

Supracondylar Fracture of Humerus in Children - An experience of closed reduction and percutaneous pinning

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This is retrospective study of patients managed by author for supracondylar fracture of humerus in children in the year 1999-2000. There were a total of 28 patients in which closed reduction was attempted under general anaesthesia. Four cases in which satisfactory position could not be achieved were excluded from this study. Rest of 24 patients in which reduction was satisfactory, percutaneous pinning was done. These patients were followed up for a minimum period of six months. The age of the patients ranged from 3-11yrs. There was male preponderance 83% male and 17% female. 16% patients developed pin tract infection, which resolved with oral antibiotics. One patient (4%) developed preoperative ulnar nerve injury, which recovered completely. In one case (4%) open reduction and internal fixation was done subsequently as position was unsatisfactory on post-operative check radiograph. Out of 23 cases in which pinning resulted satisfactory position, in 21 (92%) of cases there was good functional result in 2 (8%) cases there was lack of full extension at the end of follow-up. It is concluded that closed reduction and percutaneous pinning is the method of choice for the management of displaced supracondylar fracture of humerus in children.

Key words: Supracondylar fracture; children; closed reduction; percutaneous pinning

Supracondylar fracture, which is the most common elbow fracture in children, was described in the early writings of Hippocrates¹ during the third and fourth centuries AD. However it was not until around the 1700 AD that much was written about supracondylar fracture in classical medical literature. At the turn of 20th century, treatment began to change from the simple passive methods to more aggressive and active methods.

It is only recently that much attention has been paid to the problems of mal-reduction of supracondylar fracture of humerus in children. In case of complete fracture a small amount of rotational mal-alignment allows tilting of fragments and heralds instability. In completely displaced (Gartland type III) fracture with no cortical contact and in which the periosteum may be stripped, reduction is difficult and maintaining reduction is almost impossible without some form of internal fixation.

There are two methods of fixation. (i) Open reduction and internal fixation. (ii) Closed reduction and percutaneous pinning.

In this retrospective study, 24 cases of completely displaced (Gartland type III) supracondylar fracture of humerus in children treated by closed reduction and percutaneous pinning were reviewed to assess the outcome of this procedure.

Material and methods

In this retrospective study case notes of the patients with completely displaced (Gartland type III) supracondylar fracture managed by the author were studied. These patients were treated at The Children's Hospital, Lahore and some cases at private hospitals, in the years 1999 and 2000. These patients were diagnosed on history, clinical examination & plain Radiograph of elbow AP & lateral

view. Only those patients with completely displaced (Gartland Type-III) supracondylar fracture of humerus were included in this study. An attempt of closed reduction was made in all cases after induction of general anaesthesia under image intensifier control. Fracture was reduced by applying longitudinal traction, lateral and medial tilt and posterior displacement was corrected by manipulating with the thumbs. Four cases, in which satisfactory reduction could not be achieved, were excluded from this study. In the rest of cases percutaneous pinning was carried out after prophylactic intravenous antibiotics. Two smooth pins were used, one medial and one lateral, except in one case in which two lateral and one medial pins were used. The pins were cut out of skin. Plaster of Paris splint was applied and post-operative check radiograph was taken. Patients were discharged as soon as they were comfortable. Patients were asked to come back after one week interval for the assessment of pin tract infection and other complications. After three weeks pins were removed in the outpatient department. Elbow was protected in the splint for another week. At the end of four weeks, splint was removed and active movements were encouraged. At the end of follow-up a note of range of movements was made. Data was collected to document age, sex, mechanism of injury, any associated injury, assessment of nerve injury, infection, anatomical reduction and functional outcome based on the range of movements in all cases.

Results

During the study period a total of 28 patients with type III supracondylar fracture were managed by author. Of these 4 patients in whom satisfactory closed reduction could not be achieved, were excluded from this study. The age of the

patients ranged from 3 to 11 years, mean age being 6.5 years (Table 1). There was male preponderance, 20 (83%) male and 4 (17%) female. The mechanism of injury in 21 (88%) cases was fall from height, in the remaining 3 (12%) cases was road traffic accidents. There were no associated fractures. In 2 cases there was median nerve paresthesia on initial evaluation, which turned out to be transient. Post operatively ulnar nerve damage was detected in one case (4%), which happened during pinning. This nerve damage completely recovered in six weeks. On check Radiograph position was satisfactory in 23 (96%) cases while in one (4%) case position was unsatisfactory. In this case open reduction and internal fixation was carried out later on. In four (16%) cases there was pin tract infection, which resolved with oral antibiotics. In two (9%) cases there was lack of full extension by 10 – 15° at the end of six months follow up. In 21 (91%) cases there was good range of elbow movements.

Discussion

There are four basic types of treatment for completed displaced (Type III) supracondylar fracture of humerus in children.

1. Side arm skin traction or overhead skeletal traction
2. Closed reduction and casting
3. Open reduction and pinning
4. Closed reduction and percutaneous pinning

Closed reduction with cast, immobilisation has traditionally been recommended for displaced supracondylar fracture but loss of reduction and the necessity of repeated manipulation have been frequently reported to cause elbow stiffness and epiphyseal damage. Pirone, Graham and Krajbich²⁴ reported that closed reduction and casting of displaced supracondylar fracture resulted in a lower percentage of good results and higher percentage of early and late complications compared with percutaneous pinning and open reduction and internal fixation. A recent review by Pirone and co-worker from Toronto demonstrated a higher incidence of both early and late complications in those patients treated with closed reduction and casting.

Skeletal traction using an olecranon pin was introduced simultaneously during the 1920s by the German author Baumann and Bohler⁶ and in England by Hey Groves. Dunlop devised a method of side arm skin traction. Ippolito¹⁸ reported good results of skeletal traction on long term follow up in 78% of the cases. The length of hospitalisation, average (2.6) weeks, was cited as the major disadvantage of this method (Kramhoft, Keller and Solgaard)²⁰.

The complications associated with open reduction are infection, vascular injury, myositis ossificans, excessive callus formation with residual stiffness and decreased range of motion. The major problem of open reduction

appears to be the loss of range of movements. Coventry¹⁰ reported in the Mayo Clinic series had an average loss of 6.5 degree and extension of 5 degree F.M Smith²⁵ believes that operative intervention could lead to stiffness and even the dreadful complication of myositis ossificans. For this reason many authors have described percutaneous pinning technique and this technique has become the treatment of choice for type-III supracondylar fracture of humerus. Beaty and Graves reported good results in 95% of the cases of type III supracondylar fracture treated with closed reduction and percutaneous pinning. In this study there was good outcome in 91% of cases. Percutaneous pin fixation was also less expensive. The hospital stay of the patient is reduced, the average post-operative hospital stay was 40-hours in this series.

The major criticism of percutaneous pinning is risk of nerve injury and pin tract infection. Royce and co-workers estimated the incidence of ulnar nerve injury was 2-3% and all cleared spontaneously. In this series the incidence of per operative ulnar nerve injury was 4%, which resolved completely. The incidence of pin tract infection was 16%, which is higher as compared to other series. However infection was cleared in all cases after oral antibiotics therapy. The magnitude of this problem can be reduced by sterilization protocol. In two (9%) cases there was lack of extension by 10-15°. In 21 (91%) out of 23 cases there was good range of elbow movements.

In conclusion closed reduction and percutaneous pin is recommended as a treatment of choice for completely displaced (Gartland Type III) supracondylar fracture of humerus for better functional outcome.

Table 1: Age and sex distribution

Age	Sex		%age
	Male	Female	
3-5 years	4	2	6 (24%)
6-8 years	8	2	10 (42%)
9-11 years	8	-	8 (34%)

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