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A COMPARATIVE OBSERVATIONAL STUDY OF FUNCTIONAL OUTCOME OF COLLES' FRACTURE TREATED WITH CLOSED REDUCTION AND COLLES' CAST IMMOBILIZATION VERSUS CLOSED REDUCTION WITH PERCUTANEOUS PINNING IN ELDERLY AGE GROUP"

Orthopaedics

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ABSTRACT

Background: Distal radius fracture is extremely common and represents 16% of fractures treated by orthopaedic surgeons. Near anatomical reduction with restoration of radial length, radial tilt and ulnar variances are important for good functional results. The present study was carried out to study of functional outcome of Colles' fracture treated with closed reduction and Colles' cast immobilization versus closed reduction with k-wire fixation and cast in elderly age group. **Method:** A comparative study was conducted on total 60 patients were taken into consideration out of which 30 were subjected to Distal end radius treated with closed reduction and Colles' cast immobilization (Group -A) and other 30 were subjected to Distal end radius treated with closed reduction and k wire fixation and cast immobilization (Group -B). **Results:** In present study the wrist movements at follow-up were observed at 6th Week, 3rd Month, 6th Month and 1 year. Range of movements like dorsiflexion, palmarflexion, supination and pronation were compared in both the groups at follow up. There was statistically significant difference in range of movements between both groups. Significant increase was seen in Range of motion in patients treated with percutaneous K-Wire and casting group. **Conclusion:** We concluded that the group with closed reduction k wire fixation and cast had less complications as compared to that of the closed reduction with Colles' colles cast group and had better functionally as well as the anatomical and radiological outcome when seen at different followup interval till one year.

KEYWORDS

Colles' fracture, Distal Radius fracture, Closed reduction, Kirschner wire, Plaster immobilization

INTRODUCTION

The Colles' fracture is the most common skeletal injury in persons over 40 years of age and especially in women. This suggest an association with osteoporosis and it represents about 60% of fracture of radius in this age group. These fractures are easily reduced by traction & manipulation. This conventional closed manipulation and plaster cast immobilization is the common modality of treatment of colles' fracture. However, maintenance of reduction in a plaster cast alone is not always possible and invariably which results in malunion and deformity. Not only cosmetic result is disappointing but also disastrous results with collapse occurring within ten days in almost all fractures due to metaphyseal bone loss.[1]

Displaced, comminated colles' fracture remains challenging problems of orthopaedic surgeons as they tend to heal with malunion. The conventional method of treatment cannot maintain alignment as regards radial length and angulation in many instances and results in significant anatomic deformity and functional disability. Dorsal angulation can disturb radio-carpal function and reduces the range of motion. Decreased radial inclination or radial shortening may results in poor grip strength. Most authors agree that maintaining radial length- is one of the most crucial factor in regaining function of the wrist and the shortening of greater than 4 to 6 mm compromises function especially at the distal radio ulnar joint.

Colles' fractures have an inherent tendency for loss of reduction unless measures are taken to prevent redisplacement. This sorts of instability can be recognized by the presence of: Much comminution, Severe dorsal angulation (200 or More), Radial shortening 10 mm or More, Extensive intra articular involvement.[2]

There are various methods that reduces the residual deformity by maintaining the reduction with additional fixation have been reported to improve the result.[3] These methods include the use of:-

1) Percutaneous kirschner wire fixation with plaster cast immobilization.
2) External fixator application
3) Internal fixation by plate & Screw
4) Bone grafting &
5) Bone cementing

But there is much disagreement as to the best modality. In most colles' fracture loss of reduction is inevitable unless additional fixation is applied. Primary percutaneous kirschner wire fixation should be considered if the original fracture is unstable. Even with excellent reduction and adequate casting there is often gradual shortening at the fracture site as healing occurs. Ideally this should be prevented by adding kirschner wire fixation to cast support or by external fixation or open reduction & internal fixation.[4] It is found that after closed reduction-percutaneous kirschner wire fixation secure initial reduction and maintain radial length till bony union and prevent subsequent late collapse & other complications significantly. For this reason, this fixation method is now considered for better result in the treatment of Colles' fracture.[5,6]

MATERIAL AND METHODS

A comparative study was conducted on total 60 patients were taken into consideration out of which 30 were subjected to Distal end radius treated with closed reduction and Colles' cast immobilization (Group -A) and other 30 were subjected to Distal end radius treated with closed reduction and k wire fixation and cast immobilization (Group -B).

Inclusion Criteria:

1. Patients with age > 50.
2. Colle's fracture without joint incongruity.
3. Patients of either sex.
4. Haemodynamically stable patients with closed fracture.
5. Patients without distal neuro-vascular compromise.
6. Patients willing for treatment at tertiary care centre.

Exclusion Criteria

1. Patients with intra articular distal end radius fractures
2. Patients with open fractures, dorsal comminution fractures, fractures with dorsal tilt more than 20 degrees
3. Patients with congenital or other forearm anomalies.
4. Patients with history of previous wrist or forearm fractures.
5. Patients < 50 years.
6. Patients with evidence of distal neuro-vascular deficit.
7. Patient not willing for treatment at tertiary care centre.

8. Patient with any history suggestive of pathological fracture e.g. Malignancy, Steroid intake, metabolic disorders.

The approval to conduct this study was obtained from the institutional review board. Informed consent was obtained from patients and confidentiality and anonymity of the data was maintained throughout the study. Investigations were carried out after consideration of clinical presentations so as to find predisposing factors, precipitating factors & aetiology.

Postoperative Management:

Hand was elevated for 24 hours with monitoring of neurovascular status. Early motion of digits, elbow and shoulder were encouraged. Intravenous antibiotics were given just before anaesthesia, continued for 48 hours postoperatively and then oral antibiotics (cases treated with Percutaneous Pinning) along with appropriate analgesics and anti-inflammatory drugs were given for one week. Oral calcium supplements were given as well (for both methods of treatment). Patient was discharged at an appropriate time and followed up at the end of first, second, fourth and sixth weeks 3 months, 6 months and 1 year.

Patients were assessed, which included the subjective impressions of the patient, objective grading of function and deformity, comparison of initial and final radiograph. A detailed questionnaire was completed with each patient to evaluate subjective factors such as pain, functional limitations and occupational considerations.

Objective examination included inspection of the wrist for deformity, tenderness, abnormal mobility of the distal radioulnar joint, measurements of the range of movements and grip strength. The radiographic evaluation included radial inclination, volar tilt radial length, dorsal angle, any evidence of joint incongruity, radioulnar instability and radial collapse.

The subjective, objective and radiographic findings were quantified by Lindstrom's [15] criteria of anatomical and functional end results, visual analogue score, Saito chart. The outcome of each fracture was graded as excellent, good, fair or poor.

X-Rays Of Patient Treated With Closed Reduction And Cast

X-Rays Of Patient Treated With Closed Reduction & 'k'-wire

RESULTS

Present study was conducted in tertiary care center in department of orthopaedics. Total of 60 patients were taken into consideration out of which (Group - 1) 30 were subjected to Closed reduction and cast and other (Group - 2) 30 were subjected to closed reduction and percutaneous K-wire with cast.

In present study, patients age was between 55 to 80 years. With mean age of 65.6±5.64 in group 1 and 65.4±5.18 in group 2 respectively. Age group of patients was found to be not statistically significant. Out of 60 patients, 43(71.67%) were females out of which 22 were in group 1 and 21 in group 2. Whereas 17(28.33%) were males out of which 8 were in group 1 and 9 were in group 2. The right wrist was involved in 26 (43.33%) patients out of which 16 were in group 1 and 10 were in group 2, whereas the left wrist was involved in 34(56.66%) patients out of which 14 were in group 1 and 20 were in group 2.

The predominant mechanism of injury was fall on outstretched hand with 49(81.66%) patients out of which 25 patients in group – 1 and 22 in group – 2. The incidence of road traffic accident was observed in 9(15%) patients out of which 5 patients were in group – 1 and 4 patients were in group – 2. whereas 2(3.33%) patients had injury due to fall from height in group 2. Mechanism of injury of patients was found to be statistically significant in present study with p value = 0.05.

Class of injury as per Frykman Class in majority of patients was Type I in 33 (55%) out of which group 1 consist 17 patients and group II consist 16 patients. And 27(45%) were in Type II out of which group 1 consist 13 patients and group II consist 14 patients. This was not found to be statically significant.

Table 01: Distribution of patients as per complications

COMPLICATION	GROUP 1	GROUP 2	Total (%)
FINGER STIFFNESS	3	1	4 (6.67%)
OSTEO ARTHRITIS	6	2	8 (13.33%)
PIN TRACK INFECTION	0	2	2 (3.33%)
SUDECKS DYSTROPHY	3	1	4 (6.67%)
SWELLING	2	0	2 (3.33%)
Total	14	6	20 (33.33%)
Chi square = 9.60	P value = 0.08		

In present study the wrist movements at follow-up were observed at 6th Week, 3rd Month, 6th Month and 1 year. Range of movements like dorsiflexion, palmarflexion, supination and pronation were compared in both the groups at follow up. There was statistically significant difference in range of movements between both groups. Significant increase was seen in Range of motion in patients treated with percutaneous K-Wire and casting group.

Table 02: Distribution of patients as per Lindstrom's Criteria for Anatomical End Result (LCAER)

LCAER	GROUP 1		GROUP 2		Grand Total
	Participant	%	Participant	%	
Excellent Outcome	0	0.00	11	36.67	11
Good Outcome	4	13.33	16	53.33	20
Fair Outcome	22	73.33	2	6.67	24
Poor Outcome	4	13.33	1	3.33	5
Total	30	100.00	30	100.00	60
Chi square = 36.66	P value < 0.001				

Table 03: Distribution of patients as per Lindstrom's Criteria for Functional End Result (LCFER)

LCFER	GROUP 1		GROUP 2	
	Participant	%	Participant	%
Excellent Outcome	4	13.33	24	80.00
Good Outcome	26	86.67	6	20.00
Total	30	100.00	30	100.00
Chi square = 26.78	P value < 0.001			

Table 04: Distribution of patients as per visual analog score

Visual Analog Score	GROUP 1	GROUP 2
Mean Vas Score	5.93±0.98	3.43±1.13
P value < 0.001		

Table 05: Distribution of patients as per fine motor movements.

Fine Motor Movements	Group	Easily Possible	Possible With Difficulty	Not Possible	P Value
Pincer Grasp	Group 1	0	21	9	P = <0.01
	Group 2	26	4	0	
Thumb Grip	Group 1	0	21	9	P = <0.01
	Group 2	20	10	0	

Table 06: Distribution of patients as per Gross Motor Movements

Gross Motor Movements	Group	Easily Possible	Possible with difficulty	Not Possible	P Value

Weight Bearing	Group 1	0	19	11	P = <0.001
	Group 2	26	4	0	
Palm Grip	Group 1	0	22	8	P = <0.001
	Group 2	20	10	0	

Table 07: Distribution of patients as per cosmetic acceptability			
Cosmetic Acceptability	satisfactory and acceptable	Not satisfactory but acceptable	Not satisfactory unacceptable
Group 1	0	20	10
Group 2	23	7	0
Chi square = 39.25	P value < 0.001		

In present study, radial length, Radial Inclination and Volar tilt is used to compare the radiological outcome in both groups.

Table 08: Comparison of radiological outcome in both groups						
	Radial Length		Radial Length		Radial Inclination	
	Group 1	Group 2	Group 1	Group 2	Group 1	Group 2
Immediate Post Operative	11.93±0.79	12.47±1.11	11.93±0.79	12.47±1.11	22.8±0.76	22.77±0.73
6th Week	8.33±1.03	11.23±0.82	8.33±1.03	11.23±0.82	18.23±0.73	21.6±0.5
3rd Month	7.73±0.78	10.90±0.76	7.73±0.78	10.90±0.76	17.8±0.76	21.07±0.74
6th Months	7.27±1.08	10.67±0.48	7.27±1.08	10.67±0.48	16.8±0.76	20.9±0.84
1 Year	6.27±1.08	10.43±0.50	6.27±1.08	10.43±0.50	16.17±1.02	20.8±0.76

In both groups decline in radial length, Volar tilt and radial Inclination, at 6 weeks, 3 months, 6 months and 1 year postoperatively was observed and was found to be statistically significantly.

DISCUSSION

Present study was conducted in tertiary care center in department of orthopaedics. Total of 60 patients were taken into consideration out of which 30 were subjected to Closed reduction and cast and other 30 were subjected to closed reduction and percutaneous K-wire with cast. Distal radius fracture is one of the most common injury. Various clinical studies as well as laboratory assessment of force and stress have demonstrated the importance of anatomic reduction.[8,9]

First step in distal radius fracture is reduction and immobilization. The traditional method is closed reduction and cast immobilization, but this often fails to prevent early radial collapse and is associated with a high risk of malunion, joint stiffness and painful wrist. Hence, this mode of treatment is used for low-demand elderly patients.[10]

Radial length and radial inclination can be maintained by ligamentotaxis using external fixators, but palmar tilt is difficult to maintain.[11] With the use of external fixators complication rates are high as 60%.[12] These mainly include pin tract infection, pin loosening, sympathetic dystrophy and delayed union. Thus, external fixators are not an option in noncomminuted extra-articular distal radial fractures.[13]

A study conducted by Baryar A A et al., where they found that out of 60 patients, deformity was seen in 17 (28.33%) patients out of which 10 (16.66%) were seen in patients who underwent closed reduction and Colles' cast immobilization and 7 (11.66%) were seen in patients who underwent closed reduction and k-wire fixation.[14] Present study result was comparable to this study

A study conducted by Konde, et al. observed that restoration of anatomy for CRIF with k wire was excellent in 17 patients (56.67%) and 6 patients (20%) had a good anatomical outcome while 5 (16.67%) had fair results, 2 (6.67%) patients had poor outcome. Restoration of anatomy for cast immobilization 04 patients (13.33%) was poor, 14 (46.67%) patients had fair results, 11 (36.67%) patients had good outcome, 01(3.33%) patients had excellent results. Functionally, for CRIF with k wire 21 patients (70%) had excellent hand function; 09 patients (30%) had good results; Functionally, for cast immobilization 23(76.67%) patients had good outcome, and 7 (23.33) patients had excellent outcome.[15] Similarresults were observed in present study.

A conducted by Rastogi P et al. where they found that mean radial length at immediate post-operative of patients subjected to Closed reduction (Group I) was 11.40±1.43 mm while patients subjected to Closed reduction with percutaneous K-wire (Group II) was 12.10±1.21, between group difference in mean radial length of patients of above two groups was not found to be statistically significant (p=0.103). At 6 weeks and at 3 months postoperative (p.o.) mean radial length of Group II (11.85±1.18 mm and 11.45±1.19 mm) was found to be statistically significantly higher than that of patients of Group I (9.20±1.28 mm and 9.15±1.31 mm). Radial inclination in Group II (Closed reduction with K-wire) was found to be statistically significantly higher at post-op., 6 wk p.o. and 3 months p.o. as compared to those in Group I (23.50±1.19 vs. 21.85±1.23; 23.60±1.19 vs. 20.00±0.56; 23.45±1.19 vs. 20.00±0.56). Volar tilt in Group II (Closed reduction with K-wire) was found to be statistically significantly higher at post-op., 6 wk p.o. and 3 months p.o. as compared to those in Group I (8.35±1.14 vs. 5.10±2.34; 8.35±1.04 vs. 4.45±2.74; 8.35±1.04 vs. 4.45±2.74).[16] Similarresults were observed in present study.

Range of movements was compared in both the group at follow up. There was statistically significant difference in range of movements between both groups. Significant increase was seen in Range of motion in patients treated with percutaneous K-Wire and casting group.

CONCLUSION

Colles fracture in adults is a common injury and considering that there is very limited knowledge about the best method of treatment, either conservative or surgical, further research is called for. The treatment goal for fractures of the distal end of the radius is fully functional recovery of the wrist and prerequisites are restoration of the anatomy and early mobilization. We concluded that the group with closed reduction k wire fixation and cast had less complications as compared to that of the closed reduction with Colles' colles cast group and had better functionally as well as the anatomical and radiological outcome when seen at different followup interval till one year.

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