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CORR Insights

CORR Insights®: No Differences in Early Results of a Hybrid Glenoid Compared With a Pegged Implant

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Where Are We Now?

Total shoulder arthroplasty (TSA) is a great achievement of modern orthopaedic surgery. A "side effect" of the procedure's efficacy, however, is an ever-increasing number of procedures [2, 4], which inevitably result in more revisions. Many of these revisions are caused by painful glenoid loosening, an incident which can increase over time [3]. Avoiding this complication poses high demands on the design of the glenoid component, as well as the implantation technique [1, 5].

Many glenoid component options are available today, which makes deciding which one to use even more difficult. A comprehensive overview of design and material options has recently been presented by Pinkas and colleagues [7]. At present, no single option can be recommended universally for all patients. Some of the design features affecting the performance of glenoid implants include the pegs or keel, the number and position of pegs if pegs are used, the shape of pegs at their tips, flat or convex backside, pear or elliptical contour, inset design versus complete cover of the glenoid, and radial mismatch. The material options are: All-polyethylene, metal-backed with screws (leading to high revision rate) [8], metal-backed with porous coating but without screws, and finally, hybrid glenoid components with a central bony ingrowth attachment. The latter design is the subject of the present study by Gulotta and colleagues.

In their study, Gulotta and colleagues focus their attention, and ours, on metal-backed glenoid components. At 2-year followup, they found no differences between an all-polyethylene pegged glenoid (40 patients, four surgeons) and a hybrid glenoid (43 patients, four other surgeons) in terms of radiolucent lines, pain or shoulder scores, and complications.

In a systematic review, Papadonikolakis and colleagues [6] concluded that the use of a metal-backed glenoid components resulted in more revisions. However, loosening was responsible for only 38% of those revisions; the rest were attributed to patient related factors, material (wear) or design related problems. Perhaps we should not be too quick to label metal-

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backed glenoid components as the problem. They could offer an important advantage—the possibility of implanting a reversed shoulder prosthesis without explanting the glenoid, should revision be necessary.

Where Do We Need To Go?

There is a concern that the results of the current study could be different in a few years due to the relatively short followup, as well as the potential for the loosening rate to increase over time [3]. Having experienced early failures of "promising new" metal-backed glenoid designs, it is important to follow patient cohorts that received hybrid glenoid carefully, and to report encouraging results (or stop further application of the product if catastrophic failures are found).

CT scans performed at 2 years followup for 10 random patients with hybrid glenoid provide an interesting aspect of the article. The number of patients included in this arm of the study is low. However, calculating hypothetically, a study on a group of 10 patients would yield 80% power at alpha = 0.05 for discrimination between 0% and 28% (or higher) loosening rate. Although high loosening rates are not expected at 2 years followup, the authors (and patients) can be credited for taking the effort and risk of CT scans in an asymptomatic population. Good bone growth on the porous titanium and no signs of early loosening are encouraging findings at 2 years followup. Even so, we need future studies in other patient populations—and further followup of the population studied here—to determine whether survivorship or function will support the use of a new, and presumably more expensive, approach to glenoid component design.

We also need to assess the financial aspect of implementing new (more expensive) glenoid designs. If the hybrid glenoid does not outperform the pegged design in terms of lower loosening rate, it will be difficult to support higher prices that the health system must pay without any benefit. Therefore, financial aspects should be studied as well.

How Do We Get There?

It is logical to search for new designs and then try to find evidence for the best performance. With increasing numbers of procedures, the medical technology industry is also becoming more interested in developing better glenoid components that promise better outcomes, fewer revisions, and perhaps higher market shares. Some prosthetic designs and material properties that have proven successful for other joints might not be as suitable for TSA. For these reasons, we have a great responsibility to assess new glenoid designs meticulously. However, many biases must be addressed, and the timeframe needed to study the impact of new prosthetic designs is long, sometimes making a new design obsolete by the time we finally determine its long-term performance.

As with all new prosthesis designs, we need adequate numbers, appropriate randomized controlled study design, long-term followup, and comparable scientific reports that allow for metaanalysis. Given the relatively high frequency of glenoid loosening over time, the numbers needed to treat in order to discover the difference between two designs might be relatively low. For example, if we wanted to discern an advantage of one design compared to another in terms of reducing the frequency of loosening from 30% to 10% (theoretical values, but still relatively high, and clinically plausible), then we would need only 92 patients in each group to get an answer at $p < 0.01$, if we set the power of the study at 80%. This certainly seems within reach.

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