

Comparative Functional Outcomes of Cast Immobilization Versus Herbert Screw Fixation in Scaphoid Fractures: A Prospective Study

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Abstract: *This prospective study compared functional outcomes of cast immobilization and Herbert screw fixation in scaphoid fractures. Forty patients were enrolled between July 2023 and December 2024 and assessed using the Modified Mayo Wrist Score. Patients were randomized into casting and operative fixation groups. Outcomes measured included pain, range of motion, grip strength, and complications at 6 weeks and 3 months. The Herbert screw group demonstrated better early pain relief, improved range of motion, and fewer complications compared to the cast group. These findings suggest that surgical fixation offers faster functional recovery, although both methods remain viable depending on patient and fracture characteristics.*

Keywords: Scaphoid fracture, Herbert screw fixation, Cast immobilization, Functional outcome, Wrist biomechanics, Prospective study

1. Introduction

Scaphoid fracture is the most commonly fractured carpal bone which accounts for approximately 82- 89% of all carpal fracture.¹

The blood supply of the scaphoid is primarily from the radial artery; the dorsal carpal branch supplies proximal 80% of scaphoid via retrograde blood flow while the superficial palmar arch supplies the distal 20%. The proximal pole therefore, is dependent entirely on intraosseous blood flow. Avascular necrosis is said to occur in 15% to 60% of cases of fracture of the scaphoid leading to altered carpal biomechanics with symptoms of pain, decreased range of motion of the wrist, weakness in grip, and arthritis. The management option for patients with acute scaphoid fracture or with delayed union vary from open surgical technique to percutaneous fixation technique that reliably hasten fracture healing and return to work relative to traditional cast treatment.^{2,3}

Scaphoid fractures often do not appear on the initial X-rays and often may take 2 weeks to become visible on X-ray. MRI can diagnose a scaphoid fracture within 24 hours. The primary method of treatment is cast immobilization for undisplaced or minimally displaced scaphoid fractures, which is usually effective and yields healing rates of 90% to 100%. The degree and kind of immobility, however, can differ. The type of cast is heavily influenced by the joints that require immobilization. An issue that arises from the use of forearm casts concerns the position in which the wrist is immobilized - flexion or slight extension. Treatment options are:^{4,5,6}

- forearm cast including the thumb (scaphoid cast)
- an above elbow cast excluding the thumb
- an above elbow cast including the thumb

McLaughlin, Maudsley, and Chen advised open reduction and internal fixation of acute scaphoid fractures utilizing a compression lag screw to enable early wrist movement. Since its initial description by Herbert and Fischer in 1984, the Herbert screw has gained widespread acceptance as a therapeutic approach.^{7,8}

2. Material and Method

This study was a prospective analysis of patients presenting with wrist pain and or swelling in the wrist, diagnosed with scaphoid fracture. This study was initiated after clearance from the Institutional Ethical Committee (IEC). A total of 40 patients above fifteen years of age presenting with radiologically diagnosed isolated scaphoid fracture in the Orthopaedic out-patient department between July 2023 and December 2024 were included in the study after a written informed consent. Clinical assessment along with special test such as (1) anatomical snuff box tenderness, (2) Watson test, were performed to clinically confirm the diagnosis of scaphoid fracture after which radiographs including AP, lateral, and scaphoid views were recorded at the time of visit in the out-patient department.



Figure: Scaphoid fracture seen on wrist radiograph - AP view

Patient selection for the respective line of management was done by computer randomization. 20 patients were managed with closed reduction and casting while the other 20 patients underwent operative management- closed/open reduction internal fixation with Herbert screw, after taking proper written informed consent. Descriptive statistics were calculated for all variables, including means, standard deviations, medians, and ranges for continuous data, and frequencies and percentages for categorical data. Continuous variables were expressed as means \pm standard deviations, while categorical variables were presented as frequencies and percentages. Statistical significance was set at $p < 0.05$. Patients underwent systematic follow-up evaluations at predetermined intervals (6 weeks and 3 months)

Inclusion/ Exclusion Criteria

Inclusion/exclusion criteria were set to identify a specific study population. Patients were selected based on the following inclusion criteria: (1) patients above fifteen years of age, (2) patients with isolated scaphoid fractures, (3) patients willing to take part in the study and give consent for operative management. Studies were eliminated based on the following exclusion criteria: (1) patients less than the age required for the study, (2) patients with compound fractures, (3) patients not willing to take part in the study or to give consent for operative management. If studies included additional data on patients, chronic fractures, non-unions, malunions, data was stratified to only include data that met the inclusion/ exclusion criteria.

Data Extraction and Statistical Analysis

Data were extracted by members of the study team and subsequently reviewed to ensure data accuracy. Articles were reviewed for patient and treatment-related variables. Patient-related variables included patient age and fracture morphology (i.e., displaced, proximal / middle / distal third fracture). Treatment-related variables included the specifics of treatment provided (i.e., surgical vs nonsurgical, type and duration of immobilization). Clinical outcomes evaluated included post treatment wrist symptoms related to wrist pain, range of motion and grip strength, using the Myo modified wrist score.

Category	Points
Pain (25 points)	
None	25
Mild occasional	20
Moderate (with normal use, not at rest)	10
Severe, constant	0
Range of motion (25 points): flexion-extension (degrees)	
>140	25
100-140	20
70-99	15
40-69	10
<40	0
Grip strength (25 points)	
Normal	25
Diminished but >50% of normal	15
Less than 50% of normal	0
Activity (25 points)	
Same activities	25
Restricted activities caused by injured wrist	15
Change of work or sports caused by injured wrist	0

Excellent - 90-100, good - 80-89, fair - 65-79, poor - <65.

Figure: Myo modified wrist score

3. Result

The study analysed a cohort with an average age of 29.375 years. Notably, the two groups displayed nearly opposite gender distributions, though the anatomical injury patterns remained statistically comparable.

Feature	Herbert Screw Group	Cast Group
Gender (Male/Female)	70% / 30%	30% / 70%
Fracture: Waist	50%	45%
Fracture: Proximal Pole	40%	30%
Fracture: Distal Pole	10%	25%

Statistical Note: The **p-value of 0.583** for fracture location indicates no significant difference between the groups, ensuring the anatomical baseline was consistent for comparison.

Pain Assessment

Pain was measured using the Mayo Modified Wrist Score. The Herbert screw group consistently reported higher scores (indicating better pain control/function) than the cast group.

At 6 Weeks:

Herbert Screw: **18.5**

Cast Group: **16.75**

At 3 Months:

Herbert Screw: **21.25**

Cast Group: **19.75**

Observation: 45% of Herbert screw patients only felt moderate pain during vigorous activity, suggesting superior early-phase pain management.

Functional Outcomes

Range of Motion (ROM)

The surgical group showed an earlier return to motion, though both groups approximated out regarding "near-complete" range by the three-month mark.

Timeline	Outcome Level	Herbert Screw	Cast Group
6 Weeks	Near-complete ROM	35%	25%
6 Weeks	75% – 99% ROM	60%	60%
3 Months	Near-complete ROM	35%	35%
3 Months	75% – 99% ROM	60%	50%

Grip Strength (at 3 Months)

Grip strength results were similar between the two groups, with a slight edge given to the Herbert screw group in the "high-functioning" category.

- **Full Strength:** 35% in both groups.
- **>75% Strength:** 60% (Herbert Screw) vs. 55% (Cast).

4. Summary of Findings

The data suggests that while long-term outcomes (3 months) for grip strength and near-complete range of motion are relatively similar, the **Herbert screw group** offers:

- 1) **Better early pain control** at both the 6-week and 3-month intervals.
- 2) **Faster recovery of wrist mobility** in the early stages (6 weeks).
- 3) **Slightly better overall functional recovery** (75-99% ROM and grip strength) by the end of the 3-month study period.

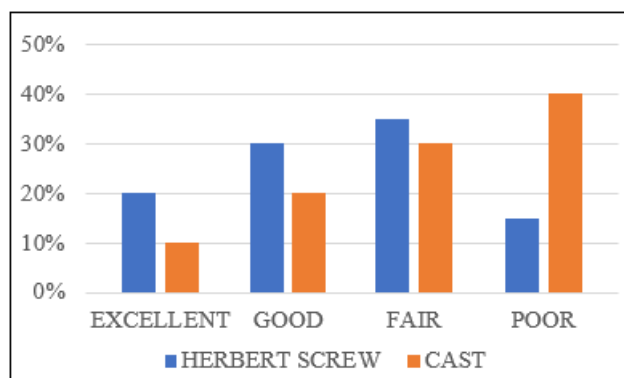


Figure: Grades based on Myo modified wrist score

Final result based on calculations using Myo modified wrist score revealed that– the cast group showed – 10% excellent, 20% good, 40% fair and 30% poor outcomes as compared to Herbert screw group which showed- 20% excellent, 30% good, 35% fair and 15% poor outcomes. Complications were observed in each group, the Herbert screw group had fewer complications (5% patients developed infection, 10% pain at surgical site), as compared to the cast group (20% patients developed stiffness, 15% developed swelling).



Figure: Scaphoid fracture operated with Herbert screw fixation seen on wrist radiograph - AP view

5. Discussion

Over recent years, management of scaphoid fractures has evolved from conservative casting to surgical options like Herbert screw fixation, though the optimal treatment remains debated due to patient and contextual factors. In this study of 40 patients (20 treated with casting and 20 with Herbert screw fixation), outcomes were assessed over 3 months. The Herbert screw group consistently showed better results, including significantly lower pain at 6 weeks and 3 months, as well as improved range of motion and grip strength. These benefits are attributed to stable internal fixation, earlier mobilization, reduced muscle wasting, and faster rehabilitation. Overall, Herbert screw fixation led to better functional recovery and higher patient satisfaction, particularly among younger, working individuals.

6. Conclusion

This study demonstrates that Herbert screw fixation provides improved early pain relief, better functional recovery, and lower complication rates compared to cast immobilization in scaphoid fractures. While both methods remain clinically valid, surgical fixation may be preferred for faster rehabilitation. Further studies with longer follow-up are needed to confirm long-term outcomes.

References

- [1] Hegazy G, Alshal E, Abdelaal M, et al. Kirschner wire versus Herbert screw fixation for unstable scaphoid waist fracture nonunion: randomized clinical trial. *Int Orthop*. 2020;44(11):2385–2393. DOI: <https://doi.org/10.1007/s00264-020-04664-5>
- [2] Patil NS, Mehta C, Kumar P. Comparative functional outcome of minimally displaced scaphoid fractures treated by conservative method versus percutaneous Herbert screw fixation. *Asian J Orthop Res*. 2020;3(2):282–294.
- [3] Sunil T, Kumar HK, Koduru SK. Percutaneous Herbert screw fixation of undisplaced scaphoid fractures: evaluation of functional and radiological outcomes. *Int J Orthop Sci*. 2020;6(3).
- [4] Dias JJ, Brealey SD, Choudhary S, et al. Surgical versus cast treatment for adults with a bicortical fracture of the scaphoid waist (SWIFFT): a pragmatic, multicentre, open-label, randomised superiority trial. *Lancet*. 2020;396(10248):390–401. DOI: [https://doi.org/10.1016/S0140-6736\(20\)30931-0](https://doi.org/10.1016/S0140-6736(20)30931-0)
- [5] Clementson M, Jørgsholm P, Besjakov J, Thomsen NOB. Union rates and functional outcomes in scaphoid fractures: a contemporary review. *Acta Orthop*. 2022; 93: 1–8. DOI: <https://doi.org/10.2340/17453674.2022.3510>
- [6] Mallee WH, Doornberg JN, Ring D, van Dijk CN, Maas M. Comparison of operative versus nonoperative treatment for scaphoid fractures: updated systematic review. *J Bone Joint Surg Am*. 2022;104(6):—. DOI: <https://doi.org/10.2106/JBJS.21.01015>
- [7] Amer HI, Nematallah SA, Elmenawi MM. Percutaneous fixation of recent scaphoid fracture by Herbert screw through the volar approach: clinical trial. *Int J Med Arts*. 2025.

- [8] Hashem MH, Mohammed KKA, Hegazi MO, Atiyya AN. Evaluation of union rate of scaphoid non-union fracture using Herbert screw versus volar buttress plate. Injury. 2025.
DOI: <https://doi.org/10.1016/j.injury.2025.02.012>