Non-Lateralizing Total Shoulder
Featuring an Inlay Glenoid with a Canal Sparing Humeral Head

“We found that alteration of the humeral head geometry may greatly influence the contact pressure and stress distribution in the glenoid. In order to reproduce the behavior of an intact shoulder, humeral arthroplasties should reproduce the anatomy of the intact shoulder head.”

Benefits of an anatomical reconstruction of the humeral head during shoulder arthroplasty: a finite element analysis; Büchler, P. et al.; Clinical Biomechanics, 2004, Volume 19, Issue 1, 16 - 23
INLAY GLENOID ARTHROPLASTY

36 MONTH SHOULDER CASE STUDY

DEMOGRAPHICS & DIAGNOSIS

Age: 53
Gender: Female
Occupation: Casino Dealer
Diagnosis: Left GH Osteoarthritis

PRIMARY COMPLAINT

Spontaneous onset of pain, waking her up at night; 9 months of difficulty raising arm above shoulder level.

Anti-inflammatory medications yielded little to no improvement.

PRE-OPERATIVE EXAMINATION

- Forward Flexion: 160
- Abduction: 90
- External Rotation: 50
- Crepitus with motion
- Glenoid Walsh Classification Type 1A
- Constant Score: 53
- X-Rays indicate severe OA of the glenohumeral joint with goatbeard osteophyte and intact RTC

TREATMENT

Left total shoulder arthroplasty, delto-pectoral approach, osteophyte removal, open biceps tenodesis, off-axis inlay glenoid replacement and anatomic humeral head resurfacing.

Implants: Arthrosurface non-spherical OVO™ Primary Stemless Shoulder with Inlay Glenoid System.

POST-OPERATIVE EXAMINATION

2 Months Post-Op:
- Forward Flexion: 160

18 Months Post-Op:
- Forward Flexion: 160
- Abduction: 160
- External Rotation: 70
- Internal Rotation: L1
- No crepitus with motion
- Constant Score: 96

FOLLOW-UP / CONCLUSION

Patient returned to work full time 77 days after surgery.

At 3 Year follow up patient reported:
- Excellent patient satisfaction
- Patient would have same surgery again
- Would recommend to friends & family

Patient provided written consent for publication of this case study
Design Rationale

Anatomic Glenoid

Inlay vs. Onlay Survivorship Comparison:

Presented at ORS Meeting 2015, Las Vegas, NV

![Inlay Glenoid & OVO Primary Stemless Shoulder Implant](image1)

VERSUS

![Onlay Glenoid & Stemmed Humeral Replacement](image2)

**Conclusion:**

The inlay implant resisted visible loosening in all fatigue testing of 4000 cycles, however, all onlays showed loosening in under 2000 cycles.

The change in location of pressure during eccentric loading to a more central area provided better stability to the inlay because the pressure was diverted to the native tissue on the glenoid edge.

<table>
<thead>
<tr>
<th>Specimen</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onlay</td>
<td>875</td>
<td>1372</td>
<td>1463</td>
<td>772</td>
<td>1838</td>
<td>n/a**</td>
<td>814</td>
<td>749</td>
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<tr>
<td>Inlay</td>
<td>4000*</td>
<td>4000*</td>
<td>4000*</td>
<td>4000*</td>
<td>4000*</td>
<td>4000*</td>
<td>4000*</td>
<td>4000*</td>
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</tbody>
</table>

*Glenoid Fatigue Testing Results for 8 Specimens; Data Source: Gagliano et al., ORS, 2015

**Anatomic Humerus**

The Humeral Head is NOT a Sphere:

![Figure 3: 50 Years of Evidence Showing Non-Spherical Humeral Head Geometry](image3)

![Figure 4: Topology of the Humeral Head Articular Surface: Ovoid Shape Shows 3x Better Match than Spherical Geometry](image4)

**Conclusion:**

The patient specific design concept was supported by Hammond et al. who showed that the center of rotation was more closely restored with inlay arthroplasty than with stemmed hemiarthroplasty. This resulted in less eccentric loading and potentially better functioning for the patient as the biomechanics of the joint and the moment arms of the rotator cuff and deltoïd more closely resemble the intact condition. Hammond et al. (PMID: 22218384)
INLAY GLENOID ARTHROPLASTY

24 MONTH SHOULDER CASE STUDY

DEMOGRAPHICS & DIAGNOSIS
Age: 57
Gender: Male
Occupation: Field Foreman
Diagnosis: Right GH Osteoarthritis

PRIMARY COMPLAINT
Right Shoulder pain which worsened over the last 5 years while working as a field foreman.
Conservative treatments, including steroid injections failed.

PRE-OPERATIVE EXAMINATION
- Active Forward Flexion: 150
- External Rotation: 50
- Internal Rotation: L5 with pain
- Strength: 4/5
- X-Rays indicate subchondral cysts in glenoid, humeral head acromial spurs and severe DJD.

TREATMENT
Right Total Shoulder Arthroplasty and Biceps Tenodesis.

Implants: Arthrosurface non-spherical OVO™ Primary Stemless Shoulder with Inlay Glenoid System.

POST-OPERATIVE EXAMINATION
1 Months Post-Op:
- Active Forward Flexion: 175
- External Rotation: 50
- Internal Rotation: L5
- Strength: 4/5
6 Months Post-Op:
- Active Forward Flexion: 160
- External Rotation: 80
- Internal Rotation: T7
- Strength: 5/5
24 Months Post-Op:
- Active Forward Flexion: 170
- External Rotation: 75
- Internal Rotation: L1
- Strength: 5/5
- X-Rays indicate a well maintained shoulder replacement with no bony abnormalities

FOLLOW-UP / CONCLUSION
Patient returned to work full time 36 days after surgery.
- Excellent patient satisfaction
- Patient would undergo same surgery again
- Would recommend to friends & family

Patient provided written consent for publication of this case study
INLAY GLENOID ARTHROPLASTY
48 MONTH SHOULDER CASE STUDY

DEMographics & Diagnosis
Age: 52
Gender: Male
Occupation: Technician at Industrial Gas Company and Body Builder
Diagnosis: Right GH Osteoarthritis

Primary Complaint
Right Shoulder Pain for past 5 years, which he attributes to overuse

Pre-operative Examination
• Active Forward Flexion: 160
• Active Abduction: 140
• External Rotation: 85
• Internal Rotation hip pocket
• Strength: 4/5
• X-Rays indicate Glenohumeral arthritis, labrum tear, RTC tendonitis

Treatment
Right Total Shoulder Arthroplasty and biceps tenodesis.
Implants: Arthrosurface non-spherical OVO™ Primary Stemless Shoulder with Inlay Glenoid System.

Post-operative Examination
3 Month Post-Op:
• Active Forward Flexion: 155
• Active Abduction: 130
• External Rotation: 40
• Internal Rotation: back pocket
• Strength: 5/5

4 Years Post-Op:
• Active Forward Flexion: 150
• External Rotation: 90
• Internal Rotation: Lumbosacral jct
• Strength: 5/5

Patient Satisfaction
Patient returned to work full time 87 days after surgery.
• Outcome Rating: Excellent
• Patient is satisfied with the current state of his shoulder
• Would undergo the procedure again & recommend to friends & family
## Comparison of Canal Sparing versus Stemmed Modular TSR

<table>
<thead>
<tr>
<th>GLENOID</th>
<th>Arthrosurface Anatomic</th>
<th>Traditional Stemmed Modular</th>
<th>Short Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implant Matches Native Glenoid Surface</td>
<td>YES</td>
<td>NO</td>
<td>Braman et al. PMID 16705689</td>
</tr>
<tr>
<td>Preserves Peripheral Glenoid Bone</td>
<td>YES</td>
<td>NO</td>
<td>Gunther et al. PMID 22173268</td>
</tr>
<tr>
<td>Prevents Joint Lateralization</td>
<td>YES</td>
<td>NO</td>
<td>Gunther et al. PMID 22173268</td>
</tr>
<tr>
<td>Minimizes Rocking Horse Effect</td>
<td>YES</td>
<td>NO</td>
<td>Gagliano et al. ORS 2015</td>
</tr>
<tr>
<td>Avoids Bone Grafting for Type C Glenoid</td>
<td>YES</td>
<td>NO</td>
<td>Davis et al. PMID 26908172</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HUMERUS</th>
<th>Arthrosurface Anatomic</th>
<th>Traditional Stemmed Modular</th>
<th>Short Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintains Anatomic Geometry Without Altering</td>
<td>YES</td>
<td>NO</td>
<td>Büchler et al. PMID 14659925</td>
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<tr>
<td>Height, Version, Inclination Angle or Joint Volume</td>
<td></td>
<td></td>
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<tr>
<td>Minimizes Blood Loss</td>
<td>YES</td>
<td>NO</td>
<td>Berth et al. PMID 23138538</td>
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<tr>
<td>Preserves Bone</td>
<td>YES</td>
<td>NO</td>
<td>Levy et al. PMID 11284568</td>
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<tr>
<td>Unique Ovoid Shape Minimizes Overstuffing</td>
<td>YES</td>
<td>NO</td>
<td>Harryman et al. PMID 7713972</td>
</tr>
<tr>
<td>Reduces Risk of Periprosthetic Fx &amp; Allows</td>
<td>YES</td>
<td>NO</td>
<td>Levy et al. PMID 15111895</td>
</tr>
<tr>
<td>Uncomplicated Conversion to Primary Stemmed TSR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimizes Eccentric Loading on the Glenoid</td>
<td>YES</td>
<td>NO</td>
<td>Hammond et al. PMID 22218384</td>
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</tbody>
</table>

For more information, visit our website:  
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This pamphlet and information is intended for markets where regulatory approval has been granted.

Patients provided written consent for publication of these case studies.

For additional product information, including indications, contraindications, warnings, precautions and potential adverse effects, please visit www.arthrosurface.com. The HemiCAP® & OVO family of devices is cleared by FDA and via international CE Mark.

This product is covered by one or more of U.S. Patent Nos. 6,520,964; 6,610,067; 6,679,917 and other patents pending.  
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