



## A PROSPECTIVE STUDY OF FUNCTIONAL OUTCOME OF RADIAL HEAD REPLACEMENT VS. RADIAL HEAD EXCISION IN COMMUNUTED FRACTURES MASON TYPE III IN ELDERLY.

### Orthopaedics

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### ABSTRACT

The radial head is essential for the stability of the forearm and resistance to valgus stress. Various treatment options are available, depending on the fracture severity and the demand of the patient. The aim of this study was to evaluate functional results in patients with Mason Type-III radial head fractures treated by radial head resection or prosthesis. In our study we have results showing ROM, MEPS score, DASH score for 12 patients undergoing radial head excision and radial head arthroplasty was compared. In our study we concluded with a finding where radial head replacement was superior to that of resection in aspects of grip, power, and range of motion

### KEYWORDS

Radial head arthroplasty, Mason's type 3 fractures, Radial head excision.

### 1. INTRODUCTION

1.1 The radial head is a valgus stabilizer of the joint and it is also involved in transmission of axial force load through the elbow during flexion [1]. It also provides rotational stability to the joint. It is also a varus and external rotatory constrainer [2]. These types of fractures are associated with multiple ligamentous injuries amounting to elbow instability. Thus, a valgus instability can result from radial head resections in cases where there is concomitant injury to the medial collateral ligament

1.2 Valgus instability can result from radial head resections in cases where there is concomitant injury to the medial collateral ligament

1.3 Although biological treatment modalities, such as conservative methods and open reduction and internal fixation, are first-choice treatments, [3] especially for Mason Type-III fractures, the optimum treatment method remains controversial. [4,5]

1.4 In isolated lesions involving the radial head, treatment can be focused on the head itself, and if the radial head is not salvageable, excision is a reasonable option. If other injuries are present, radial head reconstruction or replacement is a better option.

1.5 The main objective of this study was to compare the two treatment modalities in terms of the clinical outcomes and grip strength of patients with irreparable Mason Type-III radial head fractures.

### 2. AIM AND OBJECTIVES

The aim of the study is to compare the functional outcome of radial head replacement vs. radial head excision in Comminuted Fractures Mason Type III at the department of orthopaedics, Sree Balaji Medical College, Chennai between November 2017 and April 2019.

### 3. MATERIALS AND METHODS

#### 3.1 INCLUSION CRITERIA

- 1) Radial head fractures classified under type 3 Mason and at least 1 year follow up after operation.
- 2) Patients more than 50 yrs of age.
- 3) Isolated radial head fractures with ligament injury.

#### 3.2 EXCLUSION CRITERIA

- 1) Radial head fractures which is not under type 3 Mason. Patients who had less than 1 year follow up.
- 2) Patients less than 51 and more than 75 years of age.
- 3) Patients with additional bone damage, neurological deficit, or instability at the time of diagnosis or patients with prior upper-extremity trauma were excluded.

The protocol included evaluation of patients according to the symptoms and the functional ability to do the activities of daily living. A Performa was designed which is to be filled by the patient

himself/herself pre operatively and on his subsequent visits post operatively at 3 weeks, 6 weeks, 12 weeks and 6 months and 1 year. The patient would fill the subjective data by themselves while the muscle strength and range of motion are assessed by the surgeon and documented. The functional outcome was assessed by two scoring systems. For this study purpose we have employed MEPS (Mayo Elbow Performance) score, DASH (Disabilities of the Arm, Shoulder and Hand) score. Pre-operative and post operative MEPS score, DASH scores were taken and statistically analysed if there was significant compared with other studies.

#### 3.3 Follow up

Patients treated postoperatively were immobilized for a week in above elbow slab with 90 degree Flexion of the elbow and elbow active range of motion from the second week. Patient was followed up at 3 weeks, 6 weeks, 12 weeks and at 6 months and 1 year. Patient functional assessment was done based on pain relief, Range of motion, ability to carry on activities of daily living, strength and patient satisfaction post operatively. A protocol was designed which would be filled by the patient himself and shoulder scoring systems were calculated accordingly. Post operative radiographs were done at every visit to check for signs of implant loosening. All the modalities were noted by the surgeon.

#### 3.4 Assessment of results

The results were finally evaluated using 2 scoring systems.

1. MEPS (Mayo Elbow Performance) score
2. DASH (Disabilities of the Arm, Shoulder and Hand) score

#### Statistical software:

The Statistical software namely SAS 9.2, SPSS 15.0, Stata 10.1, MedCalc 9.0.1, Systat 12.0 and R environment ver. 2.11.1 were used for the analysis of the data and Microsoft word and Excel have been used to generate tables etc.

### 4. RESULTS

**Study Design:** A Retrospective Prospective study functional outcome with 12 patients is undertaken to study the functional outcome and evaluation with MEPS (Mayo Elbow Performance) score and DASH (Disabilities of the Arm, Shoulder and Hand) score.

**TABLE 1: AGE INCIDENCE OF PATIENTS**

| Age In Years | Number Of Patients | Percentage (%) |
|--------------|--------------------|----------------|
| 51-55        | 2                  | 16.6           |
| 56-60        | 3                  | 25             |
| 61-65        | 4                  | 33.3           |
| 66-70        | 2                  | 16.6           |
| 71-75        | 1                  | 8.3            |
| <b>TOTAL</b> | <b>12</b>          | <b>100</b>     |

**TABLE 2: GENDER RATIO**

| Gender | No. Patients | Percentage % |
|--------|--------------|--------------|
| MALE   | 7            | 58.4         |
| FEMALE | 5            | 41.6         |
| TOTAL  | 12           | 100          |

Majority of the sample was female.

**Table 3: Operative procedure**

| Technique               | No. Patients | Percentage % |
|-------------------------|--------------|--------------|
| Radial head excision    | 6            | 50           |
| Radial head replacement | 6            | 50           |
| TOTAL                   | 56           | 100          |

**Table 4 :Range Of Motion (post-operatively)**

**(A) Neutral (after 1 year)**

| Neutral  | Excision arthroplasty | Radial head replacement |
|----------|-----------------------|-------------------------|
| Operated | 41.86±22.58           | 58.18±16.62             |
| Normal   | 75.66±9.38            | 71.66±16.31             |

**(B) Pronation (after 1 year.)**

| Pronation | Excision arthroplasty | Radial head replacement |
|-----------|-----------------------|-------------------------|
| Operated  | 40.34±2.12            | 51.47±3.22              |
| Normal    | 61.12±8.23            | 60.86±8.15              |

**(C) Supination (after 1 year)**

| Supination | Excision arthroplasty | Radial head replacement |
|------------|-----------------------|-------------------------|
| Operated   | 42.21±19.87           | 56.4±18.76              |
| Normal     | 68.49±6.41            | 66.06±4.89              |

**(D) Flexion (after 1 year)**

| Flexion  | Excision arthroplasty | Radial head replacement |
|----------|-----------------------|-------------------------|
| Operated | 113.14±10.75          | 109.29±5.35             |
| Normal   | 127.86±5.99           | 128.76±6.99             |

**(E) Extention (after 1 year)**

| Extention | Excision arthroplasty | Radial head replacement |
|-----------|-----------------------|-------------------------|
| Operated  | -11±8.66              | -24±9.57                |
| Normal    | 0±0                   | 0±0                     |

**DASH scoring**

| Quick-DASH parameter                           | Correlation with satisfaction |
|--|-------------------------------|
| Open a tight or new jar                        | -0.7 <sup>a</sup>             |
| Do heavy household chores                      | -0.63 <sup>b</sup>            |
| Carry a shopping bag or briefcase              | -0.35                         |
| Wash your back                                 | -0.47                         |
| Use a knife to cut food                        | -0.47                         |
| Impact on recreational activities              | -0.51                         |
| Interference with your social activities       | -0.47                         |
| Limitation in work or regular daily activities | -0.44                         |
| Shoulder pain                                  | -0.71 <sup>a</sup>            |
| Tingling                                       | -0.17                         |
| Difficulty sleeping because of pain            | -0.38                         |
| Total score                                    | -0.61 <sup>b</sup>            |

DASH: Disability of the Arm, Shoulder and Hand.

<sup>a</sup>Strong correlation.

<sup>b</sup>Moderate-strong correlation.

**Fig.1) Quick DASH scoring**

**Response Points no difficulty**

- no symptom 0
- slight difficulty or mild symptom 1
- moderate difficulty or symptom 2
- severe difficulty or symptom 3
- unable to perform or very severe symptom 4

**DASH score (after 1 year)**

The DASH score calculated shows a score of 26.2 for the patient group which was treated by radial head excision and shows 18.7 for the group treated with radial head arthroplasty with prosthesis. Which shows the superiority of radial head replacement over radial head excision

**MAYO ELBOW PERFORMANCE SCORE**

Adapted from: Gill DR, JBJS 1998;80A:1327

| Criteria                          | Points | Patient Score             |
|-----------------------------------|--------|---------------------------|
| <b>Pain (45 points)</b>           |        | <b>= 45</b>               |
| None                              | 45     |                           |
| Mild                              | 30     |                           |
| Moderate                          | 15     |                           |
| Severe                            | 0      |                           |
| <b>ROM</b>                        |        |                           |
| >100 degrees                      | 20     | <b>= 20</b>               |
| 50-100 degrees                    | 15     |                           |
| <50 degree                        | 5      |                           |
| <b>Stability (10 points)</b>      |        | <b>= 10</b>               |
| Stable                            | 10     |                           |
| Moderate instability              | 5      |                           |
| Gross instability                 | 0      |                           |
| <b>Daily function (25 points)</b> |        | <b>= 25</b>               |
| Combing hair                      | 5      |                           |
| Feeding oneself                   | 5      |                           |
| Hygiene                           | 5      |                           |
| Putting on shirt                  | 5      |                           |
| Putting on shoes                  | 5      |                           |
|                                   |        | <b>Patient Score= 100</b> |

> 90 points = excellent, 75 to 89 points = good, 60 to 74 points = fair, and less than 60 points = poor

Stable = no apparent varus-valgus laxity clinically, moderate instability = less than 10 degrees of varus-valgus laxity, and gross instability = at least 10 degrees of varus-valgus laxity.

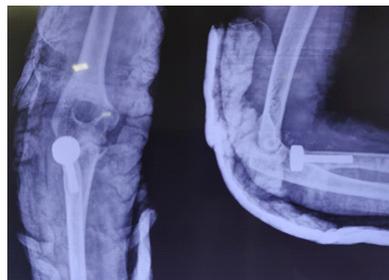
**Fig. 2) Mayo elbow performance score.**

According to MEPS the patients treated with radial head prosthetic arthroplasty score in a mean value came upto 92 and where as patients treated with radial head excision the MEPS score came to about 88 in which stability being more affected in radial head excision. Which shows the superiority of radial head replacement over radial head excision.

There were no complications such as implant loosening, dislocation or other neurovascular complications seen in the 1 year follow-up.

**6. CASE ILLUSTRATIONS**

**CASE. 1**



**Fig. 1 Post-op X ray treated with fixed radial head prosthesis.**



**Fig. 3 Post op X ray treated with Radial head excision arthroplasty.**



Fig. 4. Clinical picture after 10 months assessing range of motion.

#### 7. Previous studies over radial head arthroplasty

| Author       | Type of prosthesis   | ROM  | DASH | Meps/Mepi | Other clinical evaluations   |
|--------------|--|--|------|-----------|--|
| Laflamme -   | Modular monopolar head – uncemented loose fitting stem (Evolve, Wright)<br>Modular head - porous press-fit stem (ExploR, Biomet) | Mean elbow flexion difference compared with the normal side: 4°; extension 14° pronation 8° supination 15° | 17.7 | Mepi 96.5 | Grip strength compared with the normal side (Jamar dynamometer kg/force): 1.0 (-24-13) |
| Nestorson    | Radial head arthroplasty   | Flexion-extension arc 130° (95°-155°)<br>Forearm rotation 30° (10°-85°)                                    | 18   | Meps: 85  | -  |
| Lopez        | Radial head arthroplasty   | Flexion-extension arc 85.5°<br>Flexion 121.8°  | 24.8 | Meps: 86  | -  |
| Van Hoecke   | Judet bipolar head prosthesis  | Extension 24.8°<br>Pronation: 62.4°<br>Supination 58.8°  | 23.1 | Mepi 88.6 | -  |
| Gauci        | Modular Pyrocarbon (MoPyc) radial head prosthesis (Tornier)  | Flexion 136°<br>Extension -9°<br>Pronation 71°<br>Supination 76°   | 21   | Meps 96   | -  |
| Allavena     | Modular bipolar radial head prosthesis (De Puy)  | Flexion-extension arc 100°<br>Rotation arc 143°  | 21   | Meps 79   | -  |
| Flinkkila T. | Metallic radial head arthroplasty  | Flexion-extension arc 117°<br>extension deficit 20°  | 23   | Meps 86   | -  |

#### 8. CONCLUSION

6.1 For most of authors, mid term follow-up has shown satisfactory results in range of motion recovery (average flexion-extension arc of motion: 116°). Good results in DASH scores (from 7 to 24) and MEPS scoring (from 79 to 100). Authors highlight the importance of ligament reconstruction in case of associated injuries. Intraoperative assessment of stability and acute repair of torn ligaments is mandatory for a successful procedure.

6.2 Most common radiological modifications include osteoarthritic changes of ulnohumeral joint, capitellum wear for oversizing of radial head prosthesis, periarticular heterotopic ossifications, and radiolucency lines around the stem. Some modifications in radiological appearance does not correlate directly with clinical symptoms: bone resorption around the prosthesis does not correlate with loosening of the prosthesis and does not affect clinical scores. Marsh [6] reports favorable clinical outcomes from short to long follow-up despite a high evidence of radiolucency around the stem and arthritis in his series. Gauci [7] has found no association between neck bone resorption and postoperative symptoms.

6.3 In our study, loss of grip strength and motion were observed in patients treated with RHR, which was compatible with the literature. However, we did not encounter complications such as elbow instability, neuropathy, and proximal radioulnar synostosis because fractures with associated injuries were specifically excluded from our study. Our results are supported by a study conducted by Karlsson et

al.[8] that evaluated isolated comminuted radial head fractures; this study found that the mean range of motion deficit in the elbow was 5°-10°.

6.4 In our study, the mean functional score and grip strength results were superior in patients treated with Radial head prosthesis, but this difference did not reach significance, which may be attributable to our less number of sample size.

6.5 The Drawbacks of our study are its retrospective design, including patients treated at two different clinics by two different surgeons, and its small sample size. Studies with more patients and with a longer follow-up period are necessary for more conclusive results.

6.6 Even in elderly patients the need for hand grip is very important and according to our study the group which was treated with radial head prosthesis showed much more better outcome than the group which had only under gone excision hence to conclude radial head arthroplasty with prosthesis is a better modality than only excision even in the elderly with very minimal post operative complications.

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