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A review of 100 cases of supracondylar fractures in children seen in Ibadan.

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Summary

Supracondylar fracture of the humerus in children is one of the commonest fractures in children of school age all over the world. The experience of the mode of presentation, mechanism of injury and the different modalities of treatment in the University College Hospital, Ibadan is presented. The results suggest that severely displaced supracondylar fractures in this environment are better managed with open reduction and internal fixation.

Keywords: *Supracondylar humeral fractures; Children; Kirschner wires (K-wire); Open reduction; internal fixation.*

Résumé

La fracture supracondylaire de l'humerus chez les enfants est l'une des fractures les plus communes chez les enfants en âge d'aller à l'école partout dans le monde. L'expérience du mode de présentation, mécanisme de l'accident et les différents modalités de traitements au centre hospitalier Universitaire, Ibadan est ici présente. Les résultats suggèrent que les fractures supracondylaires sévèrement déplacées sont mieux traitées dans notre environnement avec une ouverture réduite et une fixation interne.

Introduction

Supracondylar fracture of the humerus is one of the commonest elbow injuries in children. Its management however, has presented formidable challenges to orthopaedic and trauma surgeons throughout the world. This is principally because a poorly managed supracondylar fracture often leads to complications which are easily recognizable even to the untrained eye [1,2,3,4,5,6.]

Although extensive literature on this fracture describe many methods of treatment, both conservative and operative, however, no single method is suitable for all fractures and no single method has gained universal acceptance [7,8].

The objective of this study was to assess the pattern of injury, presentations and treatment modalities of one hundred cases of supracondylar fractures in children.

Materials and methods

The study population was children seen in our Orthopaedic and Trauma Unit between January 1996 and December 1998. Neurovascular status of the involved limbs were usually assessed on admission and documented in the case files. The mechanism of injury was enquired from the parents.

The treatment of each case was determined by the amount of displacement using the Gartland [9] classification (Table I) of supracondylar fractures in children. Treatment modalities ranged from simple back slabs to skin traction, and open reduction and internal fixation with Kirschner wire.

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In assessing the outcome of our treatment, all patients were assessed by the consultants during follow-up at the fracture clinic, using the grading criteria as devised by Flynn *et al.* [10] (Table II).

All patients were seen at least twice, from a period of 2-16 weeks after discharge and subsequently reviewed 6 months after.

Table I: Type of fracture according to Gartland's classification

Type of fracture (Gartland)	No. of patient
I	35
II	25
III	40

Results

The age of patients ranged from one year to twelve years with the highest frequency between 4-6 years of age. There is a male preponderance given a sex ratio of M: F of 7:3. Fifteen patients with type I fracture had collar and cuff with tensotape strapping of the elbow at 110° and the forearm in mid pronation, while the remaining 20 patients had above elbow back slab plaster at more than 90° of flexion at the elbow. The vascular integrity of the limb was checked and found to be normal. Twenty (80%) patients with type II fracture had closed manipulation under ketalar and valium based on the method described by Charnley [1] and the reduction was maintained with an above elbow plaster back slab while the remaining five (5) patients declined any form of treatment.

All 40 patients with type III fractures were offered open reduction under direct vision using a combined medial and lateral approach and sometimes an antero-medial approach as determined by the fracture pattern. The reduced fracture was maintained with cross K-wires and an elbow back slab cast applied for support. All plaster back slabs and K-wires were removed between 3 and 4 weeks having confirmed fracture union on X-ray. Active elbow movement was commenced immediately.

Table 2: Criteria for grading results (Flynn *et al* 1973)

Result		Cosmesis	
Functional	Rating	Carrying angle Loss in degree	Loss of Motion in degrees
Satisfactory	Excellent	0-<5	0-<5°
	Good	>5-10	5-<10
	Fair	>10-5	>10-15
Unsatisfactory	Poor	Over15°	Over 15°

Table 3: Results in 100 patients

Patient Group	No. of Patients	Average Follow-up	Excellent	Good	Fair	Poor
(Gartland I)	35	3 months	14	6	0	0
(Gartland II)	25	3 months	0	20	1	4
(Gartland III)	40	4 months	10	5	10	5

Tables II & III shows the grading criteria and the functional assessment at follow-up.

Discussion

The type I fracture presented no real problem as the fractures were not displaced, but 15 out of 35 (42.8%) patients were lost to follow-up within three months. However, lower proportions (25%) of patients with type III were lost to follow-up within three months (Table III). This group of patients also had the worst prognosis with 37.5% graded either fair or poor, because of lack of funds for surgical intervention and non-maintenance of management protocols on the wards. Only 5 patients had pin tract infection which resolved spontaneously once the pins were removed.

The demographic picture in the study corroborates those of earlier workers [3,4,6,7,8]. The treatment of supracondylar fracture of the humerus in children with elbow flexion and collar and cuff was first recommended by Cooper [11], and popularised by Wilson [12]. This method has the unique advantage of preventing cubitus varus as the pronation of the forearm causes tightening of the lateral ligament of the elbow thus preventing a medial angulation of the fracture [3]. In our study, 5 out of the 15 (33.3%) patients managed with collar cuff had fracture redisplacement. We have noticed non-compliance either because of busy schedule of parents or because of lack of supervision of the children while playing at home. This method of treatment is cost effective, easily applied and prevents the development of serious complications such as Volkman's ischaemic contracture which has been reported in other casting methods [13].

Close reduction under general anaesthesia requires expertise. An acutely flexed elbow jeopardises circulation, it is advised that the elbow be extended to such a point to allow the radial pulse return; which in the process might lead to loss of reduction. Therefore, maintenance of closed reduction by plaster cast is fraught with loss of reduction and/or vascular embarrassment.

In our series this method was used for only partially displaced (Gartland type II) fractures. All the patients had single manipulation, hence reducing the risk of joint stiffness and myositis ossificans associated with repeated manipulation [9]. However, the five patients with type II fracture that declined any form of treatment had poor results.

The treatment of type III supracondylar fractures however has attracted so much attention in the literature.

Most authors agree that the indications for open reductions are:

- (i) Failed or difficult close reduction [4,14].
- (ii) Open fracture[4], and
- (iii) Serious vascular compromise pre or post closed reduction [15].

Two patients had associated vascular compromise, which resolved after internal fixation. Pirone *et al* [15]. reported 10% vascular and 13% neural complications in 230 patients while Flynn *et al.* [16] reported 18% vascular and 14% neural complications in 72 patients. Lipscomb and Barleson [17] observed neural or vascular complications in 22% of 108 cases. However, in all these reported cases, the patients were selected and all severely displaced type III fracture.

In our series, we offered open reduction and internal fixation with crossed K-wires because of lack of an image intensifier in our centre and an open fracture in one patient. As the patients are responsible for the purchase of most consumable as well as the operation cost in most government hospitals, the concept of serial radiographs is not practised because of the cost implications to the parents. This, in addition with poor clinic attendance, makes it almost mandatory that the surgeon gets it right at the first surgery. An elaborate system of traction for the treatment of this type of fracture is not only cumbersome but it prolongs patients hospital stay and put pressure on paediatric hospital bed and other services. It is associated with loss of carrying angle and cubitus varus deformity [11,14,15,16]. For these obvious reasons, this method is losing favour in the current management of displaced supracondylar fractures.

Percutaneous pinning of a closely reduced type III fracture is the current treatment of choice [4,15,16,18], and many authors have reported good results with few or minor complications. However, in one centre as previously noted, non-availability of an image intensifier made it difficult for us to perform percutaneous pinning of the fracture.

The problem of open reduction includes amongst others, limited elbow motion, infection and possibility of injury to neurovascular structures. This method however affords us an anatomic reduction under direct vision. In our 30 patients there were 5 superficial infection and 2 radial nerve palsies that recovered few months later and one patient had cubitus varus deformity despite surgical intervention as patient presented two weeks after injury.

Conclusion

In this environment with the lack of image intensifiers, the open reduction and internal fixation with crossed K-wires is best suited for severely displaced (Gartland III) supracondylar fractures while closed reduction and plaster back slab immobilisation is suitable for partially displaced fracture.

Early presentation by patients will also help in improving the fair or poor results as most of the patients

with fair or poor results presented 8-10 days after sustaining the fracture.

Poor compliance was encountered with tensotape strapping and collar and cuff. This may be due to lack of parental commitments and adequate supervision of their wards during the earlier weeks of immobilisation.

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