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Distal Radius Fractures Treated with Bridging External Fixation and Outcomes, Aden, Yemen

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Abstract: Distal radius fractures are the most common fracture encountered in clinical practice. The aim of the study was to determine the characteristics of the patients, some aspects of the clinical findings, and the complications. This is a retrospective descriptive study of patients with distal radius fracture and treated by the use of bridging external fixation. It was conducted from January 2016 to December 2018 in Aden. The patients' charts were retrieved, and data was obtained. The total cases were 40, males (87.5%) and females (12.5%). Their mean age was 40 ± 19 years. The age ranged between 13 and 80 years. The most affected side was the right side (57.5%). The main cause of the fracture was road traffic accident which represents (60%). Bone quality was good in (82.5%) of cases and osteoporotic in (17.5%) of cases. Mild displacement was (17.5%) and minimal displacement (5.0%). The majority of patients, 18(45%), were in the age group 21 – 40 years. Nonunion found in 1 (2.5%) case and pin tract infection found in I (2.5%) case. The mean duration of external fixator application was 6.2 ± 0.96 weeks. The follow-up duration was between 6 to 12 months. Bridging external fixation was performed for all patients. None of the patients had Sudeck atrophy. Further comprehensive studies are needed to find out the benefit of this surgical procedure.

Keywords: Distal radius; fracture; bridging; external fixation; Aden

Introduction

Distal radius fracture (DRF) is the most common fracture encountered in clinical practice [35] and has been estimated to account for more than one-sixth of all fractures treated in emergency rooms. The incidence is 20-40 per 10000 person-years [5,28]. The age distribution of DRF is bimodal, peaking in up to epiphyseal closure and elderly populations.

Most fractures in adolescents and young adults are the results of high-energy trauma such as sports injuries, falls from heights, or traffic accidents, in contrast to the elderly population where the fracture usually is an osteoporotic low-energy fracture [23].

Below 50 years of age, the incidence of DRF is similar among women and men [5]. The women to men ratio then increase up to 4:1 [5,24], and women over 80 years reach the highest incidence of 120 DRF per 10000 person-years [5].

A distal radius fracture, also known as wrist fracture, is a break of the part of the radius bone, which is close to the wrist [10]. In younger people, these fractures typically occur during sports or a motor vehicle collision [25]. In older people, the most common cause is falling on an outstretched hand [25].

External fixation of fractures of the distal radius has been in use since the 1940s. There are two main techniques of external fixation: wrist bridging (where the distal pins are inserted into the second metacarpal) and nonbridging (where distal pins are inserted into the distal radius fragment) [4].

Bridging external fixation is a well-accepted treatment modality for severely comminuted DRFs, relying on ligamentotaxis to realign fracture fragments [11,14,20].

The aim of our study was to determine the characteristics of the patients, some aspects of the clinical findings, and the complications.

Materials and method:

This is a retrospective descriptive study of patients suffering from distal radius fracture and treated by the use of bridging external fixation.

The study was conducted from January 2016 to December 2018 in Alnaqeeb Private Hospital in Aden.

During the study period, a total of 40 patients were seen at the Emergency Outpatient clinic of the hospital with distal radius fracture, and they were examined and transferred to the surgical ward. They were operated by the author using external bridging fixation.

The patients' charts were retrieved, and information about sex, age, affected side, cause, union and nonunion of fracture, displacement, infection, duration of removing the external fixator and mobilization were obtained.

The data was entered into a computer and analyzed using SPSS program version 17. For variables, difference, chi-square tests, and P values were calculated. A p-value of < 0.05 was considered statistically significant.

Results:

Table 1 reveals DRF patients in relation to sex, affected side, and cause of fracture. Male patients represented 35(87.5%), and female patients was 5(12.5%) of the total study patients (Table 1, Figure 1).

The mean age of the study patients was 40 ± {Standard deviation (SD) = 19} years. The age ranged between 13 and 80 years.

The mean age of females is 66.2 ± 16.9 years, and the age ranges between 45 – 80 years, while the mean age of males is 36.3 ± 16.3 years and the age range is 13 to 80 years.

The difference between age means of gender showed highly statistically significant (p = 0.000).

Also, Table 1 shows that stable fractures were 31(77.5%) and unstable fractures were 9(22.5%).

The most affected side was the right side which represented 23(57.5%), and the left hand was 17(42.5%). The main cause of the fracture was a road traffic accident (RTA) which represents 24(60%), followed by a fall down, which represents 15(37.5%), and one case (2.5%) caused by a bomb explosion (Table 1, Figure 2).

Table 1 also shows the bone quality as good 33(82.5%) and osteoporotic 7(17.5%).

On the other hand, nondisplacement represented 31(77.5%), mild displacement was 7(17.5%), and minimal displacement 2(5.0%).

In our study, we performed bridging external fixation for all patients 40(100%) as shown in Figures 3, 4, and 5.

Table 1: Distal radius fracture patients related to certain variable (n=40)

Variables	Mean & range	No	%
Sex:			
Males		35	87.5
Females		5	12.5
Age (years):			
Mean age of all patients ± SD*	40 ± 19		
Range of age of all patients	13 - 80		
Females mean age	66.2 ± 16.9		
Males mean age	36.3 ± 16.3		
Females age range	45 – 80		
Males age range	13 – 80		
P-value between groups	0.001		
Type of fracture:			
Stable		31	77.5
Unstable		9	22.5
Side:			
Right hand		23	57.5
Left hand		17	42.5
Cause:			
Fall down		15	37.5
RTA		24	60.0
Bomb explosion		1	2.5
Bone quality:			
Good		33	82.5
Osteoporotic		7	17.5
Displacement:			
Non		31	77.5
Mild		7	17.5
Minimal		2	5.0
Surgical procedure:			
Bridging external fixation		40	100.0

SD* = Standard deviation

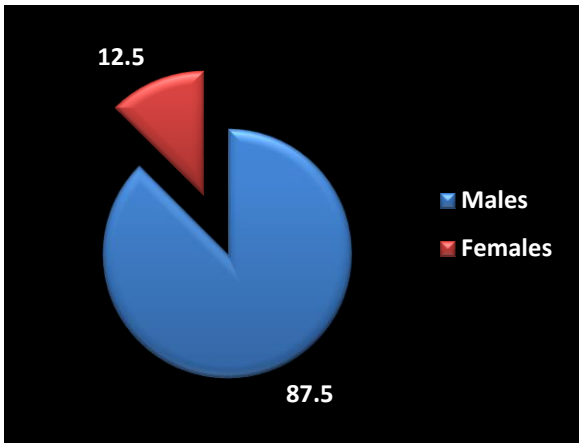

Figure 1. Distribution of study patients related to sex

Figure 3.

Figure 4.

Figure 5.

Table 2 reveals that the majority of our study patients, 18(45%), were in the age group 21 – 40 years, followed by the patient of the age group 41 – 60 years with 11(27.5%). The difference between values was statistically significant ($p < 0.05$).

Table 2: Distribution of patients according to age

Age group (years)	Sex				Total		p-value
	Males	(%)	Females	(%)			
≤ 20	5	(12.5)	0	(0.0)	5	(15.0)	P = 0.01
21 – 40	18	(45.0)	0	(0.0)	18	(42.5)	
41 – 60	9	(22.5)	2	(5.0)	11	(27.5)	
61 – 80	3	(7.5)	3	(7.5)	6	(15.0)	
Total	35	(87.5)	5	(12.5)	40	(100.0)	

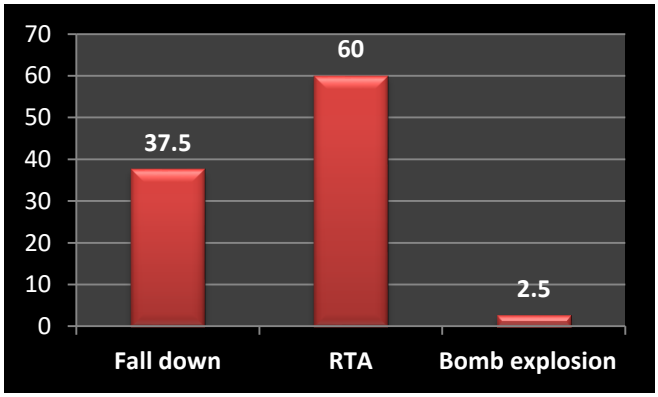

Figure 2. Distribution of percentage related to cause of distal radius fractures

Table 3 shows that nonunion of factures and pin tract infection in each one is only one case (2.5%). None of the patients had complex regional pain syndrome (CRPS), which is also known as Sudeck atrophy.

Duration of the external fixator in situ was for 4 – 5 weeks 6(15%), in 27(67.5%) of cases, an external fixator was left in place for 6 weeks, and 7(17.5%) was left for eight weeks. The mean duration of external fixator application was 6.2 ± 0.96 weeks. The follow-up duration of our cases was for a period between 6 to 12 months.

Table 3: Distribution of study patients in related to outcome

Outcome	Mean & range	No	%
Nonunion:			
Yes		1	2.5
No		39	97.5
Pin tract infection:			
Yes		1	2.5
No		39	97.5
CRPS (Sudeck atrophy):			
Yes		0	0.0
No		40	100
Duration of external fixation (weeks):			
4 – 5		6	15.0
6		27	67.5
8		7	17.5
Mean duration (weeks)	6.2 ± 0.96		
Follow up duration (months)	6 - 12		
Immobilization state:			
Excellent	32	80.0	
Good	8	20.0	

SD* = Standard deviation

Discussion:

Distal radius fracture has been described as accounting for 25% of fractures in childhood and 18% in the elderly, making it one of the most common fractures of the upper limb in all ages [3,30].

In our current study, there were 35 (87.5%) males and 5 (12.5%) females.

Various published studies reported a high incidence of fractures in males, like Leung et al. [21], found 73.6% males and 26.4% females, Jain et al. [17] found 63.6% males, also Nagi et al. [29] found 88.5% males.

Koo et al. [19] identified that males are more affected by fractures of the distal end of the forearm. Although Nogueira et al. [31] reported in their published study that the majority of cases under 30 years of age were men.

In the present study, we found the mean age of the study patients was 40 ± {Standard deviation (SD) = 19 } years, and the age ranged between 4 and 80 years.

The mean age of females is 66.2 ± 16.9 years, and the age ranges between 45 – 80 years, while the mean age of males is 36.3 ± 16.2 years and the age range is 13 to 80 years. The difference between age means of gender showed highly statistically significant ($p = 0.001$).

Our finding of mean age and range is also similar in series reported by Kapoor et al. [18] with a mean age range of 36-40 years. Others reported higher mean age of 47 years by Ruch et al. [33], 55 years by Fok et al. [13], and 56 years by Abe et al [1].

Other studies reported that females were more frequently affected. Ruch et al. [33] reported 53%, and Abe et al. [1] reported 64% females were affected.

Channareddy [7] mentioned that distal radius fractures were found more commonly in young adults (3rd and 4th decade). The mean age for males was found to be 37 years, lesser compared to females with a mean age of 51 years.

Leung et al. [21] found in their study the mean age of the patients was 35.6 years, and also Jain et al. [17] found the mean age in their study was 37 years.

Our findings demonstrated that hand fractures are more frequent in the right hand than in the left hand 23(57.5% versus 17(42.5), which could be explained by the higher engagement and exposure of the predominant hand (usually right hand, dominant hand). Similar findings have been reported by some studies [21,27], while others have reported contrasting results [2,26,36]

In the present study, the main cause of the fracture was a road traffic accident (RTA) which represents 24(60%), followed by a fall down, which represents 15(37.5%), and one case (2.5%) caused by a bombing explosion.

Our result of the mode of injuries by RTA is comparable with that reported by Gunaki et al. [15] with (60.5%), Channareddy [7] with (72.5%).

However, this was different from the results of Hayes et al. [16], who found the majority of causes were fall down.

Distal radius fractures occur as a result of both high energy and low energy trauma. There is a bimodal distribution of distal radius fractures where high-energy fractures occur in younger persons (predominately male), and high and low-energy fractures occur in older persons (predominately female) [8,9].

In our present study, we found nondisplacement represented 31(77.5%), mild displacement was 7(17.5%), and minimal displacement 2(5.0%). Channareddy [7] reported in his study that fracture displacement was volar in 6 fractures and dorsal in 24 fractures; also, most of the fractures, 32(80%), were displaced.

In the current study, we found pin tract infection only in one case (2.5%).

Minor pin tract infections were more common when non-bridging fixation was used. They were also more common in closed injuries. There were small numbers of major pin-tract infections in each group, none of which led to persistent deep infection after fixator removal [16].

However, this finding was less than the findings of Atroshi et al. [4], who reported in their study that pin site infection was recorded in 6 patients in the wrist-bridging group and 9 patients in the non-bridging group.

In our current study, we found that nonunion of factures were only 1(2.5%) case.

Nonunion of the distal radius is long considered to be extremely rare [32]. It has been noted more frequently in recent years [12,34]. Although some investigators have speculated that the advent of external fixation and other techniques for maintaining the length of the radius has created bony defects that can lead to nonunion [34].

Also, in our study, none of the patients had complex regional pain syndrome (Sudeck atrophy). Complex regional pain syndrome (Sudeck atrophy) is one of the most common distal radius fractures complications, mostly occurring within the first 4 months after the fracture. Its prevalence is estimated at 39% [22] and occurs in 4–7% of patients after the fracture surgery of the extremity [6].

In our present study, the duration of the external fixator in situ was for 4 – 5 weeks 6(15%), in 27(67.5%) of cases, an external fixator was left in place for 6 weeks, and 7(17.5%) was left for eight weeks. The mean duration of external fixator application was 6.2 ± 0.96 weeks. The follow-up duration of our cases was for the period between 6 to 12 months. A similar finding was reported by Hayes et al. [16].

Conclusion:

We carried out this study in an attempt to compile the characteristics of the patients, some aspects of the clinical findings, and the complications with distal radius fractures admitted to Alnaqeeb Private Hospital in Aden.

The results illustrated that the majority of injured patients were males. Road traffic accidents and fall down were the major cause of injuries. Bridging external fixation was performed for all patients. None of the study patients had Sudeck atrophy.

Further comprehensive studies are needed to find out the benefit of this surgical procedure.

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كسور طرف عظمة الكعبرة وعلاجها بجسر خارجي ثابت ونتائجها، عدن، اليمن

عبد الفتاح عباس منصور السعيدي

الملخص: كسور طرف عظمة الكعبرة هي الكسور الأكثر شيوعًا في الممارسة السريرية. كان الهدف من الدراسة هو تحديد خصائص المرضى، وبعض جوانب النتائج السريرية والمضاعفات . هذه دراسة وصفية استرجاعية للمرضى الذين يعانون من كسور طرف عظمة الكعبرة ويتم علاجهم جراحيا باستخدام التثبيت الخارجي. تم إجراء الدراسة من يناير 2016 إلى ديسمبر 2018 في عدن، وتم مراجعة ملفات المرضى والحصول على البيانات .بلغ مجموع الحالات 40 حالة، ذكور (87.5%) وإناث (12.5%) وكان متوسط أعمارهم 40 ± 19 سنة. تراوحت الأعمار ما بين 13 و 80 سنة، وكان الجانب الأكثر إصابة هو الجانب الأيمن (57.5 %). كان السبب الرئيسي للكسور هو حوادث الطرق بنسبة (60%). وكانت جودة العظام جيدة في (82.5%) حالة وهشاشة العظام في (17.5%) حالة. ووجد أن الإزاحة الخفيفة (17.5%) والحد الأدنى للإزاحة (5.0 %). غالبية المرضى 18 (45%) كانوا ذوي الفئة العمرية 21 – 40 سنة. ووجدت حالتان واحدة غير ملتحمة (2.5%) وحالة التهاب بجانب الدبوس (2.5%)، وكان متوسط مدة تطبيق المثبت الخارجي 6.2 ± 0.96 أسبوعًا. كما كانت مدة المتابعة بين 6 إلى 12 شهرًا. تم إجراء عملية تثبيت الجسر الخارجي لجميع المرضى. كما لم يكن لدى أي من المرضى ضمور سوديك . هناك حاجة إلى مزيد من الدراسات الشاملة لمعرفة فائدة هذا الإجراء الجراحي .

كلمات مفتاحية: طرف، عظمة الكعبرة، كسر، جسر خارجي مثبت، عدن.