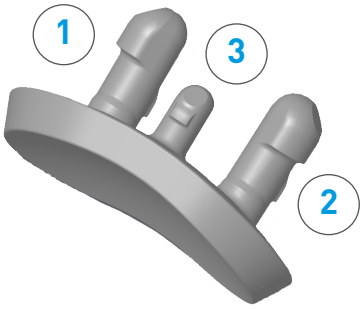
TECHNICAL BRIEF

Designing a Better Glenoid: A Science-Based Approach

Catalyst OrthoScience Research and Development

Background

Loosening of the glenoid component is the most common mode of failure in total shoulder arthroplasty[1-3]. An inability to achieve long-lasting, secure fixation within the glenoid bone that can withstand the effects of repeated eccentric loading and glenohumeral translation leads to failure[4].



In order to address this, Catalyst OrthoScience has recently introduced their patent pending 3-peg glenoid implant product with the specific goal of resolving these challenges. Key features include:

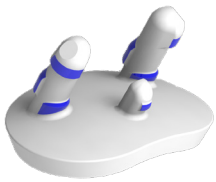
1. **Immediate interference fit fixation in the strongest regions of the glenoid vault utilizing a new backside anchoring element design.**
2. **Tapered walls on the bearing surface to reduce the effects of eccentric loading, which can contribute to implant loosening.**
3. **Quick, accurate placement of the implant using a streamlined procedure resulting in potential time and cost savings.**

Immediate Secure Fixation in the Vault

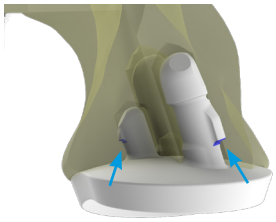
Inadequate fixation allows for micromotion to occur between the implant and glenoid bone[5]. This motion can lead to bone resorption around the implant, cement cracking, osteolysis, and motion of the prosthesis, which all can contribute to failure in fixation requiring subsequent costly revision procedures.

The 3-peg glenoid is designed to provide immediate, secure fixation to the glenoid even before the cement has hardened. The patent pending glenoid architecture consists of two large anterior pegs and one smaller posterior peg to securely anchor the prosthesis.

Each of the pegs has a direct compression fit within each of the bone tunnels created in the glenoid. Upon insertion, this creates an interference fit to minimize any free motion between the implant and bone in multiple planes irrespective of the cement mantle.



Blue regions are in direct contact with bone.



Blue regions are captured under the bone.

During implantation, the partial barbs that extend along the long axis of each peg are driven into the glenoid bone. The pegs undergo slight deformation and the proximal ends

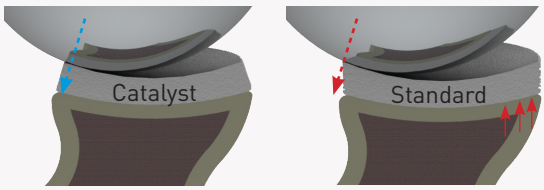
of the barbs are captured under the cortical or dense subchondral bone to resist potential pullout and/or lever out loads.

Tapered Bearing Rim

Eccentric loading can mechanically challenge the integrity of the implant, the cement and the bone-cement interface[6]. Edge loading in standard implants can create a cantilever effect and tension failure on the opposite side and within the pegs or keels[7].

Catalyst has created a glenoid with a beveled edge, designed to ensure that during eccentric edge loading of the implant, the normal loading vectors pass directly through the implant thickness and into the glenoid bone underneath resulting in direct compression of the construct. **(Figure 1)**

FIGURE 1



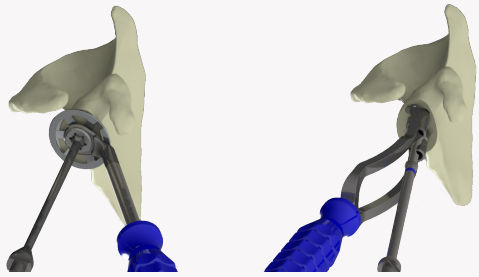
The normal loading vectors are always directed within the outer footprint of the Catalyst implant (left), thus minimizing the cantilever effect during eccentric loading, which can lead to implant loosening.

Ease of Implantation

Streamlined Steps

Glenoid preparation was designed with the goal to be the fastest in the industry. The streamlined technique involves only two instrumented steps. One reamer and one drill guide are all that are required to prepare the glenoid to receive the 3-peg glenoid implant. **(Figure 2)**

FIGURE 2

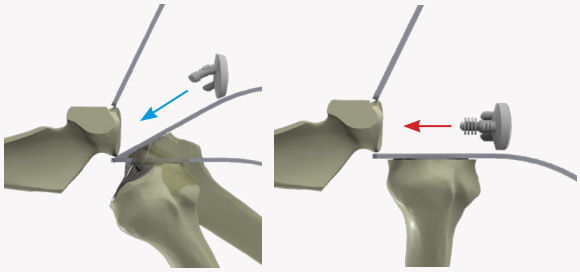


One reamer step and one drill guide are all that are needed to prepare the glenoid.

Angled Insertion

The angle of the pegs has been engineered to facilitate preparation and insertion of the glenoid implant, minimizing the retraction of the humeral head and other soft tissues. This is compared to other current standard techniques which require complete resection of the humeral head to accommodate a straight trajectory into the glenoid. **(Figure 3)**

FIGURE 3



3-peg insertion can be done at an angle with reduced retraction, though additional retraction can afford greater visibility to the glenoid (left). Standard straight peg insertion (right).

References

1. Wirth et al. Complications of total shoulder replacement arthroplasty. JBJS 1996: 603-16.
2. Franta et al. The complex characteristics of 282 unsatisfactory shoulder arthroplasties JSES 2007: 555-62.
3. Bohsali et al. Complications of total shoulder arthroplasty JBJS 2006: 2279-92.
4. Matsen et al. Glenoid component failure in total shoulder arthroplasty. JBJS 2008: 885-96.
5. Rahme et al. Stability of cemented all-polyethylene keeled glenoid components. JBJS 2004: 856-60.
6. Mansat et al. Evaluation of the glenoid implant survival using a biomechanical finite element analysis. JSES. 2007: S79-83.
7. Collins et al. Edge displacement and deformation of glenoid components in response to eccentric loading. JBJS.1992: 501-7.

CATALYST ORTHOSCIENCE®

Catalyst OrthoScience Inc.

14710 Tamiami Trail N. | Suite 102

Naples, FL 34110 | (800) 587-5137

info@catalystortho.com | www.catalystortho.com

1227-2001-B 042019