

# Functional Outcome of Elbow Kinematics in Radial Head Excision versus Radial Head Fixation: A Comparative Study

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**Abstract:** ***Introduction:** The management of displaced and comminuted radial head fractures has been a matter of debate amongst surgeons for many years. Radial head excision formed the mainstay of surgical management of these injuries. Over the years, there have been improvements in the surgical techniques and availability of better implants and instrumentation techniques, hence, open reduction and internal fixation of these fractures is gaining popularity. **Aim & Objectives:** To compare the outcome of elbow function between radial head excision and open reduction and internal fixation of the radial head with mini screws for Mason Type II and Type III radial head fractures and to assess the complications that occur in both techniques. **Methods:** A prospective study was conducted in the Department of Orthopaedic at Muzaffarnagar Medical College. A total of 30 patients between the age group of 18 - 65 years with Mason Type II and Type III closed radial head fractures were included in the study. Group I consisted of 15 patients who underwent radial head excision and Group II consisted of 15 patients who underwent open reduction and internal fixation with mini screws. Patients were reviewed at postoperative week 3, 6 and 24. Radiographs were taken and functional outcome assessed according to Mayo elbow performance score system during all the follow ups. Elbow physiotherapy was started on postoperative week two. **Result:** At the end of six months, out of 15 patients who underwent open reduction and internal fixation 7 patient had good (76% to 89%) MEP score and 6 patients had excellent (>90%) Mayo elbow performance score respectively. 15 patient who underwent radial head excision group out of them 12 patient had good result, 1 patient each had a poor and satisfactory result. This inferred that patients who underwent open reduction and internal fixation had better functional outcomes than the excision group. Complications of proximal radial migration were noted in 1 patient, and periarticular ossification was noted in 1 patients who underwent radial head excision. **Conclusion:** Open reduction and internal fixation of Mason Type II and Type III radial head fractures is a better management technique as compared to radial head excision for management of Mason Type II and III radial head fractures.*

**Keywords:** Radial head fracture, Mason Classification, Excision, Open Reduction and Internal Fixation, Mayo elbow performance scoring system.

## 1. Introduction

Radial head fractures account for upto 30% of all the elbow fractures. Frequency of these injuries has been noted to be higher in women and between the age group of 30 - 40 years [1]. These injuries were classified on the basis of their severity by Mason in 1954 [2]. He described four types of radial head fractures. Mason Type I included fractures which were undisplaced or minimally displaced. Type II injuries encompassed fractures with displacement, depression or angulation. Type III included comminuted fractures, and type IV included fractures with comminution and elbow dislocation [2]. Historically, the treatment of choice for Mason Type II fractures was radial head excision in case of failure of nonoperative management. Excision of the radial head with or without prosthetic replacement has been the mainstay in the management of Type III fractures. With the advance of better surgical techniques and instrumentation over the years, open reduction and internal fixation of Type II and Type III injuries are gaining popularity [3, 4]. For undisplaced radial head fractures (Mason Type I), conservative management, like an above elbow slab or a compression dressing with a sling is the mainstay of therapy [5]. For partial articular displaced fractures like Mason Type II, conservative management was considered a mainstay of management.

Lindenhovius et al., concluded that for long term management of partially displaced radial head fractures open reduction and internal fixation had favourable outcomes but the complication rate was also 44% [6]. Kaas et al., concluded in his nine retrospective series that there was insufficient evidence as to which method of management of radial head fractures was superior [7]. For comminuted radial head fractures, Pearce., and Gallannaugh., reported good results after open reduction and internal fixation of comminuted radial head fractures [8]. Chen et al., concluded that replacement arthroplasty of the radial head had better functional outcomes as compared to the open reduction internal fixation group after two years follow up [9].

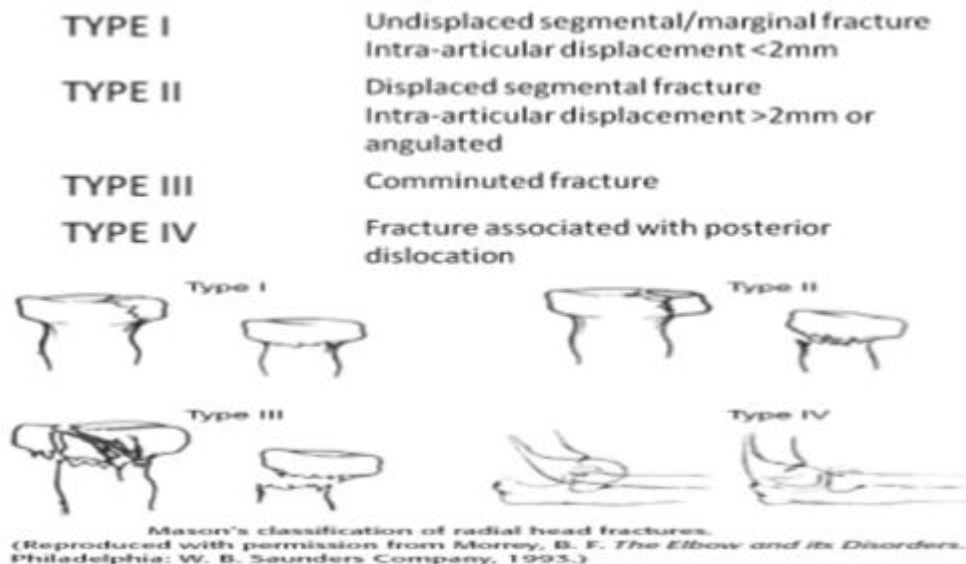
## 2. Methods

A prospective study was conducted from 2020 to 2022 in the Department of Orthopaedics, Muzaffarnagar Medical College and Hospital, Muzaffarnagar after obtaining clearance from the ethical committee and informed consent from all the patients. A total of 30 diagnosed cases of not more than 2 weeks old. Mason Type II and Type III radial head fractures, between the age groups of 18 - 65 years were included in the study. Mason Type I and IV fractures were excluded from the study. Skeletally immature patients, pathological fractures, patients with associated open injury,

ipsilateral upper limb injuries, associated elbow dislocation and elbow fractures, head injuries and patient who refused were excluded from the study. Patients with associated osteoarthritis of the elbow, associated neurovascular injuries were excluded from the study. The patients were divided into two groups. The first Group included 15 patients who underwent radial head excision and the second Group included 15 patients who underwent open reduction and internal fixation with mini screws. The patients were explained in detail regarding the advantages and complications of both the techniques. After taking into consideration, the nature of injury, degree of comminution, age of patient, financial status of the patients and day to day activities of the patient procedure was planned. Preoperative antibiotics were started six hours before the surgery after attaining medical fitness. The patient was positioned supine on the fluoroscopic table with elbow in 90 degree flexion

and internal rotation of arm and pronation of forearm in side table under general anaesthesia or regional block. Surgical exposure for both the techniques employed a Kocher's approach to the radial head, the interval between extensor carpi ulnaris and anconeus muscle [10 - 12] was made. After exposure, the comminuted fragments were removed and using an osteotome the radial head was osteotomised and removed for the patients in the excision group [Table/Fig - 1]. In the open reduction and internal fixation group, the fractured fragments were reduced and stabilized with reduction clamps and fixed with mini screws [13]. A above elbow slab was applied postoperatively and was maintained for two weeks. Intravenous antibiotics were maintained till postoperative day three and then switched over to oral antibiotics till postoperative day six. Suture removal was done on postoperative day 10 to 12 and then passive range of motion was started.





**Mean Elbow Performance (MEP) Scoring System**

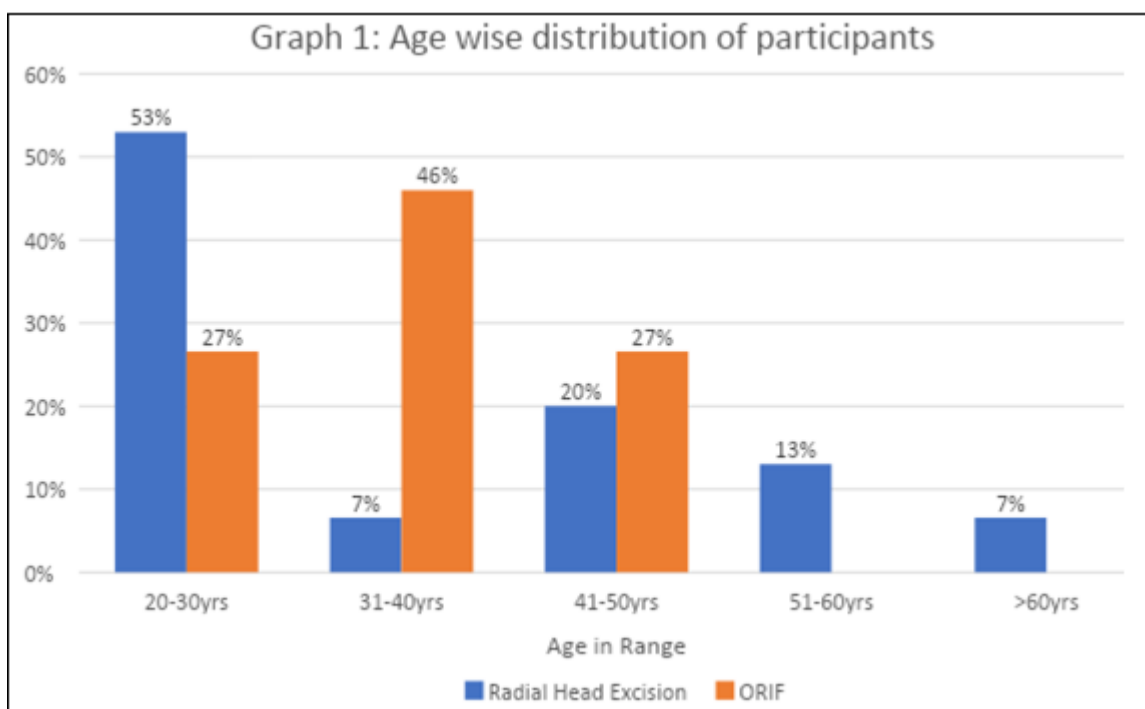
Function	Point	Definition (point)
Pain	45	None (45) Mild (30) Moderate (15) Severe (0)
Motion	20	Arc >100 (20) Arc >50 (15) Arc <50 (5)
Stability	10	Stable (10) Moderate instability (5) Gross instability (0)
Function	25	Comb hair (5) Feed (5) Perform hygiene (5) Done shirt (5) Done shoe (5)
Total	100	

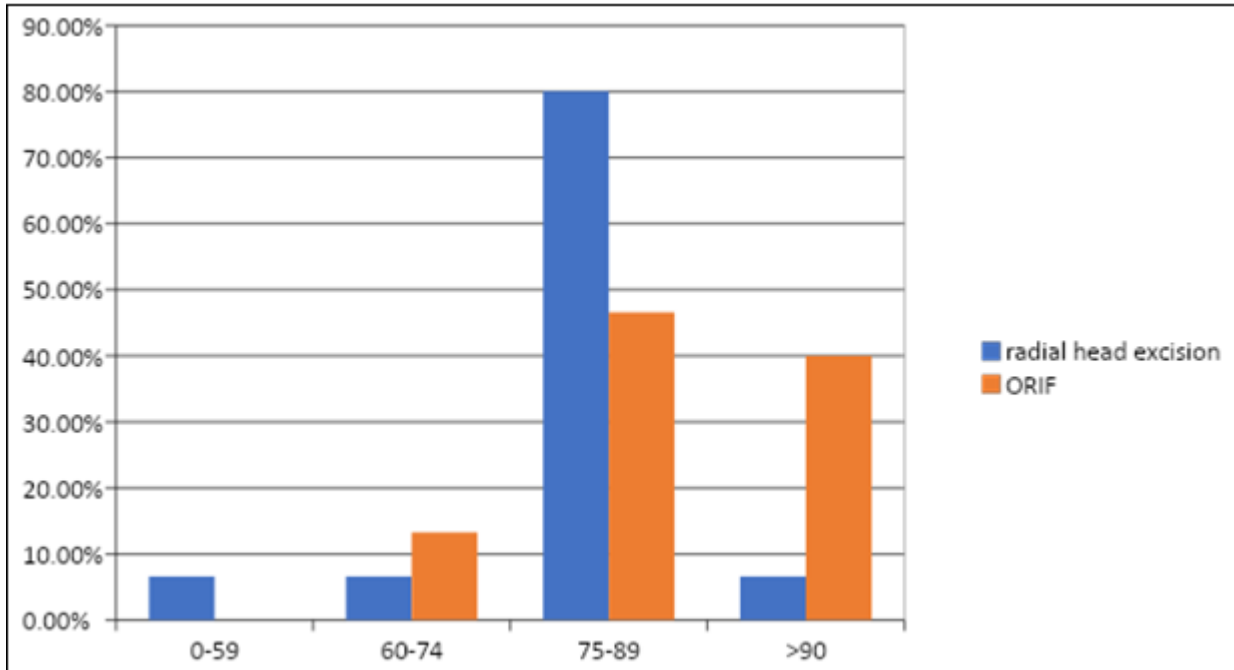
were females. Fifteen patients (50%) presented with Type II Mason radial head fractures and remaining 15 patients (50%) presented with Type III fractures. There was an equal distribution of patients with Mason Type II and Mason Type III fractures in both the excision and the open reduction and internal fixation group. All fractures united at week six. At six months the mean MEP score score for ORIF group was 88.3% with standard deviation of 8.1%. The mean MEP score of 15 patient undergoing excision of radial head was 80.66% with standard deviation of 9.7%.

Both the groups were compared using unpaired t test with a **score** of 2.24 and **p - value** is 0.02206, which was found to be significant as  $p < 0.05$ .

**3. Results**

Majority of the patients were between the age group of 20 - 40 years. A total of 50% of the patients were males and 50%

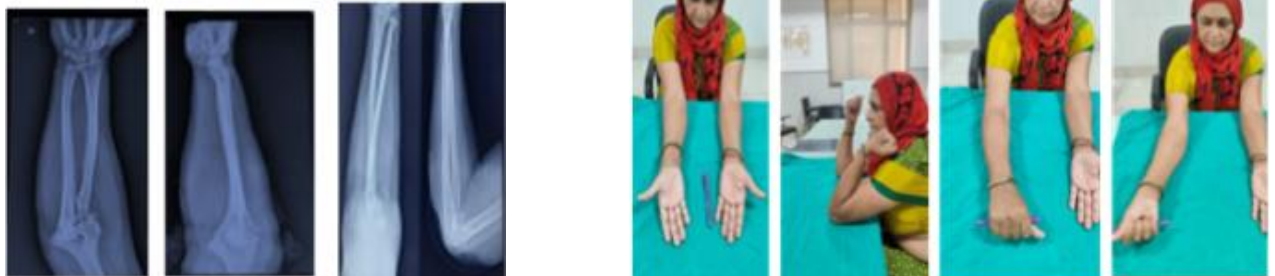




**Open Reduction and Internal Fixation of Radial Head Fractures**



**Radial Head Excision**



**4. Discussion**

The main modality of management of Mason Type II and Type III fractures in the 1970s was radial head resection whenever conservative management failed [1, 2, 15]. Reconstruction of the radial head saw the light of day in the 1980s when radial head was published as a secondary stabilizer of the elbow [16]. The 1990s saw the improvement

in surgical techniques and instrumentation, hence fixation of radial head gained importance [17]. Few authors reported a sequence of events of lateral elbow instability, increase in carrying angle and chronic strain of medial collateral ligament. These changes led to increase in the incidence of osteoarthritis of the elbow, which lead to worsening of symptoms such as elbow pain, loss of strength, range of motion and also neurovascular symptoms [18]. Several studies reported complications of proximal migration of radius, residual elbow pain, degenerative osteoarthritis and also development of periarticular ossification after radial head excision [2, 15, 16, 19, 20]. In our study, on comparison of the MEP scores of elbow function between the open reduction and internal fixation group and the radial head excision group was done at 3, 6 and 24 weeks. We noted that the MEP scores were high in the open reduction and internal fixation group as compared to the radial head excision group. One patient under radial head excision group showed proximal radius migration and one patient showed periarticular ossification. This showed that patients who underwent open reduction and internal fixation of the radial head had better outcomes in terms of elbow function as compared to the radial head excision group. These results were comparable to the studies by Zarattini et al., who in their series of 59 patients with isolated Type II Mason's radial head fractures; 24 of whom who underwent excision and 35 of who underwent open reduction and internal fixation, noted that the dash score was 21.82 points in the excision group and 2.81 points in the open reduction and internal fixation group [21]. Ikeda et al., in their series of 28 patients with Mason Type III radial head fractures of radial head resection versus open reduction and internal fixation, concluded that there was greater loss of strength, range of supination and pronation movements in the radial head resection group as compared to the open reduction and internal fixation group [22]. Study by Mikic and colleagues who reported proximal radial migration in 47% of their patients, osteoarthritis in 52% of the patients and periarticular ossification in 57% of the patients [21]. In this prospective study it was concluded that open reduction and internal fixation group of patients had a better outcome with a mean MEP score of 88.3 with standard deviation of 8.1% then group of patients that underwent radial head excision with a mean MEP score of 80.66 with standard deviation of 9.7%

Khalfayan et al., reported a good to excellent outcome of elbow function in 90% of the patients in their series after open reduction and internal fixation of radial head [4]. Ring and colleagues reported a success rate of 93% of excellent results after open reduction and internal fixation of radial head [16].

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