



Outcomes of total shoulder arthroplasty in patients younger than 65 years: a systematic review

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Background: Despite concerns about the longevity of total shoulder arthroplasty (TSA) in young patients, it remains an attractive option because of the absence of superior options.

Methods: A systematic review was performed using searches of PubMed, Embase, and Cochrane databases. English-language studies were identified with search terms “total shoulder arthroplasty” (title/abstract) or “shoulder replacement” (title/abstract) and “young” (title/abstract) or “under 65 years of age” (title/abstract). Duplicate studies, studies not reporting outcomes, and those using a humeral resurfacing technique were excluded. Outcomes of interest included pain, range of motion, patient-reported outcome scores, patient satisfaction, radiographic changes, complication and revision rates, and implant survival.

Results: Six studies met inclusion criteria. Significant improvements in pain, range of motion, and patient-reported outcomes were found across all studies that reported these measures. At an average of 9.4 years, 17.4% underwent revision and 54% had glenoid lucency. Whereas glenoid loosening is the most common reason for revision (52%), overall implant survivorship was reported at 60% to 80% at 10- to 20-year follow-up. Outcome measures including the Constant, American Shoulder and Elbow Surgeons, and Simple Shoulder Test scores were reported, with generally satisfactory but not excellent results between 3 and 10 years from surgery.

Conclusions: Although there is concern with periprosthetic radiolucency and glenoid loosening in the young patient (<65 years) undergoing TSA, overall low revision rates and high implant survivorship are reported in the current literature. Whereas the patient-reported outcomes are inferior to those of the overall TSA population, there is significant improvement from baseline levels in young patients with glenohumeral arthritis.

Level of evidence: Level IV; Systematic Review

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This paper is exempt from Institutional Review Board review as it is a review article.

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Total shoulder arthroplasty (TSA) has been accepted as a reliable treatment with predictable pain relief and functional improvement^{15,19,27} for glenohumeral arthritis in the absence of rotator cuff deficiency. However, in younger patients, concern persists about lower outcomes and component

longevity because of differing stresses that younger patients may place on shoulder arthroplasties. In addition, young patients more frequently have more complex pathologic conditions and increased self-assessed disability preoperatively.⁴¹ Despite this, many young patients undergoing TSA have been shown to remain active⁵² and in some cases even to increase their sport participation.²⁹ These patients are also more likely to be in their working prime, further heightening the need to produce consistent and reliable results.

Previous reports from the hip^{2,46} and knee^{12,22,39} literature have shown successful results and long-term outcomes after arthroplasty in young patients, leading to increased acceptance after failed conservative management. However, the role of prosthetic replacement in the surgical treatment of young patients with glenohumeral arthritis has been less defined.^{11,21} Hemiarthroplasty (HA) vs. TSA is a point of ongoing debate in managing glenohumeral arthritis in the younger patient. In older populations, it is accepted that TSA provides a more reliable reduction in pain and improved functional outcomes compared with HA.^{4,13,15,36,48} However, with concern particularly about the longevity of the glenoid component, some have offered alternative strategies, such as concentric reaming of the glenoid (ream and run) with HA,^{16,40} but the durability of this option remains unknown. Another potential alternative treatment option proposed has consisted of various glenoid softtissue interposition grafts combined with HA.^{5,14,23,28,32,50} The results from these endeavors have been mixed, with at least 1 study finding an unacceptably high failure rate of 51% at follow-up of <4 years,⁴⁷ contributing to the relative abandonment of biologic resurfacing. Given these shortcomings, TSA is an attractive option even in the young population. This review was undertaken to analyze the current literature on outcomes of TSA in young patients and to provide areas for further improvement in this population.

Methods

A systematic review was performed using guidance from the checklist of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).²⁶ Using PubMed, Embase, and Cochrane Central Register of Controlled Trials databases, 2 reviewers conducted the search with terms “total shoulder arthroplasty” (title/abstract) or “shoulder replacement” (title/abstract) and “young” (title/abstract). Titles and abstracts were reviewed for relatedness to the study question. English-language studies on human subjects were selected, and level I to level IV evidence³⁵ was considered for review. No restrictions were placed on publication date, study design, or length of follow-up. Medical conference abstracts, epidemiologic studies, and imaging studies were excluded.

After appropriate studies were identified on the basis of title and abstract, full texts were reviewed. Among studies reporting heterogeneous treatments (ie, HA and TSA), only those that separately reported outcomes for TSA were included. All underlying causes of glenohumeral arthritis were included; acute fractures were excluded. Studies reporting on outcomes after implantation of a humeral resurfacing implant were excluded, as were duplicate studies of same

patient cohorts. Among studies reporting mean ages <65 years, ranges were verified to ensure that all patients were under this restriction. Full-text references were reviewed to assess for any previously unidentified studies related to the study topic. A flow diagram summarizing this selection algorithm can be seen in [Figure 1](#). Outcomes of interest included rates of complication and revision, component survivorship, range of motion, pain, outcome scores, and patient satisfaction. When possible, weighted averages were obtained for like outcome variables.

Results

Six studies met the inclusion criteria and were further analyzed. A series of publications conducted at the Mayo Clinic were identified, and the most recent⁴³ of these 3 studies⁴³⁻⁴⁵ was included. These series included varied diagnoses; a separate study³ from the same center during a distinctly different inclusion period studied only those with glenohumeral osteoarthritis and therefore was included as a separate patient cohort. Of the remaining 4 studies included, 2 studies^{10,37} focused solely on patients with primary glenohumeral osteoarthritis, whereas the others included patients with chondrolysis²⁵ or varied diagnoses⁶ ([Table I](#)). Three^{3,6,43} of the 6 studies included both HA and TSA but reported them separately, allowing extraction of TSA outcomes. All studies included final follow-up data without direct longitudinal comparison to the same cohorts at previous time points.

Pain

Two studies^{3,43} reported on reduction of pain by the visual analog scale, whereas two others^{10,37} reported using the pain component of the Constant-Murley scoring system at the last recorded follow-up ([Table II](#)). A statistically significant decrease in visual analog scale score was found in both studies, with an average decrease from 4.5 to 2.0 at 11.4 years. The Constant-Murley pain score (0 = severe, 15 = no pain) also showed statistically significant pain improvement in the included studies, with an average change from 3.7 to 10.9 at 8.8 years.

Range of motion

Only 1 study⁶ did not include range of motion measurements. The others reported an average improvement from 90° to 130° (+40°) of abduction and from 15° to 39° (+25°) of external rotation. All studies showed >30° of improvement in abduction and at least 20° of improvement in external rotation. Various methods were used to assess internal rotation, with 2 studies^{3,43} using comparisons of vertebral level, whereas a third³⁷ used a numerical system describing the change in vertebral level. One study found no change in vertebral level,⁴³ whereas the others found a 2-level³ and nearly 4-level³⁷ improvement.

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