Midterm results of Oxford shoulder hemiarthroplasty

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Abstract
Background: Hemiarthroplasty of the shoulder is known to provide satisfactory long term results provided concentric reduction can be obtained in a high percentage of patients. Careful soft tissue balancing with appropriate adaptation of version of the component appears to allow good results permitting centering of the arthroplasty without replacement of a glenoid component. The study was aimed to evaluate the midterm outcome in patients with Oxford cementless shoulder hemiarthroplasty for end stage arthritis with intact or reparable full thickness rotator cuff tears.

Materials and Methods: 29 consecutive patients (30 shoulders) who underwent Oxford cementless shoulder hemiarthroplasty between 2004 and 2006 were analyzed. Mean age was 71 years (range 34-91 years, 95% of the confidence interval [CI] of standard deviation [SD] was 10.32-17.58). Mean duration of preoperative symptoms was 42.8 months (range 9-84 months, 95% CI of SD was 17.83-30.11). Patients’ self reported Oxford shoulder score (OSS) was collected prospectively and was used as an assessment tool to measure final outcome.

Results: The mean initial OSS was 17.9 (range 7-43, 95% CI of the SD was 7.19-12.13). The score improved by an average of 16.9 points at a mean followup of 5.9 years (range 4.3-7.6 years) to reach mean final OSS of 34.8 (range 13-48, 95% CI of the SD was 9.31-15.73). The improvement of OSS was highly significant with a two tailed $P<0.0001$ and 95% CI of this difference was 11.47-22.20.

Conclusion: This study demonstrates shoulder hemiarthroplasty as reliable procedure for improvement of shoulder function as shown by the patients’ self reported outcome score (OSS) in end stage glenohumeral arthritis with intact or reparable rotator cuff at midterm followup. Our results suggest successful outcome of the Oxford shoulder hemiarthroplasty (Corin, UK) away from its originating center and in hospitals where fewer shoulder replacements are performed.

Key words: Glenohumeral arthritis, patient reported outcome measure, rotator cuff, shoulder hemiarthroplasty

MeSH terms: Osteoarthritis, glenohumeral joint, rotator cuff, arthroplasty, prosthesis

Introduction

Hemiarthroplasty of the shoulder is known to provide satisfactory long term results provided concentric reduction can be obtained in a high percentage of patients. This is consistent with Neer’s revision rate of zero for his own 20-year series of hemiarthroplasties with long term followup not showing a significant increase in revisions rates over midterm results. Many factors contribute to the outcome of shoulder arthroplasty, including quality and anatomy of bone, integrity of soft tissues (i.e., rotator cuff and coracoacromial ligament) and the underlying etiology of disease. Although the failed hemiarthroplasty is often ascribed to lack of a glenoid component, other factors such as soft tissue problems are equally responsible. Careful soft tissue balancing with appropriate adaptation of version of the component appears to allow good results permitting centering of the arthroplasty without placement of a glenoid component.

Our aim was to look at the results of the Oxford shoulder hemiarthroplasty (Corin, UK) as used away from its originating center and to the best of our knowledge the results of this implant have not been published before.

Materials and Methods

A total of 31 consecutive patients (33 shoulders-2 bilateral) who underwent Oxford cementless shoulder hemiarthroplasty between January 2004 and December 2006 were included in the study. Primary osteoarthritis was the diagnosis in 29 patients more than 60 years of age and rheumatoid
arthrit in two patients, aged 34 and 38 years who had lower physical demands. Four patients were in full time employment, two worked part time and 25 had retired. The group consisted of 24 women and 7 men with 18 right and 15 left shoulders. None of the patients were involved in workers compensation claim and no patient had cemented shoulder hemiarthroplasty for glenohumeral arthritis during this period. In five shoulders a full thickness supraspinatus tear of <1 cm was observed intraoperatively and was repaired with closure of the joint capsule. The two patients who underwent bilateral shoulder replacement were women. One patient with bilateral shoulder replacement had died during the followup period and another patient with unilateral shoulder hemiarthroplasty was lost to followup. Therefore, 29 patients (30 shoulder replacements) were analyzed in this study.

Operative procedure
All patients were operated in the beach chair position under general anaesthesia and an interscalene nerve block. The shoulder was exposed by a delto-pectoral approach with the subscapularis and the joint capsule reflected in one layer. The humeral head was exposed by external rotation and adduction of the arm. The cartilage of humeral head and glenoid were inspected for wear and osteophytes were excised from the head of the humerus. The rotator cuff was inspected for its integrity and its appearance recorded. Any inflammatory pathology of the rotator interval, integrity of the labrum and the long tendon of the biceps brachii and loose bodies in the inferior recess were recorded. The jig was introduced into the humerus 1 cm medial and posterior to the greater tuberosity and in line with the intramedullary canal. The humeral head was resected as measured by the angled jig while maintaining the humeral height. The intramedullary canal and head were sized for definitive components. Standard soft tissue releases were undertaken and stability of the shoulder was assessed with trial implants. Definitive components consisting of an Oxford uncemented stem and humeral head were impacted once satisfactory joint stability, humeral height, humeral head version and size were determined. The subscapularis and joint capsule were repaired using a tendon-to-tendon technique. In five patients full thickness supraspinatus tears of less than 1 cm that were incidentally observed intraoperatively were repaired. The operation was performed by the senior author (AFWC) or by an Orthopedic trainee under the direct supervision of the senior author. The postoperative regime was the same for all patients. This included monitoring of postoperative pain and neurovascular status, two further doses of intravenous Cefuroxime 1.5 g each at 8 and 16 h. A sling was worn for comfort, no external rotation beyond neutral for 3 weeks and no active external rotation for 6 weeks was allowed. Physiotherapy advice at discharge and a physiotherapy rehabilitation program was started at 3 weeks postoperatively.

The assessment tool for comparison of clinical outcome was the patients’ self reported Oxford shoulder score (OSS), consisting of 12 questions involving activities of daily routine. It has a best possible score of 48 and the least (minimum) score of 0. OSS is a patient-reported outcome measure and its reliability has been validated against Constant shoulder score, SF36, Western Ontario Rotator Cuff Index and Shoulder Pain and Disability Index. The OSS was collected prospectively preoperatively on the day of operation and compared at final followup with scores obtained by post. An independent researcher who had not participated in the treatment of these patients accessed the findings from patients’ medical records and assessed their scores. Students t-test was used to compare the change in scores and a P < 0.05 was considered to be significant.

Results
A total of 29 patients (30 shoulders) with 13 left and 17 right shoulder replacements were included in the final analysis. The intraoperative glenohumeral joint findings of all patients are summarized in Table 1. The mean age of patients was 71 years (range: 34-91 years, standard deviation [SD] 13, 95% confidence interval [CI] of the SD was 10.32-17.58) and the mean duration of followup was 5.9 years (range 4.3-7.6 years). The mean duration of preoperative symptoms was 42.8 months (range 9-84 months, SD 22.4, 95% CI of the SD was 17.83-30.11).

The mean initial OSS was 17.9 (range 7-43, SD 9.03, 95% CI of the SD was 7.19-12.13). This improved by 16.9 points to reach mean final OSS of 34.8 (range 13-48, SD 11.57, 95% CI of the SD was 9.31-15.73). The two tailed P value of this improvement of OSS is less than 0.0001 and by conventional criteria, this difference is considered to be highly statistically significant. The 95% CI of this

| Findings                  | Intact rotator cuff n=28 | Tear in rotator cuff n=5 |
|---------------------------|--------------------------|--------------------------|
| Glenoid labrum            | Normal: 28               | 5                        |
| Frayed                    | 0                        | 0                        |
| Rotator interval          | Normal: 28               | 5                        |
| Frayed                    | 0                        | 0                        |
| Synovitis                 | 0                        | 0                        |
| Long head of biceps       | Normal: 26               | 1                        |
| Attenuated                | 0                        | 0                        |
| Frayed                    | 0                        | 0                        |
| Ruptured                  | 2                        | 4                        |
| Articular surface         | Normal wear for age: 7   | 0                        |
| Abnormal wear for age:    | 21                       | 5                        |
difference ranged from 11.47 to 22.20. A 63-year-old lady with a preoperative OSS of 25 had the longest followup of 7.6 years. The final followup OSS was 48 at 70 years of age. Her preoperative radiographs showed end stage arthritis [Figure 1] and final followup X-rays show a congruent gleno-humeral joint [Figure 2].

OSS improved in all but two patients. The first patient with bilateral shoulder hemiarthroplasties had multiple joint disease and a small full thickness rotator cuff tear in the right shoulder. Her preoperative OSS of 36 on the right side declined to 13 at a final followup of 5.9 years. The rotator cuff was intact on the left side however the OSS improved only from 8 to 13 at a final followup of 6.4 years. The second 80 years old patient had an initial OSS of 43, which improved to 46 at a 3-year followup but then dropped to 37 at the final followup of 5.9 years.

There were two complications (6.6%) from 30 surgical procedures among our patients. One patient had an axillary artery injury during humeral head resection, which required assistance from a vascular surgeon for repair. In the second the subscapularis tendon repair failed and a pectoralis tendon transfer was performed. There was no superficial or deep infection and no patient had undergone a revision operation until final followup.

**Discussion**

Hemiarthroplasty of the shoulder provides good to excellent results with regard to pain relief and improved functional activity in majority of patients. It has an advantage of being a simple procedure and also avoids the risk of glenoid component loosening. Although studies favor total shoulder arthroplasty for long term superior pain relief, the results are not as clear when strength, function, range of movement and overall patient satisfaction are compared. In the past, glenohumeral arthritis associated with deficient glenoid bone stock and massive irreparable rotator cuff tear were suggested to be clear indications for hemiarthroplasty of the shoulder. But inevitably biased results of hemiarthroplasty due to insufficient bone stock and lack of soft tissue envelope as against superior results of total shoulder arthroplasty which was largely performed in patients with intact rotator cuffs or reparable small full thickness rotator cuff tears.

Our study demonstrates 48.6% improvement of OSS in 29 patients at midterm followup of 5.9 years. There was clinically significant improvement of OSS in 93.1% (27/29) patients with a minimum improvement of 4 points and a maximum improvement of 40 points. A minimum change of 3.82 points of the OSS has been shown by Cloke et al. to be associated with a significant clinical improvement, when using the originally described OSS where a minimum of 12 points was the best possible score and maximum of 60 points, the worse possible score. The two patients who dropped their OSS were further investigated. The first patient with bilateral shoulder hemiarthroplasties had multiple joint disease involving hips, knees, elbows and hands and failed to improve on the right side with her OSS falling by 23 points from an initial OSS of 36 points. OSS of her left shoulder also improved marginally by 5 points from 8 at a final followup of 6.4 years, though this improvement is considered clinically significant according to Cloke et al. The second 80 years old patient showed an increase in the OSS by 3 points from an initial 43 points at 3 years followup, nevertheless his OSS dropped to 37 at 5.9 years followup. The reason for the mild improvement of OSS

![Figure 1: Anteroposterior radiograph of right shoulder in a 63 year old patient with a preoperative Oxford shoulder score of 25](image1)

![Figure 2: Anteroposterior radiograph of right shoulder in a 70 year old patient at 7.6 years followup and Oxford shoulder score of 48](image2)
is due to the initial high score of 43 out of a possible 48, while the late decline may have occurred due to glenoid wear and the deterioration of rotator cuff status over time [Figure 3a and b].

This study also shows a very low rate of complication with only one case of dehiscence of subscapularis tendon-to-tendon repair that required a pectoralis minor tendon transfer. Another patient sustained an axillary artery injury whilst a trainee was resecting the humeral head with an oscillating saw. We would suggest protecting the soft tissues medial to the proximal humerus while resecting the humeral head. The complication rate of our study (6.6%) is lower than the overall complication rates of 11.6% and 19% reported by Aldinger et al.\(^{18}\) and Edwards et al.\(^{5}\) respectively. This implant has shown good success with no revisions at a midterm followup.

The limitations of the study are that it analyses only 30 shoulders with hemiarthroplasties performed over a period of 3 years and uses a single score to measure outcome. This study, however, demonstrates a realistic picture in a District General Hospital practice away from the implants’ originating institution. Favorable results in the majority of patients stand as a testament in the ability to reproduce good to excellent outcomes from hospitals where these operations are performed in fewer numbers. The OSS is a patient reported outcome measure and has been validated against other scores. Patients’ perception of health care provided by hospitals has been incorporate in Lord Darzi’s report,\(^{19}\) which plans to reform the National Health Service in England over the next 10 years and patients’ views on the quality of care they receive will affect funding for hospitals and General Practitioners.

To conclude, this study demonstrates shoulder hemiarthroplasty as a reliable procedure for improvement of shoulder function through patients self reported scores (OSS) in end stage glenohumeral arthritis with intact or reparable rotator cuff at a mean followup of 5.9 years.

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