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FUNCTIONAL OUTCOME IN PATIENTS TREATED WITH EXTERNAL FIXATOR AS LIGAMENTOTAXIS TOOL FOR FRACTURES INVOLVING DISTAL END OF RADIUS AND ITS RELEVANCE IN DEVELOPING WORLD

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ABSTRACT: BACKGROUND: Incidence of complex radius fracture is increasing day by day due to high velocity trauma. Treatment of this group of fracture is still controversial. External fixator is an important method in the management of fractures at the distal end of radius. **AIMS AND OBJECTIVE:** Aim of our study was to evaluate the functional outcome of patient treated with external fixator for fracture of distal end of radius. **MATERIAL AND METHOD:** This is a prospective study of 26 patients with fracture of distal end of radius. Grade III to grade VIII (Frykman's classification) were included in the study. Final functional outcome was evaluated according to Patient Rated Wrist Evaluation (PRWE) score. **RESULT:** Out of 26 patients 19 (73.08%) were male and 7(26.92%) were female. Follow up duration was 18 month to 38 month with mean follow up period of 26 month. Mean hospital stay was 4 days. Final functional outcome was excellent in 20 patients (76.92%), good in 4 patients (15.38%) and fair to poor in 2 patients (7.69%). **CONCLUSION:** An external fixator is an effective method of treatment for fracture distal end of radius. In developing world where health resources are limited, external fixator is an excellent alternative, which is simpler and cost effective. **KEYWORDS:** External fixator, Distal Radius Fracture, PRWE, Ligamentotaxis, Distractor.

INTRODUCTION: Fracture of distal end of radius is one of the most common fractures, treatment of which is still controversial. Rapid socio-economic changes in developing countries characterized by urbanization leads to increased dependence on motor vehicle as a means of transport. This leads to increase in all type of injuries with significant increase in complex fractures of extremities. Incidence of Distal radius fractures which are intra-articular and comminuted has increased significantly in last decade.⁽¹⁾

These fractures have potential to compromise mechanical function of hand drastically.⁽²⁾ Closed reduction and plaster application usually leads to early loss of reduction and late collapse. In most instances good functional end result is possible by skillful and intelligent use of different treatment modalities. However in their endeavor to obtain good result, the surgeons in most developing countries face many challenges.⁽¹⁾

In light of limited healthcare facilities and surgeon's expertise, external fixator may be considered as an alternative method of treatment in many developing countries. The advantages of external fixator in fractures of distal end of radius is that it is a simple, cost effective device, can be applied under local anaesthesia (if general anaesthesia facilities are not available) with least post-operative complication.

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The open reduction for fracture of distal end of radius is a technically demanding procedure which requires costly implants (plates), with increased surgery time and its increased share of post-operative complications.⁽³⁾

In our study we will evaluate the functional outcome of patients treated with cost effective implant, the external fixator, which is readily available, can be applied in small set up and can be afforded by masses in developing countries.

MATERIAL & METHODS: Twenty six patients with fracture distal end of radius, admitted in our hospital from 2011 to 2012 were taken up for our designed study. The patients were selected as per inclusion and exclusion criteria.

Inclusion Criteria:

1. Fracture of distal end of radius, Grade III-VIII (Frykman's classification).
2. Age > 18 years.
3. Compliant patients who will follow rehabilitation protocol in post-operative period.

Exclusion Criteria:

1. Open fractures.
2. Patients with open epiphyses.
3. Fractures with diaphyseal extension.
4. Marked metaphyseal comminution.
5. Volar Barton fractures.

All patients were operated under brachial/general anaesthesia. External fixator (which acts as a radial distractor device) was used to stabilize the fracture. The distractor was placed in lateral plane from radial side. Pins were inserted by small stab incisions of less than 1 cm size. Two proximal pins (size: 3.5mm) were inserted in radius and 2 distal pins (size: 2.5mm) were inserted in proximal third of 2nd & 3rd metacarpal. Ulnar styloid fracture was not treated actively.

To prevent damage to dorsal cutaneous branch of radial nerve we used open pin insertion method with proper use of screw guide and drill guide. Reduction was achieved by traction and manipulation at fracture site. All patients but 3 were augmented with percutaneous k wire fixation. Pin insertion sites were covered with betadine soaked gauze pieces. Kirschner wire removal was done after 3-4 weeks once radiological signs of healing appeared. Distractor was removed after 6-9 weeks. Patients were subjected to aggressive physiotherapy protocol in post-operative period.

Final functional outcome was evaluated by Patient Rated Wrist Evaluation (PRWE) score. The aim of the questionnaire is to provide a reliable and valid tool for quantifying patient rated wrist pain and disability in order to assess outcome in patients with distal radius fractures. The score consist of two domains – pain and function, both of which carry equal weightage. The total function on PRWE scale ranges from 0 (normal wrist) to 100 (worst possible).

A full explanation regarding the scope of scoring system was given to patients before completion of the questionnaire with particular reference to the point that if an activity included in questionnaire had not been performed up to that point an estimation by the patient of amount of difficulty expected should be made (4, 5, 6, 7). Results were interpreted as follows:

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- i) Excellent (0 – 10).
- ii) Good (11 – 30).
- iii) Fair (31 – 70).
- iv) Poor (71 -100).

RESULT: Twenty six cases were enrolled with fracture distal radius. Patient age ranged from 18 year to 60 years. Out of 26 patient 19 (73.08%) were male and 7 (26.92%) were female. Road traffic accident was cause of fracture in 19 patient (73.08%) and fall from height in 4 patients (15.38%). Follow up duration was 18 month to 38 months with mean follow up period of 26 months. Mean hospital stay was 4 days. Fracture started showing signs of healing in mean 4.9 weeks. Mean fixator removal time was 6.8 weeks.

Final PRWE score was 0 in 11 patients (42.31 %), 1 to 10 in 9 patient (34.62%) patients. Two patients (7.6%) developed arthritis of radiocarpal joint in wrist joint. One patient required bone grafting for large metaphyseal void. Final functional outcome was excellent in 20 patients (76.92%), good in 4 patients (15.38%) and fair to poor in 2 patients (7.69%).

No patients developed median nerve or superficial radial nerve injury. Late complications like carpal instability, iatrogenic radial artery aneurysm, tendon ruptures or implant loosening were not reported. Non-union was not observed. There was no incidence of complex regional pain syndrome (reflex sympathetic dystrophy). Fracture at pinsite, late collapse and re-displacement were also not seen. Pin site infection was seen in three which resolved with proper cleaning, dressing and antibiotics.

DISCUSSION: Distal radius fractures pose a significant challenge to orthopaedicians because of inherent tendency to collapse leading to malunion, loss of function and late osteoarthritis.^(8,9) Ligamentotaxis is the principle of molding fracture fragments into alignment as a result of tension applied across a fracture by the surrounding intact soft tissues.⁽¹⁰⁾ Skeletal traction maintained by distractor between radius and second metacarpal bone appears to provide appropriate stabilization of fragments. Distractor provides stability & sustained traction prevents shortening due to either bone loss or late resorption of cancellous bone from metaphysis.

The use of external fixator requires adherence to post-operative protocol, involving pin care to avoid septic complication around the pin site. Unless this is maintained external fixation cannot be expected to provide good result.⁽¹¹⁾ Current concept reflects the growing popularity of External Fixators for complex fractures of distal radius. It provides easy accessibility of wound care and it can be combined with secondary procedures like bone grafting and skin grafting.⁽¹²⁾

While implant for internal fixation can be applied safely on palmar and dorsal surface of radius, both these surfaces are densely covered with tendon adjacent to joint, which leave this area vulnerable to tendon adhesion and tendon injury when implants are used in this area.⁽¹³⁾ In a randomized study of 50 patients by Marcus et al concluded that the difference between internal and external fixation in distal end radius fracture at 1 year regarding grip strength and range of motion was found to be diminished with the time.

At 5 year both groups had approached normal value.⁽¹⁴⁾ Gernain et al in there randomized study of 35 patients found that clinical outcome for patient treated with internal fixation or external fixations were not significantly different and complication rates were also similar.⁽³⁾

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In developing countries, there is very little to invest in health. In light of limited health care facilities and surgeons expertise in many developing countries, a simple method of treatment of fractures like external fixation may be selected not as a choice but also practical one. Use of external fixator is easy within the capacity of many surgeons. It does not require special instrumentation and facilities.

CONCLUSION: An external fixator is an effective method of treatment for fractures of distal end of radius. In developing countries where health resources are limited, an external fixator applied by a minimally invasive approach is an excellent alternative to open reduction and internal fixation with plates. The external fixator is cost effective, takes less surgery time, with less post-operative complications and good functional outcome.

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PRWE SCORE	No. of PATIENT	PERCENTAGE (%)
Excellent (0-10)	20	76.92%
Good (11-30)	4	15.38%
Fair (31-70)	2	7.69 %
Poor (71-100)	0	0%

Table 1

Frykman's classification grade	No. of patient	Percentage (%)
I	0	0
II	0	0
III	6	23.08
IV	9	34.61
V	3	11.54
VI	2	7.69
VII	2	7.69
VIII	4	15.38

Table 2

Pre-operative X-ray

Post-operative X-ray

Final follow-up X-ray

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