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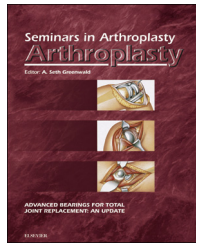

Optimal glenoid fixation requires cement!

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ABSTRACT

The choice of cemented versus uncemented glenoid component fixation has generated controversy, but the evidence favors cement. Studies have shown survivorship of cemented all polyethylene glenoid components of 95% at 10 years and still over 90% at 15 years. Virtually all glenoid with stiff metal backing, especially those that snap-fit to assemble, have had poor results even at early follow-up. Recent designs with either all-poly cementless fixation or using a less-stiff, integrated tantalum backing have promising early results.

Adequate fixation of the glenoid component is imperative to the longevity of a total shoulder arthroplasty. The choice of fixation is important, and using the most reliable and reproducible method can reduce the chances of subsequent failure. Glenoid component fixation that is inadequate results in cyclical motion at the implant bone interface [1]. Many studies have demonstrated that in revision total shoulder arthroplasty, a loose glenoid component is often the cause for reoperation [2–8]. Our preference is to routinely cement an all polyethylene glenoid component (Fig. 1) when performing a total shoulder arthroplasty. It is our belief that a cemented component provides the most reliable method of fixation and has been validated in many studies, which may be done before modern improvements in cement technique. It is our belief that a cemented component provides the most reliable method of fixation and has been validated in various studies. Many factors affect the ability for cement to provide initial optimal fixation. Various approaches used to decrease porosity within the cement, provision of a dry cancellous surface for cement–bone interdigitation, cement impaction, and pressurization all contribute to optimizing fixation and reducing initial post-operative radiolucent lines. Poor technique can lead to poor fixation, early lucent lines, and shortened implant longevity (Fig. 2).

Prior to current cementing techniques the presence of radiolucent lines following cementation of all polyethylene glenoid components was documented to be as high as 96% [9]. The rate of radiologic loosening is 0–44% [10] and revision for loosening can be as high as 10% [11,12]. The presence of early post-operative radiolucent lines was associated with over 90% of glenoid components that developed radiographic loosening [13]. Cofield et al. evaluated patients under the age of 50 with a minimum follow-up of 20 years who underwent total shoulder replacement with a cemented all polyethylene glenoid. In a population at higher risk for shorter implant longevity due to higher activity level and usage, they had an 83% 20-year survival rate [14]. A radiographically loose glenoid does not always portend poor prognosis or inevitable revision surgery. Some patients may retain a significant amount of function with manageable discomfort. The benefit of isolated failure or loosening of the glenoid component is that in some cases the glenoid component can be removed arthroscopically (Fig. 3) without need for a large open revision [15].

Alternative methods of polyethylene fixation were developed to reduce the incidence of early radiolucent lines that could potentially lead to glenoid loosening. These included metal-backed glenoids, monoblock-molded titanium, and

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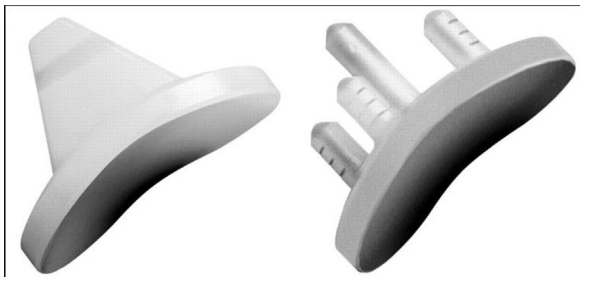

Figure 1 – (A) Keeled glenoid and (B) pegged glenoid.

tantalum implants, as well as partially cemented all polyethylene glenoid components with fluted central pegs.

Metal-backed glenoid components are associated with high revision rates due to accelerated polyethylene wear, glenoid loosening, and bone loss secondary to osteolysis [16,17]. This has been theorized because of the stiffening of the polyethylene when backed by a rigid metal shell. Survivorship was 60% at 10 years and 46% at 12 years with a significant drop 4 years postoperatively. Another complication seen with metal-backed glenoids was polyethylene dissociation from the metal backing (Fig. 4). This was likely secondary to eccentric loading and disengagement of the metal capture. Attempts to avoid this utilized a one-piece molded glenoid component with a less-stiff metal, porous tantalum (Fig. 5). Budge et al. [18] evaluated a one-piece molded polyethylene tantalum glenoid component with an average follow-up of 3.2 years. A 21% failure rate secondary to fracture was observed. Fucentese et al. [19] observed a similar complication and fracture rate with a titanium polyethylene glenoid component. A redesign of the tantalum components has shown good medium-term fixation but longer follow-up evidence is lacking [20–22].

The all polyethylene glenoid has been modified to have a central peg with radial flanges that are uncemented and peripheral pegs that are cemented. This is an attempt at encouraging boney ingrowth around the central peg (Fig. 6). Churchill et al. with an average 5.6-year follow-up looked at the rate of lucency at 5 years compared to initial 6-week postoperative X-rays. In a sample of 20 patients at 5 years follow-up 75% showed no evidence of lucency of the glenoid component. Fifteen shoulders had no peripheral peg lucency with grade 1 or 2 in the remaining shoulders. Seventeen shoulders had no detectable lucency within the central peg, 2 shoulders resulted in grade 3 lucency, and the remaining

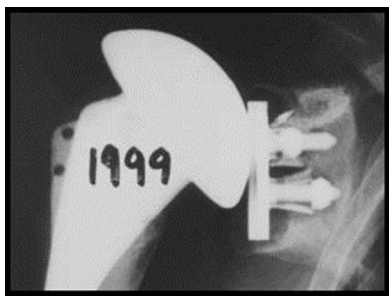

Figure 2 – Radiolucent lines along glenoid prosthesis.

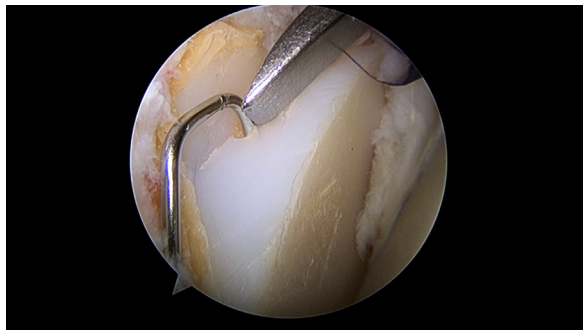

Figure 3 – Arthroscopic glenoid removal.

grade 1 [23]. A similar study, by Arnold et al., using computed tomography to evaluate ingrowth around the central pegs of a partially cemented all polyethylene glenoid component over a mean follow-up period of 43 months. They demonstrated that bone was present in 32 of 35 shoulders [24]. Wirth et al. showed increased radiodensity in 30 of the 44 shoulders. Those patients had better radiolucency scores on postoperative X-rays, which was associated with higher radiodensity scores for the central peg at the final follow-up [25]. The interaction between polyethylene and bone is not very reliable. Ingrowth of bone into the polyethylene flanges is not accomplished the way it is in tantalum or titanium. Bone ultimately grows around the flanges with concerns about actual boney ingrowth. A recent study looked at 42 patients over a period of 4 years with approximately 8 years follow-up and demonstrated a 97% survivorship with partially cemented all polyethylene components [26]. There are some promising results with the use of partially cemented prostheses, but the superiority of a properly cemented all polyethylene glenoid component has been proven with long-term studies.

A reproducible technique for glenoid implantation including glenoid and cement preparation, cementing of the glenoid,

Figure 4 – Metal-backed glenoid.