Anatomical and Functional Outcome of Conservative Treatment of Colles' Fracture

Azeem Jamil,[1] Saeed Ahmed Shaikh, [1*] Yahya Baloch, [1]

ABSTRACT

Objective *To determine the functional and anatomical outcome of non operative treatment of Colles' fracture.*

Study design *Cross sectional study.*

Place & Duration of study *Department of Orthopaedics, Jinnah Postgraduate Medical Centre Karachi, from December 2017 to June 2018.*

Methodology *A prospective study was carried out on patients with fractures of the distal end of radius. Gartland and Werley scoring system were used to assess the functional outcome by the evaluation of pain, range of active motion, grip strength, and appearance of the wrist joint. Bunger et al scoring system was used to measure the anatomical outcome by evaluating the dorsiflexion angulation, loss of radial deviation, and loss of radial height. Final outcome was assessed at the end of 4 months.*

Results *A total of 97 patients of either gender with age between 18 to 60 years meeting inclusion criteria of study were included. Average age of patient was 30.36±4.12 year. Majority of (n=67 - 69%) the patients were male. Mean duration of fracture was 3.86±1.23 days and most of the patients belong to duration of fracture less than 4 days (n=71 - 73.19%). Excellent functional and anatomical outcome was seen in 56 (58%) and 16 (16.5%) patients respectively. Excellent and good results were considered as satisfactory and noted in 90% and 66% functionally and anatomically respectively.*

Conclusions *Conservative management of the Colles' fracture in plaster cast is an effective treatment modality achieving satisfactory results both functionally and anatomically. Functional results were better than anatomical results.*

Key words *Functional outcome, Anatomical outcome Colles' fracture. Plaster cast.*

INTRODUCTION:

Distal radius fracture is one of the most frequent fractures accounting for approximately 17% of all the skeletal fractures.[1,2] It is commonly called Colle's fracture.[3] It has a bimodal age distribution. In young patients it follows high velocity motor vehicle accidents or fall from height and in older weak bones it results from trivial fall.[4] The goals of treatment of Colle's fracture are to maintain normal axial alignment and length, strength, mobile and functional wrist and hand.[5] Restoration of radial length (distance from radial styloid process to the distal end of ulna), volar angulation, congruity of articular surface, and ulnar variance are important for good functional results.[5] Failure to maintain reduction can lead to morbidity like deformity due to malunited fracture, development of wrist osteoarthritis, instability of distal radio-ulnar joint and ulnar impaction syndrome with resulting wrist pain, decreased movement, weak grip strength and function.[5]

The factors which influence the outcome of distal

[1] Department of Orthopedic Surgery, Jinnah Postgraduate Medical Centre, Karachi

Correspondence:
Dr. Saeed Ahmed Shaikh [1*]
Department of Orthopedic Surgery, Ward 14
Jinnah Postgraduate Medical Centre,
Karachi
E mail: drsashaikh2003@yahoo.com

radius fractures (DRF) are divided into the clinical parameters such the patients' age, life style, type of the facture, severity and alignment of the fracture, condition of the soft tissues and radiological findings including dorsal angulation, radial shortening, metaphyseal comminution, intra-articular extension, associated ulnar fracture and bone quality.[6,7] A variety of treatment modalities are available for distal radius fractures including close reduction and plaster cast application, close reduction and percutaneous pins application, external fixator using ligamentotaxis principle and open reduction and internal fixation with plate and screwes.[4,5,8-10] Treatment by closed reduction and casting immobilization can be adopted at low cost without admission to hospital. Very good clinical outcomes of non-operative treatment have been documented in elderly patients suffering from unstable fractures.[9] Operative management is associated with typical surgical risk factors, exposure to radiation, and financial expense. It has been demonstrated that mal-alignment does not correlate with the functional outcomes in elderly patients.[11] Literature review suggests that in older patients, functional outcome of nonoperative treatment does not differ from that of surgical management despite the poorer radiological results.[11]

The rationale of this study was to estimate the anatomical and functional outcome of conservative management of Colles' fracture as there is dearth of local literature on this topic. This study provides evidence about anatomical and functional outcome of conservative management of Colles' fracture.

METHODOLOGY:

This cross sectional study was conducted in the Department of Orthopaedic Surgery, Jinnah Postgraduate Medical Centre Karachi, from December 2017 to June 2018. Sample size was calculated using formula for single population proportion on the basis parameters, taking functional outcome as excellent = 2(10%), confidence level= 95%, absolute precision=6%, a sample size of 97 patients was obtained.

Patients were recruited from emergency department using non-probability purposive sampling technique. Patients between 18 to 60 years age of either sex with extra-articular distal radius fractures (Colles') presenting within 48 hours of injury were included in the study. Patients with open fractures, fractures in the ipsilateral upper limb like fracture shaft of radius/ulna or fracture humerus assessed on x-rays, associated neuro-vascular deficit assessed on physical examination showing wrist drop or no sensation on pinprick, were excluded from the study.

The approval to conduct this study was obtained from the institutional review board (IRB). Informed consent was obtained from patients and confidentiality and anonymity of the data was maintained throughout the study. History was taken for duration of fracture and diagnosis was confirmed on radiographs. History of comorbid like diabetes mellitus, hypertension and smoking status (smokes more than or equal to 10 cigarettes/day for more than 5 years duration) was also inquired and noted. Height and weight were measured and BMI calculated. Local anesthesia approximately 4ml was injected into the fracture site, close manipulation and reduction was done and dorsoradial splint was applied in palmar flexion and ulnar deviation. Reduction was confirmed on x-rays. Patients were followed at one, two and three months and final outcome were assessed at the end of four months.

Bunger et al scoring system was used to measure the anatomical outcome. Parameters assessed were dorsiflexion angulation, loss of radial inclination, and loss of radial height A score of 0-3 was taken as excellent to good (satisfactory) anatomical outcome.[12] Gartland and Werley scoring system was used to assess the functional outcome by the pain, range of active motion, grip strength, and appearance of the wrist joint. A score of 0-8 was taken as excellent to good (satisfactory) functional outcome.[13]

Data were entered, clean, coded and analyzed by SPSS version 21. Mean ± SD were calculated for age, height, weight, body mass index and duration of fracture in hours. Frequency and percentages were calculated for age group, gender, diabetes mellitus (DM), hypertension (HTN), smoking status, anatomical outcome and functional outcome. Effect modifiers like age groups, gender, DM, HTN, smoking status, BMI and duration of fracture were dealt through stratification. Post stratification Chi square test was applied keeping level of significance at 0.05.

RESULTS:

A total of 97 patients were managed during the study period. The average age of the patients was 30.36±4.12 (from 18-60 years). Majority of the patients were between the ages of 20-45 years, 48 (49%) patients were less than 30 years and 14 more than 45 (15%) years of age. Mean height of the patients was 1.58±0.23 meters, average weight of the patients was 69.41±4.93 kg and mean BMI was 25.68±2.84 kg/m^2. Average duration of fracture was 3.86±1.23 days (from 3-10 days). Fracture duration of less than 4 days was noted in 71 (73.19%)

Table I: Descriptive Statistics of The Study In Patients With Colles' Fracture Functional Outcome (n-97)				
	Functional outcome (Excellent and Good)		Total	p-value
	Yes	No		
Smoking				
Yes	21 (21.6%)	7 (7.2%)	28 (28.8%)	0.035
No	67 (69.1%)	2 (2.1%)	69 (71.2%)	
Hypertension				
Yes	27 (27.9%)	4 (4.1%)	31 (32%)	
No	61 (62.9%)	5 (5.1%)	66 (68%)	
Duration of Fracture (in days)				
<4	68 (70.1%)	3 (3.1%)	71 (73.2%)	0.003
>4	20 (20.6%)	6 (6.2%)	26 (26.8%)	
Diabetes Mellitus				
Yes	28 (28.9%)	3 (3.1%)	31(32%)	0.042
No	60 (61.9%)	6 (6.1%)	66 (68%)	
Gender				
Male	63 (64.9%)	4 (4.1%)	67 (69%)	0.001
Female	25 (25.8%)	5 (5.2%)	30 (31%)	

Table II: Descriptive Statistics pf The Study In Patients With Colles' Fracture Anatomical Outcome (N-97)				
	Anatomical Outcome (Excellent and Good)		Total	p-value
	Yes	No		
Smoking				
Yes	13 (13.4%)	15 (15.4%)	28 (28.8%)	0.008
No	51 (52.6%)	18 (18.5%)	69 (71.2%)	
Hypertension				
Yes	16 (16.5%)	15 (15.5%)	31 (32%)	0.003
No	48 (49.5%)	18 (18.5%)	66 (68%)	
Duration of Fracture (in days)				
<4	56 (57.8%)	15 (15.4%)	71 (73.2%)	0.001
>4	8 (8.2%)	18 (18.6%)	26 (26.8%)	
Diabetes Mellitus				
Yes	18 (18.5%)	13 (13.5%)	31 (32%)	0.111
No	46 (47.4%)	20 (20.6%)	66 (68%)	
Gender				
Male	45 (46.4%)	22 (22.6%)	67 (69%)	0.002
Female	18 (18.6%)	12 (12.4%)	30 (31%)	

patients. Most of the patients were male (n=67 - 69%). Hypertension was the more common comorbid found in 33 (34%) patients and diabetes mellitus in 31(32%) patients. Of the total 28 (29%) patients were smokers.

Excellent functional results were seen in 56 (57.7%) cases and excellent anatomical outcome in 16 (16.5%) patients. Considering excellent and good outcome together, satisfactory results were achieved with 90% functional and 66% anatomical outcome. To compare the anatomical outcome with different parameter of the study subjects, all study variables found statistically significant with p-value less than 0.05 except diabetes mellitus. To compare the functional outcome with different parameters of the study subjects all study variables found statistically significant with p-value less than 0.05.

DISCUSSION:

Distal radius fractures are common in all age groups.[14] The treatment of these fractures is challenging particularly in the maintenance of reduction. Several studies have suggested that there is a direct relationship between the anatomical reduction and functional outcome. However, older patients with lower functional demands do relatively well in spite of obvious deformity.[14,15]

In this Gartland and Werley scoring system was used to assess the functional outcome. A score of 0-8 were taken as excellent to good functional outcome. Our data showed that 56 (57.7%) cases had excellent functional results. Excellent and good results were considered satisfactory (90% functional and 66% anatomical). In a comparative study on 40 patients between plaster group and external fixator group no significant difference was found in symptoms like pain, swelling, deformity and inability to move in both groups.[16] Complication rate was also similar in both groups. Grle et al in their prospective study on 122 patients showed excellent early results with conservative management of distal radius fractures.[17] They divided the patients in two groups: dorsiflexion (DF) and palmar flexion (PF) group according to wrist immobilization in plaster cast. Functional results in terms of range of movement were better in dorsal flexion group. We used the same position of wrist immobilization in the management of distal radius fracture. However the patient related wrist evaluation survey revealed no statistically significant difference between the two groups.

In contrast some studies show equivocal or poor results with conservative treatment of distal radius fractures. Arora et al did comparative study between plaster cast treatment versus external fixation. Results were better in external fixation group and complication rate was higher in plaster group (43%).[18] Although plaster cast group took less time to heal, 17 out of 28 patients treated in plaster cast lost reduction in follow up visits and required further re-manipulation or some other intervention. However, they included intra-articular fractures of the distal radius in their study. A meta-analysis of seven studies was done to compare the results between operative and conservative treatment of distal radius fractures. Overall, the radiologic outcome was better in surgically treated cases, however no remarkable difference was found in terms of functional results and number of complications.[19] Surgical treatment of distal radius fractures is not free of complications. In a retrospective analysis of 63 cases with distal radius fractures managed with surgery, 16% of the patients developed complications which required another surgery and16 cases (25%) were re-operated for implant removal.[20]

Mean age of the patients in our study was 30.36±4.12 which corresponds to the age distribution in the study of Kumar et al with mean of 32.43 ± 10.91.[16] However several studies have shown this fracture being more common in old osteoprotic bones.[20,21] Mean duration of fracture in our study was found 3.86±1.23 days and most of the patients presented within 4 days. This was comparable to studies conducted by Chen et al and Carrozzella.[22,23] In the current study, majority of the patients were male with male to female ratio of 2.25:1 which corresponds to other studies.[16,24,25] However literature reveal that many of the affected patients are elderly females due to weak osteoporotic bones.[15,20,21]

CONCLUSIONS:

Conservative management of the colles fracture in plaster cast is an effective treatment modality achieving satisfactory results both functionally and anatomically, although the functional results are better than anatomical results

REFERENCES:

1. Court-Brown CM, Cesar B. Epidemiology of adult fractures a review. Injury. 2006; 37:691-7.

2. Singer B, McLauchlan G, Robinson C, Christie J. Epidemiology of fractures in 15 000 adults: the influence of age and gender. J Bone Joint Surg Br. 1998;80:243-8.

3. Colles A. On the fracture of the carpal extremity of the radius. Edinb Med Surg J. 1814; 10:181.

4. Sivaprakash SU, Reddy RM. Functional outcome of comminuted intra-articular distal

radius fractures managed by Ligamentotaxis. Int J Orthop Sci. 2019;5:75-9.

5. Somesula JB, Venkata Naga MRP. A prospective study of surgical management of distal radius fracture in adult with plate fixation. Int J Orthop Sci. 2017;3:236-40.

6. Leone J, Bhandari M, Adili A, McKenzie S, Moro JK, Dunlop RB. Predictors of early and late instability following conservative treatment of extra-articular distal radius fractures. Arch Orthop Trauma Surg. 2004;124:38-41.

7. Mackenney PJ, McQueen MM, Elton R. Prediction of instability in distal radial fractures. J Bone Joint Surg Am. 2006;88:1944-51.

8. Bagul R, Yadav K, Rai A, Deo S, Patole V. Comparative study of functional outcome in Colles' fracture treated conservatively by closed reduction and cast and closed reduction, Kirschner wire and cast. J Pharm Biomed Sci. 2016;6:464-8.

9. Anzarut A, Johnson JA, Rowe BH, Lambert RG, Blitz S, Majumdar SR. Radiologic and patient-reported functional outcomes in an elderly cohort with conservatively treated distal radius fractures. J Hand Surg Am. 2004;29:1121-7.

10. Grewal R, Perey B, Wilmink M, Stothers K. A randomized prospective study on the treatment of intra-articular distal radius fractures: open reduction and internal fixation with dorsal plating versus mini open reduction, percutaneous fixation, and external fixation. J Hand Surg Am. 2005;30:764-72.

11. Diaz-Garcia RJ, Oda T, Shauver MJ, Chung KC. A systematic review of outcomes and complications of treating unstable distal radius fractures in the elderly. J Hand Surg Am. 2011;36:824-35. e2.

12. Bunger C, Solund K, Rasmussen P. Early results after Colles' fracture: functional bracing in supination vs. dorsal plaster immobilization. Arch Orthop Trauma Surg. 1984;103:251-6.

13. Gartland JJ Jr, Werley CW. Evaluation of healed Colles' fractures. J Bone Joint Surg Am. 1951;33:895-907.

14. McQueen M, Caspers J. Colles fracture: does the anatomical result affect the final function? J Bone Joint Surg Br. 1988;70:649-51.

15. Young BT, Rayan GM. Outcome following nonoperative treatment of displaced distal radius fractures in low-demand patients older than 60 years. J Hand Surg Am. 2000;25:19-28.

16. Kumar K, Laghari MA, Bhutto IA, Lal K. Fracture of Distal Radius Treated by Orthofix v/s Plaster Cast. J Liaquat Uni Med Health Sci. 2014;13:120-4.

17. Grle M , Miljko M , Grle I , Hodžiæ F , Kapidžiæ T. Early results of the conservative treatment of distal radius fractures-immobilization of the wrist in dorsal versus palmar flexion. Med Glas (Zenica). 2017;14:236-43.

18. Arora J, Kapoor H, Malik A, Bansal M. Closed reduction and plaster cast immobilization Vs. external fixation in comminuted intra-articular fractures of distal radius. Indian J Orthop. 2004;38:113-7.

19. Song J, Yu AX and Li ZH. Comparison of conservative and operative treatment for distal radius fracture: a meta-analysis of randomized controlled trials. Int J Clin Exp Med. 2015;8:17023-35.

20. Raudasoja L, Vastamäki H, Raatikainen T. The importance of radiological results in distal radius fracture operations: Functional outcome after long-term (6.5 years) follow-up. SAGE Open Med. 2018;6: 2050312118776578.

21. Shaikh SI, Basit A, Iqbal J,Shaikh SS, Shaikh IS. J Islamic Int Med Coll. 2012;7:26-34.

22. Chen CE, Juhn RJ, Ko JY. Treatment of distal radius fractures with percutaneous pinning and pin-in-plaster. Hand (N Y). 2008;3:245-50.

23. Carrozzella J, Stern PJ. Treatment of comminuted distal radius fractures with pins

and plaster. Hand Clin. 1988;4:391-7.

24. Khan MS, Noordin S, Hashmi PM. Intra-articular distal radius fractures: postoperative roentgenographic and functional outcomes. J Pak Med Assoc. 2016; 66:275-9.

25. Atiq G, Hassan W, Khan AN. Functional and radiological outcome of percutaneous pinning for fractures of distal radius. Rawal Med J. 2013;38:156-9.

Received for publication: 19-03-2019

Accepted after revision: 30-06-2019

Author's Contributions:
Azeem Jmail: Conception and design
Saeed Ahmed Shaikh: Collection, assembly, analysis and interpretation of the data, final approval and guarantor of the article
Yahya Baloch: Critical revision of the article for important intellectual content.

Conflict of Interest:
The authors declare that they have no conflict of interest.

Source of Funding:
None

How to cite this article:
Jamil A, Shaikh SA, Baloch Y. Anatomical and functional outcome of conservative treatment of Colles' fracture. J Surg Pakistan. 2019;24(2):89-94. Doi:10.21699/jsp.24.2.9.