

# The Rate of Radial Head Prosthesis Removal or Revision: A Systematic Review and Meta-Analysis

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**Purpose** We conducted a meta-analysis and systematic review with the primary objective to determine the overall incidence of radial head prosthesis removal or revision. Our secondary objectives addressed the incidence of removal or revision based on the type of prosthesis fixation (cemented, uncemented smooth stem, uncemented press-fit), material (metal, Vitallium, titanium, pyrocarbon), and design (short vs long stem and monopolar vs bipolar), and the reasons for prosthetic removal or revision.

**Methods** We included 30 studies with a total of 1,017 patients out of whom 77 prostheses were removed and 45 prostheses were revised.

**Results** The pooled rate of radial head prosthesis removal or revision was 10.0% (95% confidence interval, 7.3%–13.6%) with a mean follow-up of 38 months. Subgroup analysis showed that the incidence of removal/revision was lowest with the cemented fixation, longer-stem, Vitallium material, and bipolar prosthesis. More than half of the prostheses were removed/revised for excision of the heterotopic ossification (47%) and for the treatment of stiffness and limitation of motion (42%). Other reasons recorded were pain (19%), loosening (16%), overstuffing (13%), instability (12%), infection (8%), and prosthesis disassembly (4%).

**Conclusions** The current data show that the highest incidence of removal/revision occurred within 2 years after implantation. There was no major difference in the incidence of removal/revision among different designs and materials. Implant removal was often performed as part of a procedure to manage elbow stiffness and heterotopic ossification at the surgeon's preference, not necessarily because the implant was malfunctioning. It appears that most radial head arthroplasties have an acceptable and comparable mid-term longevity; however, it is unclear whether long-term longevity will differ between devices. (*J Hand Surg Am.* 2017; ■ (■): ■–■. Copyright © 2017 by the American Society for Surgery of the Hand. All rights reserved.)

**Type of study/level of evidence** Prognostic II.

**Key words** Radial head, prosthesis, systematic review, meta-analysis.

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**A** RADIAL HEAD ARTHROPLASTY IS recommended if a radial head fracture occurs in conjunction with elbow or forearm instability and the radial head fracture is not repairable.<sup>1</sup> Radial head arthroplasties may be either monopolar or bipolar and may have fixed or smooth stems.<sup>2</sup> The overall survival of radial head arthroplasty, regardless of the individual characteristics, is unknown. In addition, it is not clear if arthroplasty removal or revision is related to arthroplasty design, injury pattern, or time from initial injury.<sup>3</sup>

We conducted a meta-analysis and systematic review with the primary objective to determine the overall incidence of radial head prosthesis (RHP) removal or revision. Our secondary objectives were to determine the incidence of removal or revision based on the type of prosthesis fixation (cemented, uncemented smooth stem, uncemented press-fit), material (metal, Vitallium, titanium, pyrocarbon), and design (short vs long stem and monopolar vs bipolar), and the reasons for prosthetic removal or revision.

## METHODS

This systematic review and meta-analysis was based on Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.<sup>4</sup> This study did not address the clinical outcomes after RHP removal/revision because we attempted to answer only the study questions.

We searched for all published clinical studies on the RHP for acute treatment of fractures of the radial head in the following databases: MEDLINE, MEDLINE preprints, SCOPUS, EMBASE, and the Cochrane Central Register of Controlled Trials (CENTRAL). The literature search was performed on March 4, 2015, using the search strings available in [Appendix A](#) (available on the *Journal's* Web site at [www.jhandsurg.org](http://www.jhandsurg.org)). We also hand-searched the bibliographies referenced in the studies identified in the computer search.

### Eligibility criteria

Any study reporting clinical information on RHP replacement for radial head fractures was considered potentially relevant and selected for primary review. There were no limitations for time period, language, and time to follow-up. The level of evidence was classified according to the definition given by the Oxford Centre for Evidence-Based Medicine.<sup>5</sup> All levels of evidence assigned by the authors were included. All prospective, randomized, controlled studies (levels I and II) and all

prospective or retrospective studies with or without control groups (levels III and IV) were accepted to be included in our study if they reported the incidences of RHP removal or revision. Because most of the included studies were case series, we used the Newcastle-Ottawa Quality Assessment Scale to assess the methodological quality of the papers. All participants had to be older than 18 years. We included studies reporting the number and proportion of RHP removal/revision for any reason. We excluded studies reporting the results of silicone arthroplasty and also excluded 1 study reporting the results of a handmade polymethyl-methacrylate radial head in an attempt to minimize the heterogeneity of the pooled data and to better reflect the current thinking regarding implant design and material. We excluded case reports and papers reporting results after prosthesis removal or failure without documentation of the clinical results of arthroplasty.

### Study selection

In stage 1, we searched for all relevant articles electronically. A total of 323 clinical studies on the RHP replacement for radial head fractures were identified. In stage 2, abstracts of all 323 studies were checked manually in a primary screening by 2 independent reviewers (A.R.K. and A.B.). Discrepancies in the review process were resolved by the senior authors (M.H.E. and N.C.). Sixty-seven articles met the preliminary inclusion criteria. In stage 3, the 2 reviewers evaluated the full texts to extract the data and manually find other relevant articles in the reference list of the included papers. When there were shared data in articles, only the latest article was included. We excluded 8 articles about the silicone RHP, 1 article about the handmade polymethyl-methacrylate radial head, 16 articles reporting late radial head implantation after failure of a prior prosthesis or open reduction internal fixation, and 15 articles because of shared data or inadequate reporting. Further, we found 3 more studies through hand-searching of the relevant references. After further exclusion via reviewing the full texts, 30 articles fulfilled all inclusion criteria. In stage 4, the 2 reviewers checked the data independently in a standardized fashion. Any conflicts were mediated by senior author (M.H.E.) review. Furthermore, the eligible articles were reviewed for quality assessment using Newcastle-Ottawa Quality Assessment Scale and included in the systematic review and the meta-analysis. We did not consider a minimum level of quality to not exclude any study ([Fig. 1](#)).

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