



GARTLAND TYPE III SUPRACONDYLAR FRACTURE HUMERUS; SURGICAL MANAGEMENT

1. MS Orthopaedic Surgery
Assistant Professor
Orthopaedic Department
Shaheed Mohtrama Benazir Bhutto Medical College Lyari/
Sindh Government Lyari General & Teaching Hospital, Karachi.
2. FCPS Orthopaedic Surgery
Senior Registrar
Orthopaedic Department
Shaheed Mohtrama Benazir Bhutto Medical College Lyari/
Sindh Government Lyari General & Teaching Hospital, Karachi.
3. MS Orthopaedic Surgery
Senior Medical Officer
Orthopaedic Department
Lyari General Hospital, Karachi
4. FCPS Orthopaedic Surgery
Professor & Head of Department
Orthopaedic Surgery
Shaheed Mohtrama Benazir Bhutto Medical College Lyari/
Sindh Government Lyari General & Teaching Hospital, Karachi.
5. Postgraduate trainee
Orthopaedic Department
Shaheed Mohtrama Benazir Bhutto Medical College Lyari/
Sindh Government Lyari General & Teaching Hospital, Karachi.

Correspondence Address:

Dr. Krishan Lal
Assistant Professor
MS Orthopaedic Surgery
Orthopaedic Department
Sindh Government Lyari General & Teaching Hospital/
Shaheed Mohtrama Benazir Bhutto Medical College Lyari
krishan_ortho@hotmail.com

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INTRODUCTION

In children supracondylar fracture of humerus is the commonest fracture needing proper management. This fracture is common in the 1st decade of life^{1, 2} due to various causes, mainly ligament laxity and anatomical structure of humerus tube (shaft) to flat transformation at the lower end of humerus, a factor in the capacity in the child for elbow hyperextension- not seen in adulthood or later childhood. The incidence decreases with age³ and 50% of the total fractures around elbow are of this type. The fracture line

Dr. Krishan Lal¹, Dr. Muhammad Bux Chachar², Dr. Mohammad Haroon Chohan³,
Dr. M. Akhter Baig⁴, Dr. Jamil Ahmed Khoso⁵

ABSTRACT... Objectives: The purpose of present study is: 1. To know the results of surgical intervention of Garland type III fracture Humerus in children. 2. To know the early and late complication of surgical intervention. **Study Design:** Prospective interventional study. **Setting:** Department of Orthopedic Unit-II, Civil Hospital Karachi. **Period:** February 2010 to January 2012. **Methods:** 200 male and female patients with Gartland type III supracondylar fracture of humerus presenting within 24 hour of injury, with age limit varying between 1- 12 years were included in our study. The anteroposterior and lateral view X-rays were taken and evaluated for displacement and angulation, medial/ lateral displacement and angulation and rotation of distal fragment. After all aseptic measures, patient under general anesthesia, through posterior approach skin was incised, subcutaneous tissue dissected along the line of incision. Triceps apponeurosis was splitted and interposed soft tissue was released and fracture reduced and fixed with K-wire on both medial and lateral sides parallel to the long axis of humerus in lateral view and an angle of 30° – 40° in A/P view. Wound closed in layers, aseptic dressing applied and well-padded back slab with elbow in appropriate angle of flexion was applied and pulses were checked. Postoperatively the hand was held elevated. Plaster of parries black slab was removed after four weeks; the wires were removed after six weeks. The follow-up ranged from 3 to 6 months. All the Data regarding patient were entered on well-designed proforma. The criteria for assessing the results were based on healing period, anatomical appearance, function and radiographic appearance. **Results:** Excellent results according to Mitchell-Adam's criteria were observed in 60 %. (120/200) cases, good results were observed in 27 % (54/200) cases. Overall excellent to good results were observed in 87% of cases. **Conclusion:** It is concluded that outcome of surgical treatment of supracondylar fractures of humerus (Gartland type III) fixed with medial and lateral placement of k- wires were excellent to good and it achieves stable fixation. As both wires were placed under vision so risk of ulnar nerve and radial nerve injuries were decreased as compared to closed reduction and percutaneous k-wiring. As this method is technically easy, less demanding and effective for stabilization and can be applied for patients with these fractures.

Key words: Kirschner wire, supracondylar fracture

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is generally transverse; results from a fall on the outstretched hand, and should always be suspected, when child complains of pain in the elbow after such an injury. These injuries can also occur due to fall from height and assault by any mean.

Treatment of elbow fractures in children remained a great challenge for surgeons since Hippocrates. Proper training is needed to adopt recent advances by young surgeons to deal with the challenges.⁴

The management of supracondylar fracture of humerus is controversial and technically difficult and complications are common.⁵

The purpose of this study was to assess the ability of open reduction and internal fixation by K-wire to obtain and maintain an adequate fixation, and to evaluate the recovery of elbow range of motion (ROM) and carrying angle.

MATERIAL AND METHODS

This prospective interventional study conducted in department of orthopedic Unit-II, Civil Hospital Karachi, from February 2010 to January 2012. 200 male and female patients with type III supracondylar fracture of humerus presenting within 24 hours, with age limit varying between 1- 12 years especially those giving consent to participate in our study were included in our study. The samples were collected by non-probability purposive technique. Children with open supracondylar fractures of the humerus, Garland type I and II supracondylar fracture, patient with multiple visceral injuries, spinal and head injuries and those who refused to give informed consent, were excluded from the study.

The categorical variable in the study were sex of the patients, type of fracture, complications, grading for assessment of results, mechanism of injury, and the continuous variable were age of the patients, time from the injury to presentation at hospital, stay in hospital and follow up of the patient.

History was taken from all patients under study, examined with attention to neurovascular status, soft tissues, skin tethering, swelling around the elbow and evidences suggesting to compartment syndrome. All these patients were also evaluated for associated injuries. The anteroposterior and lateral view X-rays were taken and evaluated for displacement and angulation, medial/ lateral displacement and angulation and rotation of distal fragment. Blood samples were taken for hemoglobin assessment. Pros and cons of the operative treatment and risk of general anesthesia were also discussed with patient and

their parents.

After all aseptic measures, patient under general anesthesia through posterior approach skin incised, subcutaneous tissue dissected along the line of incision.

Triceps aponeurosis was splitted to expose the fracture site. Interposed soft tissue was released and fracture reduced. Reduced fracture was fixed with K-wire on both medial and lateral side parallel to the long axis of humerus in lateral view and an angle of 30° – 40° in A/P view. The wires were cut and bent beneath the skin in such a way so that they could be easily removed. Wound closed in layers, aseptic dressing applied and well-padded back slab with elbow in appropriate angle of flexion was applied and pulses were checked. Postoperatively the hand was held elevated. These patients were admitted in ward and antibiotics were given for 72 hours. Circulation of the hand was checked regularly and child encouraged moving the fingers actively to reduce the edema of fingers and hand. Post-operative X-ray AP and lateral view were taken, stitches removed on tenth postoperative day. POP black slab was removed after four weeks; the wires were removed after six weeks. Meanwhile intermittent active movements of the elbow were encouraged. In the intervening period, complications if occurred were recorded and treated accordingly. The follow-up ranged from 3 to 6 months. All the Data regarding patient were entered on pre-designed proforma. The criteria for assessing the results were based on healing period, anatomical appearance, function and radiograph appearance. We followed Mitchell Adams criteria for assessment of results which is as follow.⁶

EXCELLENT

Carrying angle changed less than 5 degree. Range of motion in any plane (Flexion/ Extension) restricted by less than 10 degree. No complains.

GOOD

Carrying angle changed between 5 – 15 degrees. Range of motion restricted by less than 20 degree.

UNSATISFACTORY

Carrying angle changed more than 15 degree. Range of motion restricted by more than 20 degrees.

However Flynn, J.C has modified it in 1994 and is described below for sake of completeness.⁷

Criteria for Grading Results by Flynn, J. C

RESULTS	COSMETIC FACTOR LOSS OF CARRYING ANGLE (DEGREES)	FUNCTIONAL FACTOR LOSS OF MOTION (DEGREES)
Excellent	0-5	0 – 5
Good	6 – 10	6 – 10
Fair	11 – 15	11 – 15
Poor	>15	>15

The results were compiled by statistical analysis and the P – value of less than 0.05 was considered significant.

RESULTS

A total of 200 patients with Gartland type iii supracondylar humerus fractures were included in this study. Most of the patients (76%) were 5 to 8 years of age with mean age 7.24 ± 2.1 years.

Out of 200 cases 147(73.5%) were male and 53(26.5%) were female and ratio was 2.7:1.

Regarding mode of injury 140(70%) were presented with history of Fall & 40(20%) injured while playing games & 20(10%) were injured with road traffic accidents. Left side was affected in 65% cases and Right side was affected in 35% of cases. Average stay in hospital was 7 ± 1 days.

Following results according to Mitchell-Adams criteria were observed. Satisfactory results in 87% cases with excellent in 60% cases and good in 27% cases and unsatisfactory results were observed in 13% cases , with P-value <0.05. Paresthesia along ulnar nerve territory were observed in 3.5% cases, pin tract infection in 7.5% cases, migration of pins distally were observed in 4% cases with p-value of <0.05.

DISCUSSION

The supracondylar fracture of humerus is a common fracture in children. It can occur at any age but 4 to 10 years of age group is commonly affected. The mean age as reported by Rockwood⁸ and Pirone⁹ varies between 6 to 8 years. The same has been observed in our study which shows 5 to 8 years of age group being affected usually and the mean age being 7 ± 1 years. There is no significant difference between our study and other studies reported.

The supracondylar fracture of the humerus is common in boys. Lipscomb and Burleson¹⁰ described that the boys are livelier and their games are rough so they are more prone to the fracture. The male to female ratio as reported by S.Giannini et al¹¹ was 2.44:1 and P.Worlock¹² was 2.02:1. In our study, boys out-numbered girls by the ratio of 2.7:1 which is comparable to other studies.

The left side is commonly involved during this injury, Holmberg¹³, Lipscomb and Burleson¹⁴ concluded that the right handed persons have weaker muscles in their left arm because they use it less skillfully as compared to the right arm. The same has been reported by a number of authors during their studies. Combined data from sixty one papers indicated that 60.8% of the supracondylar fractures were on the left side as compared to 39.2% on the right side (Rockwood).⁸ Pirone⁹ reported left sided fractures in 63% of the cases as compared to 37% on right side. Our figures are comparable to these. We have 65% on left side as compared 35% on right side which is comparable and statistically the difference is not significant.

The usual mechanism reported by various authors is fall on out stretched hand followed by injuries suffered during games and RTA. Our studies show that most of the extension type of Supracondylar fractures occurs during fall (98%) with elbow extension and the tip as a center of transmission of force. Open reduction and internal fixation has advantages of accurate reduction and maintenance of position, keeping elbow in less acute flexion and early mobilization. But there

are certain risks also which include more tissue trauma due to surgery, painful scar formation, nerve injury, infection etc. Excellent results of operative treatment were achieved in 78% cases by Danielson.¹⁵ Other authors^{16, 17, 18} achieved the results between these two extremities. However in our study we achieved 87% excellent to good results. There was no statistically significant difference when compared to other authors' studies.

The results of surgical treatment are better if done early. It is difficult to obtain excellent results from supracondylar fractures if the definitive treatment is delayed for more than 5 days (Pirone)⁹ after initial treatment. This may be due to the rapid organization of the fracture hematoma.

In the presence of ischemia it is imperative to rule out compartmental syndrome and measurement of compartment pressure may be very helpful in this situation. The brachial artery can be inspected directly at the time of fasciotomy. The relationship between arterial injuries, compartmental syndrome and neural lesions in supracondylar fracture is complex and presents many diagnostic challenges (Mubarak, SJ)¹⁹

We did not observe compartment syndrome in any of our case under study hence no subsequent Volkmann's ischemia. We observed paresthesia in 7 patients (3.5%), which in international study is 8%, pure nerve injury was not observed in our series. In the present series, 15 (7.5%) patients developed pin-tract infections, which were superficial and healed after removing pins and administration of oral antibiotics. No deep infection or septic arthritis was found. Pirone⁹ found superficial pin-tract infection in 2% of cases with no deep infection and septic arthritis. Battle and Carmichael evaluated a series of 202 fractures, reported an infection rate of 7.9%.²⁰ More percentage of pin tract infection in our series was probably because of poor hygienic conditions of the patient. In the present series, the distal pin migration was seen in 8 (4%) patients and no loss of reduction, which was not significant and so, required no re-reduction and re-pinning.

CONCLUSION

Open K-wire fixation for Gartland type III supracondylar humerus fractures is technically easy, less demanding and effective for stabilization. As both wires were placed under vision so risk of ulner nerve and radial nerve injuries were decreased as compared to closed reduction and percutaneous k-wiring. Excellent to good results were observed in terms of range of motions and carrying angulation in our study at our setup.





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AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author-s Full Name	Contribution to the paper	Author=s Signature
1	Dr. Krishan Lal	Main author	
2	Dr. M. Bux Chachar	Co-author	
3	Dr. M. Haroon Chohan	Co-author	
4	Dr. M. Akhtar Baig	Co-author	
5	Dr. Jamil Ahmed Khoso	Co-author	