Technical Pearls for Shoulder Surgery: Tips for the Latarjet Procedure

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Disclosures

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The following relationships with commercial interests related to this presentation existed during the past 12 months:

• Consultant for and receives royalties from Arthrex, Inc. (Naples, FL)
• Receives book royalties from Wolters-Kluwer (Philadelphia, PA)

Bipolar Lesions

• With glenoid bone loss, H-S engages more easily

Treating the Engaging H-S by Treating the Glenoid Side

• Lengthen the glenoid articular arc so much that H-S cannot engage

The Sling Effect of the Conjoined Tendon

• Causes posteriorly-directed forces in abd-ER
• Prevents engagement of H-S
• Prevents H-S from overriding glenoid track
• Addresses glenoid and humeral defects with glenoid-based graft only

Treating the Hill-Sachs by Remplissage

• Making the H-S extra-articular
Remplissage Indications

Evaluating Bipolar Bone Loss: The Glenoid Track

The Glenoid Track

Engagement of H-S: Overriding of Glenoid Track

Evolving Concept of the Hill-Sachs Lesion:
From “Engaging/Non-Engaging” Lesion to “On-Track/Off-Track” Lesion
- DiGiacomo, Itoi, Burkhart, Arthroscopy 2014

Glenoid Track: Cadaver Study (Yamamoto et al)
- Glenoid track is 84% of glenoid width (as measured from rotator cuff attachments on posterior humeral head)
The Glenoid Track Narrows with Glenoid Bone Loss
- Glenoid Track = 84% normal glenoid width minus width of glenoid defect

Assessing Bipolar Bone Loss

In Live Subjects, the Glenoid Track is 83% of the Glenoid Width (In cadavers = 84%)
- Itoi et al 2013
- Can measure this from “en face” projection of normal shoulder on 3D CT scan

Measuring the Glenoid Track on 3D CT Scan

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)
Is Arthroscopic Observation of Engagement Adequate to Diagnose On-Track/Off-Track?

Dynamic Arthroscopy
- May over-estimate engagement due to damaged capsule/labrum
- Testing for engagement after repair could damage the repair

Templating the Glenoid Track onto the Humerus: Does the Hill-Sachs Engage?
- Plot the glenoid track width onto the humerus, beginning at medial margin of rotator cuff footprint
- This H-S lesion is Off-Track

Developing a Treatment Paradigm for Bipolar Bone Loss
- Group 1 = glenoid defect < 25% plus on-track H-S
  - Arthroscopic Bankart repair (ABR)
- Group 2 = glenoid defect < 25% plus off-track H-S
  - ABR + Remplissage
- Group 3 = glenoid defect ≥ 25% plus on-track H-S
  - Latarjet
- Group 4 = glenoid defect ≥ 25% plus off-track H-S
  - Latarjet

Treatment Paradigm
- Group 1 = glenoid defect < 25% plus on-track H-S
  - Treatment = Arthroscopic Bankart repair

Treatment Paradigm
- Group 2 = glenoid defect < 25% plus off-track H-S
  - Treatment = Arthroscopic Bankart repair plus remplissage
Treatment Paradigm

• Group 3 = Glenoid defect ≥ 25% plus on-track H-S
• Treatment = Latarjet

Treatment Paradigm

• Group 4 = glenoid defect ≥ 25% plus off-track H-S
• Treatment = Latarjet ± humeral-sided procedure (humeral bone graft or remplissage); if H-S is not engageable after Latarjet, do Latarjet only
  – From a practical standpoint, Latarjet alone is almost always adequate

Can Also Do Arthroscopic Assessment of On-Track/Off-Track Status of a Hill-Sachs Lesion

Arthroscopic Evaluation of Off-Track Lesion

Calculate Diameter of Normal Inferior Glenoid

Diameter = 2x radius
(Radius = distance from bare spot to posterior glenoid rim)
Calculate Width of Glenoid Bone Defect (d)

\[ d = \text{posterior radius minus anterior radius} \]

Calculate Width of Glenoid Track

Glenoid track width \( = 0.83 \times D - d \)
\( = 0.83 \times 30 - 5 \text{ (in our case)} \)
\( = 24.9 - 5 \)
Glenoid track width \( = 19.9 \text{ mm} \)

Measure Width of Bone Bridge Between Cuff & H-S

Calculate Width of Hill-Sachs Interval (HSI):
Distance of Medial Rim of Hill-Sachs from Rotator Cuff Attachment

\[ \text{HSI} = \text{Width of H-S plus width of intact bone bridge (BB)} \]
**Compare Width of Glenoid Track to Width of Hill-Sachs Interval (HSI)**

HSI = 12 mm (Hill-Sachs width) 
+ 12 mm (Cuff - H5 bone bridge) 
= 24 mm (H-S interval) 

Glenoid track = 19.9 mm (in our case) 

HSI > Glenoid Track 

⇒ Hill-Sachs extends medial to glenoid track 
⇒ Hill-Sachs is off-track/engaging

**Treatment**

- Glenoid defect < 25% 
- Off-track Hill-Sachs 
- Treatment = Arthroscopic Bankart repair plus remplissage

**The On-Track-Off-Track Paradigm**

- Can it be confirmed by biomechanical testing?
Remplissage of an Off-Track Hill-Sachs Lesion is Necessary to Restore Biomechanical Glenohumeral Joint Stability in a Bipolar Bone Loss Model

- Hartzler RU, Denard PJ, Burkhart SS, Lee TQ, et al (submitted to Arthroscopy)

Methods

- Bipolar bone loss model
- 15% glenoid bone loss
- "On-track" (15%) Hill-Sachs versus "off-track" (30%) Hill-Sachs

Results

- For on-track lesions
  1. Engagement was rare
  2. Stability was always restored with Bankart repair only
- For off-track lesions
  1. Engagement was routine
  2. The addition of Hill-Sachs remplissage (in addition to Bankart repair) was necessary to restore stability

Conclusions

- Glenoid track concept is experimentally confirmed
- On-track/off-track treatment paradigm is supported:
  1. On-track; Bankart repair only
  2. Off-track; Bankart repair plus remplissage

The On-Track/Off-Track Paradigm: Has It Been Confirmed Clinically?

- "Clinical validation of the on-track vs off-track concept in anterior glenohumeral instability
  – Cook, Bottoni, Tokish et al (Tripler Military); SOMOS Annual Meeting, December 2014

Results

- 57 patients; all had arthroscopic Bankart repair
- 49 on-track; 4 failed (8.2%)
- 8 off-track; 6 failed (75%)
- In the 47 patients that remained stable, only 2 (4.3%) were off-track (p=0.0001)
**Conclusion**

- Off-track bipolar bone loss was a significant predictor of failure after isolated Bankart repair, correctly predicting failure in 75% of cases

**Developing a Treatment Paradigm for Bipolar Bone Loss**

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  - Latarjet

**Latarjet**

- For > 25% loss of inferior glenoid diameter

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*Thank You!*