e-ISSN: 0975-5160, p-ISSN: 2820-2651

Available online on www.ijtpr.com

International Journal of Toxicological and Pharmacological Research 2024; 14(3); 299-307

Original Research Article

Management Modalities and Clinical Outcomes of Distal Radius Fractures: A Retrospective Study

Anshuman Dewan

Assistant Professor, Department of Orthopaedics, ICARE Institute of Medical Sciences and Research, Dr. Bidhan Chandra Roy Hospital, Haldia, West Bengal, India

Received: 10-01-2024 / Revised: 19-02-2024 / Accepted: 22-03-2024
Corresponding Author: Dr. Anshuman Dewan
Conflict of interest: Nil

Abstract

Background: Distal radius fractures may be regarded as one of the most common orthopedic injuries in clinical practice since it is common in both young trauma and osteoporosis in old age. Proper management is important to re-establish functioning and avoid chronic disability.

Aim: To compare the modalities of management and their clinical outcomes among patients with distal radius fractures.

Methodology: It was a retrospective study that was conducted over a duration of one year in one of the tertiary care hospitals where 150 patients with distal radius fractures were studied. The data was obtained on a structured proforma including the demographic data, type and modality of fracture treatment and clinical outcomes based on hospital records. The SPSS version 25.0 was used in conducting statistical analysis. A p-value that had a value lower than 0.05 was considered to be statistically significant.

Results: Most patients were males (60%), and aged between 21-40 years (42%). The most common cause (46%), was road traffic accidents. The management was 40 percent conservative, and 60 percent surgery. The surgical treatment produced functional outcomes that were good or excellent in 72 percent of patients who had surgery as compared to 55 percent in patients that were conservatively treated. The risks of complications were more in conservative management (28%) compared to surgical (18%).

Conclusion: The surgical care of distal radius fracture provides better functional outcomes as compared to conservative care, particularly intra-articular and displaced fractures. Intervention and a good selection of modality should be carried out as early as possible to recover maximally.

Keywords: Distal Radius Fracture, Management Modalities, Functional Outcome, Conservative Treatment, Surgical Fixation.

Introduction

Distal radius fractures form part of the commonest type of fractures in orthopedic practice and this is a high percentage of upper limb injury in the world population [1]. These fractures are bimodal with high-energy forces such as road traffic accidents or sports injuries affecting younger people and low-energy forces such as falls affecting older people and being osteoporosis related. Distal radius fracture is a serious clinical issue due to their high occurrence and the effects they have on the functionality of the hands and wrists [2].

Distal radial fracture treatment has undergone tremendous changes over the past decades. Traditionally, conservative approaches (closed reduction and casting) were widespread [3]. With the development of orthopedic methods and implant technology, however, there has been a trend towards surgical fixation, such as volar locking plate fixation, external fixation, and percutaneous pinning [4]. The aim of these new techniques is to have improved physiological shrinkage, early mobility and good functional returns [5]. Whether to use any of the treatment modalities or not is determined by a number of factors like fracture pattern, the level of displacement, patient age, the quality of the bones, comorbidity and the functional requirements.

Although these improvements have been made, the best management of distal radius fractures is a topic of discussion [6]. These differences are reflected in the difference in treatment regimes, patient features and outcome measures and hence, people have different perceptions regarding which specific modality is the most appropriate one. Thus, a methodological review of management strategies and their clinical effect should be carried out to develop evidence-based guidelines and enhance patient care.

Background of the Study: The prevalence of distal radius fractures is linked to high morbidity as it

has a direct effect on the mobility of the wrist, hand functionality, and quality of life [7]. When they are not properly managed, the consequences of these fractures may be malunion, joint stiffness, chronic pains, decreased grip strength and impaired functions [8]. These complications do not only impact on everyday life but can also result in long-term disability especially among the elderly patients.

Globally the rate of distal radius fractures is on the rise and this is due to the rapid urbanization, increasing number of vehicular accidents, workplace hazards, and the aging population with osteoporotic bones. The trend is causing a heavy burden to the healthcare systems and the need to deal with effective and efficient management strategies is evident [9].

Retrospective studies are significant in knowing about the real-life clinical outcomes using existing data of patients [10]. They offer useful information about the trends of treatment, complication rates, and functional recovery and, as a consequence, can aid clinicians in optimizing treatment procedures and enhancing patient outcomes.

Management Modalities of Distal Radius Fractures: The treatment of distal radius fractures may be divided into both conservative and surgical treatment with particular indications depending on the characteristics of the fracture and patient factors.

Conservative Treatment, as a rule, is closed reduction and immobilization by a plaster cast. This style is normally suggested in stable, extra-articular and minimally displaced fractures [11]. It is less expensive than surgery and does not involve surgical risks but can be accompanied by such complications like loss of reduction, malunion, and long-term immobilization resulting in stiffness [12].

Surgical Therapy is prescribed in unstable, displaced, comminuted or intra-articular fractures whereby anatomical alignment is not achievable through conservative treatment [13]. Typical surgical methods are:

- Volar locking plate Open Reduction and Internal Fixation (ORIF).
- Outside fixation to keep the fracture in position.
- Percutaneous pinning (K-wire fixation) of minimally invasive stabilization [14].

The aim of surgical management is to provide anatomical fixation, stable fixation, and early mobilization to achieve better functional outcomes and minimal long-term complications [15].

Research Objectives

1. The following objectives were used in the present study:
2. To analyze the demographic characteristics of patients with distal radius fractures
3. To assess the different modalities of management used in treatment.
4. To evaluate and compare clinical outcomes relating to each treatment modality.
5. To determine complications and aspects that determine treatment outcomes.

Methodology: The current research was undertaken to critically compare the management modalities and clinical outcomes of distal radius fractures among patients with a tertiary care hospital. An organized and systematic method was embraced to guarantee reliability and validity of the results. The analysis was aimed at predicting demographic, fracture patterns, treatment, and other related clinical outcomes of patient data that have been recorded before. Using a retrospective design, the research was able to capture the practice in the real world and give valuable information on the efficacy of various treatment plans.

Study Design: The current study was a retrospective observational study that was undertaken in a hospital. This design has been selected to assess the already treated cases of the distal radius fractures and their management modalities and clinical outcomes according to available medical records. The retrospective strategy allowed including an adequate number of cases over a specific period and offered an opportunity to obtain empirical data on treatment practices and outcomes in the real world.

Study Area: The research was conducted by the Department of Orthopaedics, ICARE Institute of Medical Sciences and Research, Dr. Bidhan Chandra Roy Hospital, Haldia, West Bengal, India

Study Duration: The research was carried out in for one year.

Study Participants: To maintain consistency and accuracy of information, patients were sampled through predetermined inclusion and exclusion criteria.

Inclusion Criteria

- Patients with fractures of the distal radius that were affirmed by clinical tests and radiological evidence.
- Patients who were treated (conservative or surgical) in the study period.
- Patients with full and available medical histories, such as follow-up information.

Exclusion Criteria

- Patients with pathological fractures (e.g., due to tumors or metabolic bone diseases)
- Patients with underlying wrist deformities or previous fracture of this wrist.

- Incomplete records or lack of critical clinical or outcome data of patients.

Sample Size: A total of 150 patients were included in the study. The number of sample cases was determined based on the number of eligible cases registered in the hospital database during the study period. The nature of the study was retrospective and this is the reason why convenient sampling approach was used.

Procedure: A pre-structured and standardized proforma was used to gather data in the form of patient case files, operation records, and hospital databases on a retrospective basis.

The following parameters were noted:

- Demographic: Age, gender.
- Mechanism of injury: Road traffic accident, falls, or other causes.
- Fracture features: based on the radiological classification and displacement.
- Treatment modality: Conservative (casting) or surgery (ORIF, external fixation, percutaneous pinning)
- Clinical outcomes: Determined using recorded functional recovery, range of motion, and physician notes during the follow up visits.
- Complications: Malunion, infection, stiffness, and other complications (postoperative/ post-treatment complications).

All data gathered were signed and checked thoroughly to ensure the accuracy and completeness of the data prior to analysis.

Statistical Analysis: The data collected were then keyed into Microsoft Excel which was then analyzed using SPSS version 25.0.

- Summarization of demographic and clinical variables was done through descriptive statistics, including mean, standard deviation, frequency, and percentage.
- Inferential statistics, mainly the Chi-square test, were used to find out the association between the treatment modalities and the clinical outcomes or complications.
- A p-value of less than 0.05 was regarded as significant signifying a significant relationship between variables.

Results

This retrospective study used 150 patients who were diagnosed with distal radius fractures. Data obtained were systematically studied to examine the demographic, mode of injury, mode of treatment, clinical outcomes and complication factors. Results are in tabular and graphical forms to make the results easier to understand.

Table 1: Age and Gender Distribution of Study Participants

Variable	Category	Frequency (n)	Percentage (%)
Age	0–20	30	20%
	21–40	63	42%
	41–60	42	28%
	>60	15	10%
Gender	Male	90	60%
	Female	60	40%

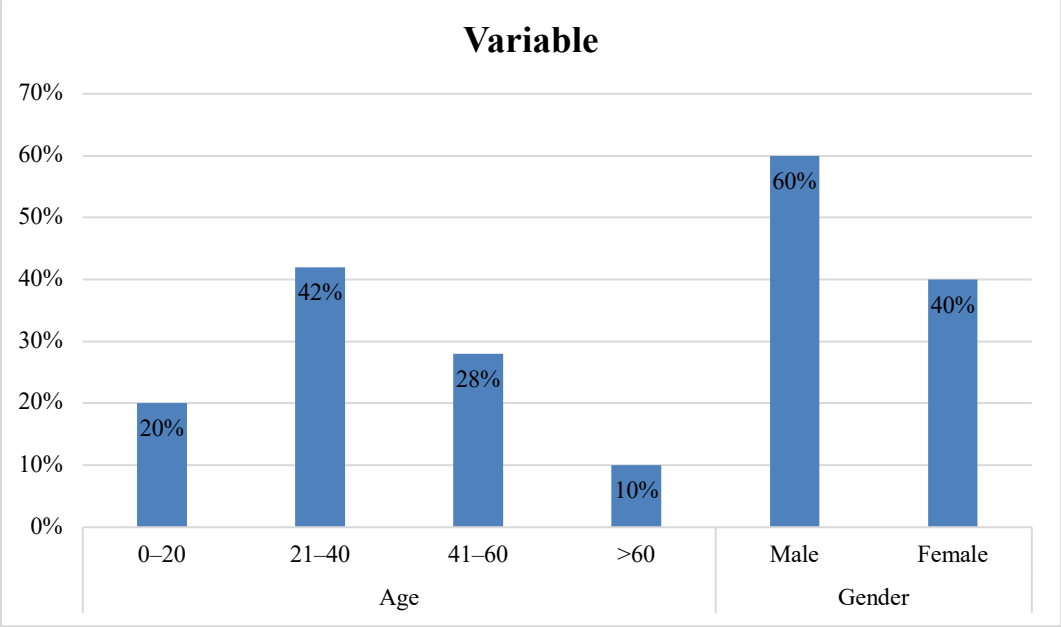

Figure 1: Distribution of Study Participants According to Age Group and Gender

Demographic analysis showed that the age group 2140 years had the greatest percentage of patients (42) showing that the incidence was greater among the working and active population. This was then followed by 4160 years (28) and young people below 20 years (20) with the percentage above 60 years being 10.

It was male dominated (60) as opposed to female (40). The implication of this tendency is that males are more susceptible to high-energy trauma such as road traffic accidents and work-related injuries, thus, they are more susceptible to distal radius fracture.

Table 2: Distribution of Patients According to Mode of Injury

Mode of Injury	Frequency	Percentage
Road Traffic Accident	69	46%
Fall on Outstretched Hand	60	40%
Others	21	14%

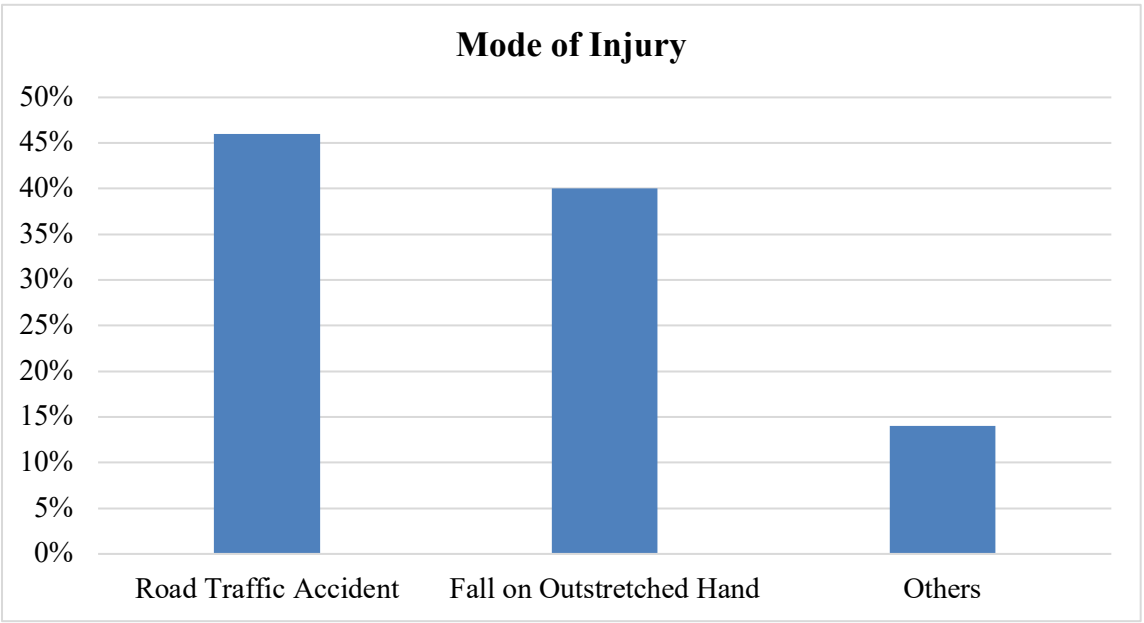

Figure 2: Distribution of Patients Based on Mechanism of Injury

The injury mechanism analysis showed that road traffic accidents were the most common (46%), followed by falls on an outstretched hand (40%). The other 14% was also spread to other causes like sports injuries and work accidents.

These results suggest that both high-energy trauma (RTA) and low-energy trauma (falls) are important contributors to the incidence of distal radius fractures, which is a bifurcated pattern of injury in orthopedic practice.

Table 3: Treatment Modalities Distribution.

Treatment Type	Frequency	Percentage
Conservative	60	40%
Surgical	90	60%

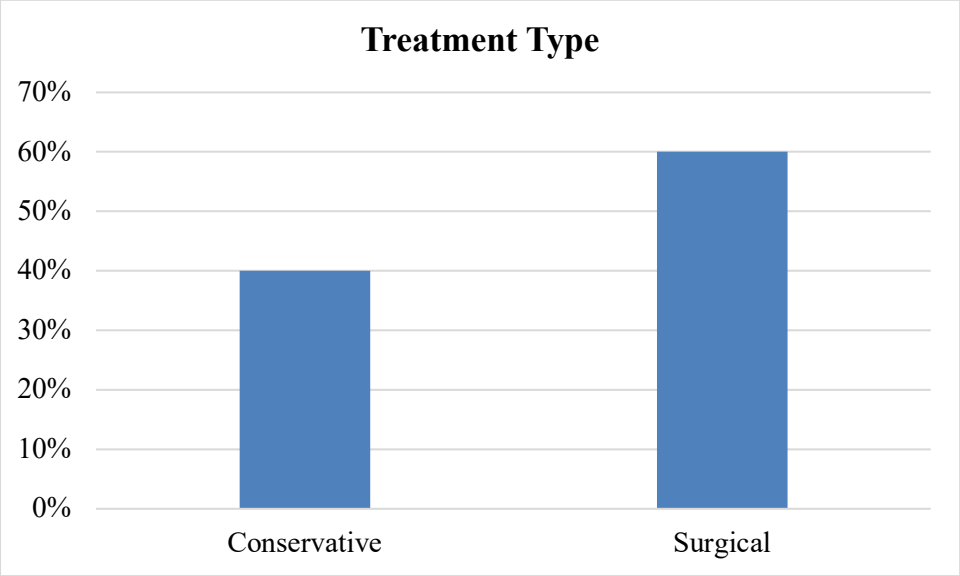

Figure 3: Distribution of Patients According to Treatment Modality

The number of cases was 60 out of the total cases of which 40 cases were conservatively managed. These higher percentages of surgical intervention are indicative of the higher incidence of unstable, displaced or intra-articular fractures necessitating anatomical reduction and rigid fixation.

Another important trend is the tendency of using operation management in contemporary orthopedic practice because of the increased quality of implants and enhanced functionality.

Table 4: Clinical Outcomes Comparison between Treatment Groups.

Outcome	Conservative (n=60)	Surgical (n=90)
Excellent	18	36
Good	15	29
Fair	12	15
Poor	15	10

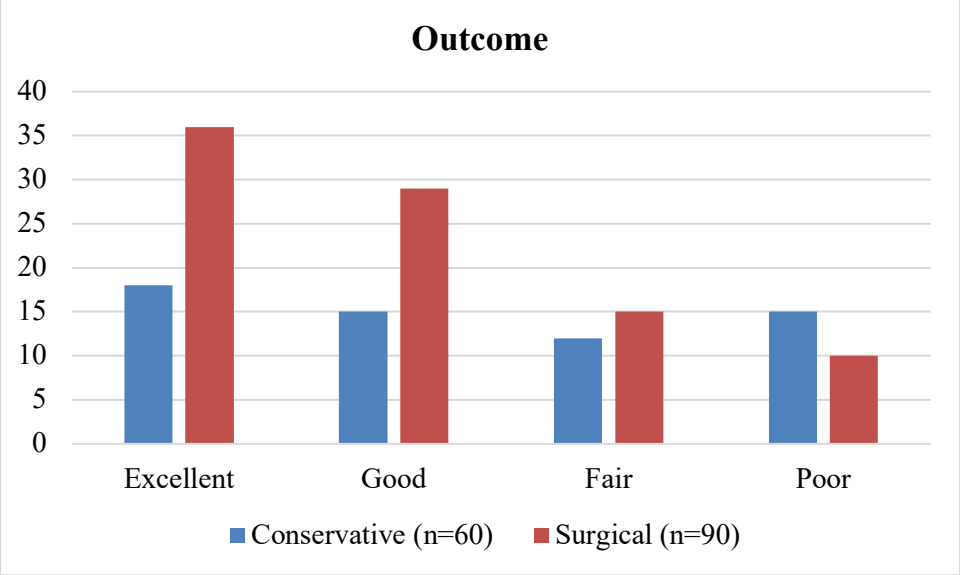

Figure 4: Comparative Analysis of Clinical Outcomes Between Conservative and Surgical Management

Clinical outcome comparison across the treatment modalities indicated that the treatment modalities that had a better functional outcome were those that were surgically treated. The surgical group recorded a higher number of patients (65) with excellent to good outcomes (72%), as opposed to 33 patients (55 per cent) in the conservative group.

On the other hand, the conservative group (15 cases) reported poor outcome more than the surgical group (10 cases). This is an indication that surgical management offers a better restoration of the functioning of the wrist especially in complicated fractures.

Table 5: Distribution of Complications Among Treatment Groups

Complication	Conservative (%)	Surgical (%)
Malunion	12%	5%
Stiffness	10%	8%
Infection	0%	5%
Total	28%	18%

The rate of complications was observed to be more in the conservative group (28%), than in the surgical group (18%). The most frequent complication associated with patients who have been treated conservatively was malunion (12%), which means insufficient alignment of the fracture during the healing process.

Despite a lesser overall complication rate in surgical management, postoperative infection (5%) was only seen in the surgical category. Both of the groups exhibited stiffness, although it was marginally higher in conservative treatment.

These results indicate that surgery has some risks in procedures but fewer complications in the long term like malunion.

Table 6: Association Between Treatment Modality and Functional Outcome

Outcome Category	Conservative (n=60)	Surgical (n=90)	P-value
Excellent + Good	33	65	0.021
Fair + Poor	27	25	

Statistical analysis revealed that there was significant association between the modality of treatment and functional outcome ($p = 0.021$). The percentage of patients who attained positive results (excellent and good) was much bigger between the surgical and the conservative groups.

This implies that surgery intervention is more successful towards the realization of superior functional recovery, especially in situations of unstable/displaced fractures. These findings are also enhanced by the statistical significance that contributes to the reliability of the findings. The results of this study highlight that distal radius fractures are more common in young and middle-aged males, with road traffic accidents being the predominant cause. There was higher use of surgical management which was linked to improved functional results and reduced incidence of complica-

tions when compared to conservative management. The results underscore the relevance of choosing the right treatment modalities depending on the nature of the fracture with the aim of maximizing patient outcomes.

Discussion

The current retrospective was done to assess the management modalities and clinical outcomes in distal radius fracture in a tertiary care environment. The results of the current research offer valuable information on the demographic profile, injury mechanisms, management strategies, and outcomes in patients with distal radius injuries.

In this study, the most frequent was discovered to be distal radius fractures (21 years to 40 years 42% and 41 years to 60 years 28%). This pattern implies that fractures are more common in the economically active population and this perhaps has to do with a higher exposure to high-energy trauma like road traffic accidents and work hazards (Qiu et al., 2015) [16]. The comparatively low rate of the elderly population (10%) could be a result of underreporting, or disparities in healthcare access, yet the low-energy osteoporotic fractures are generally more prevalent in the elder population.

The current study showed a male domination (60%), and this is within the average trend of orthopedic trauma (Rundgren et al., 2020) [17]. This is attributable to the fact that males are more engaged in outdoor activities, driving, and other physically demanding jobs resulting in more exposure to traumatic injuries. The gender difference highlights the role of behavioral and occupational factors in the epidemiology of distal radius fractures.

Injury pattern analysis found that the most frequent (46%) cause was road traffic accidents, then falls on a spread-out hand (40%). This observation highlights the dualism of the distal radius fractures, which can be caused by a high-energy trauma (RTA) and a low-energy mechanism (falls). The high role of road traffic accidents indicates the growing urbanization and motorization, which are significant health issues in the population (Sander et al., 2020) [18].

In terms of treatment modalities, the research revealed that 60% of the patients were managed surgically whereas 40% were managed conservatively. This increased percentage of surgical intervention implies that a significant number of fractures were unstable, displaced, or intra-articular in nature, and needed to be repaired by surgery (Yuan et al., 2015) [19]. This movement is also indicative of the increasing popularity of surgical procedures in the contemporary orthopedic practice as a result of the technological development of implants and improved functioning results.

Comparison of clinical outcomes showed that surgical management had better functional recovery. The percentage of patients recording excellent or good outcomes was much higher in the surgical group (72%), as opposed to the conservative group (55%). Also, the conservative group had more often poor outcomes. These results suggest that surgical intervention can be used to achieve superior anatomical reduction, stable fixation and early mobilization, which lead to improved functional results.

The complication profile also helps prove the benefit of surgical management. The total rate of complication was greater in the conservative group (28%), in comparison to the surgical (18%). Malunion was found to be significantly more prevalent in the patients that were treated conservatively, probably because the reduction was lost during the immobilization (Zou et al., 2019) [20]. Conversely, surgical management had a low risk of infection (5%), a natural complication of the procedure. Nevertheless, the reduced number of long-term complications like malunion and stiffness in the surgical group indicates improved overall results.

Notably, the researchers have discovered that there is statistically significant dependence between treatment modality and functional outcome ($p = 0.021$). It means that the difference in the results found in conservative and surgical treatment is not by chance and is clinically significant. The results are very convincing of the contribution of surgical management towards an improved functional recovery, especially in unstable or complicated fractures.

In general, the findings of this research point to the fact that distal radius fractures are mostly observed in younger males because of high-energy trauma, and surgical intervention is becoming the most effective alternative of treatment in relation to functional outcomes and complications. These results emphasize the need to assess fractures properly and plan treatment individually to maximize patient outcomes.

Conclusion

This current research paper is able to conclude that the distal radius fractures are mainly found in young and middle-aged people with more prevalence in males mainly because of the exposure to high energy trauma like road traffic accidents. The results indicate that high-energy and low-energy processes play a significant role in the occurrence of these fractures. A comparative analysis of the treatment modalities showed that surgical treatment is better in functional outcomes than conservative treatment. Surgical patients had a better ratio of excellent to good outcome, as well as reduced total percentage of long-term complications like malunion and stiffness. Despite the low risk of proce-

dure-related complications, including infection, surgical intervention has more advantages in terms of anatomical restoration and early mobilization than these risks.

Moreover, the statistically significant relationship between the treatment modality and functional outcome underlines the significance of the proper choice of treatment depending on the nature of the fracture and patient-specific factors. The conservative management is still appropriate in stable and minimally displaced fractures, but surgical intervention is more appropriate in unstable, displaced, or intra-articular fracture to attain the best outcomes. Finally, timely diagnosis, appropriate classification of fractures and timely intervention with the correct management modality are essential in enhancing clinical outcomes and reducing complications in patients with distal radius fractures.

References

1. Aparicio, P., Izquierdo, Ó., & Castellanos, J. (2018). Conservative treatment of distal radius fractures: a prospective descriptive study. Hand, 13(4), 448-454.
2. Azad, A., Kang, H. P., Alluri, R. K., Vakhshori, V., Kay, H. F., & Ghiassi, A. (2019). Epidemiological and treatment trends of distal radius fractures across multiple age groups. Journal of wrist surgery, 8(04), 305-311.
3. Aziz, A., Memon, A. A., Shah, I., Hashmi, I., & Rafi, S. (2020). A Review on Outcomes of Distal Radius Fracture Treated with Different Modes of Treatment and Rehabilitation. Pakistan Journal of Medicine and Dentistry, 9(2), 84-90.
4. Barai, A., Lambie, B., Cosgrave, C., & Baxter, J. (2018). Management of distal radius fractures in the emergency department: A long-term functional outcome measure study with the Disabilities of Arm, Shoulder and Hand (DASH) scores. Emergency Medicine Australasia, 30(4), 530-537.
5. Couture, A., Hébert-Davies, J., Chapleau, J., Laflamme, G. Y., Sandman, E., & Rouleau, D. M. (2019). Factors affecting outcome of partial radial head fractures: A Retrospective Cohort Study. Orthopaedics & Traumatology: Surgery & Research, 105(8), 1585-1592.
6. Dash, S. K., Sharma, M. K., Mishra, S., Marandi, H., Das, A., Satapathy, D., & Ahmed, S. S. (2017). Clinical outcomes in management of unstable distal radius fractures treated with external fixation and internal fixation: A prospective comparative study. International Journal of Research in Orthopaedics, 3(5), 1004.
7. DeGeorge Jr, B. R., Van Houten, H. K., Mwangi, R., Sangaralingham, L. R., Larson, A. N., & Kakar, S. (2020). Outcomes and complications in the management of distal radial fractures in the elderly. JBJS, 102(1), 37-44.
8. Ermutlu, C., Mert, M., Kovalak, E., Kanay, E., Obut, A., & Öztürkmen, Y. (2020). Management of distal radius fractures: comparison of three methods. Cureus, 12(8).
9. Hohmann, E., Meta, M., Navalgund, V., & Tetsworth, K. (2017). The relationship between radiological alignment of united distal radius fractures and functional and patient-perceived outcomes in elderly patients. Journal of Orthopaedic Surgery, 25(1), 2309499016684976.
10. Ikpeze, T. C., Smith, H. C., Lee, D. J., & Elfar, J. C. (2016). Distal radius fracture outcomes and rehabilitation. Geriatric orthopaedic surgery & rehabilitation, 7(4), 202-205.
11. Kotian, P., Mudiganty, S., Annappa, R., & Austine, J. (2017). Radiological outcomes of distal radius fractures managed with 2.7 mm volar locking plate fixation-a retrospective analysis. Journal of clinical and diagnostic research: JCDR, 11(1), RC09.
12. Mosenthal, W. P., Boyajian, H. H., Ham, S. A., & Conti Mica, M. A. (2019). Treatment trends, complications, and effects of comorbidities on distal radius fractures. Hand, 14(4), 534-539.
13. Mulders, M. A., Detering, R., Rikli, D. A., Rosenwasser, M. P., Goslings, J. C., & Schep, N. W. (2018). Association between radiological and patient-reported outcome in adults with a displaced distal radius fracture: a systematic review and meta-analysis. The Journal of hand surgery, 43(8), 710-719.
14. Ochen, Y., Peek, J., van der Velde, D., Beeres, F. J., van Heijl, M., Groenwold, R. H., ... & Heng, M. (2020). Operative vs nonoperative treatment of distal radius fractures in adults: a systematic review and meta-analysis. JAMA network open, 3(4), e203497.
15. Ogunleye, A. A., Mullner, D. F., Skochdopole, A., Armstrong, M., & Herrera, F. A. (2019). Remote injuries and outcomes after distal radius fracture management. Hand, 14(1), 102-106.
16. Qiu, W. J., Li, Y. F., Ji, Y. H., Xu, W., Zhu, X. D., Tang, X. Z., ... & Liu, H. M. (2015). The comparative risk of developing postoperative complications in patients with distal radius fractures following different treatment modalities. Scientific reports, 5(1), 15318.
17. Rundgren, J., Bojan, A., Mellstrand Navarro, C., & Enocson, A. (2020). Epidemiology, classification, treatment and mortality of distal radius fractures in adults: an observational study of 23,394 fractures from the national Swedish fracture register. BMC musculoskeletal disorders, 21(1), 88.

18. Sander, A. L., Leiblein, M., Sommer, K., Marzi, I., Schneidmüller, D., & Frank, J. (2020). Epidemiology and treatment of distal radius fractures: current concept based on fracture severity and not on age. European journal of trauma and emergency surgery, 46(3), 585-590.
19. Yuan, B. J., Dennison, D. G., Elhassan, B. T., & Kakar, S. (2015). Outcomes after radiocarpal dislocation: a retrospective review. Hand, 10(3), 367-373.
20. Zou, C., Lin, T., Wang, B., Zhao, Z., Li, B., Xie, X., ... & Shen, J. (2019). Managements of giant cell tumor within the distal radius: A retrospective study of 58 cases from a single center. Journal of bone oncology, 14, 100211.