

OUTCOME ANALYSIS OF PROXIMAL HUMERUS FRACTURES TREATED BY MINIMAL INTERNAL FIXATION

Venkatesh Kumar N¹, B. K. Dinakar Rai², Shyam Sundar³, S. M. Arvind Kumar⁴,
Raghuveer Chander Alluri⁵

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ABSTRACT: The aim of the study was to evaluate the functional outcome in patients treated with proximal humeral fracture who were treated with minimally internal fixations like K-wires, osteosutures etc.

KEYWORDS: Proximal humerus fractures, minimal internal fixation, k-wires, osteosutures, osteoporosis, functional outcome.

INTRODUCTION: Treatment of shoulder fractures has been the subject of much controversy and confusion. This is because of the complex nature of injury which makes the treating surgeon difficult to comment about displacement without proper x-rays, associated soft tissue injury (rotator cuff) and such injuries needs meticulous post-op rehabilitation.¹

Accurate definition of the type of fracture, patient compliance problems that limit rehabilitation medical co-morbidities affecting prognosis, and time from injury to treatment are critical factors affecting outcomes of these injuries. Additionally, technical factors in the surgical reconstruction of these fractures require surgical experience that few surgeons have the opportunity to develop.²

About 2 to 3 % of upper extremity fractures occur in proximal humerus and 3/4th of these fractures occur after 60 years of age and commonly seen in women. More than 85% of proximal humerus fractures are minimally displaced. In the remaining 15% of fractures, only a few are severe fracture dislocations, about which much debate is centered.^{3, 4}

The aim of the study was to evaluate the functional outcome in patients treated with proximal humeral fracture who were treated with minimally internal fixations like K-wires, osteosutures etc.

MATERIALS AND METHODS: This study was conducted at PSG Institute of Medical Science and Research, Coimbatore. Our study was a retrospective study and involved 21 patients with proximal humerus fractures that were treated by minimal internal fixation. The age of our patients ranged from 21 to 70 years. Fractures were classified according to Neer's classification system. Patients were initially assessed for airway, breathing and circulation. Initial immobilization was done for the affected arm with a sling. Assessment was also done for associated injuries. Routine antero posterior and lateral radiographs were taken and CT-Scan was done if needed.

Inclusion Criteria:

- All two-part to four-part fractures according to Neer's classification³.
- Those fractures treated by closed reduction and percutaneous pin fixation, osteosutures and cancellous screw fixation.

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Exclusion Criteria:

- Those fractures treated by conservative methods, plate osteosynthesis and nailing.
- Head splitting fractures.
- Compound fractures.

Operative Technique: General/Regional anesthesia was administered and the patient was placed in dental chair position with a sand bag underneath the scapula.

Parts were prepared and draped and closed reduction with arm abducted to about 70 degrees to 80 degrees was performed with an assistant holding at the elbow and progressive controlled longitudinal fraction, while posterior pressure is applied to humeral shaft to reduce it underneath the humeral head.

The accuracy of reduction was checked under image intensifier and if satisfactory, the same was fixed using either threaded or smooth 'K'- wires. Two 'K' wires were passed through the lateral aspect of humerus shaft just above the deltoid insertion and one through the anterior cortex. If greater tuberosity was displaced, then two more pins were inserted in retrograde for reduction and fixation.

If after closed reduction, the alignment was found not to be in satisfactory position or if the fragments were badly displaced, then open reduction with minimal soft tissue dissection was performed through deltopectoral approach. The fragments were fixed either with osteosutures using non-absorbable materials preferably ethibond, 'K' wires or cancellous screws carefully avoiding anterior humeral circumflex artery.

Post operatively, the arm was immobilized in a sling. Antibiotic coverage was given routinely (3 doses). Immediate post-operative X-Rays were done. Passive and pendulum exercises were started as soon as pain and swelling subsided. Due attention was given to pin tracts. Arm sling was discontinued by the third week and full range of movements was started.

Follow-up radiographs were taken at four weeks to six weeks-time. Pins were removed when radiological evidence of union was seen usually at five weeks (range four to ten weeks). Patients were then reviewed once in a month for initial two months. Then once in every three months for nine months.

FOLLOW UP ASSESSMENT:

POST OPERATIVELY:

- Adequacy of fixation, Re reduction/secondary procedure.
- Joint penetration, Axillary nerve, Pin infection.

FUNCTIONAL ASSESSMENT:

- ROM by goniometer, Neer's scoring

RADIOLOGICAL ASSESSMENT:

- Pin migration, Neck shaft angle, Union of fracture, Metal failure, Myositis, Avascular necrosis

OBSERVATIONS AND ANALYSIS: Out of 21 patients treated, 13 were male and 8 were female, with highest incidence at 4th decade. Right side being the dominant side was more affected, which

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accounted to 57 % and most of the injuries were due to the two-wheeler accidents. 3-part fractures constituted to be the common type.

Common mode of fixation was by using K-wires.

Results are depicted in tabular columns.

DISCUSSION: The shoulder is the link of the thorax to the upper extremity. The function of the upper extremity is to provide mobility and power that allows a range of function, from powerful explosive movements seen in athlete actions (e.g., throwing a baseball 100 mph) to very accurate fine movements (e.g., placing the arm in a position to perform microscopic surgery).

Daily independence requires the ability to position the hand within the range of an imaginary sphere and to provide access to both sides of the alimentary system. Disorders of the shoulder, in addition to limiting function, also can produce pain, which can affect the ability to sleep comfortably and the ability to easily obtain gainful employment. Therefore, fractures that involve the proximal humerus (that portion involved with the glenohumeral articulation) can be devastating to quality of life. These fractures also can cost society a significant loss of productivity from otherwise viable members in the workforce.²

In this era of biological osteosynthesis, the concept of biological fixation offers many advantages in managing not only complex and high energy fractures but also in Juxta articular fractures as well as in fractures of non-weight bearing bones. In regard to proximal humerus fractures, this concept can be applied by means of closed reduction and percutaneous pinning or a minimal open reduction and internal fixation using Osteosutures or cancellous screws.

Although accurate anatomic reduction cannot be achieved at times, a good functional outcome can be attained which is mandatory for our activities of daily living. The advantages of such fractures being stabilized by minimal techniques are, minimal fixation modes but maintaining the cuff integrity, minimal scar, maximum anatomical restoration, better enhancement of fracture healing, early post-operative rehabilitation and easy implant removal.

Literature review⁵⁻²⁵ has shown that in managing the fractures of proximal humerus, although various options like closed reduction and percutaneous pin fixation, open reduction and internal fixation or Humeral head replacement are available, closed reduction and percutaneous pinning should be reserved for physiologically young and motivated individual with two part fractures and also in minimally displaced three part fractures.

In our study, 85.7% of the patients had a good functional outcome, which is comparable or even better with that of the literature. The average age of our patient was 56 range being 20 years to 80 years, which is little older when compared to most of the studies where patients had a mean age of 43 years but this has not influenced the outcome. The most common fracture pattern in our study was three part which accounted for 57.1%.

This is little contrary to that of literature where in all studies two part fractures were predominant. The common mode of fixation that was used in our study was by using closed reduction and percutaneous pin fixation with K-wires in 17 patients, which accounted for 81%. Of the remaining 4 patients, open reduction with minimal soft tissue handling was done and the fractures were fixed by Osteosutures and cancellous screws in 2 patients each. The functional outcomes of these 4 patients were good and comparable to that of Percutaneous pinning of fractures.

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This may have been due to the fact, that all these 4 patients had 2 part fractures (but displaced widely) which normally has a better outcome. But fallacy is that number of patients treated with this technique is small. So statistically they are not significant. Sex distribution, side of injury and mode of injury did not have any influence on the results.

The average time of pin removal in our study was 4 weeks and the time of union being 8 weeks range (4 weeks to 10 weeks). In a study conducted by Chow et al the average time of union was 10 weeks. In another study by Hans Jaberg et al (JBJS 1992) the union rate was between 6 weeks to 8 weeks almost similar to our study. In respect to complications, one patient had superficial pin tract infection and one had minimal pin loosening which subsequently was managed by antibiotics. We did not encounter any other complications like pin breakage, pin migration, joint infection or avascular necrosis of Humeral head.

The functional outcome that was evaluated according to Neer's criteria showed 85.7% good to excellent results in our study, which in chow et al study was 84%. However this may be attributed to the occurrence of these fractures in comparatively younger middle age group of patients in our study, whose compliance for physiotherapy and ability for motivation is better whereas in most of the study these fractures are seen to occur in older age groups.

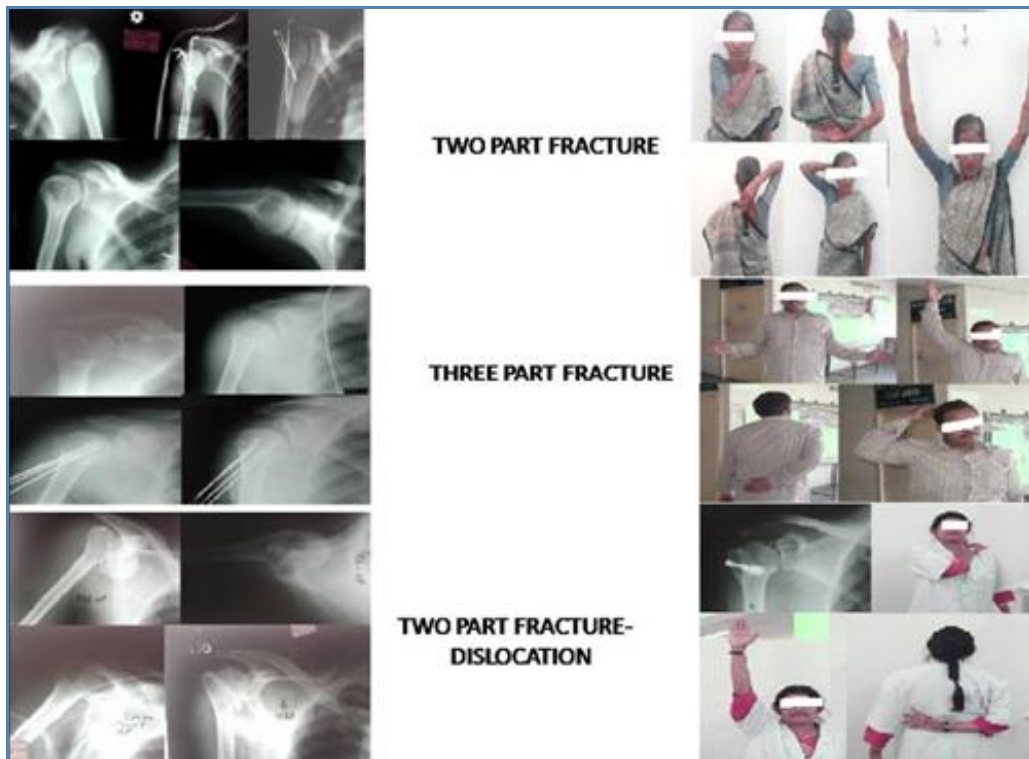
CONCLUSIONS: 2 part proximal humerus fractures yields 100% excellent/good functional outcome when treated with closed reduction and percutaneous fixation. 19% fair/poor results in 3 part fractures were due to improper patient selection. Functional outcome is poor in patients > 60 years and this should be considered in patient selection along with communitation and bone quality. There is always mild restriction (100) of abduction and forward flexion movement in 3 part fractures without significantly affecting functional outcome. Though technically demanding, with indirect reduction and adequate fixation, the results are good (83%).

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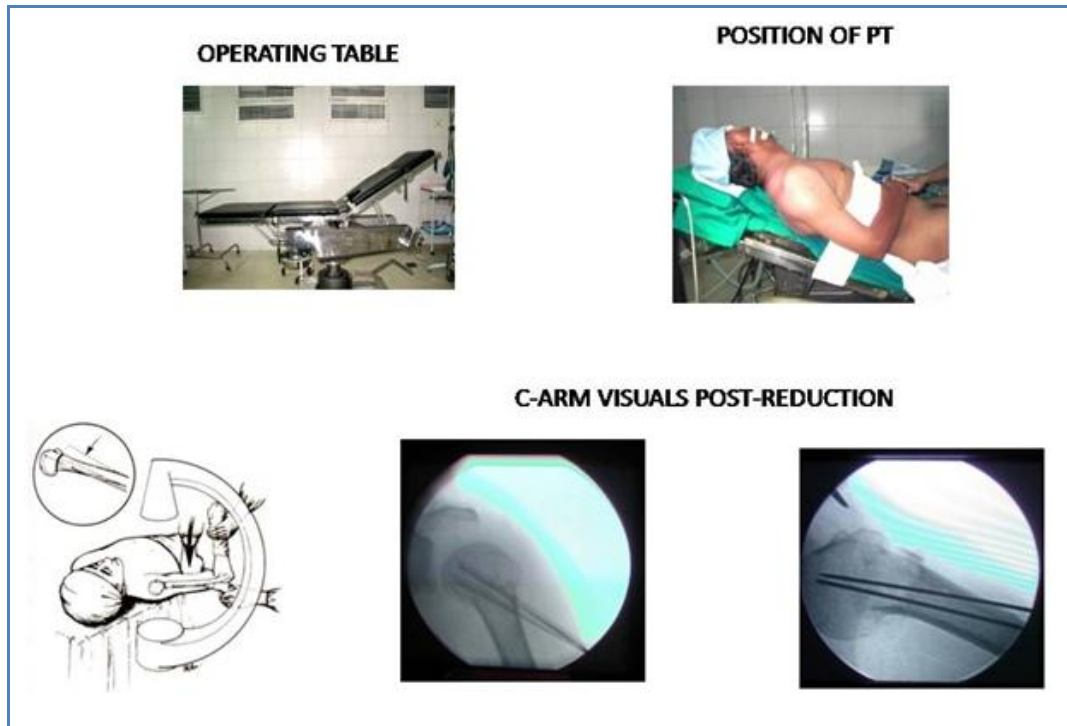
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NEERS SCORE						Implant			Nos			Percentag e		
Parameters		Points Given				K-wire			17			81%		
Pain		35				Osteosutures			2			9.5%		
Function		30				Cancellous Screws			2			9.5%		
Range of Motion		25												
Anatomy		10												
Total		100												
RESULTS	PATIENTS	AGE IN YEARS					NEERS FUNCTIONAL OUTCOME							
		21-30	31-40	41-50	51-60	61-70	EXCELLE NT	GOOD	FAIR	POOR	TOTAL			
		1	5	10	3	2								
PAIN	(20)	30	31	31	30	29	2-part	5	3	-	-	8		
FUNCTION	(20)	29	28	25	26	21	3-part	4	6	1	1	12		
ROM	(25)	25	22	16	20	16	4-part	-	-	-	1	1		
ANATOMY	(10)	9	8	9	8	6	Total	9	9	1	2	18		
NEERS AVERAGE (100)		92	92	80	84	72	%	18		3				
							(85.7)		(14.3)					
RESTRICTION OF MOVEMENTS (In degrees)						POINTS		REMARKS						
NEER	ABDUCTION	INTERNAL ROTATION	EXTERNAL ROTATION	FORWARD FLEXION	EXTENSION	>89	EXCELLENT							
2-part	10	Nil	Nil	17	Nil	80-89	GOOD							
3-part	20	Nil	15	20	Nil	70-79	FAIR							
4-part	175	50	-10	175	50	<70	POOR							
MOVEMENTS IN DEGREES (Average / Range)														
NEER	ABDUCTION	INTERNAL ROTATION	EXTERNAL ROTATION	FORWARD FLEXION	EXTENSION									
2-part	170	70	100	163	60									
Range	55-180	MAX	MAX	110-180	MAX									
3-part	161	70	87	160	45									
Range	20-170	MAX	0-100	30-170	10-60									
4-part	5	20	0	5	10									

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AUTHORS:

1. Venkatesh Kumar N.
2. B. K. Dinakar Rai
3. Shyam Sundar
4. S. M. Arvind Kumar
5. Raghuvveer Chander Alluri

PARTICULARS OF CONTRIBUTORS:

1. Associate Professor, Department of Orthopaedics, PSGIMSR.
2. Professor and HOD, Professor, Department of Orthopaedics, PSGIMSR.
3. Professor, Professor, Department of Orthopaedics, PSGIMSR.
4. Associate Professor, Professor, Department of Orthopaedics, PSGIMSR.

5. Junior Resident, Professor, Department of Orthopaedics, PSGIMSR.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Venkatesh Kumar N,
Associate Professor,
Department of Orthopedics,
PSGIMSR, Peelamedu,
Coimbatore.
E-mail:drven@rediffmail.com

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