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FUNCTIONAL OUTCOME OF VOLAR BARTON FRACTURES TREATED WITH T PLATE THROUGH VOLAR APPROACH

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Abstract:

Objective:

To assess the functional outcome of volar Barton fractures treated with T plate through volar approach.

Material and methods:

This case series study was conducted at Department of Orthopedic Surgery, Sheikh Zaid Hospital Rahim Yar Khan from November 2018 to May 2019 over the period of 6 months. Total 86 patients with volar borton fractures (within 1 week of fracture), both sex having age from 20-60 years were selected. After selecting patients, T plate through volar approach was fixed by senior consultant orthopedic surgeon having 5 years experience. After 3 month functional outcome was measured by using Pattee and Thompson criteria

Results:

Total 86 patients with volar Barton fractures were selected for this study. Mean age of the patients was 34.14 ± 10.95 years and mean duration of fracture was 2.35 ± 1.37 weeks. Functional outcome was excellent in 39 (45%) patients, good in 26 (30%) patients and fair in 21 (25%) patients. Satisfactory functional outcome was noted in 65 (76%) patients and unsatisfactory outcome was noted 21 (24%) patients.

Conclusion:

Results of this study showed higher rate of satisfactory functional outcome in cases of volar Barton fractures treated with T plate through volar approach. There was significant association of age, duration of fracture, diabetes mellitus and education with functional outcome but insignificant association between gender and functional outcome was noted.

Key words: *Fracture fixation, internal; fractures, functional outcome, distal, radius*

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INTRODUCTION:

Barton fractures are distal radius intraarticular fractures.[1] These fractures account for approximately 2-5%.[2] According to surface area of distal radius, it is classifying to volar or dorsal barton fracture.[3] According to AO classification, volar barton fractures are categorized as B3. It can be treated conservatively as well as open reduction internal fixation. Conservative treatment is not successful because of future complications such as partial loss of movement, sublaxation and osteoarthrosis of distal radius,[4-5] Now the current recommendations are fixation of distal radius fracture using precontoured volar locking compression plate. Post op recovery is rapid after ORIF distal radius fracture.[6] Volar barotn fractures are surgically treated by incising the volar surface of the skin either through Henry or FCR approach. Fractures fragments are well stabilized by using volar locking plate as a buttressing effect.[7-8] For the management of distal radial fractures, various plating options were reviewed by Swan et al[9]. They stated that Barton fractures are best treated with volar buttress plate.

There are different plating options available in orthopedic surgery for the management of distal radial fractures and Barton fractures are best treated with volar buttress plate. Distal radius fracture may lead to decrease in range of motion that may affect the earning of person. In these fractures, patients need good functioning hand with wrist joint. Applying T plate and early mobilization of wrist joint may shortened their ailing period and early returned to the work with full range of motion at wrist joint.

MATERIAL AND METHODS:

This case series study was conducted at Department of Orthopedic Surgery, Sheikh Zaid Hospital Rahim Yar Khan from November 2018 to May 2019 over the period of 6 months.

In this case series, by using non-probability consecutive sampling technique, total 86 patients with volar borton fractures (within 1 week of fracture), either male or female having age range from 20-60 years selected from the Department of Orthopedic Surgery, Sehikh Zaid Hospital, Rahim Yar Khan from November 2018 to May 2019.

All patients with open fractures, patients with history of diabetes mellitus and serum fasting sugar >110mg/dl (8 hours fast) and patients having age below 20 years and above 60 years were excluded from the study. This study approved by the institutional review committee of hospital and written informed consent was taken from every patient.

Surgical technique:

A pneumatic 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. Open reduction of all major fragments was performed, focusing on restoring articular congruity. A Kirschner wire was used to provisionally fix the position of the fragments.

Definitive fixation was done with a 3.5-mm Ellis T-plate. A below-elbow plaster-of-Paris slab was applied for 3 weeks and then active movement of wrist was started.

Postoperative radiographs were assessed by measuring the volar angulation and ulnar angulation of the distal-end radius and radioulnar index. Volar and ulnar angles were angles of the articular surface of the distal end of the radius in lateral and anteroposterior views between the sagittal and coronal planes, respectively. The radioulnar index was determined by measuring (in millimetres) the distance between the distal-most aspect of the sigmoid notch of the radius and the distal-most part of the ulnar head.

After 3 months, functional outcome was measured by using Pattee and Thompson criteria in term of excellent, good, fair and poor range of motion. Demographic profile of the patients was recorded in pre designed proforma.

OPERATIONAL DEFINITION

Functional outcome:

Functional outcome was measured after 3 months in term of excellent, good and fair range of motion by using Pattee and Thompson criteria[15] for wrist function.

Excellent: An excellent result had no pain, no disability and no more than 5° loss of wrist flexion or extension on goniometry.

Good: A good result had mild pain, no disability and 15° or less loss of wrist flexion or extension on goniometry.

Fair: Fair results had moderate pain, continued employment at the pre injury occupation and 25° or less loss of motion on goniometry.

Satisfactory outcome: Excellent and good

Un-satisfactory outcome: Fair

Volar borton fractures:

Barton's fracture is a fracture of the distal end of the radius that involves the dorsal rim and extends into the intra-articular region.[2] It was assessed on lateral view on x-ray.

Post-operative pain was measured by using Visual Analogue Scale (VAS). Pain was measured in terms of:

- 0=No pain
- 1-3=Mild pain
- 4-7=Moderate pain
- 8-10=Severe pain.

VISUAL ANALOGUE SCALE[13]

Visual Analogue Scale is a measurement instrument that tries to measure the amount of pain that a patient feels, which ranges across a continuum from none to an extreme amount of pain.

(No pain) 0 1 2 3 4 5 6 7 8 9 10 (Worst Pain)

Data was entered on computer software SPSS version 16. The quantitative variables of the study i.e. age, VAS pain score and duration of fracture were presented as Mean±SD. The qualitative variables like gender and functional outcome (excellent, good and fair), diabetes mellitus, educational status and satisfactory/unsatisfactory outcome were presented as frequency and percentages. Effect modifiers like age, gender, duration of fracture, diabetes mellitus, educational status were controlled through stratification. Post stratification chi-square test was applied to see the level of significance. P value ≤ 0.05 was considered as statistically significant.

RESULTS:

Total 86 patients with volar Barton fractures were selected for this study. Mean age of the patients was 34.14 ± 10.95 years and mean duration of fracture was 2.35 ± 1.37 weeks.

In present study functional outcome was excellent in 39 (45%) patients, good in 26 (30%) patients and fair in 21 (25%) patients. (Fig. 1)

Satisfactory functional outcome was noted in 65 (76%) patients and unsatisfactory outcome was noted 21 (24%) patients. (Fig. 2).

Stratification of functional outcome with respect to age was done and two age groups were made i.e. age group 20-40 years and age group 41-60 years. In both age groups, there were 68 (79.07%) patients and 18 (20.93%) patients respectively. Satisfactory functional outcome was found in 58 (85.3%) patients of age group 20-40 years and in 7 (38.9%) patients of age group 41-60 years. Statistically significant association of functional outcome with age groups was noted with p value 0.000 (Table 1)

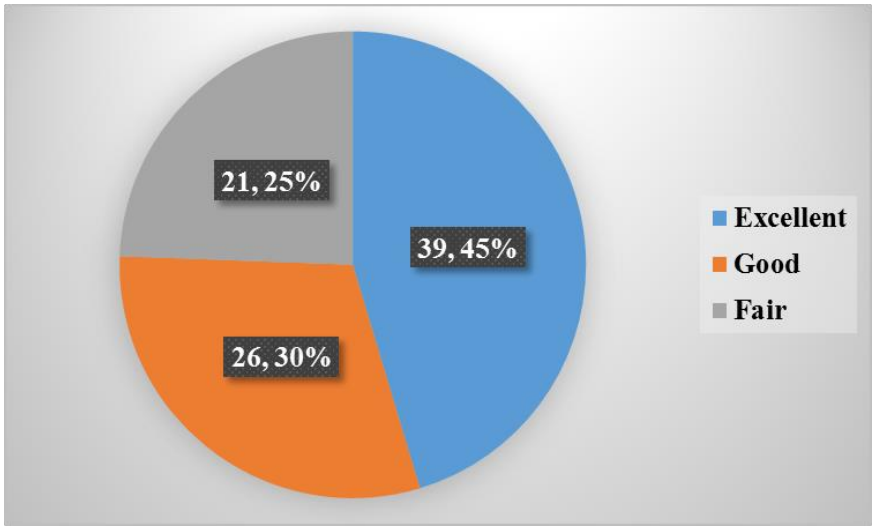
Out of 66 (76.74%) male patients, satisfactory functional outcome was noted in 48 (72.7%) male patients. Out of 20 (23.26%) female patients, satisfactory functional outcome was noted in 17 (85%) patients. Statistically insignificant association of functional outcome with gender was noted with p value 0.376 (Table 2)

Minimum duration of fracture was 1 day and maximum duration of fracture was 7 days. Patients were divided into two groups according to duration of fracture i.e. 1-3 days group and 4-7 days group. In 1-3 days duration of fracture, out of 62 (72.09%) patients satisfactory functional outcome was noted in 52 (83.9%) patients. In 4-7 days duration of fracture group there were 24 (27.91%) patients. Satisfactory functional outcome was noted in 13 (54.2%) patients. Statistically insignificant association between functional outcome and duration of fracture was noted with p value 0.10. (Table 3)

Total 31 (36.05%) patients were diabetic and 55 (63.95%) patients were non-diabetic. Satisfactory functional outcome was noted in 17 (54.8%) diabetic patients and 48 (87.3%) non-diabetic patients. Statistically significant association between functional and diabetes mellitus was noted with p value 0.001. (Table 4)

Illiterate patient were 17 (19.77%), primary 16 (18.6%), middle 12 (13.95%), matric 10 (11.63%), intermediate 21 (24.42%) and graduate and above were 10 (11.63%). Significant association between education status and functional outcome was noted with p value 0.01 (Table 5).

Fig. 1: Frequencies for functional outcome



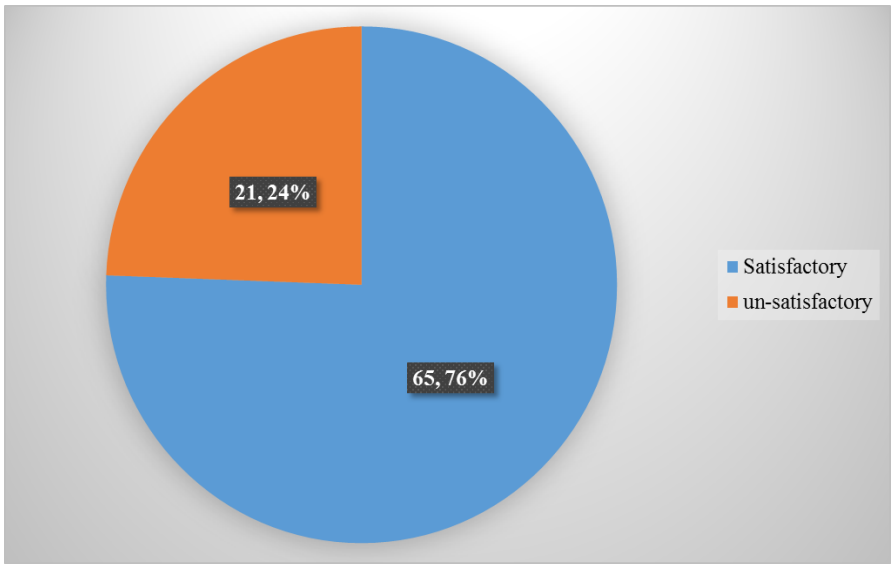


Fig. 2: Frequency for satisfactory outcome

Table 1: Stratification of functional outcome with respect to age

Age (Years)	Functional outcome		Total	P. value
	Satisfactory	Unsatisfactory		
20-40	58 85.3%	10 14.7%	68 79.07%	**0.000**
41-60	7 38.9%	11 61.1%	18 20.93%	
Total	**65 75.6%**	**21 24.4%**	**86**	

Table 2: Stratification of functional outcome with respect to gender

Gender	Functional outcome		Total	P. value
	Satisfactory	Unsatisfactory		
Male	48 72.7%	18 27.3%	66 76.74%	**0.376**
Female	17 85.0%	3 15.0%	20 23.26%	
Total	**65 75.6%**	**21 24.4%**	**86**	

Table 3: Stratification of functional outcome with respect to duration for fracture

Duration of fracture (Days)	Functional outcome		Total	P. value
	Satisfactory	Unsatisfactory		
1-3	52 83.9%	10 16.1%	62 72.09%	**0.10**
4-7	13 54.2%	11 45.8%	24 27.91%	
Total	**65 75.6%**	**21 24.4%**	**86**	

Table 4: Stratification of functional outcome with respect to diabetes mellitus

Diabetes Mellitus	Functional outcome		Total	P. value
	Satisfactory	Unsatisfactory		
Diabetic	17 54.8%	14 45.2%	31 36.05%	**0.001**
Non-diabetic	48 87.3%	7 12.7%	55 63.95%	
Total	**65 75.6%**	**21 24.4%**	**86**	

Table 5: Stratification of functional outcome with respect to education status

Education status	Functional outcome		Total	P. value
	Satisfactory	Unsatisfactory		
Illiterate	8 47.1%	9 52.9%	17 19.77%	**0.010**
Primary	10 62.5%	6 37.5%	16 18.60%	
Middle	10 83.3%	2 16.7%	12 13.95%	
Matric	8 80.0%	2 20.0%	10 11.63%	
Intermediate	20 95.2%	1 4.8%	21 24.42%	
Graduation and above	9 90.0%	1 10.0%	10 11.63%	
Total	**65 75.6%**	**21 24.4%**	**86**	

DISCUSSION:

Volar barotn fractures occurring account for 2-5% distal radius fractures. They can be caused by high velocity injury or low velocity injury.[2] Conservative treatment of volar barton fracture can lead to different complications such as sublaxation, instability and osteoarthrosis of distal radius while open reduction and internal fixation of volar fracture can lead to accurate reduction anatomically, stability and early return to daily activities of life. Wrist mobility is early after ORIF as compared to conservative treatment in which POP is applied minimum for 3 or 4 weeks.[10-12]

In present study, functional outcome by using Pattee and Thompson criteria was excellent in 45% patients, good in 30% patients and fair in 25% patients. In literature, different studies reported different percentages of functional outcome in term of excellent, good and fair. Like in one study by Aggarwal et al,[2] The functional outcome according to the Pattee and Thompson criteria was excellent in 87.5%. In another study, the functional outcome was excellent, good and poor 27.2%, 31.8% and 40.9% respectively.[13] Campbell et al[14] reported excellent, good and poor functional outcome as 16%, 44% and 40% respectively and Fawzy et al[15] reported functional outcome excellent in 17.3% patients, good in 43.4% patients and good in 30.4% patients.

In present study, satisfactory functional outcome was noted in 65 (76%) patients and unsatisfactory outcome was noted 21 (24%) patients. In one study by Herode et al,[16] 88% cases showed satisfactory anatomical results (good and excellent). Kasapinova et al[17] showed satisfactory result in 76.6% of the cases, while Kilic[18] reported 88.9% satisfactory results. In another study by Bhattacharya et al,[19] satisfactory outcome was noted in 90% and Tang et al[20] reported satisfactory functional outcome in 94.1% patients. All these findings are in agreement with my findings.

CONCLUSION:

Results of this study showed higher rate of satisfactory functional outcome in cases of volar Barton fractures treated with T plate through volar approach. There was significant association of age, duration of fracture, diabetes mellitus and education with functional outcome but insignificant association between gender and functional outcome was noted.

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