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Original Research Article

Comparison of Percutaneous Pin Fixation Versus Closed Reduction and Cast for Colles Fractures

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Abstract

Introduction: Treatment of Colles fractures is difficult due to comminution. K wire is now the standard treatment method for Colles fractures because of higher rate of complications after conservative management.

Aim: The aim of the study was to compare the result of percutaneous pin fixation versus closed reduction and cast for Colles fractures.

Materials and Methods: 145 cases of Colles fracture operated by either closed reduction and percutaneous pin fixation or cast for Colles fractures from December 2018 to March 2021 in our institution were reviewed. Standard X-ray and clinical assessment after six were measured and final outcome were assessed using modified Gartland and Werley score.

Results: According to the Gartland and Werley point system, 67% of the wrists in the k wire fixation group were rated as excellent, 30% were rated as good, 3% were rated as fair, and none were rated as poor at the time of the six month follow-up. In the cast group, 39% were rated as excellent, 55% were rated as good, 6% were rated as fair, and none were rated as poor at six months.

Conclusion: Both closed reduction with percutaneous pin fixation or cast application are effective methods for the treatment of Colles fractures of the radius. Better functional results can be expected in k wire fixation method as compared to cast application, prevents postoperative collapse of fracture.

Keywords: Fracture Distal Radius, ORIF, Volar Locking Plates.

Introduction:

Most effective treatment method for Colles fractures is difficult due to comminution. These fractures sometimes are unstable & causes complications as well as late collapse of fracture. Multiple procedures are described like closed reduction and cast appliation, external fixator application, k wire fixation etc. The residual deformity causes wrist pain, limited movement and wrist joint arthritis . Anatomic reduction directly correlates to the outcome of Colles fracture . The kwire reconstruction offers fracture reduction directly as well as a stable fixation. Another important benefits are early post-operative mobilization and rehabilitation. Thus, this study aims to compare the result of percutaneous pin fixation versus closed reduction and cast for colles fractures. [1-5]

Materials and methods

135 patients of 145 cases of Colles fracture operated by either closed reduction and percutaneous pin fixation or cast for colles fractures from December 2018 to March 2021 in our institution were reviewed who fulfilled the inclusion criteria.

Inclusion criteria : Adults(age>18yrs and < 60yrs), Displaced Colles fracture with 1)volar or dorsal angulation of $>10^0$,2)radial inclination $<15^0$, 3)intraarticular step off >2mm, 4)>5 mm of shortening by ulnar variance on the posteroanterior radiographic view, fractures < 3 weeks old.

Exclusion criteria : unfit for anesthesia, skeletal immaturity, pathological fractures, compound fractures, polytrauma, known alcohol or drug dependency, inability to participate in the study, neuromuscular disorder & Inflammatory arthritis. Patients participating in other clinical trials of a drug or device were also excluded.

The mean age of 80 male patients and 55 female patients was 51.6 years(Range from 18-60 years). The most common mechanism of injury was a fall on outstretched hand. Ninety patients had their dominant limb fractured. Most cases were treated within seven days of the injury. (range 0-14 days).

Surgical Procedure: After taking written informed consent of inclusive criteria patient to OT. Surgical procedures were performed after randomization. A block randomization method was choosen with two blocks allocations, with one block for percutaneous pin fixation, other blok for closed reduction and cast procedures in random order.. The procedure was done in supine position. Fracture fragments anatomically reduced with the help of manual distraction, intrafocal leverage, or dis-engaging the fracture then fixation done by Kirschner wires or Cast as per randomization. After fixation, In both groups, the quality of reduction was assessed intraoperatively under image intensification. A successful reduction was defined as dorsal tilt of ≤10°, volar tilt of ≤20°, an articular gap or step of ≤2 mm, radial inclination of ≥10°, and radial shortening of ≤5 mm.Postoperatively plaster splint was applied in supination and 10^0-15^0 palmar flexion till suture removal. Active and passive finger motion exercises were encouraged post operatively. Post-operatively, Sitting up in the bed was allowed once the brachial block effect was over. 1st check dress was done on day 2, Post operative X Ray was taken and the patient was discharged. Patients were started on finger range of motion exercises. Weight lifting was prohibited for at least 12 weeks

after operation. All patients were followed up at 1month, 3 months, 6 months post-operatively. At the time of each visit of patients, anteroposterior and lateral view Xrays of both wrists were done. They were assessed for reduction and bony union, volar tilt, radial inclination, radial height, and ulnar variance. Range of motion was evaluated at each visit. Scoring was done by modified Gartland and Werley scoring system. [2] The Gartland and Werley point system for Colles fractures is a demerit system in which the result is ranked according to point range on the basis of four parameters: residual deformity (0 to 3 points), subjective evaluation of pain and disability (0 to 6 points), range of motion (0 to 5 points), and complications (0 to 5 points), including arthritic change, median nerve complications, and finger stiffness.

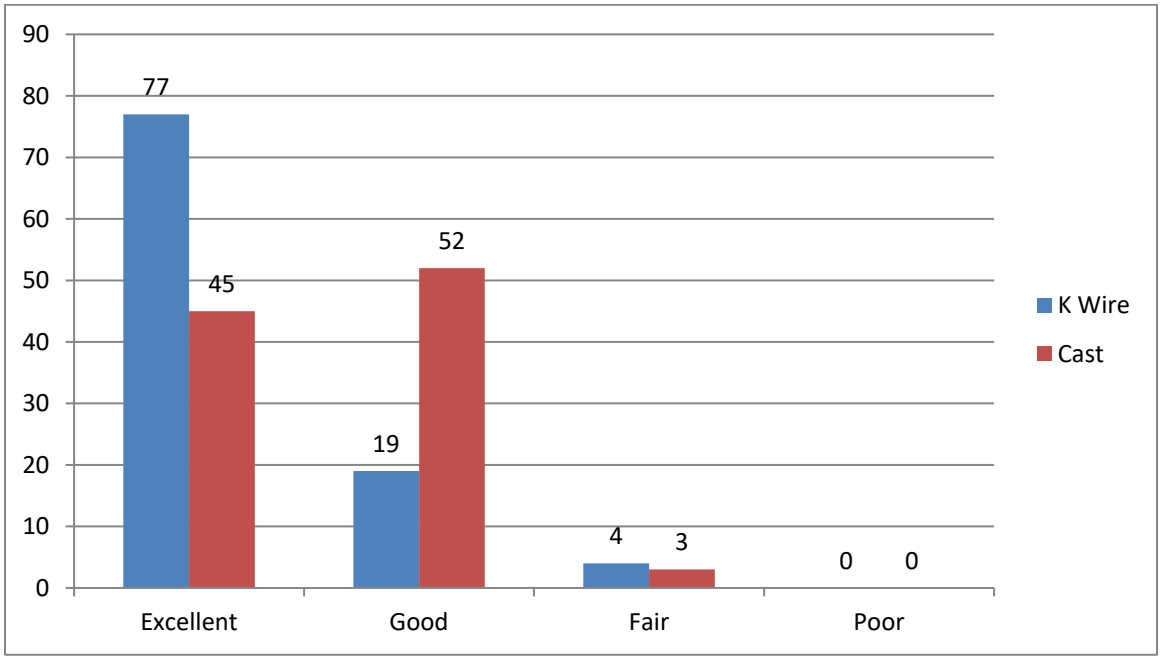

Figure 1: Observation chart

Results

Patients were traced for a minimum duration of six months. According to the Gartland and Werley point system, 77% of the wrists in the k wire fixation group were rated as excellent, 19% were rated as good, 4% were rated as fair, and none were rated as poor at the time of the six month follow-up. In the cast group, 45% were rated as excellent, 52% were rated as good, 3% were rated as fair, and none were rated as poor at six months. This difference between groups was significant ($p = 0.04$) in favor of k wire fixation. Eighty-four percent of the patients in the k wire fixation group reported that the wrist did not interfere or slightly interfered with their normal work, whereas only 76% of those in the cast group reported the same.

Complications All fractures healed uneventfully. Loss of reduction and fracture collapse occurred in five wrists that had been treated with cast. Five pin-track infections and three superficial infections occurred in the k wire fixation group. All of the patients who had an infection received antibiotics. All fractures healed without additional complications. One patient of Colles fracture developed type-1 complex regional pain

syndrome three months postoperatively. The syndrome subsided eight weeks later after treatment with a combination of an anticonvulsant and a nonsteroidal anti-inflammatory medication. In the cast group, one patient had a carpal tunnel syndrome prior to fixation was managed effectively with wrist splinting in the neutral position. Median nerve symptoms had subsided at the time of the six-month assessment.

90% of patients reported pain grading on the visual analog scale one or less than one at 12 weeks and at final follow-up. None of the case had any nerve palsy, tendon rupture, nonunion or implant failure.

Statistical analysis:

The collected data was summarized by using frequency, percentage, mean & S.D. To compare the qualitative outcome measures Chi-square test or Fisher's exact test was used. To compare the quantitative outcome measures Independent t test was used. If data was not following normal distribution, Mann Whitney U test was used. SPSS version 22 software was used to analyse the collected data. p value of <0.05 was considered to be statistically significant.

Discussion:

Stable fixation is the primary goal in the treatment of distal radius fractures. Secondary goal is to prevents secondary arthritis and poor functional outcome. [3]. Various treatment modalities for distal radius fracture fixation includes close/open reduction and cast application, k-wire fixation, external fixator, plates application. [5] Volar plate approach offers spacious distal radius suitable for implant fixation. Also, its application technique is relatively simple and prevents damage to the blood supply which is important for bony union. Locking plates are especially useful in osteoporotic fractures to prevent fracture collapse. The single unit plate and screw locking construct holds and supports the bony fragments. Plating offers direct visualization of fracture fragments helpful in anatomy restoration, early mobilization and hence early and better return of wrist function and hence reduce morbidity. [6] Numerous complications are described with plating which includes risk of infection, tendon irritation, tendon rupture requiring implant extraction in few cases. [7]

Our results compared favorably with existing literature. Limitations of our study included relatively shorter follow up, lack of controls and lack of variety of fracture patterns.

Conclusion:

Our study demonstrates that closed reduction and k wire fixation is a good method for treatment of Colles fractures as compared to cast application. Reduction is maintained in due course of time so that secondary displacement doesn't occur. Based on our results, we opine that good to excellent functional outcome can be obtained in Colles fracture with closed reduction and k wire fixation. However, long term results is inconclusive and needs further studies to prove its role.

Declarations:

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Availability of data and material: Department of Orthopaedics Bundelkhand Medical College, Sagar (M.P.)

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Consent for publication: Consent taken

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