Evaluation of Treatment of Intra Articular Fracture of Distal End of Radius By UMEX, A Uniplanner Bilateral Mini External Fixator

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This prospective study was done to evaluate the results of treatment of intra-articular fracture of distal end of radius by external bilateral uniplanner mini fixator (UMEX). Study was conducted at National Institute of Traumatology and Orthopedic Rehabilitation (NITOR) from January 2005 to January 2007. A total of 23 patients were treated by UMEX for intra articular fracture of distal end of radius. Patients were selected by convenient sampling technique. Ages of patients was 18-60 years. Patients were evaluated anatomically by criteria outlined by Lidstorm as modified by Sarmiento and Latta and functionally by criteria outlined by Gartland and Werley as modified by Sarmiento after a 24 weeks follow up. Outcome found excellent in 12, good in 6, fair in 4 and poor result in 1 patient

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Key words: Ligamentotaxis by uniplanner fixator, intra articular distal radial fracture, closed reduction

Introduction

Hand is the medium of introduction to the out side world and organ of communication .Wrist is the foundation of hand. For proper hand function wrist must be supple, stable and pain free which is invariably disturbed by fracture lower end of radius specially if it is intra articular.[1]

Fracture of distal radius is a very common injury seen in the emergency as well as out patient department. It represent 1/6th of all fractures of radius in patients over 50 years of age. It becomes very much unstable if there is intra articular involvement. There is surprising disagreement on classification, treatment and correlation between radiological and functional outcome specially in case of intra articular fracture of distal radius.

These fractures are as a rule easily reduced by traction and manipulation. However maintenance of reduction in severely comminuted fractures in a plaster cast alone is not always possible and if reduction is not maintained the deformity recurs. Not only is cosmetic result disappointing but as Bacron and kurtzke showed in series of 2000 Colles' fractures dysfunction is related to the degree of deformity.[2]

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In this clinical study only the intra articular fractures of distal radius have been selected for mini external fixator. These fractures have an inherent tendency for loss of reduction or radial shortening or both.

Several options are now available for management of these injuries that includes percutaneus pin fixation and plaster, metal external fixator device (a)unilateral uniplanner,(b)unilateral biplanner, limited open reduction with or without autogenous cancellous bone grafting, extensive open reduction and internal fixation, dynamic external fixation and ligamentotaxis and bone graft and recently bilateral uniplanner static fixator.[3]

In this study the intra articular distal radial fractures have been treated with UMEX, a bilateral uniplanner static mini external fixator applying the idea of ligamentotaxis. The fixators kept for 6 weeks. After removal of the fixators patients were allowed for gentle use of wrist for 6 weeks and then gradually resuming normal activities. The patients were then followed up for a period of 6 months. Patients were evaluated anatomically by criteria outlined by Lidstorm as modified by Sarmiento and Latta and functionally by criteria outlined by Gartland and Werley as modified by Sarmiento after a 24 weeks follow up.[4]

Methods

This study was conducted at NITOR from January 2005 to January 2007. A total of 23 patients were included in this study from emergency and out patient department as per inclusion and exclusion criteria. Inclusion criteria were-closed intra articular distal radial fracture, both sex, both side, age 18 to 60 years and patients' presented within 7 days. Patients beyond this age group, undisplaced fracture, previous fracture in same limb, prisoner, pregnant women, acutely ill patients with diabetes mellitus, hypertension, or severely malnourished, late presentation, open fracture, mental and physical inability to co operate were excluded from the study.

The study needed Universal Mini External Fixator (UMEX) which is bilateral uniplanner fixator, imported from India (fig 1).The external fixator was applied after close reduction under brachial plexus block at emergency OT of NITOR with aseptic condition (fig 2).

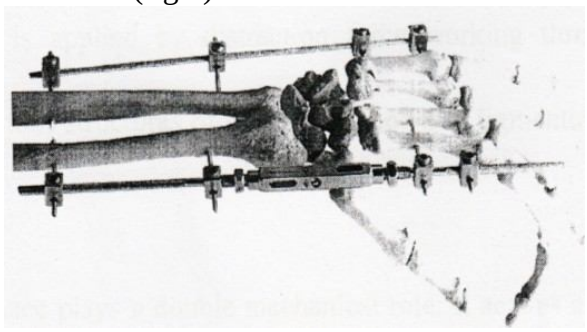

Figure 1. Bilateral external fixator to distal radial fracture

Figure 2. Patient undergoing management by UMEX

For UMEX bilateral fixator one 2 mm k-wire passed through radius from lateral aspect at the junction of upper 2/3rd and lower 1/3rd in the coronal plane. A second k-wire passed in the plane at least 0.5 cm distal to the first. The next two k-wires were passed at similar level through the ulna from medial aspect in the coronal plane. A k-wire is passed in the base of the 2nd metacarpal in the coronal plane and advanced to engage the 3rd metacarpal.

Another one is passed through neck of 2nd metacarpal and advanced to engage 3rd metacarpal. The next two k-wires were passed similarly in 5th and 4th metacarpals from the ulnar side in the coronal plane in same level, one in the base and another through the neck. Then a Distraction Compression rod is connected through clumps to k-wires along radial side and a straight rod to k-wires through clumps along ulna. Then fracture reduced and adjusted through Distraction Compression rod after x-ray.

Fixators were kept for 6 weeks. The follow up procedure was done up to 6 months and assessed anatomically and functionally.21 patients were released 0-3 days and 2 patients after 7 days due to associated injuries. All evaluated in follow up at 7 days, 21 days, 42 days. Then, one month interval upto 6 months.

Results

The results were seen at follow up for period of 6 months. Total 25 patients were selected for clinical study. But 2 cases lost to follow up. So, remaining 23 patients were finally available for evaluation. Age range of the patients was from 18 to 60 years. Mean age of patients was 36.39 years.

Time interval between injury and fixation of 22 patients is day one and 1 on third day. Duration of hospital stay in 21 patients 0-3 days and 2 patients more than 7 days due to associated injuries. Fixators kept for 6 weeks. Complication during fixation was only one pin loosening (4.34%). Complications like persistent were pain in 2, wrist stiffness in 3, finger stiffness in 2 patients after removal of fixation. No neurovascular complication found. Satisfactory anatomical end results were found in 82.6% of the patients (Table I). Satisfactory functional end results were found in 78.26% of the patients (Table II).

Table I: Over all satisfactory and unsatisfactory anatomical end result

Results	Number	%
Satisfactory (Excellent + Good)	19	82.6
Unsatisfactory (Fair + Poor)	4	17.4

Table II: Over all satisfactory and unsatisfactory functional end results

Results	Number	%
Satisfactory (Excellent + Good)	18	78.26
Unsatisfactory (Fair + Poor)	5	21.74

Discussion

There is much conflict regarding the best modality of treatment of this fracture. Several studies have cast doubt on the functional benefit of anatomic reduction. But most authors believe that there is a firm relationship between the quality of reduction and restoration of function. The best attainable anatomic result should therefore be the primary object of the treatment.

It is not very difficult to achieve radial length by close manipulation to original value but is far difficult to maintain it before fracture healing is complete, specially if such fractures are protected by only cast immobilization. Therefore it becomes necessary to use some distraction device which can maintain radial length till healing of the fracture. External fixator is such a device which can serve this purpose very efficiently. Rigid two plane fixator used by Cooney et al. should have been superior to one plane fixator.[5] Again bilateral uniplanner fixator UMEX have showed good results in regards to anatomical and functional outcome while studying at NITOR.

Most of the commonly known mini fixator systems are widely recognized to be miniature versions of conventional external fixator systems originally designed for use in the long bones. However, these miniaturized

versions of large fixator systems fail to take into account the complex interplay of small bones and soft tissues, characteristics of the hands. Close proximity of vital neurovascular structures impose severe constraints on placement of the anchoring devices used. Schanz screws or threaded pins have a propensity to wind up soft tissues. Dense cortical bone incountered in the diaphyseal areas of small bones necessitates pre-drilling for threaded anchoring devices. The UMEX system uses the K-wire as the anchoring device of choice that provides a stable skeletal hold without the mentioned constraints.[6]

Advantages of UMEX over conventional external fixator was that less soft tissue damage, less chance of metacarpal fracture as anchoring device is 2 mm k-wire and no chance of ulnar deviation as one straight rod is given on ulnar side. Initially 25 patients were taken for this study. Two failed to follow up regularly. So they were excluded from the study.

In the present series age range of patients was 18-60 years, 18 male patients and 5 female. Thirteen sustained injury from RTA and 10 from fall on outstretched hand. Thirteen patients have fracture on right side and 10 on left side. The cause of more injury on right side may be as apart of reflex protective mechanism. Most of the patients attended NITOR on day of injury (22) and all patients were operated on the day of admission. No case of this series was older than 7 days. Twenty one were discharged on the day of operation and 2 after 7 days because of associated injuries. All external fixators were removed after 6 weeks. Patients were followed up to 6 months.

In this study 78.26% functionally satisfactory result was obtained. Cooney et al. in 1979 used a unilateral biplanner fixator and observed 90% satisfactory result.[7] Clyburn used a dynamic fixator for such fracture and mentioned rigid two plane fixator that was used by Cooney et al. should have been superior to their one plane fixator.[1,5]

Conclusion

The trend shows treatment with bilateral uniplanner fixator UMEX is a good option for treatment of intra articular fracture distal end of radius. So, further study with larger sample and longer follow up is needed.

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