

Extensor Mechanism Sparing Approach to the Elbow for reduction and Internal Fixation of Intercondylar Fracture of the Humerus

Pages with reference to book, From 164 To 167

A. R. Jamali, Ghulam Mehboob, Saghir Ahmed (Department Of Orthopaedics, Jinnah Postgraduate Medical Centre, Karachi-Pakistan.)

Abstract

Objective: To evaluate the short term results of extensor mechanism sparing approach to the elbow for fixation of intercondylar fractures of the distal end of humerus and compare it with existing Surgical approaches.

Design: This is a prospective study conducted from June, 1992 to June, 1997.

Setting: Department of Orthopaedic Surgery, Jinnah Postgraduate Medical Centre and Mebran Clinic (Pvt.), Karachi.

Principle of Surgical Approach: This approach is based upon the principle that by sparing the extensor mechanism, we reduce the amount of surgical trauma and help in early rehabilitation which can contribute in improving the results of this difficult fracture.

Results: There were nine type 2 fractures, eight type 3 fractures and four type 4 fractures according to Rise borough and Radin classification. Based upon the same authors criteria, there were over all 57.14 % good 23.81 % fair and 19.04 % poor results. Adequate exposure was achieved in all of type 2 and seven (87.5 %) out of eight type 3 fractures. We failed in type 4 fractures. Mean operating time was 107.38 ($\pm$ 24.67) minutes.

Conclusion: The results in this series are comparable to other studies. They can however be improved with proper selection of cases, experience with the technique alongwith better fixation and rehabilitations (JPMA 49: 164, 1999).

Introduction

Intercondylar fractures of the humerus still pose a difficulty because of the its configuration and peculiar anatomy of the elbow. These fractures usually occur as a result of direct trauma to the elbow with olecranon ridge being the driving force. The resultant fracture is either "T" or "Y" shaped with or without "inter" or "Supra" condylar comminution. The intra articular fracture line is usually in the trochlea where olecranon ridge strikes or lateral to it depending upon their configuration, various classifications^{1,2} are used to group them.

Surgical approaches to reduce and fix these fractures are difficult because of triceps mechanism, location of ulnar and posterior introsseus nerve and blood supply to lateral condyle of humerus. The surgical exposures currently used for these fractures can be grouped into those dividing triceps mechanism³⁻⁶ and giving very good exposure or those that save triceps mechanism but give limited exposure^{3,4,7,8}. This approach is based upon the fact that the intercondylar fractures without intra articular comminution do not require extensive approach dividing triceps mechanism and by saving triceps mechanism, the surgical trauma can be reduced thus allowing early mobilization.

This study evaluates an approach in respect of adequacy of exposure and functional results following surgery and compare them with other studies^{1,2,9-12}

Patients and Methods

A prospective study was conducted at Jinnah Postgraduate Medical Centre and Mehran Clinic from June, 1992 to June, 1997. The sample consisted of twenty one fractures of the distal end of the humerus which were operated according to a modified approach to the elbow. The type of fixation varied from case to case. These fractures were classified according to Riseborough and Radin² classification and only type 2,3 and 4 were included. One patient did have Monteggia fracture dislocation and another had radial nerve palsy.

Under anaesthesia patient was placed in lateral position with fractured side up with the arm rests on a pillow with elbow flexed at 90°. Hand was towed and left free. The length of incision varied with the age of type of the fixation but it usually started 10 cm above the elbow posteriorly in midline, gently curving along the lateral side of olecranon and again to midline 4 cm below the elbow. Superficial and deep fascia were cut in the same line. Triceps muscle was split from lateral side of olecranon to lateral intermuscular septum and then dissected along it. A rim of tissue was left laterally for later closure. Triceps was now dissected subperiosteally and retracted medially to visualize supra condylar component of the fracture. An inverted "L" shaped incision was made in to the capsule and joint was opened, cleared of blood and loose fragments. By gentle retraction of olecranon, fracture was visualized, reduced and fixed starting with intercondylar component in most cases, followed by supracondylar component. If further exposure was required then Ulnar nerve was identified, dissected and secured on the medial side. A small medial para triceps incision is made to facilitate exposure and reduction. In some cases with intra articular comminution or some other problem, this was converted to V.Y tricepsplasty or transolecranon approach. If the fractures of radial head or neck warranted treatment, they were exposed by retracting anconeus and supinator. Finally a drain was kept and wound was closed. Application of POP cast depended upon the stability of fracture. The period of immobilization varied from two to eight weeks depending upon the stability of fixation.

The follow-up varied between three months to one year. The results were evaluated for adequacy of exposure, operating time and functional results based upon the criteria of Rise borough and Radin² which is as follows:

Good: Range of elbow flexion from 30° or less to 115° or more. None or minimal symptoms.

Fair: Range of elbow flexion from 30°-60° to 115° or more. None or minimal symptoms.

Poor: Range of elbow flexion from 60° or more to less than 115° with or without major symptoms.

Results

Of these 21 fractures nine were of type 2, eight were type 3 and four were type 4 according to Riseborough and Radin classification. Adequate exposure was achieved to reduce (Table 1)

Table 1. Adequacy of exposure and reduction.

*Fracture type	Type - 2 (n = 9)	Type - 3 (n = 8)	Type - 4 (n = 4)	Total (n = 21)
Adequate Exposure	9	7	--	16
reduction achieved				
Converted to V.Y	--	--	3	3
tricepsplasty				

* Based on Riseborough and Radin classification.

and fix all the type 2 fractures. Three of these required only lateral para triceps dissection. One required distal extension to fix Monteggia fracture dislocation. Adequate exposure and fixation was achieved in seven out of eight type 3 fractures. In one case with supra condylar comminution and small medial fragment, the reduction was less than ideal with V shaped deformity of the trochlea. All of these required medial and lateral para triceps dissection. Type 4 fractures posed difficulty as three of them required conversion to V. Y triceps plasty to achieve adequate exposure for reduction and fixation. In the last case, the reduction was poor with space of about 2 mm between intra articular fragments. The operating time varied from sixty minutes to one hundred sixty five minutes with mean $\pm$ SD being 107.38 ± 24.67 minutes. More operating time was required during initial cases and type 4 fractures. In the process of dissection there was iatrogenic partial damage to the ulnar nerve in one patient. Another patient had tourniquet palsy from which he recovered. Twelve patients had good functional results (Table 2)

Table 2. Functional results.**

Fracture Type	Type - 2 (n = 9)	Type - 3 (n = 8)	Type - 4 (n = 4)	Total (n = 21)
Good	7	5	0	12
Fair	2	2	1	5
Poor	0	1	3	4

**** Based on Riseborough and Radin's functional assessment.
Mean operating time 107.38 ($\pm$ 24.67) minutes.**

with seven belonging to type 2 and five to type 3 fractures. Five patients had fair results with two belonging to type 2, two to type 3 and one to type 4 fractures. Four had poor results with one belonging to type 3 and three to type 4 fractures.

Discussion

Intercondylar fractures of the humerus are not common and most¹⁰⁻¹³ of the series have limited number of the cases. This along with the fact that the different^{1,2,11} authors have used different classification and functional assessment of these fractures rendering it very difficult to compare the data. The basic surgical approaches widely accepted for open reduction and internal fixation of these fractures which give good exposure are Campbells⁴ V.Y Tricepsplasty and Transolecranon approach. Both divide triceps mechanism, require more dissection, and delay rehabilitation thus adversely affecting functional results. In fact initial results of surgery were poorer than conservative treatment². The Campbells⁴ approach gives more exposure proximally but causes triceps weakness and fibrosis, which is also seen in some of the modifications^{3,4,6,8} in an attempt to save triceps mechanism. The incidence of triceps weakness has been reported to vary from 11 % to 29 %. The transolecranon approach gives very good exposure and can allow early mobilization in some cases but is difficult to extend proximally²⁻⁴ It also adds one more fracture to already injured elbow thus increasing tissue trauma. Further more Morrey¹⁴

does not advocate this approach while considering total elbow arthroplasty because interference with cementing of ulna. We differ with the concept of dealing all intercondylar fractures with a single yard stick and feel that the intercondylar fractures without intraarticular comminution can be exposed, reduced and fixed without dividing triceps mechanism, provided fragments are large enough to be controlled and manipulated. Adequate exposure was achieved for reduction and fixation in sixteen out of seventeen Radin type 2 and 3 (Allgower C1 and C2) fractures through this approach. The same is not true for Radin type 4 (Allgower type C3) fractures, where V.Y tricepsplasty or transolecranon approach is preferred. However there is role for conservative treatment in type 4 fractures.

It is difficult to compare functional results with different authors^{1,2,8,9} because of usage of different classifications and criteria for evaluation. However it is obvious from these studies that the results are not satisfactory if seen in light of basic biomechanical properties of the elbow and its range of motion^{15,16}. The range of motion at elbow is 00 - 146° but most of normal activities of living can be accomplished with flexion of 30° to 130° and rotation of 100° (Pronation 50° and supination 50°). The results of surgery as reported by various authors are Jupiter et al' 38.21 % excellent and 41.17 % good total being 79.48 % (2) Noack et al¹¹ 18.75 % excellent and 56.25 % good total being 75 % Talha et al 85 % good and very good, and Gupta' 75% excellent.

This study shows 57.14 % good and 23.81 % fair results (total being 78.95 %) according to Riseborough and Radin² assessment criteria which is more or less comparable to excellent and good categories of Allgower's criteria.

The results are comparable to those of others however with proper selection of the cases and experience with this approach along with better fixation and rehabilitation, the results can be improved.

The basic factors² which lead to the poor results as outlined by Riseborough and Radin² include mechanical block, inverted V deformity, bony offset, joint irregularity, obliteration of olecranon fossa by callus or fibrosis, Peri articular fibrosis, repeated manipulations and triceps weakness. However the prime factor is the original injury and configuration of fracture.

Earlier surgeons² preferred conservative over surgical treatment because the wide exposure required needs extensive dissection and inadequate fixation resulting in poor results. The results however can be improved with accurate reduction and early rehabilitation⁹.

Following factors contributed to failures in this series (a) severity of injury (b) operative trauma (c) poor fixation and (d) delayed rehabilitation. Type 4 fractures in this series had all the factors operating simultaneously which lead to poor results.

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