ORIGINAL ARTICLE

THE OUTCOME OF CLOSED REDUCTION AND CAST IMMOBILIZATION OF COLLE'S FRACTURES USING RADIOLOGICAL PARAMETERS IN THE EMERGENCY DEPARTMENT

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Background: Distal radius fractures account for most of the injuries presenting in trauma centers. Colle's fractures are defined as fractures within 2.5 cm of the wrist with dorsal angulation of the distal fragment. The cornerstone of treatment remains immobilization of the wrist in a cast. The objective of the study was to determine the outcome of closed reduction and plaster cast immobilization of Colle's fractures in adults using Radiological parameters. It was a descriptive case series study, conducted at the Department of Orthopaedics Sheikh Khalifa Bin Zayed Al Nahyan /CMH Muzaffarabad Azad Kashmir from June 2018 to June 2019. **Methods:** Patients with distal radius fractures fulfilling the criteria of Colle's fractures presenting in the Emergency Department were selected through non-probability consecutive sampling. They were managed as per stated protocols and followed up for 06 months. **Results:** A total of 106 patients of either gender were included in this study. The average age of patients was 30.36±4.12. Fall on an outstretched hand is the major cause of Colle's fracture. In the older age group, most of the fractures are caused by falls while trauma was responsible for the younger age group. Normal post reduction radial inclination was seen in 72% cases; dorsal angulation was normal in 75% while post reduction height was normal in 91% cases. Post reduction radiological parameters were excellent in 49% and good results were seen in 40%. Poor post reduction anatomical results were found in 11% of cases. Overall, the Stewart Anatomical score was 84/100 (p<0.01). **Conclusion:** A large majority of Colle's fractures achieved excellent Radiological results after treatment by closed reduction and cast immobilization.

Keywords: Closed reduction; Cast immobilization; Colle's fracture; Radiological parameters

Citation: Raza MS, Khan SH, Ara I, Ali A, Mahmood K, Wani R. The outcome of closed reduction and cast immobilization of Colle's fractures using radiological parameters in the Emergency Department**.** J Ayub Med Coll Abbottabad 2020;32(4):441–4.

INTRODUCTION

Patients with distal radius fractures commonly present to the accident and emergency department for management. The most common type of distal radius injury is Colle's type (radius fracture within 2.5 cm of the wrist with dorsal angulation of the distal fragment.[1] Abraham Colle's was the first person who explained this type of fracture in 1814.[1] A 17% rise in incidence rate has been seen in the last few years. These fractures account for nearly 20% of all fractures treated in the emergency department.[2] Osteoporosis is a significant cause. Colle's fractures account for more than 600,000 per year in North America and 258 per 100,000 in Finland.[2] There is a bimodal pattern of distribution affecting the young adult male (due to high energy trauma) and elderly adult females due to low energy fall and osteoporosis. An Increased number of the aged population leads to an increase in its incidence with a substantial increase in treatment cost. Radial shortening of >2 mm and an articular step off >2 mm is associated with the worst patient outcome.[3]

According to current care National guidelines of treatment, acceptable reduction in conservative cast treatment of Colle's fractures are no dorsal/volar tilt over 15°/20°, radius shortening less than 3 mm, and maximum step off on joint surface 1 mm.[3]

Osteoporosis is most commonly associated with fractures of the spine, wrist, and hip. Colle's fractures are the most common osteoporotic fractures following the menopause.[4] Colle's fracture accounts for about one-fifth of all the injuries presenting to trauma centers in The United Kingdom.[5] Men with a Colle's fracture are at high risk for a future hip fracture and should be evaluated as candidates for preventive measures.[6] There is no statistically significant difference in the incidence rate of Colle's fracture in rural versus urban areas However evidence of epidemiological differences across Europe has been reported, with higher incidence rates of Colle's and other osteoporotic fractures in Scandinavia than in another European region.[7] Patients with osteoporosis tend to have greater communication after Colle's fracture than those having normal bone texture.[8] One large, prospective study of Colle's fractures among Caucasian women with

osteoporosis, over the age of 65, involved in low-energy falls, found three statistically significant, independent risk factors: decreased bone density at the distal radius (RR=1.8), a history of falls (RR=1.6), and history of fracture after age 50 (RR=1.3). Incidence of Colle's fracture in men vs. over the age of 35 was 9/10,000 vs. 37/10,000.[9]

The reported complication rate of Colle's fracture varies from 6–80%. The loss of the radial angle causes the normal configuration to be lost. It not only decreases the power of grip but subsequently also leads to osteoarthritis.[10] With few exceptions (primarily in older patients with low functional demands), maintenance of adequate function of the wrist after fracture of the distal end of the radius has been shown to depend on the accurate restoration of an anatomical position.[11] Still, no clinical evidence can suggest a superior method of treatment for Colle's fractures.[12]

Colle's fracture deformities can be quantified by X-ray measurements which are also used to classify the result after reduction (e.g., good or fair result).[13]

The most commonly used method of treatment is the conservative way in which closed manipulation under anaesthesia followed by immobilization of forearm and wrist in the dorsal slab is done.[14]

When the conservative method is used for Colle's fracture success rate is 84% versus 88% in surgical treatment for the fracture to heal and patients to return to their normal habitual activities.[15,16]

The restoration of the normal anatomical architecture is the ultimate goal which will lead to the most optimal functional outcome in terms of pain, grip strength, and wrist movements.[17]

MATERIAL AND METHODS

It was a descriptive, case-series one center (Department of Orthopaedics surgery CMH Muzaffarabad) study of 106 consecutive Colle's fracture, both inpatient and outpatient from 01-06-2018 to 01-5-2019. All patients above 16 years of age of both genders with unilateral simple Colle's fractures were incorporated in the study.

All patients were managed in the emergency department. Relevant history and X-ray of the wrist joint was taken. All patients with extra-articular displaced/stable radius fractures (Universal Classification Type-II) were manipulated under local hematoma anaesthesia block (1% Lignocaine).[18] and wrist and forearm were kept in a below-elbow plaster cast in a neutral position, and extremity was kept elevated in a sling for 6 weeks. We used three radiological parameters radial height, radial inclination, and dorsal angulation as showed in figures 1,2,3 and table-1. Radiological parameters of trauma as well as post reduction X-ray taken. In the out-patient review at 1st week, a check radiograph was taken and radiological measurements were done. All measurements are written in *pro forma*.

The data was analysed using SPSS version 11. Descriptive statistics were used to calculate mean±standard deviation of the age of the patient, dorsal angulation, radial height, radial inclination, frequency, and percentages for all the qualitative variables of gender, cause of fracture, success, and fracture side were calculated.

RESULTS

A total of 106 patients with Colle's fractures were included in the study. Out of these 106 patients, 50 (47%) were male and 56 (53%) were female with male to female ratio 1:1.42. The incidence of distal radial fracture was highest (40.6%) in patients' age group 46–65 years, followed by a younger age group of 16–30 (31.1%). The mean age was 43 years and the median age was 46 years with mode age 19 years. The minimum age was 16 years and a maximum of 76 years. Sixty-five (61.3%) patients had fracture distal radius on the right side while 41 (38.7%) patients had a fracture of the left radius (4 patients were left hand dominant). The mode of injury of fracture distal radius was 61 (57.5%) patients fall on outstretched hand was responsible while trauma was responsible for 45 (42.5%) cases. All fractures united well. All parameters were measured on x-rays. The means pre-reduction and post reduction parameters are shown in Table-2.

In our study success rate in the case of dorsal angulation was 75%. In the case of radial inclination, the success rate was 72%. While in the case of radial height success rate was 91%. In our study, the overall success rate in all three Parameters were 79.3%.

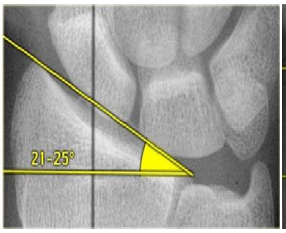

Figure-1: Radial height

Figure-2: Radial inclination

Figure-3: Dorsal angulation

Figure-4: Trauma X-Ray

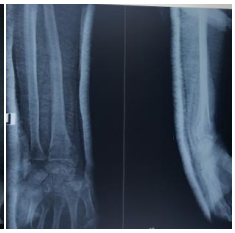

Figure-5: Post reduction X-Ray

Table-1: Anatomical Scoring Method (Stewart *et al* 1984)[18]

Dorsal angle 23° (score)	Radial length 12 mm(score)	Radial angle (Volar Tilt) 11° (score)	Score	Final Grade
18–23 (30)	10–12 (40)	11–7 (30)	100–85	Excellent
17–13 (24)	9–7 (32)	6–39 (24)	85–70	Good
12–10 (18)	6–5 (24)	2–0 (18)	70–60	Fair
<10 (00)	<05 (00)	Negative (00)	<10	Poor

Table-2: Mean results of three radiological parameters

Parameters	Normal value	Pre reduction (mean)	Post reduction (mean)
Radial Height	11 mm	4.58 mm	10.61 mm
Dorsal Angulation	20	30.85	13.55
Radial Inclination	23	9.15	19.02

DISCUSSION

Colle's fractures are one of the most common skeletal injuries treated by Orthopaedic Surgeons.[19] Good anatomical reduction leads to the best functional outcome.[2] Similarly incorrect fracture management leads to many problems. Incongruent joint surface and radial shortening lead to compromised function. Closed reduction is still the mainstay of treatment for minimal displaced Colle's fractures. Conservative management is also indicated in low demand for elder patients.[3]

There are several ways to treat the Colle's fracture including conservative management (consists of closed reduction and POP application as well as surgical reduction, internal fixation and to apply an external fixator.[18]

Pre reduction and post reduction radiological parameters were measured and compared. Normal dorsal angulation was seen in 79 (75 %) out of 106 patients in our study. Normal radial inclination was seen in 76 (72%) cases and radial height was found normal in 97 (91%) cases of our study. We used Stewart *et al* Anatomical scoring for our results Table-1.[18] In our study excellent post reduction dorsal angulation was seen in 20 (19%) cases while good results were seen in 59(56%) cases. In the case of radial length, excellent results are seen in 74 (70%) cases while good results are seen in 23 (21%) cases. Radial inclination was excellent in 58 (55%) cases while good in 18 (17%) cases. Overall excellent results were seen in 49% of cases and good results seen in 30% cases poor results seen in 21% cases (Table-2). Dr.M.K.Mam *et al* found out of 15 patients excellent radiological parameters seen in 10 (67%)cases that are also comparable to our study. Dr.M.Akhter Baig *et al* conducted their study in 2008, where he compared the radiological parameters in Colle's fracture managed by closed reduction and percutaneous K-wire fixation. He observed excellent results in 21.2% and good results in 75.8% of cases.[19]

CONCLUSION

The majority of the extra-articular Colle's fractures achieved excellent radiological results after treatment by closed reduction and POP cast. It was also seen in our study that good results were obtained regarding the three radiological parameters (dorsal angulation, radial height, and radial inclination using a closed reduction method. So conservative treatment should be the first choice.

AUTHORS' CONTRIBUTION

MSR: Conception and design, drafting of Article. SHK: Collection and assembly of data. IA: Analysis and interpretation of data. AA: Critical revision of the article. RW: Statistical expertise.

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Submitted: May 8, 2020	*Revised: August 13, 2020*	*Accepted: September 6, 2020*

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