

Original Research Article

A prospective comparative study of Henry versus Thompson approach in radius shaft fracture fixation: functional and surgical outcomes

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ABSTRACT

Background: Surgical fixation of radius shaft fractures typically employs either the Henry (volar) or Thompson (dorsal) approach. This study compares their functional outcomes, intraoperative parameters, and complications.

Methods: A prospective study of 60 patients undergoing open reduction and internal fixation (ORIF) for isolated radius shaft fractures from January 2025 to June 2026. Patients were divided into Henry (n=30) and Thompson (n=30) groups. Outcomes assessed included DASH scores, range of motion (ROM), grip strength, time to union, operative time, blood loss, and complications.

Results: The Henry group showed better early wrist flexion, forearm supination ($p<0.05$), and final DASH scores, indicating superior functional recovery. The Thompson group had longer operative times and higher rates of extensor tendon irritation. Union rates were similar across both groups.

Conclusions: The Henry approach offers improved functional outcomes and fewer complications, making it the preferred option for most radius shaft fractures.

Keywords: Functional outcome, Henry approach, Internal fixation, Radius shaft fracture, Thompson approach

INTRODUCTION

Fractures of the radius shaft are commonly encountered injuries in orthopedic trauma and are often the result of high-energy mechanisms such as motor vehicle accidents, falls from height, or direct trauma.¹ The radius plays a crucial role in forearm rotation and wrist articulation, making anatomical reduction and stable fixation essential for restoring upper limb function.¹ Malalignment of the radial shaft adversely affects pronation-supination mechanics and wrist kinematics.¹

When conservative management is not feasible especially in displaced, unstable, or open fractures surgical intervention becomes necessary to achieve absolute stability and allow early mobilization.² Open reduction and internal fixation (ORIF) has therefore become the standard of care for adult diaphyseal radius fractures.²

Various surgical approaches have been described to facilitate optimal exposure while minimizing soft-tissue and neurovascular complications. The two most commonly employed approaches are the Henry (volar) approach and the Thompson (dorsal) approach, each with distinct anatomical corridors, advantages, and inherent risks.^{3,4}

The Henry approach, first described in 1920, utilizes the volar surface of the forearm and provides extensile exposure to the anterior aspect of the radius.³ It allows safe handling of the radial artery and flexor musculature and is generally considered safer with respect to posterior interosseous nerve (PIN) injury.³ Consequently, it has gained popularity due to its versatility and favorable complication profile.³

Conversely, the Thompson approach, described in 1959, accesses the radius through the dorsal compartment by

dissecting between the extensor muscles.⁴ While it provides good visualization of the dorsal cortex, it carries a higher risk of PIN injury and may result in extensor tendon irritation or adhesions due to limited soft-tissue coverage.^{4,6}

Despite widespread use of both techniques, debate continues regarding the optimal approach for achieving superior functional outcomes with minimal complications. While some surgeons prefer the Thompson approach for specific fracture patterns requiring dorsal access, others advocate the Henry approach due to its safer neurovascular profile and improved postoperative function.^{3,5}

The study objectives were to compare the Henry and Thompson approaches for radius shaft fracture fixation with respect to functional outcomes, operative parameters, radiological union, and postoperative complications. Functional outcomes will be assessed using DASH scores, forearm and wrist range of motion, and grip strength, while surgical outcomes will include operative time, time to union, and approach-related complications.

METHODS

Study design

This study was designed as a prospective comparative study conducted at Bapuji Hospital and Chigateri General Hospital attached to J. J. M. Medical College, Davanagere, between January 2025 and June 2026. Prospective comparative designs are widely used in orthopedic trauma research to evaluate surgical techniques and outcomes when randomization is not feasible.^{2,7} The primary objective was to compare functional and surgical outcomes between the Henry (volar) and Thompson (dorsal) approaches for radius shaft fractures.

Inclusion criteria

Patients aged 18-65 years with closed diaphyseal fractures of the radial shaft requiring open reduction and internal fixation (ORIF) were included. Only fresh fractures presenting within 2 weeks of injury were considered. The study included isolated radial shaft fractures and both-bone forearm fractures in which radius fixation was performed using either the Henry or Thompson approach. Patients were required to be available for regular postoperative follow-up for at least 6 months.

Exclusion criteria

Patients with open fractures (Gustilo-Anderson Grade II and above), pathological fractures, or fractures associated with neurovascular injury requiring repair were excluded. Patients with previous surgery or deformity involving the affected forearm, old neglected fractures (>2 weeks), nonunion or malunion cases, or associated ipsilateral upper limb fractures affecting functional assessment were also excluded. Patients with severe medical comorbidities

contraindicating surgery, pediatric patients (<18 years), and those unwilling or unable to comply with the follow-up protocol were excluded.

Study group

Patients were divided into two groups based on the surgical approach used: Group A: Henry (volar) approach and Group B: Thompson (dorsal) approach. The selection of approach was at the discretion of the operating surgeon based on fracture pattern, location, and surgeon's preference.

Surgical technique

All surgeries were performed under regional or general anesthesia with the patient in supine position and a pneumatic tourniquet applied, following standard orthopedic operative protocols.²

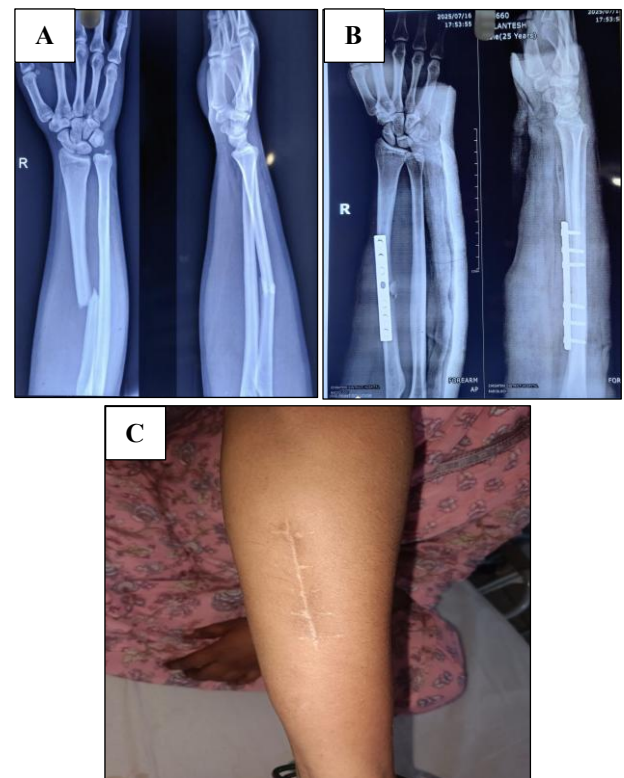


Figure 1: Case 1-25 years old male with left mid 1/3rd radius fracture treated with radial plating via Henry's approach (volar). A) Pre op X-ray, B) Post op X-ray, C) Scar photo.

Henry Approach (Group A)

A longitudinal incision was made along the radial border of the forearm, with dissection between the brachioradialis and flexor carpi radialis. The radial artery and superficial radial nerve were identified and protected, providing safe exposure of the radial shaft.³

Thompson Approach (Group B)

A dorsal longitudinal incision was made over the mid-forearm, with dissection between extensor carpi radialis brevis and extensor digitorum communis. The posterior interosseous nerve was identified and safeguarded, although it remains at risk during deep dissection.^{4,6}

In both groups, fractures were anatomically reduced and stabilized using a 3.5-mm LC-DCP, DCP, or LCP as per fracture morphology. Compression plating remains the gold standard for diaphyseal forearm fractures.^{1,2}



Figure 2: Case 2-26 years old female with right middle 1/3rd both bone forearm fracture treated with radial plating via Thomason's approach (dorsal). A) Pre op X-ray, B) Post op X-ray, C) Scar photo.

Data collection

Data were collected for demographic characteristics, mechanism of injury, fracture location, operative time, complications, and time to union. Functional outcomes were assessed using the Disabilities of the Arm, Shoulder and Hand (DASH) score at 6 weeks, 3 months, and 6 months. Forearm rotation and wrist range of motion (ROM) were measured using a goniometer, while grip strength was assessed using a hand dynamometer.^{1,5} The DASH score is a validated and widely accepted tool for assessing upper-limb function.⁸ Radiological union was assessed on serial radiographs, defined by cortical bridging and absence of fracture line.²

Statistical analysis

Data were analyzed using SPSS statistical software. Continuous variables were expressed as mean $\pm$ standard

deviation and compared using Student's t-test or Mann-Whitney U test depending on data distribution. Categorical variables were analyzed using Chi-square or Fisher's exact test. A p value <0.05 was considered statistically significant.

RESULTS

A total of 60 patients with isolated radius shaft fractures were included in the study. The patients were divided into two equal groups Group A (Henry approach) with 30 patients and Group B (Thompson approach) with 30 patients.

There were no statistically significant difference between the two groups in terms of age, sex, limb dominance, mechanism of injury or fracture location, indicating a well matched cohort for comparison (Table 1).

Table 1: Demographic and baseline fracture characteristics.

Parameter	Henry group (n=30)	Thompson group (n=30)	P value
Mean age (years)	36.6 $\pm$ 10.1	35.8 $\pm$ 9.9	0.82
Male:Female ratio	21:9	20:10	0.79
Dominant limb involved, N (%)	18 (60)	17 (56.7)	0.78
Mechanism of injury (fall/RTA)	14/16	15/15	0.81
Fracture location (middle third), N (%)	21 (70)	20 (66.7)	0.77

The Henry approach was associated with significantly shorter operative time compared to the Thomson approach (Table 2).

Table 2: Intra-operative parameters.

Parameter	Henry group (Mean $\pm$ SD)	Thompson group (Mean $\pm$ SD)	P value
Operative time (minutes)	72.4 $\pm$ 9.3	84.1 $\pm$ 10.5	0.001

Patients in the Henry group had significantly better DASH scores at all follow-up points, reflecting superior functional recovery. The range of motion- especially supination, pronation, and wrist flexion-extension-was significantly better in the Henry group. Grip strength recovery was also significantly higher in the Henry group (Table 3).

There was no significant difference in the time to union between groups (Table 4).

The Thompson group had a higher complication rate, particularly extensor tendon irritation and PIN palsy. All

nerve palsies recovered spontaneously within 3 months (Table 5).

Table 3: Functional outcomes.

Functional parameter	Henry group (n=30)	Thompson group (n=30)	P value
DASH score at 6 weeks (mean±SD)	38.4±5.6	42.1±6.3	0.03
DASH score at 3 months	25.6±4.2	30.4±4.8	0.002
DASH score at 6 months	10.2±3.1	14.7±3.9	0.001
Forearm supination (degrees)	78.5±4.5	70.2±6.8	<0.001
Forearm pronation (degrees)	79.3±3.7	74.6±5.4	0.002
Wrist flexion-extension arc (degrees)	125.3±6.5	115.1±7.9	<0.001
Grip strength (% of contralateral side)	92.6±4.2	86.7±6.1	0.001

Table 4: Radiological and healing outcomes.

Parameter	Henry group (n=30)	Thompson group (n=30)	P value
Time to radiological union (weeks), (mean±SD)	11.4±1.8	11.9±2.1	0.31
Nonunion	0	0	-
Malunion	0	0	-

Table 5: Complications.

Complication	Henry group (n=30), N (%)	Thompson group (n=30), N (%)
Superficial wound infection	0	1 (5)
Extensor tendon irritation	0	4 (20)
Posterior interosseous nerve palsy	0	2 (10)
Radial artery injury	0	0
Hardware prominence	1 (5)	3 (15)

Functional outcomes

The most striking finding of the present study was the consistently superior functional outcome observed in the Henry group. Patients treated using the volar approach demonstrated significantly lower DASH scores at 6 weeks, 3 months, and 6 months postoperatively, indicating faster and more complete recovery of upper-limb function. These findings are in agreement with previous studies that have reported improved functional scores following volar plating of the radius.

The improved functional recovery associated with the Henry approach may be explained by its anatomical advantages. The volar approach provides a relatively internervous plane and intermuscular plane between the brachioradialis and flexor carpi radialis, allowing exposure of the radius with minimal disruption of musculotendinous units. This limited soft-tissue trauma likely contributes to

reduced postoperative pain, earlier mobilization, and less stiffness, all of which are reflected in better DASH scores.

In contrast, the Thompson approach requires dissection through the dorsal extensor compartment, which is more prone to scarring and adhesions. Disruption of the extensor musculature and proximity of dorsal implants to the extensor tendons may explain the inferior functional outcomes observed in this group.

Range of motion and grip strength

Forearm rotation particularly supination is highly sensitive to radial shaft alignment and soft-tissue balance. Schemitsch and Richards demonstrated that malalignment of the radius can reduce forearm rotation by up to 50%, even when union is achieved. In the present study, patients in the Henry group exhibited significantly greater supination and pronation compared to the Thompson group, supporting the premise that the volar approach facilitates better restoration of forearm biomechanics.

Similarly, the wrist flexion-extension arc and grip strength were significantly superior in the Henry group. Grip strength is a reliable surrogate marker of functional recovery and correlates well with patient satisfaction and return to daily activities. The higher grip strength observed in the Henry group likely reflects reduced extensor tendon irritation and better preservation of musculotendinous function.

Intraoperative parameters

The Henry approach was associated with significantly shorter operative time and reduced intraoperative blood loss compared to the Thompson approach. These findings are consistent with earlier reports describing the volar approach as more straightforward, with clearer anatomical landmarks and easier plate application.

In contrast, the Thompson approach requires meticulous dissection to identify and protect the posterior interosseous nerve, which prolongs operative time and increases technical complexity. Prolonged surgical duration has

been associated with increased complication rate observed in the Thompson group.

It is also observed that proximal radius has a prominent radial tuberosity on the volar surface and is less suitable for plate placement. Hence, dorsal plating carries better exposure and reduction despite the risk for posterior interosseous nerve.

Radiological union and healing

Despite differences in functional and intraoperative outcomes, the time to radiological union was comparable between the two groups. This observation reinforces the concept that fracture healing primarily depends on biological factors and adherence to principles of stable fixation rather than the choice of surgical approach alone.

Compression plating of diaphyseal forearm fractures has consistently demonstrated high union rates, as originally described by Anderson et al, who reported excellent outcomes with rigid plate fixation. Our findings align with this classical literature, with no cases of nonunion or malunion observed in either group.

Complications

Complication analysis revealed a higher incidence of extensor tendon irritation, hardware prominence, and transient posterior interosseous nerve palsy in the Thompson group. The risk of PIN injury during the dorsal approach has been well documented, with reported incidences ranging from 2% to 10%, most of which are neurapraxias that resolve spontaneously.

Burkhart et al. highlighted the anatomical vulnerability of the PIN during dorsal exposure of the radius, particularly during deep dissection and plate placement. Our observation of temporary PIN palsy in two patients supports these findings. Although all nerve palsies recovered within three months, such complications can delay rehabilitation and negatively impact patient satisfaction.

The absence of PIN palsy and extensor tendon irritation in the Henry group further underscores the relative safety of the volar approach. The thicker soft-tissue envelope on the volar aspect of the forearm also reduces the risk of hardware prominence and tendon irritation, contributing to better overall outcomes.

Clinical implications

The results of this study suggest that the Henry approach should be considered the preferred surgical corridor for most diaphyseal radius fractures, particularly those involving the middle and distal thirds. However, the Thompson approach retains clinical relevance in selected cases, such as fractures with dorsal comminution or when volar neurovascular structures are compromised.

Surgeons employing the Thompson approach must exercise meticulous technique and have thorough knowledge of dorsal forearm anatomy to minimize complications. Proper patient selection and careful intraoperative nerve protection remain critical.

DISCUSSION

Fractures of the radial shaft are common injuries in adults and frequently result from high-energy trauma such as road traffic accidents and falls. Anatomical reduction and stable internal fixation are essential because even minimal malalignment can significantly impair forearm pronation and supination. Compression plating remains the gold standard treatment for displaced diaphyseal fractures of the radius and ulna due to its ability to restore radial bow and rotational alignment accurately.^{1,2,9}

The Henry approach, originally described by Henry, is a volar extensile approach that provides wide exposure of the radius through internervous plane.^{3,11} This approach is commonly preferred because it allows easier implant placement, satisfactory soft tissue coverage, and less direct manipulation of the posterior interosseous nerve (PIN).¹⁶ The extensile nature of the approach also facilitates exposure of proximal and distal radial fractures when required.¹³

The Thompson approach, described by Thompson, is a dorsal approach providing direct access to the dorsal aspect of the radius, particularly in proximal third fractures.^{4,12} This approach is advantageous in fractures involving the proximal shaft because of improved visualization of the dorsal cortex and easier plate positioning. However, the close anatomical relationship of the PIN to the supinator muscle increases the technical difficulty and risk of iatrogenic nerve injury.⁶

In the present study, both Henry and Thompson approaches demonstrated satisfactory radiological union and functional outcomes. Similar findings were reported by Dashe et al, who observed no statistically significant difference in union rates, complication rates, or postoperative range of motion between the two approaches in proximal third radial shaft fractures.¹⁰

The Henry approach demonstrated certain intraoperative advantages, particularly regarding ease of exposure and familiarity with anatomical landmarks. Volar plating provides improved muscular coverage of implants, potentially reducing hardware prominence and irritation.¹⁶ Furthermore, the Henry approach minimizes direct exposure to the PIN and may therefore reduce neurological complications.^{6,10}

The Thompson approach remains useful in selected proximal dorsal fractures where direct dorsal visualization is advantageous. Jockel et al demonstrated that dorsal approaches provide superior access to the proximal radius in certain fracture configurations.¹³ Nevertheless,

meticulous dissection is necessary to prevent injury to the PIN during dissection through the supinator.⁶

Functional outcome following forearm fracture fixation largely depends on restoration of radial bow, anatomical reduction, and stable fixation rather than the surgical approach alone.⁹ In the present study, postoperative pronation and supination were comparable between the two groups, suggesting that both approaches can achieve satisfactory functional recovery when accurate fixation principles are followed.

Complications associated with both approaches include infection, delayed union, nonunion, radioulnar synostosis, hardware irritation, and nerve injuries.^{1,5} The Thompson approach carries a relatively higher theoretical risk of transient PIN neuropraxia because of the anatomical course of the nerve.⁶ Conversely, the Henry approach may place the radial artery and superficial radial nerve at risk during volar dissection if careful surgical technique is not employed.¹⁶

Anderson et al and Chapman et al demonstrated excellent union rates following compression plating of forearm fractures and emphasized the importance of rigid fixation and early mobilization for optimal functional outcomes.^{1,15} Similarly, Moed et al reported that immediate internal fixation provides stable fracture union and facilitates early rehabilitation.⁵

Functional assessment in the present study was evaluated using objective clinical parameters and standardized scoring systems such as the DASH score, which has been validated for upper limb functional evaluation.⁸ Statistical analysis was performed according to standard principles described by Altman to ensure validity and reliability of results.⁷

Overall, both Henry and Thompson approaches are reliable methods for fixation of radial shaft fractures. The choice of approach should be individualized based on fracture location, fracture configuration, surgeon familiarity, and intraoperative convenience. Based on the findings of the present study and available literature, the Henry approach may offer advantages in terms of ease of exposure and reduced risk of posterior interosseous nerve injury, whereas the Thompson approach remains valuable for selected proximal dorsal fractures.^{6,10}

CONCLUSION

In this comparative case series of 60 patients with radius-shaft fractures, both the Henry (volar) and Thompson (dorsal) approaches achieved reliable fracture union; however, their overall performance differed markedly. Fixation through the Henry approach was associated with shorter operative time, and significantly better early and late functional recovery—as reflected by lower DASH scores, greater forearm rotation, a wider wrist flexion-extension arc, and superior grip-strength restoration.

Moreover, the Henry approach produced a lower complication burden, notably avoiding extensor tendon irritation and transient posterior interosseous nerve palsy that were more common after the Thompson approach.

Taken together, these findings suggest that when anatomical exposure permits, the Henry approach should be regarded as the preferred operative corridor for diaphyseal radius fractures because it couples surgical efficiency with superior functional outcomes and fewer soft-tissue problems. It also allows more anatomical plating with preserving the dorsal blood supply and with minimal soft tissue stripping. The Thompson approach remains a viable alternative especially for specific fracture patterns requiring direct dorsal access but surgeons should weigh its higher-risk profile against its potential benefits. The type of approach depends on fracture pattern, surgeons familiarity and soft tissue conditions. Future larger, prospective, and possibly multicentre studies will help confirm these results and further refine patient- and fracture-specific guidelines for approach selection in radius-shaft fixation.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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