Review Article | Trauma International | 2026 January-June; 12(1): 25-30

# Comprehensive Management of Distal End Radius Fractures in Adults: A Clinical Review and Decision-Making Approach

Sachin Kale[1], Altaf Warid[1], Gaurav Sharma[1], Ashok Shyam[1], Ashok Ghodke[1], Nikhil Makhija[1]

## Abstract

**Background:** Distal radius fractures represent one of the most frequently encountered injuries in orthopaedic practice worldwide, accounting for a significant proportion of upper limb fractures across all age groups. These fractures demonstrate a bimodal distribution, occurring commonly in young individuals following high-energy trauma and in elderly osteoporotic patients after low-energy falls. Over the past few decades, the management of distal radius fractures has undergone substantial evolution, driven by advancements in imaging modalities such as computed tomography, a deeper understanding of wrist biomechanics, and the development of improved fixation techniques. These advances have enabled more precise fracture characterization and have contributed to better functional restoration.

**Objectives:** This review aims to provide a comprehensive yet practical overview of distal radius fractures, with particular emphasis on systematic clinical evaluation, commonly used classification systems, and contemporary evidence-based management strategies. The goal is to aid clinicians in making informed decisions tailored to individual patient and fracture characteristics.

**Methods:** A narrative review was conducted using standard orthopaedic textbooks, peer-reviewed journal articles, and widely accepted clinical guidelines. Relevant literature focusing on epidemiology, fracture classification (including commonly used systems such as Frykman, Fernandez, and AO/OTA), imaging modalities, and both conservative and surgical management approaches was analyzed to synthesize current best practices.

**Results:** The management approach to distal radius fractures largely depends on fracture stability, displacement, intra-articular involvement, and patient-related factors such as age, bone quality, functional demands, and comorbidities. Stable, extra-articular fractures with acceptable alignment generally respond well to conservative treatment, including immobilization with casting. However, unstable fractures—characterized by dorsal comminution, significant displacement, loss of radial height or inclination, and intra-articular extension—are associated with a higher risk of malunion and functional impairment when treated non-operatively. Surgical intervention in such cases has been shown to provide superior anatomical reduction and improved functional outcomes. Among surgical options, volar locking plate fixation has gained widespread acceptance due to its biomechanical stability, ability to maintain reduction in osteoporotic bone, and facilitation of early mobilization. Other modalities, including external fixation, percutaneous pinning, and dorsal plating, remain relevant in selected scenarios.

**Conclusion:** The management of distal radius fractures should be individualized, considering both fracture-specific characteristics and patient-related factors. A thorough clinical and radiological assessment is essential for optimal decision-making. Modern fixation techniques, particularly volar locking plates, have significantly enhanced the ability to achieve stable fixation and early functional recovery. Nevertheless, careful patient selection and adherence to sound surgical principles remain critical to achieving favorable outcomes.

**Keywords:** AO Classification, Distal End Radius Fractures, Volar Plating, Decision Making

## Introduction

Distal radius fractures are one of the most frequently encountered fractures in orthopaedics [15]. They typically show a bimodal distribution—occurring in younger patients due to high-energy trauma and in elderly patients following low-energy osteoporotic falls [15].

Traditionally, these fractures were treated with closed reduction and casting, as described historically by Colles [3]. However, treatment philosophy has shifted toward achieving anatomical reduction and stable fixation to allow early mobilization and better functional recovery [9, 12]. This shift has led to the widespread adoption of techniques such as volar locking plate fixation [9].

## Materials and Methods

This article is a narrative review based on standard orthopaedic teaching and literature [1, 11]. The following aspects were considered:

- Anatomy and biomechanics
- Clinical presentation

[1]Department of Orthopaedics, Dr. D.Y. Patil Medical College, Navi Mumbai, Maharashtra, India.

**Address of Correspondence**
Dr. Sachin Kale
Department of Orthopaedics, Dr. D.Y. Patil Medical College, Navi Mumbai, Maharashtra, India.
**E-mail:** sachinkale@gmail.com

Submitted: 07/01/2026; Reviewed: 02/02/2026; Accepted: 06/03/2026; Published: 10/04/2026

*@Author, Trauma International ISSN 2455-538X | Available on www.traumainternational.co.in |* ***DOI- https://doi.org/10.13107/ti.2026.v12.i01.82***

- Classification systems
- Imaging modalities
- Management strategies and outcomes

**Anatomy and Biomechanics**

The distal radius is essential for proper wrist function and load transmission. Approximately 80–85% of axial load passes through the radius [12].

Important radiological parameters include:

- Radial inclination: 20–23°
- Volar tilt: 10–15°
- Radial height: 10–13 mm

Any disturbance in these parameters can significantly affect wrist mechanics, leading to reduced range of motion, decreased grip strength, and early degenerative arthritis [12].

## Clinical Evaluation

**History**

- Mechanism of injury (commonly FOOSH – fall on outstretched hand) [15]
- Associated conditions (e.g., osteoporosis, diabetes)

**Examination**

- Visible deformity (classic dinner fork deformity described by Colles) [3][FIG1.3]
- Swelling and localized tenderness
- Neurovascular status (especially median nerve involvement)

## Investigations

**Radiography**

Standard PA and lateral X-rays remain the primary diagnostic tools.

**Advanced Imaging**

- CT scan: Essential for evaluating intra-articular involvement [4]
- MRI: Useful for associated ligament injuries

A step-off >2 mm in intra-articular fractures is considered clinically significant [4].

## Classification Systems [FIG 1]

**AO/OTA Classification**

- Type A: Extra-articular
- Type B: Partial articular
- Type C: Complete articular

This system is widely used and clinically relevant [1,7].

**Other Classifications**

- Frykman
- Fernandez [4]
- Melone [5]

While these systems help in understanding fracture patterns, they are more useful for guiding treatment than predicting outcomes, and interobserver variability remains a limitation [1].

## Treatment and Decision-Making (Figure 8)

Management decisions depend on fracture stability, patient factors, and functional demand [12].

## Conservative Management [FIGURE 3]

**Indications:**

- Extra-articular, non-displaced fractures
- Minimal shortening (<3mm) and angulation (<10 degrees)
- No comminution or intra-articular involvement
- Low demand/ medically unfit patients

**Methods:**

- Closed reduction under local anesthesia or hematoma block
- Short arm cast or sugar-tong splint
- Follow-up with serial X-rays (2, 6 and 12 weeks). There is limited indication for repeating
- the serial x rays unless clinically indicated (presence of severe pain with VAS>6, Presence of
- neurovascular symptoms)

**Pitfalls:**

- Risk of late collapse leading to malunion
- Stiffness due to prolonged immobilization, can also lead to Complex regional pain syndrome

## Surgical Management

**Indications:**

- Intra-articular displacement >2 mm
- Radial shortening >3 mm
- Unstable fracture patterns

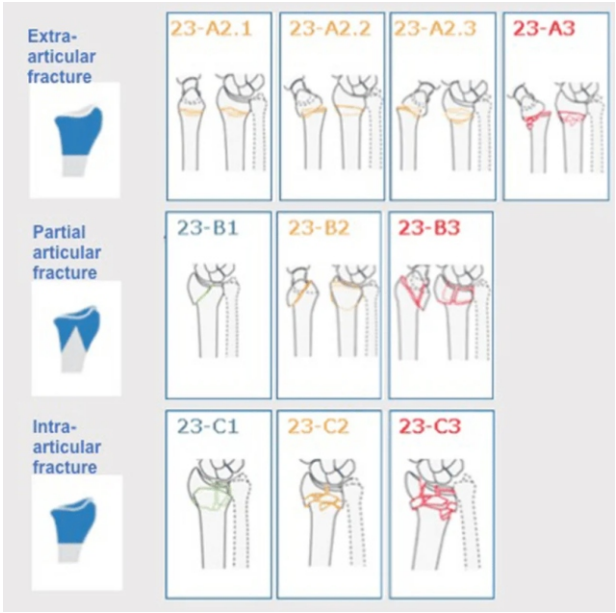



**Figure 1:** AO Classification

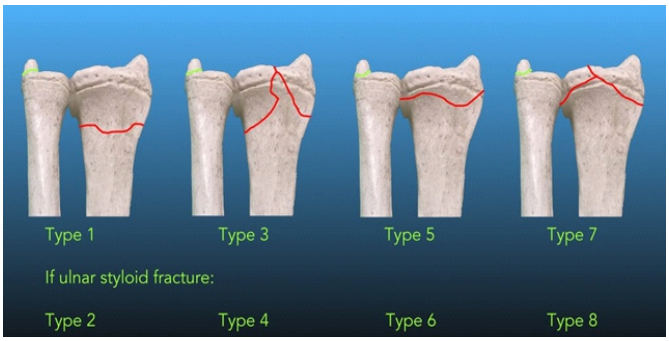



**Figure 2:** Frykman Classification

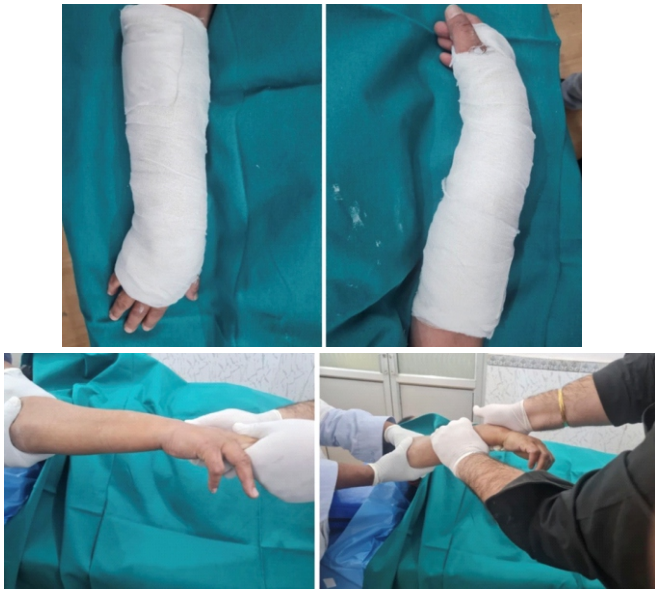


**Figure 3:** Closed Reduction And Casting

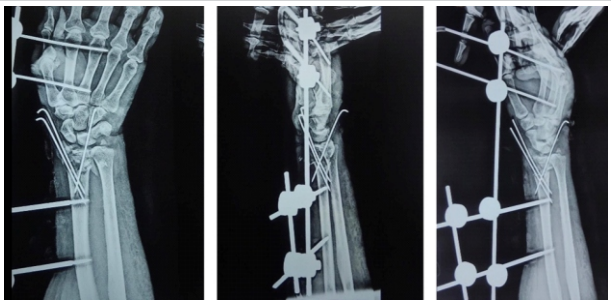


**Figure 5:** External Fixator in Distal End Radius Fracture

**Options:**

- Percutaneous K-wire fixation
- External fixation:- (Figure 5)
- Used for highly comminuted fractures with poor bone stock/open fractures
- Helps maintain length and alignment while allowing for soft tissue healing
- Can be applied in bridging mode and also augmented with K wires
- Volar locking plate fixation (Figure 6)
- Dorsal plating
- Fragment-specific fixation

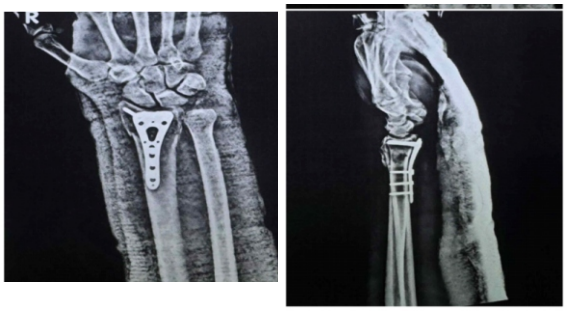


**Figure 6:** Volar Plating For Distal End Radius

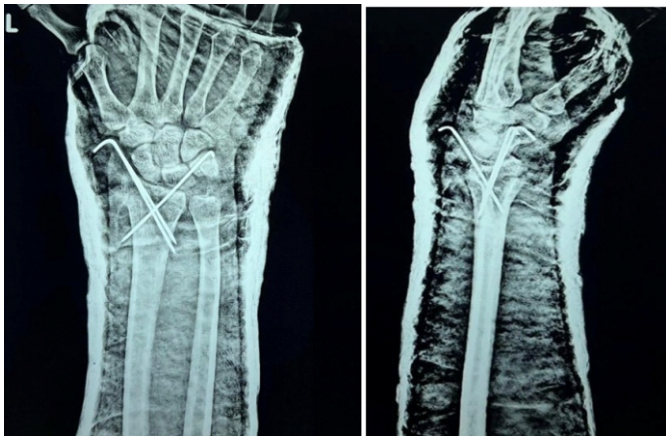


**Figure 7:** K-Wire Fixation for Distal End Radius Fracture

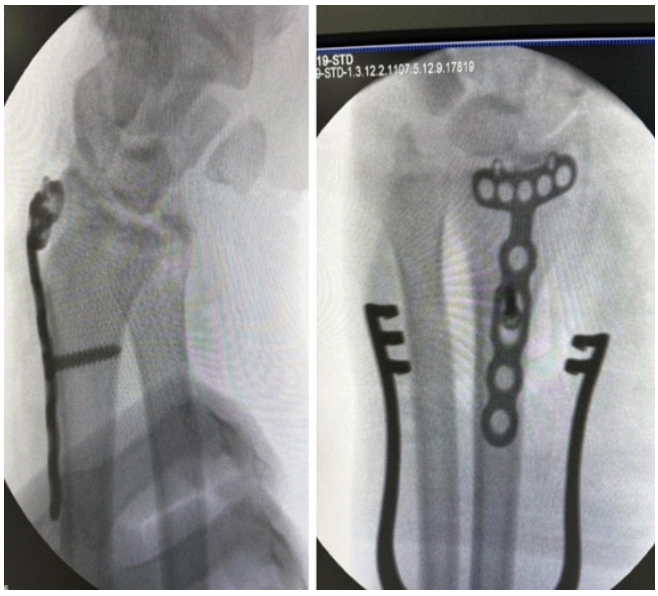


**Figure 4:** Dorsal Plate for Distal End Radius Fracture

Volar locking plates are currently considered the gold standard for many unstable fractures due to their biomechanical stability and ability to allow early mobilization [9].

## Results

- Stable fractures treated conservatively usually show good outcomes [10]

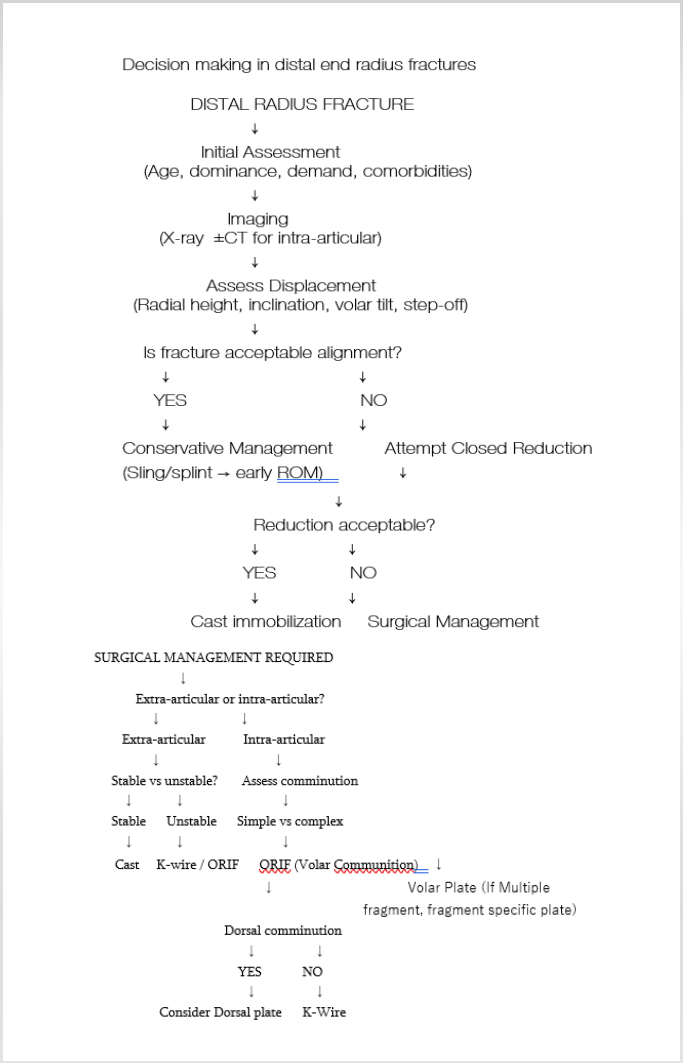



**Figure 8:** Decision Making in Distal End Radius Fracture

• Surgical fixation provides:
◦ Better anatomical alignment
◦ Earlier mobilization
◦ Improved functional recovery [13, 14]

## Discussion

### Changing Treatment Philosophy

Earlier, conservative management was the norm. While acceptable in low-demand patients, it often resulted in malunion and functional limitations [12].

Modern treatment emphasizes anatomical reduction and stable fixation, improving long-term outcomes [9].

### Role of Classification Systems [Figure 1.1]

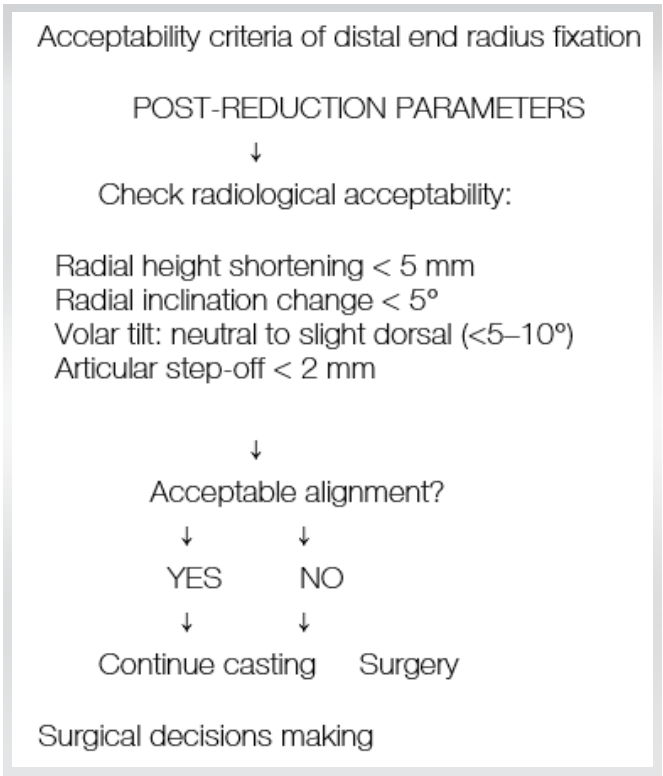
Classification systems provide a structured way to understand fractures, but their real value lies in guiding treatment decisions rather than predicting prognosis [1, 7].

### Conservative vs Surgical Treatment

This remains debated:

**Decision-Making Based on Fracture Type**

| Fracture Type | Displacement & Stability | Treatment Approach |
|---|---|---|
| **Undisplaced Stable** | Minimal displacement, no comminution | **Conservative** - Closed reduction, below-elbow cast (4-6 weeks), serial X-rays |
| **Minimally Displaced, Unstable** | Dorsal/volar angulation, intra-articular involvement | **Closed Reduction + K-wire Fixation** if unstable post-reduction |
| **Displaced Extra-articular** | Significant displacement (>10° dorsal tilt, >3mm shortening) | **Closed Reduction & Percutaneous K-wire Fixation OR ORIF (Plating) if instability** |
| **Intra-articular (Partial or Complete)** | Joint step-off >2mm, comminution | **ORIF with Volar Plate** preferred for better functional outcome |
| **Comminuted Osteoporotic (Fragility Fracture)** | High instability, metaphyseal voids | **Bridge Plating OR External Fixation** if severe comminution |
| **Open Fractures** | Wound contamination, soft tissue damage | **Urgent Debridement + ORIF/External Fixator based on stability** |




• Conservative treatment works well for stable fractures, especially in elderly patients [10]

• Surgical fixation is preferred for unstable or intra-articular fractures [13]

Younger and active individuals benefit more from precise anatomical restoration [12].

## Volar Locking Plate – Why It's Preferred [Figure 1.3]

Volar locking plates have become the most commonly used option because they:

- Provide stable fixation even in osteoporotic bone
- Allow early mobilization
- Maintain reduction effectively [9]

However, complications such as tendon irritation and hardware prominence must be considered.

### Comparison with Other Techniques

- K-wires: Less invasive but less stable [13] (Figure 7)

External fixation: Useful in high-energy injuries but may cause stiffness and pin tract infections [13]

- Dorsal plating: Good for dorsal fragments but higher risk of extensor tendon complications [Figure 4]

## Importance of Patient Factors

Treatment must be individualized based on:

- Age and bone quality
- Functional demands
- Comorbidities
- Socioeconomic considerations [12]

### Complications

**Early:**

- Median nerve compression
- Compartment syndrome
- Loss of reduction

**Late:**

- Malunion
- EPL tendon rupture
- Post-traumatic arthritis [12]

### Future Directions

Emerging techniques include:

- Arthroscopy-assisted fixation
- CT-based surgical planning
- 3D-printed implants

These approaches aim to improve precision and functional outcomes.

## Conclusion

Decision-making in distal end radius fractures in the Indian population requires a comprehensive assessment of fracture characteristics, patient factors, and available resources. While conservative management remains a common approach, operative interventions, particularly volar locking plate fixation, have shown promising results in terms of functional outcomes and earlier return to daily activities, especially for displaced and unstable fractures. Percutaneous pinning offers a less invasive surgical option. Ultimately, the optimal treatment strategy should be individualised, involving a shared decision-making process between the patient and the surgeon, aiming to achieve the best possible functional outcome while minimising complications. Further prospective randomized controlled studies, potentially considering the specific socioeconomic and healthcare context of the Indian population, would be valuable to provide higher levels of evidence for guiding treatment decisions fragment-specific fixation and arthroscopic assistance, are refining treatment outcomes.

**Declaration of patient consent :** The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his/her consent for his/her images and other clinical information to be reported in the Journal. The patient understands that his/her name and initials will not be published, and due efforts will be made to conceal his/her identity, but anonymity cannot be guaranteed.

**Conflict of Interest:** None, **Source of Support:** None

## References

1. Shehovych A, Salar O, Meyer C, Ford DJ. Adult distal radius fractures classification systems: essential clinical knowledge or abstract memory testing? Ann R Coll Surg Engl. 2016;98(8):525–531.
2. Kale SY, Ahire P, Altaf W, Shyam A, Sharma G. Beginner's Guide for Management of Distal End Radius Fractures in Adults. Navi Mumbai: DY Patil University; 2024.
3. Colles A. On the fracture of the carpal extremity of the radius. Edinburgh Med Surg J. 1814;10:182–186.
4. Fernandez DL. Fractures of the distal radius: operative treatment. Instr Course Lect. 1993;42:73–88.
5. Melone CP Jr. Articular fractures of the distal radius. Orthop Clin North Am. 1984;15(2):217–236.
6. Rikli DA, Regazzoni P. Internal fixation of distal radius fractures. J Bone Joint Surg Br. 1996;78(4):588–592.
7. Jupiter JB, Fernandez DL. Comparative classification for fractures of the distal end of the radius. J Hand Surg Am. 1997;22(4):563–571.
8. Chung KC, Shauver MJ, Birkmeyer JD. Trends in the United States in the treatment of distal radial fractures in the elderly. J Bone Joint Surg Am. 2009;91(8):1868–1873.
9. Orbay JL, Fernandez DL. Volar fixation for dorsally displaced fractures of the distal radius: a preliminary report. J Hand Surg Am. 2002;27(2):205–215.
10. Arora R, Lutz M, Deml C, Krappinger D, Haug L, Gabl M. A prospective randomized trial comparing nonoperative treatment with volar locking plate fixation for displaced and unstable distal radial fractures in patients ≥65 years. J Bone Joint Surg Am. 2011;93(23):2146–2153.
11. Handoll HHG, Madhok R. Surgical interventions for treating distal radial fractures in adults. Cochrane Database Syst Rev. 2003;(3):CD003209.
12. Diaz-Garcia RJ, Chung KC. Common myths and evidence in the management of distal radius fractures. Hand Clin. 2012;28(2):127–133.
13. Margaliot Z, Haase SC, Kotsis SV, Kim HM, Chung KC. A meta-analysis of outcomes of external fixation versus plate osteosynthesis for unstable distal radius fractures. J Hand Surg Am. 2005;30(6):1185–1199.
14. Wei DH, Raizman NM, Bottino CJ, Jobin CM, Strauch RJ, Rosenwasser MP. Unstable distal radial fractures treated with external fixation, a radial column plate, or a volar plate: a prospective randomized trial. J Bone Joint Surg Am. 2009;91(7):1568–1577.
15. Nellans KW, Kowalski E, Chung KC. The epidemiology of distal radius fractures. Hand Clin. 2012;28(2):113–125.

**How to Cite this Article**

Kale S, Warid A, Sharma G, Shyam A, Ghodke A, Makhija N | Comprehensive Management of Distal End Radius Fractures in Adults: A Clinical Review and Decision-Making Approach | January-June 2026; 12(1): 25-30 | https://doi.org/10.13107/ti.2026.v12.i01.82