



EVALUATION OF SURGICAL OUTCOME OF DISTAL RADIUS FRACTURE (VOLAR BARTON'S) TREATED BY BUTTRESS PLATE.

Medical Science

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ABSTRACT

Background: Volar Barton's fracture is a common problem among the distal radius fracture. Volar articular margin is displaced and inherently unstable fracture.

Objectives: Aim of this study is to assess outcome after stabilization of the fracture with locking buttress plate in terms of stability, functional recovery and operative complications.

Method: This study was carried out in the department of Orthopaedics of Bangabandhu Sheikh Mujib Medical University, Bangladesh for the duration of 2.5 years. Within this period 30 patients of Volar Barton's fracture were selected as per inclusion and exclusion criteria.

Results: In the final follow-up 6.7% had excellent scores, 73.3% had good scores and 20% fair scores on the basis of anatomical outcome. However, 90% had satisfactory functional outcomes on the basis of modified Mayo's wrist scoring system.

Conclusion: The Volar buttress plate is found to be an effective technique of fixation. The Volar locking buttress plate maintains articular congruity, radial length and alignment.

KEYWORDS

INTRODUCTION

Fracture of distal radius is a spectrum ranging from simple fracture requiring little management to complex multi-fragmented fracture dislocation of daunting complexity. However more often, distal radius fracture will involve the radio carpal joint and or the distal radio ulnar joint. They can be either partial articular or more complete articular. These require an anatomical reduction of the joint surface in order to reduce the incidence of post traumatic arthrosis and to achieve a successful functional outcome. Therefore, intra articular fracture like Barton's fracture that cannot be reduced in closed method more often requires operative treatment as well as internal fixation with buttress plate.

The articular injuries are more frequently comminuted and unstable, and therefore less suitable for more traditional methods of closed reduction and cast immobilization. However, skeletal fixation and realignment of fracture fragments are the better option.

The volar Barton's fracture is generally an unstable type of fracture which requires open reduction and internal fixation with small buttress plate. Internal fixation restores the articular congruity efficiently reported by several authors.^{1,2} The improper fracture reduction does not correct intra-articular incongruity or carpal change which may affect the resultant surgical outcome.³⁻⁵ Consequently, the precise surgical outcome depends on the appropriate reduction of fractures of distal radius in spite of applied fixation techniques. The great advantage of internal fixation is the capability to rearrange the major displaced fracture fragments.

The most widely used conceptions are volar-locking plates with angle stable screws or pegs offers stability and a safe approach to the fracture. Previous studies suggest that on basis of biomechanical studies of two types of plating systems, in comparison locking plate will have a better outcome to non-locking.⁶ To obtain the anatomical reduction methods of treatment involving open reduction and internal fixation with volar plates are being preferred.

Malunion occurs more often in Volar Barton's fracture and can result in

considerable disability. Malunion can be caused by failure to secure an accurate reduction, recurrence of deformity after an accurate reduction, marked comminution of fragments, complete rupture of the distal radio ulnar ligaments with excessive mobility of distal ulna, failure to keep the fracture immobilized until consolidation is complete and marked crushing of fragment in elderly people with osteoporosis.⁷

In the clinical practices, various methods are used for the management of Volar Barton's fractures. The Volar buttress plate technique is now mostly chosen for the management of this type of fracture.

MATERIALS & METHOD:

This prospective interventional study was carried out in the department of Orthopaedic surgery, BSMMU, Dhaka, Bangladesh for the duration of 2 years and 6 months (March 2014 to September, 2016). Within this period 30 patients of Volar Barton's fracture were selected as per inclusion and exclusion criteria who are admitted in this institution.

Inclusion criteria:

1. Closed Volar Barton's fracture of distal radius (AO/ASIF type B3)
2. Recent cases (within 3 weeks)
3. Age 18 to 65 years

Exclusion criteria:

1. Open wound
2. More than 3 weeks old fracture
3. Associated Infection
4. Associated fracture in ipsilateral upper limb

After proper evaluation of these patients, open reduction and internal fixation was done with volar locking buttress plate. The operative outcomes of distal radius (Volar Barton's fractures) fractures were evaluated by Modified Mayo Wrist score system⁸ and radiological criteria were outlined by Lidstrom (1959) score as modified by Sarmiento and Latta (1980).^{9,10}

Before and final follow-up the anatomical results were evaluated

following Sarmiento and Latta (1980)¹⁰ and functional outcome were evaluated using modified Mayo wrist scoring system. The minimum follow up time was 24th week from the surgery.

Measurement of Grip Strength

We used modified sphygmomanometer cuff technique. A normal hand should be able to achieve a reading of 200 Hg or over. In this study, we compared the grip strength of affected hand with normal hand.

Jebsen-Taylor Test¹¹

This test requires the least amount of extremity coordination, measures prehension and manipulative skills and consists of following seven subtests: Writing, card turning, picking up small objects, simulated feeding, stacking, picking up light objects, picking up large heavy objects.

Modified Mayo Wrist Score¹²

Pain	Point
No pain	25
Mild occasional	20
Moderate	15
Severe	0
Work status	
Regular job	25
Restricted job	20
Able to work but unemployed	15
Unable to work due to pain	0
Range of motion	
>120°	25
100 to 119°	20
90 to 99°	15
60 to 89°	10
30 to 59°	5
0 to 29°	0
Grip strength (% of normal)	
90 to 100	25
75 to 89	15
50 to 74	10
25 to 49	5
0 to 24	0

* Total point scores: excellent (91 to 100), good (80 to 90), fair (65 to 79), and poor (<64).

RESULTS:

In this study, out of 30 patients 76.67% were male and 23.33% were female where mean age 32± 9.44 (age range: 19 - 60). Left side involvement was more 63.34% (19 patients) and right side 36.66% (11 patients). The mechanisms of injury were shown 53% motorcycle accident, 37% fall, and 10% machinery accident. Two patients had superficial skin infections and treated with regular dressings. In the final follow-up according to Modified Mayo wrist score 8 cases (26.67%) had excellent scores, 19 cases (63.34%) had good scores and 3 cases (10%) obtained fair scores. However, 90% of the patients were found satisfactory functional outcomes on the basis of modified Mayo's wrist scoring system. On radiographic assessment at final follow-up mean volar tilt was 5.03±2.31, mean radial height was 9.46 ± 2.28, mean radial inclination was 20.13 ± 4.02 and articular step off was 0.55 ± 0.38. Functional outcome and radiological parameters are shown in table 1.

Table 1. Table showing assessment of various parameters at 12-month follow-up.

	Mean
Modified Mayo Wrist Score	84.33 ± 8.17
Range of Motion	
Extension	64.13 ± 7.47
Flexion	60.5 ± 7.18
Ulnar Deviation	21.46 ± 4.7
Radial Deviation	15.7 ± 4.11
Radiological parameters	
Volar tilt	5.03 ± 2.31
Radial height	9.46 ± 2.28
Radial inclination	20.13 ± 4.02
Articular step off	0.55 ± 0.38

DISCUSSION:

Cancellous bone which is involved in distal radius fracture has great healing potential. This is the reason that nonunion is a rare entity in fracture of this region. Whereas, malunion is not uncommon and volar subluxation of the carpus is a common presentation.^{15,27} Therefore, the principle of treatment is mainly to provide anatomic reduction and

stabilization.¹⁵ Malunion of volar Barton's fracture is difficult to treat and can cause serious disability. In addition, the articular cartilage may be damaged causing pain and arthritis; and articular damage cannot regenerate.^{28,29}

In this study minimum follow-up period was 12 months. Mean age of the study population was 32.0±9.3 years within the range of 19 – 64 years. Ketan et al., 2015 found mean age 33.3 year in their study on open reduction and internal fixation in volar displaced distal radial fractures.¹³

Out of 30 patients, 23 (77%) patients were male and 7 (23%) patients were female. Male Female ratio was 3.3:1. Similar male female ratio was seen in the similar study of Harish et al, (2016).¹⁴

Out of 30 patients, right side injury was in 11 (37%) patients and left side injury was in 19 (63%) patients. Harish et al, 2016 found right side injury in 45.8% and left side injury was in 54.2% cases which were almost similar to this study results.¹⁴

Regarding mechanism of injury, motor cycle accident was in 53.0% cases and fall type injury was in 37.0% cases. Harish et al, (2016) revealed 66.0% road traffic accident and 16.7% domestic fall.¹⁴

In this study, the required mean time for bony union was 7.5±1.2 weeks. The majority (76.6%) of the patients required time for bony union was 8-12 weeks. Previous studies on open reduction and internal fixation volar Barton's fractures were healed during 7-10 weeks of bony union.¹⁵

The superficial skin infections were resolved with regular dressings. In this study 7% superficial skin infections were observed and treated non-operatively. The volar locking plating system was reported to be a biomechanically stable for fixation of distal radial fractures. The volar plating reduces the soft-tissue complications observed with dorsal plating.¹⁶ Previous studies by Kevin et al. (2006) were found the volar locking plating system was associated with a short-term complication rate of 10% (nine of eighty-seven).¹⁷

In this study, most of the patients were found with slight to no deformity (90%) and only 10% patients were found with moderate deformity.



Fig 1-Preoperative radiographs-AP and Lateral view of wrist.



Fig 2-Intraoperative Photograph.



Fig 3-Postoperative radiographs-AP & Lateral



Fig 4-Range of motion at 24wks.



Figure 5-ROM at 24 wks(pronation & supination).



Fig 6-Measurement of Grip Strength.

CONCLUSION:

The Volar buttress plate is found an effective technique of fixation. The Volar locking buttress plate maintains articular congruity, radial length and alignment. There was significant improvement in functional outcomes till the end of final follow-up (48 weeks).

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