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Original Research Article

Comparative Outcomes of Conservative vs Surgical Management of Acute Scaphoid Fractures

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Abstract:

Background: Scaphoid fractures are difficult to treat because of the unique anatomical and biomechanical characteristics of the bone. Avascular necrosis, post-traumatic arthritis, and significant non-union rates are caused by challenges with early diagnosis and treatment. There is still disagreement on the best course of action for treating these fractures, especially when it comes to conservative vs surgical approaches.

Aim: This research sought to evaluate the outcomes of conservative and operative treatments for acute scaphoid fractures, emphasizing healing rates, complications, and functional recovery.

Methodology: A prospective cohort study was performed at Adesh Medical College and Hospital in Haryana, India, involving 37 patients with acute scaphoid fractures. Patients were categorized into two groups: conservative treatment involving cast immobilization and operative treatment involving surgical fixation. The research evaluated union rates, complications, and functional outcomes through the application of the Mayo-Wrist Score.

Result: The research indicated that 80% of patients in the conservative group attained union, while 20% encountered non-union. Conversely, all patients in the operative group attained union. The operative group demonstrated superior functional outcomes, with 75% attaining good to excellent results, in contrast to 64% in the conservative group.

Conclusion: Operative treatment, particularly for displaced or unstable fractures, showed higher union rates and improved functional recovery. Conservative treatment is effective for non-displaced fractures; however, it presents an increased risk of non-union and suboptimal outcomes in cases of displaced fractures. Early surgical intervention is advisable for these cases.

Keywords: Conservative Treatment, Functional Recovery, Operative Treatment, Scaphoid Fracture, Union Rates.

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Introduction

The specific biomechanical and anatomical features of the scaphoid bone make scaphoid fractures extremely difficult to treat. It is challenging to detect and treat this tiny, twisted bone since it is 80% cartilage-covered and positioned at a 45° angle in the sagittal and coronal planes within the wrist [1]. The diagnostic difficulties of scaphoid fractures are a major obstacle to their management. It is common for the first set of radiographs taken after an accident, as well as the early clinical evaluations, to fail to detect scaphoid fractures [2]. This, in turn, results in a delayed diagnosis, which further complicates the process of therapy [1]. The Second-line examinations, such as MRIs or CT scans, are still up for discussion, as various clinics and doctors have different preferences [3].

After a scaphoid fracture has been identified, another major challenge arises in terms of treatment. With each strategy having its own set of benefits and drawbacks, the debate over whether to choose conservative or surgical therapy continues [4]. When it comes to conservative therapy, experts disagree on the best way to immobilize the patient (neutral, ulnar deviation, thumb-spica cast, interphalangeal joint-free or included, long-arm vs. short-arm casts, etc.) [2]. In addition, the avascular necrosis (AVN), non-union, and post-traumatic arthritis (PTSD) that can develop after a scaphoid fracture are all known to have their roots in the bone's complicated blood supply, its location in the body, and its unique structure [5]. Similar to the management of these difficulties, the management of these complications is filled with

misunderstanding and varied perspectives regarding the most effective method [6].

Acute scaphoid fractures present a clinical conundrum regarding optimal management strategies, with treatment options broadly categorized into conservative (cast immobilization) and operative (surgical fixation) approaches. Conservative treatment is typically reserved for non-displaced fractures, with cast immobilization being effective in promoting healing. Studies suggest that for non- and minimally displaced fractures (up to 2mm) of the scaphoid waist, cast immobilization is as effective as immediate surgical fixation and results in fewer complications [7]. However, operative intervention is often recommended for displaced fractures or those with compromised blood supply, as these scenarios are associated with higher non-union rates [8]. In acute fractures, surgical techniques such as percutaneous screw fixation have been demonstrated to yield union rates of over 90% [9]. The decision regarding conservative versus operative management must be tailored to the individual, taking into account factors such as fracture displacement, blood supply integrity, patient activity level, and the risk of complications [10]. Recent randomized trials have yielded comparative data, indicating that conservative treatment may be adequate for non-displaced fractures, whereas operative fixation presents benefits regarding healing time and functional outcomes for displaced fractures. A comprehensive evaluation by an orthopedic specialist is crucial for customizing the treatment plan to the individual patient's needs.

This paper aims to address these challenges by exploring scaphoid fractures in greater detail and contributing to the ongoing discourse surrounding their management.

Methodology

Study Design: This prospective cohort study evaluated the outcomes of conservative and operative treatments for acute scaphoid fractures. This study aimed to evaluate the healing rates, complications, and functional outcomes associated with two treatment modalities in patients with acute scaphoid fractures.

Study Area: The research was carried out at the Department of Orthopaedics, Adesh Medical College and Hospital, Haryana, India for one year. The hospital functions as a referral center for trauma and orthopedic cases, receiving numerous scaphoid fracture cases from diverse regions.

Sample Size: A total of 37 patients with acute scaphoid fractures were included in the study, with 28 males (76%) and 9 females (24%). The patients were divided into two treatment groups: 25 received conservative treatment and 12 underwent operative treatment.

Sample Collection: The sample comprised patients diagnosed with acute scaphoid fractures within six weeks of injury, who received either conservative or surgical treatment. Data were collected from patients, emphasizing demographics (age, gender), fracture characteristics (location, type), treatment modality, healing duration, complications, and functional outcomes (e.g., grip strength, wrist function).

Inclusion Criteria

- **Acute Scaphoid Fracture**: Patients with a confirmed diagnosis of an acute scaphoid fracture, either displaced or non-displaced, within 6 weeks of the injury.
- **Treatment Modality**: Patients who were treated either conservatively (e.g., cast immobilization) or operatively (e.g., open reduction and internal fixation).
- **Complete Data**: Patients with complete clinical, radiological, and follow-up data available for the study.

Exclusion Criteria

- **Fractures Older than 6 Weeks**: Patients with scaphoid fractures older than 6 weeks were excluded, as the acute healing phase had passed.
- **Other Concurrent Injuries**: Patients with other traumatic injuries that might interfere with the management of the scaphoid fracture.
- **Inadequate Follow-Up**: Patients who did not complete the required follow-up visits or whose follow-up data were incomplete were excluded.

Procedure

The research included a comprehensive analysis of patient records, radiographs, and follow-up data for individuals who had been diagnosed with acute scaphoid fractures. Patients were categorized into two treatment groups according to the treating physician's decision: conservative treatment (e.g., cast immobilization) or operative treatment (e.g., surgical fixation). Data points were collected, encompassing fracture type, location, treatment modality, complications, time to union, and functional outcomes as assessed by standardized wrist function scores. The research analyzed the influence of variables including age, gender, and fracture displacement on treatment outcomes. Complications including non-union, delayed union, and infection were specifically emphasized in the operative group. Outcomes were analyzed between the conservative and operative treatment groups through the application of descriptive and inferential statistical methods.

Statistical Analysis: For continuous variables, the data were shown as means with standard deviation. For categorical variables, the data were given as percentages. For categorical data, we utilized the Chi-square test, and for continuous variables, we utilized the student’s t-test to evaluate differences between

treatment groups. Results showed a statistically significant difference between the groups treated conservatively and those treated surgically (p-value < 0.05).

Result

This research examines the management of acute scaphoid fractures, evaluating both conservative and operative treatment approaches. In a study of 37 acute scaphoid fracture cases observed for one year, outcomes were analyzed based on different treatment types.

Table 1 illustrates the distribution of gender and side preference within a cohort of 37 individuals. Among the total, 28 individuals (76%) are male, while 9 individuals (24%) are female. Of the male participants, 15 (40%) exhibit a preference for the right side, whereas 13 (35%) favor the left side. Among females, 6 (16%) exhibit a preference for the right side, while 3 (8%) favor the left side. A total of 21 individuals (57%) exhibit a preference for the right side, while 16 individuals (43%) prefer the left side.

Table 1: Gender and Side Distribution

Gender	Right	Left	Total
Male	15 (40%)	13 (35%)	28 (76%)
Female	6 (16%)	3 (8%)	9 (24%)
Total	**21 (57%)**	**16 (43%)**	**37**

Table 2 presents the distribution of the Herbert Classification by gender within a cohort of 37 individuals. Among the total, there are 28 males and 9 females. The Herbert Classification includes four individuals in the A1 category, all of whom are male. The A2 category comprises 2 males and 2 females, resulting in a total of 4 individuals. The B1 category consists of 5 males and 4 females, totaling 9 individuals. The B2 category comprises 11 individuals, consisting of 10 males and 1 female. The B3 category comprises 4 males and 2 females, totaling 6 individuals. The B4 category comprises three males and no females, resulting in a total of three individuals. The distribution of Herbert Classification by gender indicates a greater prevalence of males in the majority of categories.

Table 2: Herbert Classification Distribution by Gender

Herbert Classification	Male	Female	Total
A1	4	0	4
A2	2	2	4
B1	5	4	9
B2	10	1	11
B3	4	2	6
B4	3	0	3
Total	**28**	**9**	**37**

Table 3 displays the functional outcomes categorized by treatment type, assessed using the Mayo Wrist Score, in a cohort of 37 individuals. Of the total, 25 individuals received conservative treatment, while 12 underwent operative treatment. In the group receiving conservative treatment, 7 individuals (28%) experienced a poor outcome, 2 individuals (8%) had a fair outcome, 10 individuals (40%) achieved a good outcome, and 6 individuals (24%) attained an excellent outcome. In the operative treatment group, 1 (8%) experienced a poor outcome, 2 (17%) had a fair outcome, 4 (33%) achieved a good outcome, and 5 (42%) attained an excellent outcome. In summary, 22% of individuals experienced a poor outcome, 11% a fair outcome, 38% a good outcome, and 30% an excellent outcome. The data demonstrates that a greater percentage of individuals undergoing operative treatment attained superior outcomes relative to those receiving conservative treatment.

Table 3: Functional Outcomes Based on Treatment Type (Mayo Wrist Score)

Outcome	Conservative	Operative	Total
Poor	7 (28%)	1 (8%)	8 (22%)
Fair	2 (8%)	2 (17%)	4 (11%)
Good	10 (40%)	4 (33%)	14 (38%)
Excellent	6 (24%)	5 (42%)	11 (30%)
Total	**25**	**12**	**37**

Table 4 illustrates the distribution of union and non-union outcomes according to the treatment type administered to a cohort of 37 individuals. Among the 25 individuals undergoing conservative

treatment, 20 (80%) attained union, whereas 5 (20%) encountered non-union. In the cohort undergoing operative treatment, all 12 individuals (100%) attained union, with no cases of non-union reported. A total of 32 individuals (86%) achieved union, while 5 individuals (14%) experienced non-union. The data indicates that operative treatment achieved a union rate of 100%, whereas conservative treatment yielded a union rate of 80%.

Table 4: Union vs Non-Union Based on Treatment Type

Treatment	**Union**	**Non-Union**	**Total**
Conservative	20 (80%)	5 (20%)	25
Operative	12 (100%)	0 (0%)	12
Total	**32**	**5**	**37**

Discussion

Acute scaphoid fractures can result in non-union, which can cause permanent impairment, making them a serious clinical issue. Based on 37 patients seen over a two-year period, this study offers important insights into the importance of conservative vs. surgical therapy for acute scaphoid fractures. According to the study's findings, there are significant variations in the success rates of different treatment approaches, with operational therapy exhibiting better outcomes in terms of functional recovery and union rates.

A conservative approach using splinting or casting was used to treat 25 individuals in this research. While 80% of these patients were able to get union status, 20% did not. The Mayo Wrist Score showed that, in contrast to the surgery group, 28% of patients treated conservatively had poor results, with scores below 65. According to these results, conservative therapy may be useful, but it also entails a greater risk of non-union, particularly when dealing with unstable or displaced fractures. The prevailing consensus is that conservative therapy is better suited for non-displaced fractures, while non-union and malunion are more likely to occur for displaced fractures. Conservative therapy often fails due to delayed diagnosis and poor initial alignment, making it a less dependable alternative.

Twelve patients in this research, on the other hand, had surgical treatment utilizing percutaneous fixation methods such K-wires or Herbert screws, or open reduction and internal fixation (ORIF). According to the Mayo Wrist Score, 75% of patients had satisfactory to excellent outcomes, and the surgical group showed 100% union. Compared to the conservative therapy group, where only 64% of patients had comparable results, this outcome is noticeably superior. These results further support the benefits of surgical intervention, which stabilizes fractures, speeds up healing, and lowers the chance of non-union, particularly for displaced or unstable fractures. The operational group's 100% union rate highlights how well surgical fixation works to avoid non-union and delayed healing, two issues that are frequently seen with conservative therapy.

The study's conclusions are consistent with those of prior studies on the subject. For instance, when Modi CS et al. (2009) [11] compared conservative and surgical therapy for acute scaphoid fractures, they discovered that the former resulted in a quicker union and a superior functional recovery, especially for fractures that were displaced or discovered after the fact. Similar findings were made by Hannemann PF, et al. (2014) [12] in their systematic analysis, which noted that conservative therapy may still be useful for non-displaced fractures but found that operational treatment produced superior results, particularly for displaced fractures. Doornberg JN et al. (2011) [13] observed that non-operative treatment led to an increased incidence of non-union, whereas surgical fixation correlated with improved outcomes. Reigstad O, et al. (2015) [14] demonstrated that early surgical intervention markedly decreased the risk of non-union and enhanced long-term functional outcomes.

Conservative care is still an option for certain fractures, even with the encouraging outcomes of surgical treatment. For non-displaced fractures, it is often preferable, less expensive, and non-invasive—especially if detected early. Nonetheless, when there is any uncertainty regarding fracture stability or when conservative measures are unable to provide sufficient stabilization, surgical intervention should be taken into consideration due to the increased risk of non-union and worse functional outcomes in conservative management, especially in displaced fractures.

This study possesses notable strengths, including a direct comparison of conservative and operative treatments for acute scaphoid fractures, supported by clear data on union rates and functional outcomes. Nonetheless, it possesses certain limitations. The sample size of 37 cases is limited, and the follow-up period of 12 months may be insufficient for assessing long-term outcomes. The study fails to consider the precise timing of fracture diagnosis, which may affect outcomes, particularly in conservative treatment, where delayed diagnosis is recognized as a risk factor for non-union. Additionally, a broader range of surgical techniques could have

been investigated, as various fixation methods may produce differing outcomes.

Conclusion

This study demonstrates that operative treatment for acute scaphoid fractures, particularly in cases of displacement or instability, results in higher union rates and improved functional recovery. Conservative treatment may be effective for non-displaced fractures; however, it poses a considerable risk of non-union and suboptimal functional outcomes, especially in cases of displaced fractures or late diagnoses. The complete union rate and 75% favorable outcomes in the operative group highlight the advantages of surgical fixation in achieving fracture stabilization and facilitating expedited recovery. Due to the increased risk of complications associated with conservative management, early surgical intervention is advisable for displaced fractures. This study emphasizes the necessity for personalized treatment approaches and additional research to enhance management protocols for scaphoid fractures.

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