J Shoulder Elbow Surg (2011) 20, 123-130

ELSEVIER

Journal of Shoulder and Elbow Surgery

www.elsevier.com/locate/ymse

Shoulder arthroplasty in patients aged fifty-five years or younger with osteoarthritis

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Background: The younger patient with glenohumeral arthritis presents a challenge because of concerns about activity and frequency of failure. The purpose of this study was to define the results, complications, and frequency of revision surgery in this group.

Materials and methods: Between 1986 and 2005, 46 total shoulder arthroplasties and 20 hemiarthroplasties were performed in 63 patients who were aged 55 years or younger and had chronic shoulder pain due to glenohumeral osteoarthritis. All 63 patients had complete preoperative evaluation, operative records, and minimum 2-year follow-up (mean, 7.0 years) or follow-up until revision.

Results: Nine shoulders underwent a revision operation. The implant survival rate was 92% (95% confidence interval, 77%-100%) at 10 years for total shoulder arthroplasty and 72% (95% confidence interval, 54%-97%) for hemiarthroplasty (Kaplan-Meier result). Patients who underwent total shoulder arthroplasty had less pain ($P = .01$), greater active elevation ($P = .05$), and higher satisfaction ($P = .05$) at final follow-up compared with those who underwent hemiarthroplasty. Complete radiographs were available for 47 arthroplasties with a minimum 2-year follow-up or follow-up until revision (mean, 6.6 years). More than minor glenoid periprosthetic lucency or a shift in component position was present in 10 of 34 total shoulder arthroplasties. Moderate to severe glenoid erosion was present in 6 of 13 hemiarthroplasties.

Conclusions: This study indicates that there is intermediate- to long-term pain relief and improvement in motion with shoulder arthroplasty in young patients with osteoarthritis. These results favor total shoulder arthroplasty in terms of pain relief, motion, and implant survival.

Level of evidence: Level IV, Case Series, Treatment Study.

Keywords: Total shoulder arthroplasty; osteoarthritis; glenohumeral arthritis; young patient

The question of how to best treat the young patient with glenohumeral osteoarthritis has been a challenging issue. Better functional results have been shown for patients with osteoarthritis after receiving total shoulder arthroplasty compared with hemiarthroplasty.[2,6,8,13] However, wear of the polyethylene glenoid component with subsequent failure due to component loosening has been considered a relative contraindication to performing total shoulder arthroplasty in young patients with ostensibly higher physical demands. This is in contrast to several studies that have not shown a greater failure rate for total shoulder arthroplasty compared with hemiarthroplasty in patients aged 50 years or younger.[3,19,20] Because implant loosening is less common in hemiarthroplasty, the equivalence is likely a result of the number of early revision surgeries in patients receiving hemiarthroplasties who had inadequate pain relief.[15] The

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1058-2746/$ - see front matter © 2011 Journal of Shoulder and Elbow Surgery Board of Trustees.
doi:10.1016/j.jse.2010.05.006

experience of shoulder arthroplasty in young patients has been marked by a high percentage of unsatisfactory results,[19,20] although recent reports show favorable outcomes in the short term to midterm for total shoulder arthroplasty[11,14] and humeral head resurfacing.[1]

We are aware of only 1 study reporting the results of total shoulder arthroplasty in similarly aged patients with osteoarthritis.[14] Therefore, we reviewed our experience over a 20-year period with total shoulder arthroplasty and hemiarthroplasty in patients aged 55 years or younger with glenohumeral osteoarthritis to assess the results, the risk factors for an unsatisfactory outcome, and the rates of revision.

Materials and methods

The Mayo Clinic Institutional Review Board gave approval for this study (No. 09-004605). No external source of funding was used for any aspect of this study.

Patients

Between January 1, 1986, and December 31, 2005, 46 total shoulder arthroplasties and 20 hemiarthroplasties were performed in 63 patients aged 55 years or younger with primary or secondary osteoarthritis. Patients were identified with the use of a computerized database that contains the files of all patients having undergone joint arthroplasty at our institution since 1969. During this period, 1182 total shoulder arthroplasties and 231 hemiarthroplasties were performed at our institution for patients with osteoarthritis, regardless of age. Our study represents 5% of these patients, a similar rate to other institutions.[16] All total shoulder arthroplasties and hemiarthroplasties were included in the Kaplan-Meier survival analysis, with a revision procedure defined as the endpoint. For clinical outcome assessment, all shoulders were included in the analysis (including all revised shoulders as well as those unrevised with at least 2 years of clinical follow-up). Thus, 46 total shoulder arthroplasties and 20 hemiarthroplasties with complete preoperative evaluation, operative records, and minimum 2-year follow-up or follow-up until revision were included in the clinical analysis (mean, 7.0 years; range, 9 months to 20.2 years). For radiographic outcome assessment, 47 shoulders met the inclusion criteria of complete radiographic records and a minimum of 2 years of clinical and radiographic follow-up or follow-up until revision. These comprised 34 total shoulder arthroplasties and 13 hemiarthroplasties, with a mean radiographic follow-up of 6.6 years (range, 9 months to 20.2 years). Indications for implantation of a glenoid component were unchanged over the duration of the study period. The decision to implant a glenoid component was an individualized decision jointly made by the patient and surgeon. Factors that weighed in this decision included the patient's wish for more complete assurance about pain relief, the patient's desired activity level, the structural status of the glenoid, and the ability to balance the joint surface with or without a glenoid component. None of the total shoulder arthroplasty patients and four of the hemiarthroplasty patients had data previously reported in a study of the outcomes of hemiarthroplasty for osteoarthritis, regardless of age.[15]

Total shoulder arthroplasty

The mean age of patients who underwent total shoulder arthroplasty was 49 years (range, 21-55 years). There were 13 women and 33 men. Twenty-one shoulders had undergone a previous procedure. The previous procedures included 7 arthroscopic debridements, 3 SLAP (superior labrum anterior-posterior) repairs (1 of which included a concomitant rotator cuff repair, which was intact at the time of arthroplasty), 3 subacromial decompressions with acromioplasty, 2 rotator cuff repairs (1 intact at arthroplasty and 1 with recurrent partial-thickness tear), 1 distal clavicle excision, 1 capsular plication, and 1 Magnusson-Stack repair. In addition, 2 patients had a remote history of proximal humeral fracture, neither of which resulted in significant morphologic alteration of the glenohumeral joint as viewed on standard radiographs.

Among the 46 shoulders having a total shoulder arthroplasty and complete preoperative evaluation, operative records, and minimum 2-year follow-up or follow-up until revision, the mean length of clinical follow-up was 6.0 years, with less than 5 years of follow-up in 24 shoulders, between 5 and 10 years in 12 shoulders, between 10 and 15 years in 8 shoulders, and greater than 15 years in 2 shoulders.

Hemiarthroplasty

The mean age of patients who underwent hemiarthroplasty was 49 years (range, 26-55 years). There were 4 women and 16 men. Four shoulders had undergone a previous procedure. Previous surgical procedures included 1 arthroscopic debridement, 1 Bristow procedure, 1 procedure for instability (not otherwise specified), and 1 rotator cuff repair (repairable full-thickness tear noted at the time of arthroplasty). The procedures for instability were performed remotely from the arthroplasty.

Among the 20 shoulders having hemiarthroplasty and complete preoperative evaluation, operative records, and minimum 2-year follow-up or follow-up until revision, the mean length of clinical follow-up was 9.3 years, with less than 5 years of follow-up in 6 shoulders, between 5 and 10 years in 5 shoulders, between 10 and 20 years in 8 shoulders, and greater than 20 years in 1 shoulder.

Operative data

The condition of the rotator cuff was categorized intraoperatively by the surgeon as intact, thin (partial-thickness tear), or torn (presence of a full-thickness tear). Among patients who underwent total shoulder arthroplasty, the rotator cuff was intact in 37 shoulders and thin in 7 shoulders. Two patients had repairable full-thickness tears at the time of arthroplasty. For patients undergoing hemiarthroplasty, the rotator cuff was intact in 12 shoulders and thin in 6 shoulders. Two patients had repairable full-thickness tears at the time of surgery. Implants used for total shoulder arthroplasty were as follows: 42 Cofield humeral components, 41 of which were uncemented and 1 was cemented (Smith & Nephew, Memphis, TN); 4 Aequalis humeral components, all cemented (Tornier, Montbonnot, France); 40 Cofield glenoid components, 39 cemented and 1 ingrowth; 4 Aequalis glenoid components, all cemented; and 2 Neer glenoid components, both cemented (Kirschner Medical, Fairlawn, NJ). The hemiarthroplasty implants were as follows: 13 Cofield humeral components, all uncemented; 5 Bio-Modular components, all uncemented (Biomet, Warsaw, IN); 1 Neer component, uncemented (3M, St Paul, MN); and 1 cemented

Howmedica stem (Mahwah, NJ). Bone grafting was performed for the humerus in 1 shoulder receiving hemiarthroplasty and 1 receiving total shoulder arthroplasty. The glenoid was bone grafted in 2 shoulders receiving total shoulder arthroplasty. Postoperative rehabilitation was not different for the 2 groups, with patients beginning physical therapy for initiation of passive shoulder motion on the first postoperative day. Patients then began active assisted motion at 4 to 6 weeks postoperatively and then strengthening (isometrics, resistance bands) at 8 to 10 weeks.

Evaluation

Patients are asked to return for an examination, interview, and radiographic evaluation at regular follow-up intervals. Patients who are unable to return for evaluation are sent a standardized, validated[17] questionnaire to evaluate their function and satisfaction. In addition, patients are requested to have a local orthopaedic surgeon send us the results of a clinical examination and recent radiographs. For 32 patients, the most recent clinical information was obtained via questionnaire.

At our institution, clinical assessment of all patients who have undergone shoulder surgery is recorded by use of a standard shoulder analysis sheet. Pain is graded according to scales previously published by Cofield[5] and Neer et al,[12] where 1 indicates no pain; 2, slight pain; 3, pain after unusual activity; 4, moderate pain; and 5, severe pain. Active abduction and passive external rotation were recorded in degrees. Internal rotation was the most posterior vertebral segment that could be reached by the thumb.

Three projections were used for radiographic analysis: an axillary radiograph and 40° posterior oblique radiographs with internal and external rotation of the humerus. We reviewed these, and a consensus was reached. Radiographs for patients who underwent total shoulder arthroplasty were reviewed to determine the presence of glenohumeral subluxation, periprosthetic lucency, and component shift in position. Radiographs for patients who underwent hemiarthroplasty were reviewed to determine glenohumeral subluxation, periprosthetic lucency, component shift in position, and glenoid erosion.

Preoperative glenoid morphology was assessed when possible according to the method of Walch et al.[21] Among patients receiving total shoulder arthroplasty, there were 12 with type A glenoid morphology, 12 with a type B1 glenoid, 9 with a type B2 or biconcave glenoid, and 1 with a type C glenoid. Among those receiving hemiarthroplasty, 8 patients had type A glenoid morphology, 2 had type B1, and 1 had type C.

Periprosthetic lucency was graded as follows: 0, none; 1, 1 mm incomplete; 2, 1 mm complete; 3, 1.5 mm incomplete; 4, 1.5 mm complete; or 5, 2 mm complete. Glenohumeral subluxation was evaluated with regard to direction and degree and was graded as follows: none, mild (center of prosthetic head translated $<25\%$ relative to center of glenoid component), moderate (center of prosthetic head translated 25%-50% relative to center of glenoid component), or severe (center of prosthetic head translated $>50\%$ relative to center of glenoid component). Glenoid erosion was graded as none, mild (erosion into subchondral bone), moderate (medialization of glenoid subchondral bone with hemispheric conforming deformation of glenoid), or severe (complete hemispheric deformation of glenoid with bone loss to base of coracoid process). Component shift was either present or absent.

Statistical methods

Descriptive statistics are reported as mean (range) for continuous measures and number (percentage) for discrete assessments. All shoulders were included in the estimation and followed from the date of primary total shoulder arthroplasty or hemiarthroplasty to either revision or last follow-up. We estimated implant survival free of revision with the Kaplan-Meier method, reporting the estimate and 95% confidence interval (CI). For clinical outcomes, all 66 shoulders were included in clinical outcome assessments (all revised shoulders and those with at least 2 years of clinical follow-up). A paired t test was used to compare preoperative versus postoperative changes in pain, active abduction, and external and internal rotation. Postoperative assessments were made at last clinical contact. In patients with a revision, the last clinical information before revision was used. The radiographic outcomes of subluxation and humeral lucency were assessed in the same way as for clinical outcomes. In these assessments, 47 shoulders were included, 34 total shoulders and 13 hemiarthroplasties—all revised shoulders or those with at least 2 years of radiographic follow-up. In patients with a revision, the last radiographic information before revision was used. The α level was set at .05 for statistical significance.

Results

Complications and revisions

Five perioperative complications occurred in the forty-six shoulders undergoing total shoulder arthroplasty. These included 3 brachial plexopathies, 2 of which completely resolved; 1 minimally displaced fracture of the glenoid seen on postoperative radiographs treated in a spica cast; and 1 lower extremity deep vein thrombosis. There were 3 perioperative complications that occurred in the 20 shoulders receiving hemiarthroplasty: 1 wound hematoma requiring evacuation, irrigation, and debridement and 2 transient brachial plexopathies, which recovered completely.

Three of the patients who underwent total shoulder arthroplasty required revision surgery: one at 8.6 years for coagulase-negative *Staphylococcus* infection, one at 11.9 years for an infection with *Propionibacterium acnes*, and one at 12.3 years after index arthroplasty for glenoid loosening. Six of the shoulders with hemiarthroplasty required revision surgery. Five underwent revision for painful glenoid arthritis to a total shoulder arthroplasty. The mean time to revision for glenoid arthritis was 4.5 years (range, 1.3-13.5 years). One patient in the hemiarthroplasty group underwent revision at 9 months postoperatively for infection with *P acnes*. This patient had a postoperative wound hematoma requiring evacuation, irrigation, and debridement. The estimated revision-free survival rate for total shoulder arthroplasty was 100% at 5 years and 92% (95% CI, 77%-100%) at 10 years. The estimated revision-free survival rate for hemiarthroplasty was 85% (95% CI, 71%-100%) at 5 years and 72% (95% CI, 54%-97%) at 10

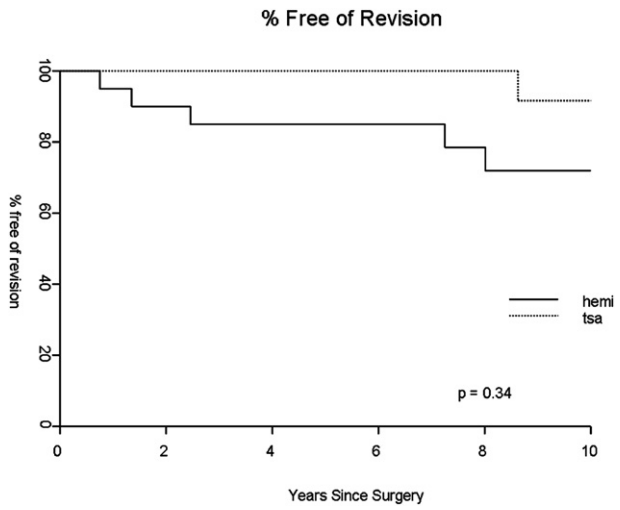

Figure 1 Kaplan-Meier survival curve for all patients aged 55 years or younger receiving shoulder arthroplasty for glenohumeral osteoarthritis. The estimated revision-free survival rate for total shoulder arthroplasty (*tsa*) was 100% at 5 years and 92% (95% CI, 77%-100%) at 10 years. The estimated revision-free survival rate for hemiarthroplasty (*hemi*) was 85% (95% CI, 71%-100%) at 5 years and 72% (95% CI, 54%-97%) at 10 years.

years (Figure 1). There was not a statistically significant difference in implant survival between total shoulder arthroplasty and hemiarthroplasty ($P = .34$). The 5 hemiarthroplasties revised to total shoulder arthroplasties had Cofield components, and the total shoulder arthroplasty revised for glenoid loosening had a Cofield cemented all-polyethylene component.

Preoperative variables were assessed for their association with implant survival. No statistical association was seen for gender ($P = .78$), age at the time of surgery ($P = .58$), status of the rotator cuff ($P = .21$), glenoid type ($P = .20$), or prior surgical procedure ($P = .64$).

Pain and motion

Patients had significant pain relief and increases in shoulder elevation and external rotation with shoulder arthroplasty. Total shoulder arthroplasty patients had a mean decrease in pain score of 2.4, from a mean of 4.4 preoperatively to a mean of 2.0 at most recent follow-up, with 7 patients having moderate or severe pain at the time of most recent follow-up. Hemiarthroplasty patients had a mean decrease in pain score of 1.5, from a mean of 4.5 preoperatively to a mean of 2.9 at most recent follow-up, with 7 patients having moderate to severe pain at the time of last follow-up. The improvement in pain score was statistically different between patients receiving total shoulder arthroplasty and hemiarthroplasty ($P = .02$) (Figure 2A).

For patients receiving total shoulder arthroplasty, the mean improvements in motion were as follows: mean active elevation of 46°, from 105° preoperatively to 151° at most recent follow-up (Figure 2B), and mean external rotation of 24°, from 23° preoperatively to 48° at most recent follow-up (Figure 2C). The mean improvements in motion for patients receiving hemiarthroplasty were as follows: mean active elevation of 9°, from 103° preoperatively to 114° at most recent follow-up (Figure 2B), and mean external rotation of 14°, from 23° preoperatively to 38° at most recent follow-up (Figure 2C). The mean improvements in motion were not statistically different for patients receiving total shoulder arthroplasty and hemiarthroplasty ($P = .06$ for active elevation and $P = .20$ for external rotation). However, the final mean active elevation was statistically greater for patients receiving total shoulder arthroplasty (151° vs 114°, $P = .005$). Internal rotation was minimally increased after surgery for both groups (sacrum to L4 for total shoulder arthroplasty and sacrum to L5 for hemiarthroplasty).

Of the 5 patients who underwent revision from hemiarthroplasty to total shoulder arthroplasty, 4 had at least 1 year of clinical follow-up after revision (mean, 5.3 years; range, 1-12 years). The mean active elevation for these patients was 130° (range, 90°-160°), and the mean pain score was 2.75 (range, 1-4).

Patient satisfaction

At the time of their most recent follow-up, or last follow-up before revision, 40 of the 46 patients receiving total shoulder arthroplasty (87%) felt that they were better or much better than preoperatively, compared with 13 of the 20 patients receiving hemiarthroplasty (65%). This difference was statistically significant ($P = .05$).

Radiographic outcomes

Of the 34 total shoulder arthroplasty patients who had complete radiographic records for evaluation, 17 had evidence of subluxation on recent radiographs. It was classified as mild in 12 shoulders (posterior in 6, superior in 3, anterior in 2, and both superior and posterior in 1), moderate in 4 shoulders (posterior in 2, superior in 1, and anterior in 1), and severe in 1 shoulder (posterior). All shoulders with moderate or severe subluxation had type B glenoid morphology. Nine of the shoulders had humeral lucency; however, only two shoulders had a 1.5-mm complete lucency or greater. One of these two shoulders and one other shoulder had a shift of humeral component position. Both of the humeral components that showed tilt and/or subsidence were uncemented. Twenty-one of the glenoid components showed periprosthetic lucency; this was 1.5-mm complete or greater in six shoulders. Two of these shoulders and four others had tilting or migration of the glenoid component. Five of the six patients with moderate or severe glenoid periprosthetic lucency had type B glenoid morphology preoperatively. A clinical example of radiographic failure at midterm follow-up is shown in Figure 3. In contrast, other patients have had excellent long-term radiographic results, as shown in Figure 4.

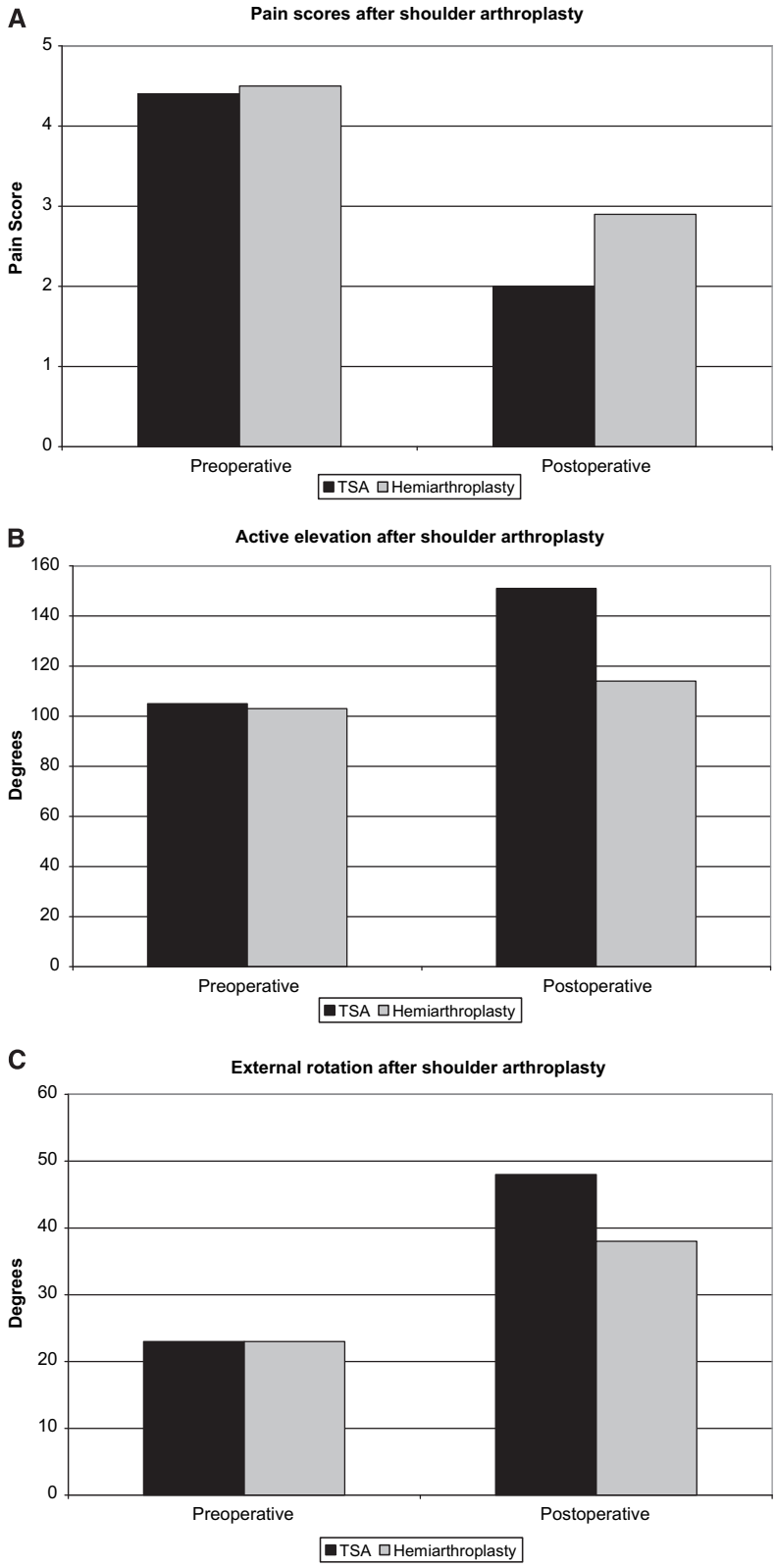

Figure 2 Preoperative and final postoperative results for pain (**A**), active elevation (**B**), and external rotation (**C**) for patients undergoing total shoulder arthroplasty (*TSA*) and hemiarthroplasty. Patients undergoing total shoulder arthroplasty had significantly less pain and greater active elevation at final follow-up.

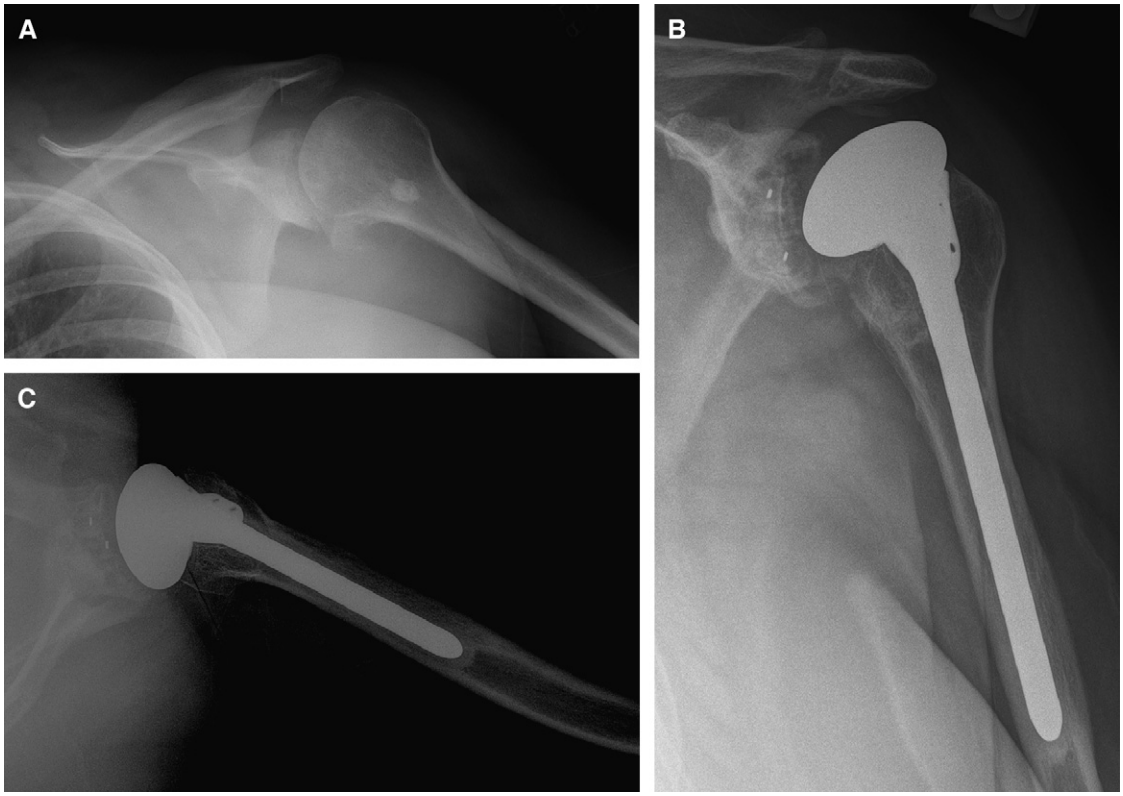

Figure 3 (**A**), Preoperative radiograph of a 49-year-old woman before total shoulder arthroplasty. She had severe pain, active elevation to 100°, and passive external rotation of 30°. (**B**) and (**C**), Radiographs taken 5.5 years after surgery. The patient reported moderate pain and showed 100° of active elevation and 40° of external rotation. Periprosthetic glenoid lucency and central migration are noted.

Of the 13 hemiarthroplasty patients who had complete radiographic records for review, 7 had evidence of subluxation on the most recent films. It was classified as mild in 5 shoulders (superior in 2 and posterior in 3) and moderate in 2 shoulders (superior in 1 and superior and posterior in 1). One of the shoulders with moderate subluxation had type B glenoid morphology preoperatively. Three of the shoulders had humeral periprosthetic lucency; however, no shoulder had a 1.5-mm complete lucency or greater, and no shoulders had tilt or subsidence of the implant. All of the shoulders had erosion of the glenoid. Seven of the thirteen shoulders had mild glenoid erosion. Erosion was graded as moderate in 4 shoulders and severe in 2. The location of erosion was central in 8 shoulders, posterior in 3, and superior in 2. All patients with posterior erosion had type B or C glenoid morphology.

Discussion

There have been few data available to guide clinical decision making for the young patient with glenohumeral osteoarthritis. Much of the previous work has addressed shoulder arthroplasty for osteoarthritis regardless of age[2,6,8,13,15,23] or arthroplasty in the young patient with varied diagnoses.[3,19,20] Recent articles have reported favorable short-term to midterm results for total shoulder arthroplasty in young to middle-aged patients with osteoarthritis[14] or chondrolysis.[11] In addition, other work has analyzed the outcomes of younger patients receiving humeral head resurfacing with[7,10,22] or without[1] interposition soft-tissue grafting of the glenoid. The present study reports on the clinical and radiographic results as well as implant survival with intermediate- to long-term follow-up (mean, 7.0 years) in patients aged 55 years or younger with osteoarthritis who have undergone shoulder arthroplasty.

There was a high rate of revision surgery or radiographic failure in this group of patients, particularly for those undergoing hemiarthroplasty. The projected 10-year survival rate of implants was 72% for those receiving hemiarthroplasty, based on Kaplan-Meier analysis. The most common reason for revision surgery was progressive glenoid arthritis in patients who had undergone hemiarthroplasty, with revision to a total shoulder arthroplasty, similar to previous reports.[15] Three other patients underwent revision for infection. One patient underwent revision of total shoulder arthroplasty for component loosening. These results argue against the idea that young patients with osteoarthritis are poor candidates for total shoulder arthroplasty because of progressive wear and failure of the glenoid component. However, 6 of 34 patients receiving total shoulder arthroplasty for whom complete radiographic records were available did have moderate or severe lucency

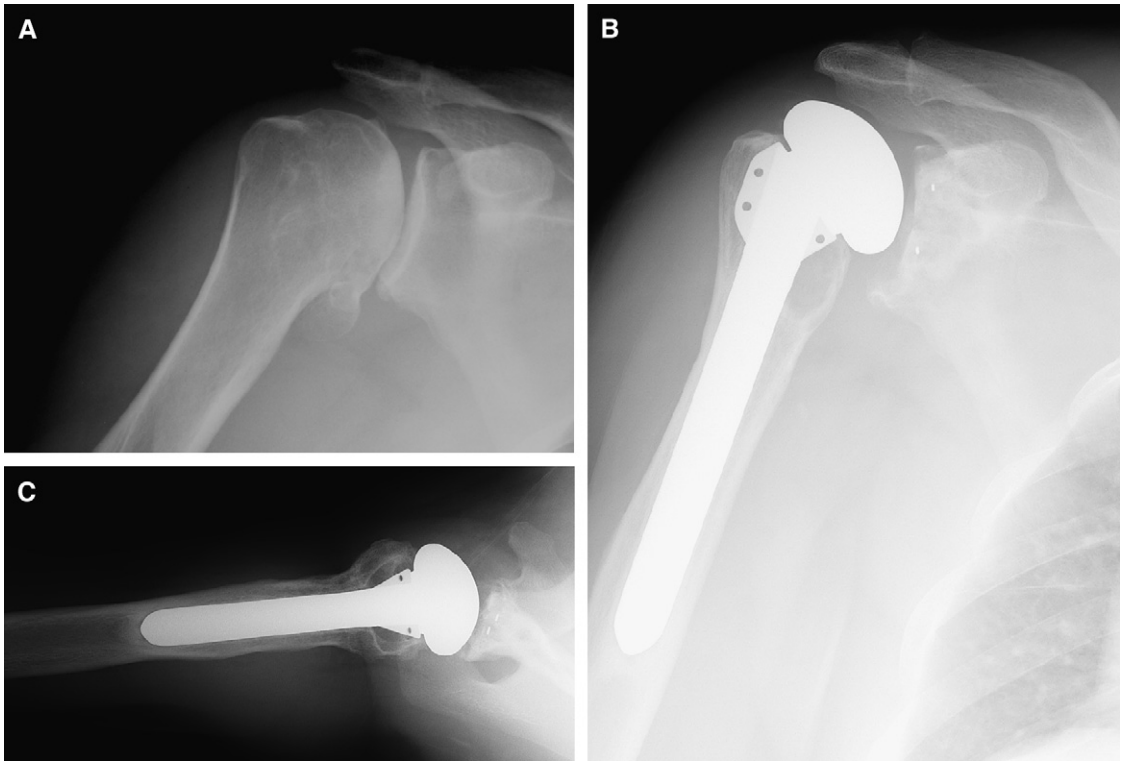

Figure 4 (**A**), Preoperative radiograph of a 48-year-old man before total shoulder arthroplasty. He had severe pain, active elevation to 70°, and passive external rotation of 0°. (**B**) and (**C**), Radiographs taken 7.8 years after surgery. The patient reported pain only after unusual activity and showed 140° of active elevation and 45° of external rotation. The glenoid component remained well fixed. However, proximal humeral osteolysis was present, which is concerning for a young patient.

around the glenoid component and another 4 had tilting or migration of the glenoid component, which is concerning for impending clinical failure. The decision for revision of a potentially loose glenoid component was based on patient symptoms, not radiographic changes alone.

Shoulder arthroplasty seems to be rarely indicated in young patients. Our relatively small study size and intermediate- to long-term follow-up limit the conclusions that may be drawn regarding the superiority of shoulder hemiarthroplasty versus total shoulder arthroplasty. However, pain relief, satisfaction, and active elevation were superior for those who underwent total shoulder arthroplasty. The small number of revisions in the group (9) limits statistical analysis of implant survival; however, our data favor the survival of total shoulder arthroplasty. This is in agreement with past reports that showed a relatively high rate of revision of hemiarthroplasty to total shoulder arthroplasty because of progressive glenoid arthritis[15]; however, other data suggest that some patients undergoing hemiarthroplasty for glenohumeral osteoarthritis have excellent long-term implant survival.[23] Analysis of our small subset of patients who underwent revision of hemiarthroplasty to total shoulder arthroplasty shows variable outcomes, with 2 of 4 patients for whom at least 1 year of clinical follow-up is available still reporting moderate pain. This is consistent with previous reports of frequently unsatisfactory results among this patient population.[4,9,18]

Limitations of the study include those inherent in retrospective reviews. In addition, complete radiographic follow-up was not available for many patients. This is likely because of the duration of the data collection period and the tertiary referral nature of our practice, with the difficulty some patients have in returning for radiographs. This limited our ability to analyze radiographic failure, which should correlate with and predict clinical failure. In addition, follow-up was longer on average for hemiarthroplasty (9.3 years) versus total shoulder arthroplasty (6.0 years), which may bias the data toward more failures in the hemiarthroplasty group. The rate of radiographic failure exceeded our rate of revision for the total shoulder arthroplasty group, and longer-term follow-up would likely show additional patients who went on to revision. Another source of potential bias is the effect of activity level on the outcome of the arthroplasty. Predicted activity level is one of our preoperative considerations in the decision to implant a glenoid component, with patients having heavier physical demands being more likely to receive a hemiarthroplasty. We were unable to study activity level after surgery because of the retrospective nature of our data collection.

The data from this study indicate that there is satisfactory intermediate- to long-term pain relief and improvement in motion with shoulder arthroplasty in young patients with osteoarthritis. However, there are frequent radiographic changes affecting the glenoid component with

a relatively high rate of revision surgery, most commonly for progressive glenoid arthritis after hemiarthroplasty. Young patients with glenohumeral arthritis should be appropriately counseled regarding the favorable expectations for pain and function and the less favorable risk of failure after either partial or total shoulder arthroplasty.

Conclusions

1. Shoulder arthroplasty for osteoarthritis in patients aged 55 years or younger is rarely indicated, and rates of revision and component loosening are high.
2. Better pain relief, motion, and patient satisfaction were seen with total shoulder arthroplasty versus hemiarthroplasty.

Disclaimer

Robert Cofield, MD, receives royalties from Smith & Nephew and DJO/Aircast (Vista, CA). John W. Sperling, MD, receives royalties from Biomet. However, no outside funding was used for any part of this study.

References

1. Bailie DS, Llinas PJ, Ellenbecker TS. Cementless humeral resurfacing arthroplasty in active patients less than fifty five years of age. J Bone Joint Surg Am 2008;90:110-7. doi:10.2106/JBJS.F.01552
2. Bryant D, Litchfield R, Sandow M, Gartsman GM, Guyatt G, Kirkley A. A comparison of pain, strength, range of motion and functional outcomes after hemiarthroplasty and total shoulder arthroplasty in patients with osteoarthritis of the shoulder. A systematic review and meta-analysis. J Bone Joint Surg Am 2005;87:1947-56. doi:10.2106/JBJS.D.02854
3. Burroughs PL, Gearen PF, Petty WR, Wright TW. Shoulder arthroplasty in the young patient. J Arthroplasty 2003;18:792-8. doi:10.1016/S0883-5403(03)00253-5
4. Carroll RM, Izquierdo R, Vazquez M, Blaine TA, Levine WN, Bigliani LU. Conversion of painful hemiarthroplasty to total shoulder arthroplasty: long-term results. J Shoulder Elbow Surg 2004;13:599-603. doi:10.1016/j.jse.2004.03.016
5. Cofield RH. Total shoulder arthroplasty with the Neer prosthesis. J Bone Joint Surg Am 1984;66:899-906.
6. Edwards TB, Kadakia NR, Boulahia A, Kempf JF, Boileau P, Nemoz C, et al. A comparison of hemiarthroplasty and total shoulder arthroplasty in the treatment of primary glenohumeral osteoarthritis: results of a multicenter study. J Shoulder Elbow Surg 2003;12:207-13. doi:10.1016/S1058-2746(02)86804-5
7. Elhassan B, Ozbaydar M, Diller D, Higgins LD, Warner JP. Soft tissue resurfacing of the glenoid in the treatment of glenohumeral arthritis in active patients less than fifty years old. J Bone Joint Surg Am 2009;91:419-24. doi:10.2106/JBJS.H.00318
8. Gartsmann GM, Roddey TS, Hammerman SM. Shoulder arthroplasty with or without resurfacing of the glenoid in patients who have osteoarthritis. J Bone Joint Surg Am 2000;82:26-34.
9. Hattrup SJ. Revision total shoulder arthroplasty for painful humeral head replacement with glenoid arthrosis. J Shoulder Elbow Surg 2009;18:220-4. doi:10.1016/j.jse.2008.09.006
10. Lee KT, Bell S, Salmon J. Cementless surface replacement arthroplasty of the shoulder with biologic resurfacing of the glenoid. J Shoulder Elbow Surg 2009;18:915-9. doi:10.1016/j.jse.2009.01.014
11. Levy JC, Virani NA, Frankle MA, Cuff D, Pupello DR, Hamelin JA. Young patients with shoulder chondrolysis following arthroscopic surgery treated with total shoulder arthroplasty. J Shoulder Elbow Surg 2008;17:380-8. doi:10.1016/j.jse.2007.11.004
12. Neer CS, Watson KC, Stanton FJ. Recent experience in total shoulder replacement. J Bone Joint Surg Am 1982;64:319-37.
13. Radnay CS, Setter KJ, Chambers L, Levine WN, Bigliani LU, Ahmad CS. Total shoulder replacement compared with humeral head replacement for the treatment of primary glenohumeral osteoarthritis: a systematic review. J Shoulder Elbow Surg 2007;16:396-402. doi:10.1016/j.jse.2006.10.017
14. Raiss P, Aldinger PR, Kasten P, Rickert M, Loew M. Total shoulder replacement in young and middle aged patients with glenohumeral osteoarthritis. J Bone Joint Surg Br 2008;90:764-9. doi:10.1302/0301-620X.90B6.20387
15. Rispoli DM, Sperling JW, Athwal GS, Schleck CD, Cofield RH. Humeral head replacement for the treatment of osteoarthritis. J Bone Joint Surg Am 2006;88:2637-44. doi:10.2106/JBJS.E.01383
16. Saltzman MD, Mercer DM, Warme WJ, Bertelsen AL, Matsen FA. Comparison of patients undergoing primary shoulder arthroplasty before and after the age of fifty. J Bone Joint Surg Am 2010;92:42-7. doi:10.2106/JBJS.I.00071
17. Smith AM, Barnes SA, Sperling JW, Farrell CM, Cummings JD, Cofield RH. Patient and physician-assessed shoulder function after arthroplasty. J Bone Joint Surg Am 2006;88:508-13. doi:10.2106/JBJS.E.00132
18. Sperling JW, Cofield RH. Revision total shoulder arthroplasty for the treatment of glenoid arthrosis. J Bone Joint Surg Am 1998;80:860-7.
19. Sperling JW, Cofield RH, Rowland CM. Minimum fifteen-year follow-up of Neer hemiarthroplasty and total shoulder arthroplasty in patients aged fifty years or younger. J Shoulder Elbow Surg 2004;13:604-13. doi:10.1016/j.jse.2004.03.013
20. Sperling JW, Cofield RH, Rowland CM. Neer hemiarthroplasty and Neer total shoulder arthroplasty in patients fifty years old or less. J Bone Joint Surg Am 1998;80:464-73.
21. Walch G, Badet R, Boulahia A, Khoury A. Morphologic study of the glenoid in primary glenohumeral osteoarthritis. J Arthroplasty 1999;14:756-60. doi:10.1016/S0883-5403(99)90232-2
22. Wirth M. Humeral head arthroplasty and meniscal allograft resurfacing of the glenoid. J Bone Joint Surg Am 2009;91:1109-19. doi:10.2106/JBJS.H.00677
23. Wirth M, Tapscott S, Southworth C, Rockwood C. Treatment of glenohumeral arthritis with a hemiarthroplasty: a minimum five-year follow-up outcome study. J Bone Joint Surg Am 2006;88:964-73. doi:10.2106/JBJS.D.03030