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A comparative study between closed reduction with percutaneous pinning and open reduction with K wire fixation in displaced supracondylar fractures of humerus in children

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Abstract*: The aim of the study was to analyze the results of fixation of supracondylar fractures by open vs. closed reduction followed by internal fixation with k wires and assessing the union radiologically, complications associated with the procedure and restoration of range of motion and function of the elbow and to evaluate the results clinically regarding pain, stiffness, range of motion. our study was conducted on 15 pt who attended orthopaedics opd /emergency rimsh with extension type of supracondylar fracture (gartland ii & iii).closed manipulation was done with application of posterior POP slab for immobilization. Check X ray was done .on adequate reduction pt was sent back home .Inadequate reduction were admitted and was planned for OT either percutaneous pinning or ORIF with k wire. Study subject were divided into 2groups .group I = closed reduction with percutaneous pinning. group ii= ORIF with k-wire fixation.Patients were followed up at an interval of 2 weeks for 2 months and subsequently every 3 month for a period of 1 year.On follow up pt was assessed for presence of complication, ROM, carrying angle, deformity (varus or valgus). Average time for union after surgery were found to be 1.90 months and 1.68 months for percutaneous pinning and ORIF with k wire. Variation is not significant (p=0.150).There for conclude that techniques are almost alike .*

Keywords*: children, closed pinning, open fixation, supracondyler fracture*

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I. Introduction

The supracondylar fracture of the humerus is the most frequently seen fracture about the elbow in children. It comprises about 58% of the elbow fractures in children.[1] The common age group is 5–10 years At this peak age for the supracondylar fractures, there is commonly occurring hyperextension at the elbow, which makes susceptible the distal humerus to this type of fracture.[2] The increased occurrence of these fractures is due to more frequent falls in children and due to metaphysis being the weakest area around the elbow.The supracondylar fracture of humerus demand great respect in treatment because, if it is not treated properly, it may lead to several complications such as Volkmann's ischemic contracture, neurovascular injury, myositis ossificans, stiffness of elbow, and malunion.[3] The need for accurate anatomical reduction for stressed more in any fracture than supracondylar fracture of humerus.Several modalities of treatment have been suggested for the treatment of displaced supracondylar fractures of the humerus in children, such as closed reduction and plaster of paris (POP) slab application, skin traction, overhead skeletal traction, closed reduction and percutaneous pin fixation, and open reduction with internal fixation (ORIF).[4] During the initial phase of the century, there was a disinclination to suggest open reduction of supracondylar fracture. A number of studies have been conducted earlier in the

past comparing the results of one form of treatment with the other with varying results. Majority of the studies show best results with operative intervention for these fractures in the form of internal fixation with Kirschner (K-wires).[5–7] Some studies have also shown excellent results with closed reduction and POP cast.[8,9] This variation may be owing to individual surgeons skill or owing to differences in surgical facilities. So, this study was done to see the results in our tertiary hospital setting as it is the most common fracture in children, and accurate and appropriate treatment needs to be decided. The study was done to discourage parents who prefer going to quacks with the sole purpose of avoiding operation so that the children do not experience the complications associated with these fractures.

II. Materials and methods:

study was conducted on 15 patient who attended orthopaedics opd /emergency rimsh with extension type of supracondylar fracture (gartland ii & iii)from January 2018 to December 2019. Both male and female patients were included in the study.The selection criterion was: Closed Gartland type 3 fractures, both extension and flexion type and the following cases were exclusion criteria: compound fractures, nerve or vessel injuries, fractures with intercondylar extension, patients with compartment syndrome. All the patients were initially assessed in the emergency section of rims imphal. They were given first aid in the form of analgesia, splint immobilization, and other resuscitation measures.closed manipulation was done with application of posterior POP slab for immobilization .Check X ray was done .on adequate reduction pt was sent back home .Inadequate reduction were admitted and was planned for OT either percutaneous pinning or ORIF with k wire. Study subject were divided into 2groups . group I = closed reduction with percutaneous pinning ,group ii = ORIF with k-wire fixation. When Blount's technique failed and closed reduction of the fracture was satisfactory, percutaneous pinning was performed. When closed reduction was not satisfactory, open reduction was performed via the medial approach then stabilised using crossed K-wire fixation. Patients with recurrent displacement after percutaneous pinning were also managed using cross-wiring. For percutaneous pinning, the surgeon gradually applied traction to the limb with the elbow extended while the assistant applied counter-traction at the axilla. Fluoroscopy was used to determine whether translation of the distal humerus occurred. While gradually flexing the elbow to about 120◦, the surgeon applied direct pressure to the olecranon with the thumb to correct any residual posterior tilting. With the elbow flexed, anteroposterior and lateral radiographs were obtained to evaluate the quality of the reduction. An Esmarch's bandage was placed to maintain the position. After sterile preparation of the elbow, two identical wires 1.6 to 2 mm in diameter were inserted from lateral to medial, using a slow-rotation power drill . For cross-wiring a medial incision centred on the medial epicondyle was performed and the ulnar nerve was isolated and placed in a noose. The fracture site was then approached via the intermuscular interstice. Reduction was achieved and a wire 1.6 to 2 mm in diameter was then inserted from medial to lateral using a slow-rotationpower drill. A lateral wire of the same diameter was inserted percutaneously under fluoroscopic guidance starting at the lateral epicondyle. The wound was closed in two planes witha continuous intradermal suture. In all patients, the wires were bent back and buried under the skin. A long arm plaster cast with the elbow flexed at 90◦ was used in all patients for 45 days, after which the wires were removed under general anaesthesia. Pt was followed up at an interval of 2 weeks for 2 months and subsequently every 3 month for a period of 1 year.On follow up patient was assessed for presence of complication, ROM, carrying angle, deformity (varus or valgus).

III. Results

results were were assessed for
(i) union
(ii) Baumann angle
(iii) Carrying angle

3.1 union

Table :1 comparisom of mean time of union(month)

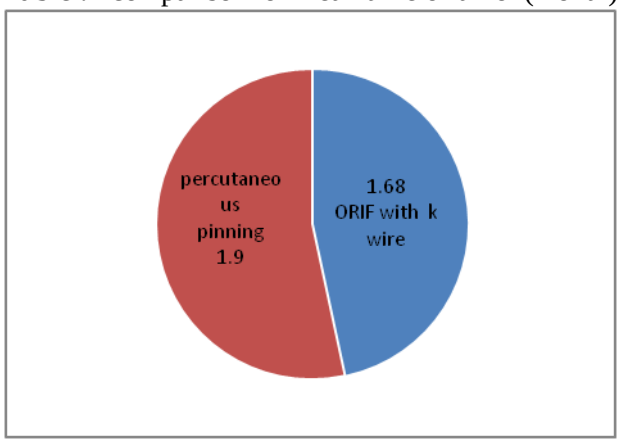

Table:2 Comparison of mean ± S.D of time of union:

Variable	Types of study				t-value	d.f	p-value
	Percutaneous pinning		ORIF with k –wire				
	No. of cases	mean± S.D	No. of cases	mean± S.D			
Time of union [month]	5	1.90±0.22	10	1.68±0.27	1.530	13	0.150

Average time for union after surgery were found to be 1.90 months and 1.68 months for percutaneous pinning and ORIF with k wire.Variation is not significant (p=0.150).There for conclude that techniques are almost alike .In the study minimum time of union was 1.4 months & maximum was 2 month with range of 6 months

3. 2 baumann angle

Table:3 comparison of mean baumann angle(degree)

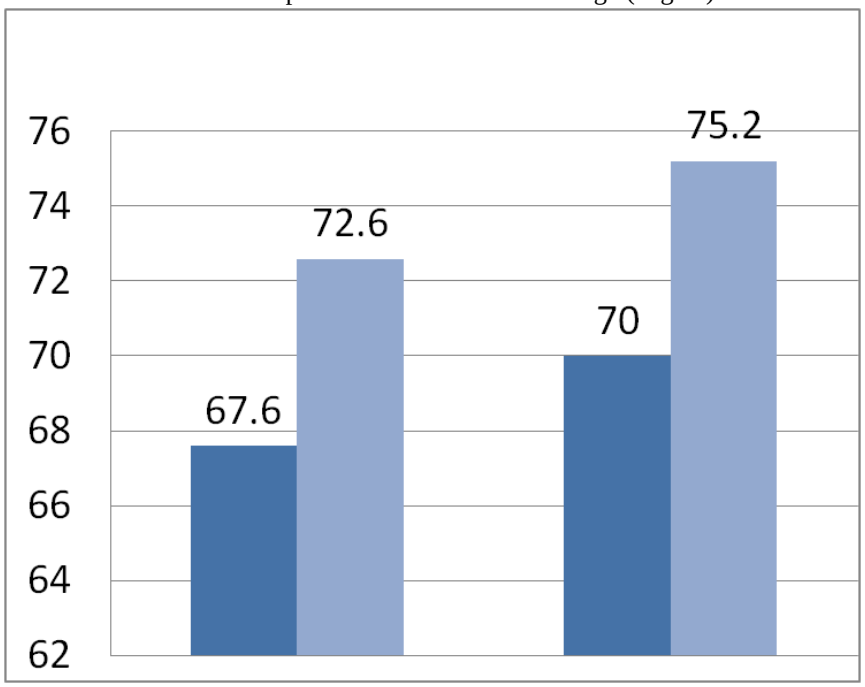

Table:4 Comparison of mean ± S.D of Baumann angle

Variable	Types of study				t-value	d.f	p-value
	Percutaneous pinning		ORIF with k –wire				
Baumann Angle(degree)	No. of cases	mean± S.D	No. of cases	mean± S.D			
Normal site	5	67.60±1.67	10	70.00±4.00	1.286	13	0.227
abnormal site	5	72.60±1.67	10	75.20±3.93	1.394	13	0.187

Mean Baumann angle (degree) for abnormal site is greater than its corresponding normal site in both percutaneous pinning and ORIF. Mean Baumann angle for normal and abnormal site between percutaneous pinning and ORIF groups were almost alike as evident by corresponding insignificant p-values[p=0.187].Indicates that techniques used are almost consistent in terms of Baumann angle

3.3 carrying angle

Table:5 Comparison of mean of carrying angle

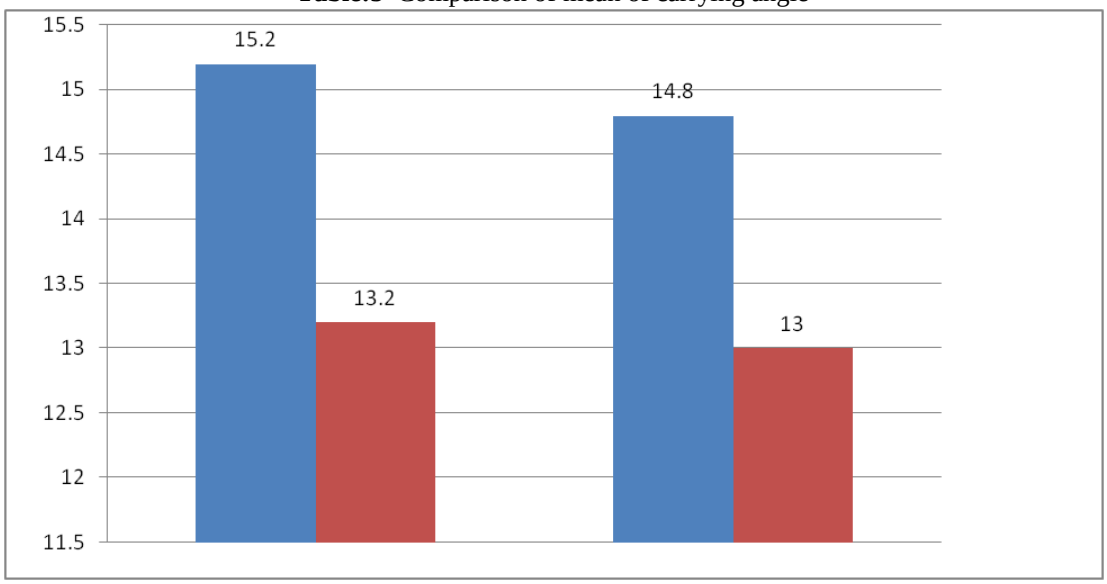

Table:6 Comparison of mean ± S.D of carrying angle

Variable	Types of study				t-value	d.f	p-value
	Percutaneous pinning		ORIF with k -wire				
Carrying Angle(degree)	No. of cases	mean± S.D	No. of cases	mean± S.D			
Normal site	5	15.20±1.09	10	14.80±1.30	0.694	13	0.500
abnormal site	5	13.20±1.09	10	13.00±1.41	0.276	13	0.787

The mean Carrying angle of normal site was found to be greater than than abnormal site in both type of study.Variations of means between the two study groups were insignificant statically as proved by corresponding p –values.[p=0.787]

Figure 1 : preoperative & post operative xray & postoperative wound

IV. Discussion

Limitations of our study are the retrospective design, small sample size, and absence of randomisation, with the surgical strategy being dependent on the usual practice of a single centre. Thus, open reduction was performed when inadequate closed reduction precluded percutaneous pinning or secondary displacement occurred after percutaneous pinning. Our assessment of outcomes using Flynn's criteria showed no significant difference between percutaneous pinning and open reduction with crossed K-wire fixation.Percutaneous pinning

has produced satisfactory outcomes in 95% to 100% of cases in earlier studies [10,11] and is consequently the most widely advocated first-line treatment [12,13]. The postoperative complication rates were 8.6 and 22% in case-series of cross-wire fixation [13] and 13.8% in our study. Secondary displacement was chiefly due to technical shortcomings. Crossing of the pins in the fracture site is associated with secondary displacement, as occurred in 21% of cases in the case-series by Damsin et al. [14]. Therefore, keeping the pins parallel and at least 10 mm apart has been advocated [15]. More recently, Skaggs et al. [16] recommended using three diverging lateral epicondylar pins when concern arose about the stability of the fixation. Using three pins provides the same degree of biomechanical stability as the cross-pinning technique described in 1948 by Swenson [17] and demonstrated in experimental studies by Zionts et al. [18]. Although the multiple drill homes in the distal humeral physis might in theory impair epiphyseal growth, this complication did not occur in any of the patients studied by Skaggs et al. [16].Cubitus varus is the most common residual abnormality after extension-type supracondylar elbow fractures in children [14]. Cubitus varus is a cosmetic rather than a functional disability and is due to persistent distal fragment rotation after reduction. Baumann's angle should be measured to minimise the risk of cubitus varus, [14]. In our study, the cubitus varus rate was 6.06% after percutaneous pinning and 4% after open reduction with cross-wiring.In our case-series, we performed lateral closed wedge osteotomy of the humerus. The limited growth potential of the distal humeral growth plate does not allow full correction of architectural deformities, and anatomic reduction must therefore be performed. Motion range limitation of the elbow is common after supracondylar fractures, with a rate of 15% in the study by Damsin and Langlais [14]. The causes include soft tissue injuries, posttraumatic remodelling, fibrous surgical scars, and malunion. In our study, a bone spur on the anterior metaphysic caused motion range limitation in two patients, who were managed with surgical release of the elbow. The appropriateness of physical therapy in patients with restricted elbow motion remains controversial. Long-term follow-up is in order, as the physical activities to which children are naturally inclined result in some degree of self-rehabilitation.

V. Conclusion

advantages over technique for reduction and movement achievement is almost same.chances of infection is less in percutaneous pinning as there is no surgical incision.in ORIF reduction can be done without IITV .closed reduction should remain as first line of treatment & ORIF with k –wire should be considered when closed reduction is unattainable. An acceptable method of treatment must provide excellent functional result and elbow of normal appearance

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