Managing the Traumatic Unstable Shoulder in the Setting of Bone Loss

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Disclosures

• Educational consultant Johnson and Johnson

• No conflict of interests within this presentation
Traumatic Instability - Current Concepts

- Identifying the at risk athlete
- Understanding the recurrence risks for nonoperative management
- Recognizing risk factors associated with failed soft tissue Bankart procedures
- Recognizing bone loss
- Use imaging tests to assist in treatment algorithm
- Counseling the team medical staff on post-intervention expectations
Why ‘failed” instability surgery?

- **Bone loss**
- **Surgical technique**
- Non-anatomic repair
- capsular laxity
- *Collision athlete*
- < 20 yo; male
- Traumatic recurrence
- Number of dislocations
- Revision Surgeries
- Poor rehabilitation

Boileau et al JBJS 2006, 07
Tauber et al JSES 2004
Burkhart, DeBeer Arthro 2000
“We’ll try to fix it with the scope and if that doesn’t work, we’ll do something else”
Bony Defects - The Problem…

- 194 patients (1992 - 98) arthroscopic Bankart repair with suture anchors
- Significant bone defects in 21 patients
  - Inverted-pear glenoid (18 patients)
  - Engaging Hill-Sachs lesion (3 patients)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Recurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>No bone defect</td>
<td>4% recurrence</td>
</tr>
<tr>
<td>Bone defect</td>
<td>67% recurrence</td>
</tr>
<tr>
<td>Inverted Pear</td>
<td>61% recurrence</td>
</tr>
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Burkhart, DeBeer Arthroscopy, 2000
Is there a role for arthroscopic stabilization in 2018?

- YES! But…

- Choose the right patient
  - Early intervention-Consideration for stabilization in the first time dislocation
  - Avoidance of Bone Defects
    - <15% Glenoid Defect
    - Beware of Bipolar Lesions

- Appropriate surgical technique
Glenoid Bone Loss

Between 4 - 6 mm anterior bone loss can amount to 20-25% of glenoid
Inverted Pear Glenoid

Shortens the “safe arc” through which the glenoid can resist axial forces
Increases forces on a labral repair

Lo and Burkhart *Arthrosc* 2004
Hill-Sachs - *Glenoid Track*

**IMPORTANCE =**

If there is **GLENOID BONE LOSS** →

Makes **HILL-SACHS more significant**

*Bipolar Problem!*

Yamamoto, Etoi, et al *JSES 2007*
“Glenoid Track”

- Measured contact area between humeral head and glenoid in ABD, 60° ER
- Defects outside the track at high risk of engagement
- As glenoid size decreases (bone loss) glenoid contact area (track) decreases

Yamamoto, Itoi, et al. *JSES 2007*
On-Track Hill-Sachs Lesion

- If H-S lesion is within the margins of glenoid track, there is no engagement (on-track)
Off-Track Hill-Sachs Lesion

- If medial margin of H-S defect extends beyond glenoid track, the H-S engages the glenoid rim (off-track)
Bone Loss: When do I need to worry about it? Patient Evaluation

Warning Signs!

- Young Age
- Contact/Overhead Sports
- Multiple Dislocations
- Mid-Range of Motion
- Night Time Instability
- Revision Situations
Basic Principles of Quantification
Importance of Pre-op Evaluation

Bone loss is at 9 o’clock position (0° not 45°)
- Provencher, AJSM 2008

Inferior aspect of glenoid can be modeled by circle
- Sugaya, JBJS 2003

Approximation of Glenoid Bare Spot
(Barchilon 2008)

Approximation of Bone Loss (Huysmans, JSES 2006)
Imaging - MRI

- Better for soft tissue
- Does allow bone assessment
Imaging-CT Scan

- 3D reconstruction
- Digitally subtract humeral head
- Best way to assess bone
3D CT Diameter Based Quantification

Burkhart, Arthroscopy 2002
Sugaya, Arthroscopy 2005
Lo, Arthroscopy 2004

Percent Bone Loss = \( \frac{B - A}{2 \times B} \)
Arthroscopic Quantification of Glenoid Bone Loss

• Burkhart’s method
• Use graduated probe
• Glenoid inferior circle roughly ~28mm in diameter

Percent Bone Loss \[= \frac{BC - AB}{2 \times BC} \times 100\%\]
Types of Glenoid Bone Loss

Not all bone loss is the same type

Acute Fracture

Partial Resorption
“Partial Attritional”

Complete Resorption
“Fully Attritional”

Provencher, Romeo  Tech Orthop 2008
How should I treat Bone Loss Problems?

- Glenoid Based
- Humeral Based
- Both
Estimate Amount of Glenoid Bone Loss

**0 to 15%**
- Arthroscopic Repair
- Incorporate Bony Fragment
- Liberal use of anchors
- Consider posterior repair (contact athletes)

**15% to 25%**
- Arthroscopic Repair
  - CAUTION! (>20%)
  - Best with bony fragment that is incorporated
- Open procedures ± bone augmentation

**> 25%**
- OPEN bone augmentation procedures

Provencher et al.
*J Bone Joint Surg Am.* 2010 Dec
Combined Lesions

XR, CT, MRI
Arthroscopy?

0 to 10%
- Arthroscopic Repair
- Incorporate Bony Fragment
- Liberal use of anchors
- Consider posterior repair (contact athletes)

10% to 20%
- Arthroscopic Repair
  CAUTION! (>20%)
  - Best with bony fragment that is incorporated
  - Open procedures ± bone augmentation

> 20%
- OPEN bone Augmentation procedures
Surgical Treatment Algorithm

Anterior glenohumeral dislocation

Patient aged ≤ 25 y
Male sex
Competitive sport
Contact sport

No

>2 recurrences

No

Nonsurgical treatment

Yes

Repair (open or arthroscopic)

No

Coracoid transfer/bone graft
Humeral bone graft/remplissage

Yes

>20% glenoid bone loss
Engaging Hill-Sachs lesion

Philipp N. Streubel et al, J Am Acad Orthop Surg 2014
When to Use Anchors

- Bony Bankart
- 5% to 25% glenoid fracture
- Anchors for soft tissue and for bone fragment
Circumferential Sutures
Bridging Sutures, 2 Anchors

- Millett Technique
Transosseous Bridging Sutures
Indications For Latarjet

• Recurrent Instability
• Glenoid Bone Loss (>10-15%)
• Young/Active Patient
  – Age
  – Degree/Type of Sports Participation
• Revision Situations
Coracoid Transfer Procedures

- **Bristow-Helfet (1958)** – transfer tip of coracoid with conjoint tendon

- **Latarjet (1954)** – transfer of larger portion of the coracoid
Principles of Latarjet Stabilization

1. Bone effect by increasing AP diameter of glenoid
2. Conjoint tendon as a sling in abduction-external rotation
3. Subscapularis Tenodesis
4. CAL to capsule (open only)
Sling Effect

- Causes posteriorly-directed force in abd-ER
- Prevents engagement of H-S
- Prevents H-S from over-riding glenoid track
- Addresses glenoid and humeral defects with glenoid-based graft only
My Thought Process

- I am fixing a fracture
- Use fracture principles
  - Good exposure
  - Respect soft tissue
  - Prepare bone surfaces for ideal apposition/reduction
  - Perpendicular fragment fixation
  - Superior compression
Open Latarjet Procedure - Triple Blocking

- Restore anterior inferior glenoid bone
- Repair lateral capsule to CA ligament
- Tension inferior subscapularis
Exposure and split of subscapularis
1. Compressive preload by screw to minimize displacement
2. Stability
3. Direct healing
Graft Placement- Ideal location?

- Superior/inferior- between 3:00 and 5:30
- Not too inferior
- Medial/Lateral
  - Avoid lateral overhang
  - Extend glenoid arc
  - Confluent with articular cartilage or subchondral bone
## Latarjet-Published Outcomes

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<tr>
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</thead>
<tbody>
<tr>
<td>Patients/Follow up</td>
<td>58/14 yrs</td>
<td>118/11 yrs</td>
<td>49/26 yrs</td>
<td>47/39 months</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>88% excellent</td>
<td>98% satisfied</td>
<td>70% satisfied</td>
<td>78% good or excellent</td>
</tr>
<tr>
<td>Recurrence</td>
<td>0%</td>
<td>0%</td>
<td>15%</td>
<td>8%</td>
</tr>
<tr>
<td>Comments</td>
<td>DJD-58% (73% grade I)</td>
<td>DJD-14% (moderate to severe)</td>
<td>-25% complication -10% nerve injury -6% infection</td>
<td></td>
</tr>
</tbody>
</table>
360 patients-recurrent shoulder instability

Comparison of

- Open Latarjet (93) vs Arthro Bankart (271)
- Minimum follow up- 6 years

<table>
<thead>
<tr>
<th></th>
<th>Latarjet</th>
<th>Bankart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instability/Apprehension</td>
<td>11%</td>
<td>41%</td>
</tr>
<tr>
<td>Dislocation</td>
<td>3%</td>
<td>28%</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>97%</td>
<td>87%</td>
</tr>
</tbody>
</table>
Recommendations

- Large acute bony Bankart
  - ARIF or ORIF
- Small acute bony Bankart (< 25%)
  - Arthroscopic Bankart repair
- Large chronic bony Bankart
  - Latarjet
- Normal glenoid, “off-track” Hill-Sachs
  - Arthroscopic Bankart, remplissage
- Borderline large bone loss, either side
  - Arthroscopic Bankart, remplissage
Conclusion

- Decreasing effect of arthro Bankart over time
- Rare recurrence after Latarjet Procedure
  - Usually occur early in post op period
- Arthro Bankart inferior to open Latarjet
- The difference between the 2 procedures with respect to the quality of outcomes significantly increased with follow-up time
I'M AWESOME
Incidence of Glenoid Bone Loss

- 1st time dislocators (Taylor AJSM 1997)
  - 22%

- 100 cases recurrent instability via CT scan (Sugaya JBJS 2003)
  - 50% bony Bankart
  - 40% erosion
  - 10% normal
Glenoid Bone Loss Threshold

Critical amount when soft tissue repair is not successful?

- >21%
- >30%
- >27%

Itoi (JBJS 2000)
Greis JSES 2002
De Beer ARTH 2000
Suguya JBJS 2005

20-30%
15% - soft tissue repair insufficient

17.3% - recurrence after Bankart repair

13.5% led to a clinically significant decrease in WOSI scores consistent with an unacceptable outcome
Consideration for Latarjet Procedure

- Anterior glenoid bone loss >15%
- Off track lesions
- Deficient anterior soft tissue
- Revision
- Recurrent instability
- ALPSA?
- Patient unable to comply with post op Bankart restrictions
Stabilizing Mechanism of the Latarjet Procedure

- Measured translational force to dislocate
- Arm positioned at mid (90/0) and end range (90/90)

Conclusion

- Main stabilizing mechanism of the Latarjet procedure is the sling effect

Yamamoto et al. JBJS (95), 2013
Low rate of recurrence (1 subluxation)

- Improved WOSI scores

- Problems - 14%
- Complications - 19%
- Results similar to open
2 groups, each performed procedure at different institution

<table>
<thead>
<tr>
<th></th>
<th>Mini open</th>
<th>Arthroscopic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients</td>
<td>22</td>
<td>36</td>
</tr>
<tr>
<td>Pain (VAS)</td>
<td></td>
<td>Less (p&lt;.002)</td>
</tr>
<tr>
<td>Pain medication required</td>
<td></td>
<td>Less (p&gt;.05)</td>
</tr>
<tr>
<td>Revision surgery</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Bone block position</td>
<td></td>
<td>More accurate</td>
</tr>
<tr>
<td>WOSI</td>
<td>78.5</td>
<td>82.3</td>
</tr>
</tbody>
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THANK YOU