Treatment of Glenohumeral Arthritis in Young Patients

“Shoulder Resurfacing”

Anthony Miniaci MD FRCSC
Professor of Surgery
CCLCM
Cleveland Clinic Foundation
Disclosures

1. Royalties/stock/equity
   1. Zimmer
   2. Arthrosurface

2. Consulting/Honoraria
   1. Stryker
   2. Arthrex
   3. DJ Ortho
   4. NFL Charities
   5. MLB Charities
   6. Arthrosurface
   7. Breg

3. Educational/Research Institutional
   1. Stryker
   2. Arthrex
   3. DJ Ortho
   4. NFL Charities
   5. MLB Charities
   6. Arthrosurface
   7. Breg
CLINICAL INDICATIONS

- Symptomatic Focal AVN
- Symptomatic traumatic chondral defects or Osteochondral defects
- dislocations
- Young patients, failed biologic procedures
- Arthritis post trauma, weight lifting etc.
Osteochondral Injuries - Solutions?

Cartilage Defect - Treatment Options

- Conservative –
  Antiinflammatories, Physiotherapy, Glucosamine, Chondroitin, Synvisc Injections, Not Cortisone

- Lavage

- Remove loose fragment, debridement

- Microfracture, ACI, matrix+ACI, OAT, allografts

- ? Role of arthroplasty
**Arthroplasty in Younger Patients**

**Specific Considerations**

- Long life span, High activity level, High expectations
- Less invasive, preserve bone stock, preserve future options - resurfacing
Arthroplasty options

- Partial/Complete
  - Hemicap (Arthrosurface)

- Full Humeral Head
  - DePuy C.A.P.
  - Biomet Copeland
  - Tornier
  - Hemicap OVO aspherical (Arthrosurface)

- Traditional Alternatives
  - Stemmed hemiarthroplasty, TSA
Mechanical Issues with Spherical Designs

- “overstuffing leading to stiffness, reduced ROM
- Incorrect version, height
- Shoulder not a sphere!!- is there need for aspherical designs
- What about smaller defects?
Sphere Modelling

Avg. Overall Error
n=16
0.30 ± 0.08 mm

Avg. Max. Error
n=16
1.69 ± 0.32 mm
Ellipsoid/Ovoid Comparison

Ovoid

1.7x improvement in fit over Ellipsoid

3.3x improvement in fit over Sphere
Anatomic Resurfacing

- Resurfacing device allowing **intra-operative** mapping of the anatomic curvature
- Placement of the implant at the same height and the same radius of curvature as the patient’s articular surface.
- Multiple geometries, curvatures
- Full head – egg shaped
- Fits implant to patient
Benefits of an anatomical reconstruction

- NO issues with height or version or too much volume
- restores center of rotation closer to normal when compared to hemiarthroplasty*
  Tibone et al JBJS 2012
- Aspherical implant gave better motion, less stress and replicated normal shoulder
  Iannotti et al JSES 2013
- used FEA to show better range of motion, bone stresses 8x lower on glenoid
  Clinical Biomechanics 2004
  Buchler P and Farron A
Anatomic Resurfacing
“The Shoulder”

**INDICATIONS**

- Young patients 20-60 years of age
- Symptomatic traumatic chondral defects or OCD, humeral head defects
- Symptomatic AVN
- Now whole head resurfacing, stemless implant opportunity to do glenoid (inlay resurfacing) without head removal

Posterior Dislocation - Reverse Hill Sachs
Focal Lesions
AVN-The Problem:
Localised & Limited Articular Cartilage Lesions-
20 pts End Stage Failed instability repairs
Minimum 2 year follow up
All had Hill Sachs with Hemicap
9 combined with Latarjet/allograft glenoid
0 repeat dislocations/instability
Improved QOL
Fritsch et al AAOS 2013
What about Posterior Dislocation?
Humeral Head Reconstruction for Instability

- Prospective Database
- 50 patients humeral bone defects
- 6 posterior, 44 anterior
- Follow up 45 months
- No recurrent instability
- Improvement in QOL, SF-12, outcomes
Contoured Anatomical Resurfacing
“The Shoulder”

**INDICATIONS**
- Symptomatic AVN
- Symptomatic traumatic chondral defects or OCD
- Young patients

- What about OA?
Contoured Anatomical Resurfacing
“The Shoulder”
Resurfacing with Glenoid Interposition
Soft Tissue Glenoid Interposition

Level 3 and 4 studies Lack of consensus

- Results poor: lack of tissue incorporation, persistent pain, short term failures
- Good results with 2 year follow up
  - Wirth (meniscus AAOS 2008), Nicholson JSES 2007
- Good results with 2-10 year follow up mixed patient population
  - Burkhead JBJS 2005
Glenohumeral OA
Full Anatomic Humeral Resurfacing
and Inlay Glenoid
Inlay Glenoid resurfacing
Preserve Glenoid Vault
**Rocking-horse Phenomenon**

- FEA and mechanical studies demonstrate reduced risk of loosening, less edge distraction with rocking motion
  - Gunther et al
  - JSES 2011
INLAY VS. ONLAY:
A COMPARISON OF TWO GLENOID SYSTEMS IN TOTAL SHOULDER ARTHROPLASTY

Sarah Helms\textsuperscript{1}, Greg Colbath, M.D.\textsuperscript{2}, Richard Hawkins, M.D.\textsuperscript{2}, Jeffrey Gagliano M.D.\textsuperscript{2}, Breanne Przestrzelski, M.S.\textsuperscript{1}, Luke Pietrykowski\textsuperscript{1}, John DesJardins, Ph.D.\textsuperscript{1}

\textsuperscript{1}Clemson University, \textsuperscript{2}Steadman Hawkins Clinic of the Carolinas
Conclusions

- The inlay implant resisted visible loosening in all fatigue testing of 4000 cycles, however all onlays failed and showed visible loosening in under 2000 cycles.
- The location of pressure during eccentric loading was diverted to mostly native tissue of the glenoids implanted with the inlay, in contrast with the onlay, where the polyethylene implant edges received all of the load.
Total Resurfacing with OVO and inlay glenoid

- 74 shoulders (4 bilateral) implanted with HemiCAP OVO
- 28 shoulders (2 bilateral) reached minimum of 2 year follow-up
- 65.9 years (range 45-81) 17 male:11 female
- Advanced Glenohumeral OA
- Outcomes: ASES, Constant, WOOS, Pain VAS, ROM
- Mean follow-up: 30 months (range 24-39)

- Forward Flexion: from 102 to 155
- Internal Rotation: from hip pocket to L3
- No loosening or migration of any implant was noted
- Satisfaction: 0.4 +/- 1 (0 best, 10 worst)
- No transfusions required
- Same day or 24 hour stay

Courtesy John Uribe MD
Results: Outcomes

- WOOS: Pre-op 29.2, Post-op 82.9, P<0.001
- ASES: Pre-op 27.9, Post-op 75.4, P<0.001
- Constant: Pre-op 26.9, Post-op 73.0
- Pain VAS: Pre-op 7.8, Post-op 1.4
Conclusions
Anatomic resurfacing

- Treatment of focal to whole head defects
- TSA with stemless HH replacement + an inlay glenoid - a viable alternative to standard stemmed TSA

Advantages:
- More anatomic, less invasive, bone preserving, with less blood loss and shorter hospitalization
- Excellent pain relief and functional improvement in advanced glenohumeral arthritis.
- Low revision rates (Australian Registry)
- Longer follow-up is needed to determine the durability of these results.