



Functional Outcome of Colles Fracture & Colles Fracture With Ulnar Styloid Fracture- A Comparative Study

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Abstract

Objectives: *To compare the functional outcome of colles fracture & colles fracture with ulnar styloid fracture, managed conservatively by closed manipulation and cast immobilization*

Methods: *Prospective observational study. Total sample size was 100. Patients were divided into two groups. 50 patients in each group were studied. Group I as those with colles fracture alone and group II as those with combined colles and ulnar styloid fracture.*

Results: *In both groups initial radiographic findings were noted and statistically significant difference was found between palmar tilt of both groups and the P value is 0.003. No statistical difference between dorsal angulation, radial inclination and radial length noted*

Conclusion: *We conclude that presence of an associated ulnar styloid fracture in a colles fracture results in poor functional status and reduced range of movements in a significant number of patients and these fractures should be taken more seriously and managed effectively.*

Introduction

Distal radius fractures are one of the most common injuries encountered in orthopaedic practice. They make up 8-15% of all bony injuries in adults. Colles fracture specifically is defined as metaphyseal injury of cortico cancellous junction (within 2-3 cm of articular surface) of the distal radius. Ulnar styloid fractures are common associated injuries in patients with colles fracture. Their role in the functional outcome of these fractures however is unclear.

Aims and Objectives

To compare the functional outcome of colles fracture & colles fracture with ulnar styloid fracture, managed conservatively by closed manipulation and cast immobilization

Review of Literature

Irish surgeon **Sir Abraham Colles** before invention of radiography, made a brief accurate description of about the distal radial fractures based on the just the clinical examination.

John Rhea Barton (1794-1871) orthopaedic surgeon worked In Pennsylvania Hospital in Philadelphia (USA) described about the fractures with intra articular involvement that was later termed as volar and dorsal barton fractures.

Robert William Smith (1807-1873) Irish surgeon described about the smith fractures. In 1967, Frykman identified the importance of ulnar involvement and published a classification based on involvement of radio carpal and radioulnar joints and the ulnar styloid fragments.

In 1993, Fernandez classification was introduced which was designed to be practical, determine stability, include associated injuries and provide general treatment recommendations.

External fixation was first described by Andersnand O'Neil.

Anatomy- Triangular fibrocartilage (Components of TFCC)

1. Cartilaginous articular disc
2. The meniscal homologue
3. Radio ulnar interconnecting ligaments
4. Floor of extensor carpi ulnaris subsheath
5. Ulnolunate
6. Ulnar collateral
7. Ulna triquetral ligament

TFCC is the main stabilizer of distal radio ulnar joint and plays an important role in load sharing. During axial loading, radius transmits 82% load and ulna carries only 18% but in positive ulnar variance load transmission across TFCC increases to 42% because TFCC extends the distal radius joint surface to cover.

The articular disk (triangular fibrocartilage)- the articular disk is triangular shaped, located transversely, maintains the distal ends of the ulna and radius close together.

Three column model of the wrist joint- The 3 column model of the distal forearm is a simple concept that aids understanding some distal radial fracture pattern and in planning internal fixation.

1. The radial column comprise the radial styloid process and with the lateral scaphoid fossa

2. The intermediate column contains the middle lunate fossa and the ulnar notch medially
3. The ulnar column is made by the distal radioulnar joint, the ulnar styloid process and the triangular fibro cartilage complex.

The major load was transmitted across the intermediate lunate fossa columns and a little by the radial column of scaphoid fossa. This pressure area is shifted when the wrist brought into extension.

Less than 5 mm shortening when compared to the contralateral wrist is accepted with good functional scores. More than 10 mm shortening indicates radial head fracture.

The acceptable reduction of radial inclination is more than 15 degree. Any decrease in the radial inclination will produce more axial and compressive load to be transmitted along the lunate facet and may lead to secondary post traumatic osteoarthritis and decreased ulnar deviation of wrist.

Palmar or volar tilt normally ranges from neutral to 25 degree and the mean is 12 degree. Any dorsal angulation up to 10 degrees is accepted and the patient becomes symptomatic if the angulation exceeds this level. Disturbances in the palmar tilt may lead to decreased hand grip strength.

Acceptable level in these radiological parameters for healed radius fracture are

1. Radial length – within 2-3 mm of the contralateral wrist.
2. Palmar tilt – neutral tilt (0 degree)
3. Intraarticular step off <2mm
4. Radial angle <5 degree loss
5. Carpal malalignment absent

Mechanism of Injury

Fall on outstretched hand is the most common mechanism leading to distal radius fracture. The fracture pattern is determined by the following variables.

- Velocity of injury
- Quality of bone
- Position of wrist, forearm and hand.

Colles fracture-When the forearm is pronated and when the person falls with hyperextended radially deviated wrist compression forces are transmitted along to weak cancellous metaphyseal bone producing tensile volar cortex and compressible dorsal cortex to be fractured. Fall over pronated wrist produces typical dorsal displacement and angulation. More severe compressive stress produces intraarticular fractures.

Materials and Methods

Study Design: Prospective observational study

Study Setting: Orthopaedics OPD and casualty, Government Medical College, Trivandrum

Study Population: All patients with colles fracture alone and colles fracture with ulnar styloid fracture presenting to department of orthopaedics Govt: Medical College, Trivandrum.

Study Period: December 2019 to November 2020.

Study Method: Total sample size was 100. Patients were divided into two groups. 50 patients in each group were studied. Group I as those with colles fracture alone and group II as those with combined colles and ulnar styloid fracture.

Both groups of patients were assessed with mayo wrist score, and comparative analysis of functional status of two groups were done. The patients were reviewed on four, eight, twelve and twenty fourth weeks, functional outcome was made from final follow up at twenty fourth week. The patients were initially observed radiologically for the type of fracture, degrees of dorsal angulation, dorsal metaphyseal comminution, intraarticular involvement, radial length, palmar tilt and radial inclinations. All the patients were treated with closed manipulative reduction and immobilized in a dorso-radial above elbow or below elbow plaster. Post reduction radiological evaluation was done for radial length, palmar tilt and radial inclination.

Cast was removed once there was union, for most of the patients cast was removed at 6 weeks.

Patients were reviewed at 8, 12, 24 weeks of treatment. Every time functional and radiological outcome was made and compared to normal side. Functional outcome was assessed using Modified Mayo wrist score.

Pain	Point
No pain	25
Mild occasional	20
Moderate	15
Severe	0
Work status	
Regular job	25
Restricted job	20
Able to work but unemployed	15
Unable to work due to pain	0
Range of motion	
>120°	25
100 to 119°	20
90 to 99°	15
60 to 89°	10
30 to 59°	5
0 to 29°	0
Grip strength (% of normal)	
90 to 100	25
75 to 89	15
50 to 74	10
25 to 49	5
0 to 24	0

* Total point scores: excellent (91 to 100), good (80 to 90), fair (65 to 79), and poor (<64).

Modified Mayo wrist score.

Interpretations

- Score between 90 to 100 are considered excellent
- Score between 80 to 89 are considered good
- Score between 65 to 79 are considered as fair
- Score less than 65 are considered as poor.

Results and Analysis

Table-1 Gender Distribution

	GROUP I	GROUP II
MALE	14	9
FEMALE	36	41
SUM	50	50
TOTAL	100	

Table-2

No statistically significant differences based on gender between 2 groups, using chi square test

	GROUP I		GROUP II	
	FREQUENCY	PERCENTAGE	FREQUENCY	PERCENTAGE
FEMALE	36	72.0%	41	82.0%
MALE	14	28/0%	9	18.0%
TOTAL	50	100%	50	100%

Pearson Chi square t-1.42 P value-0.235

Table-3 Age Distribution

	GROUP I		GROUP II	
	MALE	FEMALE	MALE	FEMALE
40-49	1	3	1	2
50-59	10	21	7	20
60-70	3	12	1	19
TOTAL	14	36	9	41

Table-4 Side of Injury

	GROUP I	GROUP 2
LEFT	15	18
RIGHT	35	32

Table-5 Mode of Injury

	GROUP I	GROUP 2
FALL	47	44
RTA	3	6

Independent sample t test showed no statistically difference between the mean ages of two groups

GROUPS	MEAN (SD)	t STATISTIC	P VALUE
GROUP 1	56.25 (5.8)	-1.667	0.099
GROUP 2	58.42(5.6)		

Table-6 Functional Outcome Score

	GROUP I	GROUP 2
EXCELLENT	30	21
GOOD	12	8
FAIR	3	9
POOR	5	12

Table-7 Functional Out Come Score

	GROUP I		GROUP II	
	FREQUENCY	PERCENTAGE	FREQUENCY	PERCENTAGE
EXCELLENT	30	60	21	42
GOOD	12	24	8	16
FAIR	3	6	9	18
POOR	5	10	12	24
TOTAL	50	100%	50	100%

Statistically significant difference is noted between functional outcomes of both groups.

Pearson Chi-square – 8.271 p value – 0.041

Table-8 Pain

	GROUP I	GROUP 2
NO PAIN	41	36
MILD	7	7
MODERATE	2	7
SEVERE	0	0

Table-9 Functional Status

	GROUP I	GROUP 2
REGULAR	24	14
RESTRICTED	17	18
ABLE TO WORK	9	18
UNABLE TO WORK	0	0

Table-10 Range of Movements

	GROUP I	GROUP 2
>120(25)	11	7
100-119(20)	22	17
90-99(15)	11	14
60-89(10)	6	12
30-59(5)	0	0
<30	0	0

Table-11 Grip Strength

	GROUP I	GROUP 2
90-100(25)	38	30
75-89(15)	9	14
50-74(10)	3	6
25-49(5)	0	0
<25(0)	0	0

Mann-Whitney Test done to find if any significant difference between the Mayo total score, functional status score, ROM score, grip strength score, dorsalangulation, palmar tilt, radial inclination and radial length values of the two groups. Mann-Whitney u test was used because the variables examined (score) did not follow normality assumptions. In both groups initial radiographic findings were noted and statistically significant difference was found between palmar tilt of both groups and the P value is 0.003.No

statistical difference between dorsal angulation, radial inclination and radial length noted.

Mean dorsal angulation in group I is 14.96±4.9 and in group II 15.19± 4.41

Mean palmar tilt in group I is 14.68± and in group II 13.08± 3.09

Mean radial inclination in group I is 20.68 ±2.62 and in group II 20.3± 2.54

Mean radial length in group I is 10.52± 1.44 and in group II 10.42± 1.51

Discussion

Ulnar styloid fractures accompany 51% to 65% of distal radius fractures and represent important factor that may affect outcome. Oskarsson et al.⁸ in a case series of 158 fractures found great degree of loss of mobility and grip strength in patients with styloid process fracture treated surgically and concluded that styloid process to be great predictor of fracture instability than articular involvement. Although there is literature supporting both surgical as well as nonsurgical treatment of styloid process fracture, we believe the individual assessment of fracture is very important as all patients with styliod process fracture do not develop DRUJ instability. In 1985, Stewart et.al reviewed the outcomes of 235 patients with extra-articular distal radius fractures, and did not find a correlation between ulnar styloid fracture and function. In 1967, Frykman suggested that fractures of the ulnar styloid substantially affect the outcomes of distal radius fractures, and he included the ulnar styloid in his distal radius fracture classification system. In 1988, Kaukonen Et.al reported a series of 207 consecutive patients with distal radius fractures treated both surgically and nonsurgically and concluded that fractures of the ulnar styloid contributed to poor results. In 1997, Oskarsson et al. evaluated 158 patients with Colles' fracture treated with cast immobilization and found that a fracture of the ulnar styloid was a more important predictor of fracture stability and functional outcome than was articular

Imtiyaz Hussain Dar et al.². Retrospectively evaluated 150 patients in 2015 and they found that presence of a fracture of ulnar styloid process with distal radius fracture results in a weak and painful wrist in a significant number of patients. Functional outcome were assessed with modified mayo wrist score in two groups and the outcome were compared. Statistically significant difference is found between the two groups and p value by Pearson Chi square is 0.041. Based on our study, significant difference is there in the functional outcome of colles fracture alone and colles

fracture with ulnar styloid fracture. Patients with colles fracture alone is having a better outcome than those with associated ulnar styloid fracture.

Conclusion

We conclude that presence of an associated ulnar styloid fracture in a colles fracture results in poor functional status and reduced range of movements in a significant number of patients and these fractures should be taken more seriously and managed effectively. However further studies need to done especially randomized trials and meta-analysis to reach to consensus in such a controversial subject.

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