

## Evaluation of Functional outcome of JESS (Joshi External Stabilization System) fixator versus volar plating in treating closed intra-articular distal end radius fracture – A Prospective Study.

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**Abstract: Introduction:** Distal end of radius fracture (DERF) is most common fracture of upper extremity in aging population. Several treatment options are available including open reduction and internal fixation (ORIF) with plate and screws, JESS fixation+ K-wires, manipulation under anaesthesia with below elbow casting. The aim of this prospective study was to analyse the functional outcome for fractures of DERF using volar plate fixation compared to JESS fixation.

**Material and Methods:** This study was conducted in N.R.S. Medical College and Hospital, between May'2016 to May'2018, treated 40 consecutive patients with DERF and was recruited alternatively with either treatment modality.

**Conclusion:** JESS remain a good treatment option for treating DERF in poor socio-economic country like India with no need of open surgical implant removal and better grip strength after long term follow-up, but, open reduction and internal fixation gives better functional outcomes (in terms of range of motion and grip strength), early mobilisation and requirement of lesser number of physiotherapy sessions.

Thus, open reduction and internal fixation with volar plate and screws is a better treatment option for treating comminuted intra-articular distal end radius fractures.

**Keywords:** Intra-articular Distal End Radius Fractures (DERF), Volar plating, JESS (Joshi External Stabilisation System), range of motion (ROM).

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### I. Introduction

The most common fracture of the upper extremity, which represent approximately 16% of fractures treated by an orthopaedic surgeon<sup>(1)</sup> is distal end of radius fracture (DERF). Such fractures are difficult to treat and the treatment is still a debate among orthopaedic community. The primary goal of treatment is restoration of wrist function, restoration of the disrupted Radial anatomy, maintenance of accurate and stable reduction and early mobilization is the key to good functional outcome<sup>(2)</sup>.

JESS assists the surgeon in obtaining fracture stabilisation and fracture healing by gradual and controlled distraction and works on the principle of ligament taxis<sup>(3)</sup>.

The purpose of our study was evaluation of functional outcome of operative management for fractures of distal end of radius fracture using open reduction and internal fixation (ORIF) with plate and screws compared to JESS fixation.

### II. Material And Method

This study was done at N.R.S. Medical College and Hospital from May'2016 to May'2018. Patients were studied prospectively and evaluated clinically and radiologically at follow-up. Total number of 40 patients satisfying the criteria were treated and followed up from admission to post-operative period and beyond. Maximum post-operative follow-up was 14 months and minimum of 4 months. Measurement taken into consideration were radial tilt, radial length, shortening, intra-articular extension, Distal radio ulnar joint (DRUJ) stability and articular congruity.

Among 40 patients, patients were recruited alternately for a particular treatment option. 20 patients were treated by JESS and 20 by ORIF with volar plate and screws after obtaining informed consent..

## **SURGICAL PROCEDURE**

- Volar approach was used for ORIF, using distal radius anatomical locking plate with distal 2.7mm screws and proximal 3.5mm screws (20 cases).
- JESS was used as an external fixator in rest 20 cases ( with supplementary K-wires in 2 cases).
- Duration from date of injury to date of operation ranged between 3-12 days.

## **POST-OPERATIVE CARE AND REHABILITATION**

Operated limb was kept elevated and active finger, elbow and shoulder movements were started on 2<sup>nd</sup> post-operative day. Pain and inflammation were managed using anti-inflammatory analgesics. Immediate post-operative X-Rays, both PA and Lateral views were taken. Fracture reduction was confirmed and displacements noted. In patients with ORIF, the limb was supported with a below elbow posterior POP slab for 2-3 weeks or so..

In patients with ORIF, dressings were changed on the 3<sup>rd</sup> post-operative day and pin sites were cleared with povidone iodine once daily in those with JESS fixation. Patients were discharged after 3<sup>rd</sup> - 12<sup>th</sup> post-operative days depending on the condition of the operative wound and the patient. Heavy weight lifting were discouraged for further 4 - 6 weeks.

First follow-up was done after 2 weeks, stitches were removed and assessed for pain, swelling, pin tract infection, operative wound condition, pin loosening and stiffness of fingers, elbow and shoulder.

On next follow-up at 6 weeks and thereafter fracture union was assessed clinically and radiologically, the external fixator and K wires (if any) removed for patients treated with JESS and physiotherapy started which included flexion - extension, adduction - abduction and pronation- supination exercises. Evaluation was done using the below mentioned criteria.

Follow-up schedule: 2 weeks, 6 weeks, 3 months, 9 months and 12 months (maximum of 14 months).

## **EVALUATION OF RESULT**

Results were assessed using:

### **A) FUNCTIONAL ASSESSMENT**

- Range of Motion (Goniometer)
- Grip Strength (compared to opposite normal side)
- Cooney modification of the Green and O'Brien score (4,5).

### **B) RADIOLOGICAL ASSESSMENT**

- palmar tilt (degree)
- radial inclination (degree)
- radial length (mm)
- articular incongruity
- Radiological score using Sarmiento et al's modification of the Lidstrom and Frykman radiological classification (1,6).

## **STATISTICAL ANALYSIS**

- For data entry and analysis: excel and SPSS - version 16 software.
- For comparative analysis: Students 't' test.
- P' value of less than 0.005 was accepted statistically significant.

## **III. Results**

Majority of patients 20 (50%) were between 30-60 age group and 10 (25%) were between 21 – 30 age group and remaining 10 patients were out of these two age groups. Most were male (67.5%) and most had left sided 25 (62.5%) fractures. Fall on outstretched hand was the most common cause 28 (70%). 08 of these 40 patients (20%) had associated injuries in other extremities.

In our study 36 (90%) patients had union within 6 – 12 weeks and 04 (10%) patients had union within 12 – 18 weeks.

According to Green and O'Brien system, we got excellent results in 12 (60%) in ORIF group compared to 6 (30%) in the JESS group.

In patients with ORIF, grip strength ( $p=0.003$ ) and restoration of palmar tilt ( $p<0.005$ ) was significantly better than those with JESS fixation. Physical therapy sessions required for JESS group (6 - 22 weeks) which was much more as compared to ORIF group (2 - 10 weeks).

Though at the end of one year follow up, ROM and grip strength were comparable, but both ROM and grip strength was significantly better in the ORIF group in the initial follow ups.

## **COMPLICATIONS**

Our study observed complications in 08 (40%) of patients in the JESS group as compared to 02 (10%) within ORIF group.

### **COMPLICATIONS IN JESS GROUP:**

- a) Pin tract infection was seen in 03 (15%), which was managed with daily cleaning and oral antibiotics.
  - b) Reflex sympathetic dystrophy was noted in 02(10%) and was managed conservatively.
  - c) Deformity was noted in 01(05%), which was later corrected with corrective surgery.
  - d) Stiffness of fingers was noted initially in all patients within JESS group and resolved in most cases with physiotherapy after JESS removal.
  - e) Shoulder hand syndrome was seen in 02(10%) patients, which was managed with shoulder mobilization exercises.
- Complications like pin loosening, pin breakage, pullout, stress fracture or neuroma were not noted in our study.

### **COMPLICATIONS IN ORIF GROUP:**

Stiffness of fingers and wrist was seen in 02(10%) patients, among which 01(05%) resolved with physiotherapy. No other complications were noted in this group.

## **IV. Discussion**

Various factors including type of fracture, functional demand, existing bone stock and medical co-morbidities need to be considered before deciding the operative method.

Our results were comparable to the results obtained in various other studies such as studies by Bradway JK et al<sup>(7)</sup>, Jupiter JB et al<sup>(8)</sup>, Kapoor H et al<sup>(9)</sup> and Catalano LW et al<sup>(10)</sup>.

Our study and the above mentioned studies showed good functional outcome rates (ROM and Grip strength) in patients treated with ORIF as compared to JESS.

## **V. Conclusion**

In our study, we concluded that ORIF with plate and screws gives better functional result as compared to JESS fixator in the treatment of distal end radius fracture (intra-articular) and allows early mobilization. In patients treated with ORIF, there is better restoration of palmar tilt and fewer requirements of physiotherapy sessions. So, ORIF with plate and screws is better treatment option than JESS fixator in treating intra-articular distal radius fractures.

But, in developing country like India and with no need of implant removal, better grip strength after long term follow-up, JESS remains a good treatment option for treating distal end radius fractures.

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