

A Study of The Management of Distal Radius Fractures as Per AO Classification in A Tertiary Care Centre



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Abstract

Introduction: One of most frequently used classification system for distal radius fractures is the AO (Arbeitsgemeinschaft für Osteosynthesefragen) Classification which has nine chief subgroups. The prognostic and outcome worth of the classification, to assess the consequence of a fracture of distal radius may not be precise, particularly concerning inter- and intra-observer level of agreement. This is a descriptive study dealing with the association of the functional outcomes in AO type of fractures at the distal end of radius which are managed by various treatment modalities and DASH score.

Methods: This is a descriptive study showing the association of AO type of distal end radius fractures treated with various modalities with DASH score, study subjects were 50 patients with fracture of distal radius of age ranging between 18 - 80 years who visited our tertiary care centre in Ammapettai from May 2017 to September 2018.

Results: The study subject who scored between 0-16 were classified as Excellent, 17 to 35 were classified as good and above 35 were classified as fair According to this classification 74% had excellent outcomes followed by 16% of study subjects who had good outcome and only 16% had fair clinical outcome based on DASH scoring. Our study results point towards good outcome subsequent to a fracture of distal radius fractures.

Conclusion: The proportion of study subjects with an adverse consequence has not undergone any change. There could be several reasons to this lack of change over the decade. The tool may not be sensitive enough or catering to minimal changes. Sometimes the DASH-score for study subjects with bad outcome has already reached its limit, and hence these study subjects would have ended up with bad outcome irrespective of management due to coexisting illness or any other psychological reasons, or the reason which is most unacceptable, that is the modification in management merely has no outcome.

Keywords: Distal end radius fractures; AO classification of distal radius fractures; DASH Score

Introduction

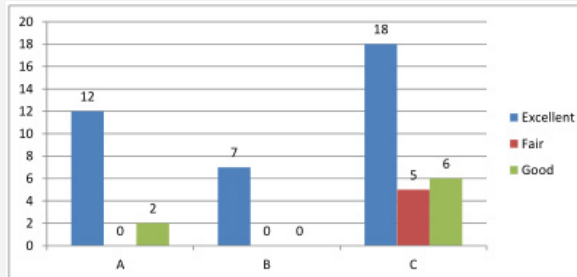


Figure 1: Association of AO type of fractures with DASH score in the study population

The distal radial fractures account for about 15 to 20% of total fractures managed by an Orthopaedic surgeon [1]. Many studies on this topic have been done earlier with reverence to the

association between various management modalities of fractures of distal radius and functional outcomes [2]. The findings of these studies have most often presented no correlation between the two factors. Distal radial fracture is common in females above 50 years of age [3]. Two of the most frequently used were the AO (Arbeitsgemeinschaft für Osteosynthesefragen) Classification which had nine chief subgroups and the Frykman classification which had 8 subgroups [4]. The prognostic and outcome worth of these classifications, to assess the consequence of a fracture of distal radius may not be precise [5], particularly concerning inter- and intra-observer level of agreement [6]. This is a descriptive study dealing with the association of the functional outcomes in AO type of fractures at the distal end of radius which are managed by various treatment modalities and DASH score (Figures 1 & 2).



Figure 2: Pre-Op Xray Ao Type C Patient-1.

Materials and Methodology

This is a descriptive study showing the association of AO type of distal end radius fractures treated with various modalities with DASH score, study subjects were 50 patients with fracture of distal radius of age ranging between 18 - 80 years who visited our tertiary care centre in Ammapettai from May 2017 to September 2018.

Inclusion Criteria

- i. Study subjects in the age group of 18-45 years of either gender.
- ii. Study subjects presenting with intra-articular unstable fracture of distal radius with acute injury.
- iii. The existence of an unstable fracture of distal radius, with antero-posterior (AP) and lateral X-rays

Exclusion Criteria

- a. Extra-articular and stable fractures of distal radius
- b. The existence of medical disorders with an influence on bone physiology and another ipsilateral fracture
- c. Severe medical co morbid conditions.
- d. Polytrauma

Study Groups

The Swiss Association for the Study of Internal Fixation (AO/ASIF) assembly established the "Comprehensive Grouping of Fractures of Long Bone" to function as a basis for management and assessing consequences [7]. The distal radius and ulna were explained as "2 3" and is additionally categorized into 3 types. Each type is again categorized into three groups and further each group into three subgroups. The lone alteration matched to the AO system was the adding of the „die-punch“ fracture to the incomplete articular fractures assembly Radiographic imaging is essential for diagnosis, categorization, and management and follows up assessment of these type of fractures.

The considerations measured include angulation or inclination of the radius – is the comparative angle of the distal

radial articular surface to a line perpendicular to the long alignment of the radial shaft. This averages 23 degrees (range, 13 to 30 degrees), length of the radius – relates the length of the radius to the ulna by space stuck between two perpendicular lines to the long axis of the radius, one connecting the tip of the radial styloid process and the further, the surface of ulnar head. This be an average of 11 mm (range, 8 to 18 mm), variance of ulna – is the vertical space between the distal ends of the medial angle of the radius and the ulnar head, width of the radius – the dislocation of distal fragment in relation to the radial shaft and is measured as the space between the longitudinal axis through the middle of radius and the most adjacent point of the radial styloid process.



Figure 3: Intra Op Orif With Plating Patient-1.



Figure 4: Post Op X-ray 3weeks Patient-1.

Guiding principle for satisfactory closed reduction as given by Nana A D et al. in the year 2005 comprise [8], radial leaning: ≥ 150 on the postero-anterior outlook. radial span: ≤ 5 mm shortening on postero-anterior outlook. radial Angle : < 150 dorsal or 200 volar tilt on lateral outlook. Articular inconsistency: < 2 mm of step off (Figures 3 & 4). radiographic signs that ready to act the surgeon, that the fracture is perhaps unbalanced and closed reduction alone will be inadequate, which further include as the following: dorsal comminution $> 50\%$ of the thickness sideways, palmar metaphyseal comminution, initial dorsal slope > 20 degrees, initial dislocation (fragment translation) > 1 cm, Initial radial shortening > 5 mm, intra-articular commotion,

related ulna fracture, severe osteoporosis. The management options for fractures of distal radius has always been in changed and improvised from cast immobilization to open reduction & internal fixation using locking compression plates. Study subjects were included in groups according to AO types of fractures with the management of choice (Figure 5).



Figure 5: Pre-Op X-ray Ao Type B Patient-2.

Methodology

Study subjects include 50 individuals who comes under the inclusion criteria, who undergoes various treatment modalities depending on the AO type of fracture at a tertiary care centre in Ammapettai with a follow-up of 2 weeks , 6 months and 1 year Initial Assessment: The initial characteristics of the injury were recorded, including the type of accident, the energy level, and the type of fracture according to the AO classifications [7], and the associated soft tissue injuries at the fracture site. AP and lateral X-rays were obtained of each study subject at the time of admission, immediately after the treatment provided and during the follow-up visits. The radiologic features were measured, and the fracture stability, according to the Altissimi [9] and Fernández [10] criteria and the treatment provided were recorded, the association of functional outcome in AO type of fractures managed with various managements and DASH score has been tabulated and projected in a bar diagram. Institutional ethical committee clearance was obtained (IEC No:2017/310)

Procedures

Closed Reduction

Closed reduction [11] and plaster cast application [12] is the main treatment for undisplaced fractures, minimally displaced fractures and bending fractures in good bone. Percutaneous pinning [13-15]: Closed reduction and percutaneous pinning is carried out when: Displaced extra articular fractures with or without Dorsal Communion, early loss of reduction after closed reduction, communitied intra articular fractures when adequate closed reduction is able to obtain but likely not maintained without additional support.

External fixation/Ligamentotaxis:

Bridging external fixation typically relies on the principle to obtain and maintain a reduction of fracture fragments. As longitudinal Traction is applied to the carpus [16], the tension is transmitted mostly through radioscaphocapitate and long radiolunate ligaments to restore radial length mainly used for: extra articular fractures with an unstable metaphysis, intra articular radial styloid fractures, intra articular fractures with depression or communion.

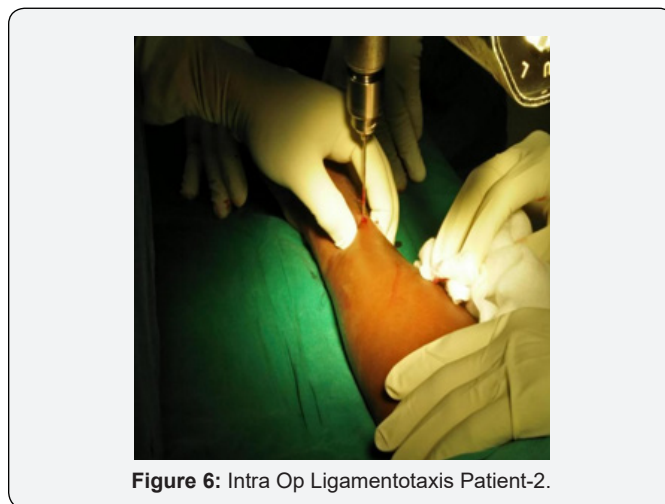


Figure 6: Intra Op Ligamentotaxis Patient-2.

Internal fixation

The ability to hold both large extra articular fragments as well as small Intra articular fragments is necessary in many complex fractures. Internal fixation with Ellis buttress plates or Volar locking plates is done [17]. Works by biomechanical principle of external fixator, does not require friction between plate and bone, locking plates are precontoured for anatomical fit, locking screws offer a fixed angle construct to support the articular surface and to obtain good fixation in osteoporotic bone.



Figure 7: Post Op X-ray 3 Weeks Patient-2.

Follow-up Interview: The study protocol was patient oriented which implemented with the application of a questionnaire 2 weeks, 1month, 6months and up to one year after treatment was provided; the questionnaire is applied during the follow-up visit

or by telephone. The functional result was calculated using the DASH questionnaire [18]. All adverse effects were documented throughout the duration of the study. The radial angle, the radial height, the ulnar variance was evaluated in the AP X-rays. The volar tilt angle, and the presence of a step off or articular

gaps were evaluated in the lateral X-rays. These measurements were made according to the criteria by Kreder et al. [6]. The association of AO fracture types in distal radius fractures with DASH score have been tabulated and projected in a bar diagram (Tables 1 & 2).

Table 1: AO classification of distal radius fractures with subtypes.

23A – Extra-articular Fracture	A1 – Extra-articular fracture of the ulna, radius integral
	A2 – Extra-articular fracture of the radius, simple, easy and obstructed
	A3 – Extra-articular fracture of the radius, multi-fragmentary
23B – Partial articular fracture where the fractures include merely portion of the articular surface, while rest of that surface remnants committed to the diaphysis.	B1 – Partial articular fractures of the radius, saggital
	B2 – Partial articular fracture of the radius, dorsal rim (-Barton)
	B3 – Partial articular fracture of the radius, volar rim (-Reverse Barton)
23C – Widespread articular fracture, in which, the articular surface is interrupted and totally detached from the diaphysis.	C1 – Widespread articular fracture of the radius, articular simple type, metaphyseal simple type
	C2 – Widespread articular fracture of the radius, articular simple, metaphyseal multi-fragmentary
	C3 – Widespread articular fracture of the radius, multi-fragmentary

Table 2: Multi-fragmentary: It is simplified to 5 Intra-articular fractures.

A – Extra-articular
B – Partial articular
a. B1 – Radial Styloid
b. B2 – Dorsal rim fractures
c. B3 – Volar rim fractures
d. B4 – Die Punch fractures
C – Complete articular

Results

Results of this study are described under the following headings:

- i. Descriptive statistics.

- ii. Inferential statistics.

- iii. Descriptive statistics:

Age: The Mean age of the study population is 40.9800, with Median being 37.0, Mode being 30.00,

Table 3: Descriptive statistics.

	Age
Mean	40.9800
Median	37.0000
Mode	30.00
Std. Deviation	14.22199
Minimum	20.00
Maximum	70.00

Table 4: Association between Type of management and DASH score among study population.

		Dash Score			Total
		Excellent	Fair	Good	
Closed Reduction	Count	12	0	2	14
	% of Total	24.0%	.0%	4.0%	28.0%
Ligamentotaxis	Count	2	4	5	11
	% of Total	4.0%	8.0%	10.0%	22.0%
ORIF with Plating	Count	16	1	1	18
	% of Total	32.0%	2.0%	2.0%	36.0%
Percutaneous K Wire	Count	7	0	0	7
	% of Total	14.0%	.0%	.0%	14.0%

Pearson Chi-Square value = 24.508 p value = <0.001 (significant)

Std. Deviation is 14.22199, Minimum value being 20.00 and Maximum value being 70.00. This is represented in Table 3. Cross tabulation of DASH score and Type of Management is done in Table 4. The association between type of management and DASH score. There is a significant association between those who had ORIF with plating as type of management and excellent DASH score have been tabulated in Table 4. The association between AO type of fractures at the distal end of radius and DASH score is tabulated in Table 5. The bar diagram Figure 1

shows that majority 18(62.07%) of those who had C type of AO type fracture were having excellent DASH score .

Discussion

According to AO classification the injury profile in our study is classified into three types namely extra articular, partially articular and completely articular. In our study it was found that 29% of the subjects had completely articular fracture which is the major type in our study group followed by 14% of the

study subjects with extra articular fractures and only 7% had completely articular fractures. In our study majority of the study subjects about 18% were managed with procedure of open reduction & internal fixation with volar plating, 14% of the study subjects were managed by closed reduction, 11 % were managed by closed reduction and internal fixation and finally about 7% were managed with open reduction & internal fixation with volar or dorsal plating. The outcome measure was analysed using DASH scoring. The study subject who scored between 0-16 were classified as Excellent, 17 to 35 were classified as good and above 35 were classified as fair According to this classification 74% had excellent outcomes followed by 16% of study subjects who had good outcome and only 16% had fair clinical outcome based on DASH scoring. Our study results point towards good outcome

Table 5: Association of AO type of fractures with DASH score in the study population.

			DASH Score			Total
			Excellent	Fair	Good	
Ao Type	A	Count	12	0	2	14
		% of Total	24.0%	.0%	4.0%	28.0%
	B	Count	7	0	0	7
		% of Total	14.0%	.0%	.0%	14.0%
	C	Count	18	5	6	29
		% of Total	36.0%	10.0%	12.0%	58.0%
Total		Count	37	5	8	50
		% of Total	74.0%	10.0%	16.0%	100.0%

Pearson Chi-Square = 6.622; p-value=0.157 (not significant)

The occurrence of DRF in European countries seems to have decreased after the turn of the 20th century because of unknown reasons. The life expectancy also tends to increase for both male and female and the whole quantity of fractures [21,22]. So it is a common expectation that fracture also increase and the societal burden should increase as well. In India the population is increasing, the number of vehicles is increasing and consequently the incidence of radial fractures is on the increasing trend. The management of a distal end radius fractures has been varied and in the last decade with recent procedures with a greater quantity of study subjects being managed through surgical treatment [3,23-25] it expected that the outcome should have advanced significantly, at least for the group treated with surgery. we have found some limitations of follow up of these patients and further analysis of the results with the details of complication and union with regard to various treatment modalities in distal radius fractures can yield a better result, the sample size is small, not a representative of the general population hence may limit the application to general population.

Conclusion

The proportion of study subjects with an adverse consequence has not undergone any change. There could be several reasons to this lack of change over the decade. The tool may not be sensitive enough or catering to minimal changes. Sometimes the DASH-score for study subjects with bad outcome has already reached its limit, and hence these study subjects would have ended up

subsequent to a fracture of distal radius (DRF). Compared to other studies done which showed a median DASH score of 19 at 6 months [19], which estimates a moderate disability according to the DASH definition. Another study shows at 6 months, 68% of the study subjects have minimal pain [20]. After 12 months, the participants had minimal pain and better function with fewer limitations in their activities of daily living [20], and a DASH score of 8.5 at 12 months [19]. Approximately 16–20% participants complained about modest to most important disability even 12 months after the injury, which is not a very favourable outcome measure of a distal end radius fractures treatment. Further it appears that only a little proportion of the study subjects with major disability after one year will revert back to pre-fracture position in the long- standing.

with bad outcome irrespective of management due to coexisting illness or any other psychological reasons, or the reason which is most unacceptable, that is the modification in management merely has no outcome.

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