

ORIGINAL ARTICLE

Radiological Outcome of Percutaneous Herbert Screw Fixation in the Treatment of Delayed Union and Nonunion of the ScaphoidSARDAR SOHAIL AFSAR¹, AKBAR ALI², YAQOOB UR REHMAN³¹Chairman and associate professor orthopaedics, Nowshera medical college and qazi Hussain Ahmed medical complex, Nowshera²Assistant professor, Nowshera medical college and qazi Hussain Ahmed medical complex Nowshera³Assistant Professor, Qazi Hussain Ahmad Medical Complex/ Nowshera Medical CollegeCorresponding author: Yaqoob Ur Rehman, Email: yaqooburrehman@gmail.com**ABSTRACT****Background:** After distal radius fractures, scaphoid fractures are the most prevalent kind of wrist fracture. Scaphoid fractures account for between 60 and 70 percent of all wrist fractures. Different treatment methods are used for their management.**Objective:** To determine the radiological outcome of percutaneous Herbert screw fixation in the treatment of delayed union and nonunion of the Scaphoid**Methodology:** The current study was descriptive study carried out at the orthopedic department, Qazi Hussain Ahmad Medical College, Nowshera from November 2021 to November 2022. All the relevant laboratory and radiological investigations were carried out for the enrolled patients. Under general anesthesia all the surgeries were performed. All the patients were followed up until union occurs. IBM SPSS version 23 was employed for analysis of data.**Results:** In our study, totally 40 patients were included. The male participants in our study were 32 (80%) whereas female participants were 8 (20%). The mean age of the patients was 27 (± 4.7) years. The radiological union was achieved in all of our patients in 15.2 (± 3.15) weeks. In Delayed union of scaphoid fracture patients the radiological union was achieved in 11 (± 3.17) weeks while in nonunion scaphoid fracture patients, it was achieved in 19 (± 4.32) weeks. Functional level was achieved in all the patients in 17 (± 2.4) weeks. Based on postoperative complications, wrist stiffness was observed in 10 (25%) patients while osteoarthritis and osteonecrosis was not reported in any of our patients.**Conclusion:** Our study concludes that scaphoid fractures are effectively and conveniently treated by using Percutaneous Herbert screw fixations, which provides satisfactory functional and radiological result with few complications. We suggest the adoption of the Herbert screw for the treatment of scaphoid fractures in our hospital, regardless of whether the fracture has delayed union or is non-union, in order to achieve better radiological and functional outcomes.**Keywords:** Radiological outcome; percutaneous Herbert screw fixation; delayed union; nonunion**INTRODUCTION**

After distal radius fractures, scaphoid fractures are the most prevalent kind of wrist fracture. Scaphoid fractures account for between 60 and 70 percent of all wrist fractures¹. Adults experience 70% of scaphoid fractures at the waist, 20% at the proximal pole, and 10% at the distal pole². Numerous distinctive features of the scaphoid influence its capacity for healing. The blood supply in the scaphoid is tenuous and articular cartilage covers around 80% of the bone. The radial artery is the principal source of blood for the scaphoid. Proximal 70%–80% of the scaphoid are supplied by branches of the radial artery that enter the nonarticular region at the dorsal ridge at waist level. The distal 20% to 30% of the scaphoid receives its supply from the volar scaphoid branches, which enter at the distal tubercle and may originate both from the superficial palmar branch and the radial artery. As a result, intra osseous blood flow is solely responsible for the proximal pole's vascularity. Scaphoid fractures have a higher risk of non-union, delayed union, and avascular necrosis because of the tenuous blood supply to the proximal pole of scaphoid³. Scaphoid fractures must be diagnosed correctly and promptly since delaying treatment may result in consequences including non-union, avascular necrosis, carpal collapse, and, ultimately, a predictable sequence of arthrosis⁴. The reported union rate for proximal pole fractures is 67%, compared to 87% for fractures of scaphoid waist⁵. There is an 88% rate of non-union for scaphoids that are diagnosed late and present more than 8 weeks after the injury⁶. Proximal pole fractures, accompanying ligamentous damage, delayed diagnosis (> 6 weeks), insufficient immobilization, and smoking are factors that enhance the likelihood of non-union⁴. Hyperextension injury, often from a sports injury or falling on the outstretched hand, is the most common mechanism of injury⁷. The proximal pole Scaphoid fracture is the most prevalent nonunion site, with the total incidence of Scaphoid nonunion ranging from 5% to 25%¹. Numerous variables, including the location of the fracture, the quantity of bone loss, the severity of the deformity, fragments vascularity, the presence of arthritis, the patient's age, their level of activity, and their degree of discomfort, influence the choice to manage Scaphoid delayed

unions and nonunion, even if the management of acute Scaphoid fractures is fairly straightforward⁷. Open reduction and internal fixation, together with vascularized or non-vascularized bone grafting, are the usual treatments for scaphoid- nonunion^{8, 9}. However, in certain instances with slightly displaced and undisplaced Scaphoid delayed union and non-union, percutaneous Herbert screw fixation alone may be used to treat the condition effectively. This procedure was first reported by Strelly in 1970. The benefits of this approach over the open procedure are early functional recovery, less scarring, and reduced morbidity^{10, 11}. The aim of our study was to assess the radiological outcome of percutaneous Herbert screw fixation in the treatment of delayed union and nonunion of the Scaphoid.

MATERIALS AND METHODS

The current study was descriptive study carried out at the orthopedic department, Qazi Hussain Ahmad Medical College, Nowshera. The study was carried out for a period of one year from November 2021 to November 2022. The study approval was taken from the institutional review board. The overall sample size based on the WHO calculator for sample size was 40 patients. The inclusion criteria of our research was all the patients with delayed union and nonunion Scaphoid fractures, patients of both gender and age range of 18-60 years and willing to participate in our study whereas the exclusion criteria of our research was all the patients with Dorsal Intercalated Segment Instability, humpback deformity, osteonecrosis, previous surgery and osteoarthritis. The study objective was explained to all the participants and then informed consent was taken. All the data was collected in a special designed proforma for this study. All the enrolled patients were examined clinically. All the relevant laboratory and radiological investigations were carried out for the enrolled patients. Under general anesthesia all the surgeries were performed. The surgical technique used in this setting was similar to previous study¹². On the next day of surgery all the patients were discharged and followed up at week two and then they were followed on monthly basis until union occurs. After the cast was removed, a post-operative range of motion exercise regimen was initiated. On

all three Scaphoid radiological views, the removal of fracture lines and crossing trabeculae were noted at each follow-up examination in order to evaluate radiographic union. IBM SPSS version 23 was employed for analysis of data. Age, surgery time and union time were documented as mean (\pm SD) while gender and post operative complications and side of injury were documented as percentage and frequency.

RESULTS

In our study, totally 40 patients were included. The male participants in our study were 32 (80%) whereas female participants were 8 (20%). (Figure 1) The mean age of the patients was 27 (\pm 4.7) years. Scaphoid fracture in right side was observed in 28 (70%) patients whereas scaphoid fracture in left side was observed in 12 (30%) patients. (Figure 2) Delayed union of scaphoid fracture was observed in 24 (60%) while non union scaphoid fracture was observed in 16 (40%) patients. (Figure 3) The radiological union was achieved in all of our patients in 15.2 (\pm 3.15) weeks. In Delayed union of scaphoid fracture patients the radiological union was achieved in 11 (\pm 3.17) weeks while in nonunion scaphoid fracture patients, it was achieved in 19 (\pm 4.32) weeks. (Figure4) Functional level was achieved in all the patients in 17 (\pm 2.4) weeks. Based on postoperative complications, wrist stiffness was observed in 10 (25%) patients while osteoarthritis and osteonecrosis was not reported in any of our patients. (Figure 5)

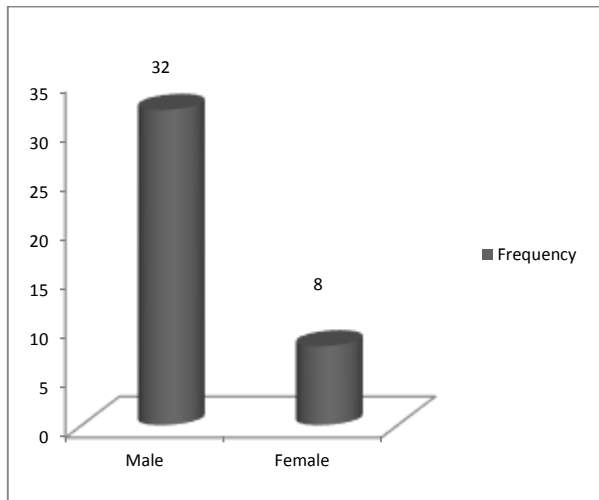


Figure 1: Distribution of study participants based on gender

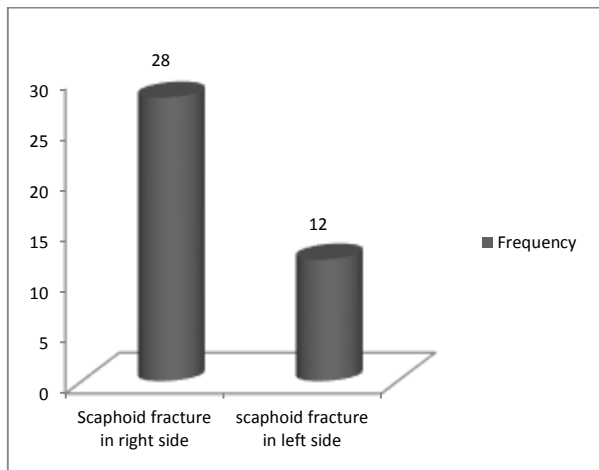


Figure 2: Distribution of study participants based on side of scaphoid fracture

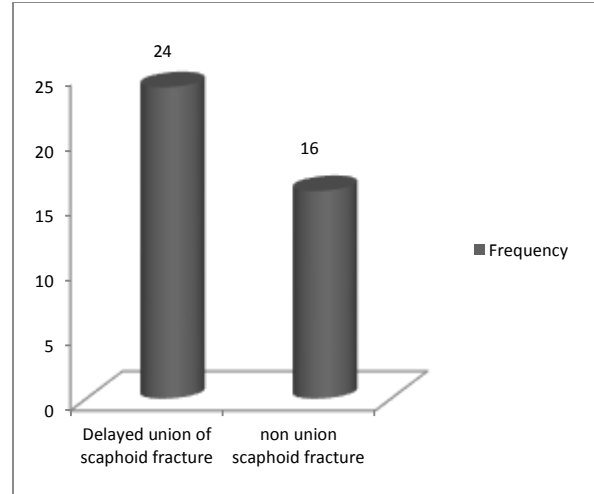


Figure 3: Distribution of study participants based on type of scaphoid fracture

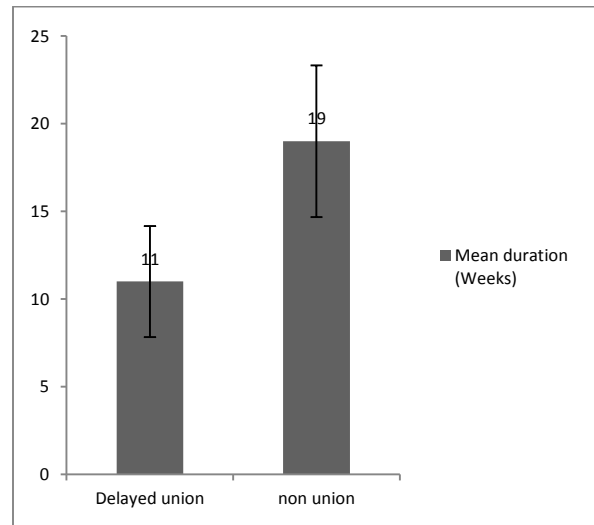


Figure 4: Radiological union time in patients of delayed union and non-union scaphoid fracture

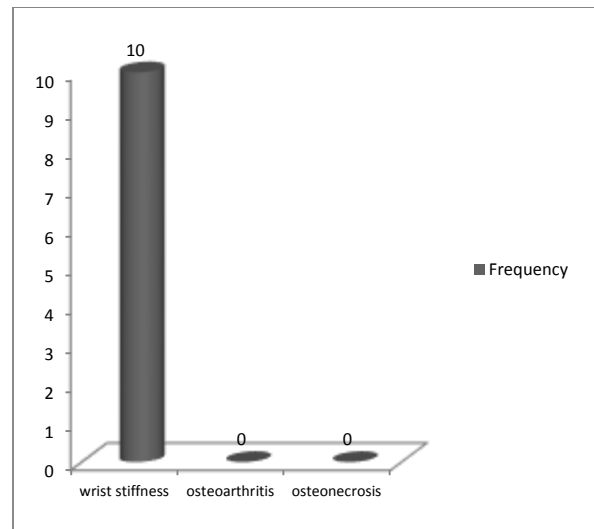


Figure 5: Post-operative complication after percutaneous Herbert screw fixation

DISCUSSION

Although scaphoid fractures are frequent, they may be challenging to diagnose and manage. Scaphoid fractures, which are most prevalent in young people, may result in protracted morbidity and absences from work¹³. Treatment for Scaphoid delayed union and non-union is challenging¹⁴. The most often used fixation technique is open reduction and internal fixation with screws¹⁵. There have also been reports of vascularized or non-vascularized graft augmentation^{15, 16}.

In our study, totally 40 patients were included. The male participants in our study were 80% whereas female participants were 20%. The mean age of the patients was 27 (± 4.7) years. Scaphoid fracture in right side was observed in 70% patients whereas scaphoid fracture in left side was observed in 30% patients. Delayed union of scaphoid fracture was observed in 60% while non union scaphoid fracture was observed in 40% patients. The radiological union was achieved in all of our patients in 15.2 (± 3.15) weeks. In Delayed union of scaphoid fracture patients the radiological union was achieved in 11 (± 3.17) weeks while in nonunion scaphoid fracture patients, it was achieved in 19 (± 4.32) weeks. Functional level was achieved in all the patients in 17 (± 2.4) weeks. Based on postoperative complications, wrist stiffness was observed in 25% patients while osteoarthritis and osteonecrosis was not reported in any of our patients. In accordance with our study, another study was done by M K Hayat et al. on scaphoid fracture patients with delayed union and non-union. In their study, all the patients were male. The mean age observed in their study was 26 (± 5) years. In their study, 55.56% of patients were observed with delayed union, while non-union was seen in 44.44% of patients. In 15.5 4.2 weeks, radiological union was obtained for all fractures. Physical therapy was used to treat 22.22% of patients who had postoperative wrist stiffness. No patient needed a revision surgery in their study which is in accordance with our findings¹². According to a research by Inaparthi, fracture compression and bone grafting may effectively treat Scaphoid waist fractures with delayed union and nonunion that has been present for less than five years¹⁷. Dedeoglu stated that 89.65% patients in another research who had percutaneous scaphoid fixation experienced good healing; however, in his series, he also underwent distal radius core decompression¹⁸. One of the key benefits of percutaneous procedures is that screws may be placed in the ideal location in the middle of the proximal pole, where they will provide the most compression and stability. A guide wire bend or extensor tendon damage might result from the hyperflexed wrist, which are potential drawbacks^{19, 20}. In a research, Kim et al. successfully used the volar percutaneous technique to treat patients with Scaphoid waist delayed union²¹. Another research by Capo et al. found that 91.66% patients had union, although only 8.33% patients needed revision surgery (20), which is not consistent with the results of our study²². A study carried out by Galal Mohamed Mansour Hegazy also reported comparable results to our study²³.

CONCLUSION

Our study concludes that scaphoid fractures are effectively and conveniently treated by using Percutaneous Herbert screw fixations, which provides satisfactory functional and radiological result with few complications. We suggest the adoption of the Herbert screw for the treatment of scaphoid fractures in our hospital, regardless of whether the fracture has delayed union or is non-union, in order to achieve better radiological and functional outcomes.

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