Radial head arthroplasty for acute versus delayed treatment of radial head fractures

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Background

Radial head arthroplasty (RHA) is a common treatment method for acute, unreconstructible fractures of the radial head and neck. RHA can also be used for patients who develop malunion or non-union of the radial head and neck after undergoing non-operative management or primary open reduction internal fixation (ORIF). While studies have shown favourable outcomes in patients treated with acute RHA, little is known about the outcome of patients who undergo delayed RHA. The purpose of this study was to compare the clinical, radiographic, and patient-reported outcomes between acute and delayed RHA.

Materials & Methods

Patients ≥16 years old who underwent a delayed RHA (>4 weeks from injury) between 2000-2020 with at least one year of follow-up were retrospectively reviewed. Twenty-nine patients who underwent RHA at a mean of 72 weeks from injury (range, 11 to 440) comprised the delayed group, with mean follow-up of 7 years. Nineteen of these patients sustained an isolated radial head fracture, while 10 had an associated fracture-dislocation of the elbow or forearm (terrible triad, Monteggia, or Essex-Lopresti). The delayed patients were matched based on injury type, sex, and age with 29 patients who underwent an RHA acutely (≤ 4 weeks) at a mean of 1 week from injury (range, 1 day to 3 weeks), with mean follow-up of 8.5 years.

Results

There were 19 females and 10 males in each group. The average age of the acute and delayed groups were 43 ± 13 and 46 ± 15 years, respectively. In the delayed group, there were 12 radial head malunions and 5 non-unions in patients who underwent non-operative treatment. There were 4 malunions and 8 non-unions in patients who first had a failed ORIF of the radial head. All patients were treated with a smooth stem radial head arthroplasty. At final follow-up, significantly more patients developed radiographic evidence of ulnohumeral arthritis in the delayed (69%) versus the acute (41%) group (p=0.02). There were no significant differences in the development of capitellum osteopenia (p=0.57), periprosthetic lucency (p=0.19), or heterotopic ossification (p=0.6) between the two groups (Table 1). The Mayo Elbow Performance Index (MEPI) was not significantly different (acute: 90 ± 12, delayed: 86 ± 11) (p=0.21). No significant differences were observed in the flexion (p=0.15), extension deficit (p=0.54), pronation (p=0.8), and supination (p=0.16) (Figure 1). The reoperation rate was higher in the delayed group (17%) compared to the acute group (3%), although this was not statistically different (p=0.09). One patient in the acute group underwent an open contracture release, while there were two open contracture releases, one arthroscopic contracture release, one ulnar shortening osteotomy for Essex-Lopresti injury, and one RHA implant resection in the delayed group.

Discussion

Our results showed favourable outcomes with both acute and delayed RHA when treated with a smooth stem radial head arthroplasty. There were no significant differences in the objective measures, nor the patient-reported outcomes between the two groups. Patients who underwent RHA in a delayed fashion had a higher incidence of ulnohumeral arthritis compared to matched patients who underwent RHA acutely. This may be attributed to cartilage injury from articular incongruity or failed hardware. While the reoperation rate tended to be higher with

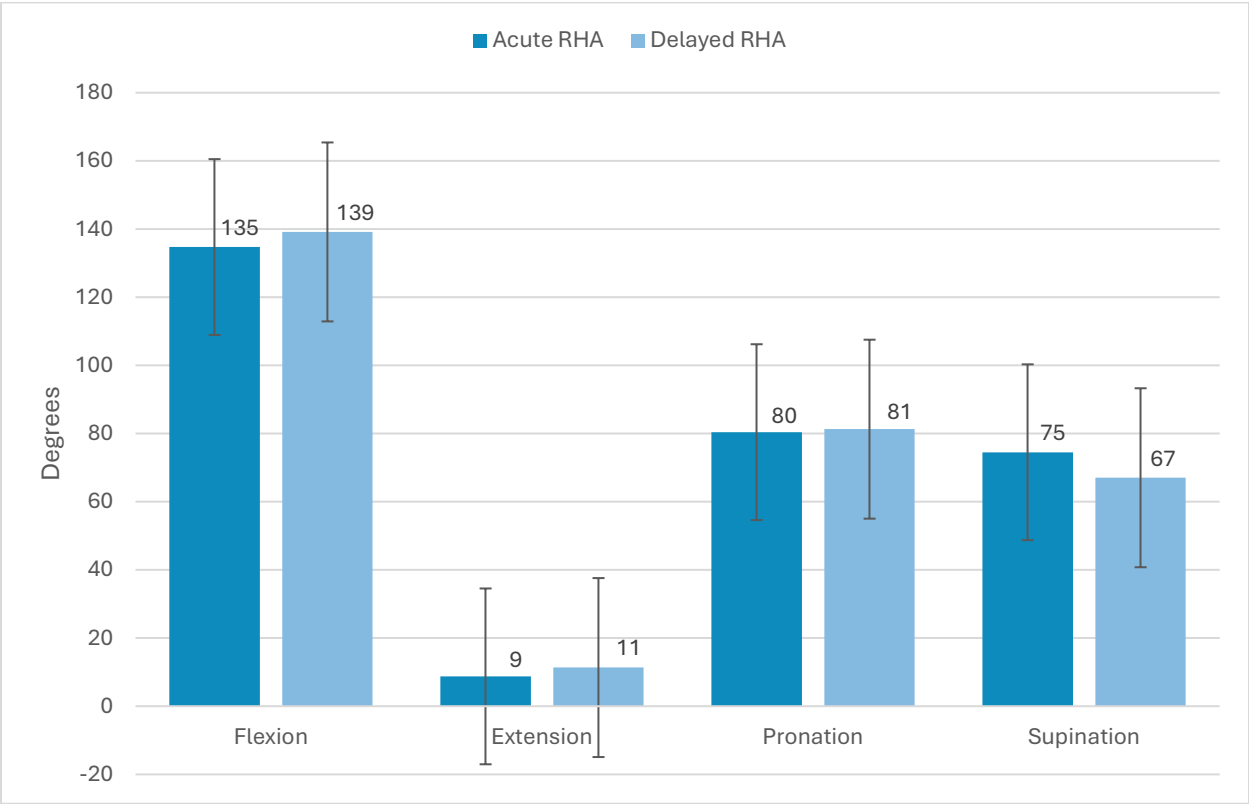
delayed RHA, this did not reach statistical significance with our sample size. This data suggests that RHA remains a valuable delayed treatment option for patients who fail non-operative treatment or ORIF of the radial head and neck.

Table 1 Radiographic Assessment

	Acute RHA	**Delayed RHA**	
Radiographic Parameter	No. (%) of Elbows	No. (%) of Elbows	*P* value
Periprosthetic Lucency	11 (38)	16 (55)	0.19*
Removed	0	1(3)	
Mild	6 (21)	9 (31)	
Moderate	5 (17)	7 (24)	
Severe	0	0	
Ulnohumeral arthritis	12 (41)	20 (69)	0.02*
Grade 1	9 (31)	15 (52)	
Grade 2	2(7)	5 (17)	
Grade 3	1(3)	0	
Heterotopic Ossification	14 (48)	12 (41)	0.6*
Grade 1	11 (38)	8 (28)	
Grade 2	3 (10)	3 (10)	
Grade 3	0	1 (3)	
Grade 4	0	0	
Capitellar Osteopenia	8 (28)	10 (34.5)	0.57*
Mild	8 (28)	10 (34.5)	
Moderate	0	0	
Severe	0	0	

* Chi-Square Test

Figure 1 Range of motion


Acute RHA
Delayed RHA
180
160
140
120
100
80
60
40
20
0
-20
Degrees
135
139
9
11
80
81
75
67
Flexion
Extension
Pronation
Supination