MAK HILL Publications Research Journal of Medical Sciences

Research Article
doi: 10.59218/makrjms.2024.2.205.208

OPEN ACCESS

Key Words
Extra-articular distal radius fractures, percutaneous pinning, VAS score, fracture union time, plaster immobilization

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Received: 15 December 2023
Accepted: 16 January 2024
Published: 22 January 2024

Citation: L.Y. Sathyanarayana, A.G. Sravan Kumar, Srijan Roychowdhury and Akash Yadhav, 2024. Comparative Study of the Functional Outcome, Complications and Time Taken for Fracture Union of Extra-Articular Distal Radius Fractures Treated with Plaster Immobilization Versus Percutaneous Pinning. Res. J. Med. Sci., 18: 205-208, doi: 10.59218/makrjms.2024.2.205.208

Comparative Study of the Functional Outcome Complications and Time Taken for Fracture Union of Extra Articular Distal Radius Fractures Treated with Plaster Immobilization Versus Percutaneous Pinning

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ABSTRACT
A break in the distal radius is among the most common types of bone fractures. Present study was aimed to compare functional outcome, complications and time taken for fracture union of extra-articular distal radius fractures treated with plaster immobilization versus percutaneous pinning. Present study was single-center, Descriptive Cohort study, conducted in patients of both the genders with age between 40 years to 65 years with closed extra-articular distal radius fracture, underwent treatment at our hospital, Treatment options were informed to the patient and selected randomly in plaster versus percutaneous pinning group. In present study, 52 patients were equally divided into two groups as Plaster immobilization and Percutaneous pinning. Mean age, gender and laterality were comparable among groups and difference was not significant statistically ($p>0.05$). Percutaneous pinning group has better VAS score compared to Plaster immobilization group at 3rd and 6th month and the association is statistically significant ($p<0.05$). Percutaneous pinning group has better SF36 score compared to Plaster immobilization group at 1st, 3rd and 6th month and the association is statistically significant ($p<0.05$). Mean fracture union time is better in Percutaneous pinning group compared to plaster immobilisation group and association is statistically significant ($p<0.05$). Functional outcome and Radiological outcome is better in percutaneous pinning compared to Plaster immobilization group and association is statistically significant ($p<0.05$). In management of extra-articular distal radius fractures, percutaneous pinning group has better VAS score, better SF36 score, better fracture union time, Functional outcome and radiological outcome compared to Plaster immobilization group and the association is statistically significant.

INTRODUCTION

A break in the distal radius is among the most common types of bone fractures. These fractures manifest themselves at the wrist, which is where the radius bone comes to an end. However, there has been no consensus reached regarding the proper manner in which these injuries should be defined, treated, or evaluated[1,2]. Following closed reduction of a distal radius fracture, an unstable distal radius fracture is one in which the alignment of the forearm cannot be maintained in a cast. This criterion is used in a backwards fashion. One It has been reported that percutaneous pinning can be employed to provide rigidity to the cast immobilisation when anatomical reduction can be done for a distal radius fracture. This is because pinning adds more stability to the cast[1,3].

In older patients, those with osteoporosis and patients whose fractures are highly comminuted, the surgical treatment has a lower chance of being successful and as a result, it is not recommended for use in these circumstances. However, there are still authors that advocate for its application due to the fact that it is simple to put into practise and that it results in very little disruption in comparison to other methods such as external fixation[4]. Present study was aimed to compare functional outcome, complications and time taken for fracture union of extra-articular distal radius fractures treated with plaster immobilization versus percutaneous pinning.

MATERIAL AND METHODS

Present study was single-center, Descriptive Cohort study, conducted in department of orthopaedics, at Shri Sathya Sai Medical College and Research Centre, Ammapettai, Chengalpettu, India. Study duration was of 2 years (January 2021 to December 2022). Study approval was obtained from institutional ethical committee.

Inclusion criteria:

- Patients of both the genders with age between 40 years to 65 years with closed extra-articular distal radius fracture, underwent treatment at our hospital, willing to participate in present study

Exclusion criteria:

- Patients with any psychiatric illness
- Intraarticular distal radius fracture
- Compound fracture

On admission, patients were informed about the study and written consent was taken for participation and follow up. Patients underwent detailed history taking and physical examination. X ray (Antero-Posterior and Lateral views.) of injured arm was done and diagnosis was confirmed. Patient's injured arm is immobilized in a plaster of Paris slab, analgesics were given. Pre-operative hematological and other investigations were done. Written and informed consent was obtained from the patient for surgery.

Sample size calculation based on the previous study[5]. The mean and standard deviation of both the groups (plaster versus percutaneous pinning) (is 76±26 and 93±12 with 5% level of significance and 80 % power. The total sample size is 26 in each group including 10% of non-responsive error. Treatment options were informed to the patient and selected randomly. Standard post-operative monitoring was done and wrist, finger movements were examined. Patient was instructed to review after 3 weeks at OPD followed by 1st, 3rd and 6th month, At each visit, clinical examination (wound/scar, tenderness, movements of joints) and radiological evaluation (evidence of union and status of the implant) was done and post-operative complications if any, noted.

Data was collected and compiled using Microsoft Excel, analysed using SPSS 23.0 version. Frequency, percentage, means and standard deviations (SD) was calculated for the continuous variables, while ratios and proportions were calculated for the categorical variables. Difference of proportions between qualitative variables were tested using chi- square test or Fisher exact test as applicable. $p>0.5$ was considered as statistically significant (Table 1-6).

RESULTS

In present study, 52 patients were equally divided into two groups as Plaster immobilization and Percutaneous pinning. Mean age, gender and laterality were comparable among groups and difference was not significant statistically ($p>0.05$). Percutaneous pinning group has better VAS score compared to Plaster immobilization group at 3rd and 6th month and the association is statistically significant ($p<0.05$).

Percutaneous pinning group has better SF36 score compared to Plaster immobilization group at 1st, 3rd and 6th month and the association is statistically significant ($p<0.05$). Mean fracture union time is better in Percutaneous pinning group compared to plaster immobilisation group and association is statistically significant ($p<0.05$). Functional outcome is better in percutaneous pinning compared to Plaster immobilization group and association is statistically significant ($p<0.05$). Radiological outcome is better in percutaneous pinning compared to Plaster immobilization group and association is statistically significant ($p<0.05$)

DISCUSSIONS

Previous studies have investigated a variety of factors that may contribute to instability[4]. Important factors to take into account include the degree of primary displacement (dorsal angulation >20 degrees

Table 1: General characteristics

	Plaster immobilization	Percutaneous pinning	p-value
Mean age in years (mean±SD)	50.09±6.3	51.63±8.4	0.93
Gender			
Male	20	16	0.44
Female	6	10	
Laterality			
Right	12	12	0.44
Left	14	14	

Table 2: VAS score

Time frame	Plaster immobilization (mean±SD)	Percutaneous pinning (mean±SD)	p-value
1 month	6.26±0.82	6.34±1.2	0.86
3rd month	8.65±0.62	6.51±1.8	0.04
6th month	9.15±0.54	7.26±1.4	0.01

Table 3: Comparison of score of SF36 questionairre

Time frame	Plaster immobilization (mean±SD)	Percutaneous pinning (mean±SD)	p-value
1 month	28.76 ± 2.1	41.26 ± 3.4	0.02
3rd month	41.23 ± 4.2	49.93 ± 4.6	0.04
6th month	55.46 ± 5.4	68.34 ± 5.2	0.05

Table 4: Comparison of mean fracture union time among study participants

Group	Union time (mean±SD)	t	p-value
Plaster immobilization	8.4±1.3	4.16	0.01
Percutaneous pinning	5.03±1.4		

Table 5: Comparison of functional outcome among study participants

Group	Good	Fair	Excellent	p-value
Plaster immobilization	19	5	2	0.04
Percutaneous pinning	4	0	22	

Table 6: Comparison of Radiological outcome among study participants

Group	Malunion	Union	p-value
Plaster immobilization	8	18	0.05
Percutaneous pinning	5	21	

and radial shortening >5 mm), patient factors (age greater than 60 years and quality of bone) and the pattern of the fracture (dorsal comminution beyond the midaxial plane of the radius, intra-articular fracture and associated ulnar fracture)[6]. Melone reported on a series of 15 patients who underwent operative reconstruction of the distal radial articular surface; 14 of the 15 had good or excellent results. A retrospective study reported that all patients with step off of 2 mm or more in the distal radial articular surface developed post-traumatic osteoarthrosis, whereas patients who healed with less than a 2 mm step off had only a 25% incidence of arthrosis[7]. Achievement of articular congruency in 88% of 17 patients treated with open reduction and internal fixation of comminuted intra-articular fractures of the distal end of the radius has been reported[8]. Hence the present study was conducted with the objective to check efficacy of two fixation procedures one with plaster immobilisation and other with percutaneous pinning.

Functional outcome and radiological outcome is better in percutaneous pinning compared to Plaster immobilization group and association is statistically significant ($p<0.05$). Several clinical studies have reported better functional results with volar plating than with dorsal plating, external fixation and percutaneous pinning, however, a complication rate of approximately 15% also has been reported with volar plating, primarily problems with tendon ruptures and tenosynovitis from screws. Precise volar plate placement on the metaphyseal area of the distal radius may lessen the problems of flexor tendon irritation and eventual rupture[9].

A retrospective study reported that all patients with step off of 2 mm or more in the distal radial articular surface developed post-traumatic osteoarthrosis, whereas patients who healed with less than a 2 mm step off had only a 25% incidence of arthrosis[7]. Achievement of articular congruency in 88% of 17 patients treated with open reduction and internal fixation of comminuted intra-articular fractures of the distal end of the radius has been reported[8]. A recent study has also provided some encouraging outcome data. Patients who underwent an arthroscopically assisted procedure had greater reduction of volar tilt, ulnar variance and articular gap displacement and increased range of motion and grip strength at a mean of 31 months after the procedure, compared with patients who underwent open reduction and internal fixation[10]. However, in the above study, intra-operative fluoroscopy was not used, hence the usefulness of arthroscopy over fluoroscopy could not be demonstrated in precise reduction. Lutsky *et al.*[11] did arthroscopic assessment in all patients undergoing open reduction and internal fixation and observed that a volar approach, indirect reduction and locked plate fixation is a useful technique in restoring articular congruity after distal radius fracture. They

also stated that the magnitude of step and gap deformity may be underestimated by fluoroscopy. Recent work assessing the follow-up functional results in patients undergoing arthroscopy and fluoroscopy-assisted external fixation with pinning versus only fluoroscopy assisted external fixation with percutaneous pinning has found better wrist range of motion in flexion, extension and supination[12]. DASH scores were comparable in either group in both studies. These above mentioned studies focused only on single technique of fixation followed by arthroscopic assessment. No recent work demonstrates the role of arthroscopy in different types of reduction and fixation techniques and its comparative results in either. The differential role of arthroscopy in various fixation techniques has not been probed yet.

The type and frequency of complications varies among different series Kreder *et al.*[13] found overall complication rates ranging from 6-80% and rates of post-traumatic arthritis that ranged from 7-65%. The most frequent complication is malunion with an intra-articular or extra-articular deformity as the most frequent complication. Other complications include non-union, hardware complications tendon attrition/rupture and neurological injuries.

CONCLUSION

In management of extra-articular distal radius fractures, percutaneous pinning group has better VAS score, better SF36 score, better fracture union time, Functional outcome and radiological outcome compared to Plaster immobilization group and the association is statistically significant.

REFERENCES

1. Jupiter, J.B., 1991. Fractures of the distal end of the radius. J. Bone. Joint. Surg., 73: 461-469.
2. McQueen, M.,M. and C. Hajducka. 1996. Redisplaced unstable fractures of the distal radius. J. Bone. Joint. Surg., 78: 404-409.
3. Simic, P.,M. and A.J. Weiland, 2003. Fractures of the distal aspect of the radius: changes in treatment over the past two decades. J. Bone. Joint. Surg., 85: 552-564.
4. Diaz-Garcia, R.J. and K.C. Chung, 2012. The evolution of distal radius fracture management: A historical treatise. Hand. Clin., 28: 105-111.
5. Trumble, T.,E. and R.W. Culp, 1999. Intra-articular fractures of the distal aspect of the radius. Instr. Cour. Lect., 48: 465-480.
6. Melone, J.,R. and C.P., 1986. Open treatment for displaced articular fractures of the distal radius. Clin. Orthop. Relat. Res., 1: 103-111.
7. Bradway, J.,K. and P.C. Amadio, 1989. Open reduction and internal fixation of displaced comminuted intra-articular fractures of the distal end of the radius. J. Bone. Joint. Surg. Am., 71: 839-847.
8. Axelrod, T.S. and R.Y. McMurtry, 1990. Open reduction and internal fixation of comminuted, intraarticular fractures of the distal radius. J. Hand. Surg., 15: 1-11.
9. Whipple, T.L., 1995. The role of arthroscopy in the treatment of intra-articular wrist fractures. Hand. Clin., 11: 13-18.
10. DOI, K., Y. Hattori, K. Otsuka, Y. Abe and H. Yamamoto, 1999. Intra-articular fractures of the distal aspect of the radius. J. Bone. Joint. Surg. Am., 81: 1093-1110.
11. Lutsky, K., M.I. Boyer, J.A. Steffen and C.A. Goldfarb, 2008. Arthroscopic assessment of intra-articular distal radius fractures after open reduction and internal fixation from a volar approach. J. Hand. Surg., 33: 476-484.
12. Ruch, D.S., J. Vallee, G.G. Poehling, B.P. Smith and G.R. Kuzma, 2004. Arthroscopic reduction versus fluoroscopic reduction in the management of intra-articular distal radius fractures. Arthro. J. Arthros. Related. Surg., 20: 225-230.
13. Kreder, H.J., J. Agel, M.D. McKee, E.H. Schemitsch, D. Stephen and D.P. Hanel, 2006. A randomized, controlled trial of distal radius fractures with metaphyseal displacement but without joint incongruity: Closed reduction and casting versus closed reduction, spanning external fixation, and optional percutaneous k-wires. J. Orthop. Trauma., 20: 115-121.