Radial Head Arthroplasty for Radial Head Fracture Is Associated with Greater Survivorship Than Open Reduction Internal Fixation: A Population-Based Cohort Study

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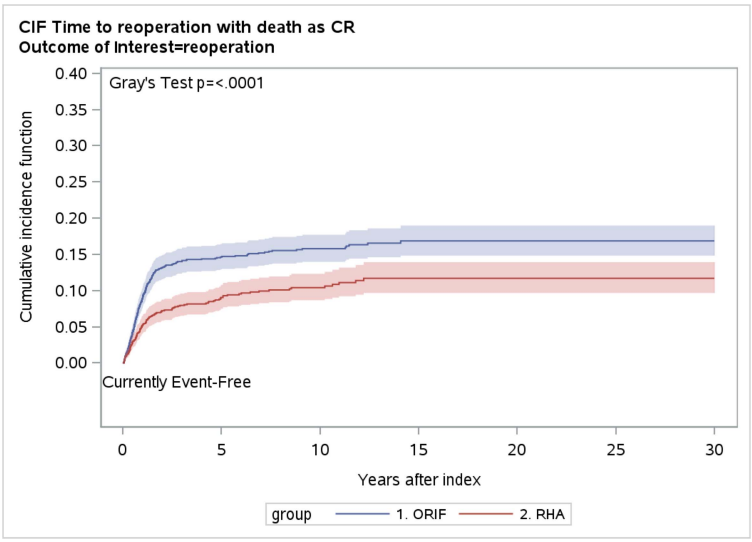
INTRODUCTION:
Radial head fractures account for one-third of all fractures around the elbow. Despite this, there remains significant debate with respect to the optimal treatment of unstable radial head fractures with significant articular displacement, comminution, or mechanical block to motion. Historically, radial head resection was a viable treatment for fractures that could not be reconstructed. However, this option has fallen out of favour due to complications such as instability, ulnar impaction, ulnohumeral arthrosis and proximal migration of the radius. Radial head arthroplasty (RHA) and open reduction and internal fixation (ORIF) are the current surgical treatments employed in the management of these fractures. Systematic reviews comparing RHA to ORIF have noted greater cost-effectiveness, fewer reoperations, lower complication rates and higher patient satisfaction among patients undergoing RHA. However, these findings are largely based on small retrospective data. Moreover, concerns exist regarding the longevity of the radial head implant, especially among young patients who undergo RHA.
METHODS:
A population-based cohort study was performed utilizing administrative healthcare data from Ontario, Canada. All adults, 16 years of age and older in Canada's most populous province, who sustained a radial head fracture between April 1, 2002 and March 31, 2020 were identified. Patients undergoing ORIF, RHA or radial head excision for a radial head fracture were followed for subsequent reoperation. An unadjusted competing risk survival analysis was performed to tally the cumulative incidence of all-cause revision procedures. Logistic regression models were constructed to identify the patient-, provider- and fracture-related factors associated with reoperation following ORIF and RHA.
RESULTS:
A total of 3159 patients underwent surgical management of a radial head fracture during the study period. The majority of patients were female (55.9%). The mean age of patients who underwent ORIF, RHA and excision was, 43.9, 51.1, 52.6 years, respectively. The rate of reoperation in the ORIF, RHA and excision cohort was 7.7%, 3.8% and 0.8%. A statistically significant difference in cumulative incidence function (i.e., survivorship) was noted favoring RHA over ORIF ($P < 0.0001$) (Figure 1). The most frequently performed secondary procedure was removal of hardware. Other secondary procedures included, total elbow arthroplasty, elbow arthroscopy, radial head replacement, irrigation & debridement of the radius, capsular release, radial head excision, excision of heterotopic ossification and loose body removal. The odds of reoperation among those undergoing ORIF increased with a greater comorbidity score (adjusted OR 1.47; 95% CI, 1.04-2.07, $P = 0.03$) and surgery performed at a teaching hospital (adjusted OR 1.76; 95% CI, 1.22-2.53, $P = 0.0023$). The odds of reoperation among those who had a RHA increased when surgery was performed overnight (between midnight and 7AM) (adjusted OR 3.27; 95% CI, 1.10-9.70, $P = 0.03$) and decreased when RHA was performed in combination with a ligament repair (adjusted OR 0.62; 95% CI, 0.42-0.94, $P = 0.02$).
DISCUSSION AND CONCLUSION:
Radial head fractures treated with radial head arthroplasty have a significantly lower rate of reoperation and greater survivorship. Concomitant ligament repair at the time of radial head arthroplasty may be a protective factor, while performing a radial head arthroplasty overnight (between midnight and 7AM) may increase the odds of reoperation. Prospective studies are needed to further elucidate the key predictors for long-term survivorship of RHA, especially among young patients.


CIF Time to reoperation with death as CR
Outcome of Interest=reoperation
Gray's Test p=<.0001
Cumulative incidence function
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Currently Event-Free
0
5
10
15
20
25
30
Years after index
group
1. ORIF
2. RHA