Systematic Review

Surgical Treatment Options for Glenohumeral Arthritis in Young Patients: A Systematic Review and Meta-analysis

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Purpose: The aim of this study was to compare surgical treatment options for young patients with glenohumeral arthritis. **Methods:** A systematic review of the English-language literature was conducted by searching PubMed, EMBASE, and Scopus with the following term: "(shoulder OR glenohumeral) AND (arthritis OR osteoarthritis) AND (young OR younger)." Studies that reported clinical or radiological outcomes of nonbiologic surgical treatment of generalized glenohumeral arthritis in patients younger than 60 years of age were included. Data were extracted to include study and patient characteristics, surgical technique, outcome scores, pain relief, satisfaction, functional improvement, return to activity, health-related quality of life, complications, need for and time to revision, range of motion, and radiological outcomes. Study quality was assessed with the Modified Coleman Methodology Score. **Results:** Thirty-two studies containing a total of 1,229 shoulders met the inclusion criteria and were included in the review. Pain scores improved significantly more after total shoulder arthroplasty (TSA) than after hemiarthroplasty (HA) ($P < .001$). Patient satisfaction was similar after HA and TSA. Revision surgery was equally likely after HA, TSA, and arthroscopic debridement (AD). Complications were significantly less common after AD than after HA ($P = .0049$) and TSA ($P < .001$). AD and TSA afforded better recovery of active forward flexion and external rotation than did HA. At radiological follow-up, subluxation was similarly common after HA and TSA. **Conclusions:** According to current Level IV data, TSA provides greater improvement of pain and range of motion than does HA in the surgical treatment of young patients with glenohumeral arthritis. AD is an efficacious and particularly safe alternative in the short term for young patients with concerns about arthroplasty. **Level of Evidence:** Level IV, systematic review of Level IV studies.

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Degenerative disease of the glenohumeral joint can cause significant pain and disability. Although surgical treatment with prosthetic replacement has been used with excellent success in the elderly, management in younger patients, especially those with high physical demands, remains controversial.[1,2] The initial management of these patients consists of physical therapy, injections, activity modification, or a combination.[3,4] Surgery is indicated when these conservative measures fail to sufficiently alleviate symptoms. Surgical decision making involves consideration of various nonprosthetic and prosthetic treatments.[2] Although total shoulder arthroplasty (TSA) reliably ameliorates symptoms and improves shoulder function,[5-9] this treatment option may lead to component wear, component loosening, and the need for multiple revisions in young patients.[2,10] Although hemiarthroplasty (HA) may be more attractive to young patients, this technique provides significantly less pain relief and functional improvement than does TSA.[9,11]

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HA with biologic glenoid resurfacing (HA + BR) was introduced as an alternative to TSA in younger active patients with glenohumeral arthritis.[12] A number of tissue sources have been used to resurface the glenoid in conjunction with HA, including fascia lata autograft,[13] anterior capsule,[13] lateral meniscus allograft,[14] and Achilles tendon allograft.[10] HA with concentric glenoid reaming, also known as ream and run (R & R),[15] avoids potential concerns about the durability of soft tissue interposition.[16] Arthroscopic debridement (AD) represents a joint-preserving approach that also effectively addresses symptom-producing pathologic conditions aside from the degenerative disease, including loose bodies, biceps tenosynovitis, and disease of the glenoid labrum or rotator cuff, or both.[17] This strategy can be supplemented with one or more arthroscopic procedures, including chondroplasty, capsular release, subacromial decompression, and biceps tenotomy or tenodesis.[17]

The objective of this review was to compare clinical and radiological outcomes across nonbiologic surgical treatment options for glenohumeral arthritis in patients younger than 60 years. It was hypothesized that TSA and AD would provide outcomes superior to other available techniques.

Methods

Eligibility Criteria

The systematic review was performed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Therapeutic studies in human patients were included if they reported outcomes after surgical management of generalized arthritis of the glenohumeral joint in a patient sample with a mean age less than 60 years. Studies that addressed focal chondral defects or other pathologic conditions were excluded. No restrictions were imposed on the publication date, study design, level of evidence, or follow-up interval. Exclusion criteria included case reports or series with a sample size less than 5, laboratory studies, review or technique articles without outcome data, inclusion of heterogeneous procedures without segregation of outcome data, and analysis of the same cohort of patients across multiple studies.

Literature Search

Two independent reviewers (E.T.S., R.M.) searched PubMed, EMBASE, and Scopus to identify relevant English-language studies. The search term was as follows: "(shoulder OR glenohumeral) AND (arthritis OR osteoarthritis) AND (young OR younger)." The resulting study titles and abstracts were reviewed according to the eligibility criteria. Full articles were procured and reviewed for eligible studies, and their references were manually screened in an effort to identify additional studies that may have been missed. The tables of contents of the past 5 years of the *Journal of Shoulder and Elbow Surgery*, the *Journal of Bone and Joint Surgery, Clinical Orthopaedics and Related Research*, and the *American Journal of Sports Medicine* were also reviewed. A PRISMA trial flow shows the study selection algorithm (Fig 1).

Data Abstraction

Extracted data included study and patient characteristics, surgical technique, outcome scores, pain relief, satisfaction, functional improvement, return to activity, health-related quality of life, complications, need for and time to revision, range of motion, and radiological outcomes. Patients were stratified into the following treatment groups: HA, TSA, and AD. HA + BR was excluded from the quantitative analysis because it is not well accepted in current practice and has shown great heterogeneity in clinical outcomes.[10,16] R & R was also excluded from the analysis because published studies using this technique have been based on a single patient cohort.[15,18-20]

Data Items

Outcome scores of interest were the American Shoulder and Elbow Surgeons (ASES)[21]; Constant[22]; University of California, Los Angeles[23]; Single Assessment Numeric Evaluation[24]; Simple Shoulder Test[25]; Neer[26]; Disabilities of the Arm, Shoulder, and Hand (DASH)[27]; Subjective Shoulder Value[28]; Rowe[29]; and Shoulder Pain and Disability Index[30] scores. Pain relief was computed using aggregated change from baseline values, standardized to a scale of 10 points, from visual analog scale (VAS), ASES, Constant, and Neer and Cofield[31] pain scores. Health-related quality of life was assessed using the 12-item or 36-item Short Form Health Survey[32,33] and the EuroQol score.[34] Range of motion parameters included active forward flexion (FF), active abduction, active external rotation (ER) in the adducted position, and active internal rotation. Radiological outcomes included joint space, radiolucent lines, implant loosening or malalignment, subluxation, periprosthetic lucency, glenoid erosion, humeral head migration, glenoid erosion, and glenoid morphologic characteristics.

Data Synthesis

Data were aggregated when an outcome was homogeneously reported by at least 3 studies per treatment group. Continuous data were analyzed through computation of the mean and standard deviation, which were frequency weighted for the sample size. Data normality was assessed using the Shapiro-Wilk goodness of fit test. Statistical comparisons were conducted with the Kruskal-Wallis nonparametric test with the Tukey post hoc test for analyses of 3 or more groups or with the Wilcoxon nonparametric test for analyses of 2 groups. Dichotomous data were analyzed using the Pearson χ-square test. Statistical significance was defined by $P < .05$. All statistical analyses were performed with JMP