



BUTTRESS T PLATE IN VOLAR BARTON'S FRACTURES: FUNCTIONAL AND SUBJECTIVE EVALUATION

Orthopaedics

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ABSTRACT

Aim: To evaluate functional and subjective outcome in patients with volar barton fracture treated with volar T plate according to modified Gartland and Werly grading system.

Patients And Methods: A comprehensive study had been conducted in the Department of Orthopaedics, P.B.M. Medical College & Hospital, Bikaner between Mar 2018 to Aug. 2019. Study included 50 cases of volar barton fractures treated with buttress plate and screws.

Results: Final result was analysed after an average follow up of 6 months. Anatomical and functional results were satisfactory in 84% cases fair in 4% cases and 2% cases had poor result. Complications were noted in 10 (30%) cases.

Conclusion: Volar buttress T-plate fixation for intraarticular lower end radius fracture is an excellent method in young and old adults and ensures a strong, painless wrist with excellent motion and good strength with minimal complications.

KEYWORDS

Distal radius, volar barton, buttress plate

INTRODUCTION:

Fractures of the distal radius constitute one of the most common skeletal injuries treated by Orthopaedic surgeons. These injuries account for one sixth of all fractures evaluated in emergency room. Barton's fracture, named after the American surgeon John Rhea Barton, is a fracture of the distal end of the radius that involves the dorsal or volar rim and extends into the intra-articular region. Such intra-articular fractures are uncommon, and they are usually associated with either low or high-energy trauma. They constitute only 1.3% of the distal radius fractures. Radiocarpal articular incongruity remains the most clinically significant radiographic parameter with regard to both functional outcome and fracture degenerative changes in intraarticular fracture of L/E radius. If >2 mm of articular incongruity is present there is a 100% incidence of degenerative changes (Knirk and Jupiter).

Volar Barton fractures are associated with volar subluxation of lunate. The carpus adapts to this with extension at midcarpal joint in order to realign hand on the forearm. This carpal malalignment is associated with poorer grip strength and rotation with fewer good results. The primary goal in treatment of volar Barton's fractures of the distal radius is to achieve proper reconstruction of the disrupted anatomy and allow the quick return of hand function without complications. To buttress the volar articular margin, T-buttress plate with screws is the most frequent tool used. The volar plate is an evolution of the blade plate as it transfers forces from the subchondral bone away from the dorsal metaphysis and toward the volar cortex. Volar fixation leverages the intact extensor compartment structural framework that contains and even reduces dorsal fracture comminution.

AIMS AND OBJECTIVES

To evaluate functional and subjective outcome in patients with volar barton fracture treated with volar T plate according to modified Gartland and Werly grading system.

MATERIAL AND METHODS

A comprehensive study had been conducted in the Department of Orthopaedics, P.B.M. Medical College & Hospital, Bikaner between Mar 2018 to Aug. 2019. Study included 50 cases of volar barton fractures treated with buttress plate and screws.

Inclusion Criteria:

- Only Fernandez type II (intraarticular fracture produced by shearing) were considered.

Exclusion Criteria:

- Age < 18 years

- Open fractures (Gustilo Grade ≥ 2)
- Pathological fracture
- Fracture > 2 weeks old

Operative Procedure:

All patients were operated under general anesthesia. The upper arm tourniquet was used in all cases in order to provide bloodless field during surgery. The fracture site was exposed through the distal part of the volar approach of Henry. The distal radius was exposed along the flexor carpi radialis tendon. After release of the pronator quadratus muscle from its radial insertion, the fracture site and volar surface of the distal radius were exposed. Fracture is reduced in anatomical position. Fracture reduction was verified with the image intensifier. Provisional Kirschner wires were used in all cases. Fixation of the fracture fragments was performed by a 3.5mm T-buttress plate.

Post Operative Management :

Postoperatively, patient was instructed to perform active finger movements, active elbow and shoulder movements from the very first day. Patient was discharged on 3rd postoperative day and reviewed for stitches removal (12th post operative day). At this time, BE slab was removed and patient was instructed to wear wrist splint. In the next follow up after 3 weeks patients was examined clinicoradiologically and for movements at wrist joint and fingers. Next follow up were done at 6 weeks, 3 months and 6 months. Final result was assessed at 6 months.

Evaluation Of Results:

Evaluation of results done at 6 months. The evaluation of result is done according to the demerit point system of Gartland and Werley (1951) modified by Sarmiento et al. (1975).

Radial deformity (Range 0 to 3 points)	Points
Prominent ulnar styloid	1
Carpal malalignment	2
Articular incongruity	2 or 3
Subjective evaluation (Range 0 to 6 points)	Points
Excellent no pain, disability or limitation of motion	0
Good occasional pain, some limitation of motion, & no disability	2
Fair - occasional pain, some limitation of motion, feeling of weakness in wrist, no particular disability and activities slightly restricted	4
Poor-pain, limitation of motion disability & activities more or less markedly restricted	6
Objective evaluation (Range 0 to 5 points)	Points
Loss of dorsiflexion (<45°)	5

Loss of ulnar deviation (<15°)	3
Loss of supination (<50°)	2
Loss of pronation (<50°)	2
Loss of palmar flexion (<30°)	1
Loss of radial deviation (<15°)	1
Loss of circumduction	1
Pain in distal radio ulnar joint	1
Grip strength 60% or less than on opposite side	1

Complications (Range 0 to 5 points)	Points
Arthritic change	
• Minimum	1
• Moderate	2
• Severe	3
• Minimum with pain	3
• Moderate with pain	4
• Severe with pain	5
Nerve complications (median)	1 to 3
Finger joint stiffness	1 to 2

Final result (Range of points)	Points
Excellent	0 to 2
Good	3 to 8
Fair	9 to 20
Poor	>21

OBSERVATIONS AND RESULT:

Total 52 patients of volar Barton fracture, treated with open reduction and internal fixation with volar Buttress plate, were included in study. 50 patients were present for regular follow ups, 2 patients did not attend follow up after 3 months, so only 50 cases were followed up. Out of 50 patients included in the study 40 i.e. 80% were males and 10 cases were female i.e. 20%. Overall right side was involved more than left i.e. 35 out of 50 cases. In this series all cases had right hand as their dominant hand. More than half of the patients i.e. 32 (64%) got their injury due to fall on outstretched hand and remaining i.e. 18 (36%) patients were injured due to road traffic accidents.

Table 1 Functional And Subjective Assessment At Final Follow Up

Results	Number of cases (%)	
	Subjective Results	Functional Results
Excellent	17 (34%)	20 (40%)
Good	28 (56%)	27 (54%)
Fair	3 (6%)	2 (4%)
Poor	2 (4%)	1 (2%)
Total	50 (100%)	50 (100%)

Most common complication faced during our study is finger stiffness which improved with physiotherapy. Tourniquet palsy (Esmarch rubber bandage was used as tourniquet) occurred in 2 cases which recovered completely within 10-12 weeks. One case got stitch line infection which was superficial and healed up completely with IV antibiotics. One case was reported with injury to pulmar cutaneous branch of median nerve (neuropraxia) which recovered after 12 weeks.

DISCUSSION:

The primary goal in treatment of volar Barton's fractures of the distal radius is to achieve proper reconstruction of the disrupted anatomy and allow the quick return of hand function without complications. Volar plate fixation is effective in buttressing a volar Barton's fracture of the distal radius. Our results are consistent with those studies that supported the effectiveness of ORIF. An extensive review of the literature revealed most of studies making use of ORIF with T-buttress plates in displaced volar Barton's fractures.

In an attempt to improve the anatomical and functional end result of distal radius fractures, wide arrays of technique from close manipulation and reduction followed by above elbow POP cast in supination and ventral flexion, open reduction and internal fixation using K-wires (when marginal fragment is small) to open reduction and internal fixation using volar buttress T-plate fixation were evolved.

The ideal outcome after volar Barton fracture should be a stable, pain free and non osteoarthritic wrist joint with a range of motion that is adequate for functional requirements. There is virtual universal agreement that proper reduction and stabilization of displaced fragments with early mobilization is necessary to achieve optimal results.

Nasir Ali et al concluded that most of the patients have returned to the baseline by 1 year though some having residual symptoms during the initial period of 3 months postoperatively. Our treatment leads to good subjective end-results regardless of the initial severity of the fractures. Mild radiocarpal osteoarthritis, seen in 2 patients in our study, did not affect their functional outcome. Our results are compareable to a recent study by Stevenson et al (2009). In this study volarly displaced intraarticular fractures of the distal radius were treated with volar plates and results were excellent to good in terms of anatomical restoration of the fracture segments and bone union with negligible complications.

In our study all fractures were reduced and fixed anatomically and the union rate was 100%. The fracture healing process is not hindered due to the cancellous bone character. The success rate is therefore high. In long term complications only the 5 out of 43 patients showed restriction of range of movement due to slight finger contraction that were labeled as fair result. These observations are compareable to the study of Kapoor and co-workers (2000). They concluded that open reduction and internal fixation provide the best articular anatomy in highly comminuted fractures with a high union rate.

The course of the flexor pollicis longus tendon is close to the palmar rim of the distal radius. The plate placed very close to the wrist joint can support the palmar aspect of the articular surface. However, it sometimes causes flexor tendon impairment. To avoid rupture of the flexor pollicis longus tendons, care has to be taken especially in very distal fractures, type C3 fractures. Adequate image intensifier control to verify the extra-articular and subchondral position of screws and plate is also quite important. In our study, two patients suffered from rupture of the flexor pollicis longus tendon. If fracture instability demands distal placement of hardware, close follow-up investigations and hardware removal should be considered at the first sign of flexor tendon irritation as reported by Droetz and Kutscha-Lissberg. This was also an important point for our study. T-buttress plate is useful for achieving good anatomical reduction, but care must be taken to avoid the complication of tendon rupture.

In our study at final functional assessment, the scores of 13 patients were excellent, 23 patients good, and 7 patients fair. Agarwal reported excellent results in 9 cases, good in 5, and fair in 2 out of 16 patients with intraarticular comminuted distal radial fractures treated with the Volar Plating. Badaruddin Sahito et al studied that, functional status was excellent in 20, Good 16, Fair 7 and poor in 2 patients. Mehra et al treated 82 patients with volar Barton fracture, out of those 39 were operated with plate, remaining treated conservatively. Bradway et al treated 16 patients with intra-articular fracture with open reduction and internal fixation and rated 7(44%) excellent, two (12%) good, 7 fair and no bad result was observed. Arora et al showed that distal radius fractures treated with locking plate showed good functional and radiological results with minimal loss of reduction. A retrospective review showed 5 patients were excellent, 7 good and 3 fair with no nonunion or infection, however, rupture of the flexor pollicis longus tendon occurred in 1 patient. Harness et al showed excellent in 1, 6 good and 1 fair results.

CONCLUSION:

This study demonstrated that ORIF with volar T-Buttress plate is an effective means of maintaining the anatomical fracture reduction and offers the following advantages.

- Ideal for intraarticular grossly displaced fracture.
- Prevents redisplacement.
- Restores articular congruity and carpal alignment.
- Safer for patient (can be performed under GA or regional anaesthesia).
- Technique easy to master.
- Economical

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