



A STUDY FOR EVALUATION OF FUNCTIONAL AND RADIOLOGICAL OUTCOME IN UNSTABLE DISTAL END RADIUS FRACTURE TREATED WITH JOSHI'S EXTERNAL STABILIZATION SYSTEM (JESS)

Orthopaedics

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ABSTRACT

Background: Distal end radius fractures are the most common upper extremity fracture. The aims of the study was to assess the effectiveness of Joshi's External Stabilization System (JESS) in comminuted, intra-articular fracture of the distal end of radius, to assess radiological and functional outcome and to assess complications of application of JESS fixator. **Method:** 25 patients with intra-articular distal end radius fracture were treated with Joshi's External Stabilization System from April 2020 to April 2021. The patients were followed up at 3 weeks, 6 weeks, 12 weeks and 24 weeks after the surgery. The assessment of pain, range of motion, grip strength and activity were assessed at 6th month and 1 year follow up and scored according to patients rated wrist/hand evaluation (PRWE). **Result:** The good and/or excellent results were found in 75% of cases. We observed that patients with age less than 45 years had greater prognosis as compared to patient with more than 45 years of age. Outcome was also found better in males as compared to females at 6 month and 1-year post operatively. **Conclusion:** JESS is a cost-effective technique and a good option in displaced distal end radial fractures.

KEYWORDS

Distal Radial Fracture, External Fixator

INTRODUCTION

Fractures of the Distal End Radius (DER) constitute one of the most common skeletal injuries treated by Orthopaedic surgeons. Majority of them are articular injuries that result in disruption of both radio-carpal and radioulnar joints. There appears to be a bimodal distribution with distinct peaks in the paediatric and elderly population. Fractures in the paediatric population occurred predominantly in males, whereas fractures in the elderly population occurred more frequently in females.

Many fractures of the distal end radius are in fact relatively uncomplicated and are effectively treated with closed reduction and immobilization in a cast. However, 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 principles of treatment for distal end radius fracture are: anatomic reconstruction, stable fixation, and early motion. The fracture pattern, the degree of displacement, the stability of the fracture, and the age and physical demands of the patient determine the best treatment option.

External skeletal fixation has been popular for the treatment of displaced, unstable fractures of the distal part of the radius as it combines a minimally invasive procedure with reduction by ligamentotaxis.

JESS (Joshi's External Stabilization System) is a kind of external fixator which is easy to apply, cost effective, less cumbersome. Its basic principle is ligamentotaxis. Through prolonged distraction by the External fixator, tension is provided by the capsule-ligamentous structures. Even in severe injuries, the soft tissues, such as ligaments, retinaculum, tendons, and periosteum, remain intact.

We did this study to assess functional and radiological outcome of unstable distal end radius fracture treated with JESS fixator.

MATERIAL AND METHODS

The prospective study of 25 patients was carried out in Department of Orthopaedics, JLN Medical College, Ajmer between April 2020 to April 2021.

Data Collection: Patients with closed or open Gustilo Anderson Type I and unstable intra-articular fracture distal end radius were included in this study. Regular follow up was done at 2 weeks, 4 weeks, 6 weeks, 3 months and final assessment done at 6 months on the basis of Patient Rated Hand / Wrist Evaluation score (PRWE)¹ and radiological assessment. The latter was done in terms of residual dorsal angulation, radial shortening and loss of radial inclination and the results were graded according to the Sarmiento's modification of Lind Strom Criteria².

RESULT

According to PRWE scoring system¹ result obtained at 12 weeks, 14 patients (56%) were in good and 10 patients (40%) were in fair group. At 6 months, 12 patients (48%) had excellent result, 8 patients (32%) had good result and 5 patients (20%) had fair result. (Table 1)

The maximum number of cases (n=13) seen in 22 - 30 years of age group. Out of 25 operative cases, 21 were males and 4 were females. (Table 2)

Maximum percentage of fracture fall under Type VIII (40%) followed by Type VII (32%), Type III (16%), Type IV (12%). There were no case in Type V and Type VI fracture. (Table 3)

Out of 25 cases, 19 (76%) had closed fracture and only 6 (24%) had open fracture.

Most common mode of injury was RTA in 68% of patients followed by FOOSH (20%) and FFH (12%). RTA was maximum in 22-30 years age group (young age) whereas FFH and FOOSH were maximum in older age group (>40 years). (Table 4)

The difference between the two means percentage of movement at 3 and 6 months was statistically highly significant i.e., $P < 0.0001$ in dorsi flexion, palmar flexion, radial deviation, ulnar deviation, supination & pronation.

Table 1: Functional Result According To Prwe Score

Outcome	12 weeks	6 Months
Excellent	1 (4%)	12 (48%)
Good	14 (56%)	8 (32%)
Fair	10 (40%)	5 (20%)
Poor	0	0

Table 2: Distribution Of Cases According To Age & Sex

Age Group (Years)	Sex		Total
	Male	Female	
22-30	13	0	13
31-40	3	0	3
41-50	4	2	6
>50	1	2	3
Total	21	4	25

Table 3: Fracture Type Based On Frykman's Classification

Fracture Type	No. of Cases	Percentage
Type III	4	16%
Type IV	3	12%
Type V	0	0
Type VI	0	0
Type VII	8	32%
Type VIII	10	40%

Table 4: Distribution Of Cases Based On Mode Of Injury

Age Group (Years)	Mode of Injury		
	RTA	FFH	FOOSH
22-30	13	0	0
31-40	1	1	1
41-50	3	1	2
>50	0	1	2
Total	17	3	5

Range of Motion**Photo 1 : Dorsi flexion Postoperative at 6 months****Photo 2 : Palmar flexion Postoperative at 6 months****Photo 3 : Supination Postoperative at 6 months****Photo 4 : Pronation Postoperative at 6 months****Photo 5 : Radial Deviation postoperative at 6 months****Photo 6 : Ulnar Deviation Postoperative at 6 months****DISCUSSION**

The Joshi's External Stabilizing System (JESS) remains a good treatment option for treating DERF with no need of open surgical implant removal and better grip strength after long term follow-up⁷. It consists of application of total of four pins (2 in radius and 2 in second metacarpal) connected by serrated connecting rod with provision for distraction.

It was first used in hand surgery and then in various other musculoskeletal disorders. It started as a simple fracture holding frame which developed into a whole system that encompassed not only the treatment of trauma but also the correction of various congenital and acquired deformities, burns contractures and reconstruction of the

thumb due to its simple design, light weight, easy manoeuvrability, and low cost⁴⁻⁷.

We evaluated our results and compared them with those obtained by various other similar studies to determine efficacy of JESS in management of Distal end Radial Fracture.

In the present study, out of 25 cases 21 were males and 4 were females. In which 11 (44%) were right side and 14 (56%) were left side. Karmakar et al⁸ also observed that non-dominant hand was involved more common (65%).

76% patients had closed fracture and only 24% had compound fracture. In all compound cases wound was on volar side. Similar observation also observed by Maruthi CV and Shivanna⁹.

According to Frykman's classification maximum cases (more than 50%) were fall in Type VIII followed by Type VII, Type III, Type IV. There were no patients in Type V and Type VI. Similar findings noted by Utkal Gupta et al¹⁰.

According PRWE scoring system¹ at 12 weeks functional results shows that 1 (4%) patient was in excellent, 14 (56%) patients were in good followed by 10 (40%) were in fair group. At the end of 6 month 12 patients (48%) had excellent result, 8 patients (32%) had good result and 5 patients (20%) had fair result. Rajeev Shukla et al.¹¹, Tanmoy Karmakar et al⁸ also get similar results in their study. Physiotherapy plays important role in functional outcome, that's why functional outcome improves with physiotherapy.

It was noticed that out of 25 patients 3 patient suffered from Pin tract infection and 4 patients suffered from finger and wrist stiffness whereas only 1 patient suffered from malunion. Higher percentage of complication were found in study done by Maruthi CV et al⁹.

CONCLUSION

JESS fixation of the distal end radius has evolved from its early beginnings in pins and plaster fixation. The current designs of fixators are well established and can be used to reliably treat many fractures around the wrist.

So, JESS is an effective treatment technique for intra-articular distal end radius fracture in our community. On long term follow-up of the patients treated with JESS for intra-articular distal end radius fractures, the functional and radiological outcomes were good with low complication rate.

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