B2 Glenoid Bone Loss and Shoulder Arthroplasty: Bone Grafts and Augmented Glenoid Components

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Presenter Disclosure Information
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Disclosure Information
The following relationships exist:
- DePuy/Johnson and Johnson: Consultant, Royalties
- Biomet: Consultant, Royalties
- Sonoma Orthopaedics: Consultant, Royalties
- Invuity: Consultant, Stock Options
- BioPoly: Consultant, Stock Options

Nothing of value received for this presentation
No “off label” use of any products

Glenoid Bone Loss in Osteoarthritis

- OA is the most common indication for TSA
- At least 75% of patients have some posterior bone loss resulting in increased glenoid retroversion
- In patients with severe OA, mean glenoid version of 11° retroversion (range 2° anteversion to 32° retroversion)
General Rules

• Bone loss must be addressed
• Glenoid rim erosion encompassing greater than 25% to 30% of the articular surface requires grafting
• Correct glenoid retroversion to < 10 degrees
  – ideally < 6 degrees

Options for Management of Posterior Glenoid Bone Loss in OA

• Ream the high side to correct version
• Use a bone graft to correct version
• Use a custom implant to correct version
• Reverse total shoulder arthroplasty

  Place the humeral component in anatomic version

Problems with Eccentric Reaming

• The maximum amount of retroversion that can be corrected with eccentric reaming is 15 degrees  
• Medialization of joint line
• Cuff weakness
• Creates smaller glenoid
• Can result in significant head/glenoid mismatch
Bone Grafting

- Restores the original glenoid plane
- Malunion, non-union, and increased surgical time
- 10 fold higher failure rate than normal TSA

Severe Glenoid Erosion
Use of a Bone Graft

- Greater than 1 cm.
- Bone graft
  - Humeral head
  - Iliac crest graft
- Screw fixation
- Avoid cement wedges
Bone loss with Reverse TSA

• Bone loss
  – Glenoid
    • Reaming
    • Cancellous grafting

Use of a RTSA

• Problems:
  – In my experience, most of the posterior erosion cases are in active males
  – What do you do with a younger (<70) male with an intact rotator cuff who wants to remain as active as possible?
Can you use an augmented glenoid?

Augmented Glenoid

• No medialization
• No implant undersizing
• No need to bone graft
• Re-establishes normal joint line
• Returns cuff to normal tension

Design Rationale

• Addresses posterior glenoid erosion
  – Walch Type B2
• Same peg fixation design as the Anchor Peg Glenoid
  – Central fluted interference fit peg
  – Two inferior pegs
  – One superior peg
• Novel instrumentation
  – Accurate placement, orientation, and precise bone preparation
Design Rationale (cont.)

- Spherical anterior backside
- Conical posterior backside (13 degree angle)
  - Design effectively counteracts posterior loading

Optimal Augmented Design

- Question:
  - Is there an optimal design that counteracts or minimizes the deforming forces on the glenoid component?

  Iannotti, et al, JSES, 2013, 22, 1530-1536

Optimal Augmented Design

- The “stepped” design was the only design that showed no increase in lift off of the component compared to a standard glenoid

  Iannotti, et al, JSES, 2013, 22, 1530-1536
Augmented glenoids allowed correction up to 27.9 degrees (±7.9 degrees) with no significant medialization

Surgical Technique

Glenoid Exposure
Walch B2

Anterior Reaming
Case Example:
60 year old female

Posterior glenoid erosion
HOW TO DEAL WITH B2-B3 GLENOID?

Vumedi Webinar Feb 17, 2015

Disclosure

- Royalties: TORNIER
- Equity: IMASCAP
- Board of the French Orthopedic Society

J Arthroplasty 1999
This classification is not accurate & reliable
(Scalise & Iannotti)

Pb with degree of retroversion
Type C (dysplasia) is > 25°
Type B2 (2ndy erosion) can also be > 25°

B2 glenoid is the consequence of
1/ static posterior subluxation of the HH
2/ secondary erosion of the posterior part of the glenoid

Need to have the proof of secondary posterior wear
  • see the paleo glenoid
  • subluxation of the HH

(degrees of retroversion is not part of the diagnostic: 15 to 60° …)

B2 and A2 are sometimes confused
if the paleo glenoid is absent

Paleo glenoid not always visible
  • level of the cut
  • osteophytes’ anterior reconstruction
  • severe erosion and minimal subluxation

concentric or eccentric glenoid…
1/ level of the cut may change the glenoid shape

Same patient at 2 ≠ levels

2/ osteophyte’s anterior reconstruction
Biconcave becomes concentric…

Osteophyte’s anterior reconstruction
Eccentric glenoid becomes a concentric one!
3/ Severe erosion – minimal subluxation
concentric glenoid but severe RV

Introduction of
B3 glenoid

- No paleo-glenoid (concentric glenoid, no biconcavity)
- Glenoid erosion & retroversion > 15°
- Posterior subluxation of the HH > 70%

B3 Glenoid

HH subluxation > 70%
Retroversion > 15°
No paleo-glenoid
Concentric glenoid
Types B2 - B3 How to address?

92 cases - 77m f-up
(Eccentric reaming, bone graft, post capsulorraphy, hum antev.)

- 66.3% satisfied or very satisf.
- 16.3 % Revisions
- 20.6% glenoid loosening

Intermed. glenoid RV > 27° = 50% complic
Sublux / scapula > 80% = 50% complic

Static posterior subluxation recurs
→ glenoid loosening (rocking horse)

Case 1
Case 2
Case 3
27 cases – 54 m f-up

81% females
Mean age: 74.1 yo (66-82)
17 dominant shoulders (63%)

Exclusion criteria
Rotator cuff tear (2 tendons or more), Cuff tear arthropathy, Post traumatic arthritis, Rheumatoid arthritis,

Reverse Prosthesis (2 stages)

Structural bone graft (1 stage)
Results

<table>
<thead>
<tr>
<th></th>
<th>Preop.</th>
<th>Postop.</th>
<th>p value</th>
</tr>
</thead>
<tbody>
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<td>Pain</td>
<td>4</td>
<td>14</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Activity</td>
<td>7.9</td>
<td>18.5</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Mobility</td>
<td>14.2</td>
<td>35.1</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Strength</td>
<td>4.5</td>
<td>8.7</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Total</td>
<td>30.6</td>
<td>76.3</td>
<td>&lt; 0.0001</td>
</tr>
</tbody>
</table>

93 % Satisfied or very Satisfied, 7 % Disappointed

Results: Range of Motion

<table>
<thead>
<tr>
<th></th>
<th>Preop.</th>
<th>Postop.</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFE</td>
<td>89°</td>
<td>152°</td>
<td>&lt; 0.0001</td>
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<tr>
<td>RE1 A</td>
<td>3°</td>
<td>27°</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>IR</td>
<td>Buttocks</td>
<td>T12</td>
<td>&lt; 0.0001</td>
</tr>
</tbody>
</table>

SSV 81.7%

All the graft but one healed, no glenoid RLL

- Scapular notching: 10 cases (37%)
  Grade 1: 6, Grade 2: 4, Grades 3 & 4: 0
- Humerus Radiolucent lines: 2 (8.3%)
  Humerus zone 1: 1, zone 7: 1
Current indications for Reverse in B2-B3 glenoid

• Subluxation HH / scapula > 80%

• Failure to implant correctly a PE glenoid
  - Glenoid RetroVersion > 10°
  - Glenoid reaming > ½ suchond bone surf
  - Seating < 80%

Thank you!
Glenoid Bone Loss

- Salvaging a failed shoulder arthroplasty with glenoid bone loss is a technically challenging procedure.
- Iliac crest can allow for successful one stage reconstruction of the glenoid vault in cases of massive glenoid bone loss.
Tricortial iliac crest bone graft for massive
glenoid bone loss during revision shoulder
arthroplasty 2yr follow up

Mark A. Schrumpf MD,
Tom R. Norris MD
ICSES 2013 Nagoya, Japan

Methods

• Database search was performed of a single surgeon's case
  log from '05-'10
• Patients who underwent reconstruction of the glenoid
  vault in a single stage revision surgery were identified
• All patients were revised to a reverse shoulder prosthesis.
• Data was collected in a prospective fashion for ASES,
  Constant, WOOS, SANE and patient satisfaction.

Reconstruction Technique

• Deltopectoral approach used to
  retrieve all failed implants
• Recipient glenoid was freed of
  any soft tissue while taking care
  to protect bone stock
• Iliac crest was prepared in-situ
  and baseplate implanted in graft
• Graft cut free of pelvis and fixed
to scapula with baseplate screws
Results
• 23 shoulders were treated in 21 patients
• Average clinical follow up of 27 months
• Patient had undergone an average of 3 prior open shoulder surgeries (max 15, min 1).

Clinical scores
• ASES scores improved from 62.9 to 68.3 (p=0.07)
• Constant improved from 37.0 to 44.2 (p=0.07)
• SANE improved from 32.7 to 41.7 (p=0.36)
• WOOS scores changed from 62.2 to 48.2 (p=0.02)
• Patient satisfaction levels improved by 16.3% (p=0.03)
Range of motion

- Range of motion improved in all directions except active external rotation.
- AFF increased from 87° to 105° (p=0.06)
- AAB increased from 76° to 103° (p=0.01)
- Internal rotation also improved from between the buttocks and lumbosacral junction to between the lumbosacral junction and L3.
- Active external rotation decreased only slightly from 20° to 17° (p=0.65)

Results – graft healing

- 14 of 23 grafts healed completely, an additional 3 had partial incorporation of the crest graft.
- There were only 6 frank graft failures

Complications/Reoperations

- Unfortunately, 11 of the 23 (48%) shoulders required reoperation and removal of some or all of their glenoid components during the follow up period.
  - 3 of the shoulder were revised for base-plate losing
  - 2 for fracture of the glenoid following low energy trauma
  - 3 for infection
  - 1 for graft non-union
  - 1 for graft fracture
  - 1 for glenosphere baseplate disassociation.
- Three patients had humeral complications with fractures of the shaft around the humeral stem necessitating intervention highlighting the complex nature of this group of patients.
Discussion

- This is a complicated and heterogeneous group of patients for whom glenoid bone loss is only one of the challenges faced in restoring shoulder function.
- The overall all cause reoperation rate was high (48%)
- 14/23 (61%) of the bone grafts healed completely to the native scapula and an additional 3 had some incorporation for a total of 74% adequate graft healing. This procedure represents a viable option for single stage revision for massive glenoid defects.

Clinical results of revision shoulder arthroplasty using the reverse prosthesis

James D. Kelly Jr, MD**, Jeff X. Zhao, MD, E. Rhett Hedgood, MD**

- 12 ICBG (12/30 RSA in study)
- Average F/U 34 mo.
- FOS, AFF, AAB significantly increased
  - Adj Constant: 24.3-64.6
  - ASES: 54.8-71.8
  - AFF: 42.0-105.7
  - AAB: 39.4-97.7

<table>
<thead>
<tr>
<th>Metric</th>
<th>Pre-Op (n=12)</th>
<th>Post-Op (n=12)</th>
<th>Difference</th>
<th>P</th>
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<td>FOS</td>
<td>24.3-64.6</td>
<td>54.8-71.8</td>
<td>30.5</td>
<td>0.005</td>
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<tr>
<td>ASES</td>
<td>42.0-105.7</td>
<td>71.8</td>
<td>30.8</td>
<td>0.005</td>
</tr>
<tr>
<td>AFF</td>
<td>39.4-97.7</td>
<td>105.7</td>
<td>66.3</td>
<td>0.005</td>
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<tr>
<td>AAB</td>
<td>24.3-64.6</td>
<td>71.8</td>
<td>47.5</td>
<td>0.005</td>
</tr>
</tbody>
</table>

1st Conclusions

- This procedure represents a viable option for single stage revision for massive glenoid defects.
- While this is a complex and difficult group of patients to treat owing to bone loss and multiple prior operations, significant and durable improvements in satisfaction, range of motion and functional scores can be obtained by using iliac crest to reconstruct the glenoid.
How to improve results?

- Base plate options
- Glenoid anatomy may determine 1 or 2-stage

Design advances
Ingrowth, locking screws

Long post base plate to engage native scapula with bone grafts

SPBP  LPBP  THREADED or SCREW-IN BP
25-50 mm screw length
Base plate advances
- Base plate designs—one or multi-piece
- Fixation to native scapula with grafts
- Textures or ingrowth coatings
- **Threaded BP 10-18x torque/compression**
- Length options for **bi-cortical fixation and grafts**

Threaded Post Baseplate
- Fixation achieved at base of glenoid vault

GBL

Global Glenoid loss (GBL type 3)

- Sideways TICBG
- Structural allograft
  - Femoral head, neck or shaft
  - Humeral head when using proximal humeral combined graft
- BMP
- Consider staging

TICBG—2-stage reconstruction with threaded baseplate

Reconstruction of massive uncontained glenoid defects using a combined autograft-allograft construct with reverse shoulder arthroplasty: preliminary results

- Autograft-allograft composite
- 5 patients
- Preliminary results show incorporation of the graft in all pts
Global GBL

TSAR-RSA-Sepsis GSL-Resection

GSL
TSAR-RSA1-GBG allograft chips, SPBP
RSAR-TICBG fracture-NU
RSAR2-subside upwards-HO inferior-instability
RSAR3-PH allograft, FNA to glenoid to lateralize
Scapula fx reaming-Staged RSA

Early RSAs: placed mid glenoid
Impingement, osteolysis, notch, instability, GSL

Malposition high, levers out
Conclusions

• Tricortical Iliac Crest Grafts offer a good option for reconstructing glenoid bone loss in revision arthroplasty
• Advances on base plate technology with long posts and screws to engage the native scapula will improve our outcomes.
• Scapular bone loss plays an important role in whether the cases can be done in 1 or 2 stages
The Use of Cancellous Bone Graft Harvested from the Humeral Head (BIORSA Technique) to Address Glenoid Deficiency: A CT-Scan Study

Pascal Boileau, Nicolas Morin-Salvo, Gregory Moineau, Thomas D'Ollonne, Patrick Gendre, Charles Bessière

Nice - France

Disclosure

Pascal Boileau – Royalties - Tornier

Preliminary study good results for glenoid without bone deficiency!

Bone Increased-offset Reversed Shoulder Arthroplasty
Minimizing Scapular Impingement While Maximizing Glenoid Fixation

CORR 2011

42 patients / 42 BIORSA
FU mean : 28 Months (24-40)

100% graft incorporated
No glenoid loosening
19% scapular notching
Excellent mobility
No instability
AIM

to report the results of the use of BioRSA technique to address glenoid deficiency

1- Is graft large enough for glenoid bone deficiency?
2- Does such a big graft heal?
3- Scapular notching
4- Functional outcomes

Retrospective Monocentric study

**Inclusion Criteria:**
- glenoid bone deficiency : Favard E2,E3,E4 or Walch A2,B2,C
- RSA + bony-lateralization with humeral bone graft
- Patient reviewed with Xray + CT-scan > 1 year

**Exclusion Criteria:**
- BIO-RSA technique with Allograft or Iliac-crest graft
- Revision shoulder arthroplasty (failed hemi or total SA)

2006 to 2013

93 BIO-RSA for glenoid bone deficiency

allograft 29, iliac crest 10

63 BIO-RSA
humeral bone graft

N = 54
### BIO-RSA for Glenoid Deficiency (n = 54)

- Women 70% - 73 years [52-85]

<table>
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<tr>
<th>Condition</th>
<th>Count</th>
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<tbody>
<tr>
<td>Cuff tears arthropathy</td>
<td>31</td>
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<tr>
<td>Osteoarthritis</td>
<td>13</td>
</tr>
<tr>
<td>Osteoarthritis post-instability</td>
<td>2</td>
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<tr>
<td>Rheumatoid arthritis</td>
<td>6</td>
</tr>
<tr>
<td>Fracture Sequelae</td>
<td>2</td>
</tr>
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</table>

- FU mean : 33 m [12-81]

### Glenoid Deficiency

#### Horizontal Plane (WALCH) A2,B2,C

- A2 = 8
- B2 = 15
- C = 7

#### Vertical Plane (FAVARD) E2,E3,E4

- E2 = 15
- E3 = 21
- E4 = 3
Radiographic Measurement of Glenoid Inclination

**FAVARD inclination**

**GERBER inclination**


---

2D-CT-Scan Measurement of Glenoid Inclination & Version

**MPR mode (Multi Planar Reconstruction)**

**GERBER inclination**

**FRIEDMAN version**


---

RESULTS
Glenoid Loosening
N = 2 (4%)

Revisions
N = 1 (2%)

Correction vertical deficiency
GERBER inclination = 10°

<table>
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<tr>
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<th>Incl. pre-op Rx</th>
<th>Incl. pre-op CT-Scan</th>
<th>Incl. post-op Rx</th>
<th>Incl. post-op CT-Scan</th>
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<tbody>
<tr>
<td>Total series (n = 54)</td>
<td>106.4° (71;142)</td>
<td>104.9° (68;139)</td>
<td>96.1° (70;122)</td>
<td>95.9° (71;121)</td>
</tr>
<tr>
<td>Favard E2, E3 (n=39)</td>
<td>111° (95;142)</td>
<td>112.1° (96;138)</td>
<td>97.6° (70;122)</td>
<td>97.3° (71;121)</td>
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Correction vertical deficiency
FAVARD inclination = 10°

<table>
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<tr>
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<th>Incl. pre-op Rx</th>
<th>Incl. post-op Rx</th>
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<td>Total series (n = 54)</td>
<td>88.1° (54;117)</td>
<td>98.1° (64;129)</td>
</tr>
<tr>
<td>Favard E2, E3 (n=39)</td>
<td>82° (54;106)</td>
<td>93.5° (68;118)</td>
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</table>
Correction horizontal deficiency

\[ \pm 10° \]

<table>
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<th>version pre-op</th>
<th>version post-op</th>
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<tr>
<td>Total series (n = 54)</td>
<td>- 12.1° (-49;+19)</td>
<td>- 4.7° (-32;+21) (p=0.30)</td>
</tr>
<tr>
<td>Walch B2, C (n=30)</td>
<td>- 21.1° (-49;0)</td>
<td>-10.6° (-32;+4) (p=0.06)</td>
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</table>

GRAFT HEALING

FU mean : 33m [12-81]

52/54 Graft incorporated (96%)

GRAFT HEALING

(CT-scan) FU mean : 33m [12-81]

52/54 Graft incorporated (96%)

3m Post-op 12m Post-op 18m Post-op

E3 / C combined 46m post-op
### Scapular notching

**= 25%**

(NO NOTCH GRADE 4)

![Images of scapular notching](image)

### Partial inferior graft lysis

**= 11%**

GRAFT HEALED

![Image of partial inferior lysis](image)

### Clinical outcomes (N=53)

<table>
<thead>
<tr>
<th></th>
<th>Preop</th>
<th>Postop</th>
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<tr>
<td>absolut CS</td>
<td>31 (9-62)</td>
<td>68 (30-99)</td>
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<tr>
<td>AAE</td>
<td>85° (20-170°)</td>
<td>148° (80-180°)</td>
</tr>
<tr>
<td>ER1</td>
<td>12° (20-60°)</td>
<td>24° (20-70°)</td>
</tr>
<tr>
<td>IR1</td>
<td>51 (3.2) (0-71°)</td>
<td>L4 (5.6) (0-24°)</td>
</tr>
<tr>
<td>SSV</td>
<td>30% (10-80°)</td>
<td>83% (0-100)</td>
</tr>
</tbody>
</table>

*P < 0.05

![Graph or table showing clinical outcomes](image)
CONCLUSION

- Correct axis + Treat glenoid deficiency
  - inclination \rightarrow -10°
- Version \rightarrow +10°

CONCLUSION

- **Graft heals** and remains viable in **96%**
  (2 failures = 1 technical error, 2 traumatic loosening)
- **Notch** 25%

PERSPECTIVES

3D-planning

- cut-guide & graft dimension personalized

Thank you for your attention!
Reverse TSA - How to Handle Glenoid Bone Loss

Thomas W. Wright MD
University of Florida
Department of Orthopaedics

Disclosure

• Design Surgeon for Exactech
  – Institutional research support
  – Royalties

Introduction Glenoid Wear - RTSA

• Reaming solutions
• Bone graft Solutions
• Metal solutions
• Early Outcomes
**Glenoid Bone Loss - Reaming**

- Ream to correct deformity
  - Give up valuable subchondral bone
  - Correct only about 15 degrees
  - Glenoid shrinks

**Eccentric Reaming**

Issues w/ eccentric reaming:
- Insufficient bone stock
- Implant downsizing
- Peg Perforation
- Implant loosening loss subchondral support
Glenoid Bone Loss - Grafting

• Bone Graft defect
  – Humeral head autograft if present
  – Allograft or autograft iliac crest
  – Technically demanding
  – Graft needs to heal
  – Use extended post

Cases Humeral Head Autograft
Glenoid Bone Loss – Metal Solutions

• Metal soutions
  – Posterior augment
  – Superior augment
  – Posterior – superior augment
  – Lateralized glenosphere

Hypothesis

• Severe Glenoid Wear treated metal augments will have comparable outcomes RTSA patients with normal glenoid
Case – Augmentation with Metal

- 60 failed hemi
- Previous surgery for instability
- Pain/ bad function
• 29 Patients
  – 20 primary
  – 9 revision
• Age - 70
• Average F/U – 18 months
• Complication – 1 dislocation
Superior Augmented Baseplate

<table>
<thead>
<tr>
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<th>SPADI 100</th>
<th>SST</th>
<th>ASES</th>
<th>UCLA</th>
<th>Constant Nrl</th>
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<tr>
<td>Pre op</td>
<td>69</td>
<td>4</td>
<td>33</td>
<td>13</td>
<td>33</td>
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<tr>
<td>Final F/U</td>
<td>32</td>
<td>8</td>
<td>71</td>
<td>28</td>
<td>67</td>
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<tr>
<td>Change</td>
<td>-37</td>
<td>good</td>
<td>+4</td>
<td>+38</td>
<td>+15</td>
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<tr>
<td>Control 2 year</td>
<td>22</td>
<td>9</td>
<td>79</td>
<td>29</td>
<td>76</td>
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Superior Augmented Objective Outcomes

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<tr>
<th></th>
<th>Active elevation</th>
<th>Active External Rot</th>
<th>Active Internal Rot</th>
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<tr>
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<td>75</td>
<td>17</td>
<td>S2</td>
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<tr>
<td>Post Op</td>
<td>116</td>
<td>28</td>
<td>L3</td>
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<tr>
<td>Improvement</td>
<td>+41</td>
<td>+11</td>
<td>+5 anatomic segments</td>
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<tr>
<td>Control</td>
<td>127</td>
<td>27</td>
<td>L3</td>
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Augmentation Metal-Lateralized

- Lateral Center of Rotation Implant
  - Encore – 32std and 32-4
  - Exactech – lateralized glenosphere
  - Others
Superior Augment/Lateralized Glenosphere

Lateralized Glenosphere

• N=29
• Age – 67
• Follow-up Ave – 8 months
• One dislocation

Lateralized Glenosphere Functional Outcomes

<table>
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<th>SPADI</th>
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<tr>
<td>Improvement</td>
<td>-41</td>
<td>+5</td>
<td>+40</td>
<td>+16</td>
<td>+31</td>
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<td>Control 1 year</td>
<td>30</td>
<td>9</td>
<td>70</td>
<td>27</td>
<td>67</td>
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</tbody>
</table>
### Lateralized Glenosphere Objective

<table>
<thead>
<tr>
<th></th>
<th>Active Elevation</th>
<th>Active External Rot</th>
<th>Active Internal Rot</th>
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<tbody>
<tr>
<td>Pre Op</td>
<td>61</td>
<td>12</td>
<td>S2</td>
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<tr>
<td>Final F/U</td>
<td>97</td>
<td>19</td>
<td>L5</td>
</tr>
<tr>
<td>Improvement</td>
<td>+36</td>
<td>+7</td>
<td>+2 anatomic Seg</td>
</tr>
<tr>
<td>Control 1 yr</td>
<td>118</td>
<td>23</td>
<td>L4</td>
</tr>
</tbody>
</table>
Posterior Augmented Baseplate

- N=42
- Age – 71
- Follow-up Average – 12 months
- Complications – 1 intraop tuberosity fx

---

Functional Outcomes Posterior Augmented

<table>
<thead>
<tr>
<th></th>
<th>SPADI 100</th>
<th>SST</th>
<th>ASES</th>
<th>UCLA</th>
<th>Constant NF</th>
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<td>43</td>
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Objective Outcomes Posterior Augmented

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<tr>
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<td>+8</td>
<td>+4 Anatomic Seg</td>
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<tr>
<td>Control 1 yr</td>
<td>118</td>
<td>23</td>
<td>L4</td>
</tr>
</tbody>
</table>
Posterior Superior Augment

- Severe glenoid wear
- Previously only treatment – bone grafting
- Posterior superior wear patterns – common in CTA
- N=5 only 6 months average f/u

Posterior Superior Augment

Posterior Superior Augment

Posterior Superior Augment
Posterior Superior Augment
Functional Outcomes

<table>
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<tr>
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<th>ASES</th>
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<td>8</td>
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Posterior Superior Augment
Outcomes

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<tbody>
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<td>Preop</td>
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<td>16</td>
<td>5%</td>
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<tr>
<td>Final Follow-up</td>
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<td>Change</td>
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<td>19</td>
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<tr>
<td>Control 6 months</td>
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</table>

Conclusion Ugly Glenoid

- Be Aware
- Know the solutions
- Solutions are in evolution
- Can make a big difference with patient
  - Pain
  - Function
  - Durability implant
- Based on Short term f/u metal augments are a viable solution