



## Surgical Management of Volar Barton's fracture with Fixed Angle LCP

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### ABSTRACT

**Introduction:** Intra-articular distal end radius fractures pose a challenge to the treating surgeon. Volar Barton fractures are intra-articular distal end radius fractures with radiocarpal instability. Conservative treatment of these fractures is associated with early osteoarthritis, deformity, subluxation & instability. Recent advances offering stable internal fixation have claimed to improve the outcome of these fractures. The purpose of the present study is to assess clinic-radiological outcomes of locking compression plating for volar Barton fractures.

**Materials and Methods:** In a retrospective study, 20 patients (M:F – 16:4) with volar Barton fractures who were treated by open reduction and internal fixation using volar locking compression plate (LCP). The average follow-up period was 1 year. Final outcome assessment was based on modified Gartland and Werley criteria.

**Results:** According to Gartland and Werley criteria of 20 patients, 11 had excellent results, 7 had good,

1 had fair while 1 had poor outcomes. Satisfactory outcomes were seen in 90%.

**Conclusion:** Open reduction & internal fixation using volar LCPs in volar Barton fractures provides satisfactory functional outcomes in majority of cases.

### I. INTRODUCTION

Volar Barton fractures are anterior marginal intra-articular fractures of distal end radius with subluxation of radiocarpal joint [1]. Dislocation of the radiocarpal joint is the hallmark of Barton's fractures and they account for 1.2% to 4.2% of distal radius fractures. Volar Barton fractures are inherently unstable resulting from low- to high-velocity trauma [2]. The primary goal in the treatment of these fractures is to achieve rigid anatomic fixation, quick return of hand function, and avoid complications [3]. Conservative treatment of these fractures is associated with early osteoarthritis, deformity, subluxation, and instability.





At present, the gold standard for the treatment of these fractures is open reduction and volar locking compression plating [4,5]. It provides direct restoration of anatomy, a biomechanically stable fixation that allows early rehabilitation, thereby potentially reducing the chances of stiffness of the wrist [6,7]. Complications like carpal tunnel syndrome, complex regional pain syndrome, screw penetration into radiocarpal joint, tendon irritation, tendon rupture, penetration of screw tip in dorsal cortex, and infection are seen in some cases. Hence, it was advised to choose carefully between conservative and operative treatment for these fractures.

## II. MATERIALS AND METHODS

It was a retrospective study conducted on patients who underwent locked compression plating for volar Barton fractures. An institutional ethical committee clearance was taken for the study. The total numbers of patients available at the time of follow-up at 1 year after surgery was 20.

### Inclusion criteria

- 1) adults over 18 years age, with volar Barton fracture
- 2) pts medically fit for surgery
- 3) pts willing for surgery and have given written informed consent

Gartland & Werley criteria:

### Exclusion criteria

- 1) pts below 18 years age
- 2) compound fractures with or without vascular injuries
- 3) medically unfit pts
- 4) pts unwilling for surgery

All surgeries were done under regional or general anaesthesia on an operation table in supine position. Prophylactic antibiotic was given in all patients 1 h before surgery. All the patients were treated by ORIF using LCP through modified Henry's approach.

A check radiograph was done on the 1st post-operative day. Following satisfactory wound inspection on the 3rd post-operative day, patients were switched over to oral antibiotics and discharged from the hospital. Suture removal was done at 2 weeks interval; after which, patients were called at 4 weeks interval for initial 6 months and then every 3 months for clinic-radiological assessment till final follow-up.

Final outcome evaluation was done using modified Gartland & Werley criteria at a mean follow-up period of 1 year.



Results	Point
<b>Residual deformity</b> (range, 0 to 3 points)	
Prominent ulnar styloid	1
Residual dorsal tilt	2
Radial deviation of hand	2 or 3
<b>Subjective evaluation</b> (range, 0 to 6 points)	
Excellent: no pain, disability, or limitation of motion	0
Good: occasional pain, slight limitation of motion, and no disability	2
Fair: occasional pain, some limitation of motion, feeling of weakness in wrist, no particular disability if careful, and activities slightly restricted	4
Poor: pain, limitation of motion, disability, and activities more or less markedly restricted	6
<b>Objective evaluation*</b> (range, 0 to 5 points)	
Loss of extension	5
Loss of ulnar deviation	3
Loss of supination	2
Loss of flexion	1
Loss of radial deviation	1
Loss of circumduction	1
Pain in distal radio-ulnar joint	1
Grip strength: 60% or less than on the opposite side <sup>†</sup>	1
Loss of pronation <sup>†</sup>	2
<b>Complications</b> (range, 0 to 5 points)	
Arthritic change	
Minimum	1
Minimum with pain	3
Moderate	2
Moderate with pain	4
Severe	3
Severe with pain	5
Nerve complications (median)	
Poor finger function due to cast	1 or 2

Excellent	0–2
Good	3–8
Fair	9–20
Poor	>20

### III. RESULTS

Fracture union was seen in all cases at a mean follow-up of 11 weeks (range 8–13 weeks). Mean follow-up period was 12 months. Patient demographics: Male: female = 16:4

The commonest cause of these fractures was road traffic accidents. There is no control over fragments devoid of capsular attachment and also it is difficult to maintain reduction. Rigid anatomical fixation and appropriate exercises are important for good prognosis.

#### Complications:

ORIF with LCP has become the standard of the treatment for volar Barton's fractures. Jakubietz et al. have shown that routine volar plating was associated with significantly better ROM, grip strength, and pain when compared with routine dorsal plating [8]. ORIF with volar LCP is superior to external fixation as well as percutaneous pinning in terms of radiological results, early functional results, and complication rates [9,10]. Due to the angular stability of LCP, reduction can be maintained.



Complication	No of cases	percentage
Malunion	2	10
Wrist pain	3	15
Tendon irritation	1	5

**Pre-op & post-op:**



**At 6 months :**



Gartland and Werley score:

Movements-within functional range	No of cases	Percentage
Palmar flexion(45degree)	20	100
Dorsiflexion(45 degree)	20	100
Supination pronation(50degree)	20	100
Pronation(50 degree)	20	100

Excellent: 11  
Good: 7  
Fair: 1  
Poor: 1

#### IV. DISCUSSION

Volar Barton's fractures are uncommon and unstable fractures of distal end radius. Closed reduction alone is usually insufficient to achieve satisfactory reduction because there is no control over fragments devoid of capsular attachment and also it is difficult to maintain the

reduction. Rigid anatomical fixation and appropriate exercises are important for good prognosis.

ORIF with LCP has become the standard of the treatment for these fractures during the last

decade. ORIF with volar LCP is superior to external fixation and percutaneous pinning in terms of radiological results, functional results, and complication rates. Due to the angular stability of LCP, reduction can be maintained.

90 % of the patients had excellent to good results. 2 patients had malunion at 1 year. 4 patients complained of wrist pain owing to arthritic changes, more distal placement of the plate and dorsal ECRL tendon irritation.



## V. CONCLUSION

Treatment of volar Barton fractures using volar LCP fixation gives satisfactory functional outcomes in majority of these fractures. Large good-quality randomized controlled trials are needed to generate evidence-based treatment options for these fractures.

treated with open reduction and internal fixation or closed reduction and percutaneous fixation. A prospective randomized trial. *J Bone Joint Surg Am* 2009;91:1837-46.

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