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A prospective study on outcome of distal radius fracture treated with external fixation in a tertiary care hospital

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Abstract

Background and objective: Fractures of the distal radius account for 10 to 12% of all the fractures. Fall on outstretched hand being most common cause. Failure to achieve and maintain near anatomic restoration can lead to various disabilities and deformities. There is evidence that surgical good anatomical articular reduction reduces the complication hence the management of distal radius fractures changed from universal use of cast immobilization to operative interventions. Aim of this study is to observe the functional and anatomical outcome of distal radius treated with external fixation.

Materials and Methods: The present study includes 22 cases of distal radius fractures who were operated with external fixation in our hospital BTGH, MRMC, kalaburagi between Jan 2017 to Dec 2017. Ethical clearance and Informed consent were taken. All the fractures were classified according to frykman's classification and patients' final outcome was measured by Gartland and Werley's Score (demerit system).

Results: The present study includes 22 patients, 14 were male and 8 were female. The mean patient age was 36 years (22yrs-50yrs). Left hand was involved in 13 patients and right hand in 9 patients. The mechanism of injury was road traffic accident in majority. Most of the patients were operated within 3-4 days of injury. 6 patients with high impact type injuries had associated fractures. Most of fractures were of Type III, IV, V of Frykman's classification of fractures. End Results according to Demerit point system of Gartland and Werley's among 22 patients treated with External fixation were Excellent in 10 patients, Good in 7 patients, Fair in 4 patients, and Poor in 1 patient.

Conclusion: External fixation in distal radius fractures provide good to excellent results and are effective in the correction and maintenance of distal radius anatomy.

Keywords: Distal radius, external fixation, gartland and werley's score, Frykman's classification

Introduction

The wrist is a complex joint that bridges the hand to the forearm. It is a collection of multiple bones and joints comprising the distal ends of the radius and ulna, 8 carpal bones, and the proximal portions of the 5 metacarpal bones. The hand has following movement: (1) flexion and extension (2) Pronation and Supination and (3) Ulnar and radial deviation.

Fractures of the distal radius are frequent injuries and account for 10 to 12% of the fractures in human skeleton ^[1]. This fracture is most commonly caused due to fall on outstretched hand. Clinically the patient will have of pain, tenderness, bruising, and swelling. There may be associated deformity like dorsal angulation and in high impact trauma distal neurovascular compromise. Distal radial fracture can present in any group of patients with bimodal age and sex distribution. Patho-physiologically, the force is applied longitudinally or obliquely to the hand and wrist is absorbed by the distal radius because it is the load-bearing bone in the forearm ^[2, 3].

Patients are investigated with antero-posterior and lateral radiographs. For intra-articular fractures CT scans are done to visualize fragment displacement.

To treat these fractures there has not been any specific single followed approach. Despite the large number of researches done ^[4, 5].

The indication of reductive or operative treatment modalities is highly dependent based on the patient's age and level of activity. Among the forms of treatment described are plaster-cast

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are plaster-cast immobilization, use of intra-focal, extra-focal or intramedullary percutaneous Kirschner wires, dorsal and volar plates and external fixation [6-9].

Locked plate and screw systems act as a single unit for fracture fixation while conventional plates require compression between the implant and the bone for stabilization. Since the bone density decreases in elderly, the locked plate and screw system provides greater rigidity and better stabilization than shown by conventional plates. The locked plate-screw mechanism also functions as a substitute for the bone cortex, thus making it possible to use monocortical screws [10-13].

External fixation is a treatment option which is primarily reserved for highly unstable and severely comminuted fractures. This technique relies on ligamentotaxis, which indirectly pulls the fracture fragments through longitudinal traction. External Fixation does not directly address the reduction and maintenance of the dorsal tilt or intra-articular fragments [14].

Aim of the study is to know the surgical and functional outcome of Distal radius fracture treated by external fixation.

Material and Methods

The present study includes 22 cases of distal radius fractures who had come to our hospital between Jan 2017 to Dec 2017. All the patients were operated with external fixation and final outcome was measured by Gartland and Werley Score (demerit system) [15]

Inclusion criteria

- Age group >14 years
- Patients with distal radius fracture.
- Patient fit for surgery and willing to be treated with external fixation

Exclusion criteria

- Open fractures of distal end radius.
- Delayed presentation (>1week).
- Patients not willing for surgery
- Associated with ipsilateral forearm or hand fracture.

Written informed consent of the patient was obtained. Detailed history was taken from each of them and investigations were done. X ray was the mainstay of concluding the fracture type, site and the basis of further intervention and follow up. X-rays were taken in standard AP/LATERAL views of wrist.

Follow up was done at 4weeks, 6 weeks, 3 months and 6 months.

Distal radius fractures were classified according to Frykman's [15] system of classification

Classification of fracture distal end of radius Frykman's classification

Type I: Extra articular radial fracture

Type II: Extra articular radial fracture + Ulnar styloid fracture

Type III: Intra articular fracture of the radio carpal joint.

Type IV: Intra articular fracture of the radiocarpal joint + Ulnar styloid fracture.

Type V: Fracture of the radioulnar joint

Type VI: Fracture of the radioulnar joint + Ulnar styloid fracture.

Type VII: Intra articular fracture involving both radiocarpal and radioulnar joints.

Type VIII: Intra articular fracture involving both radiocarpal and radioulnar joints with an ulnar styloid fracture.

Post-Operative Care and Rehabilitation

Check X -rays were taken in both Antero-posterior and lateral views on first post-operative day. Confirmation of reduction of the fracture was done and any displacement of fracture was studied. Tension across the wrist generated by the external fixation device should provide enough ligamentotaxis, so that on an Antero-posterior radiograph the radiocarpal articulation was seen to be 1 mm wider than the midcarpal joint.

Postoperatively, the fixator remains in place for approximately 6 weeks. From the day of operation active exercises of fingers and thumb were commenced. Third post-operative day the dressing were removed. The pins were cleaned with spirit on every alternate day for one week; later the patient was educated regarding pin site care. Throughout the period of the healing the patients were thought exercises for the hand, pronation and supination of the forearm and active movement of the elbow and shoulder were advised. At 2 weeks after surgery, the sutures were removed. Wrist ROM was started after external fixator removal. Strengthening was initiated as ROM improved and normalizing of symptoms. The final functional outcome was measured by Gartland and Werley scoring system at 3 months follow up.

The system of Gartland and Werley demerit system [14] is a mixed subjective and objective assessment that includes residual deformity (3 points), subjective evaluation (6 points), objective evaluation based on range of movement (5 points), and complications including pain (5 points). Points were added for the four categories and a final rating were obtained as follows With excellent being 0 to 2, good 3 to 8, fair 9 to 20, and poor ≥ 21 .

Results

Among 22 patients who fulfilled inclusion criteria and were operated with external fixation, 14 were male and 8 were female. The mean patient age was 36 years (22yrs-50yrs). Left hand was involved in 13 patients and right hand in 9 patients. The mechanism of injury was road traffic accident in 17 patients followed by fall in 5 patients. Most of the patients were operated within 3-4 days of injury. 19 patients had intraarticular and 3 patients had extra articular fracture. 6 patients with high impact type injuries had associated fractures, 2 patient had fracture shaft of femur, 1 had fracture of both bones of leg, and 1 had fracture of the Right patella, 2 patients had head injury.

According to Frykman's classification of fractures, Out of 22 cases, 2cases are of Type I fracture, 1case of Type II, 5cases of Type III, 9cases of Type IV, 3cases of Type V, no cases of Type VI and Type VII and 2cases of Type VIII.

Patients were followed up at 4weeks, 6weeks, 12weeks and 6 months. Follow up x-rays were taken. External fixator removal done at 6weeks. Patients were evaluated clinically and radiologically for union. Clinical union described as no tenderness on clinical examination at old fracture site. Radiological union described as callus bridging or no fracture line after comparing the preoperative x-ray with the latest follow up x-ray.

In our study, it reveals that, Out of 22 (100%) patients treated with external fixation 19(86%) had dorsiflexion within the normal functional range (minimum 45°), 21 (95%) had palmar flexion within the Normal functional range (minimum 30°), 20 (91%) had pronation within the normal functional range (minimum 50°), 21 (95%) had supination within the normal functional range (minimum50°), 22 (100%) had radial deviation within the normal functional range (minimum 15°) and 17 (77%) patients had ulnar deviation within the normal functional range (minimum 15°). 18(82%) patients had no pain at distal radioulnar joint, 17 (77%) patients had grip strength more than 60% compared to the opposite side. (Table-1)

Subjective evaluation: Among 22 patients of external fixation 9 patients had excellent results, 9 patients had good results, 3 patients had fair results and 1patients had poor results. (Table-2)

Out of 22 patients in external fixation, 6 (27%) patients had pin tract infection and 5(22%) patients had pin loosening which subsided with oral antibiotics.

End Results according to Gartland and Werley's score: Among 22(100%) patients treated with External fixation the results were Excellent in 10 (45%) patients, Good in 7(32%) patients, Fair in 4(18%) patients, and Poor in 1(5%) patient.9 (table 3)

Table 1: Range of motions

Movements (within normal range)	External fixation (22 patients)
Dorsiflexion (min 45 ⁰)	19 (86%)
Palmar flexion(30 ⁰)	21 (95%)
Pronation (50 ⁰)	20 (91%)
Supination (50 ⁰)	21 (95%)
Radial deviation(15 ⁰)	22 (100%)
Ulnar deviation (15 ⁰)	17 (77%)
Pain at radioulnar joint	18 (82%)
Grip strength(60% or less than on opposite side)	17 (77%)

Table 2: Subjective evaluation

Subjective evaluation	External fixation (out of 22 patients)
Excellent	09
Good	09
Fair	03
Poor	01

Table 3: End result according to Gartland and Werley's score

End result	No. Of patients
Excellent (0-2)	10
Good (3-8)	7
Fair(9-20)	4
Poor (>21)	1



Pre-op x-ray AP and lateral Post-op AP and lateral

Image 1



Pre-op x-ray AP and lateral Post-op AP and lateral

Image 2

Discussions

The Commonly seen fractures of distal radius are Colles' fracture, Smith's fracture, Barton's fracture, Chauffeur's fracture.

Colles' fracture is transverse extra-articular fracture with dorsal angulation

Smith's fracture is transverse fracture with palmar angulation

Barton's fracture is Intra-articular fracture of distal radius with dorsal or volar displacement and

Chauffeur's fracture is fracture of radial styloid.

In a prospective randomized study, Roumen *et al.* compared EF with closed reduction and immobilization for displaced distal radial fractures in older patients. Patients treated with External fixation had significantly better radiological results while the functional results did not show any difference [16].

Atroschi *et al.* compared in a randomized study, the two different methods of external fixation in a cohort of elderly patients. A better radial length at 1 year in the non-bridging group was seen but there was no significant differences in functional results of both groups. Aketin *et al.* described similar findings in a retrospective study with patients older than 65 years [17].

In our study significant number of patients had good to excellent final functional outcome.

In a study done by Cooney *et al.* the end results were excellent in 38% patients, good in 55% and fair in 13% [18].

Sanders *et al.* 1991. found end results according to gartland and werley's score as excellent in 34% patients, good in 34% patients, fair in 29% patients and poor in 3% patients [19].

To study the management of distal end radius fracture by utilizing the principle of ligamentotaxis as done by Chilakamary VK *et al*, it was concluded that external fixator was an effective method of treating unstable extra articular and complex intra articular fractures. Improved anatomical restoration with early rehabilitation produced favorable functional outcome [20].

Complications associated with EF are pin-tract infection, iatrogenic lesion of the superficial radial nerve. Complex regional pain syndrome (CRPS) may result due to over-distraction of the wrist joint. Usually the external fixation is applied for 6 week especially to osteoporotic bone with weak hold of the pins. Loosening of the pins may occur so they have to be removed before definitive bone healing. In our no neurovascular complications were reported. 6 patients had pin tract infection and 5 patients had pin loosening which subsided with oral antibiotics.

The Roger-Andersen device used by Grana WA, Kopta JA [21] in the treatment of distal radius fractures had 80% excellent and good results. They felt that 4 pins gave better fixation and

pin loosening was less when compared with 2 pins, results were in comparison with our study.

Cooney WP *et al.* analysed the results with four different external fixation devices in a consecutive series of 100 unstable distal radial end fractures and opined that quadrilateral frame fixation provided effective immobilization and produced good to excellent results in 86% of patients [22].

In another Prospective study in Indian rural set-up done by Pinnamaneni S *et al.*, it was concluded that external fixation can be considered as effective treatment in elderly populations of Indian rural set up as it is a simple and cost effective procedure with good results [23].

Conclusion

Our study concluded that external fixation for displaced distal end radius fractures is minimally invasive with almost no blood loss. The risk of neurovascular damage also runs low with this mode of treatment. The removal of hardware post healing of fracture is easy. The patients also tend to complain less pain. The patients could also return quicker to their daily normal routine. Hence this is a good treatment option in any age group of patients with excellent to good functional outcome.

References

1. Reis FB, Faloppa F, Saone RP, Boni JR, Corvelo MC. Fraturas do terço distal do rádio: classificação e tratamento. *Rev Bras Ortop.* 1994; 29(5):326-330.
2. Arora R, Gabl M, Gschwentner M, Deml C, Krappinger D, Lutz M. A comparative study of clinical and radiologic outcomes of unstable colles type distal radius fractures in patients older than 70 years: nonoperative treatment versus volar locking plating. *J Orthop Trauma.* 2009; 23(4):237-242.
3. O'Neill TW, Cooper C, Finn JD, Lunt M, Purdie D, Reid DM. Incidence of distal forearm fracture in British men and women. *Osteoporos Int.* 2001; 12(7):555-558.
4. McQueen MM, Hajducka C, Court-Brown CM. Redispaced unstable fractures of the distal radius: a prospective randomised comparison of four methods of treatment. *J Bone Joint Surg Br.* 1996; 78(3):404-409.
5. Liporace FA, Adams MR, Capo JT, Koval KJ. Distal radius fractures. *J Orthop Trauma.* 2009; 23(10):739-748.
6. McCall TA, Conrad B, Badman B, Wright T. Volar versus dorsal fixed-angle fixation of dorsally unstable extra-articular distal radius fractures: A biomechanical study. *J Hand Surg Am.* 2007; 32(6):806-812.
7. Kapandji A. [Internal fixation by double intrafocal plate. Functional treatment of non articular fractures of the lower end of the radius (author's transl)] *Ann Chir.* 1976; 30(11-12):903-908.
8. Ring D, Jupiter JB, Brennwald J, Büchler U, Hastings H. 2nd Prospective multicenter trial of a plate for dorsal fixation of distal radius fractures. *J Hand Surg Am.* 1997; 22(5):777-784.
9. Osada D, Viegas SF, Shah MA, Morris RP, Patterson RM. Comparison of different distal radius dorsal and volar fracture fixation plates: a biomechanical study. *J Hand Surg Am.* 2003; 28(1):94-104.
10. Wong KK, Chan KW, Kwok TK, Mak KH. Volar fixation of dorsally displaced distal radial fracture using locking compression plate. *J Orthop Surg (Hong Kong)* 2005; 13(2):153-157.
11. Lorich DG, Gardner MJ. Placas. In: Rüedi TP, Buckley RE, Moran CG, editors. *Principios AO do tratamento de*
12. Arora R, Lutz M, Hennerbichler A, Krappinger D, Espen D, Gabl M. Complications following internal fixation of unstable distal radius fracture with a palmar locking-plate. *J Orthop Trauma.* 2007; 21(5):316-322.
13. Orbay JL, Fernandez DL. Volar fixation for dorsally displaced fractures of the distal radius: a preliminary report. *J Hand Surg Am.* 2002; 27(2):205-215.
14. Gartland JJ Jr, Werley CW. Evaluation of healed Colles' fracture. *J Bone Joint Surg Am.* 1951; 33:895-907.
15. Frykman G. Fracture of the distal radius including sequelae-shoulder-hand-finger syndrome, disturbance in the distal radio-ulnar joint and impairment of nerve function. A clinical and experimental study. *Acta Orthop Scand.* 1967; 108:3.
16. Roumen RM, Hesp WL, Bruggink ED. Unstable Colles' fractures in elderly patients. A randomised trial of external fixation for redisplacement. *J Bone Joint Surg Br.* 1991; 73(2):307-311.
17. Aktekin CN, Altay M, Gursoy Z, Aktekin LA, Ozturk AM, Tabak AY. Comparison between external fixation and cast treatment in the management of distal radius fractures in patients aged 65 years and older. *J Hand Surg Am.* 2010; 35(5):736-742.
18. Cooney WP III. Fractures of distal radius: A modern treatment – based classification - Distal Radius fractures. *Orthop Clin N-Am,* 1993; 24(2):211-216.
19. Sanders RA, *et al.* External fixation of distal radial fractures: results and complication. *J Hand Surg Am.* 1991; 16(3):385-91.
20. Chilakamary VK, Lakkireddy M, Koppolu KK, Rapur S. Osteosynthesis in Distal Radius Fractures with Conventional Bridging External Fixator; Tips and Tricks for Getting Them Right. *J Clin Diagn Res.* 2016.
21. Grana WA, Kopta JA. The Roger Anderson device in the treatment of fractures of the distal end of radius. *J Bone Joint Surg [Am].* 1979; 61(A):1234.
22. Cooney WP. External fixation of distal radius fractures. *Clin Orthop.* 1983; 180:44-49.
23. Dr. Sankara Rao Pinnamaneni, Dr. Srikanth Choppara, Dr. Saurabh Deshpande, Dr. Manjeera R, Prospective study of unstable distal radius fractures treated with external fixation in Indian rural set-up, *International Journal of Orthopaedics Sciences.* 2017, 3(3).