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Clinical profile of geriatric patients with distal radius fracture

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Abstract
The basic concept of distal radius fracture treatment is to obtain accurate fracture reduction and then to utilize a method of immobilization that will maintain and hold that reduction. The goal of treatment in fracture distal end of radius is to restore the normal function but the precise techniques to achieve that desired outcome are contentious. The trial was conducted at the Department of Orthopaedic Surgery, KVG Medical College, Sullia, Karnataka, India. Institutional approval was obtained from the ethical committee prior to the initiation of the study. All patients provided written informed consent in their own understandable language, before their participation in the study. Eligible patients (as described below) with unstable dorsally displaced distal radial fractures were randomized to operative or nonoperative treatment. There were no significant differences in terms of the DASH and PRWE scores at six and twelve months ($p>0.05$; t test for independent samples). Grip strength was significantly better at all times for operative treatment group ($p<0.05$; t test for independent samples).

Keywords: clinical profile, geriatric patients, distal radius fracture

Introduction
Distal radius fractures are one of the most common types of fractures, accounting for 20% of all fractures treated in emergency department [1]. In women aged 65 and older there is an increased incidence of distal radius fracture due to the greater risk of osteoporosis [2].
Traditionally both surgical and nonsurgical treatment approaches have been used to treat distal radius fractures. The predominant complaints following both nonsurgical and surgical treatment include weakness, stiffness, and pain. Nonsurgical approaches include immobilization with or without reduction, whereas surgical treatments include percutaneous pinning, external fixation, dorsal spanning bridge plates, and volar plate fixation [3]. Chung *et al.* noted that the use of closed reduction has significantly reduced from 82% in 1996 to 70% in 2005 [4]. However, it still remains the most popular treatment approach among the elderly patients followed by percutaneous pinning (15.8%), internal fixation (10.9%), and external fixation (2.8%) [4].
The personality of the fracture will decide the best treatment option. Surgeons employ a multifactorial treatment approach taking into consideration the patient's age, activity level, bone quality or strength, occupation, previous or current injuries, joint involvement, extent of fracture displacement, and involvement of joint surface [5]. Rehabilitation is beneficial and critical for improving functional outcomes following the treatment of distal radius fractures.
The goal of treatment and rehabilitation is to restore reduce pain, mobility, and improve functional outcomes.

Methodology
The trial was conducted at the Department of Orthopaedic Surgery, KVG Medical college, Sullia, Karnataka, India. Institutional approval was obtained from the ethical committee prior to the initiation of the study. All patients provided written informed consent in their own understandable language, before their participation in the study. Eligible patients (as described below) with unstable dorsally displaced distal radial fractures were randomized to operative or nonoperative treatment. The primary outcome measure was the Patient-Rated Wrist Evaluation (PRWE) score [6], and secondary outcome measures included the Disabilities of the Arm,

Shoulder and Hand (DASH) score [7], the level of pain, the range of wrist motion, and the rate of complications. Our hypothesis was that there would be no difference between the operative and nonoperative treatment groups with respect to the PRWE score and objective surgeon-based functional measurements. From 2018 to 2019, 253 patients with an age of sixty-five years or more who had a distal radial fracture were managed at our institution and were evaluated for eligibility. Of these, 162 patients did not match the inclusion criteria. Eleven patients refused randomization, insisting on nonoperative treatment, and were excluded from the study. Remaining eighty patients (eighty fractures) met the inclusion criteria, agreed to participate, and were entered in the study. The mechanism of injury was a fall from a standing height in all cases. Forty patients were randomized to ORIF (the operative treatment group), and forty patients were randomized to casting (the nonoperative treatment group). Two patients in the operative treatment group and three patients in the nonoperative treatment group died of unrelated conditions before the latest follow-up examination and were excluded. Three patients from the operative treatment group and two patients from the nonoperative treatment group were lost to follow-up and were excluded. The remaining seventy patients (eighteen men and fifty-two women) with a mean age of 79.4 years of age (sixty-five to ninety years old) completed the study. Thus, thirty-five patients in the operative treatment group and thirty-five patients in the non-operative treatment group were available for the one year follow-up examination.

Inclusion and Exclusion Criteria

Inclusion criteria:

- Patient age ≥65 years (since July 2018)
- Wrist radiograph of ≥20° dorsal tilt (and/ or ≥2 mm radial shortening)

Exclusion criteria:

- Former disability of either wrist
- Intra-articular fractures with a step-off of >1 mm
- High energy trauma
- Associated ulnar fracture
- Injury to ipsilateral upper extremity
- Rheumatoid arthritis or other severe joint disorders
- Dementia
- Drug or alcohol abuse or psychiatric disorder
- Dependency in activities of daily living
- Fracture diagnosed > 6 days from injury
- Patient not fit for surgery

Results

Table 1: Demographic characteristics

Operative treatment group		**Nonoperative treatment group**
No. of Patients	35	35
Age* (yr)	77.2(65-88)	81.6(65-90)
Sex†		
Female	25(35.7%)	27(38.6%)
Male	10(14.3%)	8(11.4%)
Dominant side†		
Right	32(45.7%)	34(48.6%)
Left	3(04.3%)	1(01.4%)
Injured side†		
Right	14(20%)	19(27.1%)
Left	21(30%)	16(22.9%)
Dominant side injured†		
Yes	15(21.4%)	19(27.1%)
No	20(28.6%)	16(22.9%)
AO fracture classification†		
A2	3(4.3%)	3(4.3%)
A3	6(8.6%)	9(12.9%)
C1	4(5.7%)	10(14.3%)
C2	11(15.7%)	7(10%)
C3	11(15.7%)	6(8.6%)

*The values are given as the average, with the range in parentheses.
†The values are given as the number of patients, with the percentage of the total number of patients in the study group (N =70) in parentheses.

Patients in the operative treatment group had lower DASH and PRWE scores, indicating better wrist function, up to twelve weeks after surgery. The differences between two groups in terms of the DASH and PRWE scores were significant at six and twelve weeks (p<0.05; t test for independent samples). There were no significant differences in terms of the DASH and PRWE scores at six and twelve months (p>0.05; t test for independent samples). Grip strength was significantly better at all times for operative treatment group (p<0.05; t test for independent samples). A clinical deformity that was obvious to the patient and the examiner (a prominent ulnar head) was present in twenty-six patients (74.3%) in the non-operative treatment group and in none of the patients in the operative treatment group. Despite the deformity, none of the patients in either the operative treatment group or the non-operative treatment group was dissatisfied with the clinical appearance or function of the wrist.

Discussion

Distal radius fractures in older patients have traditionally been treated with closed reduction and cast immobilization (CI). Since the introduction of volar locking plates, there has been a shift in the surgical approach for the treatment of distal radial fractures in favour of ORIF.

In several studies, it has been suggested that there is a high correlation between the anatomical result and the functional outcome in young, active, and high-functioning patients. Malunion of distal radial fractures can result in posttraumatic wrist arthrosis and unsatisfactory functional outcome with a

deformed and painful wrist. Restoring articular congruity and radial length with ORIF is recommended for the treatment of distal radial fractures in younger patients.

There are fewer reports in the literature to support the goal of anatomical restoration of the articular surface and the radial length to achieve a satisfactory functional outcome in an older population.

In a systematic review of the literature with regard to outcomes and complications of distal radius fractures in the elderly population, Diaz-Garcia *et al*. [8] showed small but clinically unimportant differences in clinical outcome between cast immobilization, volar plating, bridging external fixation, and non-bridging external fixation. They reported a higher reoperation rate after plate fixation compared with the other groups.

Jupiter *et al*. [9] evaluated twenty patients with an age of sixty years or more who were managed with ORIF with use of palmar locking plates for the treatment of redisplaced Colles-type distal radial fractures. After an average duration of follow-up of thirty-eight months, they reported seven excellent results, eleven good results, and two fair results with use of the PRWE score and the Physical Activity Scale for the Elderly (PASE). Jupiter *et al*. reported that one patient had postoperative loss of reduction, one patient had transient neuritis of the radial sensory nerve, and one patient had a flexor pollicis longus rupture that was treated with a tendon transfer. Six patients had removal of the implant because of dorsal wrist pain. The authors suggested ORIF as a treatment for displaced distal radial fractures in older patients who have had a failure of nonoperative treatment.

Martinez-Mendez *et al*. [10] performed a randomized controlled trial of 97 patients who were >60 years and had intra-articular dorsally displaced distal radius fractures and found that both the PRWE and DASH scores were significantly better for the volar locking plate group compared with conservatively treated group.

Young and Rayan [11] evaluated the outcome of nonoperative treatment of distal radial fractures in patients with low functional demands who were more than sixty years old and found no correlation between unsatisfactory radiographic outcomes and functional outcomes. Six of ten wrists with an intraarticular fracture had progression of radiocarpal and distal radioulnar joint arthrosis. Only two of these patients had an unsatisfactory outcome. Persistent neurological symptoms were present in three (12%) of twenty-five patients. An obvious clinical deformity (ulnar head prominence) was present in fourteen (56%) of the twenty-five patients. None of the patients were dissatisfied with the appearance of the wrist.

The basic concept of distal radius fracture treatment is to obtain accurate fracture reduction and then to utilize a method of immobilization that will maintain and hold that reduction. The goal of treatment in fracture distal end of radius is to restore the normal function but the precise techniques to achieve that desired outcome are contentious.

Radiographic criteria have been established for acceptable alignment including less than 2 mm of radial shortening, radial inclination no less than 10 degrees, 10^0 dorsal to 20^0volar tilt, and intra articular step-off less than 2 mm. Studies have noted alteration in mechanical loads across the radiocarpal joint, and resultant accelerated degenerative change, with dorsal tilt 20 to 30^0 . Increased dorsal angulation, along with radial shortening, can lead to DRUJ incongruity and resultant loss of pronosupination. An articular step-off greater than 2 mm increases the probability of post-traumatic arthrosis, by almost 100%.

Closed reduction is the primary management for most extra-articular distal radius fractures. The basic technique with the closed reduction of distal radius fractures is traction/counter-traction. To reduce an overlapping distal radius fracture, manually disimpact the bones by increasing the angulation of the fracture while providing simultaneous counter-traction. After reduction, the arm should be stabilized with a 3-point molded short or long-arm cast or "sugar tong" type splint. The optimum position, the duration of immobilization and the need to extend the cast proximal to elbow are the queries that are controversial. No clear concurrence exists as to the best position for immobilizing the wrist in plaster. Sarmiento *et al*. recommended immobilization in a position of supination to decrease the deforming force of the brachioradialis, which may cause loss of reduction. In contrast, Wahlstrom [12] advocated immobilization in pronation to negate the deforming forces of pronator quadratus. Distal radius fractures are immobilized in a forearm cast in neutral position of the wrist for 6 weeks. Stable fractures are immobilized in short arm splint, leaving the elbow free. Studies have demonstrated no difference in splinting method for stable distal radius fractures. Early active and passive finger movements are encouraged.

The optimal method of treatment for unstable distal radius fractures remains controversial. In younger patients the radiological parameters for acceptable reduction is clear and there is a low threshold for operative fixation with any deviation from these, but the ideal method of fixation is indecisive. The elderly population have clearly shown to tolerate moderate degrees of malunion without significant decrease in function; however, there is an increasing trend towards operative fixation of these fractures.

At present, the literature guiding physicians to choose the optimal treatment method is inconclusive. Fractures of the distal radius are treated using either casting or surgical techniques such as internal and external fixation. There is no one treatment that is effective for all types of fractures. Each fracture requires individual treatment customized to deal with the specific characteristics of the fracture. Currently, the choice of treatment of the wide range of distal radius fractures must be based on surgeon experience and patient preference.

Conclusion

There were no significant differences between the two groups in terms of the range of motion or the level of pain during the entire follow-up period (p >0.05; t test for independent samples).

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