

Surgical technique for radial head fractures with more than 3 fragments: A new concept of fixation

Introduction

The treatment of comminuted radial head fractures (RHF) type III/IV of the Mason Johnston's classification still remains controversial. According to the current literature, RHF with more than three parts are not suitable for repair[1]. Therefore, most authors suggest a primary radial head arthroplasty (RHA)[2]. Nonetheless, in case of unstable elbow injuries, the management of multifragmentary RHF with radial head replacement seems to have a 25% risk of reoperation due to stiffness and painful loosening[3]. Given this risk as well as current improvements in reduction and fixation techniques, we believe that the indication of osteosynthesis should be enlarged before extending the indication for RHA. The purpose of this retrospective study is to determine the functional results and radiological failure rate following open reduction and internal fixation (ORIF) of displaced fractures of the radial head type III and IV according to Mason/Johnston classification using headless compression screws (HCS) and/or 1.0-2.8 plates of radial head fractures. We specifically determined (1) the minimum one-year Broberg and Morrey functional elbow score, (2) the time to healing, (3) the complication rate, and (4) the number of patients converted to RHA.

Method

This is a retrospective single-center case series. Between 2012 and 2019, skeletally mature patients who have undergone ORIF of RHF with more than three articular fragments were included. Concomitant upper limb fracture and multifragmentary proximal ulnar fracture were excluded. A minimal follow-up of one year was required. We standardized some critical steps of the surgery in all of our cases: we used a more ventral approach using extensor split, respected anatomical structures, especially the annular ligament, and used low profile implants (headless screws, plates with a thickness of 1.3mm). The cohort is composed of 9 patients with a mean age of 50 years (range 28-71 years). The preoperative CT identified nine fractures with four fragments. Five fractures were classified as Mason III and four as Mason IV.

Results

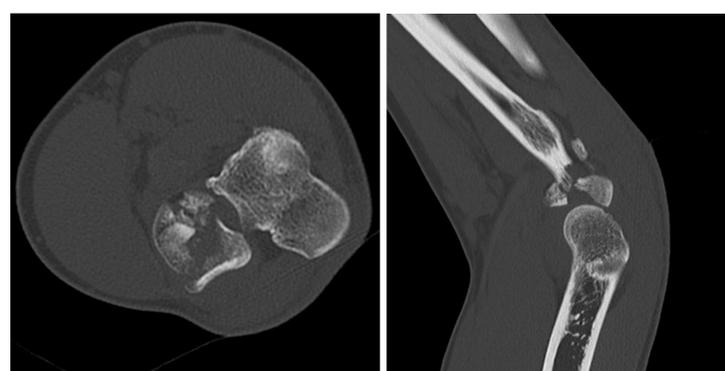
(1) The mean Broberg and Morrey score was 95 points (range, 75 to 100 points) at a mean clinical follow-up of 49 months (range, 12 to 87 months) after the ORIF (table I). The result was rated as excellent in six patients, good in two and fair in one at the final follow-up. (2) Overall, eight of the nine patients had satisfactory result. All patients showed radiological healing of the fracture with a mean of nine weeks (range, 6 to 13 weeks). (3) Two of nine patients developed complications (one heterotopic ossification and one non reduced fragment on the postoperative X-ray), but no additional surgery was necessary. (4) No patients required a conversion to RHA.

Conclusion

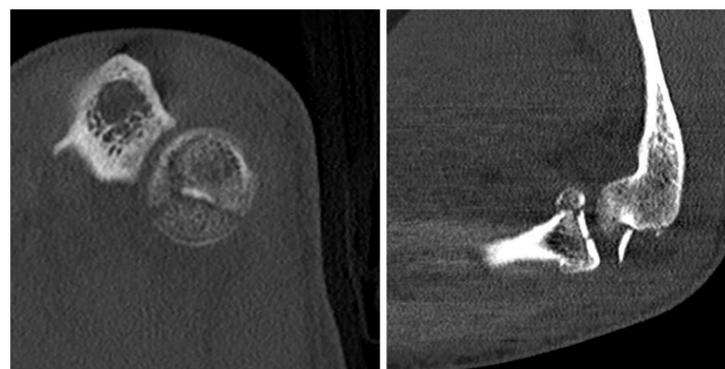
According to our results, an ORIF can be successfully applied in case of multifragmentary radial head fractures with more than three fragments. The cutoff between repair and replacement of the radial head could be extended up to four fragment.

Case	Flexion/extension (degrees)	Pro/supination (degrees)	Broberg and Morrey score
1	150/0/10	90/0/90	100
2	135/35/0	85/0/85	93
3	135/5/0	85/0/90	100
4	143/9/0	55/0/88	91
5	110/25/0	75/0/60	75
6	135/0/2	90/0/90	99
7	135/9/0	90/0/90	98
8	135/6/0	84/0/90	99
9	140/5/0	90/0/90	100

Table I. Clinical Outcomes at final follow-up



Case 1 preoperative CT and postoperative X-ray at 1 year



Case 9 preoperative CT and postoperative X-ray at 1 year

References

- [1] Ring D et al. Open reduction and internal fixation of fractures of the radial head. *J Bone Joint Surg Am.* 2002;84(10):1811-1815.
- [2] Ring D et al. Displaced, unstable fractures of the radial head: fixation vs. replacement--what is the evidence?. *Injury.* 2008;39(12):1329-1337
- [3] Cristofaro CD et al. High Risk of Further Surgery After Radial Head Replacement for Unstable Fractures: Longer-term Outcomes at a Minimum Follow-up of 8 Years. *Clin Orthop Relat Res.* 2019;477(11):2531-2540.