



EVALUATION OF INTRA ARTICULAR FRACTURE OF DISTAL END OF RADIUS IN ADULTS TREATED BY CLOSE REDUCTION AND EXTERNAL FIXATOR ORTHOPAEDICS

Orthopaedics

Dr. Deepesh Kumar Ameriya Senior resident, Dr. S.N. Medical College, Jodhpur

Dr. Nitin Goyal* Junior resident, Dr. S.N. Medical College, Jodhpur *Corresponding Author

Dr. Dharmveer Bunker Ex resident, Dr. S.N. Medical College, Jodhpur

Dr. Mahesh Bhati Senior professor, Dr. S.N. Medical College, Jodhpur

ABSTRACT

INTRODUCTION:- This study was conducted to assess anatomical and functional outcome in comminuted, intra-articular fracture distal end of radius treated by closed reduction and external fixator.

METHOD:- In this prospective study 25 cases in 21 patients with comminuted intra-articular fracture distal end of radius treated with external fixator and evaluated immediate post op, 6 weeks, 3 months and at 6 months clinically and radiologically. The assessment of anatomical and functional outcome was made according to modified Gartland and Werley scoring system at 6 months.

RESULT:- In our study 25 cases in 21 patients were studied. The age of patient ranged from 18 to 60 years. 61% Of these patients were in age group of 21 to 40. The assessment of anatomical and functional outcome was made according to modified Gartland and Werley scoring system at 6 month. 8 cases (32%) was rated as excellent, 12 cases (48%) rated as good, 4 cases (16%) was rated as fair and 1 case (4%) was rated as poor.

CONCLUSION:- We concluded that external fixation is an effective, economical and time-saving method for the treatment of such fractures in terms of maintaining reduction of axes as well as of radial length. It also has a short learning curve.

KEYWORDS

Distal radius, external fixator, Gartland and Werley score, ligamentotaxis

INTRODUCTION

Fractures of the distal radius constitute one of the most common skeletal injuries treated by Orthopaedic surgeons. Vast majority of fractures of distal radius are articular injuries that result in disruption of both radio-carpal and radio-ulnar joints¹. The optimal method of obtaining and maintaining an accurate restoration of distal radial anatomy remains a topic of considerable controversy. The fracture pattern, the degree of displacement, the stability of the fracture, the age and physical demands of the patient determine the best treatment option. Wide arrays of techniques, including closed, percutaneous and open methods of reduction and stabilization have been increasingly advocated as successful treatment².

Fractures that are either unstable and/or involve the articular surfaces can jeopardize the integrity of the articular congruence and/or the kinematics of these articulations. The goal of the treating surgeon should then be to restore the functional anatomy by a method that does not compromise hand function. Unstable fractures of the distal part of the radius have shown an inherent tendency toward loss of reduction after non-operative treatment³.

External skeletal fixation has been popular for the treatment of displaced, unstable fractures of the distal part of the radius because it combines a minimally invasive procedure with reduction by ligamentotaxis⁴ through prolonged distraction by the fixator and tension is provided by the capsuloligamentous structures. So we elected to assess anatomical and functional outcome in comminuted, intra-articular fracture distal end of radius treated by closed reduction and external fixator.

AIMS AND OBJECTIVES

To assess effectiveness of external fixator and ligamentotaxis in comminuted, intra-articular fracture distal end of radius with evaluation of anatomical and functional outcome.

MATERIAL AND METHODS

This prospective study was conducted on patients with comminuted intra-articular fracture distal end of radius, who attended and treated at Dr. S. N. Medical College and associated group of Hospitals, Jodhpur from Sept 2013 to Dec 2015. In this study 25 cases in 21 patients were studied. Patients with pathological fracture, carpal fracture, refracture, isolated distal radioulnar joint dislocation and fractures in paediatrics age group (age <18 years) were excluded from study.

After patients came to us, detailed history and thorough clinical

examination was conducted. Radiograph of involved wrist joint in antero-posterior (AP) and lateral view were taken. Fracture were classified according to Frykman's classification and patient were planned for surgery. All the patients were explained about the aims of the study, the methods involved and an informed written consent was obtained before being included in the study.

Surgical Technique: Under the effect of anesthesia, longitudinal traction was given at thumb and flexed elbow by assistants and manual moulding of the fracture fragments back into a more normal alignment by surgeon was done. The wrist was maintained in mild flexion and ulnar deviation. A stab incision was made approximately 10 cm proximal to the radial styloid process at an angle of 30 degree to the radial direction. The radius was drilled and 3.5mm schanz screw was fixed. A stab incision was made at 30 degree just below the head of the 2nd metacarpal. It was drilled and fixed with 2.5 mm schanz screw. Then the 4mm connecting rod was fixed to the schanz screw with the clamps and reduction was checked under image intensifier in both planes. The other 2 schanz screw, one in the shaft of radius about 2 cm from fracture site and the other in base of second metacarpal was fixed in similar fashion. Now the external fixation device was tightened and the reduction carefully assessed again clinically and under image intensifier.

Post-Op Care and Rehabilitation:- Check X-rays was taken in both AP and lateral views on post-operative day one. Active exercises of fingers and thumb was commenced from the day of operation. On third post operative day the dressing was removed. The schanz screws were cleaned with spirit on every alternate day for one week; later the patient was educated regarding screw site care. Patients were advised to come biweekly. On 6 weeks follow up, patients were assessed clinically and radiologically for signs of union, if satisfactory then fixator removed, otherwise kept for 2 more weeks.

Again patients were called for follow up at 3 months for clinical and radiological evaluation and finally at 6 months for final assessments of results. During follow up patient was analyzed for stability of fixator and complication related to screw. The assessment of anatomical and functional outcome was made according to modified Gartland and Werley scoring system⁶.

OBSERVATION AND RESULTS

In our study 25 cases in 21 patients were studied. The age of patient ranged from 18 to 60 years. 61% Of these patients were in age group of 21 to 40. The youngest patient was of 18 years old and eldest patient

was of 59 years old. Out of these 21 patients, 18(85.71) % were men and 3(14.28%) were women. The right side was injured in 9(42.85 %) cases, the left side was injured in 8 (38.1 %) cases and bilateral involvement was in 4(19.05 %) cases. The mode of injury was a fall (low impact) in 6 (28.57%) patients and a road traffic accident (high impact) in 15 (71.43 %). The most common mode of injury was road traffic accident. Out of these 21 Patients 13(61.90 %) patients had associated injuries. Out of 21 patients, 13 patients operated within 24 hour. 4 patients operated within 24 hours to 3 days, 2 patients operated within 3 days to 1 week and 2 patients operated after 1 week since injury, these patients had bad result.

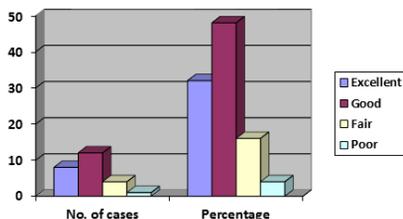
The assessment of anatomical and functional outcome was made according to modified Gartland and Werley scoring system at 6 month. 8 cases (32%) had no deformity of the wrist and there was no pain. Limitation of motion of wrist and fore-arm was less than 20% to that of the normal. They did not have any complications and hence the result was rated as excellent. 12 cases (48%) had no deformity of the wrist, Occasional pain and some limitation of motion were present initially. The limitation of motion of wrist and fore-arm was less than 20% to that of normal. One patient had superficial pin tract infection, which was controlled with oral antibiotics. Hence the result was rated as good.

On subjective evaluation, 4 cases (16%) had pain, limitation of motion and restricted activities around the wrist. Range of motion-of wrist and fore-arm had limitation to less than 50% to that of normal and the result was rated as fair. 1 case (4%) who was operated 14 days after injury, had dinner fork deformity with pain, limitation of motion and restricted activities around the wrist. There was limitation of motion more than 50% and the result was rated as poor. Radiographs demonstrated maintenance of radial length between 1-4 mm of original reduction in the patients.

Table 1;- End Result Using Gartland-Werely System

Grade	No. of cases	Percentage (%)
Excellent	8	32
Good	12	48
Fair	4	16
Poor	1	4
Total	25	100

Graph 1;- End Result Using Gartland-Werely System



COMPLICATIONS;-

Out of 25 cases pin tract infection was in 5 patients, which was effectively controlled by antibiotics, 1 patient has pin loosening but this was not required early removal of fixator, 2 patients had malunion, 1 patient had non-union which lost to follow up after 6 months.

Table -2;- Complications

Complications	No. of patients
Pin tract infection	5(20%)
Pin loosening	1(4%)
Non-union	1(4%)
Mal-union	2(8%)

PRE- OP. X-RAY AP VIEW PRE- OP X-RAY LATERAL VIEW



DISCUSSION

The treatment of distal radius fractures has undergone changes owing to the advances in technology. Improved imaging methods providing better understanding of fractures and elucidation of the effects of injury type on fracture formation and factors leading to instability have given way to new fixing methods and materials appropriate for the fracture, resulting in today's treatment options in distal radius fractures.

Distal radius is important in the kinematics of radiocarpal and radioulnar joints. Hence, reduction of the articular surface, stable fixation, restoration of the radial length, volar angulation and radial inclination are the prerequisite for good clinical outcome. Integrity of the osseous, articular, and ligamentous structures is needed to maintain motion and transmit load. All this reduces the incidence of post-traumatic osteo-arthritis and allow early functional rehabilitation.

External fixation is versatile in managing both intra- and extra-articular fractures with acceptable functional results. Reasons for using external fixation include the continuity of reduction under fluoroscopic control, improved reduction by ligamentotaxis, and the ability to protect the reduction until healing occurs. The advantages of external fixation are the relative ease of application, minimal surgical exposure, and reduced surgical trauma.

Cooney et al⁵, 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.

In our study, majority (61%) of the cases were in the age group of 20 to 40 years. This was similar to study conducted by Yalavarthi and Vishal¹⁰ in 2015 In which majority of patients were between the age group of 20 years to 40 years and was also similar to study conducted by Sukla et al¹¹ in 2013 in which the mean age group was of 40.07 years. In our present study results for Communicated Intra Articular Distal Radius Fractures treated with external fixator using Gartland-Werely System were Excellent in 32% cases & Good in 48% cases which is in accordance with Cooney et al⁵ in which 32% were Excellent & 55% were Good And Sanders et al¹² in which 34% were Excellent & 34% were Good And Steffen et al¹³ in which 22% were Excellent & 53% were Good And Huang¹⁴ in which 31% were Excellent & 51.4% were Good, While our results are equivalent with Cooney et al⁵ and Huang¹⁴, however, in comparison with the studies of Sahito et al¹⁵ in which 41% were Excellent & 51% were Good, our results showed inferior results. In our present study results were Fair in 16% case & Poor in 4% case which is in accordance with Cooney et al⁵ in which 13% were Fair & 0% was Poor And Sanders et al¹² in which 26% were Fair & 3% were Poor And Steffen et al¹³ in which 22% were Fair & 3% were Poor And Huang¹⁴ in which 12.9% were Fair & 4.9% were Poor, While our results are equivalent with Huang¹⁴, however, in comparison with the studies of Sahito et al¹⁵ in which 6% were Fair & 1% was Poor, our results showed inferior results.

TABLE 3;-Comparison with other studies :-

Authors	Fixators	Criteria	Results			
			Excellent	Good	Fair	Poor
Cooney et al ⁵ 1979	External Fixator	Intra articular	32	55	13	0
Sanders et al ¹² 1991	External Fixator	Intra-articular	34	34	26	3
Steffen et al ¹³ 1994	External Fixator	Intra-articular	22	53	22	3
Huang ¹⁴ 2005	External Fixator	Intra-articular	31	51.4	12.9	4.3
Sahito et al ¹⁵ 2015	External Fixator	Intra-articular	41	51	6	1
Present study static	External Fixator	intra-articular	32	48	16	4

In our study, 4% cases was operated 10 days after injury, those ended with poor results. The soft tissue changes that had occurred within these twelve days prevented adequate palmerflexion and ulnar deviation. Hence, we recommend external fixator to be applied within seventy-two hours to achieve favorable results. We had a high rate of favorable results and low rate of complications.

The ligamentotaxis is the basic principle used by external fixation¹⁶. The early mobilization of the wrist leads to normalization of blood supply, hastened functional recovery, earlier resolution of wrist swelling, and decreased jointstiffness¹⁷. So we removed fixator as soon as sign of sound union appeared (6-8 weeks).

In 2013 Pradhan et al¹⁸ also showed open reduction and internal fixation of fracture distal end of radius that provides good results. However objective and subjective functional assessment showed no significant superiority between external fixator and volar plate fixation at 6 months follow up.

The complication rate was high at 36% percent but similar to the results obtained by Weber and Szabo¹⁹. Sixty one percent of their thirteen patients treated with external fixation experienced complications. As in our study, pin track infection was the most common complication. Pin track infections occurred in 5(20%) of our 25 cases. These all resolved with antibiotics. This rate was similar to other studies, which had a range of 0-27 percent. Other complications were Pin Loosening(4%), Mal-Union(8%), Non-Union(4%).

CONCLUSION

In our study external fixator was used in 25 cases with comminuted, intra-articular fracture distal end of radius. Excellent results were obtained in 32% of the cases and good results were obtained in 48% of the cases. We concluded that external fixation is an effective, economical and time-saving method for the treatment of such fractures in terms of maintaining reduction of axes as well as of radial length. It also has a short learning curve.

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