






## Computer Assisted Planning for RSA

**Jonathan C. Levy, MD**  
Chief of Orthopedics  
Program Director, ASES Fellowship  
Holy Cross Hospital  
Fort Lauderdale, Florida USA



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## Case

- 58 year old male with left shoulder pain following trauma 10 years ago
  - Forward Elevation 70
  - 3/5 SS and 3/5 ER
  - Severe Pain
- PHM –
  - DM
  - Smoking
  - Bilateral total knees
- Previous Treatments
  - Cortisone Injections
  - PT
  - NSAIDs



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## CT Scan

- Superior Migration
- Superior Humeral Head Collapse
- Severe Arthritic Changes (Hamada 5)



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## RSA Plan

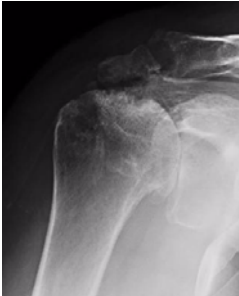
- Straightforward RSA
- Routine Plan
  - Anatomical Humeral Cut
  - 36 Neutral Glenosphere
    - Larger Male
  - Inferior Tilt to baseplate

**Q1: Where do I like my Baseplate?**

- 2005: So glenosphere rests at lower glenoid
- 2010: Mid glenoid to prevent over-lengthening
- 2016: So glenosphere rests at lower glenoid

**Q2: How do I select my Glenosphere?**

- Small patients – smallest sphere (32-4)
- Larger patients – match size of glenoid




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## RSA Plan

- Humeral Stem
  - Anatomic Neck Cut
  - Plan for Metaphyseal Press Fit
    - 58 year-old strong bone
    - Use bone from humeral head for impaction grafting




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## Right Shoulder RSA

- 36N Glenosphere high?
  - Burr used for inferior glenoid
- 1<sup>st</sup> Generation Press-Fit Stem
  - Metaphyseal Press Fit
  - Standard implants – too loose
    - Anterior Drawer in Add/IR/Ext
  - +4 Neutral
    - Too Tight
- *+4 Semiconstrained Poly*
  - *Acts as +2.5 with 10 degrees of greater constraint*




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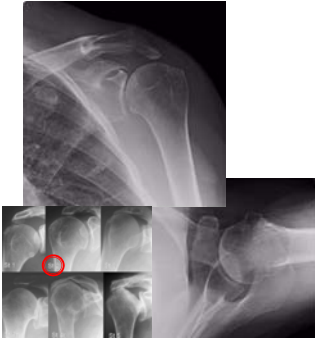
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## Opposite Shoulder

- 1.5 years later
- Left shoulder pain
  - Forward Elevation 70
  - 3/5 SS and 3/5 ER
  - Severe Pain
  - Tried cortisone, PT, NSAIDs
- Xrays – Hamada 2
  - Min arthritic changes
  - Narrow AH Interval



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## MRI

- Patient presented with MRI (not typically ordered)
  - Massive irreparable tear
  - Superior Migration



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## Opposite Shoulder

- Decision to proceed with RSA
- My Plan: use additional surgical planning to anticipate soft-tissue balancing



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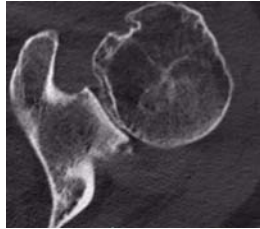
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## CT Scan

- Routine CT Scan
  - 2D Reconstructions
- Allows estimated measurements
  - Humeral head Cut
  - Diameter of Canal
  - Size of Glenoid



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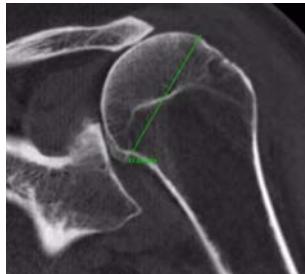
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## CT Scan

- Size of Humeral Neck Cut
  - Estimates how metaphyseal reaming will seat implant
  - Outer Diameter of Altvate (and Monoblock) at the osteotomy cut is 42mm
  - Measured 47mm
  - Should fit well with circumferential fit for **metaphyseal press-fit**



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## CT Scan

- Humeral Canal Size
  - Use smallest diameter
    - Humeral canal becomes trapezoidal distally
  - Measured 15mm
- If metaphyseal press fit is insufficient, can anticipate **diaphyseal fit** with 14mm stem
  - Understand Diaphyseal Tilt



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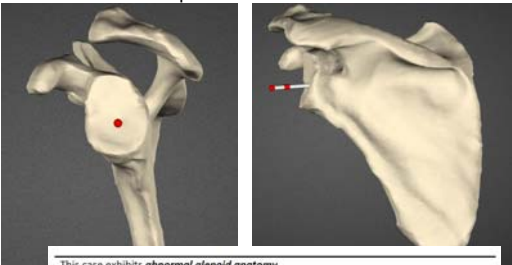
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## SurgiCase Planning

Unreamed without implant



This case exhibits *abnormal glenoid anatomy*.

Inclination (superior) = 12.7 degrees	Acromion-glenoid distance = 23.1 mm
Version (retro) = 8.6 degrees	Coracoid-glenoid distance = 2.1 mm

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## SurgiCase Planning

- Baseplate Position
  - Restoration of tilt with 13 degrees of inferior tilt
  - Maintaining natural retroversion of 8 degrees
  - 100% implant coverage

This case exhibits *abnormal glenoid anatomy*.

Inclination (superior) = 12.7 degrees	Acromion-glenoid distance = 23.1 mm
Version (retro) = 8.6 degrees	Coracoid-glenoid distance = 2.1 mm

Procedure

RSA TSA

Inclination Angle  
- 13° +

Version Angle  
- 0° +

Implant Rotation  
- 15° +

Implant Coverage  
100%

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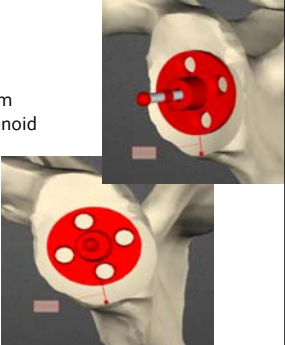
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## Reamed with Implant view

- Anticipating 36 Neutral Glensphere
  - Baseplate positioned 5-6mm from the inferior pole of glenoid
    - 36N diameter = 18
    - Baseplate diameter = 13



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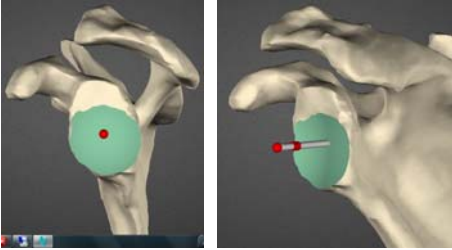
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## Reamed without Implant

- Expected view after reaming
- Screen shot taken to surgery for confirmation




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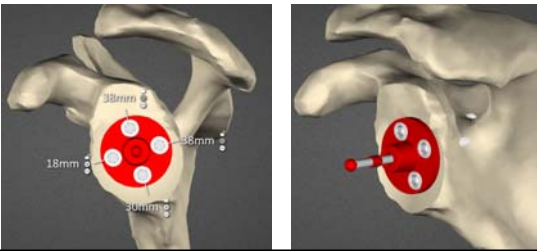
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## Reamed + Implant + Screws

- Optimal implant rotation for screw placement
- Avoid long screws directed at base of scapular spine
- Avoid screws directed along spinoglenoid notch




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## SurgiCase Planning

### Baseplate Orientation Options

Planned Screw Length			Suggested Screw Length			Suggested Screw Length		
Screw Number	Estimated Depth	Planned Screw Length	Screw Number	Estimated Depth	Suggested Screw Length	Screw Number	Estimated Depth	Suggested Screw Length
1	42mm	35mm	1	31mm	24mm	1	22mm	22mm
2	62mm	30mm	2	59mm	18mm	2	28mm	30mm
3	29mm	30mm	3	36mm	15mm	3	45mm	30mm
4	16mm	18mm	4	18mm	18mm	4	23mm	25mm

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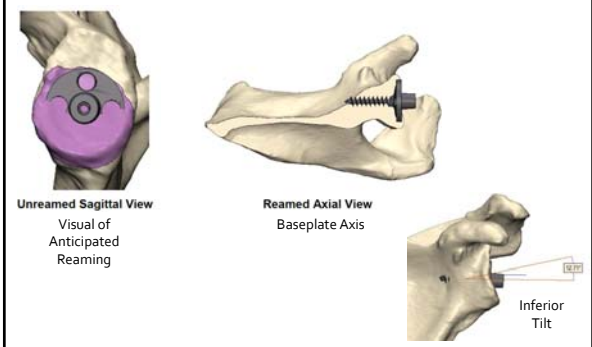
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### Approved Surgical Plan



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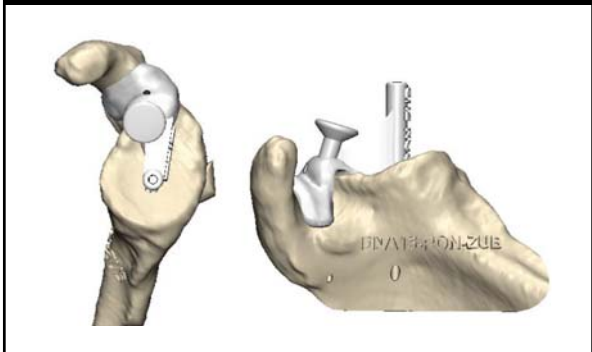
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### MatchPoint Guide



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### Intra-op

- Live Surgery ICJR
- 36 Neutral Glenosphere
- Peripheral Screw Orientation matched plan



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### Intra-op

- 12 Altivare Stem
  - Metaphyseal Press Fit
- Well Balanced using standard neutral polyethylene



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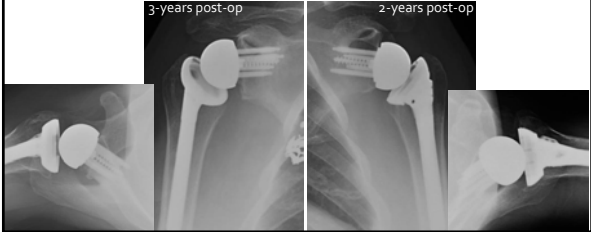
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### Post-op Function

<ul style="list-style-type: none"><li><b>Right Shoulder</b> (3.5 years post-op)<ul style="list-style-type: none"><li>Forward Elevation 145</li><li>ASES 88.3</li><li>SANE 85</li><li>Excellent Rating</li></ul></li></ul>	<ul style="list-style-type: none"><li><b>Left Shoulder</b> (2-years post-op)<ul style="list-style-type: none"><li>Forward Elevation 150</li><li>ASES 93.3</li><li>SANE 90</li><li>Excellent Rating</li></ul></li></ul>
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### Steps for Planning

- Obtain CT Scan with thin cuts
- Know your goals
  - RSA – unclear
  - TSA – correct glenoid version
- Know your software
  - How is version/inclination calculated?
- Virtually Plan Case
- Print out screen shots to assist during surgery
- If using a guide always be ready to be a surgeon and make judgement

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## Comments

- Without MatchPoint
  - Balanced shoulder with +4 semiconstrained polyethylene
  - Burred inferior glenoid to prevent potential notching impingement
  - Would have preferred glenosphere to be lower in this larger patient



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## Comments

- With MatchPoint
  - Glenosphere placement perfect
  - No need for humeral augments for soft-tissue balancing
  - No need to ream the inferior glenoid



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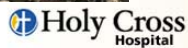
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# Thank You

**Jonathan C. Levy, MD**  
Holy Cross Orthopaedic Institute  
Fort Lauderdale, Florida  
(954) 958-4800

[jonathan.levy@holy-cross.com](mailto:jonathan.levy@holy-cross.com)



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