A PROSPECTIVE STUDY TO ASSESS THE FUNCTIONAL OUTCOME FOLLOWING ORIF VS PERCUTANEOUS FIXATION IN SCAPHOID FRACTURE

Orthopaedics

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ABSTRACT

The study aimed to assess clinical, radiological as well as functional outcome in patients of scaphoid fracture following open reduction as compared to percutaneous fixation with Herbert Screw. This study was conducted at Department of orthopedics, for 1 year on 30 patients of scaphoid fracture. Fractures were first tried for percutaneous fixation using volar approach, ORIF with volar approach was used when adequate reduction was not achieved. Patients were followed at 2 week interval till union. Clinical assessment at final followup was performed using MMWS. The mean mean duration of presentation after injury of 19.9 days (3 to 162 days). The mean MMWS score was 93.8 (90-100) for percutaneous and 83.8 (70-95) for ORIF. Since fracture treated with percutaneous fixation are associated with early union and early return to functional activity as compared to ORIF, Herbert screw for fixation with percutaneous technique for scaphoid fracture must be encouraged for displaced or undisplaced fracture.

KEYWORDS

Percutaneous Fixation, Orif, Mmws, Scaphoid Fracture, Bhopal

INTRODUCTION:

The word scaphoid has been derived from a Greek word “*skapnos*” which mean boat due to its shape.^[1] The scaphoid bone fracture account to about 80 to 90% fracture of all carpal bones. Scaphoid fracture are commonly encountered in young, adult males.^[2] The management of displaced, comminuted, and unstable fractures is only surgical intervention, however, management of undisplaced or minimally displaced surgical fracture is controversial. Literature suggests that patients with undisplaced fracture of scaphoid must be initially managed with the help of cast immobilization for 2 to 3 months.^[3,4,5] Casting is an ancient technique that has traditionally been reserved for distal pole fractures and nondisplaced waist fractures, with union reported to occur at a mean of 53 days and 65 days respectively.^[6] Cast has been associated with longer time of union which in turn has multiple drawbacks which include sclerosis, comminution, translation and location in the proximal pole.^[6] Apart from non union, other complications of displaced fracture of scaphoid include increased rate of redisplacement and delayed union, when managed with cast immobilization alone.^[7,8]

Alternative management of scaphoid fracture include early operative intervention with screw fixation which not only limits the need for a cast, but may also allow earlier return to sports and work.^[5,9,10] The rate of complications such as non union are much lower for non displaced fractures and complication rate are almost nil when a non displaced fracture is adequately treated and protected.^[11] However non union rate for displaced fractures is approximately 50% as compared to 10% non union rate of undisplaced fracture.^[3,12,13] The occurrence of non union is responsible for various sequelae i.e. altered carpal biomechanics, pain, diminished range of motion of wrist, poor grip strength etc.^[14] Since rates of nonunion scaphoid fractures treated with conservative management are quite high, thus, open reduction with internal fixation (ORIF) has been recommended.^[15,16]

Open reduction and internal fixation technique for management of fracture of scaphoid was first introduced by McLaughlin^[17] and then the results were reproduced positively by various other studies.^[18] Percutaneous fixation is also an alternative and simple technique for management of scaphoid fracture.^[19,20] Both the methods have shown superiority over management of displaced fracture when compared to cast immobilization. The present study aimed to assess clinical, radiological as well as functional outcome in patients of scaphoid fracture following open reduction as compared to percutaneous fixation with Herbert Screw.

METHODS:

The present study was conducted as an interventional study at a tertiary care Centre, Bhopal for a period of 2 years i.e. from 1st November 2017 to 20th October 2019. A total of 34 cases of scaphoid fracture reported to

the study area during the study period. Inclusion criteria was patients of acute scaphoid fracture, patients with delayed union or fractures showing no sign of healing after 12 weeks of cast immobilization. Patients with distal radial tuberosity fracture, or presenting with osteonecrosis, patients with previous wrist injury or any other associated fracture around the wrist were excluded.

Written consent was obtained from all the study participants. The present study was conducted on 30 patients out of 34 cases of scaphoid fracture fulfilling the inclusion criteria. All the cases were treated using Herbert screw. Patients were subjected to X ray wrist postero-anterior view, lateral view, semipronation oblique and antero-posterior view to assess the scaphoid fracture. Injuries were graded according to Herbert and Fisher Classification.

All fractures were first tried for percutaneous fixation using volar approach, patients in whom adequate reduction was not achieved with percutaneous method, ORIF with volar approach was used. However patients with history of fracture more than 5 months were managed with ORIF and bone grafting directly.

Post operatively, cast immobilization was done for all the patients. Patients were followed at 2 weeks, 6 weeks and 10 weeks and then every two weeks till fracture union post operatively. The minimum follow up was twelve months. After 2 weeks of operative management, sutures were removed whereas cast was removed at 6 weeks and a removable wrist immobilizer brace was tied for next four weeks. Also all patients were advised physiotherapy with hand grip strengthening exercise and active assisted range of motion exercise.

At each follow up, clinical and radiological examination was conducted to assess the healing and union. Union was considered to have occurred when there was no tenderness at the anatomical snuff box or at scaphoid tubercle and there was evidence of trabeculae crossing fracture on at least two views. Clinical assessment at final follow up was performed using Modified Mayo Wrist Score (MMWS). To assess grip strength, patients were asked to squeeze the examiners index finger, and the strength was compared on contralateral side. Range of motion was measured using goniometer.

Data analysis- Data was compiled using Ms Excel and analysed using IBM SPSS software version 20. Numerical variables were expressed as mean and standard deviation. MMWS score was calculated for each patient for ORIF and percutaneous method separately.

RESULTS:

The present study included 30 patients with scaphoid fracture with mean age of 32.5±7.94 years and mean duration of presentation after injury of 19.9 days (3 to 162 days).

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Table 1: Distribution of patients according to socio-demographic profiles and details of approach, MMWS and complication.

S no	AGE	SEX	SIDE	Herbert Type	Time To Surgery (Days)	Approach	Time To Union (Week)	MMWS (POINTS)	Remark
1	32	F	L	B2	5	Orif Volar	12	85	
2	34	F	R	B2	8	Percutaneous Volar	10	90	
3	45	M	R	B2	8	Percutaneous Volar	10	90	
4	22	M	L	B2	3	Orif Volar	10	95	
5	51	M	R	C	162	Orif Volar	14	80	Bone Grafting Was Done
6	36	F	L	A2	18	Percutaneous Volar	9	90	
7	28	F	R	C	44	Percutaneous Volar	11	70	
8	32	M	R	A2	14	Orif Volar	12	90	
9	33	F	L	A2	4	Percutaneous Volar	7	90	
10	21	F	R	C	56	Orif Volar	14	70	
11	21	F	R	A2	5	Orif Volar	12	85	
12	29	M	R	B2	8	Percutaneous Volar	12	95	
13	42	M	R	A2	5	Orif Volar	16	85	Cast Failure
14	42	F	L	B2	8	Orif Volar	16	80	Cast Failure
15	44	F	R	A2	4	Percutaneous Volar	10	95	
16	31	M	L	A2	1	Percutaneous Volar	8	100	
17	21	M	R	B2	12	Percutaneous Volar	12	90	
18	29	M	R	A2	5	Percutaneous Volar	8	95	
19	29	M	L	A2	16	Orif Volar	14	85	
20	41	M	R	B2	5	Percutaneous Volar	10	90	
21	23	M	L	A2	8	Percutaneous Volar	9	90	
22	32	M	L	B2	7	Orif Volar	14	85	
23	45	M	R	C	150	Orif Volar	14	80	Bone Grafting Was Done
24	31	M	R	B2	8	Percutaneous Volar	12	95	
25	24	F	L	A2	5	Percutaneous Volar	8	85	
26	34	F	L	B2	8	Orif Volar	14	80	
27	36	M	R	A2	4	Percutaneous Volar	10	95	
28	23	F	L	A2	1	Percutaneous Volar	8	100	
29	32	F	R	B2	12	Orif Volar	12	90	
30	31	M	R	A2	5	Percutaneous Volar	8	95	

In present study, 13 (43.3%) patients were operated within one week following injury whereas 2 patients were operated very late i.e. at 150 and at 162 days following injury. About 17 patients were managed with percutaneous fixation and rest 13 cases were managed using ORIF. Though, all the fractures treated either with ORIF or percutaneous fixation united successfully, delayed union was observed in 2 patients (6.7%) at 16 weeks postoperatively. Mean time for radiological union following ORIF was 12.6 ± 2.4 weeks whereas that following percutaneous fixation was 9.2 ± 2.5 weeks.

Range of motion was assessed using goniometer. Following percutaneous fixation ; wrist flexion averaged 61° (range 40 to 70°) and wrist extension averaged 58° (range 35 to 65°) whereas following ORIF, wrist flexion averaged 60°

(range 40 to 65°) and wrist extension 54° (range 30 to 60°).

Modified Mayo wrist score (MMWS) was used to assess the final functional outcome. In present study, mean pain score was 22.4 (range 10 to 25) following percutaneous whereas it was 19.6 (range 10 to 25) following ORIF. Mean range of motion score according to MMWS following percutaneous was 24.3 (range 15 to 25) whereas that following ORIF was 22.3 (range 15 to 25). Mean grip strength score was 24.5 (range 15 to 25) after percutaneous fixation and 22.5 (range 15 to 25) after ORIF. Similarly mean activity score was 22.6 (range 15 to 25) and 19.4 (range 15 to 25) following percutaneous and ORIF respectively. The mean MMWS score was 93.8 (range 90 to 100) for percutaneous and 83.8 (range 70 to 95) for ORIF .

Delayed union was observed in 2 cases which were managed with open reduction with fixation. None of the patients showed malunion or signs of post traumatic osteoarthritis of the scaphoid or wrist at final follow up.

DISCUSSION:

The present prospective study aimed to assess functional outcome following ORIF or percutaneous fixation amongst 30 patients presenting with scaphoid fracture.

Injuries were graded according to Herbert and Fisher Classification

which classify the fracture based upon fracture site and displacement. Clinical assessment at final follow up was performed using Modified Mayo Wrist Score (MMWS) which is a 100 point scoring system including 4 areas i.e. pain, range of motion, grip strength and activity comprising of 25 points each.

Mean age of the patients in present study was 32.5 ± 7.94 years and slight male preponderance was observed in a ratio of 1.1:1. Brogan et al also observed similar findings in which scaphoid fracture were commonly encountered in young, adult males.^[2] About 17 patients were managed using percutaneous fixation whereas 13 patients were managed using ORIF.

McLaughlin and Maudsley & Chen recommended ORIF amongst patients with scaphoid fracture to allow early mobilization of wrist,^[17,21] and these findings were replicated by present study. In present study, union was observed in all the patients and the mean union time following ORIF and percutaneous fixation was 12.6 ± 2.4 weeks and 9.2 ± 2.5 weeks respectively. These findings were similar to study by Mittal et al in which mean union time following percutaneous fixation was 8.4 weeks (range 7 to 12) and that following ORIF was 12.1 week (range 8 to 16).^[14] The benefit of percutaneous Herbert screw fixation is that the fracture reduction and fixation can be accomplished without further injury to the scaphoid blood supply.^[22,23] Also reduced radiological healing time and less union time are the added advantage in fractures treated by percutaneous method.^[14] Naranje et al also reported 100% union rate with Percutaneous Herbert screw fixation in 32 patients similar to present study.^[24]

The present study observed union in 100% cases I both the techniques, but outcome using MMWS score including pain reduction, range of motion, grip strength and activity were significantly better in patients treated with percutaneous fixation as compared to ORIF. Though MMWS score was significantly better amongst patients treated with percutaneous fixation as compared to ORIF, complications in both the procedures were almost nil except for delayed union. The present study had certain limitations, i.e. small sample size and inhomogeneous population, the findings of the results could not be generalized.

CONCLUSION-

Since fracture treated with percutaneous fixation are associated with early union and early return to functional activity as compared to open reduction and internal fixation as replicated by MMWS score, Herbert screw for fixation with percutaneous technique for scaphoid fracture must be encouraged for displaced or undisplaced for better radiological and functional outcome.

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