

Internal impingement and SLAP lesion

대구가톨릭 대학병원 정형외과

최창혁

Anatomy

Area of great variation

Sublabral hole: Detrisac and Johnson, 1986

 Type A in 5 variations in labral anatomy(A-E)

 Cooper and Arnoczky, 1992

 Ellman and Gartsman, 1993

Buford complex: Williams et al. Arthroscopy, 1994

Superior labral lesions

Pathomorphologically located in the same anatomical region

 SLAP: superior labrum anterior & posterior lesion

 Isolated biceps tendon avulsion

 Biceps-SGHL injury

 Injury to the anterosuperior quadrant

 Internal impingement

History

1. SLAP: Snyder, 1990

1) 4 types(27/ 700 arthroscopic case)

 Type I: fraying with irregularity of the tip of the ant-sup. Labrum

 Type II: complete separation of the sup. Labrum from the glenoid

 Type III: Bucket-handle tear

 Type IV: Bucket-handle tear with extension into the biceps tendon

2) Combined Bankart/SLAP lesion: Maffet et al, 1995

 Lee's classification

2. Internal impingement

Arthroscopic study Walch, J Shoulder Elbow surg, 1992.

Cadaveric study: Jobe, J Shoulder Elbow surg, 1993.

Mechanism of injury

1. SLAP:

Sup. Labrum-biceps complex play a role in shoulder stability

- 1) Traction injury-sudden pull in an inf., ant., and upward direction, throwing
- 2) Compression injury-fall onto an outstretched arm(slight forward flexion and abduction)
- 3) Direct blow 17%(Stetson, AAOS, 1998)
- 4) Insidious onset: 33%(Resch, J shoulder Elbow Surg, 1993)

2. Internal impingement:

A hyperangulation of the glenohumeral joint role of instability(?)

Late cocking phase of throwing(90 abduction & maximal ER)

→ contact btw. The undersurface of the rotator cuff and the post-sup glenoid & labrum

Pathophysiology

1. SLAP: Type II-50% of all SLAP, Snyder,

1) Three categories of Type II SLAP : Anterior, posterior, combined type (Morgan, Arthroscopy, 1998, Burkhart, clinics in sports medicine, 2000)

Posterior Type II - 62% of all SLAP

Posterior & combined type` disabling to over-head throwing athletes

2) Failure mechanism:

Deceleration phase of throwing(Andrews, Morgan)

Biomechanical model of traction & inf. Subluxation(Bey, 1998)

① Tension overload of the biceps

→ avulsion of the post-sup labrum & biceps anchor(SLAP II)

→ post-sup. Instability

- ② Peel-back mechanism in the cocked position
 - extension of posterior type II SLAP
- 3) Lesion-specific location of the rotator cuff tear
 - Post-sup. Instability in chronic SLAP II lesion
 - damage the rotator cuff from inside
 - Morgan 31%, Snyder, 40%
- 4) Summary of posterior SLAP lesion(Morgan, 1998)
 - Post-sup instability & ant-inf. Pseudolaxity(drive-through sign)
 - Peel-back mechanism: cause of post. Type 2
 - Tight post-inf capsule with lack of IR(>40°)
 - predispose to Type 2 SLAP lesions
 - Jobe relocation test(+)
 - Rotator cuff undersurface tear
 - Repair of posterior SLAP lesion 84% success rate(preinjury level)
- 2. Internal impingement(post-sup glenoid impingement)**
 - 1) Anterior instability in throwers(Jobe, Arthroscopy, 1995)
 - Direct mechanical effect(abducted and externally rotated position)
 - entrapment of the cuff btw. the glenoid and GT
 - post-sup. Rotator cuff pathology
 - 2) Five structures at risk
 - Rotator cuff
 - Superior labrum & biceps anchor
 - Greater tuberosity
 - Bony glenoid
 - Ant-inf. Ligament & labrum
 - 3) Role of instability : not a causative factor, Walch, Jobe
 - 4) Internal impingement contact is physiological Halbrecht, arthroscopy, 1999
 - Repetitive contact in ABER position
 - pathologic findings on MRI
 - not necessarily correlate to symptoms

Alternative explanation of the connection btw. Instability & internal impingement

- 1) SLAP is primary(Morgan, Burkhart)
 - Biceps overpull→ SLAP→ Instability→ Internal impingement
 - Correction of SLAP→ Stability→ Elimination of glenoid impingement
- 2) Internal impingement is primary(Christopher M. Jobe)
 - Glenoid impingement→ SLAP→ Instability with respect to the SGHL &MGHL
 - Repair of SLAP→ Restore SGHL & MGHL stability→ Eliminate glenoid impingement

Diagnosis

History

Symptom & Sign

1. SLAP:

- Pain-with over head activities
- Mechanical Sx catching locking, popping, glinding

2. Internal impingement

- Throwers with symptoms of pain in the late cocking phase

Physical Examination

1. SLAP: SLAP test, Kibler test, O'Brien test, "Load and shift" test

- Whipple test, Biceps load test

SLAP lesions may present with signs and symptoms of RC lesions or instability

2. Internal impingement

- Relocation test
- Increased anterior GH translation
- Impaired scapular excursion

Diagnostic studies

MRI

MR arthrography(12 to 20 mL of diluted Gadopentetate meglumine)

1. SLAP:

- 1) Findings High signal intensity in the labrum-biceps anchor
High signal intensity btw. Sup. Glenoid labrum & glenoid
Glenoid labral cyst(Tirman, Radiology, 1994)
20 cystic mass on MRI
All 9 cyst in sup. Portion-SLAP lesion(arthroscopy)
- 2) Chandnani, AJR, 1993.
Sensitivity of MR arthrography. labral tear(96%), labral detachment (96%)
Sensitivity of conventional MRI labral tear(93%), labral detachment (46%)
Problems. specificity, false-positive→ Arthroscopy

2. Internal impingement

(Schickendantz, MRI clinics of North America, 1999)

Position of extreme ER & abd.

Findings. lesions of post-sup. Labrum

Undersurface irritation

Tearing of the SST & IST junction

Cystic changes of the Post-sup. Glenoid & Post-lat. GT

Instability is not a necessary prerequisite for the development of the pathologic lesions

Diagnostic Arthroscopy

Incidence

SLAP lesions(Snyder, J Shoulder Elbow Surg, 1995)

140 injuries(5.9%)to sup. Glenoid labrum/ 2,375 arthroscopy(1985-1993)

1) Classification Type I 29(21%), Type II:77(55%),

Type III: 13(9%), type IV 14(10%), Complex: 7(5%)

- 2) Isolated SLAP lesions. 39(28%) · 1.6% of total cases
- 3) Associated pathologic conditions 101(72%)
 - RC injury(40%) partial tear(29%), full thickness tear(11%)
 - Bankart lesions(22%)
 - Humeral head injury(10%)
 - ACJ degenerative change(16%)
- 4) Findings(Snyder, Shoulder Arthroscopy, 1994).
 - Hemorrhage of granulation tissue
 - Presence of space
 - Arching of sup. Labrum with traction > 3 to 4mm

Nonsurgical management

1. SLAP

Delay in diagnosis
Generally a failure

2. Internal impingement

Usually successfully treated without operation
Goal: Decrease excessive motion & fatigue
Modalities Physical therapy, conditioning, and mechanical technique correction

Surgical management

1. SLAP

Best managed using arthroscopic technique
Type II screw type suture anchor in a mattress-suture
Type I & III Debridement & careful assessment for glenohumeral stability
Type IV depends on the extent of biceps tearing

- <30% detached fragment resction
- >30% older patients-labral debridement & biceps tenodesis
younger patients-suture repair & anchor fixation

2. Internal impingement

- 1) Thermal capsulorrhaphy: Levitz, *Arthroscopy*, 2001
Back to competition NHP(67%), HP(90%)
- 2) ACLR: Rubenstein, *J shoulder Elbow Surg*, 1992
77% of professional pitchers-return to preinjury level
Montgomery & Jobe, *Am J Sports Med*, 1994
86% of professional pitchers-return to preinjury level

Current recommendations

Begin with rehabilitation

Fix the structure that is injured

REFERENCES

1. Bey MJ, Elders GJ, Huston LJ, Kuhn JE, Blaster RB, and Soslowsky LJ: The mechanism of creation of SLAP lesions in a dynamic biomechanical model of the shoulder: The role of inferior subluxation. *J Shoulder Elbow surg*, 7:397-401, 1998.
2. Burkhart SS, and Morgan CD: The Peel-back mechanism: Its role in producing and extending posterior Type II SLAP lesions and its effect on SLAP repair rehabilitation. *Arthroscopy*, 14:637-640, 1998.
3. Davidson PA, Eltrache NS, Jobe CM, and Jobe FW: Rotator cuff and posterior-superior glenoid labrum injury associated with increased glenohumeral motion: A new site of impingement. *J Shoulder Elbow Surg*, 4:384-90, 1995.
4. Halbrecht JL, Tirman P, and Atkin D: Internal impingement of the shoulder: Comparison of findings between the throwing and nonthrowing shoulders of college baseball players. *Arthroscopy* 15:253-258, 1999.
5. Handelberg F, Willems S, Shahabpour M, Huskin JP, and Kuta J: SLAP lesions: A retrospective multicenter study. *Arthroscopy*. 14:856-862, 1998.
6. Mc Farland EG, Hsu CY, Neira CN, and O'Neil O: Internal impingement of the shoulder: A clinical and arthroscopic analysis. *J Shoulder Elbow surg*, 8:458-60, 1999.
7. Jobe CM: Superior glenoid impingement. *Clin Orthop* 330:98-107, 1996.
8. Mileski RA, and Snyder SJ: Superior labral lesions in the shoulder: Pathoanatomy and surgical management. *J Am Acad Orthop surg*.6:121-131, 1998.

9. Morgan CD, Burkhart SS, Palmeri M and Gillespie M: Type II SLAP lesions: Three subtypes and their relationships to superior instability and rotator cuff tears. *Arthroscopy*, 14:553-565, 1998.
10. Paley KJ, Jobe FW, Pink MM, Kvitne RS, and ElAttrache: Arthroscopic findings in the overhead throwing athlete: Evidence for posterior internal impingement of the rotator cuff. *Arthroscopy*, 16:35-40, 2000.
11. Snyder SJ, Karzel RP, Del Pizzo W, et al: SLAP lesions of the shoulder. *Arthroscopy*, 6:274-279, 1990.
12. Walch G, Boileau P, Noel E, and Donell ST: Impingement of the deep surface of the supraspinatus tendon on the posterosuperior glenoid rim: An arthroscopic study. *J Shoulder Elbow Surg*, 1:238-45, 1992.