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Surface replacement arthroplasty for glenohumeral arthropathy in patients aged younger than fifty years: results after a minimum ten-year follow-up

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Background: The role of cementless surface replacement arthroplasty (CSRA) in young individuals is currently unclear. The aim of this study was to evaluate CSRA long-term results for glenohumeral arthritis in young patients.

Methods: Between 1990 and 2003, 54 CSRAs were performed on 49 patients (25 men, 24 women) aged younger than 50 years. Mean age was 38.9 years (range, 22-50 years). Three patients (4 shoulders) died over time and 8 were lost to follow-up, leaving 38 patients (42 shoulders) with a mean follow-up of 14.5 years (range, 10-25 years). There were 17 total shoulder replacements with metal back glenoid, and 37 underwent humeral head resurfacing with microfracture of the glenoid.

Results: The indications were avascular necrosis, 16; rheumatoid arthritis, 20; instability arthropathy, 7; primary osteoarthritis, 5; fracture sequelae, 3; postinfection arthritis, 2; and psoriatic arthritis, 1. The mean relative Constant score increased from 11.5% to 71.8% ($P < .0001$), and the mean patient satisfaction at final follow-up was 8.7 of 10. The mean relative Constant score for the humeral head resurfacing with microfracture of the glenoid improved to 77.7% compared with 58.1% for total resurfacing arthroplasty. Two required early arthrodesis due to instability and deep infection. Seven were revised to stemmed prosthesis: 1 for traumatic fracture and 1 for glenoid erosion 16 years after the index procedure. Five shoulders in 4 patients (4 rheumatoid arthritis, 1 avascular necrosis) were revised at 8 to 14 years after surgery for cuff failure and loosening. Three were revised to stemless reverse total shoulder arthroplasty due to rotator cuff failure at 23, 16, and 13 years after surgery.

Conclusions: CSRA provides good long-term symptomatic and functional results in the treatment of glenohumeral arthropathy in patients aged younger than 50 years in 81.6% of the patients. This improvement is maintained over more than 10 years after surgery, with high patient satisfaction (8.7 of 10). However, 10 shoulders (of 54) (18.5%) underwent revision arthroplasty. Resurfacing offers a valuable tool in treating young patients with glenohumeral arthritis, providing reasonably good long-term results in 81.6% of the

†Deceased.

The Royal Berkshire Hospital Audit and Review Board (IRB) approved the study (Study No. 8-13/3845).

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patients, while allowing preservation of bone stock if the need for revision arises. All the revision arthroplasty options are preserved, including less invasive procedures.
Level of evidence: Level IV, Case Series, Treatment Study.
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Shoulder arthroplasty is performed increasingly frequently with good results in patients who are usually elderly. The treatment of shoulder arthritis and arthropathy in the young patient remains a challenging issue. Young patients have higher functional demand and would like to resume all of their activities, including all sporting activities. This raises concerns regarding the risks of failure and need for early revision shoulder arthroplasty or even the need for a number of revision surgeries during their lifetime.

The experience of shoulder arthroplasty with stemmed implants in young patients showed worse and less predictable results than in the older patient population, with a high percentage of unsatisfactory results and a high percentage of revision surgery.[9,22,23] Recent reports have presented more favorable short-term to midterm outcomes,[3,11,19] yet, with a high rate of revision surgery and reoperation.[3,11,19]

Cementless surface replacement arthroplasty (CSRA) of the shoulder was introduced in the mid-1980s as a treatment for glenohumeral arthrosis in an attempt to restore anatomy, preserve bone, and avoid humeral head resection.[13-15,25] The patient-specific anatomy, including the native inclination, offset, head-shaft angle, and version of the humerus, is restored by following the anterior and inferior line of the anatomic neck of the humerus and finding the center of the humeral head with the initial guidewire using a jig in parallel to the line of the anatomic neck.[13-15,25]

Preservation of the bone stock of the humeral head facilitates easier later revision to a stemmed total shoulder arthroplasty (TSA),[13-15] stemless or stemmed reverse TSA (rTSA),[1,12] or arthrodesis,[14] should the need arise.

Available data regarding the short-term and midterm results of shoulder resurfacing arthroplasty in younger patients are limited.[2,7,10] Our study evaluated the long-term results of CSRA for the treatment of glenohumeral arthritis in patients aged younger than 50 years with more than 10 years of follow-up (range, 10-25 years).

Materials and methods

The patients eligible for this study were identified from our institution's computerized database. The inclusion criteria were patients who were aged 50 years or younger at the time of surgery and had a minimum of 10 years of follow-up since the procedure at the time of the review. The data for all these patients were collected prospectively on the institutional database. All procedures were performed by the 2 senior authors (O.L. and S.A.C.).

Between 1988 and 2003, 54 consecutive CSRAs (Copeland Shoulder; Biomet, Swindon, UK) were performed in 49 patients (25 men, 24 women), with 5 patients undergoing bilateral procedures. Patients were aged younger than 50 years, with a mean age of 38.9 years (range, 22-50 years) at the time of surgery.

The indications for shoulder resurfacing were pain and dysfunction and the etiology for the arthroplasty included: 16 shoulders with avascular necrosis (AVN; mainly corticosteroid induced), 20 with rheumatoid arthritis, 7 with instability arthropathy, 5 with early onset of primary osteoarthritis, 3 with malunion and fracture sequelae, 2 with postinfection arthropathy, and 1 with psoriatic arthritis.

All patients with adequate humeral bone stock (usually less than 40% bone loss), excluding those with acute fracture, will have resurfacing prosthesis in our institution.

There were 17 TSAs with a metal-backed glenoid implant (Fig. 1) and 37 humeral head resurfacing with microfracture of the glenoid (humeral surface arthroplasty [HSA]) (Fig. 2).

At the latest follow-up, 3 patients (4 shoulders) had died of unrelated causes, and 8 patients were lost to follow-up (came from abroad for surgery or moved and were lost to follow-up), leaving 38 patients (42 shoulders) with a mean follow-up of 14.5 years (range, 10-25 years).

Surgical procedure

The operative technique and postoperative management have been described previously.[14] The principles of bone preservation and minimal bone removal remained unchanged. All components were cementless press-fit impacted, and all implants used after 1993 were hydroxyapatite (HA) coated. In this series, 15 non-HA-coated implants and 39 HA-coated implants were used. At the operation, the state of the deltoid muscle, the rotator cuff, and the glenoid bone was assessed and recorded.

The deltopectoral approach was used in 20 shoulders and the anterosuperior (Neviaser-Mackenzie) approach[14,17] in 34. The deltopectoral approach was used until 1993, and since 1993, the anterosuperior approach (Neviaser-Mackenzie approach) was the preferred approach and was usually used, unless the deltopectoral approach was used for a previous procedure.

When humeral head resurfacing is performed, all steps as for TSA are performed, but without insertion of a glenoid implant. A thorough release around the glenoid is performed to enable the humeral head to be pushed away (posteroinferiorly) and to get a good soft tissue balance. Release of the subscapularis contracture and release of the anterior soft tissues tightness allows the resurfaced humeral head to recenter on the glenoid by achieving soft tissue balance in the horizontal plane. The thorough release around the glenoid enables insertion of a glenoid component (if desired) or to perform microfracture to promote fibrocartilage cover on the glenoid.[27]

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