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Original Research Article

Surgical Management of Distal End Radius Fractures by Ligamentotaxis

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ABSTRACT

Background and Objectives: Preservation of the articular congruity is the principle prerequisite for successful recovery following distal radius fractures. The best method of obtaining and maintaining an accurate restoration of articular anatomy however, remains a topic of considerable controversy. External fixation as a method of treatment for distal end of radius fracture has more than 60 years of documented clinical experience. The main aim of this study is to evaluate the results obtained by treatment of distal end radius fractures by external fixation.
Methods: In a prospective controlled study, 20 cases of unstable distal end radius fractures with / without intra-articular extension were treated with uniplanar static type of external fixation using the principle of ligamentotaxis and augmentation by K-wires. The age group of the patients is 18 to 70 years, external fixator was applied for duration of 6 to 8 weeks and cases were followed up for an average of 6 to 10 months post operatively.
Results: Assessed as per Demerit point system of Gartland and Werley (modified by Sarmiento 1975) for functional results and criteria for anatomical results by Sarmiento (1975) at the end of 6-8 months of follow up. Excellent anatomical result was seen in 3 patients, good results seen in 12 patients, fair results are seen in 4 patients with a 1 poor result patient.
Conclusion: External fixation and ligamentotaxis provides better functional and anatomical results in comminuted intra-articular and unstable extra-articular wrist injuries. The successful use of external fixator for distal end radial fractures requires careful assessment of fracture pattern, appropriate patient selecting, meticulous surgical techniques appropriate choice of fixation, judicious augmentation with internal fixation and bone grafting, careful postoperative monitoring and aggressive early institution of rehabilitation. The final functional result of treatment of distal radius fractures not only depends on the anatomical restoration of the articular surface but also on the associated soft tissue injuries and articular damage.

Keywords: Distal radius fracture; External fixation, Ligamentotaxis; Intra-articular fractures; Distal end radius.

INTRODUCTION

Fractures of the distal radius continue to be the most common skeletal injuries treated by the orthopedic surgeon. In fact these injuries are the most common fractures of the upper extremity and account for approximately 1/6th (16%) of all fractures seen and treated in emergency rooms. [1,2,3] Distal radius fractures disturb the mechanical foundation of the man's most elegant tool, the hand. No other fracture has a greater potential to devastate hand function, and no other metaphysis of bone is embraced by more soft tissues. 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. [4] In majority of cases prompt detection of articular fragments displacement, stability, and reducibility provides a rational basis of optimal management of these complex distal end radius fractures. Many fractures of the distal aspect of the radius are relatively uncomplicated and are effectively treated by closed reduction and immobilization in cast. However unstable / intra-articular fractures can jeopardize the integrity of the articular congruence and /or kinematics of these articulations. [5]

Aims and Objectives

- The main aim of this dissertation is to evaluate the results obtained by treatment of distal end radius fractures by external fixation in terms of:
- Duration of immobilization in external fixation.
- Restoration of anatomy of distal end radius (radial length, palmar tilt and radial angulation).
- Effectiveness in allowing early motion of digits and rehabilitation.
- Prevention of deformity and disability due to malunion.
- Evaluation of treatment related complications.

MATERIALS AND METHODS

In a prospective controlled study, 20 cases of unstable distal end radius fractures with / without intra-articular extension were treated with uniplanar static type of external fixation using the principle of ligamentotaxis and augmentation by K-wires. The age group of the patients is 18 to 70 years, external fixator was applied for duration of 6 to 8 weeks and cases were followed up for an average of 6 to 10 months post operatively.

RESULTS

In our study, the maximum patients sustained distal end radius fractures are in the age group of 20-30 (65%) followed by age groups of 31-40 and 41-50 equally(15%) and only one patient belong in the age group of 51-60.

In this study male population is predominantly injured 18 patients (90%) than the female (2 patients) population (10%).

In this study, 16 patients sustained the right sided injury (80%) than the 4 patients with left sided injury (20%).

In this study of 20 patients, 12 patients (60%) sustained injury with road traffic accident, whereas 8 patients (40%) were injured in falls.

In this study of 20 patients, 4 (20%) patients sustained associated fractures than other 16 (80%) patients who sustained isolated distal end radius fracture.

In this study of 20 cases, all the patients underwent surgery the very next day of the injury occurred.

In this case study of 20 patients, 8 patients (40%) were treated with 6 weeks

fixation, where as 2 patients (10%) were continued with 7 weeks of fixation and 10 patients (50%) were treated with a period of 8 weeks.

In this study, under Frykman's classification of distal end radius fractures,; there was no patients in types I and II treated with ligamentotaxis. 3 patients were classified in type III fractures, 2 patients in type IV, only one patient in type V classification, 4 patients were classified in type VI group and 7 patients are categorized in type VII and 3 patients are categorized in type VIII classification.

In 20 patients, 6 patients were found to with loss of radial length of -2mm and 10 patients were suffered with -1mm loss of radial length. And 4 patients had no loss of radial length at all.

In 20 patients, 5 patients were found to with rate of union in 8-12 weeks, 11 patients radiological union evident on 13-16 weeks, 4 patients were found radiological union in 17-20 weeks and 0 patients were found radiological union in 21-24 weeks.

All the 20 patients studied for the study have not identified as suffering from arthritis of the wrist joint.

4 patients (20%) of the total 20 patients have reported to have pain on exertion and 16 patients (80%) had no complaints while moving.

10 (50%) patients were regular in follow up range of 1-6 weeks and rest of 10 patients (50%) has followed up to 6-12 weeks.

According to Gartland and Werley score for the outcome, 3 patients (15%) had excellent result, 12 patients (60%), 4 (20%) patients had fair result and 1 (5%) patient had poor result.

DISCUSSION

Although Abraham Colles was evidently satisfied with the results of his treatment of distal radial fractures in 1814, more recent authors have drawn attention to the high prevalence of unsatisfactory results. In 1952, DePalma hypothesized that a residual dorsal tilt of the distal end of the radius of more than 5 degrees led to a poor result. Gartland and Werley found that immobilization of a distal radial fracture in a cast resulted in a 60 percent loss of reduction and an unsatisfactory result with regard to pain and loss of function in nineteen (32 per cent) of sixty patients. Cole and Obletz documented radial shortening of three millimeters or more in twenty-two (67 percent) of thirty-three patients and radial shortening of six millimeters or more in eleven patients (33 percent) after fixation with pins and plaster. Chapman et al. reported radial shortening of five millimeters or more in twenty (25 percent) of eighty patients who had been managed with the same technique; a complication led to a reoperation in thirteen patients (16 percent). Short et al. found that loss of volar tilt after a distal radial fracture led to progressive load on the ulnocarpal and radioscaphoid articulations, which caused pain and early degenerative disease. Taleisnik and Watson reported an association between malunion of the distal end of the radius and dynamic midcarpal instability.

Unsatisfied with the available methods of treatment, Cooney et al., in 1979, critically reviewed external fixation for the treatment of distal radial fractures and reported a good result for fifty-one (85 percent) of sixty patients, with decreased radial shortening and improved volar tilt. Since then, external fixation has become a popular and reliable method for the treatment of these frequently seen fractures. supplemental fixation with Kirschner wires, and, frequently, the use of a bone graft or bone substitute. The external fixator is a versatile tool in the treatment of intra-articular fractures of the distal radius. Our

standard reduction procedure is similar to the conservative management of these fractures. Continued traction results in controlled distraction of the fracture and facilitates manipulation. This technique is simpler than other techniques. The procedure is performed during a short hospital stay. The external fixator is reliable in terms of maintaining reduction of axes as well as of radial length. Simple intra-articular fractures with dorso ulnar fragments can be reduced with ligamentotaxis [Vidal et al]. In our study, 20 patients was operated 1 day after injury, he ended with fair to good results, and we recommend external fixator to be applied within seventy-two hours from the injury to achieve favorable results. Excellent results were obtained in three patients and good results in twelve patients and fair results in four patients and one poor result patient. Overall we had a high rate of favorable results and low rate of complications. The relatively long period of immobilization (6-8 weeks) had no adverse effects on the long-term functional outcome. The fixator can therefore be left according to the radiologic evidence of fracture healing. [6,7,8,9,10.]

Our prospective study of the results of distal radius fractures treated by external fixation emphasizes that,

1. External fixation for distal radius fracture is a safe and reliable method in terms of fracture fixation, with good functional results and a low complication rate, in particular when external fixation is the primary treatment.
2. Eight weeks of fixation are well tolerated.
3. External fixation is not an adequate tool to maintain volar tilt.

IMAGES

Pre-Operative AP View

Pre-Operative Lateral View

Post-Operative AP View

Post-Operative Lateral View

CONCLUSION

External fixation and ligamentotaxis provides better functional and anatomical results in comminuted intra-articular and unstable extra-articular wrist injuries. The successful use of external fixator for distal end radial fractures requires careful assessment of fracture pattern, appropriate patient selecting, meticulous surgical techniques appropriate choice of fixation, judicious augmentation with internal fixation and bone grafting, careful postoperative monitoring and aggressive early institution of rehabilitation. The final functional result of treatment of distal radius fractures not only depends on the anatomical restoration of the articular surface but also on the associated soft tissue injuries and articular damage.

Competing Interests - The authors declare that they have no competing interests. Both authors have read and approved the final manuscript.
Consent - was taken from the institutional ethics committee.

REFERENCES

1. Ark J, Jupiter JB. The rationale for precise management of distal radius fractures. Orthop Clin North Am. 1993 April; 24(2): 205-210.
2. Nagi ON, Dhillon MS, Aggarwal S, Deogaonkar KJ. External fixators for intra-articular distal radius fractures. Indian Journal of Orthopaedics. 2004;38: 19-22.
3. Jupiter JB. Current concepts review-Fractures of the distal end of the radius. J Bone Joint Surg (Am). 1991; 73-A: 461-469.
4. Agee JM. External fixation: Technical advances based upon multiplanar Ligamentotaxis. Othop Clin North Am. 1993; 24 (2): 265-274.
5. Simic PM., Weiland AJ. Fractures of the distal aspect of the Radius: Changes in Treatment Over the past two decades. J Bone Joint Surg (Am).2003; 85-A: 552-564.
6. Melone CP Jr. Articular fractures of the distal Radius. Orthop Clin North Am. 1984; 15: 217-236.
7. Melone CP Jr. Distal radius fractures: Patterns of articular fragmentation. Othop Clin North Am.1993; 24 (2): 239-253.
8. Knirk JL, Jupiter JB. Intra-Articular Fractures of the Distal End of the Radius in Young Adults. J Bone Joint Surg. 1986; 68-A: 647–659.
9. Szabo RM. Extra articular fractures of the distal radius. Orthop Clin North Am. 1993 April; 24 (2): 229-237.
10. Cooney WP, Linscheid RL, Dobyns JH. External Pin Fixation for Unstable Colles' Fractures. J Bone Joint Surg. 1979; 61-A: 840–845.

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