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Comparison of Functional and Anatomical Results of Colles Fracture Treated by Percutaneous k- Wire Fixation and Plaster Cast, a Randomized Prospective Study

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Abstract: ***Introduction:*** ***Although Colles fracture are is the most common fracture treated by an orthopedic surgeon still various controversies remain regarding best method of treatment. There are numerous studies regarding optimal management of these fractures with variable results and conclusions. Closed reduction followed by plaster cast application and percutaneous pinning are the two standard methods of treatment but there are few studies which compare results both objectively and subjectively.*** ***Materials and methods:*** ***Sixty four cases of Colles fractures were included in the study. Thirty two patients underwent closed reduction and percutaneous two crossed wire fixation followed by below elbow cast application under nerve block or general anaesthesia (group A). Thirty two every alternate patient underwent closed reduction and below elbow cast application under nerve block or anaesthesia (group B). Radiological and functional evaluation of results was done at three and six months and compared between two groups.*** ***Conclusion:*** ***Closed reduction and Percutaneous k-wire fixation combined with plaster cast immobilization is better method than the conventional plaster cast immobilization- in restoration of pre injury anatomical alignment in the management of Colles fracture. Anatomical reduction has not much of role in determining the functional outcome which is statistically significant in our study.***

Keywords: Anatomical, Functional, Colle's, Percutaneous, Plaster cast, K wire fixation

1. Introduction

Ever since Abraham Colles description of a fracture of distal end of radius at corticocancellous junction that bears his name, various controversies still remain regarding the best method of treatment(1).The management of distal end radius fracture has undergone extraordinary evolution of treatment over period of time(2-9). There are numerous studies regarding optimal management of these fractures with variable results and conclusions. Closed reduction followed by plaster cast application and percutaneous pinning are the two standard methods of treatment but there are few studies which compare results both objectively and subjectively. Our purpose of the study was to compare anatomical and functional results after treatment with percutaneous fixation and conventional plaster cast immobilization.

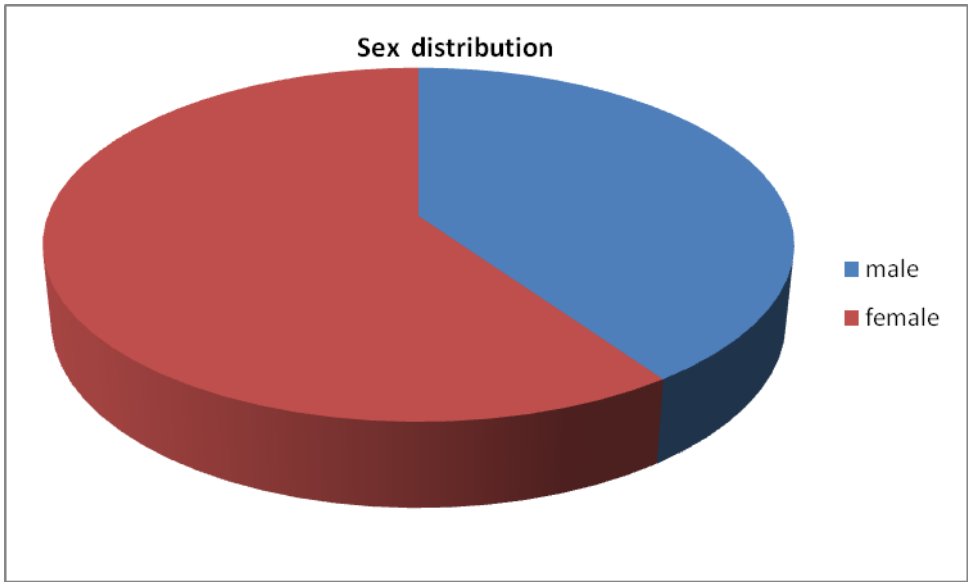
2. Materials and Methods

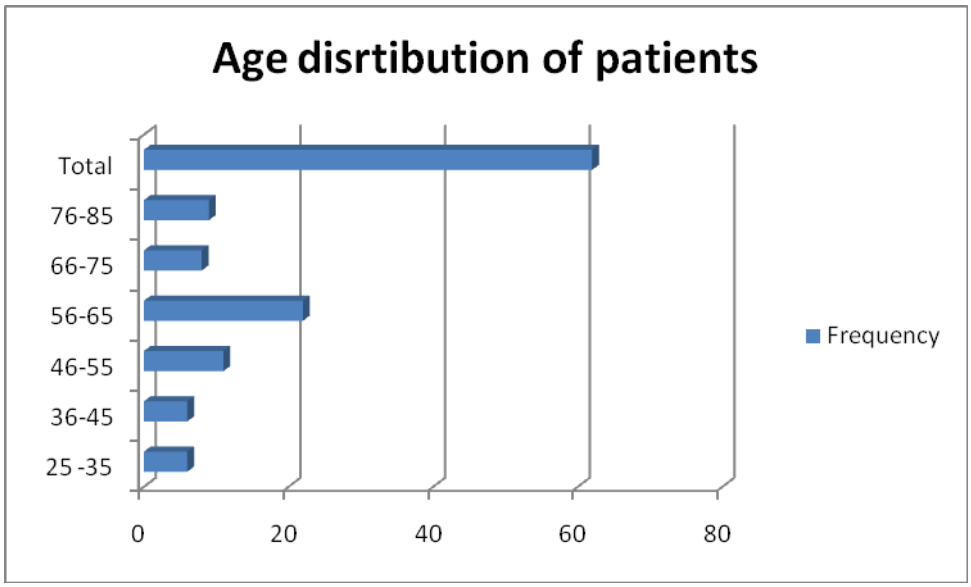
Between June 2010 and June 2012, 64 cases of Colles fractures were included in the study. Thirty two patients underwent closed reduction and percutaneous two crossed k –wire fixation followed by below elbow cast application under nerve block or general anaesthesia (group A). Thirty two every alternate patient underwent closed reduction and below elbow cast application under nerve block or anaesthesia (group B).

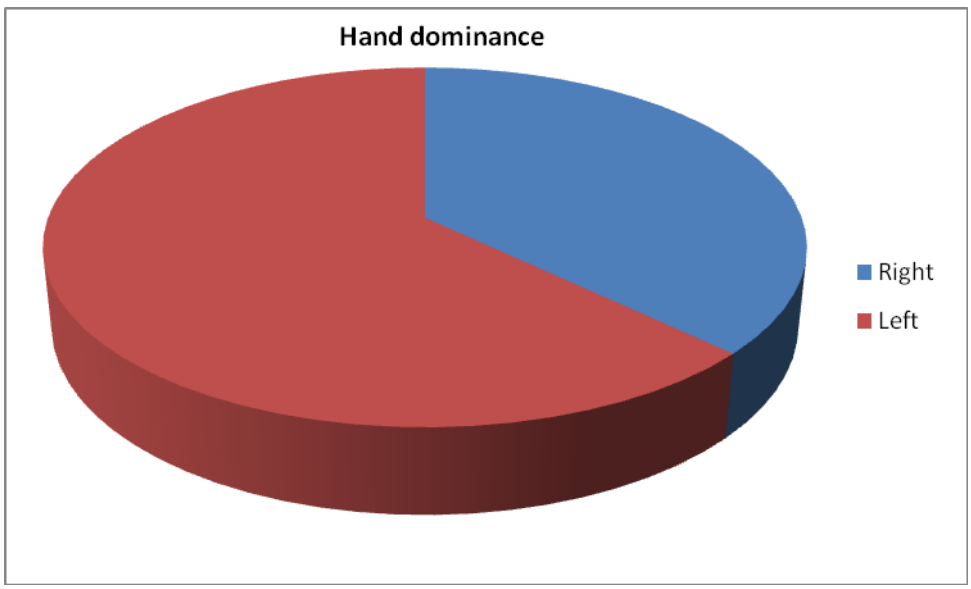
Reduction of the fracture was done under image intensifier guidance using appropriate reduction maneuver. Colles fractures having increased dorsal angulations, shortening and radial deviation of distal fragment was reduced by applying longitudinal traction, ulnar deviation and palmar flexion at the wrist. Once the fracture was reduced as seen under C-arm group A patients were treated with percutaneous k-wires and immobilized with below elbow plaster, whereas group B patients were immobilized with a below elbow cast. Active finger movements were taught during period of cast immobilization. Both group of patients were followed at regular intervals as outpatients. Plaster and k-wires were removed at six weeks in both the groups and physiotherapy in the form of wrist ROM and finger stretching exercises was started. Radiological evaluation was done on post operative day 1, at 6 weeks, 3 months and 6 months. Functional evaluation was done at 3 months and 6 months. We compared anatomical and functional end results of both the groups at 3months and 6months.

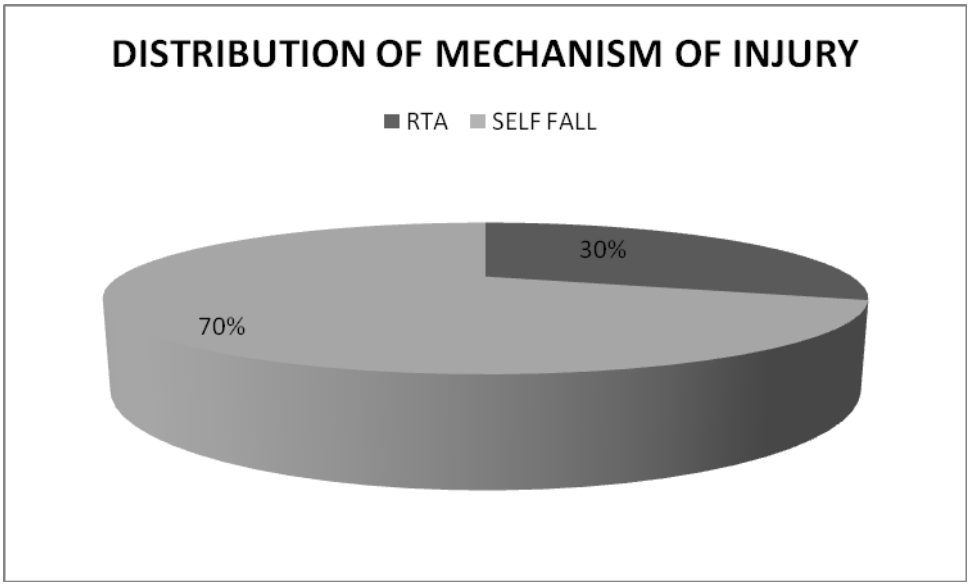
3. Results

The demographic data of our study has been shown in pictorial representation below.









Anatomical results were studied based of Sarmiento modification of Lidstrom criteria on anteroposterior and lateral radiograph of wrist. Excellent and good scores were considered as satisfactory whereas fair and poor results were considered as unsatisfactory. Functional results were studied according to Gartland and Werely scores. Satisfactory results included excellent and good scores whereas fair and poor results were unsatisfactory. The anatomical and functional results at 3 and 6 months have been depicted in table 1-4.

4. Discussion

Though Colles fracture is the most common fracture in middle aged and elderly patients, there is a controversy still regarding the best modality of treatment of this fracture (1-8). The conventional method of treatment with a plaster cast usually cannot maintain radial length and angulation in many instances and results in significant morbidity. On the other hand after closed manipulation additional fixation in the form of percutaneous crossed k-wire can maintain the reduction till bony union and provide better anatomical and functional results (9).

Though anatomical and functional results do not correlate completely, good anatomical restoration by fixation method invariably yields a good functional results. Whereas poor anatomical results are associated with poor functional results(10).
Abbaszadegan et al concluded that initial radial shortening is the best predictor of future instability and hence more importance has been given on the prevention of radial shortening than on the reduction of dorsal angulation and radial angulation (11). It is not very difficult to achieve radial length by closed manipulation to the original value but fairly difficult to maintain it before fracture healing is complete, especially if such fracture is protected by only cast immobilization. Additional fixation offers the advantage of maintaining the reduction with the wrist in neutral position and allow full motion of fingers. Although the use of an external fixator is an effective means of achieving this result, it requires more specialized equipment and added expense and the bulk of the apparatus is cumbersome for elderly patient (12). Percutaneous wire fixation can serve this purpose very efficiently till healing of the fracture is complete.

Overall satisfactory results are more in case of percutaneous wire fixation group (Group-A) which suggest that maintenance of reduction till complete healing with additional device is more important factor than the fracture pattern in determining the final outcome. Among Group B patients there were loss of reduction in 10 patients which subsequently led to various disabilities like persistent wrist pain, stiffness of wrist and finger. There was no loss of reduction seen in any of the group a patients. This late collapse seen more in group B patients resulted in the more residual anatomic deformity and functional disability at final outcome. And within 3-6 month of physiotherapy there were substantial improvement regarding functional outcome.

An anatomical result of our study was satisfactory in 75% cases of percutaneous wire fixation group whereas in conventional group it was 38% at six months (Table 3). Functional results (Gartland & Werleys scoring) in our study were satisfactory in 86% of percutaneous fixation group and 62 % in conventional group at six months.

Most of the authors concluded that correction and maintenance of anatomical land mark (radial length, radial angle, and dorsal angle) are the most important factors to regain hand and wrist function. But in our study there is no significant difference in functional outcome between the two groups at six months as alone as assessed using Gartlands And Werleys scoring ($p>0.467$) though there is significant difference in anatomical reduction between the two groups with 86% satisfactory reduction with only few late collapse in patients treated with K wire group as compared to 62% patients treated with plaster alone ($p<0.013$).

5. Conclusion

Closed reduction and Percutaneous K-wire fixation combined with plaster cast immobilization is better method than the conventional plaster cast immobilization- in restoration of pre injury anatomical alignment in the

management of Colles fracture. Anatomical reduction has not much of role in determining the functional outcome which is statistically significant in our study. Long term follow up with larger sample size is required to study the role of anatomical reduction in functional outcome.

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Table 1: Anatomical end results at 3 months

Lidstrom score (Sarmiento modification)	Procedure Performed	
	Group A	Group B
Excellent	6	2
Good	24	14
Fair	2	10
Poor	0	6
Total	32	32

Table 2: Functional end results at 3 months

Gartland and Werlev score	Group A	Group B
Excellent	6	0
Good	18	6
Fair	8	16
Poor	0	10
TOTAL	32	32

Table 3: Anatomical end results at 6 months

Lidstrom score	Procedure Performed	
	Group A	Group B
Excellent	6	2
Good	18	8
Fair	7	10
Poor	1	12
Total	32	32

Gartland and Werlev score	Group A	Group B
Excellent	10	2
Good	18	14
Fair	4	14
Poor	0	2
TOTAL	32	32

Figure 1: Anteroposterior radiograph after closed reduction and cast application

Figure 2: Lateral wrist radiograph after closed reduction and cast application

Figure 3: Anteroposterior radiograph after closed reduction and percutaneous k-wire fixation

Figure 4: Lateral radiograph after closed reduction and percutaneous k-wire fixation

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