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Original Article

Functional outcome of Unstable Distal Radial Fracture Management by External Fixator using the Principle of Ligamentotaxis

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Abstract:

Objective: The aim of the present study was to asscess the functional outcome of Unstable Distal Radial Fracture managed by External Fixator using the Principle of Ligamentotaxis.

Methods: A prospective observational study was conducted from July 2016 to June 2018 among 32 patients attending at Orthopaedics and Traumatology department of the Dhaka Medical College Hospital after obtaining requisite consent from the patients. The collected data were entered into the computer and analyzed by using SPSS (version 20.1) to asscess the functional outcome of Unstable Distal Radial Fracture managed by External Fixator using the Principle of Ligamentotaxis. The study was approved by the institutional ethical committee.

Results: 32 patients were enrolled for the study. The mean age of the patients was 37.56±11.82. More than half of the respondents were male (68.75%). Results were assessed by Demerit point system of Gartland and Werley for functional outcome In this study satisfactory result was seen in 84.37% and unsatisfactory result was seen in 15.63%. All fractures (100%) were united nicely.

Conclusion: Unstable distal radial fracture management by external fixator using the principle of ligamentotaxis is an effective method of treatment.

Keywords: Distal radius fracture, External fixator.

Introduction

Distal radius fracture has been estimated to account for one-sixth of all fractures that are seen and treated in emergency rooms.[1] It occurs in middle aged and elderly women commonly. But it can also occur in young men with high velocity injury though less in number. Patients with fracture of distal end of radius have serious complications more frequently than generally appreciated and failure in management may cause permanent disability.[2] Recently surgical management has been widely recommended and performed to prevent disability. Several studies have shown convincingly that functional outcome is good when the anatomy is restored by obtaining good reduction of fracture fragments, maintaining the angulations of the articular surface of radius and radial length.[3] Various surgical interventions are available presently, like percutaneous pinning, intra focal pinning, external fixator and plate fixation. In this clinical study only the unstable distal radius fractures have been selected for external fixation, which are not amenable to treatment by closed reduction and plaster cast immmobilization. As these fractures have an inherent capacity for loss of reduction or shortening or both. The instability can be recognized by the presence of much communition, severe dorsal angulation (≥20°) or extensive intra articular involvement. In these cases it is difficult to align the fracture fragment, and to maintain the reduction.[4] External fixator may be performed in a bridging technique and a non bridging technique. Bridging external fixator allows distraction across the radio carpal joint. Anderson and O Neil were first to maintain fracture reduction using an external fixator using in 1977, but Vidal Jacques described original method of treatment of these fractures with ligamentotaxis.[5] The moulding of fracture fragments into alignment by traction force applied across the fracture through the surrounding soft tissue is known as ligamentotaxis. The same ligaments, retinaculae, tendons and the periosteum that envelop the fracture

which are the surgical barrier for open reduction of the fracture fragments, help to achieve reduction of the fracture by ligamentotaxis.[6] Multiple studies have documented the efficacy of this technique. If unstable distal radial fracture management by external fixator using the principle of ligamentotaxis shows acceptable outcome, it would help many patients in the rural areas. Because it less invasive and comparatively easy procedure.

Materials & method

A prospective observational study was conducted from July 2016 to June 2018 among 32 patients attending at Orthopaedics and Traumatology Department of the Dhaka Medical College Hospital after obtaining requisite consent from the patients. Purposive sampling was done to collect the data. The collected data were entered into the computer and analyzed by using SPSS (version 20.1).

Result

Table-I shows distribution of patients by age. In this study the highest number of patients 9 (28.13%) were within 35-43 years. The mean age was 37.56±11.82 years.

Table-I: Age distribution of the study population (n=32)

Age in years	Frequency	Percentage (%)
18 – 25 years	7	21.88 %
26 – 34 years	8	25 %
35 – 43 years	9	28.13 %
44 – 52 years	3	9.38 %
≥53 years	5	15.63 %
Total	**32**	**100 %**

Among the study population male (68.75%) was found 22 and female (31.25%) was 10 (Figure-I).

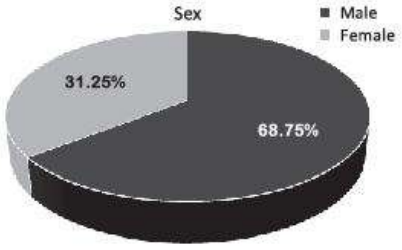


Figure-I: Pie chart showing percentage of sex distribution of patient

According to table-II, most of the patients had closed fractures. Number of such cases was 25 (78.12%)

Table-II: Distribution of patients according to soft tissue involvement (n=32)

Type of fracture	Frequency	Percentage (%)
Open fracture	3	9.37 %
Closed fracture	25	78.12 %
Technically open fracture	4	12.5 %
Total	**32**	**100 %**

According to table 3, majority (37.50%) injury was AO/ASIF type C3 fracture. It signifies that majority of injuries were as a result of high velocity.

Table-III: Distribution of patients according to AO/ASIF type of the fractures of the distal radius (n=32).

AO / ASIF Type	Frequency	Percentage (%)
A3	1	3.13%
B1	2	6.25%
C1	8	25
C2	9	28.13
C3	12	37.50

Majority cases were operated on the day of injury. It was 20 in number (62.50%). No cases were delayed more than 7 days. The mean time interval between injury and fixation was 2.12±1.43 days

Table-IV: Distribution of time interval between injury and fixation (n=32)

Group	Time interval between injury and fixation (days)	Frequency	Percentage (%)
1	0-1	20	62.50%
2	2-3	8	25%
3	3-7	4	12.50%

In majority cases (68.75%) external fixators were kept for 6 weeks. Only in 10(31.25%:= 25% + 6.25%) cases more than 6 weeks were required but no cases got more than 8 weeks of immobilization. The mean time of keeping the fixator was 6.69±0.61 weeks.

Table-V: Distribution of duration of immobilization by external fixator (n=32).

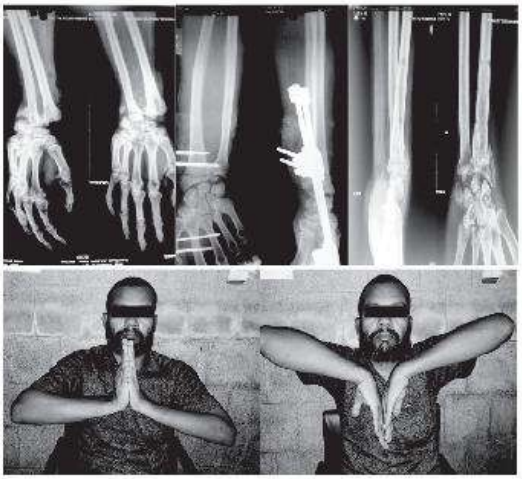
Group	Duration of immobilization (weeks)	Frequency	Percentage (%)
1	6	22	68.75%
2	7	8	25%
3	8	2	6.25%

In this series 32 patients were available finally for functional evaluation. It shows excellent results in 25%, good results in 59.37% cases, fair results in 9.37% cases and poor result in 6.25% cases. The mean functional score was 6.78±5.69 ranging from 1 to 22 points.

Table-VI: Distribution of the study patients according to functional score Gartland and Werley (n=32)

Result	Score	Frequency	Percentage (%)
Excellent	0-2	8	25%
Good	3-8	19	59.37%
Fair	9-20	3	9.37%
Poor	>20	2	6.25%

According to Demeritpoint system of Gartland and Werley, excellent and good outcome are considered as satisfactory & fair and poor outcome are considered as unsatisfactory.Satisfactory= Excellent + Good= 25% + 59.37%= 84.37% Unsatisfactory= Fair + Poor= 9.37%+ 6.25%= 15.62%.



Discussion

In this study it is observed that mean age of the patient was 37.56 ± 11.82 years and the maximum number of the patients belonged to the age range between 35 to 43 years. Bacron & Kurtzke in a study with two thousand cases in New York between the period of 1945 to 1949 had found that the average age of the patients was 48.2 years.[7] In this study 22 patients were male (68.75%) and 10 were female (31.25%). Dissimilar results were obtained in the study conducted by Baron, JA et al.[8] study. In their study they stated that womens were approximately 4.88 times more likely than men to obtain a distal forearm fracture.[8] In our study out of 32 patients we found 84.37% satisfactory and 15.63% unsatisfactory result. In a popular study Vaughan et al. assessed 52 patients for a period of 58 months and produced 85% satisfactory result.[9] Alamgir et al. assessed the result of 15 patients of unstable distal radial fractures with/without intraarticular extension and produced 86% satisfactory and 14% unsatisfactory result.[10] So there is no significant difference of result of present series with that of the previous work. Maruthi & Shivanna produced 76.68% satisfactory result in 30 patients with external fixator with an average follow up of 9 months. The dissimilarity may be contributed to the different scoring system used by the authors. He used modified Green-O'Brein clinical scoring system.[5]

Conclusion

It is concluded that unstable distal radial fracture management by uniplanar static external fixator using the principle of ligamentotaxis is a satisfactory and effective method of treatment. Moreover, it is simple

technique, less invasive procedure, learning curve is also short and hardware can be removed in outpatient basis.

Acknowledgements

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Conflict of Interest

Authors declare no conflict of Interest.

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