

Multidirectional Instability of the Shoulder

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Introduction

1. Definition

- symptomatic glenohumeral instability in more than one direction
- grossly patulous and redundant capsule

2. History

- Neer and Foster (1980): describe the diagnosis and define capsular redundancy
- Thomas and Matsen (1989): characterized AMBRII (Atraumatic origin, Multidirectional instability, Bilateral nature, treated initially with a Rehabilitation, and if surgery is needed, it must address the Inferior and rotator Interval)
- Burkhead and Rockwood (1992): 80% had good or excellent result with exercise program. If surgery is indicated, focus the pathoanatomy, either in an open or arthroscopic manner.
- Schen and Brems (1998): review clinical and pathophysiological aspect and non-operative treatment was recommended.
- Previously benign ligamentously lax shoulder might become pathologically unstable: complex clinical condition

3. Several confusions leading to complex and challenging treatment

- 1) MDI = young, sedentary patient, bilateral symptom, atraumatic cause?
 - In reality = athletic patients with repetitive microtrauma (pitcher, butterfly swimmer, gymnastics etc): other joints are normal
- 2) classic anterior unidirectional instability (TUBS): dislocate humeral head anteriorly & inferiorly
 - not same as bidirectional instability (anterior & inferior)
 - sulcus sign is necessary for inferior instability
- 3) all loose shoulders are symptomatic?
 - - not always!!

- asymptomatic laxity and symptomatic instability in the same shoulder

4) MDI = patients of voluntary dislocator with psychiatric disorder, operation is contraindicated?

- some is true, but not always,

- mostly it is positional dislocation, and patients were reluctant to do so, and avoid it!!

4. Spectrum of MDI: different severity and direction

- primary unidirectional instability

- bidirectional instability

- uni-or bidirectional instability with multidirectional laxity

- classic MDI: symptomatic instability in at least 2 planes with loose capsule

Pathoanatomy

- Multifactorial nature: capsular restraint, RI widening, labral shape and tears, glenoid shape and version, dynamic pull of the rotator cuff, intra-articular negative pressure, collagen laxity

- Optimal treatment would involve defining which factors may be causing instability, and addressing as many of those factors as possible: arthroscopic procedures are preferred nowadays

1. Capsular redundancy

- Neer and Foster (1980): “inherent laxity of the shoulder capsule”

- should be initial focus of surgical intervention

2. Rotator interval

- contribute capsular laxity

- Harryman (1992): increased posterior instability by RI sectioning, and decreased translation after imbrications of RI in cadaveric study

3. Glenoid concavity with capsular laxity

- Metcalf (2001): posteroinferior capsular augmentation: increase glenoid depth, decrease capsular laxity

- result in increased resistance of humeral head displacement posteriorly and inferiorly in cadaveric study

4. Labral construct

- Kim (2005): more retroverted posteroinferior chondrolabral portion of glenoid in MRI of 33 atraumatic & symptomatic posteroinferior MDI

- concomitant loss of labral height and glenoid depth

5. Deltoid weakness

- Morris (2004): EMG/NCV in 7 normal, 5 asymptomatic MDI & 6 symptomatic MDI
- rotator cuff function: no difference
- abnormal anterior, posterior and middle deltoid in MDI
- different activation of posterior deltoid in asymptomatic group: coping mechanism

6. Proprioception

- Barden (2004): with 3-dimensional video analysis
- greater hand placement error in MDI group than normal
- inaccurate hand positioning in place
- MDI patients lack the proprioception needed to regulate movement and maintain a functionally stable shoulder.
- Non-operative treatment and improvement of neuromuscular control improve stability in the face of deficient passive anatomic restraint.

Diagnosis

1. History

- AMBRII
- generalized ligament laxity
- repetitive microtrauma and overuse: fatigue the dynamic stabilizer
- trauma: initiated asymptomatic “laxity” to symptomatic “instability”
- pain: usually associated with put inferior traction on shoulder

2. Physical examination: BILATERAL EXAM!!

- generalized ligament laxity
- DDx. “laxity” with “instability”: apprehension with re-creation of symptoms
- Sulcus sign greater than 2 cm with pain and reproduction of the feeling if instability
- Load and shift sign
- Anterior instability test: apprehension, relocation, augmentation, surprise test
- ROM
- Muscle power

3. Radiographs

- simple radiographs: usually normal
flattening of glenoid fossa, excessive retroversion, Hill-Sachs or reverse Hill-Sachs lesion
- MRI: usually normal
labral tears, capsular avulsion, wide rotator interval

4. Examination under anesthesia

- important part of surgical treatment
- role of diagnostic evaluation??
- exaggerate the degree of instability
- bilateral examination

Non-surgical treatment

1. Buckhead and Rockwood: satisfactory results in 90% of MDI
2. At least 6 months of rehabilitation program
3. rehabilitation of muscle that stabilize the humerus
4. strengthening of deltoid and rotator cuff muscles with the arm below the shoulder
5. strengthening of scapulothoracic stabilizing muscle
6. activity modification and patient education for comprehensive program
7. improving muscle tone and coordination: improving functional adaptation
8. NSAIDs and subacromial steroid if secondary impingement syndrome: to allow participation in the rehabilitation program

Surgical treatment

1. Open stabilization

1) Literature review: principle is to reduce capsular volume

- (1) excellent to good result: 88~100%
- (2) recurrence rate: 0~10%
- (3) limited loss of motion

2) Approach

- (1) anterior
- (2) the side of greater instability

3) Open capsular shift with a humeral based T incision (Neer et al)

- (1) suitable for the funnel-shaped capsule
- (2) horizontal incision btw. MGHL & IGHL
 - superior flap contains SGHL & MGHL
 - inferior flap contains IGHL
- (3) capsular shift by north-south direction
 - inferior flap is shifted superiorly and repaired first

4) Glenoid based modified T incision by Altchek et al

- (1) allow visualization of the glenoid labrum
- (2) concomitant treatment of Bankart lesion and capsular redundancy
- (3) 10% of recurrence: 70% was posterior instability probably due to anteriorly over-tightening

5) capsular shift by use of subscapularis-sparing split to assess capsule

6) address rotator interval imbrications

- (1) RI: important stabilizer to inferior translation, especially in adduction-ER
- (2) RI closure let MGHL act as a sling against inferior subluxation

7) Technical considerations

- EAST-WEST direction of plication
- inadvertently shortens the glenohumeral ligament
 - limit ER
 - cannot reduce patulous inferior capsule
 - can exacerbate symptomatic instability
 - flask deformation of capsule

2. Arthroscopic stabilization

1) Principle of arthroscopic stabilization is same as open procedure: reduce capsular volume

- (1) results are comparable to open surgery
- (2) less perioperative morbidity
- (3) capsular shift achieved is generally less than open humeral based shift

2) McIntyre: arthroscopic trans-glenoid technique

3) Gartsman: arthroscopic placement of suture anchor with adjunctive thermal capsulorrhaphy and rotator interval closure

- * Arthroscopic thermal capsulorrhaphy

- (1) initially very popular despite a lack of scientific evidence
- (2) technically easy way to treat large area of redundant capsule
- (3) laser or radiofrequency energy: 65~75°C cause collagen shrinkage
- (4) degradation of mechanical properties
- (5) biologically, fibroplasias and angiogenesis
- (6) complications: nerve injury, capsular necrosis
- (7) 40~60% of unsatisfactory outcome or recurrence
- (8) Nowadays, most effective use may be to augment or enhance suture reconstruction
- (9) isolated treatment: only in patient with subtle instability, particularly in throwing athlete

4) Arthroscopic capsular plication

- (1) gathering the excess capsule and suturing it to itself, the labrum or both
- (2) with or without rotator interval closure
- (3) with or without suture anchor
- (4) Wiley: suture capsule 1 cm lateral and inferior to labrum ? tied to labrum? repeated 3~4 times
- (5) Cicak: extra-capsular plication
- (6) Sekiya: multiple pleat plication
- (7) Kim: arthroscopic posteroinferior labroplasty, capsular shift, and rotator interval closure
- (8) volume reduction of capsule: 1 cm vs. 29~58% of volume reduction
- (9) limitation of ROM, especially ER

5) Arthroscopic procedure: should be familiar to surgeon

- (1) EUA with opposite extremity
- (2) lateral decubitus vs. beach chair position
- (3) arthroscopic findings
 - “drive-through” sign, increased glenohumeral joint space, large inferior capsular pouch, widened rotator interval
 - check superior and anterior/posterior labrum for SLAP lesion, Bankart/reverse Bankart lesion, cuff status, Hill-Sachs lesion/reverse Hill-Sachs lesion, humeral avulsion of capsule (HAGL, RHAGL)
- (4) fix the abnormal findings
 - anchor, tack etc
 - make bleeding surface by decortication of cartilage, shaving soft tissue

Postoperative rehabilitation

1. abduction sling with 30° abduction for 3~6 weeks
2. active ER exercise and scapular exercise for next 3 weeks
3. at 6 weeks: more aggressive ROM exercise and isometric strengthening
4. btw. 8~12 weeks: resistive exercise

5. after 12~16 weeks after operation: sports specific exercise
6. Rehabilitation must be patient-specific and take into account patient factors (collagen quality, dependability, and future demand on shoulder) and surgical factors (quality of repair).

Conclusion

1. The cause of MDI is multi-factorial in individual patients.
2. The mainstay of MDI treatment is conservative, with most doing well with this form of management.
3. In the recalcitrant patients with MDI, surgery can provide good, reproducible outcomes with comparable success with both open and current arthroscopic techniques.
4. Treatment of MDI continues to progress toward the use of minimally invasive technique, with the goals being maximizing outcomes and minimizing morbidity.
5. Open inferior capsular shift can provide a large shift, and for many surgeons open repair is still the gold standard for the treatment of classic MDI.
6. Arthroscopic approach is attractive to minimal invasive surgery, but is associated with steep learning curve.
7. Thermal capsulorrhaphy cannot be recommended at this time, except perhaps as an adjunctive to capsular plication.
8. The key to success is addressing the capsular laxity and redundancy to restore anatomic capsulo-ligamentous tension without over-tightening.

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