Revision Instability Repair

Anthony A. Romeo, MD
Professor, Department of Orthopedics
Head, Section of Shoulder and Elbow Surgery
Team Physician, Chicago White Sox and Bulls
Chief Medical Editor, Orthopaedics Today
Revision Instability Repair

DISCLOSURES

1. Royalties: Arthrex, Elsevier
2. Consultant: Arthrex
3. Miscellaneous Support: Arthrex
4. Basic Science/Research Support: Arthrex, Smith and Nephew, Ossur, Miomed, DJOrtho, Conmed Linvatech, Athletico
5. Editorial Board: Orthopedics Today (Chief Medical Editor), Journal of Shoulder and Elbow Surgery, Techniques in Shoulder and Elbow, Techniques in Sports Medicine, Sports Health, Orthopedics
6. Publisher Support: Elsevier (Textbook), Orthopedics Today
Anterior Bankart Tear
“Soft Tissue Dominant”
How do we define the injury?

+ Stretch

How can we measure:

- Translation
- Rotation

Adjust tension?
Anterior Instability with Bone Loss
On Track, Off Track

Courtesy of Giovanni Di Giacomo
Examination with Bone Loss
Fix Primary Direction, then Augment Repair

Reliable Repair, Motion Recovery and Result

“3 Anchors below 3” (O’ Clock)
Portal Access

Four-quadrant approach to capsulolabral repair: an arthroscopic road map to the glenoid. Seroyer ST, Nho SJ, Provencher MT, Romeo AA

Posterior

Anterior - Superior

Posterior – Inferior (7 o’clock)

Anterior – Inferior (5 o’clock)
Suspension of the Arm
Outcomes of Arthroscopic Anterior Shoulder Instability in the Beach Chair Versus Lateral Decubitus Position: A Systematic Review and Meta-Regression Analysis

Rachel M. Frank, M.D., Maristella F. Saccomanno, M.D., Lucas S. McDonald, M.D., Mario Moric, M.S., Anthony A. Romeo, M.D., and Matthew T. Provencher, M.D.


Recurrence of Instability:
Beach Chair Surgeons → 14.7%
Lateral Decubitus Surgeon → 8.5%

\[ P = 0.002 \]

Lateral decubitus allows you to see ALL the pathology easier... (level V)
Anterior Instability

Posterior

Anterior
MLB Baseball Player
Major League Baseball Player

Initial Injury

Scope Repair
Anterior – INFERIOR Stabilization

Access

Proper Fixation
Remplissage
Systematic Review

Long-Term Outcomes After Bankart Shoulder Stabilization


- Level of Evidence: IV
- 26 studies (n=1781) patients
- Mean: f/u 11 yrs, age 28, 81% male
- Mean of 11 dislocations before surgery

2013 AANA J Whit Ewing Award
No significant difference between:

Open and Arthroscopic Suture Anchor Bankart

Recurrence of instability  
(8% vs 8.5%; p=0.82)

Rate of return to sport  
(89% vs 87%; p=0.43)

Radiographic osteoarthritis  
(33% vs 26%; p=0.06)

Constant score, Rowe score  
(p > 0.05 for both)
Return to Sport → Contact Athlete

Return to Play After Shoulder Stabilization in National Football League Athletes

Matthew J. White, MD¹, Glenn S. Fleisig, PhD¹, Kyle Aune, MPH¹, James R. Andrews, MD², Jeffrey R. Dugas, MD³, E. Lyle Cain, MD³

¹American Sports Medicine Institute, Birmingham, AL, USA, ²The Andrews Institute, Gulf Breeze, FL, USA, ³Andrews Sports Medicine and Orthopaedic Center, Birmingham, AL, USA.

- 60 NFL players underwent stabilization at single institution
  - 11 open; 49 arthroscopic

- RTP definition → at least one regular season NFL after surgery

- 54/60 (90%) → RTP at average 8.6 months
  - No differences between open and arthroscopic in RTP rates
  - No differences in age, career length, or # of games before surgery in athletes who RTP verses those who did not

- Athletes selected before 4th round of NFL draft → 7.6x more likely to RTP

- Timing of surgery (in-season or off-season) → unclear
The Influence of Evidence-Based Surgical Indications and Techniques on Failure Rates After Arthroscopic Shoulder Stabilization in the Contact or Collision Athlete With Anterior Shoulder Instability

Timothy S. Leroux,*†‡ MD, Bryan M. Saltzman,† MD, Maximilian Meyer,† BSc, Rachel M. Frank,† MD, Bernard R. Bach Jr,† MD, Brian J. Cole,† MD, Anthony A. Romeo,† MD, and Nikhil N. Verma,† MD
Investigation performed at Rush University Medical Center. Chicago. Illinois. United States

TABLE 3
Stratified Failure Rates According to Patient Selection and Surgical Technique

<table>
<thead>
<tr>
<th>Factor</th>
<th>No. of Applicable Studies</th>
<th>Total No. of Patients</th>
<th>Failure Rate, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST or TG</td>
<td>13</td>
<td>244</td>
<td>25.0</td>
</tr>
<tr>
<td>Only SA</td>
<td>13</td>
<td>555</td>
<td>14.6</td>
</tr>
<tr>
<td>SA minimum</td>
<td>6</td>
<td>275</td>
<td>8.7</td>
</tr>
<tr>
<td>Excluded bone loss*b</td>
<td>6</td>
<td>331</td>
<td>8.8</td>
</tr>
<tr>
<td>Lateral position</td>
<td>11</td>
<td>345</td>
<td>17.4</td>
</tr>
<tr>
<td>Lateral position and excluded bone loss*</td>
<td>3</td>
<td>203</td>
<td>7.9</td>
</tr>
<tr>
<td>Lateral position and SA minimum</td>
<td>4</td>
<td>215</td>
<td>8.8</td>
</tr>
<tr>
<td>Lateral position, excluded bone loss,* and SA minimum</td>
<td>3</td>
<td>203</td>
<td>7.9</td>
</tr>
</tbody>
</table>

**Reduction in failure rate from 17.4 to 7.9 if lateral decubitus, <20% bone loss and 3 anchor minimum.**
Predictors of Dislocation and Revision After Shoulder Stabilization in Ontario, Canada, From 2003 to 2008

David Wasserstein,*† MD, MSc, FRCSC, Tim Dwyer,†‡ MBBS, FRCSC,


AOSSM Herodicus Award 2012

ONTARIO POPULATION COHORT

- Billing & hospital admission coding
- July 2003 → December 2008; min >2 year f/u

<table>
<thead>
<tr>
<th>INCLUSION</th>
<th>EXCLUSION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 15-60</td>
<td>Previous stabilization</td>
</tr>
<tr>
<td>Elective surgery (no fractures)</td>
<td>Posterior, inferior dislocation history (ICD-10)</td>
</tr>
<tr>
<td></td>
<td>Bony reconstructions</td>
</tr>
</tbody>
</table>
Results

- N=5,904 surgeries (Population: 13+ million people)
- Median age 27 years (IQR 20-37)
- 80.6% male

REVISION

STABILIZATION = 4%
After a mean 2.2 ± 1.3 years

POST-OP

DISLOCATION= 6.9%
After a mean 2.0 ± 1.4 years
Younger Age = Higher Risk

Revision Post op relocation

Figure 5. The percentage of patients by age category who underwent revision stabilization surgery and postoperative physician-documented relocation.
More pre-op dislocations = Higher Risk

Figure 6. Rates of revision stabilization and postoperative relocation by number of Ontario physician–documented dislocations prior to the index event.
194 patients (101 contact athletes)
• Average 27 month follow-up
• Arthroscopic repair with suture anchors
• Bone loss → #1 Reason for Failure

11% recurrence overall

- No bone defect
  4% recurrence
- Bone defect
  67% recurrence
- Inverted Pear
  61% recurrence
Recognize glenoid bone loss

**Glenoid Rim Morphology in Recurrent Anterior Glenohumeral Instability**

By Hiroyuki Sugaya, MD, Joji Morishii, MD, Michiko Dohi, MD, Yoshiaki Kon, MD, and Akihiro Tsuchiya, MD

**TABLE 1: Morphology of the Glenoid Rim in One Hundred Shoulder X-Rays with Recurrent Anterior Glenohumeral Instability**

<table>
<thead>
<tr>
<th>Morphology of Glenoid Rim</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bone fragment</td>
<td>50%</td>
</tr>
<tr>
<td>Large fragment (&gt;20%)</td>
<td>1%</td>
</tr>
<tr>
<td>Medium fragment (5%-20%)</td>
<td>27%</td>
</tr>
<tr>
<td>Small fragment (&lt;5%)</td>
<td>22%</td>
</tr>
<tr>
<td>Erosion or compression fracture</td>
<td>40%</td>
</tr>
<tr>
<td>Normal</td>
<td>10%</td>
</tr>
</tbody>
</table>

Why does Instability surgery fail?

Reasons for failure after surgical repair of anterior shoulder instability

Mark Tauber, MD, a Herbert Resch, MD, a Rosemarie Forstner, MD, b Michael Raffl, MD, a and Josef Schauer, MD, a Salzburg, Austria

- Anterior Glenoid Bone Loss (55%)
- Loose Capsule (22%)
- HAGL (5%)
Why does Instability surgery fail?

**Risk Factors:**
- Bone loss (either HH or glenoid)
- Hyperlaxity
- Less than 4 anchors

*Risk Factors for Recurrence of Shoulder Instability After Arthroscopic Bankart Repair*

BY PASCAL BOILEAU, MD, MATIAS VILLALBA, MD, JEAN-YVES HÉRY, MD, FRÉDÉRIC BALK, MD, FRCSC, PHILIP AHRENS, MD, FRCS, AND LIONEL NEYTON, MD

Investigation performed at the Department of Orthopaedic Surgery and Sports Traumatology, Hôpital de L’Archet, University of Nice, Nice, France

“Fix” Bone Loss with Soft Tissue Operation?
Critical size: ~20% (6-8mm)

Revision case: ≥ 4mm is concerning or anything over 10%

*Critical size = 20% of L = 25% of W
Glenoid Bone Deficiency in Recurrent Anterior Shoulder Instability: Diagnosis and Management

Dana P. Piasecki, MD
Nikhil N. Verma, MD
Anthony A. Romeo, MD
William N. Levine, MD
Bernard R. Bach, Jr, MD
LCDR Matthew T. Provencher, MD, MC, USN

Table 1

<table>
<thead>
<tr>
<th>Anterior-posterior Defect Width (mm)</th>
<th>Anterior-posterior Width (% of inferior glenoid circle diameter)</th>
<th>Circular Segment Area (% of inferior glenoid circle)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insignificant</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>2.8†</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>3.6†</td>
<td>15</td>
<td>9</td>
</tr>
<tr>
<td>Borderline</td>
<td>21</td>
<td>15</td>
</tr>
<tr>
<td>5§</td>
<td>25</td>
<td>15</td>
</tr>
<tr>
<td>6‖</td>
<td>25</td>
<td>20</td>
</tr>
<tr>
<td>Significant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.8†</td>
<td>28</td>
<td>23</td>
</tr>
<tr>
<td>7.5§</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>8.6**</td>
<td>36</td>
<td>32</td>
</tr>
</tbody>
</table>

* On a circle, a marginal defect can be described by a width (measured from the outer rim) that corresponds with a circle segment area. When applied to the glenoid, such a segment defect represents a percentage of the inferior glenoid circle’s surface area. With this understood, relevant anterior-posterior defect widths can be converted to surface area percentages.
† Corresponds with “9%” resection (anterior-inferior) of Itoi et al
‡ Corresponds with 15% anterior-posterior width
§ Corresponds with 20% anterior-posterior width measurement
‖ Corresponds with 25% anterior-posterior width of Bigliani et al
§§ Corresponds with “21%” resection (anterior-inferior) of Itoi et al
ª Corresponds with cadaveric pear glenoids of Lo et al
** Corresponds with clinical pear glenoids of Lo et al
Estimate Amount of Glenoid Bone Loss

XR, CT, MRI Arthroscopy?

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

Examples of 3D CT Scans

“Bone Fragment” Bone Loss
Inferior 2/3rds of Glenoid is Circle and can Measure

“Attritional” Bone Loss
Results of Arthroscopic Revision

Creighton et al
Arthroscopic Revision

- 18 patients
- 3 recurrences
- 5 failures (28%)
- Follow-up: 29 mos.

Neri et al

No scientific assessment of bone loss

- 11 patients
- 3 recurrences (27%)
- g/ex results: 73%
Case Example…

- 20yo male football player, RHD, with R shoulder instability
- Defensive back, hurt shoulder with tackle
- More shoulder subluxation events, may have been on other dislocation (self-reduced)
- PT, modified activities >6 months
- Wants to continue to play football
Pre-Op X-rays
Intraoperative
1 Year later…

Recurrent Dislocation with Football
2nd Soft Tissue Stabilization + Augmentation?
Recurrence after Revision:
2 Failed Arthroscopic Repairs?
CT Scan After 2 Failures
Arthroscopic Capsulolabral Revision Repair for Recurrent Anterior Shoulder Instability

Christoph Bartl, MD, Katrin Schumann, MD, Jochen Paul, MD, Stephan Vogt, MD, and Andreas B. Imhoff, MD

Investigation performed at the Department of Orthopaedic Sports Medicine, Technical University Munich, Munich, Germany

AJSM 2011

- 56 patients failed bankart repair
- 88% good or excellent results
- Most pts able to return to sport at same level
- 11% recurrence

Proper Fixation
Is there a role for revision arthroscopic bankart repair?

Systematic Review

Revision Arthroscopic Bankart Repair

Jihad Alexander Karim Abouali, M.D., Katerina Hatzantoni, M.B.B.S., Richard Holtby, M.D., Christian Veillette, M.D., and John Theodoropoulos, M.D.


Systematic Review 16 studies, 349 patients included

Avg 12.7% recurrence after arthroscopic revision at avg 35 mo
Most common reason for recurrence after revision was under appreciated *bone loss either on glenoid or humerus*
Arthroscopic Bankart Revision:
May require “ideal” situation

Overhead athlete
Traumatic recurrence
Inadequate initial repair

Minimal Bone Loss
Good tissue

“perfect standard Bankart repair” + augmentation
Glenoid Bone Defects
Coracoid Transfer

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

Latarjet (1954): transfer of larger portion of the coracoid

Raw edge of cut coracoid
Biceps m.
Coracobrachialis m.
In conclusion, under these experimental conditions, the main stabilizing mechanism of the Latarjet procedure was the sling effect produced by the subscapularis and conjoint tendons, at both the end-range and mid-range arm positions.
Latarjet, through Subscapularis Split

The Sling resists anterior translation
Latarjet → replaces bone loss with bone

10 studies with follow-up ranging from 6m to 14.3 years
- **Recurrence rates → 0% to 8%**
- Satisfaction → good to excellent in >90% of patients
- Patient reported outcomes → variably reported, generally good when reported
- Complications → variably reported, most often malunion or neuropraxia

- Surgical technique and coracoid fixation → variable!
The Latarjet Procedure for the Treatment of Recurrence of Anterior Instability of the Shoulder After Operative Repair

A Retrospective Case Series of Forty-nine Consecutive Patients

Samuel L. Schmid, MSc, Mazda Farshad, MD, Sabrina Catanzaro, RRN, and Christian Gerber, MD, FRCSEd(Hon)

49 patients

38 months follow-up

No recurrent dislocations

No revision surgery

Relationship between arthritis and suboptimal graft placement
Despite higher dislocation rates (10% vs 0%), Arthroscopic Bankart repair had improved return to sport.

### TABLE 3

<table>
<thead>
<tr>
<th>Independent Variable for Return to Sport</th>
<th>Coefficient</th>
<th>SE</th>
<th>(t)</th>
<th>(P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bristow-Latarjet</td>
<td>-2.74</td>
<td>0.82</td>
<td>-3.36</td>
<td>.0012</td>
</tr>
<tr>
<td>Degree of Shoulder Involvement in Sports scale</td>
<td>-0.44</td>
<td>0.15</td>
<td>-2.95</td>
<td>.0042</td>
</tr>
<tr>
<td>Recurrent dislocations</td>
<td>-3.75</td>
<td>1.37</td>
<td>-2.73</td>
<td>.008</td>
</tr>
<tr>
<td>ER2</td>
<td>0.06</td>
<td>0.03</td>
<td>1.80</td>
<td>.08</td>
</tr>
<tr>
<td>Age</td>
<td>-0.07</td>
<td>0.05</td>
<td>-1.51</td>
<td>.13</td>
</tr>
<tr>
<td>ER1</td>
<td>-0.04</td>
<td>0.04</td>
<td>-1.0</td>
<td>.28</td>
</tr>
<tr>
<td>Dominant arm</td>
<td>-0.74</td>
<td>0.81</td>
<td>-0.91</td>
<td>.36</td>
</tr>
<tr>
<td>No. of preoperative dislocations</td>
<td>0.005</td>
<td>0.02</td>
<td>0.24</td>
<td>.8</td>
</tr>
</tbody>
</table>
A systematic review and meta-analysis of clinical and patient-reported outcomes following two procedures for recurrent traumatic anterior instability of the shoulder: Latarjet procedure vs. Bankart repair

Vincent Vinh Gia An, BSc (Adv) a,b,*, Brahman Shankar Sivakumar, MBBS BSci(Med) MS b, Kevin Phan, BSc (Adv) a, John Trantalis, MBBS FRACS (Ortho) FAOrthA c

Latarjet
- lower recurrence,
- improved outcome scores
- improved external rotation

No significant difference in complications requiring reoperation

Table II  Stability outcomes of the Bankart (B) and Latarjet (L) procedures

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>L</th>
<th>RR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recurrence</td>
<td>21.10%</td>
<td>11.60%</td>
<td>1.81</td>
</tr>
<tr>
<td>Revision</td>
<td>4.48%</td>
<td>3.40%</td>
<td>1.32</td>
</tr>
<tr>
<td>Dislocation</td>
<td>9.52%</td>
<td>5.06%</td>
<td>1.89</td>
</tr>
<tr>
<td>ER ROM loss</td>
<td>20.93°</td>
<td>11.47°</td>
<td>—</td>
</tr>
<tr>
<td>Rowe score</td>
<td>79.03</td>
<td>85.4</td>
<td>—</td>
</tr>
<tr>
<td>Complications</td>
<td>3.1%</td>
<td>5.0%</td>
<td>0.62</td>
</tr>
</tbody>
</table>

RR, relative risk; ER ROM, external rotation range of motion.

Table III  Reasons for revision other than recurrent instability in Bankart (B) and Latarjet (L) procedures

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nerve palsy</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Infection</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Arthropathy</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Internal rotation contractures</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Screw related</td>
<td>—</td>
<td>10</td>
</tr>
<tr>
<td>Bony rim fracture</td>
<td>—</td>
<td>6</td>
</tr>
<tr>
<td>Hematoma</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
Clinical Outcomes Following Revision Anterior Shoulder Stabilization: Arthroscopic Revision Stabilization versus Latarjet

Rachel M. Frank, MD; Chris Mellano, MD; Jason J. Shin, MD; Terrence F. Feldheim, BS; Randy Mascarenhas, MD; Adam B. Yanke, MD; Brian J. Cole, MD MBA; Gregory P. Nicholson, MD; Anthony A. Romeo, MD; and Nikhil N. Verma, MD

Department of Orthopaedic Surgery, Rush University Medical Center

2016
Methods:
Revision Anterior Shoulder Stabilization

91 shoulders $\rightarrow$ 4 surgeons (2007-2012)
- <10% bone loss $\rightarrow$ Arthroscopic stabilization (n=63)
- >10% bone loss $\rightarrow$ Latarjet (n=28)

Inclusion Criteria $ightarrow$
- Prior stabilization (min 15 months earlier)

Exclusion Criteria $ightarrow$
- Seizures, work-comp cases
- Prior open bone grafting
Methods – Data Collection

Minimum 18 month follow-up

PROs → ASES, SANE, VAS, WOSI

Preoperative data → imaging, PROs, exam
Intraoperative data → lesion size, concomitant pathology
Postoperative data → imaging, PROs, exam, RTP

Failure → recurrent dislocation or subluxation
Results – Revision Arthroscopy

- 63 shoulders (74% males)
- Average age 23.2 years
- Average follow-up → 46.9 months

- Sig improvements in ASES, SST, and VAS

Risk factors for failure

- Number of prior surgeries (P≤0.001)
- Baseline hyperlaxity (P=0.04)
Results – Latarjet

- 28 shoulders (75% male), average age 27.5 years
- Average follow-up → 30.0 months
- Average glenoid bone loss → 18.7%
- 14 (50%) with >1 prior stabilization attempt

Significant improvements in ASES, SST, and VAS
Average WOSI → 71.9

Recurrence
N=1 → dislocation from motocross → progressed to rapid arthrosis → converted to HA

Protrusio
N=1 → symptomatic subluxation
Principal Findings

- Both revision arthroscopic stabilization and Latarjet result in satisfactory outcomes in patients with failed index stabilization.

- Despite smaller degrees of glenoid bone loss, recurrent instability rates were higher in the arthroscopic group (19% versus 8%).
Conclusions

Is there a role for revision arthroscopic stabilization?

YES…

But with STRICT indications

- Technical failure that may be improved
- Good capsular tissue quality

- Caution in patients with >1 prior surgery and/or hyperlaxity, even if minimal bone loss
Thank you!

Chicago
Anthony A. Romeo, MD
Section Head, Shoulder and Elbow Service
Professor, Dept. of Orthopaedic Surgery
Rush University Medical Center
1611 W. Harrison St., Suite 300
Chicago, IL 60612
312-243-4244
Anthony.Romeo@rushortho.com
www.ShoulderElbowSports.com

Chicago