J Shoulder Elbow Surg (2016) 25, 398-405

ELSEVIER

Journal of Shoulder and Elbow Surgery

www.elsevier.com/locate/ymse

Total shoulder arthroplasty with an augmented component for anterior glenoid bone deficiency

Brett A. Lenart, MD[a,*], Surena Namdari, MD, MSc[b], Gerald R. Williams, MD[b]

[a]*Department of Orthopedic Surgery, Metropolitan Hospital, New York, NY, USA*
[b]*Department of Orthopedic Surgery, Rothman Institute, Thomas Jefferson University, Philadelphia, PA, USA*

Background: Glenoid bone loss is a challenging problem when performing total shoulder arthroplasty (TSA). Posterior glenoid bone deficiency is more common than anterior deficiency, and so the literature on methods to treat anterior glenoid deficiency in the setting of TSA is not common. The purpose of this case series was to describe preoperative factors, surgical technique, and clinical outcomes in select patients who underwent placement of an anteriorly augmented glenoid component during TSA.
Methods: This was a retrospective case series of 5 patients who underwent TSA with an anteriorly augmented component. The medical records were reviewed, including preoperative demographics, clinical examination, radiographs, Penn Shoulder Score and American Shoulder and Elbow Surgeons score.
Results: Preoperative diagnoses were anterior glenoid erosion in 2 patients, and 1 patient each with malunited glenoid fracture, nonunited glenoid fracture, and post-traumatic arthritis. The mean age at the time of surgery was 67.4 years (range, 53-75 years). No patient demonstrated radiographic or clinical signs of glenoid component loosening at final follow-up. Postoperative Penn Shoulder Scores averaged 84.4 points (range, 58-100 points), and postoperative American Shoulder and Elbow Surgeons scores averaged 88.0 points (range, 68-100 points). Average postoperative active forward elevation was 140° (range, 80°-170°), and active external rotation was 29° (range 10°-45°). There were no dislocations or revision surgeries at an average of 33.2 months (range, 21.9-43.2 months) after surgery.
Conclusion: In the short term, glenohumeral arthrosis in the setting of anterior glenoid deficiency can be treated with an anteriorly augmented glenoid component. Further follow-up and a larger series of patients are necessary to determine the long-term outcomes and complications associated with this technique.
Level of evidence: Level IV, Case Series, Treatment Study.

Keywords: Total shoulder arthroplasty; glenoid; bone loss; anterior; augmentation

Total shoulder arthroplasty (TSA) is a successful treatment option for degenerative conditions of the shoulder. Long-term studies demonstrate excellent clinical outcomes, with improvement in pain and return of function.[10,27,29,47] Despite this, glenoid component loosening remains a major cause of failure in TSA.[2,11,17,24,27,44] Eccentric glenoid loading, secondary to unaddressed glenoid bone deficiency, failure to correct glenoid version, or soft tissue imbalance contribute to glenoid loosening and to the potential for early failure and poor clinical results.[6,8,9,32,39,44,45]

In anatomic TSA, anterior glenoid bone deficiency presents a unique challenge because most of the literature

The Thomas Jefferson University Institutional Review Board approved this study (IRB number 11D.608).

*Reprint requests: Brett A. Lenart, MD, Metropolitan Hospital, 1901 1st Ave, New York, NY 10029, USA.
E-mail address: brett.lenart@nychhc.org (B.A. Lenart).

1058-2746/$ - see front matter © 2016 Journal of Shoulder and Elbow Surgery Board of Trustees.
http://dx.doi.org/10.1016/j.jse.2015.08.012

concerning glenoid bone deficiency is focused on posterior glenoid bone deficiency.[3,7,12,37,43] A variety of techniques have been described to address posterior glenoid bone deficiency, including asymmetric anterior reaming of the glenoid[5,14,22,30,38] and posterior bone grafting.[1,18,21,28,35,38,41] These same techniques can be used for anterior glenoid deficiency; however, asymmetric reaming and bone grafting have limitations, regardless of the location of bone loss. Asymmetric reaming decreases the length of the glenoid vault and medializes the joint line, reducing the bone stock available for glenoid implantation.[5,14] Glenoid bone grafting may prevent medialization of the joint line and restore normal version, but poor graft incorporation, graft resorption, and graft collapse can lead to early glenoid loosening, causing instability and adverse clinical outcomes.[37]

To address some of the inadequacies associated with these techniques, custom-made and augmented glenoid components have been proposed in the treatment of glenoid bone deficiency.[4,15,16,23,25,34,36] To our knowledge, no clinical studies address the prevalence, etiology, and short-term or long-term consequences or treatment of isolated anterior glenoid bone deficiency in the setting of TSA. The purpose of this study was to describe preoperative factors, surgical technique, and clinical outcomes in select patients who underwent placement of an anteriorly augmented glenoid component during TSA.

Materials and methods

Study design and demographics

This was a retrospective case series of patients who underwent TSA with an anteriorly augmented component. The medical records of the senior author (G.R.W.) were reviewed from March 2010 to March 2014 for patients who underwent TSA performed with an augmented glenoid component. During this period, the senior author performed 438 anatomic TSAs in which augmented glenoid components were used in 126, of which 121 were for posterior glenoid deficiency, and 5 were for anterior glenoid deficiency. In the 5 patients with anterior glenoid deficiency, the augmented component, which was designed for posterior bone deficiency, was used by using a component for use in the opposite shoulder. The medical records of these 5 patients were retrospectively reviewed for demographic, range of motion, radiographic, and self-assessed outcomes data. Postoperative shoulder outcomes measures, including Penn Shoulder Score (PSS) and American Shoulder and Elbow Surgeons (ASES) score, if present, were obtained. Preoperative PSS and ASES scores were only available for 2 patients and thus were not included in the analysis.

Surgical technique and implants

All arthroplasties were performed with the StepTech augmented anchor peg glenoid component (DePuy Global, Warsaw, IN, USA; Fig. 1) with an interference-fit center peg for osseous integration and 3 smaller peripheral pegs designed for fixation with polymethylmethacrylate cement. The spherical backside component has a step through the component midline in sizes of +3, +5, or +7 mm, built into the component. Each step size was available in a diameter of curvature of 40, 44, 48, 52, and 56 mm. A +3 step corresponds to 10° version correction, a +5 to 15°, and a +7 to 20° (each step incorporates 5° of asymmetric reaming). A corresponding rasp and rasp guide are used prepare the glenoid surface for implantation. Humeral components used were the DePuy Global AP anatomic uncemented or cemented humeral prosthesis.

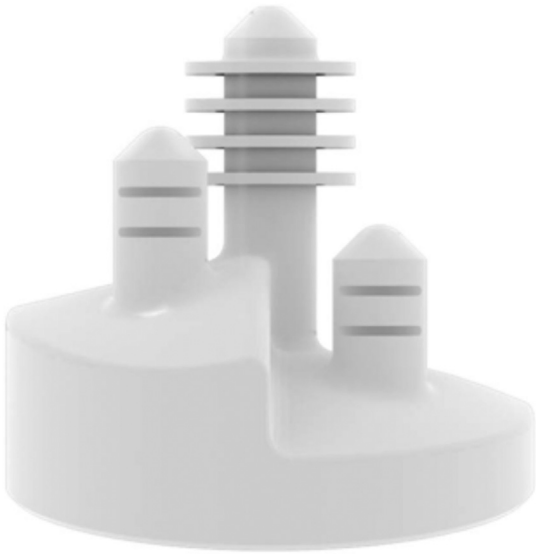

Figure 1 Photograph shows the augmented anchor peg glenoid component (DePuy Global, Warsaw, IN, USA).

Patients were placed in the beach chair position using a McConnell arm positioner (McConnell Orthopedic Manufacturing, Greenville, TX, USA). The shoulder was accessed through a standard deltopectoral approach. The subscapularis muscle was taken down through a 5-mm osteotomy, with later fixation using nonabsorbable polyester sutures through bone tunnels.[13,33] Glenoids were sized to determine the correct diameter and glenoid augment size to recreate native glenoid version. The size of the step used was determined through the use of preoperative computed tomography (CT) scans and intraoperative measuring. On an axial CT section that best demonstrated the defect, a line was projected from the intact posterior surface, and a perpendicular line was drawn from this line to the surface within the defect to estimate the size of step needed (Fig. 2). The glenoids were asymmetrically posteriorly reamed with a guide with orientation of the reamer set by a guide pin placed at the centerline of the glenoid. Humeral version was determined by recreating the native version with a cut made just inside the rotator cuff insertion.

Radiographic analysis

Radiographic analysis of glenoid radiolucent lines and glenoid component seating were assessed as described by Lazarus et al.[26] Radiolucency about a pegged component was graded 0 (no lucency), 1 (incomplete radiolucency around 1 or 2 pegs), 2 (complete radiolucency, minimum 2 mm wide, around 1 peg only, with