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Original Research Article

Comparison of functional outcomes of scaphoid fractures treated by open reduction internal fixation versus percutaneous fixation: a retrospective study from a tertiary care center in South India

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Conflict of interest: Nil

Abstract:

Background: Scaphoid fractures are common carpal injuries with a high propensity for nonunion and long-term functional impairment. Surgical fixation using open reduction internal fixation (ORIF) or percutaneous fixation is widely employed, yet the optimal approach remains debated.

Objectives: To compare functional outcomes of scaphoid fractures treated with ORIF versus percutaneous fixation.

Methods: This retrospective comparative study was conducted at the NRI Institute of Medical Sciences, Sangivalasa, Visakhapatnam. Records of 30 patients treated surgically over two years were reviewed. Functional outcomes, union rates, and complications were analyzed.

Results: Both techniques achieved satisfactory union. Percutaneous fixation allowed earlier functional recovery, whereas ORIF was effective for displaced fractures. Final functional outcomes were comparable.

Conclusions: Both techniques are effective, surgical approach should be individualized based on fracture characteristics.

Keywords: Scaphoid fracture · ORIF · Percutaneous fixation · Functional outcome · Retrospective study.

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Introduction

Scaphoid fractures represent the most frequently encountered carpal bone fractures, accounting for nearly two-thirds of all carpal injuries. They predominantly affect young, active individuals and commonly result from a fall on an outstretched hand with the wrist in dorsiflexion [1]. Despite their frequency, scaphoid fractures pose significant diagnostic and therapeutic challenges due to the bone's unique anatomy, biomechanical role, and precarious vascular supply.

The scaphoid plays a critical role in carpal stability and wrist kinematics, acting as a mechanical link between the proximal and distal carpal rows. Its blood supply is predominantly retrograde, entering distally and supplying the proximal pole last, rendering the bone particularly susceptible to delayed union, nonunion, and avascular necrosis—especially in proximal pole fractures [2]. Failure to achieve timely union can result in chronic pain, loss of wrist function, carpal instability, and progressive degenerative arthritis known as scaphoid nonunion advanced collapse (SNAC) wrist [3].

Management strategies for scaphoid fractures depend on fracture location, displacement, stability, and patient-related factors. While nondisplaced fractures may be treated conservatively, unstable or displaced fractures increasingly warrant surgical intervention to ensure reliable union and early functional recovery [4]. Surgical fixation has been shown to reduce immobilization time, facilitate early return to work, and lower the risk of nonunion compared with prolonged casting in selected patients [5].

Open reduction internal fixation (ORIF) has long been considered the gold standard for displaced scaphoid fractures. The technique enables direct visualization of the fracture site, accurate anatomical reduction, and rigid fixation using

headless compression screws [6]. However, ORIF is not without drawbacks. Surgical exposure may disrupt surrounding soft tissues and compromise the scaphoid's already tenuous blood supply, potentially increasing the risk of postoperative stiffness, scarring, and vascular insult [7].

Percutaneous fixation has emerged as a minimally invasive alternative, particularly for acute nondisplaced or minimally displaced fractures. This technique preserves soft tissue integrity, minimizes vascular disruption, and reduces operative morbidity [8]. Several studies have demonstrated that percutaneous fixation allows shorter operative times, reduced hospital stays, and earlier mobilization while achieving union rates comparable to ORIF [9].

Despite the availability of these surgical options, considerable debate persists regarding the optimal approach for scaphoid fracture fixation. Factors such as fracture pattern, displacement, surgeon experience, imaging availability, and institutional resources often influence treatment decisions [10]. Furthermore, outcomes reported in the literature vary, and comparative data from Indian tertiary care centers remain limited.

In the Indian context, delayed presentation, variable access to advanced imaging, and high patient activity levels further complicate management decisions. Real-world evidence comparing ORIF and percutaneous fixation in such settings is essential to guide clinical practice and optimize patient outcomes. Therefore, this retrospective study was undertaken to compare the functional outcomes of scaphoid fractures treated with ORIF versus percutaneous fixation at a tertiary care institution in South India.

Materials and methods

Study design and setting: This retrospective comparative study was conducted at the NRI Institute of Medical Sciences, Sangivalasa, Visakhapatnam.

Study population: Medical records of 30 adult patients with acute scaphoid fractures treated surgically over a two-year period were reviewed. Patients were divided into two groups based on the surgical technique used: ORIF and percutaneous fixation.

Inclusion and exclusion criteria: Included were patients with acute scaphoid fractures who underwent surgical fixation and had a minimum follow-up of 6 months. Patients with pathological fractures, previous wrist surgery, or incomplete records were excluded.

Outcome measures: Functional outcomes were assessed using wrist range of motion, grip strength, pain scores, and time to fracture union. Radiological union was evaluated using serial radiographs.

Statistical Analysis: Descriptive statistics were used. Continuous variables were expressed as mean ± standard deviation, and categorical variables as percentages.

Results and Discussion

This retrospective study demonstrates that both ORIF and percutaneous fixation are effective techniques for the surgical management of scaphoid fractures, with comparable union rates and satisfactory functional outcomes. These findings are consistent with previous reports in the literature [10–13].

Percutaneous fixation was associated with reduced operative morbidity, shorter operative time, and earlier functional recovery, supporting its role in nondisplaced or minimally displaced fractures [14–16]. Conversely, ORIF provided reliable outcomes in displaced fractures where anatomical reduction was essential [17].

Several studies have emphasized that fracture characteristics rather than fixation technique alone determine outcomes [18–20]. Recent systematic reviews and meta-analyses have also suggested equivalent long-term functional outcomes between minimally invasive and open techniques when appropriately indicated [21–23].

Current expert recommendations and clinical practice guidelines emphasize individualized decision-making based on fracture morphology, stability, and surgeon expertise [24,25]. The findings of this study align with these recommendations and support a tailored approach to scaphoid fracture management.

Limitations: The retrospective design, small sample size, and short follow-up limit the generalizability of the findings. Patient-reported outcome measures were not uniformly available.

Conclusions

Both ORIF and percutaneous fixation yield satisfactory functional outcomes in scaphoid fractures. Percutaneous fixation offers advantages in selected cases, while ORIF remains indispensable for displaced fractures requiring direct reduction.

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