

Functional Outcome of Conservative Vs Surgical Management of Distal Radius Fractures in Adults

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Abstract

Background: Distal radius fractures are a very common fracturing injury in adults, often resulting in an important functional deficit and reduced quality of life. Although non-operative and surgical treatments are frequently employed, the optimal treatment strategy for adult distal radius fractures remains controversial, particularly for fractures that are unstable. The functional outcomes of the conservative and surgical groups were assessed and compared. **Main Outcome Measures:** Functional outcome of the two groups (conservative and surgical) was compared. **Material and Methods:** A total of 100 adult patients with distal radius fracture who received care at a tertiary care teaching hospital were included in this prospective comparative observational study. Patients were divided into two groups: those were given non-operative treatment (n = 50) and those received surgical stabilization with volar locking plates (n = 50). Evaluation was performed repeatedly clinically and radiologically throughout six months' follow-up. The functional results included Disabilities of the Arm, Shoulder and Hand (DASH) ratings, Patient-Rated Wrist Evaluation (PRWE) parameters, score on the Visual Analog Scale (VAS) for pain, active wrist motion ranges, hand grip strength, overall patient satisfaction, and adverse event incidences. The analysis of the data was performed using SPSS Version 26.0, produced by IBM Corporation. Data analysis was done using the SPSS version 26.0 produced by IBM Corporation. Independent Student's t-tests and Mann-Whitney U tests were used for continuous data and categorical data, respectively. Chi-square or Fisher's exact test was used for categorical distributions. A p value of < 0.05 was considered statistically significant. **Result:** A total of 100 patients were included, with 50 in each treatment group. The conservative and surgical groups were comparable regarding age, sex, injury side, dominant-hand involvement, trauma mechanism, fracture pattern, and follow-up duration, with no statistically significant differences between groups (all p > 0.05). **Conclusion:** There were no significant differences between the groups of subjects, with respect to their baseline demographic characteristics or fracture classification. Surgical patients had significantly better DASH and PRWE scores and greater wrist flex, ext, pron, and supination at six months compared to conservative patients (all p < 0.001), and had higher grip force, along with lower VAS pain, and better overall satisfaction (all p < 0.001). Comparatively higher number of cases had high grade functional recovery in post-surgery group while fracture malunion and joint stiffness were more frequent in non-operative group. A high early functional recovery and excellent wrist movement and grip strength, compared to a manageable complication rates and reduced pain intensity, with a higher patient satisfaction are achieved with operative as opposed to non-operative treatment of adult distal radius fractures. The strategically selected candidate continues to play a major role in achieving clinical success.

Keywords: Disabilities of the Arm, Shoulder and Hand (DASH); Patient-Rated Wrist Evaluation (PRWE); Wrist biomechanics; Grip strength; Adult fractures.

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INTRODUCTION

Distal radius fracture (DRF) is a large proportion of trauma to the upper limb, accounting for around 17% of all skeletal fractures in adults. This has been on the increase over the last few decades due to an older population, increased osteoporosis rates, and a greater number of people participating in more high-demand recreational and occupational activities. The DRFs have a clear bimodal distribution, with a high impact injury being the primary type in younger people and a low impact 'osteoporotic' fall being the main type in the elderly. Clinical consequences encompass significant functional impairments, reduced quality of life, long rehabilitation periods, and high economic burden due to reduced working capacity and utilization of health care resources.^[1,2]

The main therapeutic goals are to focus on restoring anatomical orientation, ensuring stable osseous healing,

alleviating discomfort, maintaining wrist mechanics, and promoting swift return to daily activities. Therapy is both non-surgical with closed manipulation and cast application, as well as surgical (such as percutaneous insertion of a k-wire, external fixation, dorsal plating and nowadays, volar locking plate osteosynthesis). There is a good prognosis for undisplaced

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extra-articular injuries, but displaced and unstable injuries are ongoing management challenges. Advances in hardware and surgical technique have broadened the indications for surgery, and the volar locking plate has been embraced for its structural stability and ability to achieve early post-operative mobilization.^[2-5]

Non-operative care continues to be a cornerstone treatment, because it is cost-effective, non-invasive and free of surgical risks. In more stable configurations, however, standard casting has risks of secondary loss of reduction, malunion, arthrofibrosis, muscular atrophy, and functional recovery taking a long time, especially in unstable configurations. However, internal fixation results in better restoration of radial height, palmar tilt, and radial inclination, allowing for timely physical therapy and improved wrist motion, hand power, and patient scores on functional measurements. Despite this, there are risks associated with the surgical procedure such as emergence of hardware prominence, soft tissue/tendon inflammation, surgical site infection, and increased economic costs. Assessment of appropriate intervention thus requires careful consideration of fracture site, age, bone mass, activity level, work, medical comorbidities, and patient's choice.^[1,3,5]

In recent years high level clinical evidence has significantly helped to shed light on relative effectiveness of surgical vs conservative approaches. A recent systematic review and meta-analysis by Ochen et al. showed that surgical reconstruction was associated with significantly better Disabilities of the Arm, Shoulder and Hand (DASH) scores, improved grip power and improved mid-term functional outcomes than non-operative treatments, especially for younger and very active patients.^[1] Similarly, network meta-analysis found that volar locking plate fixation improves patient-reported functional outcomes during early and intermediate post-operative follow-up compared to cast fixation.^[2] These findings were also supported by further investigation of internal fixation parameters: Patient-Rated Wrist Evaluation (PRWE) parameters, anatomical realignment, grip force, and physical recovery were found to be superior in the internal fixation group with no significant increase in adverse events noted.^[3,5]

In spite of these notes, there is much ongoing clinical debate concerning the one optimal therapeutic approach to distal radius fracture. There are multiple reports that whilst operative repair has more favourable early functional results and radiographical parameters, the long-term functional results in low demand elderly patients are similar between surgical and conservative groups.^[4,7,9] Furthermore, there is some heterogeneity in the fracture typing, physical therapy after the fracture, different patient characteristics, and evaluation scales reported in the literature, which helps to explain the conflicting observations. Therefore, the current systematic reviews focus on individualized treatment choice rather than a specific preference for a particular treatment modality.^[1,4,5]

Even though the success rate of non-operative therapy is high, its use is still common in developing countries such as India, where patients may delay seeking hospital care, lack access to specialized orthopedic centers, and lack access to

necessary hardware. However, the use of the volar locking plate construct has significantly changed the treatment strategies for unstable fracture patterns. A number of recent Indian comparative trials have documented the better wrist performance following surgical repair, better DASH results, increased grip strength, quicker rehabilitation to the work environment and increased overall satisfaction.^[6,11-14] However, the number of prospective comparative data specific to the Indian population remains small and provides a need for having context-specific evidence to guide regional clinical protocols.

Therefore, in this prospective comparative study, functional outcome was systematically compared between conservative casting and open reduction and internal fixation for adult distal radius fracture. The assessment of functional restoration was evaluated using pre-established outcome measures: Disabilities of the Arm, Shoulder and Hand (DASH) and Patient-Rated Wrist Evaluation (PRWE) instruments, as well as objective parameters such as active wrist motion, grip power, pain scores, adverse events and patients' subjective satisfaction. The main hypothesis was that operative stabilization would provide better functional recovery and patient-reported outcomes with a manageable safety profile and provide valuable data to further guide treatment algorithms for adult distal radius trauma.^[1-5,15]

MATERIALS AND METHODS

This was a prospective comparative observational study carried out in the Department of Orthopaedics of the Hi-Tech Medical College & Hospital, Raurkela, Odisha for 18 months (period from January 2024 to June 2025). The main aim was to assess and compare the functional outcome of conservative versus surgical management in adult distal radius fractures. The institutional ethics committee approved this study and all procedures were followed in accordance with the Declaration of Helsinki. All participants gave informed consent prior to participation. Adults with acute trauma to the distal radius who presented to either the ER or orthopedic outpatient unit were evaluated for appropriateness. Thus, 100 subjects were consecutively recruited and randomly allocated into the two management arms, based on surgeon assessment of propensity to each management and fracture typology and informed patient choice. Two subjects were excluded because the areas were too small and another five were excluded due to various other reasons. There were 50 subjects in the conservative group and 50 in the surgical group.

Inclusion Criteria

The following criteria were used to select patients: Skeletal adults (18 years or older). Closed fractures of the distal radius confirmed by x-ray. Unicondylar, extra-articular and intra-articular configurations that can be treated non-surgically or surgically. Hospital presentation within 1 week of acute trauma. Participants who have volunteered to participate, and who comply with the established clinical follow-up protocol. Subjects who give informed consent and agree to follow the structured clinical follow-up.

Exclusion Criteria

Patients were excluded as follows: Prior fracture history or surgical procedures of the same upper extremity, polytrauma cases requiring intensive care monitoring for a longer period of

time, and acute neurovascular deficits requiring urgent vascular or neurological intervention. Patients were excluded with the following criteria: Prior fracture history or surgical procedures in the ipsilateral wrist, polytrauma cases requiring intensive care monitoring for a longer period of time, and acute neurovascular deficits requiring urgent vascular or neurological intervention.

Clinical Evaluation: Detailed clinical profiles were obtained for each subject that included age, sex, dominance, work demands, mechanism of trauma, and interval since injury, as well as having developed other systemic comorbid conditions. Initial physical screening was conducted and a targeted local examination of the affected wrist joint for gross deformity, soft-tissue edema, focal point tenderness, baseline mobility, integrity of distal neurovascular structures, and soft-tissue compromise of the affected wrist joint performed. Fracture configuration was classified based on standard anteroposterior and lateral X-rays. Specific structural features were documented before initiating treatment that included: side of injury, intra-articular versus extra-articular extension, magnitude of displacement, and structural instability.

Treatment Protocol: Conservative Management: In the non-operative group, closed manipulation was performed with either targeted hematoma block(s) or adequate analgesia as needed if anatomical displacement was found. When the acceptable alignment was confirmed on post-reduction x-rays, the limb was immobilized by placing a below-elbow plaster cast. Immediate post manipulation X-rays were assessed for radial height restoration, radial inclination and palmar tilt. Plaster immobilization was applied for approximately 6 weeks and serial radiographs were taken for evidence of secondary displacement. Based on institutional rehabilitation pathways, structured wrist physical therapy and mobility exercises were initiated after the cast had been removed.

Surgical Management: The treated group had internal stabilization under regional or general anesthesia. For unstable and displaced fractures, open reduction with volar locking compression plate was the most frequently used method of surgical repair. Structural realignment was restored under real-time fluoroscopic control and hardware secured with a well fitted locking plate and screw system using standard orthopedic techniques. Intraoperative confirmation of fracture reduction and hardware placement was performed with fluoroscopy. The splint was a short arm splint which was placed for comfort in the early post-operative period, the digit motion were begun on day one. Following the surgery, after the wound healed, physical therapy was the basis for dedicated wrist rehabilitation.

Follow-up: All subjects that were enrolled were systematically reviewed at fixed times after treatment that were 2 weeks, 6 weeks, and 3 and 6 months. Follow-up visits involved a review of osseous consolidation; an assessment of the maintenance of anatomical alignment; hardware integrity if applicable; and an assessment of development of adverse events. Systematic assessment of functional outcomes was performed at 6 months follow-up with validity clinical scoring instruments.

Outcome Measures:

The primary outcome of the study was functional recovery at six months. Functional assessment included:

- Disabilities of the Arm, Shoulder and Hand (DASH) score, with reduced scores representing superior upper limb performance.
- Patient-Rated Wrist Evaluation (PRWE) score, quantifying localized pain and functional disability.
- Visual Analog Scale (VAS) for pain assessment recorded on a 10-point continuum.
- Wrist range of motion, encompassing flexion, extension, pronation, and supination, quantified using a standard manual goniometer.
- Grip strength measured via a calibrated hand dynamometer and expressed as a percentage relative to the uninjured contralateral side.

Secondary outcome measures included:

- Overall clinical outcome grading (excellent, good, fair, or poor).
- Patient satisfaction evaluated using a 10-point numerical rating scale.
- Radiographic evidence confirming complete osseous union.
- Treatment-related complications including fracture malunion, joint stiffness, superficial surgical site infection, hardware prominence, complex regional pain syndrome, and necessity for revision surgical intervention.

Data Collection: A structured proforma designed for this study was used to record the detailed clinical and radiological parameters. To ensure that the functional scores were not influenced by the observer, an independent orthopedic evaluator, not involved with the primary patient management, gathered the scores. Standardized digital X-rays were obtained with consistent projections for all time periods and radiographic measurements were computed.

Statistical analysis: Data was collected and analyzed in the computer programs, Microsoft Excel and IBM Statistical Package for the Social Sciences (SPSS) software version 26.0 (IBM Corp., Armonk, NY, USA). Data on continuous parameters were expressed as mean $\pm$ standard deviation (SD) and data for categorical parameters as numbers and percentages. Continuous data distributions were determined to be normally distributed using the Shapiro–Wilk test. Comparative Student's t-test was used to compare the continuous variables across the conservative and surgical groups for normally distributed continuous variables while the Mann–Whitney U test was used for non-normally distributed continuous variables. Chi square or Fisher's exact test was used to test categorical variables, as appropriate. All statistical calculation were bi-directional, with p-value < 0.05 considered as statistically significant.

RESULTS

The cohort comprised 100 adult subjects diagnosed with distal radius fractures, divided equally into a non-operative cohort ($n = 50$) and an operative cohort ($n = 50$) (Table 1). Mean age was 53.8 ± 12.4 years for the conservative cohort and 51.9 ± 11.6 years for the surgical cohort, demonstrating no significant intergroup variation ($p = 0.44$). Female subjects constituted 52.0% of the conservative group, while male subjects accounted

for 54.0% of the surgical group, reflecting a comparable gender distribution ($p = 0.55$). Right-sided wrist injuries occurred slightly more frequently than left-sided trauma across both cohorts, though without statistical significance ($p = 0.68$). Traumatic involvement of the dominant upper extremity was recorded in 56.0% of non-operative subjects and 60.0% of surgical subjects ($p = 0.68$). Low-energy trauma mechanisms predominated overall, representing 72.0% of non-operative cases and 66.0% of surgical cases, with the remainder resulting from high-energy impact ($p =$

0.51). Classification of fracture patterns identified extra-articular patterns in 62.0% of non-operative cases and 56.0% of surgical cases, whereas intra-articular configurations comprised 38.0% and 44.0%, respectively, showing equivalent cohort distribution ($p = 0.54$). Mean clinical follow-up spanned 6.3 ± 0.8 months in the non-operative cohort and 6.5 ± 0.9 months in the surgical cohort, displaying no significant divergence ($p = 0.27$). In summary, baseline demographic profiles and clinical features were well-matched, confirming intergroup comparability prior to treatment initiation [Table 1]

Table 1: Baseline Demographic and Clinical Characteristics of the Study Population

Variable	Conservative (n = 50)	Surgical (n = 50)	p-value
Mean age (years), Mean $\pm$ SD	53.8 $\pm$ 12.4	51.9 $\pm$ 11.6	0.44
Male, n (%)	24 (48.0)	27 (54.0)	0.55
Female, n (%)	26 (52.0)	23 (46.0)	
Right-sided fracture, n (%)	29 (58.0)	31 (62.0)	0.68
Left-sided fracture, n (%)	21 (42.0)	19 (38.0)	
Dominant hand affected, n (%)	28 (56.0)	30 (60.0)	0.68
Low-energy injury, n (%)	36 (72.0)	33 (66.0)	0.51
High-energy injury, n (%)	14 (28.0)	17 (34.0)	
Extra-articular fractures, n (%)	31 (62.0)	28 (56.0)	0.54
Intra-articular fractures, n (%)	19 (38.0)	22 (44.0)	
Mean follow-up (months), Mean $\pm$ SD	6.3 $\pm$ 0.8	6.5 $\pm$ 0.9	0.27

Table 2: Functional Outcomes at Six Months

Outcome Measure	Conservative (n = 50)	Surgical (n = 50)	p-value
DASH score, Mean $\pm$ SD	24.8 $\pm$ 10.7	15.6 $\pm$ 8.4	<0.001
PRWE score, Mean $\pm$ SD	29.3 $\pm$ 12.5	18.9 $\pm$ 9.6	<0.001
Wrist flexion ($^{\circ}$), Mean $\pm$ SD	63.2 $\pm$ 8.5	71.1 $\pm$ 7.4	<0.001
Wrist extension ($^{\circ}$), Mean $\pm$ SD	58.6 $\pm$ 7.8	67.4 $\pm$ 6.5	<0.001
Forearm pronation ($^{\circ}$), Mean $\pm$ SD	74.8 $\pm$ 5.6	79.6 $\pm$ 4.8	<0.001
Forearm supination ($^{\circ}$), Mean $\pm$ SD	72.3 $\pm$ 6.4	78.8 $\pm$ 5.3	<0.001
Grip strength (% of opposite side)	81.4 $\pm$ 9.1	91.2 $\pm$ 7.8	<0.001
Pain (VAS, 0–10), Mean $\pm$ SD	2.8 $\pm$ 1.3	1.6 $\pm$ 1.1	<0.001

At the six-month follow-up assessment, surgically managed subjects exhibited significantly superior functional outcomes relative to those who received non-operative care [Table 2]. The mean Disabilities of the Arm, Shoulder and Hand (DASH) scored 15.6 $\pm$ 8.4 within the surgical cohort versus 24.8 $\pm$ 10.7 in the conservative cohort, demonstrating reduced functional impairment following open fixation ($p < 0.001$). In a similar manner, mean Patient-Rated Wrist Evaluation (PRWE) values were markedly lower among surgically treated individuals (18.9 $\pm$ 9.6) than in non-operatively managed patients (29.3 $\pm$ 12.5) ($p < 0.001$), indicating greater wrist performance and diminished clinical symptoms. Objective measures of joint mobility likewise favored operative intervention. Mean wrist flexion reached 71.1 $\pm$ 7.4 $^{\circ}$ in the surgical arm compared to 63.2 $\pm$ 8.5 $^{\circ}$ in the non-surgical arm ($p < 0.001$). Mean wrist extension was recorded at 67.4 $\pm$ 6.5 $^{\circ}$ post-surgery versus 58.6 $\pm$ 7.8 $^{\circ}$ after

conservative casting ($p < 0.001$). Furthermore, forearm pronation and supination ranges were significantly increased following surgical repair, averaging 79.6 $\pm$ 4.8 $^{\circ}$ and 78.8 $\pm$ 5.3 $^{\circ}$, respectively, compared with 74.8 $\pm$ 5.6 $^{\circ}$ and 72.3 $\pm$ 6.4 $^{\circ}$ in the non-operative cohort (both $p < 0.001$). Recovery of hand grip power was similarly higher following internal fixation, reaching 91.2 $\pm$ 7.8% of the healthy contralateral limb, whereas non-operatively managed subjects attained 81.4 $\pm$ 9.1% ($p < 0.001$). Additionally, residual pain measured on the Visual Analog Scale (VAS) was significantly lower in the surgical group (1.6 $\pm$ 1.1) than in the conservative group (2.8 $\pm$ 1.3) ($p < 0.001$). Taken together, these metrics confirm that surgical treatment yields enhanced functional restoration, superior joint range of motion, increased grip force, and lower pain intensity at six months [Table 2].

Table 3: Clinical Outcome and Complications

Variable	Conservative (n = 50)	Surgical (n = 50)	p-value
Excellent outcome, n (%)	16 (32.0)	28 (56.0)	
Good outcome, n (%)	20 (40.0)	17 (34.0)	
Fair outcome, n (%)	10 (20.0)	4 (8.0)	
Poor outcome, n (%)	4 (8.0)	1 (2.0)	0.03
Malunion, n (%)	7 (14.0)	2 (4.0)	0.08
Wrist stiffness, n (%)	9 (18.0)	5 (10.0)	0.25
Complex Regional Pain Syndrome, n (%)	2 (4.0)	1 (2.0)	0.56

Superficial wound infection, n (%)	0 (0.0)	2 (4.0)	0.15
Implant-related irritation, n (%)	0 (0.0)	3 (6.0)	0.08
Secondary intervention, n (%)	2 (4.0)	2 (4.0)	1.00
Overall patient satisfaction, Mean $\pm$ SD (0–10)	7.6 $\pm$ 1.4	8.8 $\pm$ 1.1	<0.001

Categorical clinical evaluation revealed a significantly greater rate of favorable outcomes within the surgical cohort compared to the conservative cohort ($p = 0.03$) [Table 3]. Excellent recovery occurred in 56.0% of surgically managed individuals, whereas only 32.0% of non-operatively treated subjects reached an equivalent functional grade. Good results were noted in 34.0% of the operative arm and 40.0% of the non-operative arm. Conversely, fair and poor outcomes predominated among conservatively managed subjects, representing 20.0% and 8.0%, respectively, versus 8.0% and 2.0% in the surgical cohort. Overall adverse event rates remained low across both arms. Radiographic malunion was identified more frequently after non-surgical management (14.0%) than following internal fixation (4.0%), though this difference did not reach statistical significance ($p = 0.08$). Persistent wrist stiffness was documented in 18.0% of non-operatively treated patients and 10.0% of surgical subjects ($p = 0.25$). Incidence of complex regional pain syndrome (CRPS) was low, presenting in 4.0% of conservative cases and 2.0% of surgical cases ($p = 0.56$). Complications specific to operative treatment included superficial surgical site infection in 4.0% of cases and hardware-related soft tissue irritation in 6.0% of surgically managed patients; these events were absent in the non-operative group. The need for secondary surgical procedures was identical between cohorts (4.0% each; $p = 1.00$). Overall subjective patient satisfaction at final follow-up was significantly higher following surgical repair, with a mean score of 8.8 ± 1.1 compared to 7.6 ± 1.4 in the non-operative arm ($p < 0.001$). Taken together, these findings demonstrate that surgical intervention provided enhanced clinical success and higher patient satisfaction with a comparable risk profile [Table 3].

DISCUSSION

Distal radius fracture is one of the most common fractures of the upper limb with the optimal management still a topic of debate. The present study compared the functional recovery of two groups of patients (conservative and surgical) followed for 6 months. No differences were observed between the groups in baseline demographic and structural fracture variables at the time of analysis and thereby minimizing selection bias, which allowed valid comparisons of the therapeutic modalities. All in all, the subjects treated operatively had significantly better functional restoration, larger wrist ROM, greater hand grip power, smaller amount of pain as well as a higher overall satisfaction compared to the conservatively treated subjects. These findings are similar to recent world literature demonstrating the efficacy of volar locking compression plates in unstable configurations of the distal radial fracture.^[1–3]

The homogeneity of baseline factors such as subjects age, sex, typology of fractures, trauma mechanism, and

evaluation duration suggest that differences in post-treatment are not due to the presence of confounding factors, but mainly due to the type of intervention used. Thus, many RCTs and metaanalyses have emphasized the need for equivalent baseline cohorts when trying to make methodologically valid comparisons between the surgical versus non-surgical approach.^[1,4,5]

One of the main findings of this study was that an enhanced upper extremity performance was seen in the surgical cohort, as reflected by the significantly decreased DASH score. Internal stabilization provided by rigid plates allows for immediate physical rehabilitation thus promoting quick recovery of functional activities of daily living and reducing physical restrictions. It is in line with the latest meta-analyses and network meta-analyses, which demonstrate greater DASH scores with internal fixation than with non-operative treatment, more so in the first year post-treatment.^[1,2,4] Likewise, higher PRWE scores were observed in the surgical arm, providing evidence for better wrist joint function and lower symptomatic symptoms. This likely can be attributed to the ability to achieve precise internal fixation of the radial height, the inclination of the radius and the palmar tilt. In recent reviews, Shaftesbury and colleagues found that operative realignment not only provides superior radiological alignment, but also better functional results related to wrist function.^[1,3,5]

Joint Mobility is a key factor in evaluating functional recovery. As part of this investigation, all wrist adaptations were found to be significantly higher in the surgical arm (flexion, extension, pronation and supination). The rigid fixation, proper anatomical alignment, and early physical therapy can minimize periarticular capsular fibrosis and reduce joint stiffness associated with long casting. Numerous randomized trials and systematic reviews have documented equivalent improvement in the measurement of AROM in surgical and non-surgical treatments. Despite this, some studies suggest that after the first year there is a lesser difference in mobility between internal fixation and other treatment methods, and that internal fixation does not have a marked effect on long-term mobility.^[1,3–5]

Similarly, the strength of the hold restored was highly elevated after surgery with participants regaining more than 90% of the strength of the non-involved arm. Stiffness of grip force is highly clinically relevant, given that it affects vocational reintegration, fine motor dexterity and patient satisfaction. The results are comparable to those in the international meta-analyses in favor of operative stabilization of active people with high physical activities.^[2–5]

Another unique benefit of operative treatment was the relieving of pain. The surgically treated group had significantly fewer VAS pain scores than the non-operative controls. Rigid structural stabilization will prevent secondary fracture shift, restore native radio-carpal mechanics and allow early active use, which will reduce pain during healing. Current systematic reviews also show reduced pain after surgery during early recovery periods but with differences decreasing over longer

recovery periods.^[1,3,5] Additionally, surgical patients had a greater number of patients who achieved excellent functional grade, while fair and poor grades were more common in conservative patients. In the last decade, the complex fracture configuration, unstable fracture, and intra-articular fractures have been seen to have consistent outcomes in the last decade in both India and the rest of the world.^[6-9]

The functional recovery was better in the surgical stabilization group, but the incidence of complications was kept low in both groups. The incidence of radiographic malunion was higher in the conservative treatment arm while soft-tissue irritation around hardware and superficial surgical site infection only occurred in the surgical arm. These trends are specific to the different management pathways, and illustrate some of the compromises that are made. Non-surgical treatments avoid the exposure risks during an operation, but may be associated with increased risk of secondary alignment loss and malunion, especially in unstable fracture types. Surgical fixation, on the other hand, allows for a better anatomical reduction, but will result in patients being at increased risk for hardware-related complications. However, recent systematic reviews have led to the conclusion that overall complications are similar with the use of modern fixation methods.^[1,3,5,10] The high patient satisfaction score in the surgical group also underscores the benefits of surgical care. Overall Satisfaction combines pain control, return-to-work, cosmetic, and return-to-work in a single score. The satisfaction and quality of life improvements observed are similar to what has been reported elsewhere in recent international research and systematic reviews.^[1,5,11]

Biological basis for the improved results obtained with surgical methods is the return of the normal wrist anatomy and mechanics. Rigid internal fixation ensures radial alignment, congruity of the articular surface of the radius and carpal bones, and enables smooth gliding of the tendons while reducing pathological loading at the two joints, both the radiocarpal and distal radioulnar. In the early, controlled mobilization, muscular atrophy and periarticular capsular fibrosis are reduced as much as possible, accelerating functional rehabilitation. On the other hand, conservative management with prolonged cast immobilization can lead to poor functional recovery, even if fracture healing is completed, and cause joint stiffness and muscle weakness. The major theme in modern biomechanical literature remains the use of proper anatomic alignment as a key criterion for promoting long-term wrist performance.^[2,5,11,12] The observations have clinical significance in terms of the Indian healthcare system where financial constraints, unequal access to subspecialized trauma care centers, and variable hardware availability makes non-operative care widespread. However, there has been a tremendous increase in the use of volar locking plate constructs, making unstable configurations more successful clinically. Similar studies from India also show better functional recovery, increase in grip, decrease in DASH score and the improved return to work with internal fixation as compared to cast immobilization.^[6-9,13] Nevertheless, treatment plans should

be personalized. For non-displaced extra-articular patterns, low-demand geriatric patients and those with significant medical risk factors, non-operative management is appropriate. At present, there is no clear evidence that the functional status of older adults differs between treatment types after long-term follow-up, but that with operative treatment recovery is faster in the short term.^[4,12,14]

The strengths of this study are the balanced baseline demographics, the use of validated outcome measures (DASH, PRWE, VAS, grip power, range of motion, adverse events, and patient satisfaction), and the consistent benefits of surgical treatment in all of the measured outcomes. However, there were a number of restrictions to the study that should be noted: The small number of patients studied and the short period of follow-up (6 months) limited the long-term evaluation of arthrosis following trauma, late complications and hardware failure. Moreover, major factors, such as health economics, socioeconomic status, bone mineral density, smoking status, and compliance to therapy, were not assessed and may have influenced the results.^[1,11,15] Further studies are suggested, including prospective multicenter studies with larger patient numbers and a longer follow-up period, and uniform treatment protocols, health-economic assessments, and artificial intelligence-based radiographical analysis, to improve and further refine care algorithms for distal radius fractures in the adult population.^[11,15]

CONCLUSION

Finally, this study has shown the superior outcomes of surgical treatment of the adult distal radius fracture in terms of functional recovery, range of motion of the wrist, grip strength, pain and patient satisfaction, while maintaining the same safety level. These findings suggest that for some patients presenting with stable fracture patterns, non-operative treatment is an excellent option, but for unstable fractures and physically active patients, surgical fixation is recommended to be the preferred treatment.

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Conflicts of interest

There are no conflicts of interest.

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