Shoulder Instability Evolved: An Algorithm for Rx

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Disclosures

- Consultant
  - Depuy Synthes Mitek Sports Medicine
  - Smith Nephew
- Director
  - Southern California Orthopedic Research and Education
- Fellowship Support
  - Depuy Synthes Mitek Sports Medicine
  - Smith Nephew
- AANA
  - Secretary, Executive Board of Directors
- Wolther-Kluwer royalty

Introduction

- Instability Repair
  - Many techniques were tried through the 20th century
    - Magnuson-Stack
    - Putti-Platt
    - Nicola Biceps Transposition

Introduction

Had we only followed our early pioneers:

The only rational treatment is to reattach the glenoid ligament to the bone from which it has been torn.

Bankart '39

Introduction

- Instability Repair
  - Evolved to Open Bankart Techniques
  - Initially performed with Bone Tunnels
  - Suture Anchors were Developed
    - Made open repair much easier
  - Allowed Transition to Arthroscopic Techniques

Traumatic Anterior Instability

- Common Injury
  - Affects 1.7% of the population
- Arthroscopic Repairs Have Improved
  - Marked Advancement through 1990's
  - Standard of Care 2000's
  - Failure Rates Have Decreased
    - Better Surgical Technique
    - Greater Surgeon Experience
    - Improved Equipment
    - Failure Rates (5-10%)

Arthroscopic Instability Repair

- In patients without significant bone loss, Arthroscopic Repair is predictable with good to excellent outcomes
- Current tissue management techniques can repair the labrum, reduce capsular volume and restore capsulolabral balance

Need an Algorithm that makes sense

The literature indicates that arthroscopic stabilization can be successful in the presence of significant bone loss

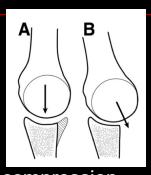
(Mologne, et al)

CAUTION

Failure Rates can be High in Patients with Significant Bone Loss (67%, Burkhart/DeBeer)

Patients with Attritional Glenoid Bone Loss >30% at Highest Risk Very Rare-- 5% of 121 Glenoids Evaluated (Sugaya)

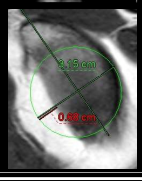
Pathoanatomy



- Anteroinferior Bone Loss
  - Decreases the Articular Arc which Increases Shear Forces across Bankart repair
  - Decreases Depth of Glenoid
    - Negatively impacts concavity-compression
- Effects are Magnified When Associated with Hill-Sachs Lesions that can Engage

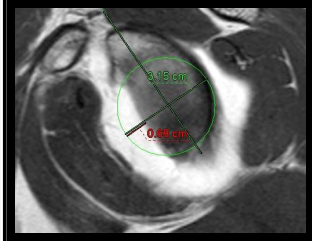
Assessment of Bone Loss

CT vs MRI



- 3D CT considered the "gold standard"
  - Bishop, CORR, 2012
- Increasing evidence supports use of MRI
  - Gyftopoulos, AJR, 2012
  - Markenstein, Skel Rad, 2014
  - Stecco, Radiol Med, 2013

Glenoid Bone Loss Assessment

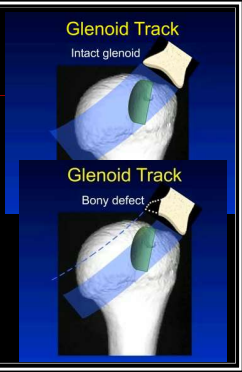


Circle Diameter (Intact) = 31.5mm
Anterior Bone Loss = 6.8mm
%Bone Loss: 6.8/31.5 = 21.5%

Sugaya JBJS 2003
Gyftopoulos AJR 2012

Glenoid Track

- It is the relative size of the Hill-Sachs lesion combined with the glenoid defect that is significant
- If the HSL does not contact the glenoid track the shoulder will not dislocate



Glenoid Track Measurement

Measured distance of the articular contact area to the rotator cuff footprint, and noted that it was 84% the width of the glenoid

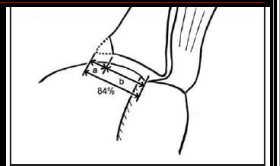


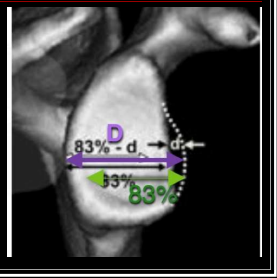
Figure 4.
In the case of a bony defect of the glenoid, the defect width (a) should be subtracted from the 84% length to obtain a true glenoid track width (b) in this shoulder.
(Reprinted from: *J Shoulder Elbow Surg*, Volume 16, Number 5, Authors: Nobuyuki Yamamoto, Eiji Itoi, Hidekazu Abe, Hiroshi Minagawa, Nobutoshi Seki, Yoichi Shimada, Kyoji Okada, Title: Contact between the glenoid and the humeral head

Glenoid Track Measurement

Measure the Diameter (D)
Of the glenoid by CT/MRI

Determine the width of the
Anterior bone loss (d)

Calculate the width of the
Glenoid track GT
GT=0.83D-d



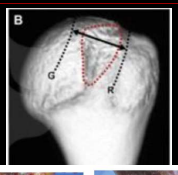
Yamamoto, Itoi

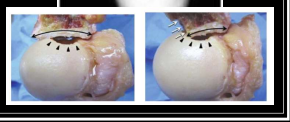
Glenoid Track Measurement

Measure the size of the
HSL and Glenoid Bone Loss

Effectively the width of the
HSL plus the bone bridge
that remains to the RC
Insertion

If the HSL>GT engaging
Off track
HSL < GT on track

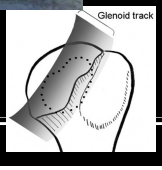




On track Off track

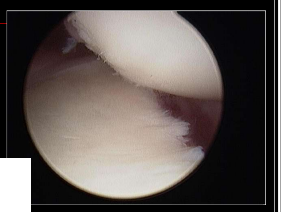
Pathoanatomy Itoi JSES

If the HSL does not
contact the glenoid
track the shoulder
will not dislocate



Inverted Pear Glenoid

- Patients with Inferior Glenoid Bone Loss
  more > 25-30%

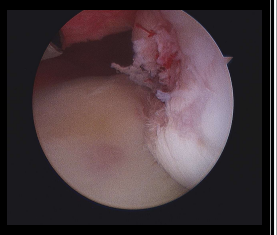


Engaging Hill-Sachs Lesion

- Recognized as a Contributing Factor in Arthroscopic Failures
- Often Associated with Glenoid Bone Loss

Ideal Treatment??

There is still Controversy as to how best treat those patients with instability and glenoid bone loss with significant Hill-Sachs lesions



Bankart + Remplissage

- On Track Lesions
- Easy
- Expands Indication for Bankart
- Best with bone loss under 15%
- HSL amenable to repair

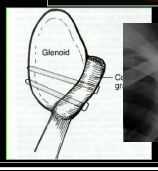
Remplissage

- Ideal Patient: 1° or Revision Patients with Large H-S Lesions and Normal Glenoid or ENGAGING H-S Lesion & Bone Loss <15%.

Courtesy of Jeff Abrams

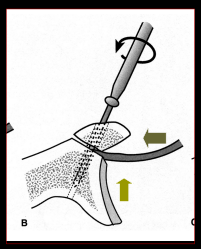
Inverted Pear Glenoid

- Patients with Inferior Glenoid Bone Loss
  - more > 25-30%
  - Bone Block
    - Iliac Crest Graft
    - Articular Options
  - Latarjet
    - Open
    - Arthroscopic



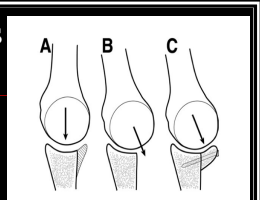
Iliac Crest Bone Graft Eden-Hybinette Procedure

- J.P. Warner – ASES 2004
  - 12 patients
  - Minimum 2 year follow up
  - No recurrences
  - Intra-articular placement
- Historically
  - 10% loss of ER
  - 10% incidence of OA



The Bone Graft vs Dynamic Effect

- The Bone graft will widen the articular arc to allow glenoid to resist off axis load
- The sling effect
  - Not created with bone graft alone



Latarjet Procedure

- Originally described in 1954
- Creates the Triple Blocking Effect
  1. Coracoid Graft increases the osseous diameter of the glenoid to prevent engaging of Hill-Sachs Lesion
  2. Sling effect of the inferior Subscapularis limits humeral translation in ABD/ER
  3. Augmentation of the Ant Capsule with CAL

J Bone Joint Surg Am. 2013 Aug 7;95(15):1390-7. doi: 10.2106/JBJS.L.00777.

The stabilizing mechanism of the Latarjet procedure: a cadaveric study.

Yamamoto N[1], Muraki T, An KN, Sperling JW, Cofield RH, Itoi E, Walch G, Steinmann SP.

RESULTS: The translational force, which decreased significantly after creation of a Bankart lesion or a large glenoid defect, returned to the intact-condition level after the Latarjet procedure was performed. At the end-range arm position, the contribution of the sling effect by the subscapularis and conjoint tendons was 76% to 77% as the load changed, and the remaining 23% to 24% was contributed by the suturing of the capsular flap. At the mid-range position, the contribution of the sling effect was 51% to 62%, and the remaining 38% to 49% was contributed by the reconstruction of the glenoid.

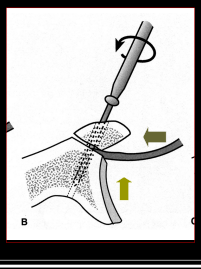
CONCLUSIONS: The main stabilizing mechanism of the Latarjet procedure was the sling effect at both the end-range and the mid-range arm positions.

The Sling Effect is the main stabilizing mechanism at both mid range and end range of motion

End range 76% sling 24% suture of the capsule
Mid range 50-60% sling effect 40-50% Bony reconstruction

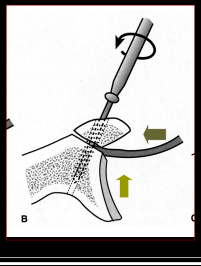
Arthroscopic Glenoid Bone Grafting

- Iliac Crest Auto/Allograft
- Distal Clavicle Autograft
- Distal Tibia Allograft
- Arthroscopic Insertion and Screw Fixation
- Spares the subscap
- Capsulorraphy to the native glenoid rim making the graft extraarticular



Arthroscopic Iliac Crest Bone Grafting

- Sugaya/SCOI
- Iliac Crest Autograft
- Arthroscopic Insertion and Screw Fixation
- Rigid vs Suture Fixation
- Capsulorraphy to the native glenoid rim making the graft extraarticular



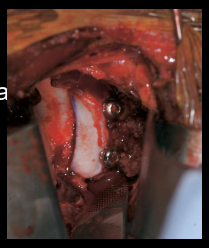
Distal: Tibia Clavicle

- Provencher
- Tokish

Always An Entertaining Debate

Distal Tibial Allograft

- Provencher, et al
- Open Approach
- Matches the articular a the glenoid
- Uses “Fresh” allograft
  - Cost
  - availability
- Resorbtion Concern
- Long term results--coming



But, As an Arthroscopist… Open vs. Arthroscopic

Open

- Excellent visualization
- Rigid Fixation
- Easy to ID neurovascular structures

Arthroscopic

- Difficult Exposure
- Must be absolutely comfortable with arthroscopic anatomy
- Easier done in Beach Chair Position-requires scapular retraction to get appropriate angle for internal fixation

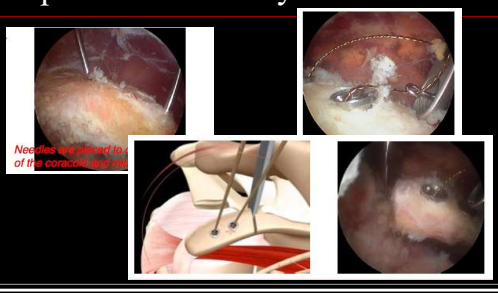
Arthroscopic Latarjet Procedure

5 Stages

1. Achieve Exposure
2. Coracoid Prep
3. Coracoid Drilling/Osteotomy
4. Coracoid Transfer
5. Graft Fixation

Courtesy L. Lafosse

Coracoid Exposure/Osteotomy

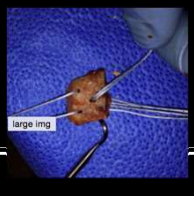


Open vs Arthroscopic Technique

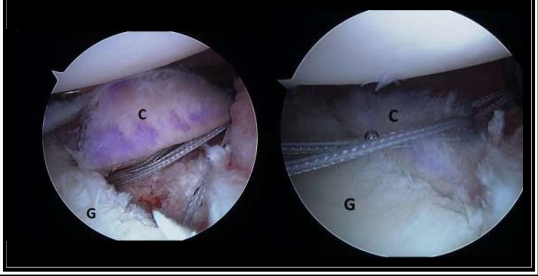
- Steep Learning Curve
- Scope more difficult to achieve proper fixation orientation
- Fixation currently available
  - 3.5 titanium cortical
  - 4.0 Cancellous

Dictal Clavicle Autograft

- John “JT” Tokish
- Osteoarticular Graft
- Typically the “right size”
- Spares the Subscap
- Works well for anterior and posterior bone loss
- Arthroscopic Fixation
  - “Double Pulley”



Distal Clavicle Autograft



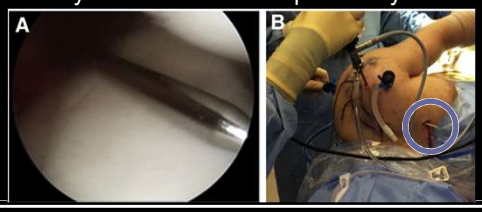
The Winner: Here Today!

Canada…

- Ivan Wong, MD
- SCOI Fellowship

Transpectoral Portal
Ivan Wong and Joe Burns, MD

- Spares Subscap/ Lateral to Conjoined
- Easily Done Lateral—Drape Widely



Distal Tibial Allograft
Ivan Wong, MD

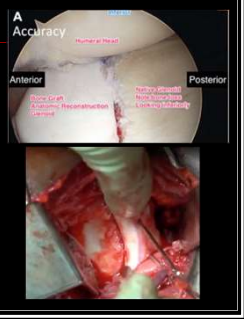
- Matches the articular arc of the glenoid
- Spares Subscap
- All Arthroscopic
- Done Lateral
- Published in Arthroscopy Techniques

Arthro Distal Tibial Technique
Ivan Wong, MD

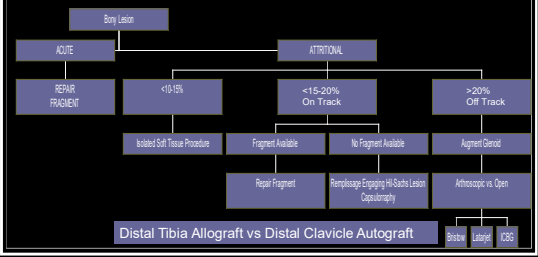
Full video arthroscopytechniques.org

Open vs Arthroscopic

- Steep Learning Curve
- May be more difficult to achieve proper fixation orientation
- Wong Technique has made this more reproducible



Bone Loss Algorithm



Bone Loss Repair Summary

- Identify Pathoanatomy
- Select the Appropriate Procedure
  - For patients with >20% bone loss, OFF TRACK lesions a glenoid reconstructive procedure is necessary
- Arthroscopic Bone Grafting
  - Small lesion-Distal Clavicle Autograft
  - Larger lesion-Distal Tibial Allograft vs. Latarjet will result in Improved Outcomes and are currently the best options for those who have clinically significant erosion
  - Need PRCT between Grafting vs. Latarjet to help solve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Thank You