

Healing scaphoid non-union using Ilizarov method

Abstract

The scaphoid is the most commonly fractured bone among the carpal bones in orthopedic practice. While many fractures heal successfully, some develop nonunion despite appropriate treatment, leading to complications if left untreated. Displaced scaphoid nonunions (SNUs) should be reduced and fixed to prevent further degenerative changes, even when asymptomatic. Various treatments, including percutaneous fixation with a k-wire or screw and open reduction with or without bone grafting, have been described, but no single method has emerged as the gold standard. This study examines the use of the Ilizarov method in treating scaphoid nonunion in 12 patients at the Bari-Ilizarov Orthopaedic Centre from 1990 to 2024. The Ilizarov technique, involving a three-stage process of distraction, compression, and immobilization, was applied. The outcomes, including healing time, complications, and wrist function, were evaluated. Results showed significant improvements in bone healing, pain reduction, and wrist function, though range of motion did not significantly change. The Ilizarov method proves to be an effective treatment for scaphoid nonunion, especially in cases without carpal collapse or avascular necrosis, and further research is needed to compare it with other treatment options.

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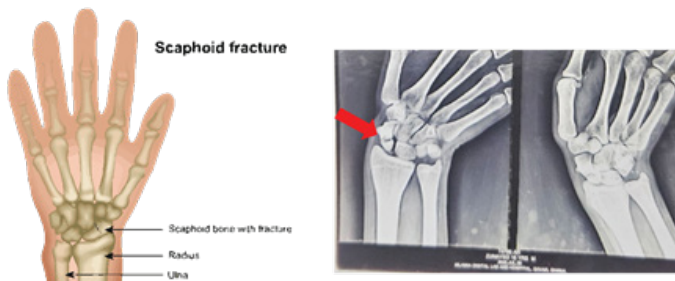
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Introduction

Scaphoid fractures are the most commonly fractured carpal bones and pose significant challenges in orthopedic practice. While many of these fractures heal successfully with appropriate treatment, some progress to nonunion, especially in cases of delayed diagnosis or inadequate initial management. Scaphoid nonunion can lead to complications such as carpal instability, collapse, and degenerative arthritis, significantly impacting wrist function and quality of life.

Management of scaphoid nonunion often requires surgical intervention to restore bone continuity, stability, and function. Among the various surgical techniques, the Ilizarov method has emerged as a promising option, particularly for cases of displaced or longstanding nonunion. Known for its ability to stimulate biological healing through controlled distraction and compression, the Ilizarov method^{1,2} offers a potential solution for even the most complex scaphoid nonunions.

This article explores the effectiveness of the Ilizarov method in managing scaphoid nonunion. By reviewing fracture patterns, outcomes, and long-term consequences, we aim to highlight the benefits and limitations of this technique.



Materials and methods

This study involved 12 patients (10 men and 2 women) treated for scaphoid nonunion at the Bari-Ilizarov Orthopaedic Centre between 1990 and 2024. The average age of the patients was 27.95 years. We

reviewed their medical histories, sociodemographic data, and details about their fractures, including location, associated injuries, treatment methods, healing time, and complications like nonunion and Scaphoid Nonunion Advanced Collapse (SNAC), using the Picture Archiving and Communication System (PACS). The study was approved by the relevant scientific and ethical committees.

All patients underwent surgery using the Ilizarov method, which was performed in three stages. The first stage involved distracting the frame by 1 mm per day until radiographs showed a 2-3 gap at the nonunion site. In the second stage, compression was applied at 1 mm per day for 3 days, with the wrist held in 15 degrees of flexion and radial deviation. The final stage involved immobilization in the Ilizarov fixator for 8 weeks.^{3,4}

The Ilizarov frame with two cross olive wires was applied to provide compression at the fracture site and was maintained for six weeks. We assessed the outcomes based on healing time, complications, and the success of the Ilizarov method in achieving bone union and restoring wrist function. The final results were evaluated using the Scaphoid Outcome Score.

Results

Our analysis of results in 12 patients treated for scaphoid nonunion using the Ilizarov method between 1990 and 2024 showed promising outcomes. The patients had a mean age of 27.95 years, and overall satisfaction rates were high. Significant improvements were observed in bone union, with a notable reduction in complications and pain. While wrist function showed improvement, there was no significant change in range of motion (ROM).

Discussion

Scaphoid nonunion (SNU) is tough to treat because the scaphoid bone doesn't have a lot of blood flow, and it gets even harder when the nonunion has been around for a long time. Over time, the chances of healing drop, and patients can end up with constant pain, limited movement in the wrist, and joint damage. This really shows how

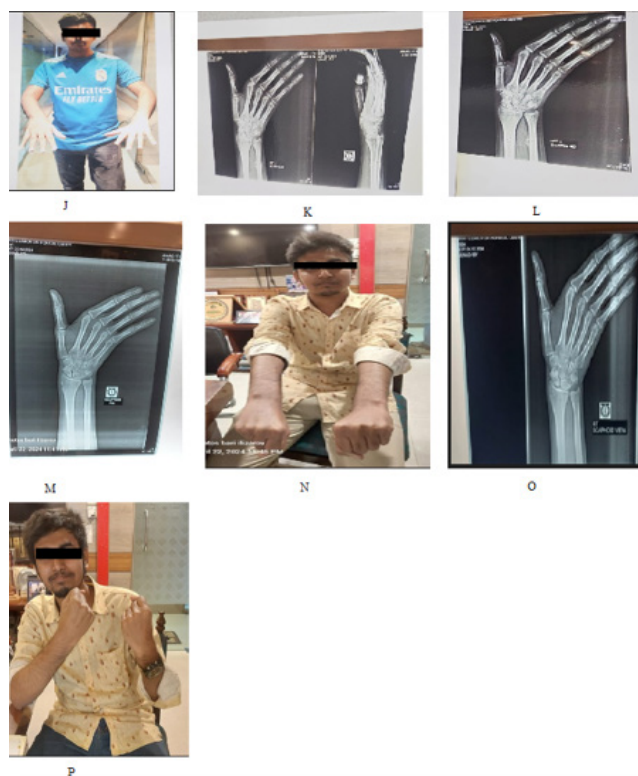
important it is to treat the condition early. There are several ways to treat SNU, like bone grafting and internal fixation. Studies comparing vascularized and nonvascularized grafts have shown no big difference in the healing time or success rates. Likewise, healing rates didn't vary based on factors like gender, age, where the fracture happened, or smoking. Interestingly, patients who were office workers or who had conservative treatment seemed to have higher success rates, suggesting that lifestyle and how the treatment is managed might play a role in recovery.^{5,6}

The Ilizarov method offers a less invasive option by using an external fixator with olive wire compression. This approach doesn't require opening up the nonunion site, which helps keep the blood supply intact, lowers infection risks, and prevents damage to surrounding soft tissues. Plus, it eliminates the need for bone grafting, avoiding complications at the graft site. In our study, the Ilizarov fixator worked well, providing effective compression and improving healing rates. We saw good to excellent results in 90% of patients, and the immobilization time was shorter than with other methods. While the Ilizarov frame can feel bulky, most patients adjusted to it without trouble. No one had significant stiffness after the frame was removed, thanks to the physiotherapy included in their treatment.

Conclusion

The Ilizarov method using two cross olive wires is an effective and safe treatment for scaphoid nonunion (SNU), providing successful results without the need to open the nonunion site or use bone grafts. This technique has shown promise, especially in cases without complicated issues like carpal collapse or avascular necrosis. While further research is needed to directly compare this method with other established treatments, our findings suggest that the Ilizarov approach could be a strong option for treating SNU and improving wrist function.

Figure 1



- A, B & C) 17 years old boy with Scaphoid non union Rt Wrist
- D) X-ray showing Scaphoid non union Rt Wrist
- E) Radiograph of Rt Wrist with visible olive wires in the Scaphoid bone
- F) Patient with Ilizarov apparatus after 1 month
- G) Patient with Ilizarov apparatus after 2 months
- H & I) Radiograph showing patient with the Ilizarov apparatus after 2.5 months
- J) Clinical appearance of patient after 3 months
- K, L) Radiographic result, full correction is achieved after 3 months to the surgery
- M) Radiographs at 8 months confirm scaphoid union with proper alignment and no complications.
- N) After 8-months follow-up, successful scaphoid union and improved wrist function were achieved without complications or grafting
- O) At the 1 year and 2 months follow-up, radiographs show complete scaphoid union with optimal alignment and no complications
- P) The clinical appearance of the patient at the 1 year and 2 months follow-up shows a well-healed wrist with no swelling, deformity, or signs of complications, and restored function

Acknowledgments

None.

Conflicts of interest

The authors declare that there are no conflicts of interest.

References

1. Bari M, Konchada S, Pradhan S, et al. Management of scaphoid nonunion (snu) with ilizarov ring fixator using two olive wire compression without bone grafting: a case series. *Cureus*. 2022;14(11):e31646.

2. Bari MM. Ilizarov in upper limb reconstruction. 2022;180–190.
3. Ilizarov GA. The tension-stress effect on the genesis and growth of tissues: Part I. The influence of stability of fixation and soft-tissue preservation. *Clin Orthop Relat Res.* 1989;238:249–281.
4. Buijze GA, Ochtman L, Ring D. Management of scaphoid nonunion. *J Hand Surg Am.* 2012;37:1095–1100.
5. Herbert TJ, Fisher WE. Management of the fractured scaphoid using a new bone screw. *J Bone Joint Surg Br.* 1984;66(1):114–123.
6. Green DP, Wolfe SW. Green's Operative Hand Surgery. 6th ed. Philadelphia, PA: Elsevier. 2011.