Acute disassembly of a bipolar radial head arthroplasty

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Introduction

The treatment of comminuted radial head fractures associated to medial collateral-ligament disruption is challenging. Radial head excision was advocated in the past, but patients presented common complications, for instance valgus elbow instability, joint stiffness and proximal migration of the radius with subluxation of the distal radioulnar joint [1]. When reconstruction is not possible, radial head replacement is the nowadays recommended treatment [2]. Different models of prosthesis, ranging from monopolar to bipolar and with different modularity are available. Several possible complications have been described related to these implants. To our best knowledge, complete disassembly has been only once published related to a GUEPAR® bipolar radial head arthroplasty in a series of four cases [3]. We report herein the 5th case of a complete disassembly of a GUEPAR® bipolar radial head arthroplasty and review the literature in search of similar cases.

Case report

A 72-year-old right hand-dominant female fell 1 m (3.28 feet) from a ladder on her outstretched hand and was admitted in our hospital due to pain and swelling in the right elbow region. Examination revealed tenderness and swelling at the elbow. The patient’s relevant past medical history included diabetes mellitus. Radiographs disclosed a Mason type III radial head fracture according to Broberg and Morrey modification of the Mason classification [4] (Fig. 1A). The patient underwent surgery on the day after injury. Under general anaesthesia with the patient lying supine and the
Figure 1  A. Radiograph of the right elbow showing a comminuted radial head fracture. B. Stress intraoperative radiograph, depicting a widening of the medial joint space, indicating a rupture of the ulnar collateral ligament. C. Intraoperative radiograph after implantation of the GUEPAR® radial head prosthesis. An overstuffing can be observed, with a widening of the humeroulnar joint line.

Arm exsanguinated, the radiocapitellar joint was accessed via a posterolateral approach. The radial head and neck fractures were found severely comminuted and intraoperative stress x-ray imaging, disclosed a widening of the medial joint space, indicating a rupture of the ulnar collateral ligament (Fig. 1B). Reconstruction was unfeasible and a floating radial head prosthesis GUEPAR® (DePuy® France SAS, Saint-Priest, France) was implanted so as to reconstruct the radiocapitellar joint (Fig. 1C). The radial head prosthesis was implanted assessing the tensioning with the elbow at 90° of flexion. The annular ligament was repaired. The elbow remained unstable and stability was achieved at 90° of flexion and pronation of the forearm. A moderate overstuffing was observed in the immediate postoperative radiographs (Fig. 2A and B). The elbow was immobilized during 3 weeks with a plaster and then it was allowed to begin mobilization using a dynamic splint with a block of the extension at −60°. The patient was referred to control at 5th week to add 30° of extension. During that control, the patient referred the presence of pain during the last days, which had appeared acutely and that had decreased suddenly 2 days after, associated with a diminished range of movement. The radiological study revealed a complete dissociation of the radial head of the bipolar prosthesis as well as a mild subluxation of the ulnohumeral joint (Fig. 2C and D). A removal of the prosthesis and the cement was performed 2 days after this diagnosis. The prosthesis did not demonstrate any macroscopic wear or damage of the polyethylene and the humeral condyle showed no signs of injury on its articular surface. The patient was allowed to move the elbow free in flexion and with a block on last 30° of extension during 2 more weeks, with the dynamic splint. The elbow was left free without splint at the 7th week after the fracture and the patient was referred to complete the rehabilitation.

At 6-month follow-up, examination revealed motion from a 20° deficit of extension to 130° of flexion, complete pronation and supination, and a moderate instability. There was no functional impairment for the daily life activities, and the patient was pain free. Radiographs did not show heterotopic ossifications nor degenerative changes. The Mayo Elbow Performance Score (MEPS) [4] was excellent, scoring 95 over 100 points. At most recent follow-up, 1 year after surgery, the patient was satisfied with the procedure, had no pain and felt that her elbow was stable. Examination revealed the same arch of motion with the same functional result according to the MEPS. X-ray imaging revealed a cubi-

Figure 2  Postoperative radiographs. A. Anteroposterior view: signs of overstuffing are more evident. B. Lateral view: volar displacement of the radial head, with intimate contact between the head and the rim. C and D. Control radiographs at the 5th week showing complete dissociation of the radial head of the bipolar prosthesis. The ulnohumeral joint is subluxed.
Figure 3  Radiology of the elbow 1 year after removal of the prosthesis. A. Anteroposterior view, showing a cubitus valgus deformity. A medial osteophyte has been formed. B. Lateral view presenting heterotopic ossifications.

tus valgus deformity and heterotopic ossifications (Fig. 3A and B).

Discussion

The radial head resection as a treatment for the comminuted fractures of the radial head has reported poor outcomes, and therefore the radial head replacement has been advocated as a first-line treatment option [2,5]. Several complications can occur related to radial head arthroplasty in the acute setting, when treating a radial head fracture type III or IV according to the modified Mason classification [4]. Complications can occur related to:

- incomplete diagnosis of the lesions;
- inadequate surgical technique;
- inappropriate selection of the implant.

Regarding this third subject, no large randomised-controlled studies have been published comparing different radial head implants. Different series report satisfactory outcomes using both modular [6,7] or bipolar prosthesis [8,9]. These series evaluate single cohorts with no control or comparison group.

The present case shows a complete disassembly of a GUEPAR® bipolar radial head prosthesis. This complication is an uncommon yet well described finding in bipolar hip replacements [10,11]. It has been described related to dislocations or spontaneously, and it occurs in up to 4–6% of bipolar hip replacements [12]. The published data regarding a disassembly of a bipolar radial head prosthesis is scant and always related to the same implant as described in the present case. Alnot el al. reported the largest series evaluating the results of the GUEPAR® radial head bipolar prosthesis in the treatment of acute and old fractures of the radial head [8]. The mean follow-up was 18 months and the mean age was 41 years. Eighteen prosthesis were implanted in the acute setting and the final average MEPS scored 83 without any complication. However, the authors indicated that one of the cases presented a partial disassembly of the radial head prosthesis, remaining between the capitellum and the stem without functional impairment. Winter et al. reported recently four cases of disassembly of a radial head prosthesis GUEPAR® [3], with initial postoperative radiographies that were considered correct. Three of the patients required surgery: in two cases, the cupule was removed and in one case, the cupule was exchanged modifying the size. The last patient rejected any further surgery.

Herald and O’Driscoll have recently described the case of a complete dissociation of the Judet floating radial head from the bipolar radial stem (Tornier SAS, Saint-Ismier, France), in a woman with an unstable elbow [13]. The authors hypothesize that instability was the cause for disassembly, since the elbow was stabilized by an external fixation and disassembly occurred after removing this device due to a pin tract infection 2 weeks later. In the present case, the presence of subluxation of the ulnohumeral joint indicates the presence of a remaining instability that might have contributed to the disassembly.

In any case, adequate neck resection and sizing of the radial head implant is one of the main factors for success [14]. In the present case, overstuffing was diagnosed in the postoperative radiographs. Overstuffing has been related to capitellar erosion or radial head dislocation [15]. We consider that the present case adds another possible complication related to overstuffing; the radial head disassembly. In order to prevent overstuffing, radiology and clinical intraoperative evaluation are necessary. However, a recent in vitro study indicates that even the radiology can be misleading to evaluate this subject [16]. The authors consider that the clinical visualization of a lateral ulnohumeral joint gap is a reliable indicator of overlengthening following implantation of a radial head prosthesis. In contrast, they report that
radiographic measurements are relatively insensitive and cannot reliably demonstrate overlengthening of less than 6 mm [16]. We consider that both overstuffing and instability played a major role for disassembly. Both in the series of Winter et al. and in the case report of Herald and O’Driscoll, no postoperative radiographs were provided to evaluate if overstuffing could have participate in this complication. However, Winter et al. indicated that the postoperative radiographs were correct. They considered that for their series, the explanation would point out to a cam effect and an important grip [3], whereas Herald and O’Driscoll considered the instability as the main cause and suggested that a bipolar radial head prosthesis may be relatively contraindicated in patients with, or at risk for persistent elbow instability [13]. Since it is a complication inherent for bipolar prosthesis, one possible recommendation would be to use monopolar radial head prosthesis in the context of instability. In this way, several biomechanical studies performed on frozen elbows demonstrate that monopolar radial prosthesis are more effective in stabilizing the radiocapitellar joint than bipolar radial head prosthesis [17,18].

As a conclusion, the present case illustrates a complete disassembly of a radial head prosthesis implanted for the treatment of a comminuted radial head fracture associated with disruption of the medial collateral-ligament of the elbow. When a bipolar radial head prosthesis is implanted, achieving full stability of the elbow and avoiding overstuffing are necessary to prevent this complication.

Conflict of interest statement

None.

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References