

Results of Shoulder Hemiarthroplasty in Humeral Head Pathologies

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Abstract

Introduction: Shoulder hemiarthroplasty has produced satisfactory, repeatable, and durable results in the treatment of conditions such as glenohumeral arthritis, avascular necrosis, and rheumatoid arthritis of the shoulder joint.

Method: We have evaluated the functional outcome of ten patients with proximal humerus pathologies requiring hemiarthroplasty. Standard deltopectoral approach was performed in beach chair position. Patients were followed at regular intervals and statistical analysis was done using SPSS software.

Results: Seven patients had excellent to good results, two patients had fair results, and one patient had poor result. In our series, one case of superficial infection treated with oral antibiotics was observed. The result from Shoulder Hemiarthroplasty in this study has been assessed utilizing the Constant Murley score (CMS) to assess individual patient results. In our review, we have found excellent to good results in 7 patients (68 ± 7), 2 patients had fair results (39 ± 5) and 1 patient had poor result (29).

Conclusion: There were no significant differences in functional outcome between different sexes, age groups, and those who experienced radiologically higher prosthesis migration. However, there was a statistically significant difference in functional outcome between patients with poor quality or high quality rotator cuff, indicating that rotator cuff quality is an important predictor of functional outcome.

Keywords: Shoulder Hemiarthroplasty; Simple Shoulder Test; Constant-Murley Score; Oxford Shoulder Score; Rotator Cuff; Glenohumeral Arthritis

Introduction

As the population ages the number of pathologies related to the shoulder increases. End-stage degenerative and inflammatory arthritis, as well as comminuted proximal humeral fractures with coronally split humeral heads, can all be managed with a primary shoulder hemiarthroplasty. The evolution of shoulder arthroplasty has led to the generation of newer implants, with exquisite designs offering to reconstruct the shoulder joint. One of the key roles is played by the modularity of prostheses. Proximal humerus fractures

with three or four-part fractures are common in the geriatric age group and younger individuals. When there is little or no displacement, orthopaedic management gives good functional results in most of these fractures. In complex (3 or 4-part) displacement fractures, however, indications for surgery are controversial [1]. Many prefer osteosynthesis, which has its disadvantages in patients with poor bone quality and often increases the risk of osteonecrosis of the humeral head. The second, introduced by Neer in the 1950s, is gleno-humeral joint replacement, for which the reference technique is anatomic hemiarthroplasty. This, however, inevitably involves tuberosity reinsertion, which frequently entails complications with a catastrophic impact on the evolution of shoulder function. We hereby have a total of 10 cases in which we have performed primary shoulder modular hemiarthroplasty in various pathologies of the shoulder joint. The present study retrospectively compared short-term clinical and X-ray results of emergency treatment of four-part displaced fracture dislocation of the proximal humerus, along gleno-humeral arthritis of the shoulder in cases of rheumatoid arthritis.

Aim of the Study

The aim of this study is to investigate the results of shoulder hemiarthroplasty in various shoulder joint pathologies involving the humeral head.

Materials and Methods

We studied ten shoulders with the following diagnoses: fracture sequelae (n = 3), primary osteoarthritis (n = 2), avascular necrosis (n = 2), and rheumatoid arthritis (n = 3). Patients were followed for 1 month, 3 months, 6 months and 1 year. Functional status was assessed using Constant-Murley score. The Constant-Murley shoulder score includes a pain score (15 points), functional assessment/activities of daily living (20 points), strength measures (25 points), range of motion: anterior elevation, internal rotation, external rotation and shoulder abduction (40 points). The higher the score, the higher the quality of the function. The inclusion criteria included patients with early arthritis involving humeral head, rheumatoid arthritis of shoulder joint, Neer four-part fractures and avascular necrosis of humeral head due to sickle cell disease. The exclusion criteria included active infection of shoulder joint, massive rotator cuff injury, neuropathic shoulder and ankylosed shoulder as well as proximal humerus fractures treated conservatively or with osteosynthesis.

The patients were treated under general anaesthesia after optimum fitness with proper consent. The patients were operated in beach chair position on radiolucent table with standard delto-pectoral approach. Biceps tendon worked as lighthouse for the approach. Cephalic vein was isolated and retracted medially. Standard cuts were made on humeral head. Sequential reaming was carried out which was then followed by canal preparation, cementing and implantation of the prosthesis after standard trials. Layer-wise closure was done and drain was kept for 48 hours. The patients were discharged on third post-operative day and followed up regularly at 15 days, one month, two months and six months till one year. The statistical analysis was done using SPSS software (Illinois, Chicago).

Observation and Results

Shoulder hemiarthroplasty has shown significant reduction in pain and improvement in movements such as abduction and external rotation. In our study, ten patients were available for follow-up and the median follow-up was 15 months (range, 12 - 18 months). There were 6 men and 4 women, average age 47 ± 6.3 years (range 23 - 76 years). The intraoperative blood loss was 455 ± 34 ml. The average duration of surgery was 66 ± 7.6 minutes. Mean follow up was 10 ± 2.3 months. Seven of the ten patients had no significant medical history, while the remaining three patients had a significant medical history ranging from lung disease, coronary heart disease, diabetes, parkinsonism, and depression. Two patients were treated for osteoporosis before injury. Five patients were smokers. Three patients were social drinkers.

Pain: 70% of patients had no pain (seven patients). Three patients (30%) complained of pain after light activity.

Movements: Average active forward motion was 95° (range 20 - 150°). Five patients had an active anterior elevation above 120°. Three patients had an active anterior elevation of 90 - 120°. Two patients had 45 - 90° anterior elevation and forward flexion.

Function: Eight patients had normal function after hemiarthroplasty. Two patients reported mild limitations or limitations in general activities.

Patient satisfaction: Seven patients were extremely satisfied with the result of the operation. Three patients were less satisfied with their outcome.

Sequential imaging showed no signs of dislocation, instability or impingement taken one year after surgery. No radiolucent lines, cement fractures, or stem migration were observed on any of the final follow-up radiographs, and no ectopic bone formation were observed in our series. The result from shoulder hemiarthroplasty in this study has been assessed utilizing the Constant Murley score (CMS) to assess individual patient results. In our review, we have found excellent to good results in 7 patients (68 ± 7), 2 patients had fair results (39 ± 5) and 1 patient had poor result (29).

Complications: One case of superficial infection was observed in our series, which was treated with oral antibiotics for six weeks. No deep infection, deep vein thrombosis or myocardial infarction were observed.

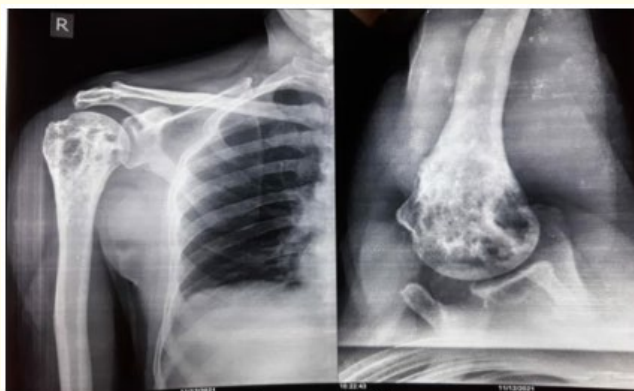


Figure 1: Pre-operative X-ray.



Figure 2: Post-operative X-ray.

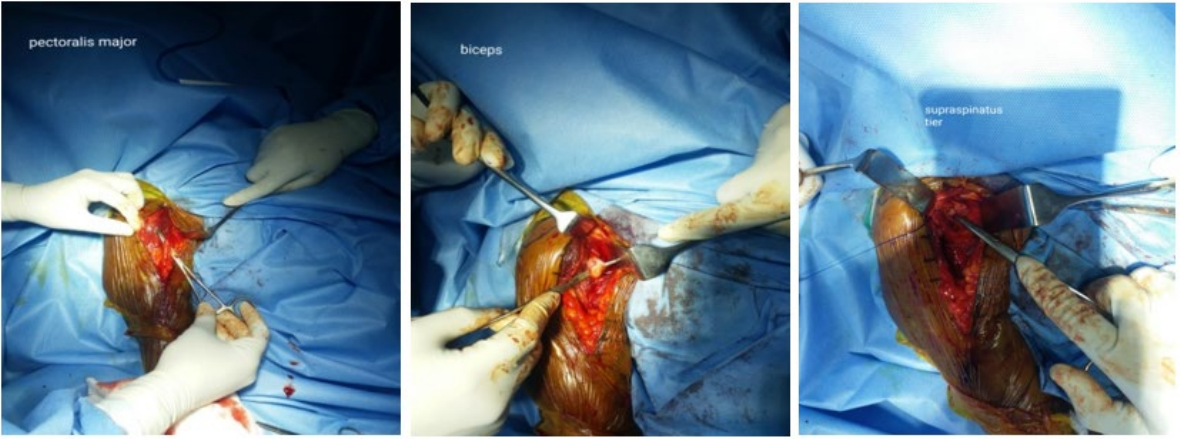


Figure 3: Intra-operative images.



Figure 4: Removal of humeral head.

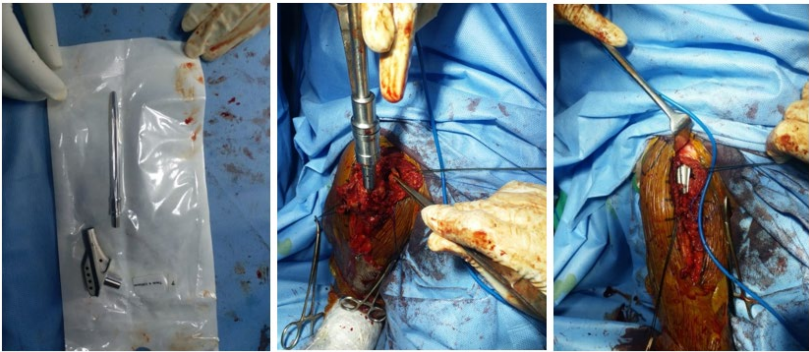


Figure 5: Implantation of humeral stem component.



Figure 6: Post-operative movements after 6 months.

Discussion

A frequent treatment for shoulder conditions such as glenohumeral arthritis, avascular necrosis, capsulorrhaphy arthropathy, avascular necrosis, and proximal humeral fractures is hemiarthroplasty [2-4]. Although this procedure is often successful, it can result in painful, stiff, weak, or unstable shoulders [5-8]. These results may prompt the patient to consider revision surgery. Rotator cuff status is the most influential factor in postoperative function after shoulder hemiarthroplasty. The goal of hemiarthroplasty for a proximal humerus fracture is to restore normal biomechanics, achieve adequate range of motion, and provide patients with a pain-free, functional joint [9-12]. This is a technically demanding procedure that requires restoration of humeral height, anatomical reconstruction of the tubercles, and fixation of the stem in proper retroversion. Preoperative patient selection and postoperative rehabilitation are important factors influencing outcome. The status of the greater tuberosity were classified as intact, poor (> 1 cm displacement from anatomic position [13-16], absent, or absent.

The main advantage of shoulder hemiarthroplasty is the preservation of glenoid bone stock. Shoulder hemiarthroplasty offers an alternative to total shoulder arthroplasty for patients with humeral deficits and a treatment option for patients with humeral fractures who can achieve adequate tuberosity fixation, preserve rotator cuff function, and respond to subsequent physical therapy and functional rehabilitation. Disadvantages of shoulder hemiarthroplasty include poor outcomes in osteoarthritis and proximal humerus fractures with rotator cuff disease and inadequate fixation of the tuberosity. The initial goal of postoperative rehabilitation is to maximize passive ROM while allowing the reattached subscapularis to heal. Passive ROM exercises are started on the first postoperative day. The first postoperative follow-up visit focuses on passive ROM development during the first 6 weeks. Active ROM started after the first 6 weeks. With good passive ROM, Deltoid, rotator cuff and scapular stabilization strengthening is continued every 6-12 weeks. Strengthening exercises are continued every 12 to 24 weeks and the patient should return to normal daily activities. Although most improvements are seen within the first 24 weeks, functional improvement can take up to a year. Complications may include progressive glenoid arthrosis, instability, infection, aseptic loosening, nerve and muscle dysfunction, heterotrophic ossification, loosening and deformity, periprosthetic fracture, and persistent pain [5].

In our study, of the 10 patients who underwent shoulder arthroplasty, 6 were men (60%) and 4 were women (40%). These patients had good self-assessed shoulder comfort and function, with average SST scores of 5.2 ± 1.7 ; the maximum score on the SST is 12. The age of the patients was between 23 to 76 years and the mean age of the patient was 47 ± 6.3 years (Males 42 ± 5.3 years, Females 49.8 ± 3.2 years). Mean active forward elevation was 95° (range $20 - 150^\circ$). At the final follow-up, 70% of patients had No pain (7 patients). Three patients (30%) complained of pain after light activity. All patients except one resumed their activities of daily living as well as pre-disease

occupational status. One instance of superficial contamination was found in our series which was treated with oral antibiotics for six weeks.

Boileau, *et al.* [2], in an investigation of 66 patients, tracked down expanded more noteworthy tuberosity movement and unfortunate result in ladies north of 75 years old. Comparable outcomes were accounted for by Demirhan, *et al.* [17] in their investigation of 32 cases and by Mighell, *et al.* [16] in an investigation of 72 patients. The authors also observed that there is no significant difference between hemiarthroplasty and anatomical total shoulder arthroplasty. Also, in our study, the implant used is modular humeral prosthesis which can be modified in future to anatomical total as well as reverse total shoulder arthroplasty.

The mean forward movement in our report was 95°, which is similar to different studies. Zyto, *et al.* [18] referenced that middle forward rise was 70° among their 27 patients. In their series of 20 patients, Anjum, *et al.* [19] revealed that four patients professed to have moderate agony after the hemiarthroplasty and the middle forward movement and abduction was around 60°. Prakash, *et al.* [20] expressed that among their 22 patients mean forward flexion was 93° and the relief from discomfort was the most unsurprising result. In our series, there was no tremendous contrast in utilitarian result, after the shoulder hemiarthroplasty for proximal humeral breaks, between various ages, sexes or prevalent subluxation.

A portion of the qualities of our review incorporate the length of the development, that our patients were generally not lost to follow-up, and that every one of the patients were worked upon by a similar specialist, got a similar embed and had a comparative postoperative recovery. We recognize the shortcoming of our review that a little companion of patients was incorporated, however despite this our series showed relative outcomes to different studies.

Conclusion

The best sign for shoulder hemiarthroplasty is avascular necrosis, and the most terrible is post-traumatic break sequelae. Rheumatoid joint inflammation and essential glenohumeral osteoarthritis are great signs for patients under 50 years old. Hemiarthroplasty is a significant choice in the treatment of proximal humerus break in older patients. Revision of primary hemiarthroplasties can be kept away from by careful strategies pointed toward focusing the articular surface of the humeral prosthesis in the glenoid concavity, utilizing right positioning of the humeral parts and delicate tissue balance, staying away from valgus situating of the humeral part.

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Conflict of Interest

None.

Financial Sponsorship

None.

Contribution from All Authors

Dr. Aditya Agrawal and Dr. Hardik Nayak performed the surgery. Dr. Aditya Agrawal and Dr. Hardik Nayak were primarily responsible for the research, including systemic analysis, writing, and publication of case study. Dr. Gaurav Vadodaria performed the documentation case related clinical formalities. Dr. Aditya Agrawal was involved in pre-operative planning, proof-reading and expert correction in the manuscript. The author(s) read and approved the final manuscript.

Use of Artificial Intelligence Tool

None.

Data Availability

Written and Informed consent of the patient and the guardian taken.

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