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Comparison of Closed Reduction and Plaster Cast versus Kirschner Wire Fixation for the Management of Colle's Fracture

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Abstract
Objective: To evaluate the functional outcomes of closed reduction and plaster cast versus kirschner wire fixation in treatment of colle's fracture.**Study Design**: Randomized Control Trial.**Place and Duration:** Study was conducted in the department of Orthopedic surgery Bahawal Victoria Hospital Bahawalpur from April 2017 to April 2018.**Methodology:** A total of sixty patients with colle's fracture enrolled in the study. Adult patients of age more than 20 years, both genders with unstable distal radius end fracture were included in the study. Patients unfit for medical treatment, compound fracture with vascular injury and who were not willing for surgery were excluded from the study. Patients were divided into two groups with lottery method. Complications after surgery and outcomes (excellent, good, and poor) were assessed. SPSS version was used to analyze data. P value ≤ 0.05 was considered as significant.**Results:** mean age and time of union of Group A was 42.90±3.53 years and 3.80±1.58 respectively. There were more males than females i.e. 70% and 30% respectively. Majority of the patients' outcome was good in both the groups' i.e. 46.7% and 53.3% respectively. The differences were statistically insignificant.**Conclusion:**Results of our study reveals that both treatment methods are equally effective less costly mode of treatment should be adopted for management of colle's fracture.
Keywords: Close Reduction, Plaster Cast, Kirschner Wire, Collles' Fracture

Introduction

Management of fracture of distal radius due to high energy trauma which involves intra articular region or vominution is a challenge now these days. Treatment of such type of fracture is difficult because most of them are unstable (difficult to reduce anatomically), high incidence of complications. Osteoarthritis is a common complication after intra articular fracture of distal radius. Misalignment of intra articular portion may lead to reduced grip strength carpal instability and reduced motion. Multiple management options like pins and plaster, closed reduction, percutaneous pining, external and internal fixation are available according to the pattern of fracture.

Various combinations are available for fracture angulation. AO classification of colle's fracture is C1, C2, C3 (complete articular simple articular and metaphyseal fracture labeled as colle's 1, simple articular with complex metaphyseal is C2 and complex articular with metaphyseal fracture is C3). During management of distal radial fracture main objective should be to attain normal functioning of wrist function. Other outcomes may include restoration of radial anatomy, maintenance and stability of reduction and early hand mobilization.

In cases of unstable distal radius fractures open reduction and internal fixation is recommended in those cases which are difficult to manage with external fixation and ligamentotaxis for achievement of early range of motion. Fracture with unstable bending is ideal choice for management with open reduction and internal fixation. Internal fixation is popular treatment method due to achievement of physiologic palmer tilt, control of collapse with external fixation and safety from bridging radiocarpal joint.

Many treatment options are in trend now for fixation of radius fracture. Fixation with percutaneous k wire gives extraordinary stability and is one of the common used modality. Purpose of our study is to compare outcomes of treatment of colle's fracture with closed reduction and cast versus closed reduction with krischner wire and cast.

Methodology

Randomized control trial was conducted in the department of Orthopedic surgery Bahawal Victoria Hospital Bahawalpur from April 2017 to April 2018.after ethical approval from hospital ethical committee. A total of sixty patients with distal radial fracture enrolled in the study. Adult patients of age more than 20 years, both genders with colle's fracture were included in the study. Patients unfit for medical treatment, compound fracture with vascular injury and who were not willing for surgery were excluded from the study. After hospital admission detailed history was taken from patient or their attendants to judge the mechanism or severity of injury. General physical examination was done and any associated disease was noted. Patients were divided into two groups (group A and group B) with lottery method. Patients in group A were treated with closed reduction and plaster cast and patients in group B were treated with Krischner wire fixation.

All patients with hand supported with other hand and flexed elbow were assessed for severity of injury any deformity, swelling, movement restriction, crepitus, ulnar or radial styloid process were examined thoroughly. Movement of forearm and wrist also assessed if restricted or painful was noted. To check distal vascularity capillary refill, parasthesia, pallor and radial pulsation was assessed. To reduce mobilization POP cast or back slab was applied and patients were asked to elevate the injured limb. Routine laboratory investigation, physician fitness and consent was obtained.

X ray with AP and lateral view were obtained to confirm diagnosis and fracture type. In case of complex vomunated fracture oblique view of x ray was taken. Type of fracture and grade was assessed by using Frykman's or AO classification. Duration of fracture was also noted from date of fracture to date of admission. Treatment options were depended upon type and pattern of fracture. Extra articula distal radial fractures were managed with closed reduction and percutaneous pinning and cast application. Percutaneous krischner wire was inserted in cases with displaced radial styloid or segmental fractures. All cases wee done under general anesthesia. Follow up was done from 4 weeks to six months and grading was assesed with Gartland criteria.

Results

Sixty patients were enrolled in this study, both genders. We further categorized the patients as Group A and Group B respectively. The mean age and time of union of Group A was 42.90±3.53 years and 3.80±1.58 respectively. There were more males than females i.e. n=21 (70%) and n=9 (30%) respectively. n=21 (70%) patients were road accidents and n=9 (30%) were fell on their outstretched hand. fractures type was n=11 (36.7%) extra articular and n=19 (63.3%) intra articular fractures. While, the mean age and time of union of Group B was 38.93±3.75 years and 3.73±1.41 respectively. There were more males than females i.e. n=29 (96.7%) and n=1 (3.3%)respectively.n=23 (76.7%) patients were road accidents and n=7 (23.3%) were fell on their outstretched hand. fractures type was n=13 (43.3%) extra articular and n=17 (56.7%) intra articular fractures. The differences were statistically insignificant except age (p=0.000) and gender (p=0.006). (Table. I).

Deformity was noted as prominent ulnar styloid in n=5 (16.7%) patients, radial deviation in n=3 (10%) patients and dinner fork deformity in n=2 (6.7%) patients, for Group A. While, for Group B, Deformity was noted as Prominent ulnar styloid in n=4 (13.3%) patients, radial deviation in n=2 (6.7%) patients and dinner fork deformity in n=1 (3.3%) patients. The distribution of movement (within normal functional range) in both groups was shown in table 2. The complications in both the groups were shown in table II. While, the outcome wise distribution of both groups were shown in table III. Majority of the patients' outcome was good in both the groups' i.e. n=14 (46.7%) and n=16 (53.3%) respectively. The differences were statistically insignificant. P-value ≤0.05 considered as significant.

Table: I: Demographic Characteristics among the groups

Variable	Group A n=30	Group B n=30	P-value
Age (years)	42.90±3.53	38.93±3.75	0.000
Time of Union	3.80±1.58	3.73±1.41	0.864
Gender			
Male	n=21 (70%)	n=29 (96.7%)	0.006
Female	n=9 (30%)	n=1 (3.3%)	
Distribution of time of union			
2-3 minutes	n=14 (46.7%)	n=11 (36.7%)	0.409
4-5 minutes	n=11 (36.7%)	n=16 (53.3%)	
>5 minutes	n=5 (16.7%)	n=3 (10%)	
Type of Accident			
Road accident	n=21 (70%)	n=23 (76.7%)	0.559
fell on their outstretched hand	n=9 (30%)	n=7 (23.3%)	
Fractures type			
Extra articular	n=11 (36.7%)	n=13 (43.3%)	0.598
Intra articular fractures	n=19 (63.3%)	n=17 (56.7%)	

Table: II: Outcome Variables

Variable	Group A n=30	Group B n=30	P-value
Deformity			
Prominent ulnar styloid	n=5 (16.7%)	n=4 (13.3%)	0.837
Radial deviation	n=3 (10%)	n=2 (6.7%)	
Dinner fork deformity	n=2 (6.7%)	n=1 (3.3%)	
Total	10	7	
Movement (within normal functional range)			
Dorsiflexion (min. 45°)	n=17 (56.7%)	n=15 (50%)	0.605
Palmar flexion (30°)	n=19 (63.3%)	n=16 (53.3%)	0.432
Pronation (50°)	n=10 (33.3%)	n=11 (36.7%)	0.787
Supination (50°)	n=19 (63.3%)	n=18 (60%)	0.791
Radial deviation (15°)	n=14 (46.7%)	n=18 (60%)	0.303
Ulnar deviation (15°)	n=16 (53.3%)	n=14 (46.7%)	0.606
Pain in distal radioulnar joint	n=4 (13.3%)	n=2 (6.7%)	0.389
Grip strength (60% or less than on opposite side)	n=2 (6.7%)	n=2 (6.7%)	1.0
Complications			
Pin tract infection	n=0 (0%)	n=0 (0%)	--
Pin loosening	n=2 (6.7%)	n=2 (6.7%)	1.0
Malunion **Wrist stiffness**	n=3 (10%)	n=1 (3.3%)	0.301
Radiocarpal Arthritis	n=5 (16.7%)	n=2 (6.7%)	0.228

Table: III: Outcome variables

Results	Group A n=30	Group B n=30	P-value
Excellent	n=7 (23.3%)	n=6 (20%)	0.909
Good	n=14 (46.7%)	n=16 (53.3%)	
Fair	n=7 (23.3%)	n=7 (23.3%)	
Poor	n=2 (6.7%)	n=1 (3.3%)	

Discussion

Management of colle's fracture is a challenge since the day of its introduction in orthopedic surgery, multiple treatment options are available but least costly mode management should be adopted[11]. Many studies have been conducted on its management options. Common sites of distal radius fracture involve radio carpal and radio ulnar joint. To avoid post traumatic arthritis and for better outcome of surgery anatomical reduction is necessary.

Mean age of pantie in our study in group A is 42.90±3.53 and in group B 38.93±3.75 which comparable with studies conducted by John K Broadway et al[12] who reported average age of 40 years. In another study Jesse B Jupiter et al[13] reported 42 years of avarage age limit. Our study is also comparable with studies by Haris Kapoor et al[14] and Louis Catalano III et al[15] who reported 39 years and 30 years of age respectively.

In our study most of the patients had road traffic accident and remaining fell on their outstretched hand, similar findings were reported by Jesse B Jupiter et al[13] and Haris et al[14] also reported similar finding that mostly patients presented with history of road traffic accident. On other hand Louis Catalano et al[15] and John K Bradway et al[12] reported fell on outstretched hand is most common type of injury in his study. Population of Harish Kapoor et al[14] and our study is subcontinent.

In our study we have excellent results in group A 23.3% and in group B 20 % good results in group A are 46.7% and in group B 53.3% poor results. In a study by Gupta et al[16] reported 40% patients have good results and 20% have fair and poor results in plaster cast appli action group whereas 18% good results and 4% fair and poor results were reported in Krischner's wire insertion group. In a study by Nikunj M etal[17] reported 5 patient with excellent results out of 50 patients and 12 with good results and at the end 8 patients have fair to poor results in plaster cast application group. On other hand in Krischner's wire group 5 patients have excellent results 13 have good results and 7 patients have fair results. Poor outcome was not found in this group.

Another study was conducted in 2011 on this topic by Das AK et al[18] and reported that excellent to good results were obtained in 93.75% of cases and fair results were found in 6.25% of cases who were treated with

percutaneous pinning technique. In many other studies it was reported that complications of deformity, malunion and reduction in range of motion is more common in plaster cast alone as compared to percutaneous pinning technique[19,20]. This study is also comparable with our results. Best results can be obtained by exact estimation of immobilization period.

Conclusion

Results of our study reveals that both treatment methods are equally effective less costly mode of treatment should be adopted for management of colle's fracture.

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