

Original Research Article

Outcome of volar Barton fractures of distal radius managed with open reduction and internal fixation with volar locking plate

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ABSTRACT

Background: Volar Barton fractures of distal radius almost always require a surgical fixation. Near anatomical reduction and a stout fixation is imperative for good outcome. The present study aimed at studying the outcome of open reduction and internal fixation with volar locking plate for volar Barton fractures.

Methods: The present study included 25 patients with volar Barton fractures of distal radius presenting to the orthopaedic department who were managed with volar locking plate. The minimum follow-up period was 12 months. Wrist movements were recorded and outcome was studied using modified mayo wrist score at final follow-up.

Results: The mean modified mayo wrist score at final follow-up was 88.47 ± 15.3 . Excellent to good outcome was observed in 80% of the patients. None of the patients had a poor outcome. Clinically significant movements were observed at wrist at final follow-up. Superficial wound infection was the most common complication and deep infection was seen in two patients and both of them needed early implant removal at three months. Hypertrophic scar at surgical incision site was observed in two patients but did not bother the patients. Two patients needed a stellate ganglion block and physiotherapy for complex regional pain syndrome (CRPS) and both responded well.

Conclusions: Open reduction and internal fixation (ORIF) with volar locking plate provides stout fixation in volar Barton fractures and allows early physiotherapy and rehabilitation of wrist. The results are predictably good in most patients with minimal complications rates.

Keywords: Volar Barton fracture, Volar locking plate, ORIF

INTRODUCTION

Distal radius fractures are one among the most common fractures encountered by an orthopaedician. The literature on the subject is exhaustive and dates back to reports by Colles who busted the myth of the distal radius fracture being a wrist dislocation.^{1,2} Barton fractures are the intra-articular fractures resulting due to shear forces with displacement of volar or dorsal lips of the distal radius. Volar Barton is more common and is almost always associated with volar subluxation of the radiocarpal joint.³ Conservative management for volar Barton fractures is associated with unsatisfactory outcome and a

set of myriad complications.³ For good outcome it is imperative to start early wrist movements which is only possible if a near anatomical reduction is attained followed by a stout fixation.^{4,5} ORIF using volar locking plate is one among various management options available in literature.⁶⁻⁹ The present study was aimed at assessing the functional outcomes of volar Barton fractures in adults managed with ORIF with volar locking plate.

METHODS

The present prospective study was carried out in the department of orthopaedics government medical college

Jammu. 25 patients with volar Barton fractures of distal radius managed with ORIF with volar locking plates from August 2019 to October 2022 were included in the study. Ethical clearance was taken from the institutional ethical committee and informed written consent was taken from the study participants.

Inclusion criteria

Patients with age >18 years, closed fractures, fracture <1 week old, no associated fractures of wrist were included in the study.

Exclusion criteria

Children with <18 years, open fractures, neglected fractures (>1 week old), polytrauma and associated wrist injuries were excluded from the study.

All the patients included in the study were taken from the OPD and emergency wing of orthopaedic surgery. At the presentation, requisite radiographs were ordered and a CT scan was ordered in every patient. After confirmation of a volar Barton fracture the patients were placed in a short arm plaster and baseline investigations were performed as a part of pre-anesthetic check-up. The patients were operated in elective operating room under supraclavicular block or general anaesthesia.

A modified henry approach was used for open reduction of the fracture. A skin of around eight centimeters was made over the volar aspect of distal forearm, directly over the flexor carpi radialis (FCR) tendon. After superficial dissection, the volar sheath of the tendon was incised and the tendon was retracted medially. The dorsal sheath of FCR tendon was then incised and with gentle retraction the flexor pollicis muscle was retracted laterally. Median nerve along with other flexors was gently retracted medially. An L shaped rent was made in the pronator quadratus muscle to expose the volar lip of the fracture. The fracture was reduced and fixed using a volar locking plate (Figure 1). Image intensification was used to confirm plate placement and reduction.

The patient was allowed early wrist movements as pain allowed and a physiotherapy was started from second post-operative day. Skin sutures were removed two weeks after surgery. The patients were followed regularly in OPDs to document the outcome and note the complications. The minimum follow-up was 12 months. At the final follow-up, the outcome was studied using modified Mayo wrist score and the wrist movements were noted. The wrist movements and the final modified Mayo wrist score were the primary outcome variables while as the complication profile was the secondary outcome. Statistical analysis including mean, percentage and standard deviation of the data was calculated using SPSS statistics programme version 20 (IBM, Armonk, NY, USA).

RESULTS

Demographic details of the patients have been tabulated in Table 1. The mean age of study participants was 30.43 ± 11.3 years and 76% of the patients were males. Mean time interval between injury and surgery was 6.83 ± 4.5 days and mean operative time was 46.5 ± 13.6 minutes. The mean modified Mayo wrist score at final follow-up was 88.47 ± 15.3 . Excellent to good outcome was observed in 80% of the patients (Table 2). None of the patients had a poor outcome. Clinically significant movements were observed at wrist at final follow-up as listed in Table 1. Complication profile has been depicted in Table 3. Superficial wound infection was the most common complication and was dealt with regular dressings and culture specific antibiotics. Deep infection was seen in two patients and both of them needed early implant removal at three months. Hypertrophic scar at surgical incision site was observed in two patients but did not bother the patients. Two patients needed a stellate ganglion block and physiotherapy for CRPS and both responded well.



Figure 1 (A-D): Radiographs of a 29-year-old male with volar Barton fracture managed surgically using volar locking plate. Pre-operative radiographs of a volar Barton fracture of distal radius. Post-operative radiographs of the same patient with volar locking plate *in situ*.

Table 1: Demographic details of the study participants.

Variables	Observation
Age of patients (Mean ± SD) (Years)	30.43±11.3 (Range: 21-47)
Gender	
Male	19 patients (76%)
Female	06 patients (24%)
Male: Female	3.16:1
Average time between injury and surgery (days)	6.83±4.5
Mean operative time (min)	46.5±13.6
Average wrist movements at final follow-up	
Mean flexion	67.47°±4.8°
Mean extension	71.52°±3.98°
Mean radial deviation	8.45°±2.6°
Mean ulnar deviation	27.56°±2.9°
Mean pronation	72.65°±2.3°
Mean supination	76.35°±3.67°
Mean modified mayo wrist score at final follow-up	88.47±15.3

Table 2: Final functional result of patients on the basis of modified mayo wrist score.

Results	N	Percentage (%)
Excellent	03	12
Good	17	68
Fair	05	20
Poor	0	0

Table 3: Complication profile of patients.

Complications	N (%)
Superficial wound infection	3 (12)
Deep infection	2 (08)
Hypertrophic scar	2 (08)
CRPS	2 (08)

DISCUSSION

Volar Barton fracture fixation is aimed at reconstructing the wrist anatomy to aid early physiotherapy and rehabilitation.^{10,11} Volar locking plating provides the advantage of a stiff fixation construct and early wrist movements may be commenced.¹² Many researchers have reported that early mobilization of wrist after volar plating helps in maintaining the radiological reduction parameters.^{13,14} The present study aimed at assessing the outcome of volar Barton fractures in adults using volar locking plating using modified mayo wrist score. The present study included 25 volar Barton fractures with a mean age of 30.43±11.3 years and 76% of the patients were males. The mechanism of injury was road traffic accident in 72% of the patients and fall in rest of the 28%. There is contrasting literature on the age and gender predilection for volar Barton fractures.^{15,16} At the final follow-up the authors observed a mean flexion of

67.47°±4.8°, mean extension of 71.52°±3.98°, mean radial deviation of 8.45°±2.6°, mean ulnar deviation of 27.56°±2.9°, mean pronation of 72.65°±2.3° and mean supination of 76.35°±3.67°. These observations are comparable to the studies by previous researchers.^{10,17,18}

The final functional outcome, as calculated using modified Mayo wrist score was excellent, to good among 80% of patients in the present study. These observations are comparable to the previous studies.^{15,16,18-20} Superficial wound infection was the most common complication in the present study, and was dealt with regular dressings and culture specific antibiotics. Deep infection was seen in two patients and both of them needed early implant removal at three months. Hypertrophic scar at surgical incision site was observed in two patients but did not bother the patients. Two patients needed a stellate ganglion block and physiotherapy for CRPS and both responded well. Kolla et al reported arthritis of wrist joint, malunion and extensor pollicis longus tendon irritation in few patients in addition to the complications observed in the present study.¹⁶ Similarly, Kundu et al reported residual pain, stiffness and deformity in some patients.¹⁵ The present study has some limitations. The sample size is small and there is lack of a control group. Large scale randomized control trials should be conducted on the subject.

CONCLUSION

ORIF with volar locking plate provides stout fixation in volar Barton fractures and allows early physiotherapy and rehabilitation of wrist. The results are predictably good in most patients with minimal complications rates.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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