Original Research Paper

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A Study of Functional Outcome of Volar Barton Fracture Treated With Open Reduction and Volar Plate Fixation

Medical Science

KEYWORDS : volar barton fracture, volar locking plate

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ABSTRACT

Introduction: *Barton's fracture, named after the American surgeon John Rhea Barton, is a fracture of the distal end of the radius that involves the articular surface and is usually accompanied by subluxation or dislocation of the radiocarpal joint. Many modalities are being used now a days to treat this fracture including conservative treatment with casting, close reduction and K-wire fixation, external fixation with or without K- wire fixation, open reduction and internal fixation using volar plate. The purpose of this study is to assess the functional outcome of volar barton's fracture of distal radius treated with open reduction and internal fixation using volar plate.*

Material and method: *The study is carried out at department of orthopedic at tertiary health care center. All the patients having volar barton fracture of distal radius satisfying inclusion and exclusion criteria and treated with open reduction and internal fixation using volar plate were selected.*

Result: *Functional and radiological evaluation as per Modified Cooney, Green and O'Brien functional score for wrist was done on last follow up which is minimum of 18 months.*

Conclusion: *Volar barton fracture are best treated with open reduction and internal fixation using volar locking plate. Routine decompression of median nerve is not required in all the cases.*

Introduction

Barton fracture, named after the American surgeon John Rhea Barton, is a fracture of the distal end of the radius that involves the articular surface and is usually accompanied by subluxation or dislocation of the radiocarpal joint[1, 2]. Such intra-articular fractures are uncommon, and they are usually associated with high-velocity trauma. On the basis of the site and shifting direction of fragments, barton fractures are classified into volar or dorsal barton fractures[3]. Many modalities are being used now a days to treat this fracture including conservative treatment with casting, close reduction and K-wire fixation, external fixation with or without K- wire fixation, open reduction and internal fixation using volar plate. The purpose of this study is to assess the functional outcome of volar barton fracture of distal radius treated with open reduction and internal fixation using volar plate.

Material and method

The study is carried out at department of orthopedic at tertiary health care center. All the patients having volar barton fracture of distal radius satisfying inclusion and exclusion criteria and treated with open reduction and internal fixation using volar plate were selected.

Inclusion Criteria:

All patients having volar barton fracture of distal radius in the age group of above 18 years.

Exclusion Criteria:

(a) Age: Less than 18 years.

(b) Patients who are medically unfit for the surgery.

(c) Open fracture.

(d) Patients with distal neurovascular deficit

Classification system:

"A classification is useful only if it considers the severity of the bone lesion and serves as a basis for treatment and for evaluation of the results"

Maurice E. Müller, 1988

The fracture pattern were classified according to Muller AO classification system[4].

Preoperative workup:

All the patients with volar barton fracture were evaluated with X-ray of wrist with forearm and elbow AP & Lateral views. Immediate closed reduction and below elbow plaster slabs were applied and post reduction X-rays were taken. This assists to reduce pain, swelling and deformity. The post-reduction X-rays assist in understanding the fracture pattern better, which would help in preoperative planning for fracture fixation.

Preoperative routine blood investigation and chest X-ray were done for every patients and preoperative cardio-respiratory assessment was done and all medically fit patient for surgery were posted for open reduction and internal fixation.

Surgical technique:

All patients were given brachial block anesthesia. Injectable antibiotic given before tourniquet inflation. After painting and draping tourniquet were inflated. Incision was made directly over flexor carpi radialis tendon. Sheath of flexor carpi radialis was incised and flexor carpi radialis tendon was retracted medially and radial artery was retracted laterally. The flexor pollicis longus muscle retracted to gain rapid exposure of the pronator quadratus. Pronator quadratus muscle incised in L shape from lateral aspect of radius and elevated with periosteum elevator. Now fracture site was exposed and reduced under direct vision. If necessary fracture was temporarily fixed with k wire. Now volar locking precontoured plate was applied and fixed with one proximal simple cortical screw and then all locking screw. Care was taken to place plate proximal to water-shade line and all screw was checked under fluoroscopy to confirm extraarticular placement. Routine decompression of median nerve was not done in any patient. Then wash with saline taken, pronator quadratus was closed with vicryl and subcutaneous tissue was closed with vicryl and skin closure was done with ethilon.

Postoperative protocol and patient evaluation:
All patients were given enzymatic preparation for 5 days to reduce swelling as well as encourage to mobilize finger as soon as effect of anesthesia wears off along with pint stand elevation to prevent compartment syndrome to develop. All patients were given volar plaster slab for 10 days when stitches were removed. Then patient were started passive and active assisted range of motion of wrist joint. X-ray was taken on 6, 10, 14 weeks postoperatively and then on 2 monthly follow-up till union. On every visit ROM was also checked. Functional and radiological evaluation as per Modified Cooney, Green and O'Brien functional score for wrist was done on last follow up which is minimum of 18 months [5, 6, 7].

Table 1: Modified Cooney, Green and O'Brien functional score for wrist

Category	Findings	Score
Pain	No pain	25
	Mild occassional	20
	Mild, regular, no significant effect on activity	15
	Moderate, activity reduced, no pain at rest	10
	Severe, pain at rest	0
Range of movements(arc)	$>140^0$	25
	100^0 to 140^0 degree	20
	70^0 to 99^0 degree	15
	40^0 to 69^0 degree	10
	$<40^0$ degree	0
Hand grip (compared to normal side)	Normal	25
	75 to 90 %	20
	50 to 74 %	15
to no	25 to 49%	10
rmal	<24%	0
Activity	No Limitations	25
	Normal duties, Some medication	20
	Light duties due to wrist pain	15
	Unable to work	0
Final Results	Excellent 90-100 Good 80-89 Fair 65-79 Poor <65	

Results
Table 2: Age and sex distribution

Age group	Male	Female	Total
<30	7	4	11
31-40	9	4	13
>40	0	1	1
Total	16	09	25

We have study sample of 25 volar barton fracture treated with open reduction and internal fixation. Out of 25 patient, 11(44%) patients were in the age group of less than 30 year while 13(52%) patients were in the age group of 30 to 40 years of age and 1(4%) patient was above 40 years of age. The mean age of our study sample was 31.2 years. In our study sample total 16(64%) patients were male while 9(36%) patients were female and male: female ratio was 1.7:1.

Table 3: Patient distribution according to classification

Classification	Number of patients
AO B3.1	5 (20%)
AO B3.2	14 (64%)
AO B3.3	6 (24%)

Table 4: Results according to classification

Classification	Excellent	Good	Fair	Poor	Total
AO B3.1	4	1	0	0	5
AO B3.2	6	7	1	0	14
AO B3.3	1	1	0	4	6
Total	11	9	1	4	25

Out of total 5 patient of AO B3.1 type fracture 4 (80%) patients had excellent result while 1 (20%) patients had good result. Out of total 14 patient of AO B3.2 type fracture 6 (43%) patients had excellent result while 7 (50%) patients had good result and 1 (7%) patients had fair result. Out of total 6 patient of AO B3.3 type fracture 1 (17%) patients had excellent result while 1 (16%) patients had good result and 4 (67%) patients had poor result. Out of total 25 patient 11 (44%) patients had excellent outcome, 9 (36%) patients had good outcome, 1 (4%) patients had fair outcome and 4 (16%) had poor outcome. All the patients with poor outcome was in the group of AO B3.3 classification.

Out of total 25 patients 8 (32%) patients had no pain, 7 (28%) patients had mild but occasional pain, 6 (24%) patients had mild but regular pain while 4 (16%) patients had moderate pain on final follow-up.

Out of total 25 patients 11 (44%) patients had no limitation of activity, 9 (36%) patients had normal duty with some medication while 5 (20%) patients light duty due to pain on final follow-up.

Out of total 25 patients 7 (28%) patients had $>140^0$ ROM, 13 (52%) patients had 100^0-140^0 ROM, 3 (12%) patients had 70^0-99^0 ROM while 2 (8%) patients had 40^0-69^0 ROM on final follow-up.

Out of total 25 patients 20 (80%) patients had normal hand grip, 3 (12%) patients had 75% – 90% of hand grip while 2 (8%) patients had 50%-74% of hand grip compared to normal hand on final follow-up.

In our study group there was no median nerve palsy in any of the patient and there was no any patient with compartment syndrome.

Discussion
In today's world of speed and technology there seems to be an increase in complex injuries to various parts of the human anatomy. As discussed earlier there are many modalities being used now a days to treat this fracture. Volar Barton fracture is an unstable fracture of distal radial, commonly accompanied by subluxation or luxation of wrist joint. The primary goal in treatment of this injury is to provide good reduction and immediate stability to achieve anatomic fracture union, allow the quick return of hand

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function, and avoid complications. The management of volar barton fracture remain a subject of debate but still open reduction and internal fixation with volar locking plate remain gold standard treatment option. Operative treatment with platting restores articular congruity, joint stability and permits early wrist mobilization. Routine intraoperative median nerve release not required as none of our patient develops median nerve palsy despite of not decompressing the median nerve. All patients with poor outcome in the present study group had AO B3.3 type fracture which suggests that comminution of fracture will affects the final outcome.

Conclusion

Volar barton fracture are best treated with open reduction and internal fixation using volar locking plate. Routine decompression of median nerve is not required in all the cases. Still long term study would be required to assess long term outcome in relation to development of arthritis.

Referrances

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