Humeral Bone Loss:
Does it matter?

A.D. Mazzocca MD,MS
Professor Shoulder and Elbow Surgery
Chairman Department of Orthopaedic Surgery
Director of the New England Musculoskeletal Institute
University of Connecticut USA
mazzocca@uchc.edu

The following relationships exist and have been fully disclosed and approved by the
STATE OF CONNECTICUT ETHICS BOARD

1. Royalties and stock options-NONE
2. Consulting income-ARTHREX INC
3. Research and educational support – ARTHREX INC
4. Other support-Educational and Research grants from OREF, Donohue Foundation

Thanks to the following for slides, pictures, and experience
Arciero, Romeo,
Nicholson, Warner,
Provencher, Cole,
Millett

mazzocca@uchc.edu
A.D. Mazzocca, MD
University of Connecticut
Why is it important to recognize Bone Defects in Treating Instability??

Primary reason for failure after arthroscopic shoulder stabilization

Glenoid Defects

- Glenoid Fracture
- Glenoid Dysplasia

Humeral Defects

- Hill-Sachs Lesion
- Reverse Hill-Sachs Lesion

Boileau et al JBJS 2006
Tauber et al JSES 2004
Burkhart, DeBeer Arthro 2000
How do you differentiate a lesion requiring a soft tissue solution from one requiring a bone graft solution (JP Warner MD)

**History:**
recurrent instability, midrange instability, multiple surgeries, Dislocation while sleeping, reducing force for dislocation

**Imaging:**
Plain x-rays – Axillary, West Point, Stryker notch
MRI, MRI arthrogram, CT arthrogram

**Arthroscopy:**
“inverted pear”, engaging/articulating Hill-Sachs

---

**Humeral Defects/Hill-Sachs Lesion**

Chondral impaction injury in posterosuperior humeral head secondary to contact with anterior glenoid rim.

80% cases of traumatic instability

25% subluxations

---

**Biomechanics of the Hill Sachs Lesion**

*Kaar et al AJSM 2010.* Found biomechanically a larger defect 38% affected glenohumeral stability

Concern with 25-35% defect

Engaging Hill Sachs Lesion (Burkhart and Danaceau)
Clinical Evaluation of Hill Sachs lesions

Rowe et al JBJS 1984 and Boileau et al JBJS 2006—significant risk factor associated with recurrent instability

Burkhart and De Beer Arthroscopy 2000—every patient with “engaging Hill Sachs” failed arthroscopic procedure

Bone Defects in Anterior Instability

- Occur in combined fashion
- “Bipolar” problem
- Incidence:
  - Glenoid: 73-89%
  - Humeral Head: 82-100%

Calandra Arthroscopy 1989; Rowe JBJS 1981; Edwards Arthroscopy 2003; Provencher JBJS 2010,12

Need for Revision: Bone Defects

- primary reason for revision
- young, collision athlete
- Critical defect:
  - Glenoid: 20-25%
  - Humeral Head: 25%
- traumatic recurrence
- non-anatomic repair

Burkhart Arthroscopy 2000; Itoi et al JBJS 2000; Gross JSES 2002; Gross JBJS 2006; Tauber JSES 2004; Kaar AJSM 2010
Clinical Features: Bone deficiency

- History
  - multiple dislocations
  - instability in sleep
  - instability with abduction
  - failed instability surgery
- Physical exam
  - marked apprehension
  - guarding at less abduction/ER
- Plain radiographs: any bone loss

Indication for CT Scan

Measurement/Quantification

Measure off plain radiographs

- AP 60 degrees internal rotation
- Bernigau view
- multiply x, y, z
- Grade I - 1.5 cm²
  - recurrence 16%
- Grade II - 1.5-2.5 cm²
  - recurrence 23%
- Grade III - >2.5 cm²
  - recurrence 66%

Kralinger et al AJSM 02
Measure off 2-D CT

- validated accuracy of axial and sagittal measurements; no clinical data

Kodali JSES 2011

How to Determine Clinically Significant Combined Lesions
“The Glenoid Track”

Yamamoto and Etoi, et al JSES 2007
Provencher et al ASES 2009

“Contact between the glenoid and humeral head in abduction, external rotation, and horizontal extension”

Combined Glenoid and Humeral Bone Defect

- Width of the glenoid tract is 84% of the glenoid width with no defect
- If + glenoid defect, subtract from 84% to find glenoid tract

If medial margin of the humeral head defect ≥ the glenoid tract, the humeral head is likely to engage
The Effect of a Combined Glenoid and Hill-Sachs Defect on Glenohumeral Stability: A Biomechanical Cadaveric Study Using 3D Modeling of 142 Patients

Two Hill-Sachs Lesions Selected
- Small Hill Sachs 25% (0.87cm3)
- Medium hill-Sachs 50% (1.47cm3)

Bankart Repair w/ No Glenoid Loss
Bankart Repair w/2mm Glenoid Loss
Bankart repair w/4mm Glenoid Loss
Bankart repair w/6mm Glenoid Loss

Arciero Mazzocca and Provecncher AJSM 2015
Combined Lesions: Additive Adverse effect

Treatment

Humerus Defect Options

**Hill-Sachs:**
- Capsular Shift
- Glenoid Reconstruction
- ICBG/Latarjet
- Osteoarticular Allograft
- Arthroplasty
- Arthroscopic HemCAP
- Rotator Cuff “Remplissage”– Arthroscopically place infraspinatus tendon into defect with suture anchors

**Reverse Hill-Sachs:**
- Lesser Tuberosity Transfer (McLaughlin)
- Osteoarticular Allograft
- Arthroplasty
- Arthroscopic HemCAP

Goal of operative fixation is to extend the arc of motion.
Arthroscopic options: "Remplissage"

- no or mild (5-10%) Glenoid bone loss
- engaging HS
- older patient

Concerns:
- loss of motion
- 30% posterior cuff pain

Camp et al. Arthroscopy techniques 2015

Arthroscopic bone augmentation:

- "OATS"
- Arthroscopic Latarjet

Lafosse et al. JSES 10; Boileau et al. Arthroscopy 2010
Chapovsky, Kelly Arthroscopy 07

Small Humeral Head Defect in a Collision Athlete:
Open Bankart/Capsulorrhaphy

Rowe JBJS 1981 - collision athlete
- defects: 1/3 glenoid bone loss
- 10-15% bone loss
- non-engaging HS

Pagnani AJSM 2008-85%
Collision athlete
- 84% Hill-Sachs
- 14% glenoid loss
- 2 recurrences
Humeral head defect > 30%
- Matched allograft
- Resurfacing arthroplasty

Hill Sachs Lesion treated with Humeral Allograft

Engaging Hill Sachs Lesion
Arthroscopically Repair Anterior and Posterior Labral Tear

Posterior and Inferior  Anterior

Posterior Humeral Bone Graft

Matched Humeral Allograft
Use bone wax to help with the shape of defect

Reverse Hill Sachs Treated with Humeral Head Allograft-26 yo male with seizure
Arthroscopic Repair of 360 degree labral Tear

Pre Repair Ant/Post Labral Tear  Post Repair 7 anchors

Preparation of Hill-Sachs Lesion

Measure Defect  Bone wax for size/shape  Contour defect for better fit

Preparation of Allograft

Measure Graft  Cut Graft
Placement and Fixation of Graft

6 Months Post Op

Combined Bone Defects (Glenoid and Humerus)
Laterjet to Correct Glenoid

Humeral Head Allograft to correct Hill Sachs Lesion

12 Months Post Op
Conclusion

- Hill-Sachs lesions are best approached as bipolar problems with the glenoid defect having the majority of the indication
  - **Small lesions** may addressed solely on the glenoid side
  - **Large lesions** may require combined procedures that address the humeral defect, arthroplasty, humeral head allograft, resurfacing, and remplissage

Use of 3D CT

- measure diameter
- measure defect
- GT = .83 D-d
- HSI = HS+BB
- if HSI > GT, "off-track", engaging
Humeral Head Defects in Glenohumeral Instability

Robert A. Arciero, MD
Professor, Orthopaedics
University of Connecticut
“We’ll try to fix it with the scope and if that doesn’t work, we’ll do something else”

Imaging: Bone Defects

- AP
- West Point axillary
- correlates with CT
- Humeral Head views
- AP caudad view
- AP internal rotation

The Problem…

Relevant osteoarticular lesions can reduce stability

The question…

When is a bony lesion clinically relevant???

Holovacs, Warner courtesy Matsen et al U of W
Open Bankart Reconstruction

- Patient factors:
  - Collision athlete
  - Hyperlaxity
  - Male, < 20 yo
  - Revision

- Pathoanatomic factors:
  - Bone loss > 15%
  - Poor capsulolabral tissue
  - Capsular deficiency
  - Exposed hardware
  - Subscapularis deficiency

Open Coracoid transfer: Latarjet

engaging Hill-Sachs and any glenoid bone loss

Open Latarjet Technique
Postoperative Protocol

Postop 0-6wks
  AAROM
  ER 0-30
  FE 0-180
Postop 6-12 weeks
  AROM all Planes
Postop 12-16 weeks
  Strengthening
Postop 16-24 weeks
  Sport Activities
Postop 24-36
  Full Contact

Clinical Outcomes Bone Block

Khazzam et al AJO 2009
N=10 no diff auto vs allo
No re-dislocation
Good to excellent outcomes

Rodeo JBJS 1993
Pagnani JBJS 2002

No re-dislocation
Good to excellent outcomes
Thank You for Inviting me to your Amazing Country

Diagnosis and Treatment of
Massive 270 Degree
Labral Tears

Diagnosis and Treatment of
HAGL Lesions

Diagnosis and Treatment of
Bone defects

Arciero’s Responsibilities
UCONN Athletics
Basketball Mens and Womens National Champions

Mazzocca’s Responsibilities
UCONN Penal System

Arciero is a PUFTA!!!
Is There a Role for Non-Operative Treatment? Why, When, How?

WHY-
Describe Literature pertaining to delayed treatment of acute and acute/chronic instability operative vs nonoperative

WHEN-
Discuss literature pertaining to timing of return to play, immobilization, etc

HOW-
Describe Exercises
Describe Braces

CONCLUSION-
Individualized Rehab/Brace/Return Stabilization after season

WHY-
Operative Treatment

Definitive Treatment of Young, Athletic Anterior Instability

<table>
<thead>
<tr>
<th>AUTHOR</th>
<th>RECURRENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheeler 1989</td>
<td>nonop-92%(35/38) op-22%(2/9)</td>
</tr>
<tr>
<td>Arciero 1994</td>
<td>nonop-80%(12/15) op-14%(3/21)</td>
</tr>
<tr>
<td>Kirkley 1999</td>
<td>nonop-47%(9/19) op-15%(3/19)</td>
</tr>
</tbody>
</table>

Nonoperative Treatment for recurrent traumatic anterior instability in the young athletic population has had limited success
**Young Anterior Instability**

*Deitch et al. AJSM 2003*

Age 11-18 years

32 patients experienced traumatic anterior dislocation

24/32 (75%) had a recurrent episode

16/32 surgical stabilization

*Postacchini et al. JSES 2003*

Same high rate of recurrence with younger athletes

28 adolescents with acute anterior dislocation

24/28 (86%) had a recurrence

---

**Basic Facts**

Initial operative stabilization has less recurrence than nonoperative treatment in the young contact athlete (Arciero, DeBerardino, Taylor, Uhorchek)

Operative Stabilization of chronic instability also does well (Pagnani, Mazzocca, Cole, Bacilla)

---

**WHEN**

Attempt to have athlete maintain sport and have delayed stabilization at a more convenient time
Non-Operative Treatment
Traditional
Late Return/Immobilization

Immobilization 4 wks
Exercise Program
Braces
Delayed return to sport

DeBerardino et al 2001

Longer Immobilization Decreases Recurrence but increases symptoms

N=5476 Japanese Rugby Players
Immobilization 0-3wks
Recurrence 78%
Symptom Free 4months

Immobilization 4-7wks
Recurrence 44%
Symptom Free 14months

Maeda et al 2002 J Orthop Sci

TIMING
Non Operative Treatment
Early Return/No Immobilization

Results
87% (26/30) Return to Sport
Average Time Out (10.2 Days)
37% Experienced 1 Episode of Instability During Season
16/30 underwent stabilization following the season

Buss et al. 2004 AJSM
HOW-
Exercise/PT to establish symptom
free strength, motion, and sport
specific activity

UCONN PT and Brace

HOW-
Braces may allow athletes to return
to high risk contact sports
Nonoperative Treatment Braces

- Duke Brace - Non-overhead Throwing athletes
- Sully Brace - Recommended for Overhead athletes

Temporary/Game Time Stabilization

- 6 inch ace bandage with elastic tape - B Howard ATC

Does Delayed Fixation Cause More Damage Later?
Single vs Multiple Dislocations

**Hintermann AJSM 1995**
No Difference in Anatomy

**Habermeyer JSES 1999**
Increased capsule-labral damage

**Spatschil AOTS 2005**
Increased Hill-Sachs Lesions
More IGHL,MGHL lesions

---

Initial Anterior Shoulder Dislocation
**PRCT 10 year follow-up**

<table>
<thead>
<tr>
<th>Nonoperative</th>
<th>Operative</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 39 pts</td>
<td>• 36 open repair</td>
</tr>
<tr>
<td>• 24 recurred</td>
<td>• 2 recurred</td>
</tr>
<tr>
<td>• 19 needed surgery</td>
<td>1 revision repair</td>
</tr>
<tr>
<td>• 15 no recurrence</td>
<td>• 4 pain</td>
</tr>
<tr>
<td>5 w problems</td>
<td></td>
</tr>
</tbody>
</table>

* 75% unsatis result

Nonoperative group requiring surgery:
Only 63% good/excellent

**Jakobsen et al Arthroscopy 07**

---

Can need for Surgery after 1st time dislocation be predicted?

• 131 pts: (age:12-81)
• 5 year f/u:
• High risk group (55% recurrence)
  young, collision sport
  overhead use
  Only 32% “requested” surgery

Need for surgery could not be predicted

**Sachs et al JBJS 08**
What Rx. provides the best Result?

<table>
<thead>
<tr>
<th></th>
<th>ASES</th>
<th>Constant</th>
<th>WOSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stable</td>
<td>87</td>
<td>92</td>
<td>84</td>
</tr>
<tr>
<td>Unstable, coping</td>
<td>72*</td>
<td>84*</td>
<td>60*</td>
</tr>
<tr>
<td>Bankart repair</td>
<td>86</td>
<td>93</td>
<td>78</td>
</tr>
</tbody>
</table>

Bankart repair group did better than conservative group.

Sachs et al. JBJS 08

Systematic Review of Nonoperative vs. Operative Treatment for First-time Anterior Dislocation

- RCTs of Level I and II evidence
- Outcomes:
  - recurrence
  - Rowe score
  - WOSI

Available evidence supports operative stabilization for primary anterior shoulder dislocation for primary acute shoulder dislocations in young active patients participating in highly demanding physical activities.

Godin, Sekiya Sports Health April 2010

Common Argument- “Let them experience another dislocation”

- Articular surface lesions
  - Glenoid, Humeral Head
- Bone defects
- Repetitive subfailure strains
  - Capsular and ligament elongation
  - additional laxity induced with recurrence

Pollack et al, JSES 2000; Urayama, Itoi AJSM 2003
Buscayret, Szabo, Walch, et al AJSM 2004
Progressive labral-ligamentous injury and degeneration with increasing episodes of instability

- 91 patients
- Gr. I: 1st dislocation
- Gr.II: 1-2 recurrences
- Gr.III: 3-5
- Gr.IV: > 5
- Gr.V: subluxations

Habermeyer et al JSES 1999

Hovielius JSES May/June 09: 25 year radiographic follow-up

Arthropathy after primary dislocation:

- Shoulders without recurrence had less arthropathy than those with recurrence or who stabilized over time

Ogawa AJSM 2010 Buscayret AJSM 2004

Does External Rotation Bracing Work?
**External Rotation Effect on Labrum**

19 shoulder dislocation MRI in ER and IR (6 Acute 13 Chronic). Separation and displacement of labrum significantly less in ER than in IR.

Itoi et al. 2001 JBJS

---

**Immobilization with Arm in External Rotation**

40 patients with acute anterior dislocation. F/U=15.5mo.

- **Traditional Immobilization (IR)**
  - N=20
  - Recurrence Rate=30%

- **Immobilization in ER**
  - N=20
  - Recurrence Rate=0%

Itoi et al 2003 JSES

---

**“Instability Severity Index Score”**

10 point score

- <20 y.o.
- competitive/contact sports
- hyperlaxity
- Hill-Sachs on AP/ER radiograph
- loss of sclerotic glenoid contour

If > 6pts.: 70% recurrence with arthroscopic repair

Balg, Boileau JBJS Br 2007
Conclusions

External Rotation Brace has yet to be verified with a young athletic population

Braces are available that will allow continued participation

PT—Should first concentrate on pain reduction and ROM. Then with strength start working on SCAPULA.

Individual decision with patient and family considering activity

---

270 labral tears—Combined anterior, inferior, and posterior labral lesions

---

SANE Score

Score

How would you rate your shoulder today as a % of normal (0 to 100 scale with 0 being awful and 100 being perfect)

95.4

---
Combined Anterior and Posterior Lesions
Current Research

Alpert et al Arthroscopy 2008 - 13 patients with MDI arthroscopic 270 repair

Lo and Burkhart Arthroscopy 2005 - 7/297 had a anterior, superior, and posterior lesion

Warner et al Arthroscopy 1994 - 7/585 patients had a Bankart and SLAP tear

Seroyer et al AJSM 2007 - 23 patients with SLAP and Posterior extension

MRI Imaging-Combined Anterior and Posterior lesions

Physical Exam and Exam Under Anesthesia

History
Traumatic etiology
Complained of primarily anteroinferior instability but some had bidirectional instability.

Physical Exam
Symptomatic instability;
2+ anterior inferior and posterior inferior load shift testing
Failure of nonoperative management

Arthroscopic Confirmation
Arthroscopic confirmation of labral lesions that extended from the biceps anchor, anteriorly, inferioiy, and with extension to the mid-glenoid posteriorly.
Surgical Goals

- Re-establish labral anatomy
- Re-tension IGHL
- Rx. associated pathology

Arthroscopic Labral Repair: Technical Pitfalls

- Exposure
- Failure to mobilize Bankart
- Failure to re-tension IGHL
- Failure to get to the 6 o’clock position
- Failure to address capsular redundancy
- Too few fixation points

MUST MIRROR THE OPEN METHOD!

Boileau et al JBJS 2006

Tensioning Suture Placement
Posterior Combination labral and Capsular Plication Suture

Second Suture Second Anchor-Posterior

Anterior Inferior Anchor
All patients (ADM) with shoulder instability undergoing a stabilization procedure between January 2005 and December 2007

N = 121

Inclusion Criteria
N = 21

- Traumatic etiology
- Primarily complained of anteroinferior instability or bidirectional instability
- MRI indicated extensive labral injury
- Symptomatic instability; 2+ anterior inferior and posterior inferior load shift testing on physical exam
- Arthroscopic confirmation of labral lesions that extended from the biceps anchor, anteriorly, inferiorly, and with extension to the mid-glenoid posteriorly.
- SLAP lesions
- Revision procedure

Exclusion Criteria
N = 100

- Non-traumatic etiology
- Bone defects of the glenoid greater than 20%
- Hill-Sachs lesions greater than a third of the humeral head
- 360 degree labral tear
- 270 degree labral tear
- Bilateral shoulders

Mazzocca et al AJSM 2011
Results

All Outcomes Scores Significantly (p<0.05) Improved

WOSI
(Western Ontario Shoulder Instability Score)

Physical Symptoms
Failures (n=3)

1- baseball player underwent 2 subsequent revisions
?? Bone loss
1- collegiate wrestler failed during a match; subsequent revision, doing “fair”.
1- soccer; had one subluxation; returned full activity; no sequelae

Conclusion

Arthroscopic repair of these extensive labral injuries involving 270 degrees of the glenoid fossa was an effective surgical treatment and restored shoulder stability.

Performing the procedure arthroscopically allowed for complete visualization of the glenoid which assisted in the diagnosis and repair of all labral pathology.

The extensive nature of these injuries may explain our ~19% failure rate.

Humeral Avulsion of the Glenohumeral Ligaments (HAGL)
Introduction

Instability of the shoulder is multifactorial involving many structures.

Review of HAGL Literature
- Incidence of HAGL Lesion
- Pathology
- Imaging
- Technique-mini open repair
- Outcomes

Review of HAGL Literature

• Nicola (JBJS 1942)
• Bach (JBJS-B 1988) - 2 patients lateral repair
• Wolf (Arthroscopy 1995) - Incidence 6/64=9.3%
• Bokor (JBJS-B 1999) - Incidence 41/547=7.5%
• Warner (Arthroscopy 1997) - Combined HAGL and Bankart
• Field (JSES 1997) - 5 patients with floating capsule

Incidence of HAGL Lesions 1-9%
71 cases reported in the literature

- 66/71 (93%) Anterior Lesion
- 5/71 (7%) Posterior Lesion
- 44/71 (62%) Associated with Concurrent Lesions:
  - 25% Labral Tears
  - 23% Rotator Cuff Tears
  - 17% Hill-Sachs Lesions

Bui-Mansfield et al. AJSM 2008
Anterior HAGL 66/71 (93%)  
Three varieties

- Anterior Capsule
- Bone Avulsion
- Floating capsule

Posterior HAGL 5/71 (7%)  
Three Varieties

- Posterior Capsule (2/71)
- Bone Avulsion (0/71)
- Floating (3/71)

Imaging

- Without Gadolinium
- With Gadolinium
- J Sign

Mazzocca Case

Guanche Case
HAGL Technique
1. Arthroscopic evaluation and Bankart repair
2. Deltopectoral approach
3. Lower/inferior 1/3 subscap taken down
4. Suture anchor fixation of the capsule
5. Repair Subscap

Arthroscopic Visualization of HAGL and Bankart

Repair Bankart Arthroscopically to Allow Inferior Subscap Violation Only
**Deltopectoral Approach**

- Cephalic vein marking
- Deltopectoral Interval

**Medial Mobilization (Ensure Visualization) and Retraction of the Conjoined Tendon**

- Lateral to “Red Stripe” (Coracobrachialis Muscle)
- Triangle VS Trapezoid Concept

**Evaluation of Axillary Nerve**
Lower 1/3 of Subscap Removed 15mm from Insertion

Tag Subscap and Remove Muscle from Capsule, Visualize HAGL

Anchor placed to repair HAGL
**Repair Capsule**

**Repair Subscap**

**HAGL Outcomes**

**UCONN** - N=8 Greater than 3 year follow-up
Subscap Strength intact
All returned to previous level of activity
No recurrent instability

**Field** - N=5 26 month follow-up “floating capsule”
No instability

Arciero and Mazzocca Arthroscopy 2005
Conclusion

Occurs in violent dislocation be suspicious

Use MRI arthrogram for imaging

Mini open saves subscap tendon and reproducibly repairs lesion

Excellent results if lesion is recognized and fixed

Techniques in Treating Glenoid Defects

Arthroscopic
Coracoid
Distal tibia
Iliac Crest
Scapular Spine

Arthroscopic Repair of Glenoid Bone Fragment
26 yo acute anterior dislocation with displaced fracture on radiograph

20-30% glenoid Fracture with >4mm displacement

Arthroscopic Bankart Repair

Arthroscopic reduction

Millett and Braun Arthroscopy 2009
Reduction and Fixation

- Suture tack placed medially
- Reduction with knotless anchor

Glenoid Insufficiency – Open Solutions

- ICBG
- Coracoid Bone Graft

- Matsen et al., 1998
- Burkhead & DeBeer, 2002
- Allain, 1998
- Hovelius et al, 2003

Coracoid Bone Graft Laterjet Procedure
Laterjet Positioning and Incision

Laterjet: Coracoid Harvest

- Detach pec minor
- Osteotomize coracoid at the “knee” – leaving CC lig.

Subscapularis

- Horizontal split: 2/3 superior, 1/3 inferior
- Detach upper 2/3
Coracoid Position

Too Lateral  
Too Medial  

Just right

Capsule Repair

CA ligament to capsule: *Intra-articular graft*

Capsule to glenoid: *Extra-articular graft*

Repair Capsule and Subscapularis
16 yo recurrence after arthroscopic Bankart repair
Scapular neck decorticated

6 months postop

Failed Laterjet — a poorly done Laterjet can cause more damage than persistent dislocations

22 yo male that wants to be a police officer who has terrible pain
Screw Removal and Microfracture

Distal Tibia Fresh Allograft

New Glenoid Bone Graft-Fresh Distal Tibia “Provencher et al 2009”
Case

Great contour and has cartilage
Iliac Crest Bone Graft

Matsen

Management: Glenoid Deficiency

• > 30% structural graft: iliac crest

Eden-Hybinette
Matsen
Millett, Warner
Complex Shoulder 2004

Scapular Spine Graft for Posterior Bone Loss
Case 1: 19 yo D-I hockey goalie

- 4 dislocations req reduction
- Multiple subluxations
- Glove hand
- PE: marked apprehension
  1+ sulcus
**Options:**

- Arthroscopic Bankart
- A’scopic Bankart + remplissage
- A’scopic Bankart + remp + scope Latarjet
- Open Bankart
- Open Bone transfer/augmentation

**Open Bankart**

**Case #2: 19 year old collegiate Lacrosse player**

- 2 complete dislocations req reduction
- TNTC subluxations
- PE:
  - Marked apprehension @ 45deg ABD
  - 1+ sulcus
Options:

- Arthroscopic Bankart
- A’scopic Bankart + remplissage
- A’scopic Bankart + remp + scope Latarjet
- Open Bankart
- Open Bone transfer/augmentation

60 yo Vermont farmer

- Chief Complaint:
  - recurrent dislocation requiring manual reduction after injury
  - NO PAIN!
Hybrid Technique

22 yo collision athlete
Recurrent anterior instability

Labral Injury

Finished capsulolabral reconstruction

“270” degree labral repair
Biomechanics

Decreasing glenoid surface area increases displacement

Biomechanics

The Inverted Pear

Shorter glenoid arc length less resistance to humeral forces
Greater stress on soft tissue repair

Introduction

Diagnosis and Treatment of
Massive 270 Degree Labral Tears

Diagnosis and Treatment of
HAGL Lesions

Diagnosis and Treatment of Bone defects
Hill-Sachs Lesion
Reverse Hill-Sachs
Glenoid Anterior and Posterior
“Glenoid Track”
- contact zone of humeral head with glenoid
  from adduction to ABD/ER shifts from inferomedial to superolateral
- 83% of the glenoid width at its widest margin

Methods:
- 142 patients with recurrent anterior shoulder instability (M.T.P.)
- 3-D Computed Tomography

Volumentric analysis:
- 1.47 cm³

Testing Sequence:
- Intact
- Bankart lesion
- Bankart repair
- 2 mm defect
- Bankart repair
- Hill-Sachs
- Bankart repair
- 4 mm defect
- Bankart repair
- 6 mm defect
- Bankart repair
Operative Set up

Primary Viewing Anterior Superior Portal
Conclusions

- 2mm glenoid bone loss (8%) with medium sized Hill-Sachs (1.47 cm³) defect compromised Bankart repair by 26%
- 6mm defect decreased load by 50%
- Combined lesions: additive adverse effect
- Amount of bone loss required to compromise soft tissue repair much less than in isolation
- Combined lesions: may require additional surgical strategies besides Bankart repair