.6%) had excellent functional outcome, (27.7%) of them had good functional outcome and (11.1%& 5.6%) had fair and poor functional outcome respectively **(Figure 4)**.

Table (1): Age distribution of the studied group:

Variable	**The studied group(18)** **mean ± SD** **(Range)** **Median**	
Age (years):	6.6±2.1 (3-11) 6.5	
Variable	**NO (18)**	**%**
Age grouping ***≤ 6.5 years*** ***>6.5 years***	 9 9	 50.0% 50.0%

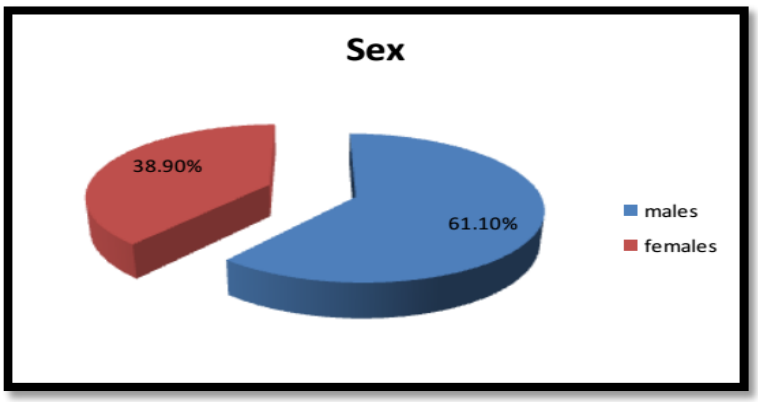

Figure (1): Pie chart for sex distribution among the studied group

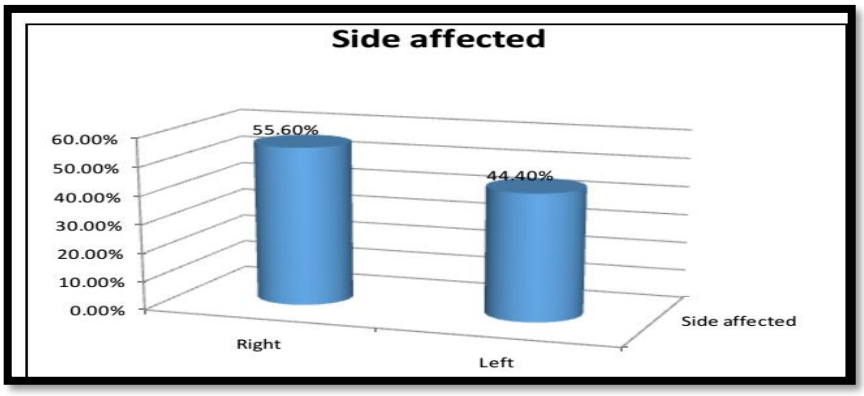

Figure (2): Bar chart for the affected side among the studied group.

Table (2): Mechanism of injury among the studied group:

Mechanism of injury	**NO(18)**	**%**
RTA	3	16.7%
FD	15	83.3%

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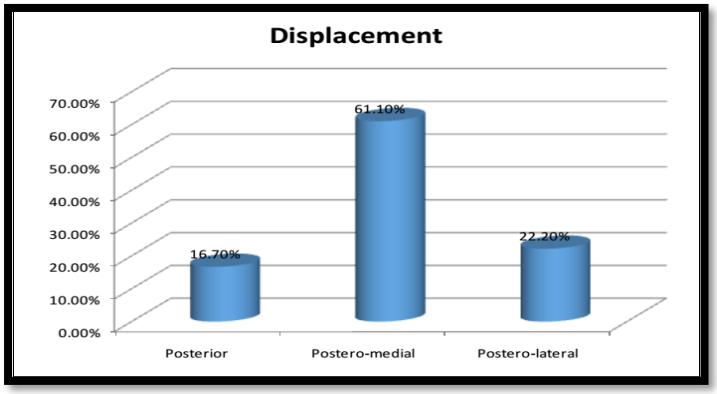

Figure (3): Bar chart for the displacement among the studied group

Table (3): Cosmetic score among the studied group:

Variable	**The studied group(18)**		
	Variables	**NO(18)**	**%**
Cosmetic Score	***Excellent***	10	55.6%
	Good	5	27.7%
	Fair	2	11.1%
	poor	1	5.6%

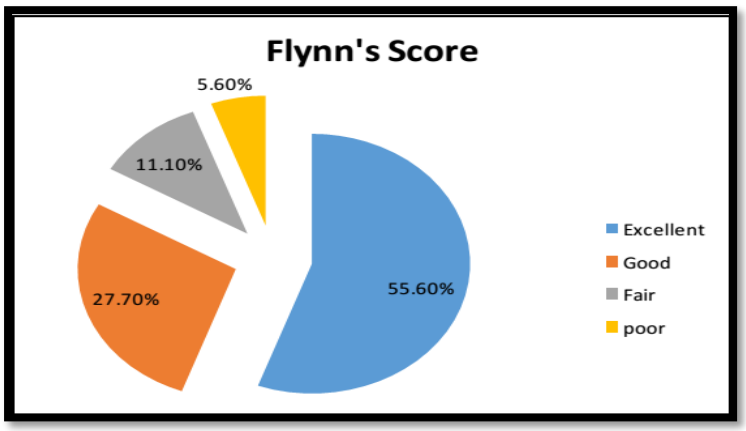

Figure (4): Pie chart for final outcome by Flynn's Score among the studied group

DISCUSSION:

There is several treatment options most widely provided for displaced supracondylar fractures to the patients. Closely manipulating the fracture and stabilizing it in a posterior plaster splint, with two cross K wires, with a clear reduction of the inner and K wires fixation, close manipulation and stabilisation. Fluoroscopic control and fracture stabilization using two cross k-wire is the most effective way to treat these patients **(9)**. There are different ways to insert the K wire, one method is two parallel K wires from lateral side and other is two cross K wire, one is from medial and other is from lateral side. Which construct is mechanically more strong is still debatable **(10)**.

Danielson and Peterson (11) were in favour of using one K wire. But this construct was not strong enough to hold the fracture fragment at their anatomical position. The method has been modified. **Flynn et al. (12)** used cross-K cables, one on the side and another on medium epicondyls. This structure is high enough mechanically and provides strong post-operative stability. This design also enables the patient to begin early movement exercises. Literature reports a neurological complication (injury to the ulnar nerve). This can happen when the wire from the media side is inserted. The incidence reported is between 2 and 8% **(13)**.

This research included 18 children with supracondylar humerus fracture undergoing lateral pinning in the pediatric department, in the hospitals of Zagazig University, and in the teaching hospital

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at IbnSina. Average age of 6-11 years in the study group was between 6.6±2.1, of which 50% were females (50%) and 55% (6.5 to 11 years).. of the study group, over half (61.1%) were males and (38.9) females, (55.6%) were left (44.4%) were males and (55.6%) were female. The average age was 4.1%. The FD (83.3 percent) of the research group followed by RTA was the most common mechanism for injury in our study (16.7 %) Postero media of the studied group were the most frequent (61.1 %), followed by postero-lateral displacements of the studied group (22.2 %), and finally posterior displacement of the studied group (16.7 %). More than half (55%) have a strong cosmetic score, of which 27.7% have a good cosmetic score, and (11,1% and 5,6%) a reasonable and bad cosmetic score respectively, and the same is true of the Flynn score; over half (55,6%) of the studied population have a good functional score (27,7%) Outcome (11.1 % & 5.6 %)had respectively a good and bad functional result.

Our study was in line with a study **Osman &Abd Al-Hadi., (14)** reported the closed reduction and lateral cross-pinning procedure was used in their institution for 32 cases of displaced supracondylar humeral fractures. Patients' average age was 6 years (4–11 range). The children were 17 (53%), and the girls were 15(47%). In 16 cases, injury processes had fallen to a flat surface, 11 cases had dropped in height and 5 road accidents. The extension form was all of the fractures. Gartland type II consisted of 12 (37.5%) fractures, while Gartland type III consisted of 20 (62.5%) fractures. The median length of follow-up was 12 months (from 9 to 20 months). The clinical outcomes were assessed on the basis of Flynn's cosmetic and operational criteria; 30 patients (93.8%) were cosmetically successful, and the results were fairly obtained by two patients (6.2%). Functional outcomes were achieved in 28 patients (87.5%), and four (12.5%), inadequate results were achieved.

Another study was conducted in 40 children in Egypt for the supracondyla fracture Type II and Type III in humerus. Randomly, the children were split into group A and group B. Average follow-up was 27 weeks (range between 23 and 29 weeks) Group A consisted of 20 lateral cross-conducting patients. The average age was 6.54. In which 15 (75%) patients were children and 5 (25%) were girls. Girls were children. Due to heights dropping in 13 patients, 6 had been injured while playing, while 1 had been injured as a result of a road accident. The right elbow had six patients (30%), and the left elbow fracture had 14 (70%).Posteromedially 10 patients were displaced, 4 were posterolaterally displaced and 6 had direct posterior displacement. Twenty patients were included in Group-B. The average age was 5.88. Fourteen of those patients (70%) had boys and six (30%) had children. In 11 patients with injuries, 7 were injured during their playing, while 2 were injured by road accident. The right Elbow was in 9 patients (45%) and the left Elbow fracture in 11 patients (55%). In 12 patients, 4 were posterolateral, and 4 were directly post displaced posteromedically.The Flynn ranking system assessed the final follow-up; In group A, the findings showed 11 healthy patients, (55%), six good (30%), two decent (10%) and just one poor, according to the angle at which it was carried (5 percent). In Group B, 8 were really good (40%), 7 were good (35%), 3 were average (15%) and 2 were bad (10 %). The two groups had no statistically significant difference ($p>0.05$). In group A, according to the results, 11 (55%) were fine, 5 (25%) were good, 3 (15%) were fair and only 1 (8%) was bad. Nine (45%) were really fine, 5 (25%), 4 (20%) were fair and two (10%) were bad. Group B was outstanding. The two groups had no statistically significant difference ($p>0.05$).The average of loss in carrying angle and range of motion (both flexion and extension) is higher in group B than group A but the difference is statistically not significant **(13)**.

CONCLUSION:

Closed approaches can be used to minimize most supracondylar fractures. In type II and in type III fractures, the procedure is initially a closed reduction followed by percutaneous pin stabilization. Possibly the best mechanical stability is provided by a cross pin fixation. The lateral cross-pinning technique has been found to be excellent for stability with crossed pins and to prevent damage to the ulnar nerve.

No Conflict of interest.

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