Management and Outcomes of 3- and 4-Part Proximal Humerus Fractures in Patients ≤ 60 Years: Acute Versus Salvage Reverse Shoulder Arthroplasty After Open Reduction and Internal Fixation

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Introduction: Surgical management of complex proximal humerus fractures (PHFs) is often influenced by several factors such as patient age, functional demands, and fracture pattern. Given the high complication rate associated with open reduction and internal fixation (ORIF) of 3- and 4-part PHF, the utilization of reverse shoulder arthroplasty (RSA) has increased, particularly in the elderly patient. ORIF is preferred whenever possible among younger patients given their greater functional demands and concerns regarding implant longevity. However, RSA provides a salvage option for failed fixation, nonunion, or posttraumatic arthritis following ORIF. Additionally, RSA is also performed in the acute setting in selected younger patients with severe fractures. This study aimed to assess and compare outcomes and complications of RSA when performed acutely versus RSA when performed following failed ORIF for 3- and 4-part PHFs in patients aged ≤ 60 years.

Material & Methods: All patients aged ≤ 60 years who sustained a 3- or 4- part PHF between 2008 and 2023 were reviewed. Patients were excluded if they had an ipsilateral upper extremity fracture, pathologic fracture, or less than 1 year of follow-up. Thirteen acute RSA (11 shoulders, 73% female) and 14 salvage RSA (13 shoulders, 64% female) cases were included, with an overall mean follow-up of 5.8 years. Cemented fixation was used in 13% of acute and 14% of salvage RSA. Dedicated fracture stems were utilized in 54% of acute and 14% of salvage RSA. The average time to salvage RSA from the time of ORIF was 2.7 years (range 0.4 – 9.4 years). Primary indications for salvage RSA included avascular necrosis (n=8), malunion or nonunion (n=3), posttraumatic arthritis (n=2), and rotator cuff arthropathy (n=1). Postoperative complications and reoperations were recorded. American Shoulder Elbow Surgeons score (ASES), Subjective Shoulder Value (SSV), Numeric Pain Rating Scale (NPRS), and satisfaction were assessed at final follow-up. Reduction quality and other radiographic outcomes were analyzed on postoperative radiographs.[1]

Results: Patients who underwent salvage RSA were younger (48.3 vs. 55.9 years; p=0.011), had lower BMI (28 vs. 40 kg/m^2; p=0.018), and more commonly had concomitant mood disorders (57% vs. 18%; p=0.047). Cohorts did not differ in fracture severity, with 4-part PHF comprising 69% of acute RSAs and 71% of salvage RSAs (p=1.000). Rates of severe displacement and concomitant dislocation were similar between groups (p≤0.222). Excluding conversion to RSA, the rate of reoperation was higher in salvage RSA patients, though this did not reach statistical significance (36% vs. 7%; p=0.165). Two patients in the salvage RSA cohort required revision arthroplasty due to loosening. Four patients had tuberosity nonunion (2 acute RSA, 2 salvage RSA). Salvage RSA yielded inferior ASES (62.8 vs. 70.5; p=0.417), SSV (59.8 vs. 65.6; p=0.421), NPRS (2.6 vs. 2.2; p=0.586), and satisfaction scores (6.7 vs. 7.1; p=0.746). Range of motion at final follow-up did not differ between acute and salvage RSA for external rotation (30° vs. 35°; p=0.577) or forward elevation (132° vs. 122°; p=0.351).

Discussion: Acute RSA tended to be associated with better clinical outcomes than salvage RSA, although with the numbers available, the differences were not statistically significant. Similarly, acute RSA was associated with lower reoperation rates, although not statistically significant. Larger study cohorts are needed to confirm these findings.

1.Schnetzke et al. Quality of Reduction Influences Outcome After Locked-Plate Fixation of Proximal Humeral Type-C Fractures. J Bone Joint Surg Am. 2016 Nov 2;98(21):1777-1785. doi: 10.2106/JBJS.16.00112.