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Results of percutaneous fixation of Scaphoid fracture in patients with delayed presentation

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Abstract

Background: A scaphoid fracture is the most common type of carpal bone fracture affecting young active people. In spite of its occurrence, many a times scaphoid fracture goes undetected. A patient presenting late, makes the line of management even more controversial. The purpose of our study is to evaluate the results of percutaneous fixation of scaphoid fracture in patients with delayed presentation.

Materials and Method: We did a prospective case study. 17 cases presented to us with delayed history of scaphoid fracture. All patients were managed by percutaneous fixation of the scaphoid with Herbert screw. Post-surgery patients were evaluated clinically and radiologically. Functional outcome was assessed by functional scores. Patients were followed up for minimum of 12 months.

Results: Almost all patients returned to work within one-month post-surgery. 13 patients had excellent result. N2 patient has good result, one developed AVN and one lost to follow-up.

Conclusion: We suggest percutaneous fixation of the scaphoid fracture by Herbert screw in cases with delayed presentation.

Keywords: Percutaneous, fixation, Scaphoid, fracture, patients

Introduction

Scaphoid is the largest bone of the proximal row of carpus. It articulates with a number of bones due to its boat shape like radius, lunate, capitate, trapezium and trapezoid. Scaphoid receives its blood supply from the branch of radial artery which enters via a foramina at the dorsal ridge of scaphoid^[1,2]. Proximal pole depends on the blood supply from the distal ridge. Due to this peculiar style of blood supply of scaphoid, many a times fracture of scaphoid results in disruption of the blood supply leading to its most common long-term complication that is avascular necrosis.

The conservative treatment as cast of scaphoid fractures generally has good outcome, with bony union; however, closed treatment can result in delayed union, non-union, malunion, cast-induced joint stiffness, and lost time from employment and avocations^[3]. Despite appropriate cast treatment, some scaphoid fractures carry a risk of non-union of from 5% to 25%, depending on the fracture type^[4,5]. Also, fractures treated to successful union with a cast can result in wrist pain secondary to arthritis because of scaphoid fracture malunion. However, recently prospective randomised studies comparing acute fixation to closed (cast) treatment of stable fracture have shown that patients with surgically fixed fractures have a faster rate of healing and earlier return to work. Hence there has been a trend towards surgical fixation of these fractures. Percutaneous fixation of scaphoid fractures with headed cannulated screws was first performed in Germany by Strelis^[6], beginning in 1962, as modification of the technique of open reduction with solid bone screws of McLaughlin^[7]. The treatment of scaphoid non-unions requires careful pre-operative assessment and planning, and the purpose of the treatment is ensuring reduction and a stable fixation without compromising blood supply^[8]. To achieve these goals, volar or dorsal percutaneous screw fixation methods that can be combined with arthroscopic techniques and allow biological grafting have been developed^[9,10]. In addition, the percutaneous technique has additional advantages, such as protection of the carpal ligaments and causing less scarring of tissues^[8].

In this study, we present the radiological and clinical results of scaphoid non-unions that were treated by percutaneous screw fixation.

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Materials and Methods

This was a prospective study which was conducted from Jan 2017 to March 2019. About 17 cases participated in the study who had delayed presentation. The fractures were diagnosed and classified with the help of standard anteroposterior, lateral and semi-pronated radiographs. Few of the patients in whom radiographic features were inconclusive were further evaluated by MRI. All the patient had undergone percutaneous Herbert screw fixation placed in a supine position after either brachial block or general anesthesia. After fixation, the position of the screw was verified using an image intensifier. Active assisted finger exercises were encouraged immediately after surgery. Weight-bearing exercise was allowed after fracture union was established. Clinical and radiographic assessments were performed at one month, 3 months, 6 months and 12-month post op. Post-operatively patients were evaluated clinically, radiologically and functionally. Clinically patient pain scale, range of motion and grip strength. Radiograph were taken in postero-anterior and lateral views. For functional assessment mayo wrist scoring system was used.

Results

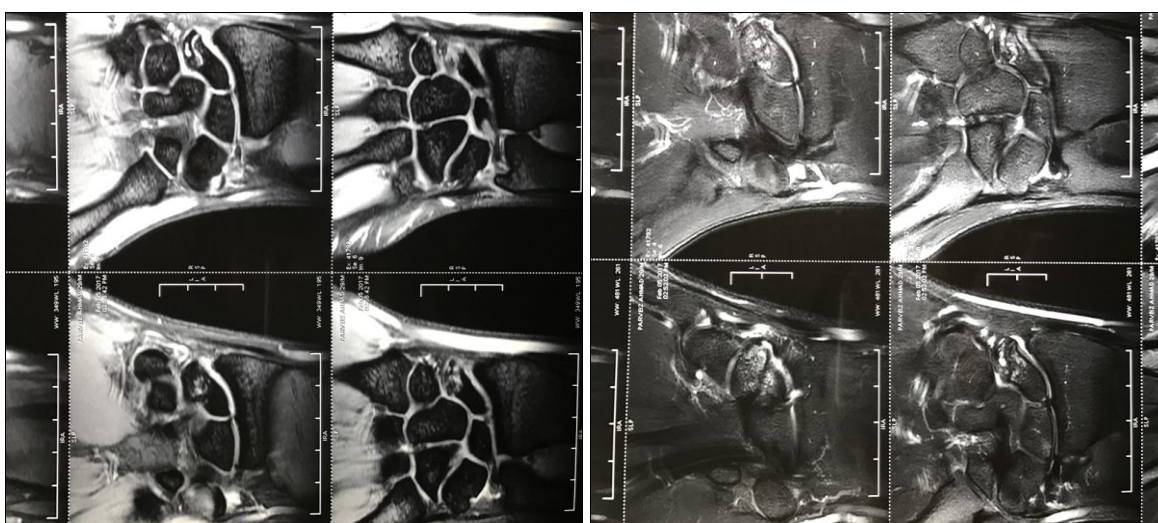
In total of 17 people participated 13 were male and rest 4 were female. Mean age was 27 years (range = 19-41). Eleven patients had scaphoid fracture of the right hand, and six patient had scaphoid fracture of the left hand. The mean operating time was 31 min (15-45 min) and there were no intraoperative complications. All patients were discharged within 24 h of admission. None of the patients reported with wound infection, reflex sympathetic dystrophy, scar pain or hypertrophy. Most subjective pain was reduced by internal fixation of the scaphoid three or four days postoperatively. The outcome measurements of pain, tenderness, range of motion, grip strength, and Mayo wrist score were measured at minimum follow-up of 14 months. Fracture union was achieved in all by the time of the visit at 12 weeks. The mean range of motion and grip strength with the standard error of the mean (SEM) were 1391 (SEM 5.1) and 57 kg (SEM 4.9) for the injured side and 1441 (SEM 4.9) and 52 kg (SEM 4.2) for the uninjured side. The mean MMWS was 95 ± 5 points. Based on MMWS system, 8 patients were interpreted as excellent, 3 patients as good. One patient developed osteonecrosis of the scaphoid.



Preop AP



Lateral



MRI



Immediate post OP



6 Month follow up



1 Year Follow-up

Discussion

Scaphoid bone is one of the most common bone to get fractured among carpal bones. But inspite of its occurrence the management is controversial [3]. The closed (cast) treatment of acute undisplaced scaphoid fractures generally has good outcome, with bony union. Conservative management with cast can result in delayed union, non-union, mal-union, cast-induced joint stiffness, and lost time from employment and avocations [11]. Primary fixation of scaphoid with percutaneous Herbert screw decreases the short coming of patient treated with cast. It has been clearly shown by Dias *et al.* [12] and Barton [13] that the diagnosis of union can be very difficult. The results of this series showed that all patients achieved excellent and good scores, and this is consistent with the results of Herbert and Fisher who reported a much higher rate of union for acutely stabilized scaphoid fractures and with the results of O'Brien and Herbert [21] who reported 97% success in a series of acute scaphoid fractures treated by primary internal fixation.

In India many a times patients are treated by local bone setter and these patient presents late to surgeon with non-healing wrist sprain. These patients are through examined and turns out to be scaphoid feature with delayed presentation. Very few literatures are present regarding management of scaphoid fracture with delayed presentation.

Streli [7] was first to advocate use of percutaneous fixation of scaphoid fractures in the year 1970. Herbert developed the headless compression screw [14], and later it was modified into

headless cannulated compression screw by Whipple [15-17]. Whipple [15] also added the use of arthroscopy to assist in reduction and developed a cannulated headless screw to allow for percutaneous insertion.

Both the approach volar and dorsal is used for fixation. The choice of an approach is one of surgeon preference except in cases of proximal pole fractures; these should be approached dorsally. We have used volar approach in most of the cases except few proximal pole fractures. Adjunctive arthroscopy can be used at the time of fracture fixation allows one to determine accurate scaphoid fracture reduction and the diagnosis and treatment of concomitant ligament injuries. But we have not used arthroscopy in any of the case.

In the study done by Herbert and Fisher [13] shown a much higher rate of union for acutely stabilised scaphoid fractures. In another study O'Brien and Herbert [14] reported 97% success in a series of acute scaphoid fractures treated by primary internal fixation. The average period to return to work was 3.7 weeks. People returned to work as they were comfortable average 4 weeks. Inoue and Shionoya [15] have shown a shorter time to union and an earlier return to manual labour when acute fixation is compared with conservative treatment.

In our study again, union rate was 100% comparable with any other studies. We believe that fixation of these fractures with delayed presentation is the key. Not many literatures are present regarding patients presenting with delayed scaphoid fractures. All the patient had good range of motion

postoperative. There was a significant improvement in modified mayo wrist score. As the patient were not managed with cast, they had quick rehabilitation and they returned to work quickly.

There were a few limitations to this study. A control group was not included and the results could not be compared with those treated by conservative management or treated with other methods of fixations such as bone-grafts. The radiographs did not include a 45-degree pronated view for better assessment of the screw position as recommended recently by Jeon *et al.* [16]. This study was carried out in a selected type of scaphoid fracture. So, this approach may not be suitable for other types of scaphoid fractures.

To conclude, we feel delayed scaphoid fracture should be assessed by surgeon experienced with hand surgery. The choice between surgical and non-surgical fracture with delayed presentation is difficult. We suggest that percutaneous fixation of scaphoid fractures with delayed presentation gives good results in acute and delayed scaphoid fractures. It not only gives you the advantage of good union rate, but also helps in quicker rehabilitation and early return to work.

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