

견관절의 이학적 검사

경상의대

박형빈

Basic Principles

- A. Examine joint above(neck) and below
- B. Undress the patient
- C. Compare sides
- D. Do a neurovascular exam

The Basic Examination

A. Inspection

- 1. Winging
- 2. Shrugging
- 3. Muscle atrophy
- 4. Cervical excessive lordosis
- 5. Thoracic excessive kyphosis, scoliosis

B. Range of motion

Active and passive ROM

- 1. Forward flexion
- 2. Abduction
- 3. External rotation at abduction
- 4. Internal rotation at abduction
 - GIRD (Glenohumeral Internal Rotation Deficit)
- 5. External rotation at side
- 6. Internal rotation at position

C. Palpation

- 1. SC joint
- 2. AC joint

3. Tuberosities
4. Coracoid process and conjoined tendon insertion
5. Biceps tendon: internal rotation 10°
6. Rent test¹⁾: transdeltoid palpation of rotator cuff tear

D. Manual muscle tests

1. Supraspinatus muscle test

a. Empty can test (Jobe's test)²⁾

- Position: standing
- Maneuver: resistive abduction, abducted 90°, horizontally flexed 20-30°, thumb down position
- Positive test: muscle weakness with or without pain

b. Full can test³⁾

- Position: standing
- Maneuver: resistive abduction, abducted 90°, horizontally flexed 20-30°, 45° external rotation
- Positive test: muscle weakness with or without pain

c. Which is more useful, the "Full can test" or the "Empty can test" ?

- 1) Kelly et al.³⁾ EMG activities of the supraspinatus muscle in both the "Full can" and "Empty can" tests were similar but that "Full can test" was less pain provocative
- 2) Itoi E et al.⁴⁾
 - ㄱ) Muscle weakness alone (not pain): Both tests are equivalent in diagnostic accuracy.
 - ㄴ) Considering pain provocation, the full can test may be more beneficial in the clinical setting.

2. External rotator muscle test

- Position: standing or sitting
- Maneuver: resistive external rotation arm at side, elbows in tight to thorax
- Positive test: muscle weakness with or without pain
- Interpretation: infraspinatus muscle weakness

3. Internal rotator muscle test

- Position: standing or sitting
- Maneuver: resistive internal rotation, arm at side
- Positive test: muscle weakness with or without pain
- Interpretation: weakness of pectoralis and of subscapularis, not specific for any one muscle

Provocative tests

A. Subacromial impingement signs

1. Neer impingement sign⁵⁾

Position: standing or sitting

Maneuver: passively forward elevate the arm during stabilizing scapula

Positive test: complaint pain

2. Hawkins impingement sign⁶⁾

Position: standing or sitting

Maneuver: 90° forward flexion and internal rotation

Positive test: complaint pain

3. Painful arc sign⁷⁾

Position: standing

Maneuver: active full abduction and adduction in the same arc of the scapular

Positive test: pain or painful catching between 60° and 120° of abduction.

B. Coracoid impingement

1. Coracoid impingement test⁸⁾

Position: standing or sitting

Maneuver: Flex arm, internally rotate and adduct

Positive test: aggravate shoulder pain or clicking

Interpretation: impingement of humeral head or supraspinatus tendon to coracoid process

C. Internal impingement test

1. Relocation test⁹⁾

Position: supine

Maneuver:

- Apprehension: arm abducted and externally rotated until pain or instability

- Relocation: push posterior on humeral head

Positive test: disappear pain or instability

Interpretation:

A) Pain goes away: internal impingement

B) Sense of instability goes away: instability

D. Rotator cuff integrity tests

1. Supraspinatus tendon integrity

a. Drop arm sign¹⁾

Position: standing

Maneuver: The patient was asked to elevate the arm fully and then to slowly reverse the motion same arc.

Positive test: If the arm dropped suddenly or the patient had severe pain, the test is considered to be positive.

2. Supraspinatus and infraspinatus tendon integrity

a. External rotation lag sign¹⁰⁾

Maneuver: i) The elbow flexion 90°, 20° elevation of shoulder in scapular plane with near maximal external rotation,

ii) The patient is asked to actively maintain the external rotation in elevation as the physician releases the wrist while maintaining support of the limb at the elbow.

Positive test: lag or angular drop

* false positive in suprascapular nerve palsy

3. Infraspinatus tendon integrity

a. Drop sign¹⁰⁾

Maneuver: i) the patient's arm is held at 90° scapular plan elevation and full external rotation with 90° elbow flexion,

ii) The patient is asked to actively maintain this position as the physician releases the wrist while supporting the elbow.

Positive test: lag or "drop"

* false positive in suprascapular nerve palsy

4. Subscapularis tendon integrity

a. Lift off test¹¹⁾

Position: standing

Maneuver: lift one's hand off one's back at full extended and internal rotated arm position

Positive test: unable to lift off

b. Belly press test¹²⁾

Position: standing

Maneuver: press abdomen with maximal internal rotation

Positive test: elbow drops back behind trunk

c. Napoleon sign

Modified belly press test¹³⁾

- Belly press is exerted by extension of the shoulder and flexion of the wrist.
This position is considered as the “Napoleon sign”

Modification by Burkhart and Tehrany¹⁴⁾

- Negative: The angle of wrist is 0 ° , normal subscapularis function
- Intermediate: The angle of the wrist flexion is between 30 ° and 60 ° partial function of subscapularis

Positive: The patient can press on the belly only by flexing the wrist 90 ° using posterior deltoid, nonfunction of subscapularis

d. Internal rotation lag sign¹⁰⁾

Position: Sitting

Maneuver:

- The affected arm held by the physician at almost maximal internal rotation,
 - The elbow is flexed to 90 ° , and the shoulder is held at 20 ° elevation and 20 ° extension,
 - The dorsum of hand is passively lifted away from the lumbar region until almost full internal rotation is reached,
- iv) The patient is then asked to actively maintain this position as the physician releases the wrist while maintaining support at the elbow.
- Positive test: presence of lag

e. Belly-off sign¹⁵⁾

- Position: standing
- Maneuver:
- Starting position: The affected arm of the patient is passively brought into flexion and maximum internal rotation with the elbow flexed to 90 ° . The elbow of the patient is supported by one hand of the examiner while the other hand places the palm on the abdomen.
- Examination: The patient is asked to keep the wrist straight and actively maintain the position of internal rotation at the examiner releases the wrist while maintaining support at the elbow.
- Positive test: the hand lifts off the abdomen

5. Teres minor tendon integrity

a. Hornblower' s sign

1) External rotation at 90 ° of abduction¹⁶⁾

- Position: standing or sitting
- Maneuver: i) The examiner supports the patient' s arm at 90 ° of abduction in

scapular plane.

ii) The elbow is then flexed to 90°.

iii) The patient is asked to rotate the forearm externally against the resistance of the examiner's hand.

- Positive test: the shoulder can not be externally rotated

2) Modification by McClusky¹⁷⁾

- Position: standing

- Maneuver: arm by the side, bring hand to the mouth

- Positive test: unable to do this without abduction

* Walch et al.¹⁸⁾ found that hornblower's sign had 100% sensitivity and 93% specificity for irreparable degeneration of teres minor

6. Combination of tests for diagnosing rotator cuff disease

- Murrell et al.¹⁹⁾

- Three tests; supraspinatus weakness, weakness in external rotation, and impingement (Hawkins or Neer)

- Rotator cuff tear; all three were positive, or if two tests were positive and the patient was aged 60 or older, the individual had 98% chance

- Rule out rotator cuff tear; absence of three tests

- Park et al.²⁰⁾

가) The combination of the Hawkins impingement sign, the painful arc sign, and the infraspinatus muscle test yielded the best post-test probability (95%) for any degree of impingement syndrome.

나) The combination of the painful arc sign, drop-arm sign, and infraspinatus muscle test produced the best post-test probability (91%) for full-thickness rotator cuff tears.

E. Biceps tests

1. Speed's test²¹⁾

- Maneuver: arm flexed 90 degrees and 10 degrees horizontal abduction, then resisted elevation

- Positive test: pain during forward elevation

- Interpretation: Biceps long head problem (tendonitis, subacromial impingement, SLAP)

2. Yergason's test²²⁾

- Position: sitting

- Maneuver: resisted supination of elbow

- Positive test: pain localized on the bicipital groove

- Interpretation: biceps tendon problem

3. Ludington' s test²³⁾

- Position: sitting
- Maneuver: clasps both hand top of or behind of head, alternatively contracts and relax the biceps tendon
- Positive test: impossible to feel biceps tendon
- Interpretation: rupture of biceps tendon

4. Biceps instability test²⁴⁾

- Maneuver: palpation biceps in the groove while taking the arm from an abducted external rotated position to a position of internal rotation
- Positive test: palpable or audible painful click
- Interpretation: subluxation or dislocation of biceps tendon

F. SLAP tests

1. Compression-rotation test ²⁵⁾

- Position: Supine or lateral position
- Maneuver: arm abducted 90 degrees and grind— idea is to capture labral fragment (McMurray' s of the shoulder)
- Positive test: pain or a click
- Interpretation: sensitive for labral tears, not specific for SLAP

2. Crank test²⁶⁾

- Position: Supine or standing
- Maneuver: arm elevated 160° in the scapular plane, humerus loaded axially with maximum internal and external rotation
- Positive test: pain with or without click reproduction of symptoms during activity
- Interpretation: glenoid labral tears, not specific for SLAP lesions

3. Active compression test²⁷⁾

- Position: standing
- Maneuver: arm forward flexed 90° with elbow extended, arm adducted 10 to 15° , maximum internal rotation (thumb down position), examiner applies resisted downward force to arm, patient then maximally supinates arm and the maneuver is repeated
- Positive test: either a click or pain
Pain should decrease with palm up.
- Interpretation: SLAP, AC arthritis

4. Anterior slide test²⁸⁾

- Position: standing
- Maneuver: hand on hip, axial load along arm to create shear
- Positive test: should produce click or pain
- Interpretation: SLAP

5. Biceps Load test²⁹⁾

- Position: supine
- Maneuver: Arm abducted 90°, externally rotated, with the elbow flexed 90°, and the forearm supinated. Apprehension test is performed. Apprehension appears, and then performs resisted elbow flexion.
- Positive test: The apprehension remains the same or the shoulder becomes more painful
- Interpretation: superior glenoid labrum integrity in shoulders with recurrent anterior dislocation

6. Biceps Load test II³⁰⁾

- Position: Supine
- Maneuver: arm elevated 120°, maximum external rotation, elbow flexed 90°, forearm supinated, resisted elbow flexion
- Positive test: pain during resisted elbow flexion
- Negative test: no pain or pain unchanged or less by resisted elbow flexion
- Interpretation: SLAP lesions specifically

7. Pain provocation test or Mimori's test³¹⁾

- Position: Sitting
- Maneuver: arm abducted approximately 90° to 100°, examiner externally rotates shoulder and puts forearm in maximum pronation and then maximum supination
- Positive test: pain provoked only when forearm is in pronated position
pain in pronation > pain in supination
- Interpretation: superior labral tear

8. Biceps tension test²⁵⁾

- Position: standing
- Maneuver: resisted shoulder flexion with elbow extended and forearm supinated (basically Speed's test)
- Positive test: reproduction of patient's symptoms
- Interpretation: Superior labral lesion

9. Other SLAP test

- SLAPrehension test, Relocation test, Mayo shear test, etc.

G. AC joint tests

1. Cross arm adduction stress tests (Horizontal adduction test)³²⁾

- Position: Sitting or standing
- Maneuver: Examiner passively forward flexes the arm 90° and then horizontally adducts the arm as far as possible.
- Positive test: localized pain on AC joint
- Interpretation: AC joint lesion, Posterior joint capsule tightness

2. Acromioclavicular resisted extension test³³⁾

- Position: Standing
- Maneuver: arm flexed 90 degrees, elbow bent, resist arm extension horizontal plane
- Positive test: pain is created at AC joint
- Interpretation: AC joint lesion

3. Active Compression test²⁷⁾

- Please see SLAP
- Pain should localize on AC joint

H. Laxity tests

1. Anterior and Posterior Drawer³⁴⁾

- Position: supine
- Maneuver:
 - A) Anterior drawer: One hands holds the patient's scapula firmly, other hand draws arm anteriorly, while the shoulder positioned 80° to 120° abduction, 0° to 20° forward flexion and 0° to 30° external rotation.
 - B) Posterior drawer: One hand holds arm 120° elbow flexion, shoulder 80° to 120° abduction, and 20° to 30° flexion initially.
Thumb of other hand push humeral head posteriorly during arm holding hand rotates the arm medially and flexes it 60° to 80°.
- Grading systems: modified Hawkins scale
 - I: to the glenoid rim, but not over glenoid edge (or doesn't sublux)
 - II: goes over the rim but spontaneous reduction when the force was removed
 - III: locks out

2. Load and shift test³⁵⁾

- Position: sitting or supine
- Maneuver: One hand holds scapula. Other hand holds proximal arm and reduces humeral head concentrically in glenoid fossa. Then shifts humeral head anteriorly and posteriorly.
- Grading system: same grading system of drawer test

3. Sulcus sign

- Position: standing or sitting (best done sitting since relax better)
- Maneuver: Grasps the patient's forearm below the elbow and pulls the arm distally. Repeat with arm in external rotation.
- Grading system:
 - I: less than 1.0 cm
 - II: 1.0~2.0 cm
 - III: over 2.0 cm
- Interpretation: a sign of inferior laxity, not inferior instability unless reproduces symptoms, if not decreased with ER then supposedly rotator cuff interval lesions

4. Generalized laxity signs

I. Instability tests

1. Anterior Instability

A) Crank test

- Position: Supine, Standing or Sitting
- Maneuver: Abduction and external rotation, push anteriorly on shoulder (fulcrum test)
- Positive test: apprehension
- Interpretation: anterior instability

B) Relocation test³⁶⁾

- Initially for "internal impingement" but great useful for evaluation of anterior instability

C) Anterior release test³⁷⁾

- Position: supine
- Maneuver: The patient's arm is abducted 90° while the examiner places a posteriorly directed force on the patient's humeral head with his hand. The posterior force is maintained while the patient's arm is brought into extreme of external rotation. The humeral head then released.
- Positive test: sudden pain, a distinct increase in pain, or reproduction of symptoms
- Interpretation: anterior instability

D) Hyperabduction test³⁸⁾

- Position: sitting

- Maneuver: The forearm of the physician holds the shoulder girdle
- The other hand lifts the patient's arm up in the frontal plane. Measure the range of passive abduction (RPA).
- Positive test: Positive of RPA $> 105^\circ$
- Interpretation: lengthening and laxity of IGHL

2. Posterior instability tests

A) Posterior apprehension or stress test

- Position: Supine or sitting
- Maneuver: arm flexed 90° at scapular plane, apply posterior force on elbow
- Positive test: pain or apprehension
- Interpretation: posterior instability

B) Jerk test

- Position: Sitting or standing
- Maneuver: initially 90° abduction and apply axial loading, then horizontal adduction return to initial 90° abduction position
- Positive test: sudden jerk or clunk as the humeral head slides off and the back of glenoid
- Interpretation: posterior instability

C) Push-pull test³⁹⁾

- Position: supine
- Maneuver: abducts arm 90° and flexes it 30° , one hand pushes down humeral head, other hand pulls up the arm at the wrist.
- Positive test: pain, apprehension, locks out
- Interpretation: posterior instability

3. Inferior instability test

A) Feagin test⁴⁰⁾ (Itoi et al.⁴¹⁾)

- Position: standing
- Maneuver: Arm abducted 90° , apply inferiorly directed force
- Positive test: apprehension or sulcus above coracoid
- Interpretation: Anteroinferior instability

J. Evaluation of Scapulothoracic Articulation

1. Scapular position and motion

- Sick scapula
- Scapular dyskinesis

2. Muscle strength

A) Scapular isometric pinch or Squeeze test⁴²⁾

- Position: standing
- Maneuver: Actively “pinch” or retract the scapulae together
- Positive test: burning pain occurs in less than 15 sec.
- Interpretation: weakness of scapular retractors

B) Wall pushup test⁽⁴²⁾

- Position: standing
- Maneuver: arms length from wall, wall pushup 15 to 20 times
- Positive test: scapular winging may be noted with 5 to 10 wall pushups
- Interpretation: weakness of Serratus anterior

C) Lateral scapular slide test⁽⁴²⁾

- Position: standing or sitting
- Maneuver: measure the distance from inferior angle of the scapular spine to the closest spinous process in three different positions; 1) arms at side, 2) arms abducted, approximately 10° shoulder extension, hands on waist, thumbs back, 3) arms abducted to 90°, thumbs down position
- Positive test: asymmetry more than 1.5 cm
- Interpretation: dysfunction of scapular stabilizer

3. Corrective tests

A) Scapular assistance test⁽⁴²⁾

- Purpose: to evaluate scapular and acromial involvement in subacromial impingement
- Position: standing
- Maneuver: One hand stabilizing clavicle and scapula and holds scapular retracted.
- Other hand hold inferior angle of scapula, then, stabilizes and pushes the inferior medial border of the scapula up and laterally during the patient actively abducts or forward flexes the arm.
- Positive test: elimination or modification of external impingement symptoms
- Interpretation: Serratus anterior and/or lower trapezius muscle weakness

B) Scapular retraction test⁽⁴²⁾

- Position: standing
- Maneuver: manually stabilizing the scapula in a retracted position
- Positive test: improvement in rotator cuff manual strength testing
- Interpretation: Trapezius and Rhomboids muscle weakness

K. Neurovascular examination

1. Peripheral nerves

- a. Musculocutaneous --- biceps

- b. Radial --- triceps
- c. Ulnar --- intrinsics
- d. Median --- opponens pollicis
- e. Axillary --- deltoid
 - Swallow-tail sign
 - Deltoid extension lag sign

2. Vascular Examination

- a. Adson's maneuver
- b. Wright's maneuver
- c. Roos stress test
- d. Costoclavicular maneuver

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