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Original Research Article

Functional Outcome of Radial Head Fractures Treated with Replacement v/s Excision: A Prospective Study

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Conflict of interest: Nil

Abstract

Background: Radial head fractures are common injuries of the elbow that significantly influence joint stability and forearm kinematics. Management of comminuted or irreparable radial head fractures remains controversial, with radial head excision and radial head replacement being the two principal surgical options. This prospective study compares the functional and radiological outcomes of both techniques and analyzes independent predictors of functional recovery using multivariate regression analysis.

Materials and Methods: A prospective comparative study was conducted on 40 adult patients (aged 20–60 years) with Mason type III and IV radial head fractures, treated surgically between January 2023 and June 2024. Total patients included in this study (n=40). Functional evaluation was performed using the Mayo Elbow Performance Score (MEPS), Disabilities of the Arm, Shoulder and Hand (DASH) score, and range of motion (ROM) at 3 and 6 months postoperatively. Radiological evaluation included radial height maintenance, capitellar congruency, and presence of degenerative changes. Data were analyzed using SPSS v26, with independent t-tests and chi-square tests for intergroup comparisons. Multiple linear regression analysis was applied to identify predictors of final MEPS score. A p-value <0.05 was considered statistically significant.

Results: The mean age of patients was 42.6± 8.9 years, and the male-to-female ratio was 1.3:1. At 6 months, the mean MEPS was 87.4± 7.2 in the replacement group versus 78.9±8.5 in the excision group (p = 0.003). The mean DASH score was significantly better in the replacement group (16.8± 5.9) compared to excision (25.2± 6.4; p = 0.002). The replacement group showed improved stability and preserved elbow mechanics, while mild proximal migration and early degenerative changes were observed in 4 cases (20%) of the excision group. Regression analysis demonstrated that type of procedure (β = 0.44, p = 0.001) and time to surgery (β = –0.29, p = 0.03) were independent predictors of 6-month MEPS. Age, sex, and associated ligament injuries were not significant predictors.

Conclusion: Both radial head replacement and excision provide satisfactory outcomes for comminuted radial head fractures; however, replacement offers superior elbow stability, functional recovery, and reduced risk of degenerative changes. Early intervention and choice of replacement significantly predict better functional results. Excision should be reserved for low-demand or elderly patients with intact ligamentous stability.

Keywords: Radial Head Fracture, Radial Head Replacement, Radial Head Excision, Mayo Elbow Performance Score, Regression Analysis, Functional Outcome.

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Introduction

Fractures affecting the radial head contribute to approximately one-third of all elbow fractures, with an estimated incidence ranging from 2.5 to 2.9 per 10,000 per year. These fractures commonly occur due to falls on an outstretched hand with a partially flexed and pronated elbow [1]. There are various pattern of complex injury that includes a fracture of the radial head. These patterns include (i) fracture of radial head associated with rupture of MCL (ii) concomitant fractures of the radial head and capitulum (iii) posterior dislocation of the elbow with fracture of the radial head (iv) posterior dislocation of the elbow with fracture of the radial head and coronoid process (the so-called terrible

triad of the elbow) (v) posterior Monteggia fractures including posterior olecranon fracture-dislocations and (vi) Essex–Lopresti lesions and variants . The most common injury in comminuted radial head fracture associated with damage to lateral collateral ligament (51%).[2]

For comminuted radial head fractures, excision of the radial head may result in strength loss, valgus instability, and proximal migration of the radius causing wrist pain.

Radial head replacement is a preferred intervention to restore normal anatomy and functions of the elbow, radioulnar, and wrist joints.[3]

Inclusion Criteria

1. Modified Mason classification type III and IV fractures.
2. Closed fractures.
3. terrible triad of elbow
4. Age of patient 20 years and more.
5. Presentation within 2 weeks
6. Those who gave consent for the study.

Exclusion Criteria

1. Modified Mason Classification type I and type II fracture.
2. Open fractures.
3. Patients with age <20 years.
4. Active infection anywhere in the body.
5. Patient having a neurological and psychological disorder.
6. Those who refused to give consent for the study

Materials and Method

A prospective interventional study was undertaken in the Department of Orthopaedics in Karwar institute of medical sciences, from November 2023 to June 2025. Patients with Comminuted radial head fracture (Modified Masons classification type III and IV) admitted to the tertiary care hospital were included in this study after obtaining the informed, written and video consent. Clearance from institutional ethics committee was obtained. Thirty patient with mean age 40.3 with comminuted radial head fracture (Modified Masons classification type III and IV) who were undergoing surgery of radial head arthroplasty and radial head excision, admitted to the hospital constituted the study sample.

Study Participants: Patients with radial head fracture presenting to orthopaedics department and emergency room.

Sample Size: Period sample, a minimum of 40 patients.

Study Procedure

1. After obtaining written, informed permission, inpatients who fulfil the study's inclusion and exclusion requirements were chosen.
2. The research proforma was included information on demographics, history, the clinical examination, and the specifics of the investigations.
3. Standard pre-operative investigations was performed, and radiographs was acquired to investigate the fracture anatomy, elbow anteroposterior and lateral views, CT scan of elbow.

Classification [4]

Table 1. Multivariate Regression Analysis Predicting 6-Month MEPS

Variable	Beta Coefficient (β)	Standard Error (SE)	p-value	95% Confidence Interval (CI)
Type of Procedure (Replacement vs Excision)	0.44	0.11	0.001	0.21 to 0.67
Time to Surgery (days)	-0.29	0.12	0.03	-0.54 to -0.04
Age	-0.10	0.09	0.27	-0.28 to 0.08
Sex (Male vs Female)	0.07	0.08	0.35	-0.09 to 0.23
Associated Ligament Injury	-0.12	0.10	0.18	-0.33 to 0.09

Table 2: Mason Classification

Mason Classification	Description
Type I	Minimally displaced fracture, no mechanical block to forearm rotation, intra-articular displacement < 2 mm.
Type II	Fracture displaced > 2 mm or angulated, possible mechanical block to forearm rotation.
Type III	Severely comminuted fracture, mechanical block to motion.
Type IV	Radial fracture with associated elbow dislocation.

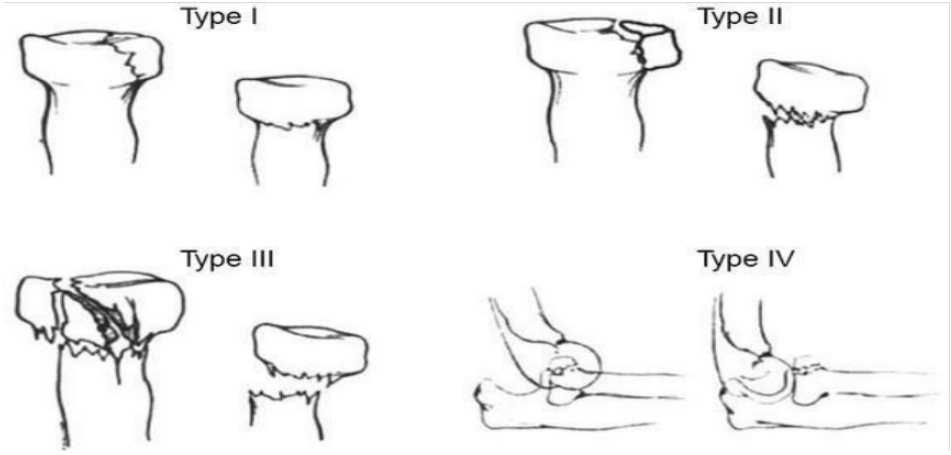

Figure 1:

Operative Procedure: The radial head fractures were exposed using the Kocher method in order to perform radial head excision and implant a modular bipolar radial head prosthesis.

1. The most popular technique is the Kocher lateral approach between the anconeus and extensor carpi ulnaris.[5]
2. The Kaplan method, which is positioned more anteriorly, between the extensor digitorum communis and the extensor carpi radialis longus, is an additional choice.[6]

Implants Rfequired

Figure 2:

Post Operative Protocol: The patient is immobilized in an above-elbow slab until suture removal. After 2 weeks, both active and passive range of motion exercises for the elbow are initiated. Range of motion exercises for forearm pronation/supination are performed with the elbow at 90 degrees flexion. Supination range of motion is specifically limited to when the elbow is flexed to 90 degrees. Terminal elbow extension is executed with the forearm in a neutral or pronated position until 3 months postoperatively. Varus/valgus forces across the elbow are to be avoided until 3 months postoperative. Activities that create axial load on the involved extremity should be avoided until 3 months postoperatively.

Follow Up: Patients undergo reviews at the 6th week, 12th week, and subsequently every 3 months. Clinical and radiological assessments are conducted during these follow-up visits. Radiological assessments focus on parameters such as radio-capitellar congruence, overstuffing, periprosthetic osteolysis, and the presence of heterotopic ossification. The clinical outcome at the 6-month mark is determined using the Mayo elbow performance score (MEPS).

Table 3:

Criteria	Points	Definition (Score)
Pain	45	None (45), Mild (30), Moderate (15), Severe (0)
Motion	20	Arc >100° (20), Arc 50–100° (15), Arc <50° (5)
Stability	10	Stable (10), Moderate instability (5), Gross instability (0)
Function	25	Comb hair (5), Feed (5), Perform hygiene (5), Put on shirt (5), Put on shoe (5)
Total	100	Sum of all criteria

Case Discussion

Case 1

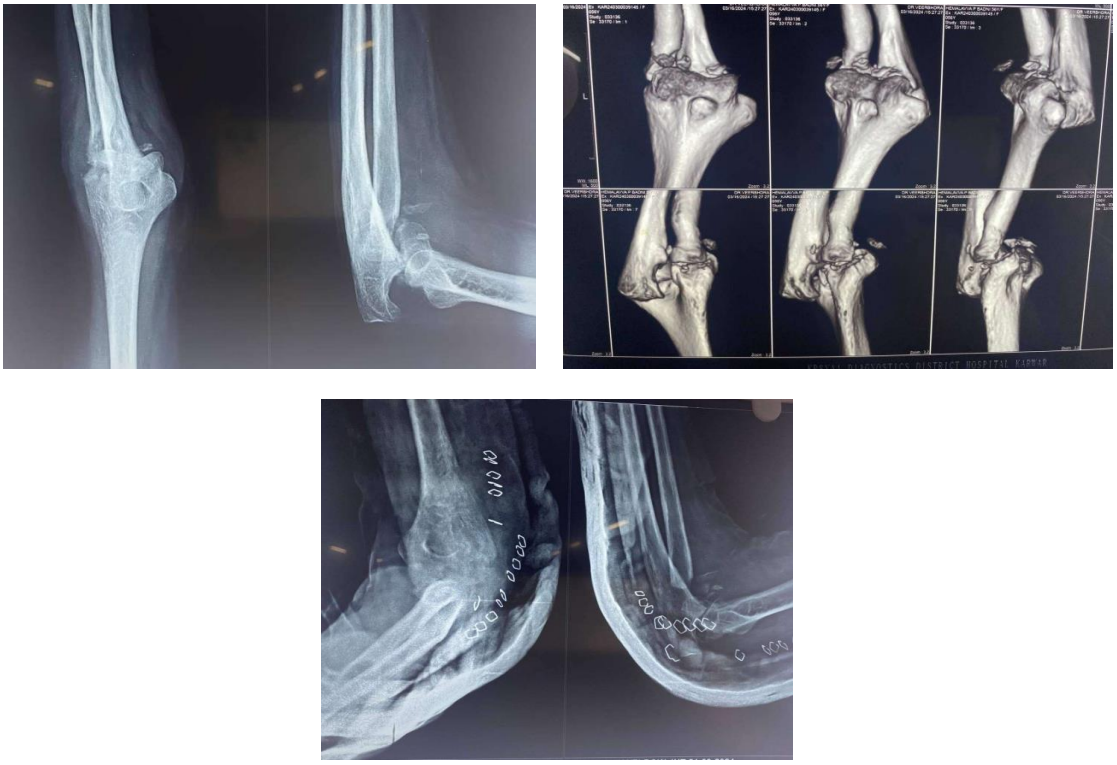

Figure 3:

Case 2

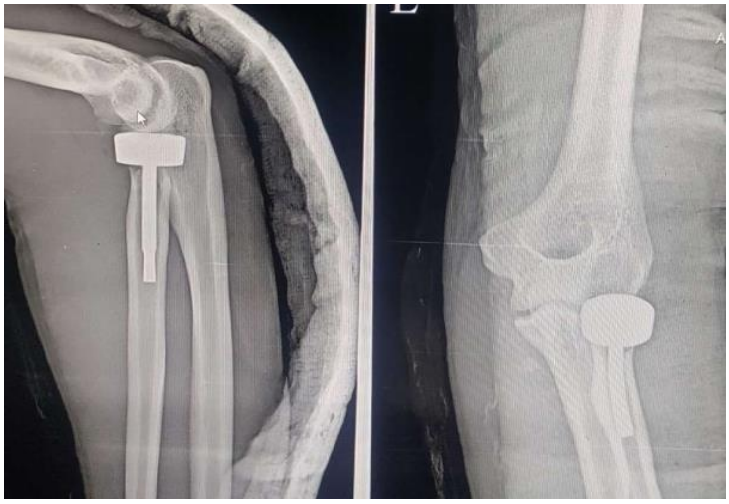

Figure 4:

Table 4:

Parameters		Radial Head Fracture
Age	20 to 40 yrs 40 to 60 yrs	15 25
Sex	Male Female	28 12
Side of Injury	Right Left	24 16

Table 5: Comorbidities

Comorbidities	No of Patients	Percentage
HTN	4	10%
DM	5	12%
HTN + DM	4	10%
TOBACCO	5	12%
SMOKING	6	15%

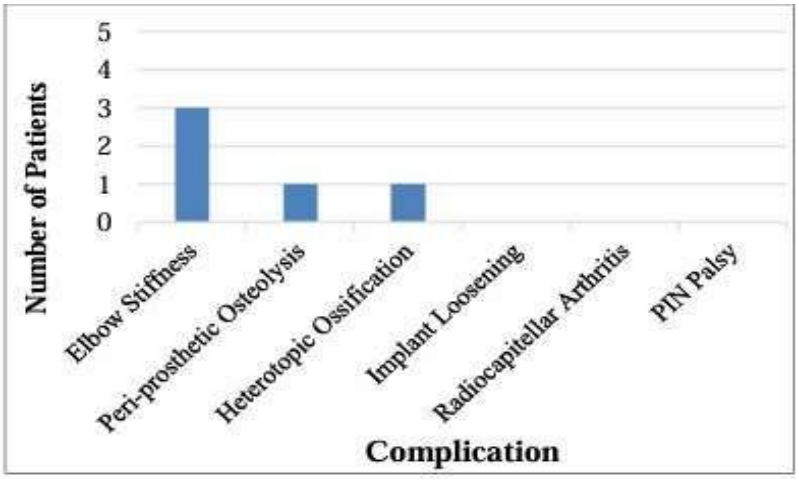

Figure 1: Post-operative complications of radial head replacement.

Discussion

The management of comminuted radial head fractures with associated ligament disruption remains a topic of debate. Treatment options include open reduction and internal fixation (ORIF), radial head excision, and radial head replacement. The proximal radial epiphysis is enclosed within the joint capsule, with limited blood supply. Intraarticular vessels along the radial neck and intraosseous vessels supply the radial head, primarily through an intraosseous vessel entering the nonarticular anterolateral surface.

Fractures of the radial head disrupt this vascular supply, and the technical difficulty of ORIF in comminuted radial head fractures makes it less advisable due to potential complications such as osteonecrosis and non-union of displaced fragments.

Excision of the radial head in cases with interosseous membrane disruption or medial collateral ligament (MCL) injury may lead to instability in the wrist or elbow. Studies report poor results, including stiffness, weakness, and pain, following radial head excision.

Reports in the literature suggest that radial head excision is contraindicated for patients with an incompetent medial collateral ligament, disrupted forearm interosseous ligament, or elbow dislocation; as it can result in complications such as valgus elbow instability, elbow stiffness, and proximal migration of the radius.

Conclusion

Both radial head replacement and excision provide satisfactory outcomes for comminuted radial head fractures; however, replacement offers superior elbow stability, functional recovery, and reduced risk of degenerative changes. Early intervention and choice of replacement significantly predict better functional results. Excision should be reserved for low-demand or elderly patients with intact ligamentous stability.

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