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MANAGEMENT OF SUPRACONDYLAR FRACTURE OF HUMERUS USING CROSSED LATERAL PINNING IN PEDIATRICS

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ABSTRACT

Background: A sufficient background and careful initial clinical evaluation are needed for the assessment and treatment of the supracondylar fracture of the humerus. The study aimed to evaluate the results of cross lateral ascending and descending pinning in pediatric supracondylar fractures humerus. Patients and methods: This study included 18 children with supracondylar humerous fractures who underwent lateral pinning in the pediatric department, the hospitals of Zagazig University, and the hospital of teaching Ibnsina. Surgical technique was performed and outcomes were recorded. Results: Regarding cosmetic score, more than half of the studied group (55.6%) had excellent, (27.7%) of them had good and (11.1%) had fair and (5.6%) had poor cosmetic score respectively. Concerning Flynn's Score, 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.There was statistically significant difference between patients with satisfactory and unsatisfactory outcome regarding presence of complications and mechanism of injury with better outcome in injury due to FD and patients with satisfactory outcomehad no complications. Conclusion: Near manipulation and percutaneous attachment in the paediatric age group is an appropriate and conclusive treatment procedure with two crossing-lateral K wire of Gartland type II and III supracondylar fractures with less complications.

Keywords: Supracondylar Fracture; Pediatrics; Crossed Lateral Pinning

INTRODUCTION

The treatment approach of supracondylar fractures of the humerus depends upon the degree and position of the displacement when initial evaluation and diagnostic evaluation are carried out **(1).** Gartland classification is the basis of existing procedures for treatment of supracondylar fracture **(2).** The goals of treatment of displaced supracondylar fracture of humerus (Gartland type II and III) in children are to achive stable reduction and prevent nerve injury and vascular compromise leading to compartment syndrome. Also, in long term to reduce cubitusvarus deformity **(3)**.

In fractures Types III, all need reduction, some closed with pinning and others possibly open with pinning. Because of the greater potential for soft tissue interposition with type III fractures, the indication for open reduction with these fractures is greater **(4).**

There has been no uniformity of opinion concerning the ideal method of the treatment of supracondylar fractures. Supracondylar fracture of the humerus is a condition that needs a most important skill that the orthopaedic surgeon must develop. Namely the ability to choose from a number of treatment modalities the best treatment for a given condition in a given patient **(5)**.

Lateral crossed pinning (Dorgan technique) offers good outcomes in most patients with practical, cosmetic and good stability **(6)**. In Dorgan's procedure, 72 children received satisfactory functional results and also satisfactory cosmetic results in 91.4% of the children and 8.6% had unsatisfactory results in all patients. In their research, there has been no reported ulnar nerve or radial nerve damage **(7)**.

The present study aimed to evaluate 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 of Orthopedic Department Zagazig University Hospital (Egypt) and Ibn-Sina Hospital (Libya). The age of the studied group was (6.6±2.1) years ranged from 6 to 10 years.

Inclusion and exclusion criteria:

Unstable displaced or irreducible (Gartlandtype II and type III) supracondylar humeral fractures in young childern. Closed injuries except cases that had Gustilo type I open fractures. While, Gustilo type II or III open fractures, injuries that required open reduction and internal fixation and associated neurovascular injuries.

Surgical Technique:

A neurovascular preoperative evaluation was conducted with local inspection for swelling, deformations and loss of function of the damaged elbow is carried out AP and lateral x-rays are collected. All children separated into 70o-90° flexion by the top elbow plate. In addition, the consent for surgery will be also taken from the parents and attendants after explaining the procedure and possible complications.

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 was performed and Fluoroscopic images in anteroposterior and lateral planes were then checked for reduction. fixation technology. These drums were handled with the elbow hyper-flexed to keep the initial reduction under C -arm guide. The first wire has been retrogradely (ascending) into the medium cortex through the lateral condyle through the fracture. The wires were then bent, cut. Left outside the skin to facilitating their removal in follow up, and dressing **(Figure 1)**.

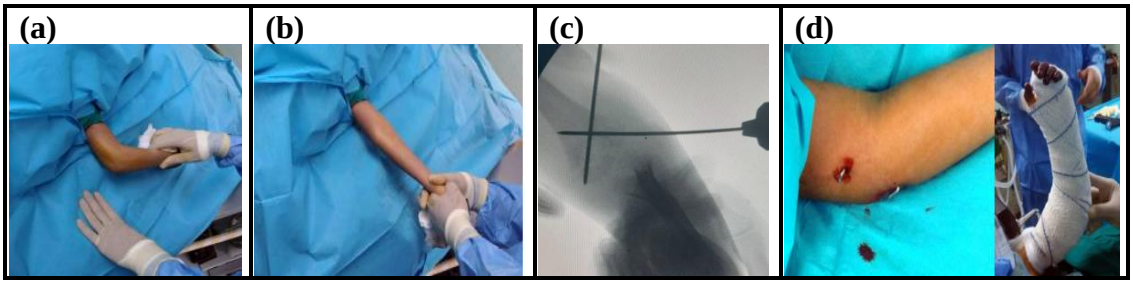

Figure (1): Closed reduction and Crossed lateral (Dorgan) Technique in following steps; (a) Drapping, (b) counter traction, (c) Crossed lateral K-wires under C-arm and (d) cutting wires and dressing.

Postoperative follow-up:

Patients visit the outpatient clinic after 3-4 weeks postoperatively for K-wires removal after AP, with lateral radiographs indicating an appropriate radiological union. Radiographic evaluation will be performed using the (humero capitellar angle) in the lateral view and (Baumann's angle and metaphyseal-diaphyseal angle) in the AP view. Clinical evaluation was performed using Flynn's cosmetic and functional criteria.

Criteria of Flynn:

Flynn criteria are obtained by measuring the range of elbow movement and the carrying angle. Both loss in carrying angle and loss in elbow motion compared with normal side are scored as follows: between (0 and $5^{o)}$ excellent; (6 - 10^{o}) good; (11 - 15^{o}) fair and more than 15^{o} is poor **(8)**.

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

The present study showed 55.6% of the studied group were right sided affected and (44.4%) of them were left sided. 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%) **(Table1)**.

Regarding cosmetic score, more than half of the studied group (55.6%) had excellent, (27.7%) of them had good and (11.1%) had fair and (5.6%) had poor cosmetic score respectively **(Figure 2)**.

Concerning Flynn's Score, 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 **(Table 2)**.

Regarding postoperative complications, most of the studied group (88.9%) didn't have any complications, (11.1%) of them had Pin tract infection **(Figure 3)**.

There was statistically significant difference between patients with satisfactory and unsatisfactory outcome regarding presence of complications and mechanism of injury with better outcome in injury due to FD and patients with satisfactory

outcomehad no complications. Regarding age, sex, displacement, there was no statistically significant association with the different functional outcome **(Table 3)**.

Table (1): Side affected and displacement among the studied group:

	NO(18)	%
Side affected		
Right	**10**	**55.6%**
Left	**8**	**44.4%**
Displacement		
Posterior	**3**	**16.7%**
Postero-medial	**11**	**61.1%**
Postero-lateral	**4**	**2.22%**

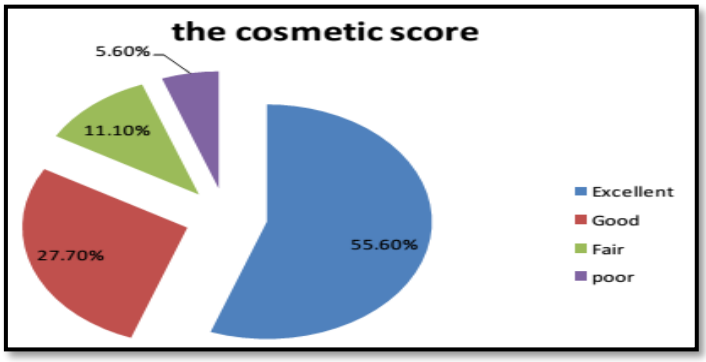

Figure (2): Pie chart for the cosmetic score among the studied group

Table (2): Final outcome by Flynn's Score among the studied group:

Final outcome	The studied group (18)		
	Variables	**NO(18)**	**%**
final outcome by Flynn's Score	***Excellent***	10	55.6%
	Good	5	27.7%
	Fair	2	11.1%
	poor	1	5.6%

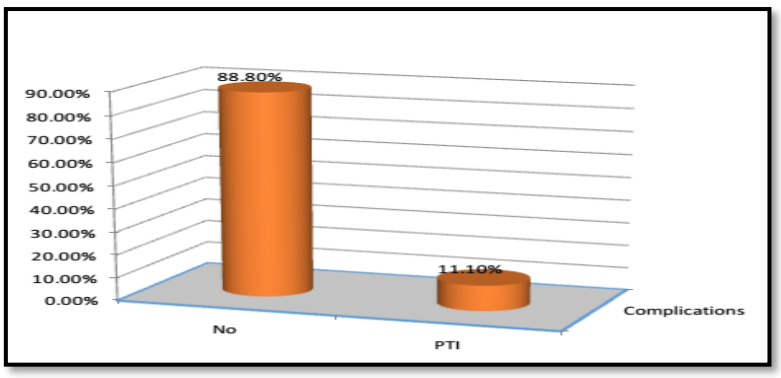

Figure (3): Bar chart for complications among the studied group

Table (3): Comparison between patients with different functional outcome regarding patients characteristics among the studied group:

Variable	Satisfactory		Unsatisfactory		χ^2	p
	NO. (15)	%	NO. (3)	%		
Age group						
≤6.5 years	8	53.3	1	33.3	0.4	0.2
>6.5 years	7	46.7	2	66.7		
Sex						
Male	10	66.7	1	33.3	1.16	0.3
Female	5	33.3	2	66.7		
Side						
Left	6	40.0	2	66.7	0.72	0.4
Right	9	60.0	1	33.3		
Displacement						
posterior	2	13.3	1	33.3	1.2	0.5
postero-lateral	3	20.0	1	33.3		
postero-medial	10	66.7	1	33.3		
Mechanism of injury						
RTA	1	6.7	2	66.7	6.5	**0.01***
FD	14	93.3	1	33.3		
Complications						
No	15	100.0	1	33.3	11.2	**0.02***
Yes	0.0	0.0	2	66.7		

* Statistically significant difference (P ≤ 0.05), FET=Fischer Exact test.

DISCUSSION:

Humerus Supracondylar Fractures in children are very common. Supracondylar fractures extra articular represent 3% in children and 60% in all elbow-related fractures. These fractures are normal in a pediatric 3-10 year age group **(9)**.

Due to the ligamentous laxity and anatomical structure of humerus shaft the greatest prevalence in the first decade of existence. The lower end of the humerus is flattening, which causes that portion to weaken. Children are very energy-intensive throughout their first decade of life and the distal portion of Humerus is weaker than fractures. Patient pain, swelling and tenderness around the elbow are typically the most common occurrence **(10)**.

The classification of such injuries is based on a Gartland scheme. The Gartland classification divided the fracture into three groups, and it lets the surgeons choose a better approach to each shape. The Gartland classification Unreplaced fractures of type I Gartlandare usually treated with cast immobilisation, leading to good working results **(11)**.

Care for supracondyl fractures seeks to recover anatomical or near-anatomic reductions, to restore the early function of the elbow with a successful ROM, to prevent neurovascular, deformity and other complications.Elbow rigidity and physical

and psychological effect on children and their parents are decreased by the fracture **(12)**.

In addition, the child's location on the operating bed may be supine or susceptible. The possibility of an ulnar nerve injury during the insertion of the media pin was an unresolute concern for those who favor cross-pinning. But,These problems are not reported to those who use the prone position **(13)**.

Flynn's criteria used other practical criteria, radiographic or re-operation rates after plaster cast failure**.** The technique of side cross-pinning provides stability to fractures and protection to the ulnar nerves. This research was conducted to enhance the results of cross lateral ascertaining and descending pinning of pediatric supracondylar fracture humerus and could be considered a viable choice for the treatment of displaced supracondyla fractures in children **(12)**.

The present study included 18 children with supracondylar humerus fracture undergoing lateral pinning with an average age of 6-11 years of both gender for evaluatation the clinical and functional results of cross lateral ascending and descending pinning in pediatric supracondylar fractures humerus.

In this study the age was 6.5 years (range 2 to 13 years 8 month) in accordance with **Eberhardt et al. (14)** presented 49 were male (53%) and 35 female patients (47 percent). 93% good to excellent functional results were achieved. They had 93% outstanding and 7% decent cosmetic results, with no low results. 87 percent of its cases were radiologically with a typical condyl angle of the humeral shaft. No secondary displacement occurred. No closed reduction patients formed a cubitusvarus in the closed reduction community. In seven cases of shut down, the pins migrated and reached the skin early and allowed one or both pin to be removed. For superficial pin infections, two cases needed short-term antibiotic treatment. In all of the cases handled with a closed or open reduction there were no deep pin infections.

Also, **El-Fouly (8)** found that twenty-five kids were treated with percutaneous lateral cross-wired techniques with displaced types II and III supracondylar human fractures. The average age was sixteen boys and nine girls, 6.5 years.The Dorgans percutaneous lateral cross cording technique was used by all patients within 24 hours of trauma. Patients were monitored for 9-month duration and radiologically tested in accordance with the Flynn requirements for union, functionally and cosmetically. Both patients were strongly united. All patients received satisfactory results, while 96% were good in functional terms and 4% had fair results. For either the ulnar or radial nerves there was no iatrogenic neurologic damage.

Queally et al. (15) reported all kids undergoing the treatment over a 10-year period have been retrospectively reviewed. A mean follow-up period of 36 months was used for 43 patients undergoing side cross-cutting of the humeral for displaced supracondylar fractures (Gartland Type II and Type III). There has been no significant decrease loss. The mean change between intraoperative and follow-up radiographs was not substantial ($p>0.05$) at the angle of Baumann (4.2o ±1.6). There was no iatrogenic ulnar case. The "carrying angle" and "return to work" had come back to normal in both children compared with the opposite hand. Three patients developed pin-site infections, postoperative complications which have been treated successfully. This study concluded that lateral cross-conducting is an efficient choice in children for the treatment of displaced human supracondylar fractures. It is as efficient in fracture healing with a decreased risk of nervous ulnoid injury as is the conventional crosswire technique.

Similarly **Shafi et al.(16)** stated that 70 patients were male and female in their sample. There were children between the ages of 4 and 11 years. 42 patients (60%) were male patients and 28 (40%) were female patients. Of the total 72.85% patients, satisfactory results were achieved. However, 27,14% were unsatisfactory in patients. 31 male and 20 female patients reported satisfactory results in male patients, while 11 male and 8 women did not. Of 70 patients, 22 were decent (31.4%), 18 were good (25.7%), 11 were fair (15.7%) and 19 had bad results (27.1 percent). Infection was a complication that they had to face at the site of installation of K cable. At the K wire insertion site, two patients (2.8 per cent) had infection. Their K wires were cut at an early stage and antibiotics were recommended for five days orally.

Finally, the previous studies showed the best stability for crossed pins and although the lateral cross wiring technique does not provide supporting biomechanical data, the cross wire configuration obtained by insertion of the lateral side on both wires is close to that obtained by conventional media and side technology.

CONCLUSION:

Near manipulation and percutaneous attachment in the paediatric age group is an appropriate and conclusive treatment procedure with two crossing-lateral K wire of Gartland type II and III supracondylar fractures with less complications.

No Conflict of interest.

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