European Journal of Molecular & Clinical Medicine

ISSN 2515-8260 Volume 09, Issue 07, 2022

ORIGINAL RESEARCH

Surgical Management of Volar Barton fracture with Fixed Angle Locking compression Plate

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ABSTRACT

Background: Volar Barton's fracture is an unstable distal radial fracture with wrist subluxation or luxation. The goal of treatment is to accomplish anatomic fracture union, regain hand function quickly, and avoid complications. Healing fractures require limited space, stability, and blood supply. The locking plate lowers compressive pressures on the bone to achieve stability, which may prevent periosteal compression and blood supply degradation. It is favoured for fracture healing.

Martial and Methods: 25 volar barton fracture patients were treated at Kakatiya Medical College/MGM Hospital, Warangal, Telangana, India, from July 2021 to July 2022. Open reduction and internal fixation with a 2.5 mm locking compression plate were used. We employed 2 forms of LCP, universal and fixed angle, through a modified Henry's volar approach and an ulnar palmar approach. We followed up until functional recovery and examined radiologically at 1, 3, 6, and 12 months.

Results: The study included 20 men and 05 women aged 18 to 59 with a mean age of 36.5. Injury-to-surgery averaged 2.35 days. 6 to 24 months of follow-up. Applying 55% excellent, 35% good, 5% average and 5% poor on Gartland and Werley's demerit scale.

Conclusion: Fixing distal radius fractures, especially intraarticular volar barton fractures, with a locking compression plate is satisfactory for both patient and surgeon. Locking plates improve wrist function after volar Barton's fractures.

Keywords: Volar barton fracture; Openreduction; Fixed angle Locking compression plate.

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INTRODUCTION

Distal end of radius fractures still present a treatment problem. Intra- and extra-articular misalignment can result in a number of problems, including post-traumatic osteoarthrosis, diminished grip power and endurance, restricted motion, and carpal instability.[1-3] If enough bone stock is present to allow for early range of motion, open reduction and internal fixation is appropriate for treating unstable distal radiusfractures and articular incongruities that cannot be anatomically reduced and sustained with external manipulation and ligamentotaxis.[4,5] After the American surgeon John Rhea Barton, the fracture known as Barton's fracture involves the articular surface of the distal end of the radius and is sometimes accompanied with dislocation or luxation of the radiocarpal joint. These fractures, which can be caused by high- or low-energy trauma, account for 1.2% to 4.2% of distal radial fractures.[6-8] Barton's fractures are divided into volar and dorsal types based on the location

and shifting direction of the fragments. Volar Barton's fractures are distal radius type B3 fractures, according to the AO classification system. Conservative treatment typically fails and is riddled with issues like deformity, early osteoarthrosis, subluxation, and instability.[9,10] There have been reports of a variety of surgical procedures in the literature, but open reduction and internal fixation with a volar plate system are currently recommended for the treatment of volar barton fractures because they provide a satisfactory reduction and provide immediate stability. Additionally, early and speedy patient mobilisation may help to lessen wrist stiffness.[11-13]

In order to (a) directly control and maintain physiological palmar tilt, (b) prevent collapse with external fixation, and (c) avoid bridging the radiocarpal joint, internal fixation of metaphyseal bending fractures has gained popularity.[14-16] The distal piece can be addressed from either a dorsal or a volar approach and is often large enough and intact enough to provide appropriate purchase. It is preferable to have palmar plating since the screws immediately support against collapse and loss of palmar tilt. A dorsal plate must be positioned distally on the dorsum of the radius with smaller and more distal fragments, increasing the risk of extensor tendon injury. For fractures of the distal radius, there are two different types of plates: (a) conventional plates and (b) fixed angle locking compression plates. When utilising conventional plates, the communition must be lower since they do a poor job of holding the fragments of cancellous bone and cause setteling and reduction loss when screws are turned in the distal holes of the plate.[17-19]

By compressing the plate to the bone using bicortical screws, stability is achieved with traditional plates and screws. The locking screws support subchondral bone and withstand axial stresses when fixed angle locking plates are used. It is not necessary to compress the locking compression plate to the bone in order to maintain the periosteal blood flow.[20] By building a scaffold beneath the distal radial articular surface, fixed angle construct gives fixation additional strength. For unstable extra-articular distal radius fractures, volar fixed angle locking plates are a successful therapy that enables early post-operative rehabilitation. The aim of this study was to assess the functional result of patients who underwent fixed angles locking compression plate treatment for volar barton fractures.[21,22]

MATERIALS & METHODS

25 patients with volar barton fractures who were treated at Kakatiya Medical College/MGM Hospital, Warangal, Telangana, India., from July 2021 to July 2022.

Inclusion Criteria:

1. Adults (aged over 18years), both male and female with un stable, intra Articular volar barton fractures of distal end radius
2. Patients willing for treatment and given-informed written consent

Exclusion Criteria:

1. Patientsagedbelow18years
2. Patients medically un fit for surgery
3. Compound fractures associated with vascular injuries
4. Patients not willing for surgery.

RESULTS

The 25 volar barton fracture cases treated at Kakatiya Medical College/MGM Hospital, Warangal, Telangana, India, from July 2021 to July 2022.make up the current study. The 20 fractures were all closed. All cases were periodically followed up from July 2021 to July 2022at 1, 3, and 6 months after surgery. At the conclusion, results were analysed and graded using the Gartland and Werley scoring system. The observations made in relation to the available data, as analysed below, are as follows.

Table 1: Age Incidence

Age in years	No of cases	Percentage
18-20	2	5
21-30	5	20
31-40	10	45
41-50	6	25
51-60	2	5

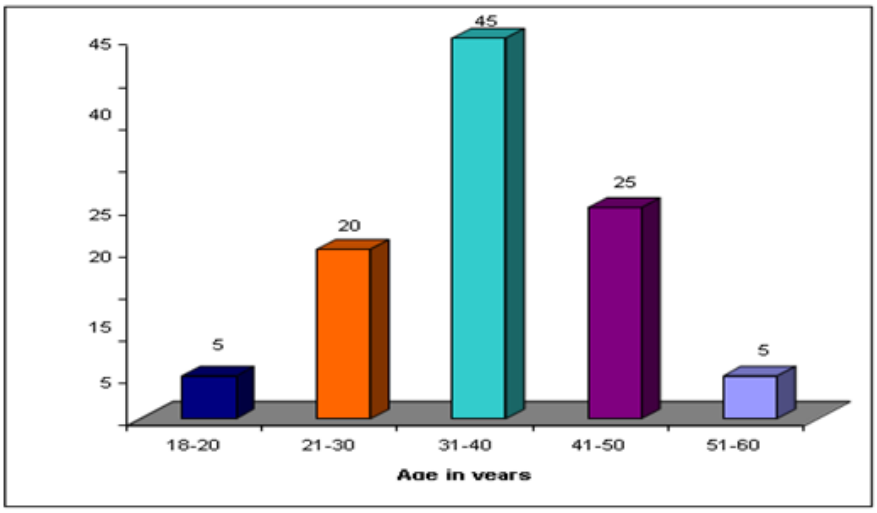

Figure 1: Age incidence

In this series 2(5%) patient was of 18yrs, 5 (20%) patients between 21-30yrs, 10 (45%) patients between 31-40yrs, 6 (25%) patients between 41-50yrs and 2 (5%) patient between 51-60yrs.The age of the patients ranged from18-59 years with an average of 36.5 years.

Table 2: Sex incidence

Sex	No of cases	Percentage
Male	20	80
Female	05	20

Out of 25 patients, 20(80%) were males and 05(20%) were females, showing a male preponderance with the ratio beingM:F-4:1.

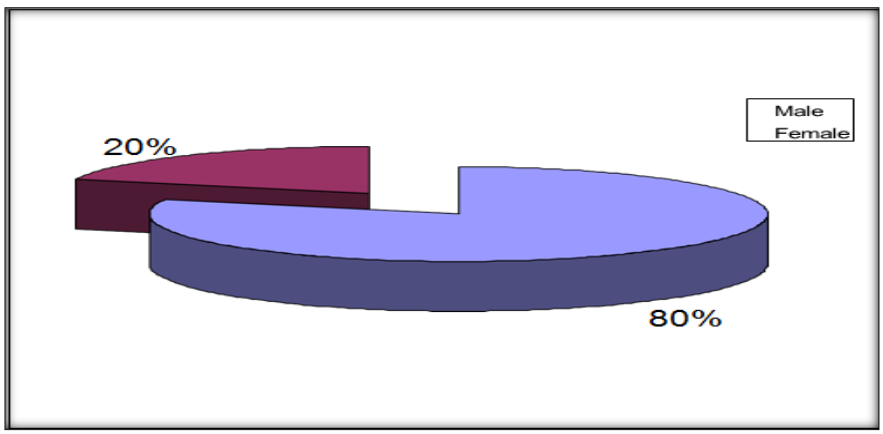

Figure 2: Sex incidence

Table3: Side of involvement

Side	No of cases	Percentage
Right	9	35
Left	16	65

Right wrist involved in 9(35%) cases and left wrist in 16 (65%) cases.

Table4: Mode of injury

Mechanism of injury	No of cases	Percentage
Road traffic accident (RTA)	15	60
Fallon out stretched hand (FOOH)	10	40

In our study there were15 (60%) patients with road traffic accidents and 10 (40%) patients fell on their out stretched hand.

Table5: Type of Fracture According to Frykman's classification

Type	No of cases	Percentage
I	0	0
II	0	0
III	14	55
IV	11	45
V	0	0
VI	0	0
VII	0	0
VIII	0	0

In the 20 cases 14(55%) patients belong to type III and 11(45%) patients belong to type IV.

Table 6: AOC classification

AO type	No of cases	Percentage
A1	0	0
A2	0	0
A3	0	0
B1	0	0
B2	0	0
B3	25	100
C1	0	0
C2	0	0
C3	0	0

Table 7: Closed or open fracture according to Gustilo and Anderson classification

Type	No of cases	Percentage
Closed	25	100
Open	0	0

Table 8: Duration of operation from date of injury

Duration	No of cases	Percentage
1-5days	20	85
6-10days	5	15

Table 9: Duration of fracture union:

Time of union	No of cases	Percentage
2-3months	20	85
3-4months	5	15

In our study 20(85%) patients had union with in2-3 months and 5(15%) patients had union by3-4months.

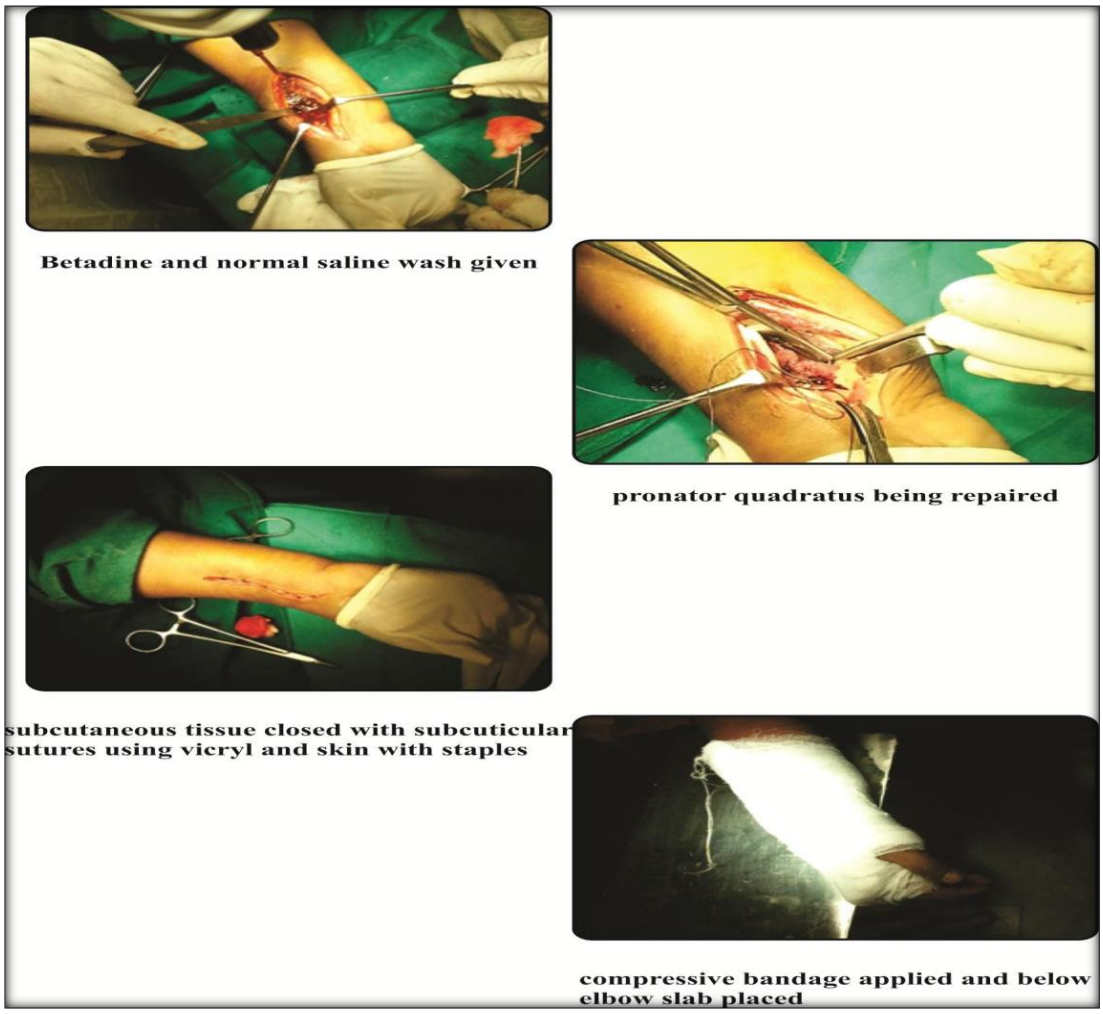

Figure 3: Surgical Procedure

Table No 10: Range of Motion

Movement (with in normal functional range)	No of cases	Percentage
Dorsiflexion(min. 45°)	25	100
Palmar flexion(30°)	25	100
Pronation(50°)	25	100
Supination(50°)	25	100
Radial deviation(15°)	23	90
Ulnar deviation(15°)	24	95
Pain in distal radio ulnar joint	6	15
Grip strength (60%or less than on opposite side)	2	5

DISCUSSION

Colles first documented the fracture of the distal end of the radius more than 190 years ago. It is amazing that this common fracture is nonetheless one of the hardest to treat of all fractures. Regarding the definition of the condition and the suitable result, there is no agreement. An unstable fracture of the distal radial called a volar Barton's fracture frequently involves subluxation or luxation of the wrist joint. In order to accomplish anatomic fracture union, hasten the recovery of hand function, and prevent sequelae, the main goals of treatment for this injury are to offer excellent reduction and rapid stability. A small gap, appropriate stability, and adequate blood flow are all requirements for fracture healing. The locking plate is preferred for fracture healing because, in theory, it reduces the compressive forces placed on the bone to maintain stability, which may decrease periosteal compression and the resulting impairment in blood flow.

Restoring the wrist's interarticular integrity and maintaining the radial length in unstable intra-articular fractures is frequently not viable with closed techniques. Different surgical techniques and fixation materials can be applied in these situations where an open placement is necessary. The limits of surgical treatment have been widened by a greater understanding of wrist anatomy and functioning as a result of recent studies as well as rising patient expectations. Additionally, new prospects have been made possible by developments in fixing materials.[20-23]

The goal of the current study was to evaluate the functional results of surgically treating distal radial fractures with a volar locked compression plate. We assessed our findings and contrasted them with those of numerous other research that used diverse therapeutic techniques. As a result of inappropriate reduction, we found complications such as malunion in 10% of cases, arthritis in the wrist joint in 15% of patients, irritation of the extensor pollicis longus tendon in 5% of cases, and complex regional pain syndrome in 1% of cases. 55% of patients in our study had great results, 35% had well results, 5% had acceptable results, and 5% had poor results. Patients with great results experienced no pain or lasting deformity. Motion range was within the range of normal function. They had no problems or arthritic changes. Within four days of the injury, they underwent surgery. The articular step-off, volar tilt, and radial length were all within acceptable bounds. They cooperated with the physical therapy. Patients who had positive outcomes had few remaining abnormalities, discomfort, and minor restriction. The rest of their research fell within reasonable limits. Patients who had fair results also had minor problems, distal radio-ulnar joint pain, and persistent deformity, pain, and restriction. Few of their motions were less than what was necessary for them to function normally. At three months, one patient had severe wrist discomfort and functional limitations, and the Darracks surgery was performed for them.[24-27]

According to Kevin C. Chung et al., outcome measurements for the affected side included grip strength, lateral pinch strength, the Jubsen Taylor test, wrist range of motion, and the Michigan hand questionnaire. In his series, the average wrist flexion, average wrist flexion, and average loss in grip and pinch strength were all 86% of the normal side. Utilizing clinical examination grip strength measurements, radiography, and PRWE (patient related wrist evaluation) rating, the system outcome described by R.E. Anakwe et al. was evaluated.

CONCLUSION

The functional outcome of adult volar barton fractures treated with precontoured volar locking compression plates was assessed in this study. In the third to fifth decades, distal radial fractures are typical. In manual labour, outdoor pastimes, and driving, men prevail. Young people are more likely to get intra-articular fractures from high-energy trauma or auto accidents. Older persons develop extra-articular osteoporotic fractures from straightforward falls on extended wrists. Type B3 volar barton fractures range from 1.2% to 4.2% of distal

radius fractures. The analysis included 9 (45%) type IV instances and 11 (55%) Frykman type III cases.

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