



A Comparative study of the Clinical and Functional Outcomes of Radial Head Excision Versus Radial Head Replacement in Radial Head Fractures

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Abstract

Background: Radial head fractures are common elbow injuries that compromise stability and forearm rotation. Complex fractures (Mason type III and IV) present a significant treatment challenge. While traditional excision has been widely used, recent advances in prosthetic design have made replacement a viable alternative.

Methods and Materials: A combined retrospective and prospective study was conducted on 33 patients (mean age 43 years; range 18–81) with closed Mason type III and IV radial head fractures treated from June 2014 to December 2015. Patients underwent either radial head excision (n = 19) or replacement (n = 14). Preoperative clinical and radiographic assessments were performed, and postoperative outcomes were evaluated at 6 weeks, 3 months, 6 months, and 1 year using the Disabilities of the Arm, Shoulder and Hand (DASH) score, Mayo Elbow Performance Score (MEPS), and Broberg and Morrey index.

Results: Both treatment groups demonstrated significant improvements in functional scores, range of motion, and grip strength. No statistically significant differences were observed between the groups. Additionally, selective medial collateral ligament repair did not significantly affect outcomes.

Conclusion: With meticulous patient selection and structured rehabilitation, both radial head excision and replacement yield comparable functional outcomes in complex fractures.

Keywords: Radial head fracture, Excision, Replacement, DASH, MEPS, Elbow stability, Mason classification

Introduction

Radial head fractures represent 1.7–5.4% of all fractures and may account for up to 33% of elbow injuries [1]. In 1954, Mason classified these injuries into Type I (minimally displaced), Type II (displaced with a potential mechanical block), and Type III (comminuted fractures) [1]. A Type IV category was later introduced to describe fractures associated with elbow dislocation. Broberg and Morrey demonstrated favorable outcomes with delayed excision in these injuries [2],

and retrospective analyses by Goldberg et al. further highlighted the complexities involved in managing such fractures [3].

Advancements in fixation methods have been reported by Peltó et al., who described the use of absorbable pins for comminuted fractures [4], and Janssen et al. documented the long-term outcomes after radial head resection [5]. Smets et al. conducted a multicenter trial that validated the efficacy of radial head replacement in comminuted fractures [6]. Comparative studies



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by Ring et al. [7] and Chen et al. [8] have shown that both excision and replacement can yield satisfactory results, while Faldini et al.'s long-term follow-up study [9] reinforced these findings.

Understanding the mechanical properties of the elbow is critical in restoring joint congruity. Morrey et al. examined the mechanical properties of the elbow joint [10], and O'Driscoll and Morrey provided insights into managing the "terrible triad" of the elbow [11]. Systematic reviews by Duckworth et al. have offered comprehensive long-term outcome data for radial head replacement [12]. Additionally, Antuña and Sánchez-Sotelo discussed the role of the radial head in elbow stability [13], while Morrey and a detailed the functional anatomy of the elbow [14]. Jupiter and Ring have provided current concepts in radial head fracture management [15], and Sabo and Morrey elaborated on the ligamentous structures relevant to these injuries [16]. Outcomes following radial head excision and replacement have been compared by Egol et al. [17] and Eygendaal et al. [18]. Finally, Ikeda et al. compared excision versus open reduction and internal fixation [19].

Methods and Materials

A combined retrospective and prospective study was conducted at the Sancheti Institute for Orthopaedics and Rehabilitation, Pune, from June 2014 to December 2015. Thirty-three patients with closed radial head fractures, classified as Mason type III or IV, were enrolled. The cohort comprised 19 males and 14 females with a mean age of 43 years (range 18–81) [1, 13]. Patients were excluded if they were younger than 18 years, had non-displaced (Mason type I or II) fractures, open injuries, additional ipsilateral upper limb fractures or dislocations, pathologic fractures, or were medically unfit for surgery [14].

Preoperative Evaluation:

Each patient underwent a detailed history and physical examination with particular emphasis on the mechanism of injury, which was predominantly due to road traffic accidents or falls [15]. Standard radiographic views (anteroposterior, lateral, and oblique/Greenspan) were obtained to confirm the fracture classification and guide treatment planning [1, 4]. Data on hand dominance and the side of injury were also recorded.

Treatment Approach:

Patients were managed with either radial head excision or replacement based on intraoperative assessments and the surgeon's judgment [7,8]. Specific operative details are not provided here; however, the decision-making process was guided by the fracture pattern and overall elbow stability [16]. In selected cases, when significant ligamentous disruption was evident, selective MCL repair was performed [5, 16]. The chosen treatment modality was tailored to each patient's

individual fracture characteristics [17].

Postoperative Management and Follow-Up:

Following surgery, patients were immobilized in an above-elbow slab for approximately three weeks before initiating a structured rehabilitation program that included both active and passive range-of-motion exercises [17, 18]. Follow-up evaluations were conducted at 6 weeks, 3 months, 6 months, and 1 year. Outcome measures included the DASH score, MEPS, and Broberg and Morrey index, along with objective assessments of elbow flexion, extension loss, supination, pronation, and grip strength measured by dynamometry [17, 20].

Results

At the 1-year follow-up, both treatment groups exhibited significant improvements.

Functional Outcome Scores:

The excision group's mean DASH score improved from 35.47 at 6 weeks to 15.53 at 1 year, while the replacement group's score improved from 37.50 to 15.43 over the same period. Statistical analysis revealed no significant differences between the two groups at any follow-up interval ($p > 0.05$). Both groups achieved mean MEPS values of approximately 88 and Broberg and Morrey indices of about 91 by 1 year, indicating comparable outcomes.

Range of Motion and Grip Strength:

At 1 year, the average elbow flexion was 126.6° in the excision group and 121.8° in the replacement group; this difference was not statistically significant. Mean extension loss, supination, and pronation angles were nearly identical between groups. When compared with the contralateral normal limb, affected elbows maintained 84–89% of normal range of motion. Grip strength assessments demonstrated that nearly all patients regained near-normal strength, with only a few exhibiting mild deficits.

Impact of Medial Collateral Ligament Repair:

Subgroup analysis revealed that patients with selective MCL repair did not show statistically significant differences in DASH, MEPS, or Broberg and Morrey scores, nor in range-of-motion parameters compared to those without ligament repair. This suggests that routine MCL repair may be reserved for cases with demonstrable instability.

Conclusion

This study demonstrates that both radial head excision and replacement yield significant and comparable improvements in managing complex, comminuted radial head fractures. Over a one-year follow-up period, patients in both treatment groups

achieved substantial enhancements in functional outcome scores (DASH, MEPS, and Broberg and Morrey), range-of-motion parameters, and grip strength. Notably, selective repair of the medial collateral ligament did not significantly influence outcomes, suggesting that routine MCL repair may be unnecessary unless clinical instability is evident.

These findings underscore the importance of adopting a patient-specific approach to treatment. Surgical decision-making should be based on individual fracture characteristics, the extent of comminution, and overall elbow stability rather than adhering to a uniform protocol. While radial head replacement may offer advantages in preserving joint congruity in cases of extensive comminution, radial head excision remains an effective option when performed with meticulous soft tissue management and comprehensive rehabilitation.

Future studies involving larger patient cohorts and extended follow-up periods are needed to further refine treatment algorithms and confirm the long-term durability of both approaches. Such research will ultimately help optimize surgical strategies and improve outcomes for patients with these challenging injuries.

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