Midterm Follow-Up of Metal-Backed Glenoid Components in Anatomical Total Shoulder Arthroplasties

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Total shoulder arthroplasty (TSA) is being performed with increasing frequency. According to recent data, the number of TSAs performed annually increased 2.5-fold from 2000 to 2008.\(^1\) As more are performed, the need for improved implant survival will increase as well. In particular, advances in glenoid survivorship will be a primary focus. Previous experience has demonstrated that the glenoid component is the most common source of loosening and failure, and glenoid loosening has been documented in 33% to 44% of arthroplasties, with the rate of radiographically lucent lines even higher.\(^2-5\) Thus, a correlation between increasing incidence of procedures and high rates of glenoid loosening represents the potential for a significant increase in the number of future revisions. A recent report from Germany indicated that TSA had a 3-fold higher relative burden of revision than hemiarthroplasty.\(^6\)

Ingrowth metal-backed glenoid components offer the theoretical advantage of bone growth directly into the prosthesis with a single host–prosthesis interface. Use of a novel tantalum glenoid may avoid the stress-shielding, component-stiffness, dissociation, and backside-wear issues that have produced the high failure rates of conventional metal-backed glenoids. According to the literature, the multiple different-style cementless glenoids being used have had unpredictable outcomes and demonstrated an increased need for revisions.\(^7-11\)

In this article, we present a case series of midterm radiographic and clinical outcomes for TSAs using porous tantalum glenoid components. Our goals were to further understanding of survivorship and complications associated with ingrowth glenoid components and to demonstrate the differences that may occur with use of tantalum.
Materials and Methods

Data were examined for all TSAs performed at a single institution between 2004 and 2013. Before reviewing the data, we obtained approval from the hospital institutional review board. Our retrospective chart review identified all patients who underwent TSA using a tantalum ingrowth glenoid component. Exclusion criteria included revision arthroplasty, use of a non-tantalum glenoid, reverse shoulder arthroplasty, and conversion from hemiarthroplasty to TSA. Twelve shoulders (11 patients) were identified. We obtained patient consent to examine the data collected, and patients were reexamined if they had not been seen within the past 12 months. Figures 1 and 2 show the preoperative radiographs.

The TSAs were performed by 2 fellowship-trained shoulder surgeons using glenoid components with porous tantalum anchors (Zimmer). Indications for this procedure were age under 60 years, no prior surgery, and glenoid morphology allowing for version correction without bone grafting. Patients with severe posterior erosion that required bone graft or with a dysplastic glenoid were not indicated for this glenoid implant.

In each case, the anesthesia team placed an indwelling interscalene catheter, and then the surgery was performed
with the patient under deep sedation. The beach-chair position and a deltopectoral approach were used, and biceps tendon tenodesis was performed. The subscapularis was elevated with a lesser tuberosity osteotomy and was repaired with nonabsorbable braided suture at the end of the case. During glenoid implantation, the periphery of the polyethylene was cemented. This is consistent with the approved method of implantation for this device. Closed suction drainage was used. After surgery, the patient was restricted to no weight-bearing. During the first 6 weeks, passive forward elevation was allowed to 130° and external rotation to 30°. Active and active-assisted range of motion was started at 6 weeks, and muscular strengthening was allowed 12 weeks after surgery.

We analyzed standard radiographs at yearly intervals for trabecular bony architecture and lucency surrounding the tantalum anchor of the glenoid. Before and after surgery, American Shoulder and Elbow Surgeons (ASES) scores and active forward elevation (AFE) and active external rotation (AER) measurements were recorded. These measurements served as endpoints of analysis.

Results

Twelve shoulders (11 patients) were identified and examined. Mean follow-up was 20 months (range, 6-84 months). In all cases, annual standard radiographs showed bony trabeculae adjacent to the tantalum anchor without lucency. There was no sign of glenoid loosening in any patient.

ASES scores and AFE and AER measurements were obtained with physical examinations and compared with t tests. ASES scores, available for 8 patients, increased from 32 before surgery to 85 after surgery ($P < .01$). Mean AFE increased from 117° to 159° ($P < .01$), and mean AER increased from 23° to 53° ($P < .01$). Figures 3 and 4 show the postoperative radiographs, and the Table highlights the ASES and range-of-motion data.
Discussion

Data for the 12 TSAs followed in this series showed promising outcomes for cementless ingrowth glenoid components. Much as with other data in the literature, there were significant improvements in ASES scores, AFE, and AER. What differs from the majority of available data is the survivorship and lack of radiolucent lines on follow-up radiographs.

Boileau and colleagues\(^7\) randomized 39 patients (40 shoulders) to either a cemented all-polyethylene glenoid or a cementless metal-backed glenoid component. Although the metal-backed glenoid components had a significantly lower rate of radiolucent lines, the metal-backed glenoids had a significantly higher rate of loosening. The authors subsequently abandoned use of uncemented metal-backed glenoid components. Taunton and colleagues\(^8\) reviewed 83 TSAs with a metal-backed bone ingrowth glenoid component. In 74 cases, the preoperative diagnosis was primary osteoarthritis. Mean clinical follow-up was 9.5 years. During follow-up, there were improvements in pain, forward elevation, and external rotation. Radiographic glenoid loosening was noted in 33 shoulders; 9 required revision for glenoid loosening. Both series demonstrated a high rate of revisions for cementless glenoid components.

Similar revision difficulties were noted by Montoya and colleagues.\(^9\) In their series of 65 TSAs performed for primary osteoarthritis, a cementless glenoid component was implanted. There were significant improvements in Constant scores, forward flexion, external rotation, and abduction but also an 11.3% revision rate noted at 68
months (mean follow-up). Glenoid revisions were required predominantly in patients with eccentric preoperative glenoid morphology. Lawrence and colleagues\textsuperscript{10} used a cementless ingrowth glenoid component in 21 shoulder arthroplasties performed for glenoid bone loss (13) or revision (8). They noted a high rate of revisions but good outcomes for the cases not revised. In both studies, there was a high rate of revision for glenoid loosening but also a tendency for revisions to be correlated with more challenging clinical applications.

Wirth and colleagues\textsuperscript{11} followed 44 TSAs using a minimally cemented ingrowth glenoid component. There were significant improvements in ASES scores, Simple Shoulder Test scores, and visual analog scale pain ratings. No revisions for glenoid loosening were noted. The implants were thought to provide durable outcomes at a mean follow-up of 4 years. These results were similar to those appreciated in the present study. In both series, the revision rate was much lower than described in the literature, and there were predictable improvements in pain and active motion.

Our study had several limitations: small number of patients, no comparison group, and relatively short follow-up. More long-term data are needed to appropriately compare cemented and uncemented glenoid components. In addition, it is difficult to compare our group of patients with those described in the literature, as the implants used differ. Despite these limitations, our data suggest that tantalum ingrowth glenoid components provide predictable and sustainable outcomes in TSA. With longer-term follow-up, tantalum ingrowth glenoids may demonstrate a durable and reliable alternative to cemented glenoid components.

### Key Info

### Figures/Tables

### References

#### References


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