CLINICO-RADIOLOGICAL OUTCOMES OF RADIAL HEAD EXCISION VERSUS REPLACEMENT: A RETROSPECTIVE COMPARATIVE STUDY.

ABSTRACT

Background: Radial head fractures account for approximately one-third of adult elbow fractures and are essential for preserving elbow stability. Although open reduction and internal fixation is favored for minor fractures, the treatment of comminuted radial head fractures (Mason type III and IV) is contentious, with excision and prosthetic replacement as the primary alternatives.

Objective: To evaluate the clinical and radiological outcomes of radial head excision versus replacement in cases of comminuted radial head fractures.

Methodology: A retrospective comparison study was performed at R.L. Jalappa Hospital in Kolar from May 2022 to April 2024. Twenty-six skeletally mature patients (aged 20–60 years) with Mason type III or IV fractures were included, with 13 undergoing radial head removal and 13 receiving replacement. Functional outcomes were evaluated using the Mayo Elbow Performance Index (MEPI) and the Disability of the Arm, Shoulder and Hand (DASH) score, whereas radiographic outcomes examined joint stability, degenerative alterations, and complications. Data were evaluated with SPSS version 25.

Results: At the 12-month follow-up, the mean MEPI was considerably elevated in the replacement group (89.2 ± 7.1) compared to the excision group (78.5 ± 9.3; p=0.02). DASH scores indicated a preference for replacement (22.6 ± 6.4) compared to excision (31.4 ± 8.1; p=0.01). Radiological evaluation revealed an increased occurrence of proximal radial migration and degenerative alterations in the excision cohort. Complications, including stiffness and heterotopic ossification, were analogous in both groups.

Conclusion:- Radial head replacement yielded improved functional and radiological results compared to excision in cases with comminuted fractures. Although excision is technically less complex, it is linked to long-term instability and degenerative alterations, rendering prosthesis replacement the favored choice for younger, active individuals..

Keywords: Radial head fracture, excision, replacement, clinico-radiological outcomes, elbow stability

INTRODUCTION

Radial head fractures (RHFs) are among the most common periarticular elbow injuries, accounting for approximately one-third of all elbow fractures and nearly 3% of all fractures in adults.[1] The radial head plays a key role in maintaining elbow stability, particularly against valgus stress, contributing to nearly 30% of valgus resistance. These fractures often occur following a fall on an outstretched hand and are frequently associated with concomitant ligamentous or bony injuries, leading to instability that complicates management.[2]

The Mason classification, later modified by Morrey, remains the standard for categorizing RHFs. While Mason type I and II injuries are usually managed conservatively or with open reduction and internal fixation (ORIF), Mason type III (comminuted) and type IV (with dislocation) pose significant treatment challenges. In these cases, ORIF often fails due to comminution, poor bone quality, and associated instability, prompting the need for excision or prosthetic replacement.[3-5]

ERadial head excision has historically been performed for irreparable fractures; however, long-term complications such as proximal radial migration, valgus instability, decreased grip strength, and secondary osteoarthritis have limited its use.[6] With the advent of modern prosthetic designs, radial head replacement has emerged as a reliable alternative, restoring joint biomechanics and preventing sequelae of instability. Several comparative studies have highlighted improved functional outcomes and fewer degenerative changes with replacement compared to excision.[7-9]

Nevertheless, prosthetic replacement is not without limitations. Complications such as implant loosening, periprosthetic osteolysis, overstuffing, stiffness, and heterotopic ossification remain concerns.[10] Moreover, cost considerations and surgical expertise influence decision-making in resource-limited settings. Thus, the choice between excision and replacement in comminuted RHFs continues to generate debate.[11]

This study aims to provide a retrospective comparative analysis of clinico-radiological outcomes between radial head excision and replacement, focusing on functional recovery, elbow stability, and complication rates. By systematically analyzing patient outcomes using validated scoring systems and radiographic assessment, this research intends to guide surgical decision-making for Mason type III and IV radial head fractures.

METHODOLOGY

This study was designed as a retrospective comparative analysis and was conducted in the Department of Orthopaedics at R.L. Jalappa Hospital, Tamaka, Kolar, under Sri Devaraj Urs Academy of Higher Education and Research. Ethical clearance was obtained from the Institutional Ethics Committee (Approval No: IEC/2022/ORTHO/034). The study period extended from May 2022 to April 2024.

A total of twenty-six skeletally mature patients between the ages of 20 and 60 years, who presented with Morrey-modified Mason type III and IV radial head fractures, were included. These patients had been treated with either radial head excision or prosthetic replacement, with 13 cases in each group. All patients had a minimum follow-up duration of one year. The choice of procedure was determined intraoperatively, based on fracture comminution, bone quality, and surgeon preference.

The inclusion criteria were adult patients aged between 20 and 60 years, who sustained comminuted radial head fractures of Mason type III or IV, treated acutely with excision or replacement. Patients were excluded if they had Mason type I or II fractures, fracture duration greater than four weeks, pathological or open fractures, associated neurovascular injuries, or a history of prior trauma or surgery to the ipsilateral elbow.

Data were retrieved from hospital records and operative notes. Demographic variables, mechanism of injury, fracture pattern, operative time, intraoperative blood loss, immediate postoperative pain, duration of hospital stay, and perioperative complications were recorded. Postoperative outcomes were assessed clinically and radiologically. Functional assessment included the Mayo Elbow Performance Index (MEPI) and the Disabilities of the Arm, Shoulder and Hand (DASH) score at 1 month, 6 months, and 12 months. Radiological evaluation was performed using standard anteroposterior and lateral radiographs of the elbow, with attention to joint congruency, presence of proximal radial migration, degenerative changes, implant-related complications, and heterotopic ossification.

All patients were followed at regular intervals with detailed clinical and radiographic evaluation. Early physiotherapy was initiated postoperatively in both groups to ensure adequate mobilization and to minimize stiffness.

Data entry and statistical analysis were carried out using Microsoft Excel and SPSS software version 25. Continuous variables were expressed as mean and standard deviation, while categorical variables were presented as frequencies and percentages. Comparisons between groups were performed using the independent t-test or Mann–Whitney U test for continuous variables, and the Chi-square test for categorical variables. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 26 patients with comminuted radial head fractures fulfilling the inclusion criteria were analyzed, comprising 13 patients treated with radial head excision and 13 with radial head replacement. The mean age of the excision group was 42.8 ± 10.6 years, while that of the replacement group was 40.7 ± 9.8 years, with no statistically significant difference (p=0.56). The gender distribution was comparable, with a slight male predominance in both groups (7 males and 6 females in the excision group; 8 males and 5 females in the replacement group). The mechanism of injury was most commonly a fall on an outstretched hand, observed in over 60% of cases in both groups. Mason type IV fractures were more frequent in the replacement group (46.1%) compared to the excision group (38.5%), but this difference was not statistically significant.

At the 12-month follow-up, patients in the replacement group achieved significantly better functional outcomes. The mean Mayo Elbow Performance Index (MEPI) was 89.2 ± 7.1 in the replacement group compared to 78.5 ± 9.3 in the excision group (p=0.02). Similarly, the mean Disabilities of the Arm, Shoulder and Hand (DASH) score was significantly lower in the replacement group (22.6 ± 6.4) than in the excision group (31.4 ± 8.1; p=0.01), indicating less disability and improved function.

Radiological assessment revealed notable differences between the two groups. Proximal migration of the radius was observed in 30.7% of patients who underwent excision, whereas no such cases were reported in the replacement group (p=0.04). Degenerative arthritis was detected radiographically in 23.1% of the excision group and 7.7% of the replacement group; however, this difference did not reach statistical significance (p=0.18). Heterotopic ossification occurred in both groups, with slightly higher incidence in the replacement group (23.1%) compared to excision (15.3%), though this difference was not significant. Postoperative stiffness was seen in 23.1% of excision cases and 15.3% of replacement cases, again without significant difference.

DISCUSSION

Radial head fractures, particularly Mason type III and IV, represent complex injuries that compromise elbow biomechanics and stability. Management of such comminuted fractures remains debated, with radial head excision and replacement being two widely practiced surgical options.[12]

Our study demonstrated that patients undergoing radial head replacement achieved significantly superior functional outcomes compared to those treated with excision, as evidenced by higher MEPI scores and lower DASH scores at 12-month follow-up. These findings align with prior reports, such as those by Lópiz et al.[13] and Kumar et al.[14], who concluded that replacement provides better joint stability and functional range of motion in irreparable fractures.

Excision, while technically simpler and avoiding prosthetic complications, carries long-term disadvantages. In our cohort, proximal migration and degenerative arthritis were more frequent in the excision group, consistent with earlier studies by Scoscina et al.[15]and Khan et al.[16] The loss of the radial head alters load transmission across the forearm and elbow, predisposing to instability, valgus deformity, and arthritis, particularly in younger and more active patients.[17]

Replacement, on the other hand, maintains radiocapitellar contact, preserving joint kinematics and distributing axial load. Several biomechanical studies confirm that prosthetic replacement restores valgus and axial stability better than excision.[18] Our findings support this, with replacement patients demonstrating fewer degenerative changes and higher satisfaction scores.

Nevertheless, prosthetic replacement is not devoid of limitations. In our study, complications such as heterotopic ossification and stiffness were observed in both groups, with no significant difference. Previous literature has highlighted issues such as prosthetic loosening, overstuffing, and periprosthetic osteolysis as long-term concerns. Cost considerations, availability of implants, and surgical expertise also influence decision-making, particularly in resource-limited settings like India.[19]

Interestingly, some systematic reviews, including that by Lópiz et al.[13], suggest that long-term outcomes may not differ significantly when excision is performed in low-demand or elderly patients. Thus, patient selection remains critical. Excision may still be considered in low-demand elderly patients where functional expectations are modest, whereas replacement is favored in younger, active individuals requiring durable elbow stability.[20]

Our study adds to existing literature by providing comparative data from an Indian tertiary care setting. The retrospective design and small sample size are limitations. A longer follow-up is also necessary to evaluate late complications such as prosthesis loosening and arthritis. Despite these limitations, the study provides meaningful evidence supporting radial head replacement as the preferred surgical strategy in comminuted fractures.[21]

Clinical Implications- Replacement should be preferred in young, active patients with Mason type III/IV fractures, Excision may be considered in elderly, low-demand patients and Long-term surveillance is essential to monitor implant-related complications.

Future Directions: Prospective, multicenter randomized controlled trials with larger cohorts and long-term follow-up are warranted to strengthen the evidence base and optimize patient selection.

CONCLUSION

Radial head replacement offers superior functional and radiological outcomes compared to excision in comminuted radial head fractures (Mason type III and IV). While excision remains a viable option in select patients, particularly the elderly, prosthetic replacement should be considered the standard of care in younger and active individuals to ensure long-term elbow stability and function.

Table 1:- Baseline Characteristics of Patients

Variable	**Excision (n=13)**	**Replacement (n=13)**	**p-value**
Mean Age (years)	42.8 ± 10.6	40.7 ± 9.8	0.56
Male : Female	7:6	8:5	0.72
Mechanism – Fall (%)	61.5	69.2	0.64
Mason Type IV (%)	38.5	46.1	0.71

Table 2:- Functional Outcomes at 12 Months

Outcome Measure	**Excision (n=13)**	**Replacement (n=13)**	**p-value**
MEPI Score	78.5 ± 9.3	89.2 ± 7.1	0.02*
DASH Score	31.4 ± 8.1	22.6 ± 6.4	0.01*

Table 3: Radiological and Complication Profile

Complication	**Excision (n=13)**	**Replacement (n=13)**	**p-value**
Proximal Migration (%)	30.7	0	0.04*
Degenerative Arthritis (%)	23.1	7.7	0.18
Heterotopic Ossification (%)	15.3	23.1	0.61

Stiffness (%)	23.1	15.3	0.66

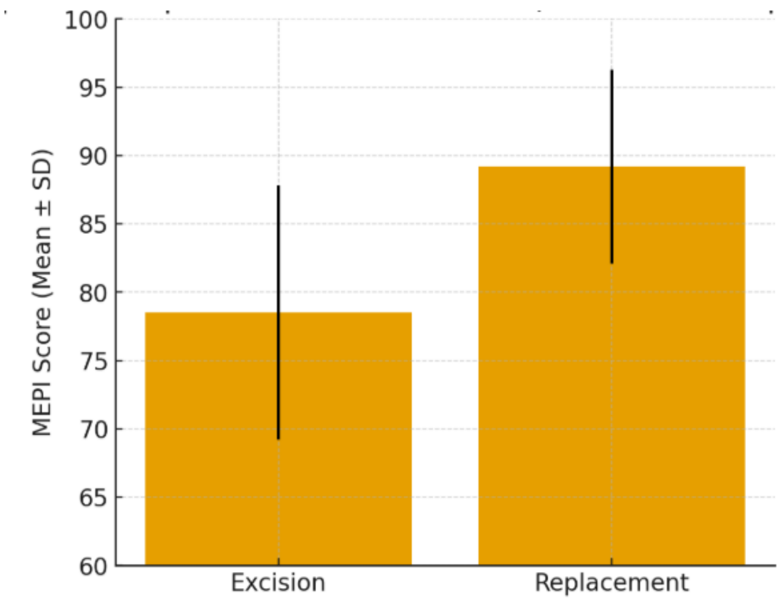

Fig 1: **Comparison of MEPI Scores (Excision vs Replacement)**

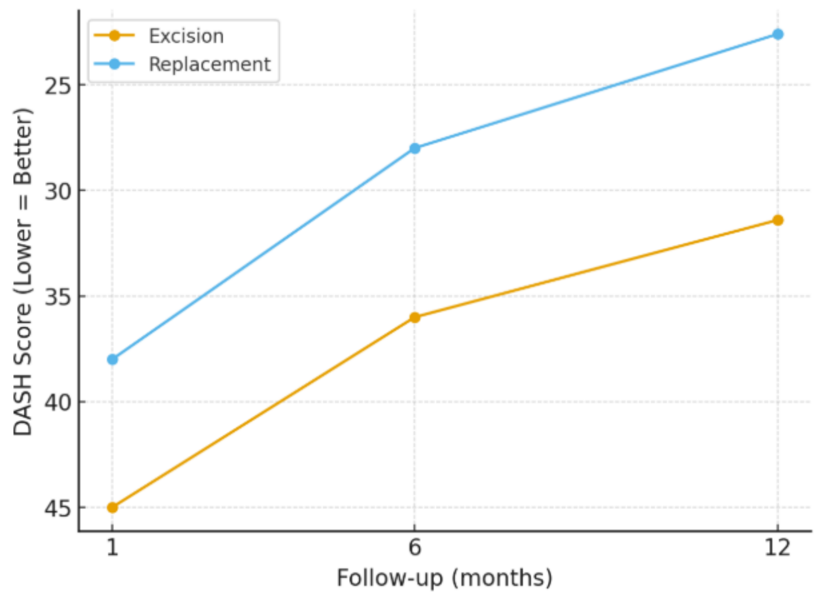

Fig 2:- **DASH Scores over Follow-up (1, 6, 12 months)**

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