

Closed reduction and dorsal percutaneous screw fixation of scaphoid fracture

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Abstract

Background: Surgical treatment of scaphoid fractures is technically demanding and the goals of surgery are to restore the anatomical configuration accurately and to maintain the vascularity of the bone with pain free wrist movement. **Methods:** The study was conducted in the Department of Orthopedics M.G.M. Medical College and L.S.K. Hospital, Kishanganj, (20 Patients) who were operated between March 2018 to December 2019 and who were previously operated in our institution and subsequently followed them. **Results:** all cases were treated with closed reduction and dorsal percutaneous fixation with Herbert screw. Fifty five percent's cases were operated between 10-15 days of injury. Average hospital stay was 5 days. All cases showed union at around 18 weeks. Regarding functional results, sixty percent cases had no difficulty doing day to day activity, in last follow up according to DASH score. **Conclusion:** Closed dorsal percutaneous method gives minimal post-operative complication, better patient compliance and best functional outcome.
Key Word: dorsal percutaneous screw fixation, scaphoid fracture.

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INTRODUCTION

Scaphoid fractures are the most common fractures of the carpal bones, accounting for seventy to eighty percent of all carpal fractures and 11% of all hand fractures. In adults, seventy percent of all scaphoid fractures involve the waist of the scaphoid, twenty percent involve the proximal pole, with the remaining ten percent involving the distal pole. Young males between 10 and 19 years of age are at highest risk for fracture of the scaphoid. The scaphoid has several unique characteristics that affect its healing potential. Approximately eighty percent of the bone is covered with articular cartilage and the scaphoid has a tenuous blood supply.¹ The dorsal carpal branch of the radial artery enters

the dorsal ridge at the level of the waist and supplies the proximal seventy to eighty percent of the scaphoid. Distal-to-proximal orientation of blood supply of the scaphoid and the lack of anastomoses between the dorsal and palmar vessels makes the proximal pole of scaphoid more susceptible to non-union and avascular necrosis after fracture. Even the primary treatment demands expertise and familiarity with different treatment options. If those requirements are met a good prognosis can be expected. Open reduction and internal fixation of acute fracture of the scaphoid using a compression lag screw was recommended by McLaughlin and Maudsley and Chen to allow early mobilization of wrist. Herbert and Fischer first described the technique in 1984, since then the Herbert screw has become widely accepted as a mode of treatment. Rettig ME *et al.* evaluated fourteen patients with acute displaced scaphoid waist fractures treated by open reduction and internal fixation with Herbert screw and K wires using either volar approach or dorsal approach²⁻⁴. Open technique, however, is not without risk and significant complications have been reported. It requires significant soft tissue dissection and violation of the extrinsic volar and dorsal ligaments. The most common complication seen in various studies were; problem with

scar (Hypertrophied scar), difficulty in guide wire placement, screw protrusion, osteoarthritic changes in scaphotrapezial joint after volar approach and post operative instability. Another common complication following Herbert screw fixation is nonunion. Review of literature, however, shows that the most common reason for failure in Herbert screw procedure is improper screw placement. Several authors have stressed that, important consideration during Herbert screw fixation is that the screw should be placed within the center of the scaphoid. A high successful union rate of approximately ninety five percent can be achieved after adequate screw fixation; however malpositioning can result in nonunion of scaphoid fractures.⁵ Nonunion may occur in five to ten percents of all cases, with an even higher incidence in displaced fracture and proximal pole fracture. The reason behind such high incidence is attributed to the tenuous blood supply of the scaphoid. The blood supply of the scaphoid is primarily from the radial artery via the artery to the dorsal ridge of the scaphoid, whose branches enter the scaphoid via foramina at the dorsal ridge and run proximally and palmarly to supply the proximal pole. The proximal pole therefore, is dependent entirely on intraosseous blood flow. Avascular necrosis is said to occur in thirteen to fifty percents of cases of fracture of the scaphoid, and the incidence of avascular necrosis is even higher within those with involvement of the proximal one fifth of the scaphoid. These findings by various authors explains the nonunion and avascularity of proximal fragment in one of our case^[6]. In other patients only minor complications were seen.

METHODS

The study was conducted in the Department of Orthopedics M.G.M. Medical College and L.S.K. Hospital, Kishanganj, (20 Patients) who were operated between March 2018 to December 2019 and who were previously operated in our institution and subsequently followed them.

Inclusion criteria

- active patients with scaphoid fractures without any major fracture of the Upper limb .
- Delayed union or fracture within 3 (three) months.
- Closed fracture.

Exclusion criteria

- Elderly patients with low functional demands.
- Distal pole fracture scaphoid.
- Scaphoid non-union.
- Old fracture with cyst formation or sclerosis.

- Associated with major fractures of upper limb.
- Pre-existing neurological problems of upper limb.
- Associated with previous hand diseases

The patients were evaluated thoroughly to exclude any co-morbid conditions by history taking, detailed clinical examination including X-rays and CT-scans with 3D-reconstruction.

Implants and instruments for fracture fixation:

- General instruments for mini incision.
- 2.4/2.7 mm Herbert screw and its matching instruments.
- 2mm canulated drill bead.
- guide wire
- 2.4/2.7 screw driver.

Follow up:

- All patients were evaluated at four weeks interval until fracture united. After union three monthly follow up done till date.
- At each follow up, patients were subjected to clinical as well as radiological examination with scaphoid profile. 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 three views.
- On final follow up clinical assessment were performed based on disabilities of the arm, shoulder and hand score (DASH).



Pre-operative x-ray (PA and Lat view) of SCAPHOID Fracture



Post-operative x-ray (PA and Lat view) of SCAPHOID Fracture

RESULTS

Table 1: Age distribution

Age group(years)	No	%
18-20 years	6	30
21-30years	10	50
31-40 years	4	20
Total	20	100

The mean age was 26.2 Years.

Table 2: Sex Distribution

Sex	No of Cases	%
Male	18	90
Female	2	10
Total	20	100

The male and female ratio was – 9:1

Table 3: Mode of injury

Mode of Injury	No of Cases	Percentage
RTA	4	20
Accidental Fall	16	80
Total	20	100

In our study major trauma was due to accidental fall; eighty percent; whereas road traffic accident was twenty percent.

Table 4: Duration of surgery

Duration of Surgery(minutes)	No of cases	Percentage
<35	9	45
35-45	11	55
Total	20	100

Average duration of surgery in our series was 40 min(range 35 to 45 minutes).

Table 5: Post-operative complication

Complications	No of cases	Percentage
Surgical site infection (Superficial)	1	5
Neurological Complication	NIL	NIL
Loss of reduction	Nil	Nil
Implant related complication	1	5
Nonunion	NIL	NIL

One case had surgical site infection and one case had implant related complication

Table 6: Union Time

Union Time	No of cases	Percentage
BY 10 WKS	9	45
BY 14 WKS	8	40
BY 18 WKS	3	15
TOTAL	20	100

All cases showed union, eighty five percent cases had united within 14 weeks and remaining three cases(fifteen percent) were united within 18 weeks. The clinical outcome according to DASH SCORE at the time of last follow-up was graded as no difficulty in 12 patients, mild

difficulty in 6 patients, moderate difficulty in 1 patient and severe difficulty in 1 patient.

Table 7: DASH Score

Category	No of patients
No difficulty	12
Mild difficulty	6
Moderate difficulty	1
Severe difficulty	1
Unable	0

18 months follow-up twelve patients had no difficulty, six patients had mild difficulty, one patient had moderate difficulty and one patient had severe difficulty to do there day to day activity according to DASH score.

DISCUSSION

Fractures of scaphoid are common, and many times are difficult to diagnose and treat. Pain at anatomical snuff box, wrist movement difficulty and difficulty in finger grip on the affected side are the usual presenting features. Fracture scaphoid can cause prolonged morbidity and absences from work in young adults in which they are most common. Advanced imaging modalities, better understanding of fracture biomechanics and modern reduction tools have helped in establishing surgical treatment as the standard method of treatment in these patients⁷⁻⁹. Surgical treatment of scaphoid fractures is technically demanding and the goals of surgery are to restore the anatomical configuration accurately and to maintain the vascularity of the bone with pain free wrist movement. In our series only four (twenty percent) patients were above 30 years, rest sixteen (eighty percent) patients were below 30 years. This finding suggests that scaphoid fracture is common in young adults which correlates with the literature.^{7,8} The mode of injury was accidental fall in majority of patients (accidental fall in 16 patients; eighty percent; and road traffic accident in four patients; twenty percent). Majority of patients in our study were males (18 males, 2 females) which can be explained by the fact that, males are more prone to accident. The male preponderance in our study also correlates with the literature^{10,11}. The majority of authors use Herbert and Fisher classification of scaphoid fractures in their publications. According to medical resources, fractures of the proximal pole and waist fracture are most frequent fractures. The time elapsed after injury is important because it is difficult to achieve union and preserve vascularity of fragments if surgery is delayed. In our study, the time interval between injury and surgery ranged from 11 to 15 days (median 13 days). Relative delay was due to late presentation to our hospital, case load in our hospital and their socio-economical status. In our study all patients were treated with closed reduction and dorsal percutaneous fixation of scaphoid fracture with Herbert screw. In our series all cases showed union. Forty five

percent cases(nine cases)united in around ten wks and forty percent (eight cases) united around twelve wks. The remaining three cases were united within eighteen wks. No experience of delayed union and non union in our study. Naranje S *et al.* reported hundred percent union rate with Percutaneous Herbert screw fixation in thirty two patients involving both fresh and late scaphoid fracture presentations with dorsal approach. In our series we achieved hundred percent union rate, minimal complication and an early return of wrist function with closed reduction and internal fixation with Herbert screw irrespective of type of fracture. Several authors have stressed that, important consideration during Herbert screw fixation is that the screw should be placed within the center of the scaphoid. A high successful union rate of approximately ninety five percent can be achieved after adequate screw fixation; however mispositioning can result in nonunion of scaphoid fractures. Nonunion may occur in five to ten percent of all cases, with an even higher incidence in displaced fracture and proximal pole fracture.

CONCLUSION

Closed dorsal percutaneous method gives minimal post-operative complication, better patient compliance and best functional outcome. We conclude that, the closed operative method should be trailed in displaced and undisplaced scaphoid fractures.

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