Shoulder Instability in the Contact Athlete - I do it arthroscopically

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- Key points:
  - Greater incidence of anterior shoulder instability in contact and collision athletes
  - Most important factors to consider when planning surgery: patient age, sport, and glenoid/humeral head bone loss
  - Clinical outcomes, recurrence rate, and return to sport rate are not significantly different between arthroscopic suture anchor and open techniques (at > 5 year follow-up)
  - Lateral decubitus positioning and four portal (including 7 and 5 o'clock positions) techniques allow for 360 degree access to the glenoid rim, with at least three anchors below 3 o'clock (author preference)
  - In patients with significant glenoid bone loss (>20-25%, "inverted pear" glenoid), open bone augmentation techniques are considered and may lead to relative contraindication to open techniques
  - Three-dimension computed tomography (3D-CT) is most accurate imaging modality for evaluation of glenoid bone loss

- Age-related risk of recurrence dislocation without surgery: < 20 years old >90% risk of re-dislocation
- "Inverted pear" glenoid = significantly greater glenoid bone loss (8.6mm, 36% inferior glenoid width) than those without "inverted pear." -Lo, et al. Arthroscopy. 2004.
  - Cadaver study: creation "inverted pear" requires 6.5-9.0 mm defect (28.8% glenoid width).

- "Engaging" (larger and more horizontally-positioned) Hill-Sachs lesion is predictor for recurrence following arthroscopic stabilization - Burkhart et al. Arthroscopy. 2000; Cho et al, AJSM, 2011.
- Increased recurrence following arthroscopic treatment if bone loss > 19-25%
  - Assess ISIS (Instability Severity Index Score) - Balg & Boileau, JBJS Br, 2007
  - 3/6 points of ISIS are devoted to contact athletes.

- Type of sport played
  - 5 year period of US High Schools - largest number of dislocations in football and wrestling
  - Level I prognostic study of 131 subjects with a first-time dislocation with 4 years follow-up
    - 43 recurrent dislocation, 37 contact/collision athletes (86%) - Sachs, JBJS Am 2007

- Considerations
  - Timing (start of season, end of season, off-season), contract, scholarship, bonus, expected vs desired length of career, "weekend warrior", other sources of input (family, spouse, friend, agent, trainer, coach, manager, teammate, owner).
  - Concomitant connective tissue (e.g. Marfan's, Ehlers-Danlos, etc).

- Surgical goal (regardless of approach - open vs arthroscopic)
  - Fully define the pathologic lesion, establish healing potential, anatomically repair the pathology with secure fixation and appropriate ligament tensioning, and avoid complications.
• Outcomes
  o Recent systematic review (Harris et al, *Arthroscopy* 2013) of 26 studies, ~2,000 subjects
  o Mean 11 year follow-up with validated clinical outcomes and radiographs
  o Modern arthroscopic suture anchor technique vs open techniques
    ▪ 8.5% (scope) vs 8.0% (open) (p=0.82) recurrent dislocation
    ▪ 87% (scope) vs 89% (open) (p=0.43) rate of return to sport
    ▪ 26% (scope) vs 33% (open) (p=0.06) rate of radiographic OA
  o Meta-analysis (Petrera et al, *Knee Surg Sports Traumatol Arthrosc* 2010) similar conclusions regarding recurrence rate, clinical outcomes, rate of return to sport, radiographic OA.
***Pearls of shoulder anatomy and pathoanatomy in instability***

<table>
<thead>
<tr>
<th>Key shoulder anatomy</th>
<th>Key shoulder pathoanatomy</th>
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<tbody>
<tr>
<td>Glenohumeral joint has largest range of motion in body</td>
<td>Glenohumeral joint is most commonly dislocated joint in the body</td>
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<tr>
<td>Most important passive soft tissue stabilizers are inferior glenohumeral ligament complex and glenoid labrum, especially in abduction and external rotation</td>
<td>Shoulder laxity (asymptomatic) is normal; instability is pathologic (symptomatic)</td>
</tr>
<tr>
<td>Glenoid is wider inferiorly than superiorly, “pear-shaped”</td>
<td>Bankart (anteroinferior labral tear) and Hill Sachs (posterolateral humeral head) lesions and anteroinferior capsular stretch are frequently associated with anterior shoulder instability</td>
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<tr>
<td>Glenoid &quot;socket&quot; is only 5 mm deep in anterior-posterior direction (minimal articular conformity-based constraint)</td>
<td>Do not miss less common causes of instability: HAGL, ALPSA, GLAD, SLAP</td>
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<tr>
<td>25% - 30% of humeral head contacts glenoid at any range of motion</td>
<td>&quot;Inverted pear&quot; glenoid is indicative of significant glenoid bone loss (20-25%)</td>
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***Pearls of history and physical examination in shoulder instability***

<table>
<thead>
<tr>
<th>Key history items</th>
<th>Key physical examination items</th>
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<tbody>
<tr>
<td>Age at time of first dislocation</td>
<td>Inspection: atrophy, prominence/fullness of humeral head, ecchymosis, winging</td>
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<tr>
<td>Exact injury situation description (mechanism, arm position, nerve symptoms)</td>
<td>Palpation: glenohumeral joint line, acromioclavicular joint, cervical spine, periscapular, upper extremity</td>
</tr>
<tr>
<td>Number of dislocations</td>
<td>Motion: active and passive; forward elevation, internal and external rotation</td>
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<tr>
<td>Sport(s) played, timing in relation to season, desire to return to sport, career length</td>
<td>Strength: deltoid, rotator cuff, biceps and triceps brachii</td>
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<tr>
<td>Other joints dislocated (hypermobility syndromes)</td>
<td>Special: Identify correct direction of instability (anterior, posterior, inferior)</td>
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<td>Prior treatments (e.g. immobilization, surgery)</td>
<td>o Apprehension, relocation, load-and-shift</td>
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<td>o Posterior jerk test, load-and-shift</td>
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<td>o Sulcus sign, Beighton’s criteria</td>
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***Pearls and pitfalls for arthroscopic shoulder stabilization***

<table>
<thead>
<tr>
<th>Pearls</th>
<th>Pitfalls</th>
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<tbody>
<tr>
<td>Successful interscalene regional block anesthesia</td>
<td>Poor patient positioning and visualization, with body tilted straight upright or leaning forward</td>
</tr>
<tr>
<td>Lateral decubitus position, with slight (~30 degrees) posterior body tilt</td>
<td>Poor portal placement, avoid iatrogenic articular cartilage damage</td>
</tr>
<tr>
<td>Longitudinal and overhead lateral traction</td>
<td>Failure to recognize significant glenoid bone loss (20-25%), “inverted pear”</td>
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<tr>
<td>Accurate and precise portal placement (including 7 and 5 o’clock portals...can be percutaneous)</td>
<td>Failure to identify other pathology: HAGL, ALPSA, SLAP, GLAD, rotator cuff tear</td>
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<tr>
<td>At least three anchors below 3 o’clock</td>
<td>Failure to completely mobilize the capsulolabral Bankart / inferior glenohumeral ligament complex off the glenoid neck</td>
</tr>
<tr>
<td>Recognition of concomitant hypermobility and tissue quality, thus allowing individualized greater degrees of capsular plication as necessary</td>
<td>Inability to access 4 to 8 o’clock on glenoid</td>
</tr>
<tr>
<td>Appropriate rehabilitation - know your physical therapist</td>
<td>Fewer than three suture anchors</td>
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<td>o Appropriate ligament tensioning</td>
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### Outcomes after arthroscopic stabilization in contact or collision athletes.

<table>
<thead>
<tr>
<th>Study</th>
<th>Level of evidence</th>
<th>Number subjects</th>
<th>Mean age (years)</th>
<th>Population</th>
<th>Length of follow-up (years)</th>
<th>Outcomes</th>
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</table>
| Castagna A et al, 2012        | IV                | 19              | 16               | Collision  | 5.2                         | Following arthroscopic suture anchor repair, 26% rate of recurrent dislocation (rugby, soccer)  
Post-operatively: mean SANE 87%, mean Rowe 85%, mean ASES 84.  
Significant association (p=0.002) between recurrence and type of sport (collision vs non-collision)                                                                                                             |
| Castagna A et al, 2010        | IV                | 21              | 26.3             | Contact    | 10.9                        | Following arthroscopic suture anchor repair, 84% overall satisfaction  
19% and 9.5% rate of atraumatic and traumatic recurrent dislocation, respectively                                                                                                                                 |
| Banerjee S et al, 2009        | IV                | 3               | 23               | Contact    | 2                           | 3 rugby players had recurrent instability during rugby after arthroscopic repair (6-24 months)  
Imaging (CT) and arthroscopy confirmed glenoid fracture at anchors                                                                                                                                                                                                   |
| Thal R et al, 2007            | IV                | 42              | 26.7             | Contact    | 4.5                         | Following arthroscopic suture anchor repair, 7.1% recurrence rate in contact/collision sports  
6.7% recurrence rate in non-contact or non-collision athletes (p=0.95)  
No difference in Rowe (p=.9) and ASES (p=.32) between contact and non-contact athletes                                                                                                                                                                              |
| Larraín MV et al, 2006        | IV                | 160             | 22               | Collision  | 5.7                         | Following arthroscopic suture anchor repair, 4.4% rate of recurrent dislocation (rugby)  
Good/excellent results in 95% and 92% of 1st-time and recurrent instability groups, respectively  
100% and 84% rate of return to rugby in 1st-time and recurrent instability groups, respectively                                                                                                                                                                     |
| Rhee YG et al, 2006           | IV                | 46              | 20               | Collision  | 6                           | VAS, Rowe, Constant significantly improved after both open and arthroscopic repair  
No significant difference between open and arthroscopic groups (VAS, Rowe, Constant)  
Greater number of recurrent dislocations in arthroscopic group (19% vs 9.4%; p=0.04)                                                                                                                                                                             |
| Cho NS et al, 2006            | III               | 29              | 21               | Collision vs non-collision | 5.2                        | Significantly (p<0.05) improved Rowe scores following arthroscopic suture anchor repair  
Greater recurrence rate (29%; 4/14) in collision group vs non-collision group (7%; 1/15)  
57% (8/14) return to sport in collision vs non-collision group (73%; 11/15)                                                                                                                                                                      |
| Calvo E et al, 2005           | IV                | 61              | 27.5             | Contact    | 3.7                         | Significantly (p<0.05) improved Rowe scores following arthroscopic suture anchor repair  
Overall, 20% rate of recurrence (recurrence mean 23 years of age; no recurrence mean 29)  
58% rate of recurrence in contact athletes (7/12) vs 11% recurrence in non-contact (4/38)                                                                                                                                                                  |
| Mazzocca et al, 2005          | IV                | 18              | 17               | Collision and contact | 3.1                        | 11% rate of recurrence (0% contact, 15% collision) following arthroscopic suture anchor repair  
Significant improvements (p<0.05) in ASES, SST, VAS, Rowe, and SF-12 PCS  
100% return to sport at previous level of play (mean 5.7 months) by 10 months after surgery                                                                                                                                                                     |
| Ide J et al, 2004             | II                | 55              | 19.5             | Collision and contact | 3.5                        | Significantly (p<0.05) improved Rowe scores following arthroscopic suture anchor repair  
No difference (p>0.05) in recurrence rate between contact (10%) and non-contact (6%) athletes  
80% return to sport at previous level of play (44/55) at mean 5.8 months                                                                                                                                                                                   |
| Hubbell J et al, 2004         | III               | 50              | 25.5             | Collision  | 5.7                         | Significantly (p<0.05) greater rate of recurrent dislocation in arthroscopic vs open (44% vs 0%)  
100% return to sport at previous level (9/9) in arthroscopic group                                                                                                                                                                                                  |
| Burkhardt S et al, 2000       | IV                | 194             | 28               | Collision and contact | 2.3                        | Following arthroscopic suture anchor repair:  
6.5% recurrence rate in contact athletes without significant bone loss (inverted pear glenoid)  
89% recurrence rate in contact athletes with significant bone loss                                                                                                                                                                                                |
| O’Neill DB, 1999              | IV                | 41              | 20               | Collision  | 4.3                         | 12% rate of recurrent subluxation (2/17) following arthroscopic trans-glenoid suture repair                                                                                                                                                                             |
References: 1-23


15. Larrain MV, Montenegro HJ, Mauas DM, Collazo CC, Pavon F. Arthroscopic management of traumatic anterior shoulder instability in collision athletes: analysis of 204 cases with a 4- to 9-year follow-up and results with the suture anchor technique. *Arthroscopy*. Dec 2006;22(12):1283-1289.


