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Effect of glenoid cementation on total shoulder arthroplasty for degenerative arthritis of the shoulder: a review of the New Zealand National Joint Registry

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Background: Despite the lack of literature showing improved results compared with cemented designs, uncemented glenoid components are still commonly used in total shoulder arthroplasty (TSA). Most studies comparing cemented with uncemented glenoids involve small numbers or include patients with inflammatory arthritis.

Methods: New Zealand National Joint Registry data was used to compare the outcomes of uncemented and cemented glenoids in TSA performed for degenerative arthritis. Measured variables were the revision rate and the Oxford Shoulder Score (OSS).

Results: Data were retrieved on 1596 patients, with a mean follow-up 3.5 years (range 2-10.7 years), 1065 of whom had a cemented glenoid. There were no significant differences in any preoperative factors between the 2 groups. The revision rate for uncemented glenoids was 4.4 times higher than for cemented glenoids (1.92 vs 0.44 revisions per 100 component-years, $P < .001$). Age <55 years was an independent risk factor for revision ($P < .001$). The most common reason for revision was rotator cuff wear (35.5%) in the uncemented glenoids and loosening (36.3%) in the cemented glenoids. The difference in the mean OSS between the 2 groups was less than 1 point at 6 months ($P = .109$) and at 5 years ($P = .377$).

Conclusion: Uncemented glenoids had a markedly higher revision rate. Patients aged <55 years have the highest revision rate regardless of glenoid fixation method. The higher revision rate in the uncemented glenoid group persisted when the effect of young age was corrected for. There was no clinically or statistically significant difference in the OSS results for clinical outcome between the two groups.

Level of evidence: Level III, Retrospective Cohort, Treatment Study.

Keywords: Total shoulder arthroplasty; glenoid; uncemented; cemented; revision rate; joint registry; clinical outcome

The New Zealand Health and Disability Ethics Committee (Reference: 13/STH/21) determined this study did not meet the minimum threshold of risk to require a full committee review.

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Total shoulder arthroplasty (TSA) with a cemented glenoid component has been shown to be an effective treatment for glenohumeral arthritis.[8,13,18,20,23] However, concerns have been raised about the presence of radiolucent lines around the glenoid component[3,20,23] and the potential for glenoid loosening. This has been identified as the most common cause for implant failure in TSA.[4] Concerns about loosening around the cement mantle led to the design of metal-backed, bone-ingrowth prostheses to provide more stable fixation than that obtained with a cement–bone interface[5-7,11,12,15,17]

Unfortunately, the results of these metal-backed components in TSA have been largely inferior to those of cemented glenoids.[5,6,11,12,15,17,22] The results of a randomized controlled trial of bone-ingrowth glenoids compared with cemented glenoids led the authors to abandon the use of the uncemented glenoid component at their institution.[5]

The SMR (Systema Multiplana Randelli) uncemented prosthesis (Lima LTO, Udine, Italy) has been reported to show good results in the New Zealand Joint Registry (NZJR) from data collected up to 2008.[16] In 2009, however, the company released the SMR L2, a new version of the glenoid component. The SMR has subsequently had poor results in the Australian Joint Registry, with a high incidence of glenoid component breakage and liner dissociation.[1]

Despite these results, uncemented glenoid components are still used for TSA, with reported survival rates in some studies equivalent to those of cemented TSA.[7] In addition, there is a potential benefit of modularity in the setting of revision due to rotator cuff failure, with the ability to convert an anatomic TSA to a reverse TSA without compromising the fixation of the humeral stem and glenoid baseplate components of the prosthesis.

Almost all studies published on this topic are retrospective case series (Level IV) or involve low patient numbers, or both.[6,7,11,12,15,17,22] The randomized controlled trial[5] comparing cemented with uncemented glenoids did not specify if a power analysis had been performed, but had only 20 patients in each group. Several studies reporting glenoid loosening have included patients with multiple different diagnoses, including avascular necrosis and inflammatory arthritis.[8,11,23]

National joint registries have the potential to generate large patient groups and, therefore, have the statistical power to identify subtle independent effects on outcomes from many different sources. We used data from the NZJR to attempt to determine if the results of TSA for degenerative arthritis using an uncemented glenoid component were different from those of a cemented glenoid.

Materials and methods

New Zealand Joint Registry

The NZJR was established in 1999 and has collected data on shoulder arthroplasty since January 1, 2000. Data are collected for patients throughout New Zealand, with the compliance rate exceeding 95%,[19] An Ethics Committee review process was followed when the NZJR was set up in 1998, and the registry has had ethical approval to collect data since then.[2] The NZJR produces annual reports that are publically available.

Implant survival to revision is recorded as survival per 100 component-years. This unit allows comparison of components that have been implanted for differing lengths of time. The registry records patient functional outcomes using the self-assessed Oxford Surgical Score (OSS), with questionnaires sent to patients 6 months and then 5 years after surgery. The OSS, a validated instrument for assessment of functional outcome,[9] consists of 12 questions scored from 0 to 4, giving a total score of 0 (worst) to 48 (normal function). The registry does not collect radiographic data or preoperative clinical scores.

Patients

Data covering the period between January 1, 2000, and September 30, 2010, was obtained from the NZJR. All patients with a diagnosis of ''Osteoarthritis'', ''Post recurrent dislocation,'' and ''Post old trauma'' who underwent primary total shoulder arthroplasty (TSA) were included. The patients were grouped according to the fixation of the prosthesis components. The cemented group was compared with the uncemented group with respect to the primary outcomes of revision rate and the OSS at 6 months and 5 years.

Statistical analysis

Revision rates are shown using Kaplan-Meier curves and were compared using log-rank tests. Cox proportional hazards regressions were used to compare cemented and uncemented glenoids, allowing for the effects of age on revision rates. The OSS results were compared between groups using 1-way analysis of variance. A 2-tailed P value $< .05$ was used to indicate statistical significance.

Results

Within the 10.75-year interval of the study, 1596 TSAs were performed, of which 1065 had a cemented glenoid and 531 an uncemented component. The median follow-up time was 3.5 years (range, 2-10.7 years). The mean age at the time of surgery was 69.6 years, and 63% of patients were female. Osteoarthritis was the most common single diagnosis, affecting 1530 patients (95.9%), and 120 patients (7.5%) had undergone prior (nonarthroplasty) surgery to the index joint. The most common American Society of Anesthesiologists (ASA) class was grade 2 (59.1%), followed by grade 3 (29.2%) and grade 1 (11.1%). There was no statistically significant difference in age, sex, preoperative diagnosis, prior surgery, or ASA grade between the uncemented glenoid and cemented glenoid groups.

The most commonly used implant combinations are given in Table I.

Implant survival

The revision rates are given in Table II. The number of revisions per 100 component-years in the uncemented glenoid group was 4.4 times higher than that of the cemented glenoid group ($P < .001$). Kaplan-Meier survival