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ORIGINAL ARTICLE

Survival of the pegged glenoid component in shoulder arthroplasty: part II

Paul B. McLendon, MD, Bradley S. Schoch, MD, John W. Sperling, MD, MBA*, Joaquin Sanchez-Sotelo, MD, PhD, Cathy D. Schleck, BS, Robert H. Cofield, MD

Department of Orthopedic Surgery, Mayo Clinic, Rochester, MN, USA

Background: Loosening of the glenoid component is a primary reason for failure of an anatomic shoulder arthroplasty. Pegged glenoids were designed in an effort to outperform keeled components. This study evaluated the midterm clinical and radiographic survival of a single implant design with implantation of an in-line pegged glenoid component and identified risk factors for radiographic loosening and clinical failure.

Materials and methods: There were 330 total shoulder arthroplasties that had been implanted with a cemented, all-polyethylene, in-line pegged glenoid component evaluated with an average clinical follow-up of 7.2 years. Of these shoulders, 287 had presurgical, initial postsurgical, and late postsurgical radiographs (mean radiographic follow-up, 7.0 years).

Results: At most recent follow-up, 30 glenoid components had been revised for aseptic loosening. This translated to a rate of glenoid component survival free from revision for all 330 shoulders of 99% at 5 years and 83% at 10 years. Of 287 glenoid components, 120 were considered loose on the basis of radiographic evaluation. Four humeral components were considered loose. Component survival (Kaplan-Meier) free from radiographic failure at 5 and 10 years was 92% and 43%. Severe presurgical glenoid erosion (Walch A2, B2, C) and patient age <65 years were risk factors for radiographic failure. Late humeral head subluxation was associated with radiographic failure.

Conclusion: Despite the predominant thinking that pegged glenoid components may be superior to keeled designs, midterm radiographic and clinical failure rates were high with this pegged component design, particularly after 5 years. Advanced presurgical glenoid erosion and younger patient age are risk factors for radiographic loosening. Revision rates underestimate radiographic glenoid loosening.

Level of evidence: Level IV; Case Series; Treatment Study

Keywords: Shoulder arthroplasty; pegged glenoids; radiographic survival; revision surgery; shoulder; arthroplasty; glenoids; survival

Anatomic total shoulder arthroplasty (TSA) is a viable surgical option for patients suffering from debilitating end-stage arthritis, with relief from moderate to severe pain achieved in most patients and 10-year survival rates free of revision surgery exceeding 90%.[35] Glenoid component loosening remains a common reason for failure and subsequent

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*Reprint requests: John W. Sperling, MD, MBA, Department of Orthopedic Surgery, Mayo Clinic, 200 First St SW, Rochester, MN 55906, USA.

E-mail address: sperling.john@mayo.edu (J.W. Sperling).

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revision of these implants.[20,23] Considerable attention has been devoted to analyzing radiographs and determining both the prevalence and significance of radiolucent lines, with multiple studies demonstrating that lucencies are common and progress with time.[6,16,17,38] Although revision rates are relatively low, radiographic failure is much more ubiquitous, with 10-year radiographic survival rates as low as 52% for some keeled designs.[39] To date, the majority of the peer-reviewed literature has assessed the survivability of keeled glenoid components. Pegged glenoid components were introduced in an effort to outperform keeled components on the basis of basic science research demonstrating a biomechanical advantage of pegs vs. keels with regard to glenoid loosening.[1,18,24] However, there is little clinical data available in the literature regarding the midterm or long-term survivability of these implants.

This study was conducted to evaluate the long-term survival of a single glenoid component design with 3 in-line pegs implanted at the time of anatomic shoulder arthroplasty and to evaluate factors predicting success or failure. We hypothesized that pegged glenoid components will have similar rates of clinical and radiographic failure compared with previously reported rates for keeled components.

Methods

A query of our department's Total Joint Registry database identified 330 primary anatomic TSAs performed between March 1997 and May 2010 that used a common polyethylene, pegged glenoid component. Survival analysis free of component revision or removal was conducted on all 330 shoulders. These 330 shoulders were observed for an average of 7.2 years (range, 4.0-15.4). Of these, 287 had a full set of radiographs (presurgical, immediate postsurgical, and late postsurgical), with the most recent radiographs being at least 4 years out from surgery. The average follow-up for shoulders with a complete set of radiographs was 7.0 years (range, 4.0-14.3). These 287 patients composed the primary radiographic study group.

There were 141 operations performed in women and 146 in men. The average age of the patient at index TSA was 65 years (range, 21-85). The primary indications for performing shoulder arthroplasty consisted of osteoarthritis (233), inflammatory arthritis (9), post-traumatic arthritis (30), osteonecrosis (5), and other diagnoses (10). The demographics of patients with complete radiographic assessment (287 shoulders) were compared with those of patients with incomplete radiographic follow-up (43 shoulders). The male/female ratio was identical, whereas age at surgery and the distribution of underlying diagnoses were also similar, with osteoarthritis being 81% in both groups.

The Cofield II all-polyethylene pegged component (Smith & Nephew, Memphis, TN, USA) was used in all 330 patients included in the study (Fig. 1). This component was a commonly implanted device during the time of the study through 2008, when newer designs were starting to be used. This component has a 2-mm radial mismatch in association with the Cofield II humeral head, a backside that is rounded and textured, and 3 in-line pegs with grooves. Four surgeons specializing in shoulder surgery performed all cases, with 205 cases performed by a single surgeon. Minimal concentric reaming was performed to maintain as much subchondral bone as possible. The peg holes were prepared using precise instrumentation. Pulsatile lavage was used to cleanse the bone. Cement was vacuum mixed and placed in each peg hole and pressurized to facilitate interdigitation with the native bone. An impactor was used to hold the component still while the cement hardened; 321 of the humeral components (97%) were press fit, and the remaining were cemented. The Cofield II humeral head and stem were used in all but 12 (3.6%) of the cases. In these 12 cases, the Aequalis (Tornier, Bloomington, MN, USA) humeral head and stem was used instead, as this was a single surgeon's preference. Intraoperatively, 34 rotator cuff tears were identified and repaired.

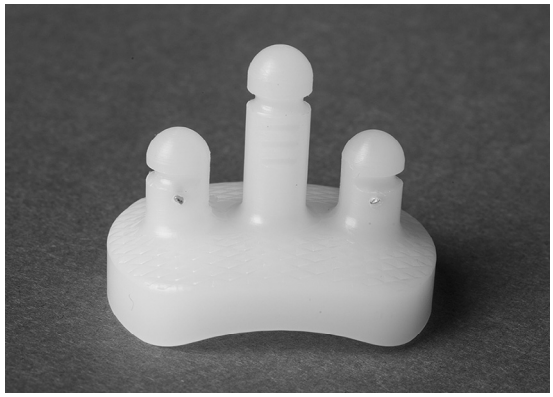

Figure 1 Design of the all-polyethylene glenoid implant used in this study. It has a curved and textured back, 3 in-line pegs with grooves for cement interdigitation, and 3 sizes (small size is shown).

All 330 shoulders were prospectively observed after surgery. Patients were requested to return for a clinical examination and radiographs at 3 months, 1 year, 2 years, and 5 years from surgery, then every 5 years for the life of the prosthesis. If this was not possible, patients were requested to send radiographs and were mailed a validated shoulder questionnaire.[29] If a secondary operation was performed elsewhere, these records were obtained. A set of presurgical, early postsurgical, and late postsurgical radiographs including axillary and true anteroposterior views of the shoulder in internal and external rotation were required for a shoulder to be included in the group with complete radiographic follow-up. "In-growth views" using fluoroscopic positioning were also obtained to allow further critical analysis of the interfaces between the glenoid component, cement, and bone. All radiographs were reviewed by 3 orthopedic surgeons, and a consensus was reached.

Presurgical glenoid morphology was categorized using the Walch classification.[36] Presurgical and postsurgical humeral head subluxation, glenoid periprosthetic lucency, and humeral component periprosthetic radiolucency were quantified and categorized on the basis of previously described classification systems.[7,30,31] Glenoid and humeral component shift in position was determined by contrasting early and late postsurgical radiographs. Glenoid components were considered to have met the criteria for radiographic failure on the basis of the presence of a complete lucent line ≥1.5 mm or a shift in component position.[30] Similarly, humeral components were considered to have met criteria for radiographic failure on the basis of the presence of a 2-mm incomplete lucent line in 3 or more zones or a component shift in position.[31]