

주관절의 이학적 검사 (Physical Examination of the Elbow)

경희대학교 의과대학 동서신의학병원 정형외과학교실

조 남 수

GENERAL CONSIDERATIONS

- Function of the Elbow

1. to position hand to perform its action
2. to change height and length of the arm to position hand correctly
3. to position hand most effectively by rotation

- History & Physical Examination

- is most valuable diagnostic tool available in elbow lesion
- knowledge of anatomy is the key of a good physical examination

1. Organization of the history
2. Selective physical examination
3. Framework for physical examination

- Elbow Lesions

- Overuse Elbow Injury

- * Causes of overuse elbow pain

- 1) Anterior elbow
 - Biceps tendinosis
 - Pronator syndrome
 - Anterior capsule strain
- 2) Posterior elbow
 - Triceps tendinosis
 - Olecranon impingement
 - Olecranon stress fracture

• TABLE • Overuse-Induced Lesions at the Elbow and Affected Tissue Types

Involved Tissue	Manifestations
Bone Joint	Angular change, hypertrophy Degenerative arthrosis, loose body, spur, osteophyte (olecranon), osteochondritis dissecans
Synovium Ligament	Reactive synovitis, effusion Collateral ligament tear, stretch, calcification
Tendon	Epicondylitis, distal biceps, triceps detachment
Muscle	Myofasciitis, hypertrophy, compartment syndrome (anconeus)
Bursa Nerve	Inflammation, radiobicipital, olecranon Entrapment, cubital tunnel, arcade of Frohse

- Olecranon bursitis

3) Lateral elbow

- Lateral tennis elbow
- Radial tunnel syndrome
- Radiocapitellar chondromalacia
- Posterolateral rotatory instability

4) Medial elbow

- Medial tennis elbow (golfer' s elbow)
- Ulnar collateral ligament sprain
- Ulnar nerve entrapment

- Angular Deformity
 - : Cubitus varus, Cubitus valgus
- Stiff Elbow
 - : Post-traumatic, Degenerative
- Arthritis
 - : Degenerative, Infectious, RA

HISTORY TAKING

: essential to accurately identify the singular nature of a problem

- Chief Complaint
 - pain (m/c): severity (intermittent or constant), quantity and type of analgesia used, association of night pain
- * Conditions involving lateral compartment (radiocapitellar articulation)
 - : provoke pain that extends over the lateral aspect of the elbow with radiation proximally to midhumerus or distally over the forearm
- * RA
 - : pain in a periarticular distribution (vs pain arising from a neuropathy)
- * Pain from a median neuropathy
 - : localized anteromedially, reproduced with resisted forearm pronation and wrist flexion
- * Ulnar neuropathy arising in the cubital tunnel
 - : lancinating pain, producing paresthesia into the ulnar two rays of the hand
- * Nonspecific Sx, poorly localized to the medial aspect of the elbow
 - : ulnar nerve pathology, medial epicondylitis, or arthrosis
- * Sx, arising from cervical radiculopathy

제 7차 대한건·주관절학회 연수강좌

: neck or shoulder pain, elbow discomfort
- plus) specific radicular distribution of pain
associated neurologic abnormality of the upper extremity

- deformity
- limited motion
- apprehension
- functional compromise

: with chronic pain, certain accommodative activities for lessening or eliminating pain

- Age & Sex
- Hand Dominancy
- Occupation & Recreation

* Common injuries according to activities

- 1) Bowling
 - Biceps tendinosis, Radial tunnel syndrome
- 2) Boxing
 - Triceps tendinosis
- 3) Friction in football, wrestling or basketball
 - Olecranon bursitis
- 4) Golf
 - Golfer' s elbow (trailing arm), Radial tunnel syndrome
- 5) Gymnastics
 - Biceps tendinosis, Triceps tendinosis
- 6) Posterior dislocation
 - Posterolateral rotatory instability
- 7) Racket sports
 - Pronator syndrome, Triceps tendinosis, Olecranon stress fracture, lateral tennis elbow, Radial tunnel syndrome, Golfer' s elbow, Ulnar nerve entrapment
- 8) Rowing
 - Radial tunnel syndrome
- 9) Skiing
 - Ulnar nerve entrapment
- 10) Swimming
 - Radial tunnel syndrome
- 11) Throwing
 - Pronator syndrome, Triceps tendinosis, Olecranon impingement, Olecranon stress fracture, Radiocapitellar chondromalacia, Ulnar collateral ligament sprain, Golfer' s elbow, Ulnar nerve entrapment

12) Weight lifting

- Biceps tendinosis, Triceps tendinosis, Anterior capsule strain, Radial tunnel syndrome, Ulnar nerve entrapment

- Symptom
 - : onset, duration, neurologic Sx.
- Symptom Aggravating or Alleviating Factors
 - : activity, position, degree of disability
- Injury Mechanism

PHYSICAL EXAMINATION

- Inspection
 - Palpation
 - Range of Motion
 - Strength
 - Neurologic Examination
-
- Inspection
 - : can gain considerable information from visual inspection because much of the joint is subcutaneous

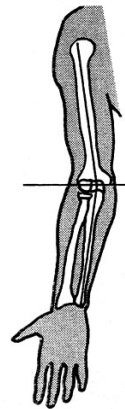


Fig. 1.

1) Axial Alignment

- “carrying angle”
 - : formed by the long axis of the humerus and the long axis of the ulna
 - : is most evident when the elbow is straight and the forearm is fully supinated
- men (average: 10 °), women (average: 13 °)
- cubitus valgus: > 15 ° , cubitus varus: < 5 °
- moves from a valgus to varus alignment as ulnohumeral flexion occurs

* Axial malalignment of the elbow

- : prior trauma, skeletal growth disturbance, or repetitive valgus overuse

2) Lateral Aspect

- * Fullness about the infracondylar recess just inferior to the lateral condyle
 - increase in synovial fluid
 - synovial tissue proliferation
 - radial head pathology (fracture, subluxation, or dislocation)
- * Thin, taut, adherent skin with/without discoloration over the lateral condyle

→ indicative of excessive cortisone injections

* Prominence involving the lateral triangle

→ often indicates posteriorly dislocated radial head

3) Posterior Aspect

- prominent olecranon: posterior subluxation or dislocation

- prominent subcutaneous olecranon bursa: when inflamed or distended

* loss of active extension: rupture of the triceps tendon

* loss of terminal passive extension: sensitive indicator of intraarticular pathology

* loss of active motion with full passive extension

: mechanical (triceps avulsion) or neurologic conditions

4) Medial Aspect

- ulnar nerve: anterior subluxation during flexion

5) Associated Joints

- interplay of shoulder and wrist function as they complement the usefulness of the elbow

- radicular pattern of elbow pain

→ review cervical alignment & ROM, perform neurologic testing

- main nerve roots involved with elbow function: C5-7

* general distribution of sensory levels

- C5: lateral arm

- C6: lateral forearm

- C7: middle finger

- C8 & T1: medial forearm & arm

• Palpation

1) Bony Landmarks

- medial & lateral epicondyle & olecranon process

: 90° flexion → normally form an isosceles triangles (triangular sign)

: full extension → normally form a straight line

2) Anterior Aspect

- musculocutaneous nerve

- biceps tendon (lacertus fibrosis)

- brachial artery & median nerve

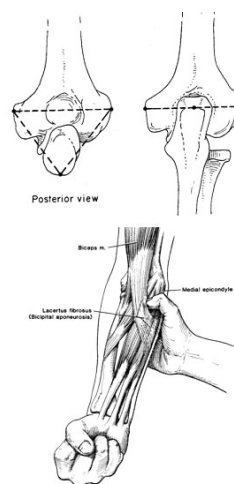


Fig. 2.

- coronoid process

3) Posterior Aspect

- olecranon tip & triceps aponeurosis
 - : spur or bony prominence
- olecranon fossa

* basketball palyer or baseball pitcher, heavy laborer
 (snap their elbow into full extension)
 → pain at posteromedial olecranon and ulnohumeral joint

4) Lateral Aspect

- lateral supracondylar ridge (lateral column)
 - : surgical landmark of the lateral approach
- radial head & LCL
 - : digital pressure, appreciated by pronating and supinating the forearm
- ECRL, ECRB & EDC
 - : enhanced by radial wrist and elbow extension
- arcade of Frohse (posterior interosseous nerve)
 - : 2 cm anterior & 3cm distal to lateral epicondyle

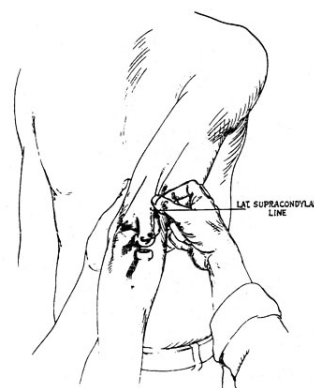


Fig. 3.

5) Medial Aspect

- cubital tunnel (ulnar nerve)
 - : swelling, subluxation, dislocation
- wrist flexor-pronator muscle group
- MCL
 - : slightly anterior & inferior to medial epicondyle
 - fan out to greater sigmoid fossa

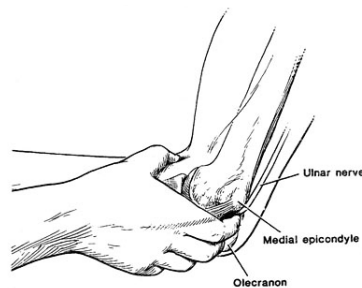


Fig. 4.

• Range of Motion

1) Active Motion

- flexion/extension: 0~140 ° (±10 °)
- pronation/supination: 80~90 ° /90 °
- functional ROM for daily activity: 30°/130°/50°/50°

* loss of pronation: compensated by shoulder abduction

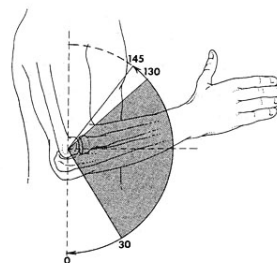


Fig. 5.

- 2) Passive Motion & Normal End Feel
- elbow flexion: tissue approximation
 - elbow extension: bone-to-bone
 - forearm supination: tissue stretch
 - forearm pronation: tissue stretch

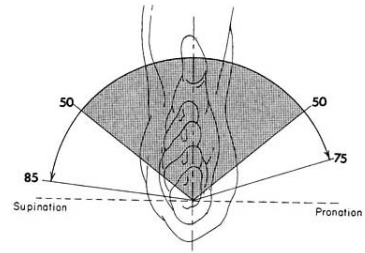


Fig. 6.

- 3) Resisted Isometric Movement
- elbow flexion & extension
 - forearm supination & pronation
 - wrist flexion & extension

* Full pronation & supination

: only when both the proximal and distal radioulnar joints are normal in their relationships for the full length of the radius

* Loss of forearm rotation

- problem with the elbow
- residual shortening or malrotation of the radius secondary to fracture
- distal radioulnar joint incongruence
- congenital or idiopathic abnormality of either radius or ulna

• Strength

1) Flexion and extension strength testing

- extension strength: normally 70% of flexion strength

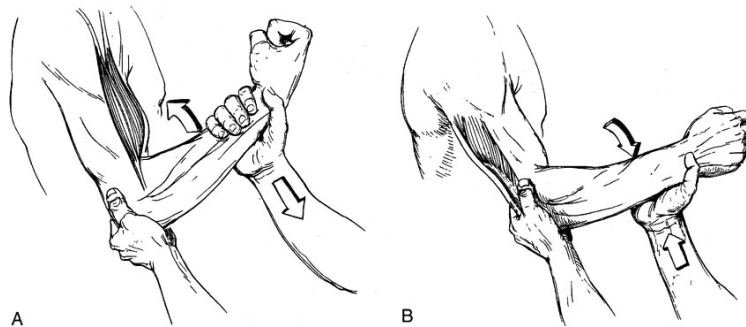


Fig. 7.

2) Pronation and supination strength testing

- supination strength: normally 15% greater than pronation strength

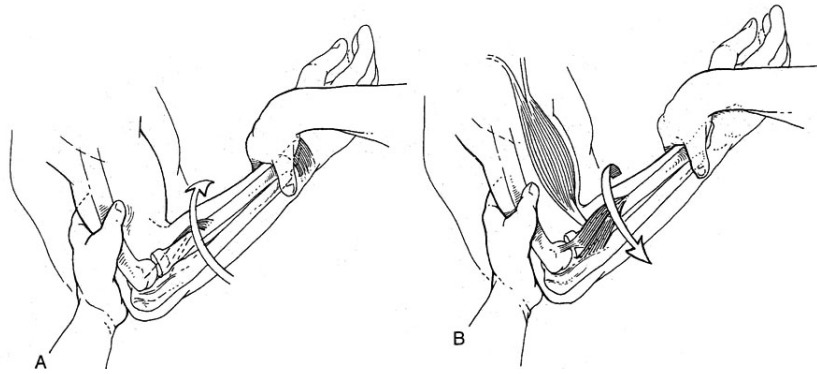


Fig. 8.

- * dominant extremity: 5~10% stronger than nondominant side
- * females: 50% of males

• Neurological Examination

1) Reflex

- biceps reflex: C5
- brachioradialis reflex: C6
- triceps reflex: C7

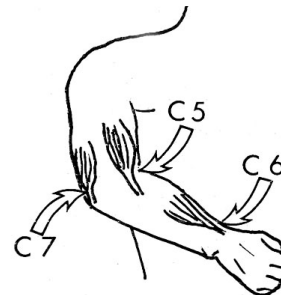


Fig. 9.

2) Cutaneous distribution

SPECIAL TESTS

Tests for lateral epicondylitis

1) Cozen's test

: The patient's elbow is stabilized by the examiner's thumb, which rests on the patient's lateral epicondyle. The patient is then asked to make a fist, pronate the forearm, and radially deviated and extend the wrist while the examiner resists the motion.

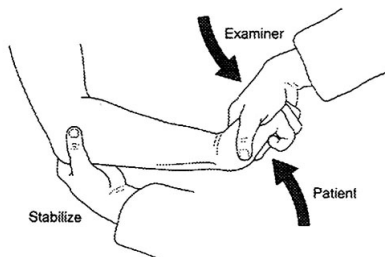


Fig. 10.

2) Mill's test

: While palpating the lateral epicondyle, the examiner passively pronates the patient's forearm, flexes the wrist fully, and extends the elbow.

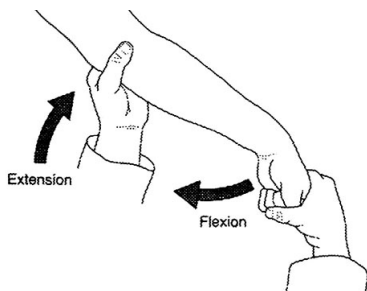


Fig. 11.

3) Maudsley's test

: The examiner resists extension of the third digit of the hand distal to the proximal interphalangeal joint, stressing the extensor digitorum muscle.

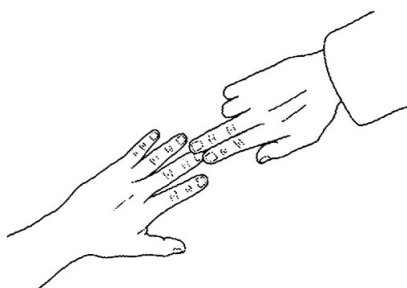


Fig. 12.

Tests for medial epicondylitis

: While the examiner palpates the patient's medial epicondyle, the patient's forearm is passively supinated and the elbow and wrist are extended by the examiner.

Tests for cubital tunnel syndrome

1) Tinel's sign

: The area of the ulnar nerve in the groove is tapped. A positive sign is indicated by a tingling sensation in the ulnar distribution of the forearm and hand distal to the point of compression of the nerve.

2) Elbow flexion test

: The patient is asked to fully flex the elbow with extension of the wrist and shoulder girdle

abduction and depression and to hold this position for 3 to 5 minutes. A positive test is indicated by tingling sensation or paresthesia in the ulnar nerve distribution of the forearm and hand.

Tests for pronator teres syndrome

: The patient sits with the elbow flexed to 90°. The examiner strongly resists pronation as the elbow is extended. A positive test is indicated by tingling or paresthesia in the median nerve distribution in the forearm and hand.

Tests for anterior interosseous nerve syndrome

1) Pinch grip test

: The patient is asked to pinch the tips of the index finger and thumb together.

- normal: tip to tip pinch
- AIN entrapment: pulp to pulp pinch

Tests for valgus instability

1) Jobe test

: is evaluated with the humerus in full external rotation while a valgus stress is applied to the slightly flexed joint

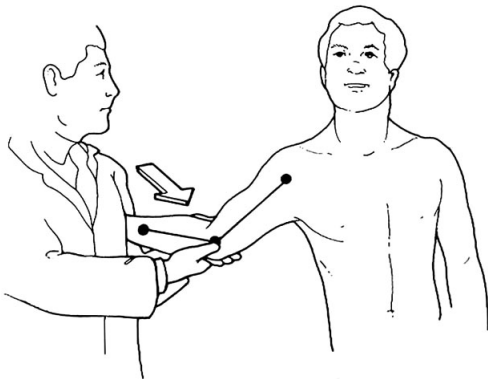


Fig. 13.

Tests for varus instability

: is evaluated with the humerus in full internal rotation and a varus stress applied to the slightly flexed joint

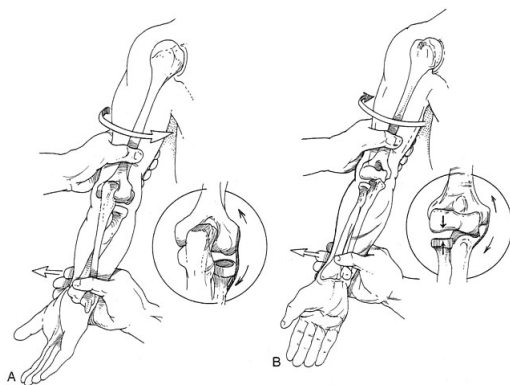


Fig. 14.

Tests for posterolateral rotatory instability

1) Lateral pivot shift test

- A mild supination force is applied to the forearm at the wrist.
- The patient's elbow is then flexed while a valgus stress and compression is applied to the elbow.
- If the examiner continues flexing the elbow at about 40~70°, there is sudden reduction of the joint.

2) Active apprehension test

- (1) Test using the arms to rise from a chair
- (2) Push-up test
: forearm supination + valgus stress + axial loading

REFERENCES

1. Buehler MJ, Thayer DT. The elbow flexion test. A clinical test for the cubital tunnel syndrome. Clin Orthop Relat Res. 1988;233:213-216.
2. Chumbley EM, O' Connor FG, Nirschl RP. Evaluation of overuse elbow injuries. Am Fam Physician. 2000;61:691-700.
3. Colman WW, Strauch RJ. Physical examination of the elbow. Orthop Clin North Am. 1999;30:15-20.
4. Jobe FW, Stark H, Lombardo SJ. Reconstruction of the ulnar collateral ligament in athletes. J Bone Joint Surg Am. 1986;68:1158-1163.
5. Kraushaar BS, Nirschl RP. Tendinosis of the elbow (tennis elbow). Clinical features and findings of histological, immunohistochemical, and electron microscopy studies. J Bone Joint Surg Am. 1999;81:259-278.
6. Magee DJ. Orthopedic physical assessment. 4th ed. Philadelphia, WB Saunders, 2002. Morrey BF. Complex instability of the elbow. Instr Course Lect. 1998;47:157-164.
7. O' Driscoll SW, Bell DF, Morrey BF. Posterolateral rotatory instability of the elbow. J Bone Joint Surg Am. 1991;73:440-446.

8. O' Driscoll SW, Horii E, Carmichael SW, Morrey BF. The cubital tunnel and ulnar neuropathy. *J Bone Joint Surg Br.* 1991;73:613-617.
9. O' Driscoll SW. Classification and evaluation of recurrent instability of the elbow. *Clin Orthop Relat Res.* 2000;370:34-43.
10. Regan WD and Morrey BF. Physical examination of the elbow. In: Morrey BF ed. *The elbow and its disorders.* 3rd ed. Philadelphia, WB Saunders: 61-73, 2000.