



# Press-fit bipolar radial head arthroplasty, midterm results



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**Background:** Theoretical advantages of bipolar compared with monopolar radial head arthroplasty include better accommodation of radiocapitellar malalignment, reduction of capitellar abrasion, and reduction of stress at the bone-implant interfaces. Our purpose was to report the midterm results of press-fit bipolar radial head arthroplasty.

**Methods:** Thirty patients were treated by press-fit bipolar radial head arthroplasty for acute fracture of the radial head, failed earlier treatment, or post-traumatic sequelae. Three patients were lost to follow-up. Results are presented for the remaining 27 patients.

**Results:** At mean follow-up of 48 months (range, 28-73), there had been 3 (11%) revisions. Two involved conversion to prosthetic radiocapitellar hemiarthroplasty for symptomatic capitellar abrasion; a third involved exchange of the articular component (ie, head) for instability. In all, the stems appeared well fixed. A prosthesis in a subluxed position accounted for the 1 (4%) additional radiologic failure. The average flexion-extension arc was 136° (range, 120°-145°), and the average pronation-supination arc was 138° (range, 70°-180°). According to the Mayo Elbow Performance Score, the combined excellent and good results accounted for 70%.

**Conclusions:** The overall midterm outcome of this series of 30 press-fit bipolar radial head arthroplasties can be considered favorable. Although the revision rate was 11%, the stems were well fixed in all. There was 1 (4%) additional radiologic failure. We suggest considering a press-fit bipolar radial head prosthesis for acute comminuted radial head fractures with limited bone loss of the proximal radius.

**Level of evidence:** Level IV; Case Series; Treatment Study

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**Keywords:** Elbow; fracture; prosthesis; radius; replacement; trauma

Approval for this study was waived by our institution's Medical Ethical Committee because data were collected as part of routine clinical care. Patients were informed that data concerning their case could be submitted for publication.

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The radial head is an important secondary stabilizer of the elbow and forearm, and its integrity becomes crucial to elbow stability especially in the case of disruption of the medial collateral ligament, lateral ulnar collateral ligament, or interosseous membrane and large fractures of the coronoid process.<sup>14,22</sup> Approximately 36% of all radial head fractures are Mason types 2 to 4 and are frequently associated with

injury of the stabilizing structures.<sup>17,18</sup> Consequently, prosthetic replacement of the radial head is to be considered for comminuted fractures of the radial head that are not amenable to adequate reconstruction.<sup>5</sup>

In general, radial head arthroplasty has been associated with about 85% favorable results when it is performed in the acute situation but with only about 50% favorable results when it is performed in delayed fashion.<sup>21</sup> Although associated injuries about the elbow may have a significant effect on prosthetic function and survival, hardly any clinical study is of such methodology that it can contribute to quantifying this.

Radial head prostheses may be categorized according to material (silicone, polyethylene, pyrocarbon, metal), modularity (monoblock vs. modular), polarity (unipolar or monopolar vs. bipolar), or method of fixation (cemented, uncemented press fit, intentional loose fit, or fixation with an expandable stem).

The rationale of the bipolar prosthesis is the freedom of movement of the articulating component on the intramedullary component. This may theoretically reduce abrasion of the capitellar cartilage and reduce stress at the implant-bone and bone-cement interfaces during forearm rotations. In addition, radiocapitellar contact may be facilitated and consequently contact pressures reduced during flexion and extension of the elbow.<sup>26</sup> Also, malalignment of the radius onto the capitellum, which may be the case in long-standing injuries with soft tissue contracture, may be compensated for to some degree.

Initially, the bipolar radial head prosthesis was cemented.<sup>16</sup> Only more recently has a short-stemmed, press-fit design become available. The rationale for the press-fit design is to obtain biologic fixation by bone ongrowth onto the stem for optimal long-term fixation. Loosening of cemented implants at the cement-bone interface had been observed in up to 10% of cases with cemented prostheses.<sup>26</sup> In addition, because of the shorter stem, the press-fit prosthesis is easier to implant and may be easier to revise.<sup>9</sup> The literature on bipolar radial head arthroplasty is limited and consists of several midterm follow-up case series of cemented arthroplasties.<sup>3,4,8,15,26,29</sup> To our knowledge, no results have been published on press-fit bipolar radial head arthroplasty.

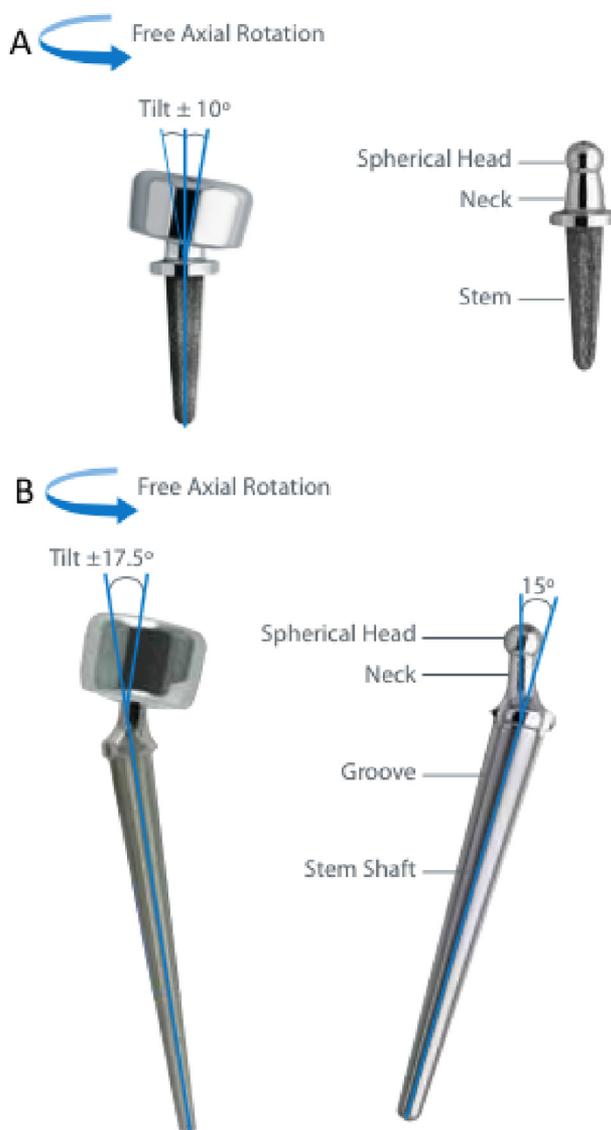
The purpose of this study was to report our experience with 30 patients who were treated by uncemented (press-fit) bipolar metallic radial head replacement for acute fracture of the radial head, failed earlier treatment, or post-traumatic sequelae. We hypothesized that the results would not be different from the results of other types of radial head arthroplasty reported in the literature.

## Materials and methods

This is a retrospective case series of 30 press-fit bipolar radial head arthroplasties that were performed in our institution between September 2007 and June 2011. All were treated for acute fracture of the radial head, failed earlier treatment, or post-traumatic sequelae. The inclusion period was set to ensure minimum follow-

up of 2 years for each individual case. The senior author (D.E.) performed all surgeries. Initially, we treated these cases routinely with a cemented bipolar prosthesis. When press-fit designs became available, we started placing a press-fit prosthesis if bone quality was good and the trial components showed a good press-fit and a cemented prosthesis if there was any doubt about bone quality or fixation of the trial components. This is still the algorithm we use in our clinic today.

The press-fit RHS bipolar radial head prosthesis (Tornier, Montbonnot-Saint-Martin, France; Fig. 1) is a modular system and consists of 2 parts. The stem is made of cobalt-chrome and is titanium plasma sprayed. The head is made from high-density polyethylene encased in cobalt-chrome. The head is available in 4 sizes and articulates with the stem by means of a low-friction, snap-on ball-and-socket joint with 10° bipolarity. The stem is available in 4 length sizes (21, 22, 23, and 24 mm), and each size is avail-



**Figure 1** (A) The press-fit RHS bipolar radial head prosthesis (Tornier, Montbonnot-Saint-Martin, France). (B) For comparison, the cemented prosthesis is also depicted.

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