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Pattern of presentation of distal radius fractures

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Abstract
Background: Fractures of distal radius are predominantly high energy fractures with bimodal presentation. Since prevention of such fractures is almost impossible, it is important to evaluate the risk assessment, so as to enable prediction of functional outcomes with these fractures. The present study was carried out to assess the pattern of presentation of distal radius fractures.
Methods: This cross sectional study was carried out among 50 patients admitted for surgical management of distal radius fractures. The anatomical scoring of the fractures was done using AO and Frykman classification. All the participants were surgically treated with either open reduction and internal fixation with plating or closed reduction.
Results: Most of the participants underwent Open reduction and internal fixation (ORIF) with plating (36%). Based on the anatomical scoring, majority of the participants were categorized as excellent (90%) while 14% were categorized as good. Younger age and road traffic accidents demonstrated excellent scores compared to other risk factors ($p<0.001$).
Conclusion: The present study may also be used as a basis for evaluating the functional outcomes of each of the surgical management as a prospective analysis.

Keywords: Distal radius fractures, fall on outstretched hand, open reduction, road traffic accidents

Introduction
The distal radial fractures (DRF) account for 15 to 20% of total fractures treated by an orthopedic surgeon [1]. These fractures have a bimodal age distribution, consisting of a younger group susceptible to high-energy trauma to the upper extremity and elderly group who are vulnerable to both highand low-energy fractures [2]. Many studies have been done in the past to evaluate the functional outcomes of various management modalities of distal radius fractures [3-7]. Most of the distal radial fractures are stable and there is universal agreement with respect to its treatment i.e. it is managed by closed reduction and cast immobilization with a good therapeutic and functional outcome [8, 9]. The older method of external fixation has some technical difficulty and costlier implants. However, there are various newer methods of techniques such as pin and plaster fixation, pinning percutaneously, pinning through intramedullary canal, fixation with bone cement and internal fixation with implants. The recent trend in the management of radial fractures is more towards surgical management rather than conservative management, with increasing use of volar locking plate [10]. There are various factors that lead on to bad functional outcomes such as dorsal angulation, incongruence of articular surface, shortening and secondary displacement of the fracture fragments. Some of these factors impinge upon the treatment outcomes too. Further the mortality rates increased to 14% in 7 years following a DRF fracture; and men who suffered a distal radius fracture are almost 3 times more likely than women to die during that time period. Nellans *et al* also reported a 5-10 times greater rate of vertebral fractures in women and men, respectively, a year after suffering a distal radius fracture [11].
The treatment algorithm is multifactorial, which takes into account the factors such as the patient's age, activity level, bone quality or strength, occupation, previous or current injuries, joint involvement, extent of fracture displacement, and involvement of joint surface [3, 12]. Patients with good bone quality, limited fracture displacement, and minimal involvement of joint surface are commonly treated with closed reduction. With extensive fracture displacement and poor bone quality, the age of the patient can help decide the most appropriate

surgical treatment approach. In spite of this evidence the number of orthopaedic surgeons picking up the option of operative treatment has vastly increased over the last 10 years. It is imperative that there is a pressing need to conduct an in depth evaluation of treatments and its functional outcome based on scientific methods. With this background, the present study was carried out to assess the pattern of presentation of DRF based on the anatomical scoring.

Methodology

Study setting and participants

This cross sectional study was carried in the Department of Orthopedics among patients diagnosed with distal radius fractures for a period of one year between April 2018 and March 2019. All the adult patients with skeletal maturity, presenting with intra-articular unstable distal radius fractures within four days of injury. Patients with extra-articular and stable distal radius fractures and those with medical disorders impacting bone physiology or those with another ipsilateral fracture were excluded. The study was carried out among 50 patients who were eligible for the study, selected during the study period.

Ethical approval and informed consent

Approval was obtained from the Institutional Ethics Committee prior to the commencement of the study. Each participant was explained in detail about the study and informed consent was obtained prior to the data collection.

Data collection

The demographic characteristics and particulars related to the injury including type of fracture according to AO and Frykman classification were documented using a structured proforma [13, 14]. AP and lateral X-rays were obtained of each patient at the time of admission, immediately after the treatment provided and during the follow-up visits. The baseline radiologic parameters were measured, and the fracture stability, according to the Altissimiand Fernández criteria and the treatment provided were recorded [15, 16]. The participants underwent surgical procedure, either as closed reduction, open reduction with internal fixation and percutaneous K wire insertion.

Data analysis

Data was entered and analyzed using SPSS ver. 21 software. The functional outcomes as per DASH questionnaire were expressed as percentages. Chi square test was used to evaluate the test of statistical significance between the functional outcomes and demographic parameters. A p value <0.05 was considered statistically significant.

Results

Majority of the participants belonged to the age group of 31-45 years (36%) followed by <30 years (30%) and were females (60%). The most common mode of injury among the study participants was fall on outstretched hand (FOOH) (60%). (Table 1).

Table 1: Background particulars of the study participants

Characteristics	Frequency (n=50)	Percentage (%)
Age (in years)		
<30	15	30.0
>60	6	12.0
31-45	18	36.0
41-60	11	22.0
Gender		
Males	20	40
Females	30	60
Mode of injury		
Fall on outstretched hand	30	60
Road Traffic Accidents (RTA)	20	40

Most of the participants underwent Open reduction and internal fixation (ORIF) with plating (36%) while 28% of them underwent closed reduction. About 22% of the participants underwent ligamentotaxis. (Figure 1)

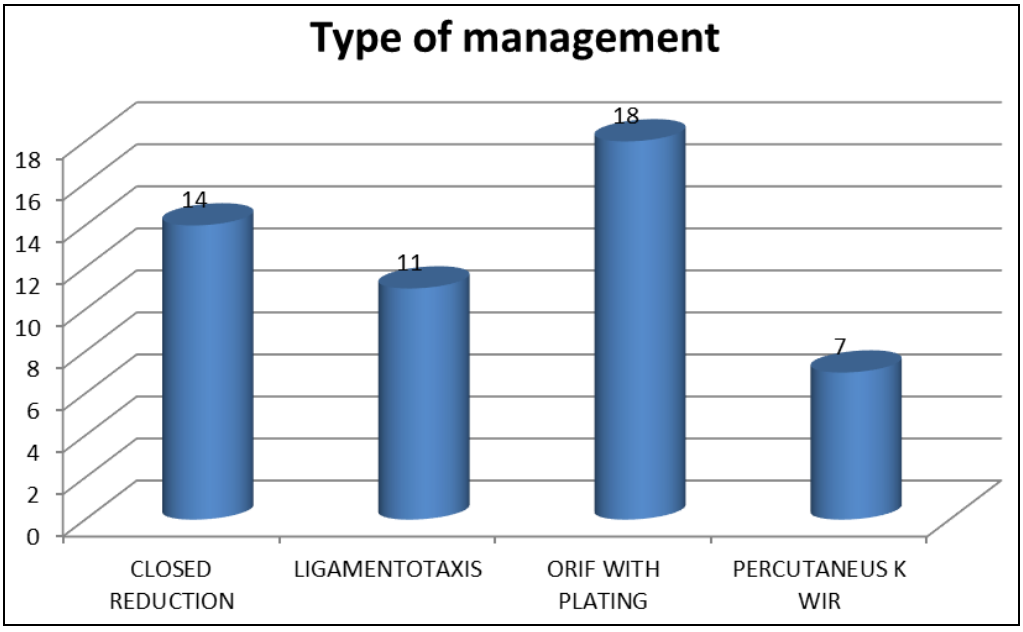

Fig 1: Type of procedure

Based on the anatomical scoring, majority of the participants were categorized as excellent (90%) while 14% were categorized as good. (Table 2)

Table 2: Categorization of Anatomical scoring among the study participants:

Score	Frequency (n=50)	Percentage (%)
Excellent	40	80.0
Fair	3	6.0
Good	7	14.0

On comparing the anatomical score with the type of procedure, it was observed that all the participants who underwent closed reduction were categorized as excellent (100%) while only 27.3% of the participants who underwent ligamentotaxis showed excellent scores. However, both ORIF and percutaneous K-wire also showed excellent scoring as per anatomical score (88.8% and 100% respectively). The observed difference was statistically significant (p<0.0001). (Table 3)

Table 3: Comparison of Anatomical score based on the type of surgical intervention

Type of procedure	N	Anatomical score			Chi sq	P value
		Excellent	Fair	Good		
Closed reduction	14 (28)	14 (100)	0(0)	0(0)	25.8	0.0001
Ligamentotaxis	11 (22)	3 (27.3)	2(18.2)	6(54.5)		
Open reduction with internal fixation with plating	18 (36)	16(88.8)	1(5.6)	1(5.6)		
Percutaneous K wire	7(14)	7(100)	0(0)	0(0)		

On comparing the anatomical scoe based on the mode of injury, 100% of the participants with RTA demonstrated excellent scores compared to Fall on outstretched hand (66.7%). The observed difference was statistically significant (p<0.05). (Table 4)

Table 4: Comparison of Anatomical score based on mode of injury:

Mode of injury	N	Anatomical score			Chi sq	P value
		Excellent	Fair	Good		
FOOH	30 (60)	20 (66.7)	3(10)	7(23.3)	8.3	0.016
RTA	20 (40)	20(100)	0(0)	0(0)		

On comparing the anatomical score with the age group, 100% of the participants in the age group of 31-35 years showed excellent score, while 86.6% in the age group of <30 years showed excellent score. However, only 16.7% of the participants above 60 years of age showed excellent score. The observed difference was statistically significant (p<0.001). (Table 5)

Table 5: Comparison of Anatomical score based on the age group:

	N	Anatomical score			Chi sq	P value
		Excellent	Fair	Good		
31-45	18 (36)	18(100)	0(0)	0(0)	23.3	0.001
46-60	11(22)	8(72.7)	0(0)	3(27.3)		
<30	15(30)	13(86.6)	1(6.7)	1(6.7)		
>60	6(12)	1(16.7)	2(33.3)	3(50)		

Discussion

The basic demographic characteristics showed the mean age group of the study population to be 40.9 which is a younger age group. As expected the group most likely to get involved in high energy impact fractures are young age group. However it was found that the female population were more in the study group compared to male patients. The reasons could be the lack of estrogen protection among the post menopausal women and the weaker bone strength among the female participants could be another assumption. The mean months of follow up of our study population comes around 9 months. There are various studies done on the outcome measures of DRF treatment and the usual time of follow up goes up till 12 months [8, 17-20]. The possible explanation could be the difficulty in follow up of these patients beyond one year because of the monetary and other resource constraints as well as patient co operation.

It was found that the fall on an outstretched hand as the most common mode of injury in our study which correlates well most other studies reporting on mode of radial fracture injuries [14, 21-24]. 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 patients had completely articular fracture which is the major type in our study group followed by 14% of the patients with extra articular fractures and only 7% had completely articular fractures. In our study majority of the patients about 18% were managed with open reduction and internal fixation with volar plating, 14% of the patients were managed by closed reduction, 11% were managed by closed reduction and internal fixation and finally about 7% were managed with open reduction and internal fixation with volar or dorsal plating.

Conclusion

The present study has elucidated the pattern of presentation of DRF in respect to the management and anatomical scoring. While majority of the participants presented with excellent scores, certain factors including younger age, road traffic accidents and open reduction are associated with excellent anatomical scores. The present study may also be used as a basis for evaluating the functional outcomes of each of the surgical management as a prospective analysis.

Declaration
Conflict of interest: Nil
Funding: Nil
Ethical approval: Obtained

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