Faculty of Health

Elbow pain – but I don't play tennis or golf

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Overview

Elbow Pain – but I don't play tennis or golf!

Assessment and management of elbow pain

- Functional anatomy of the elbow
- Common elbow injuries
- Assessment of the elbow
- Soft tissue management of the elbow
- Exercises and stretches to complement soft tissue treatments
- The research

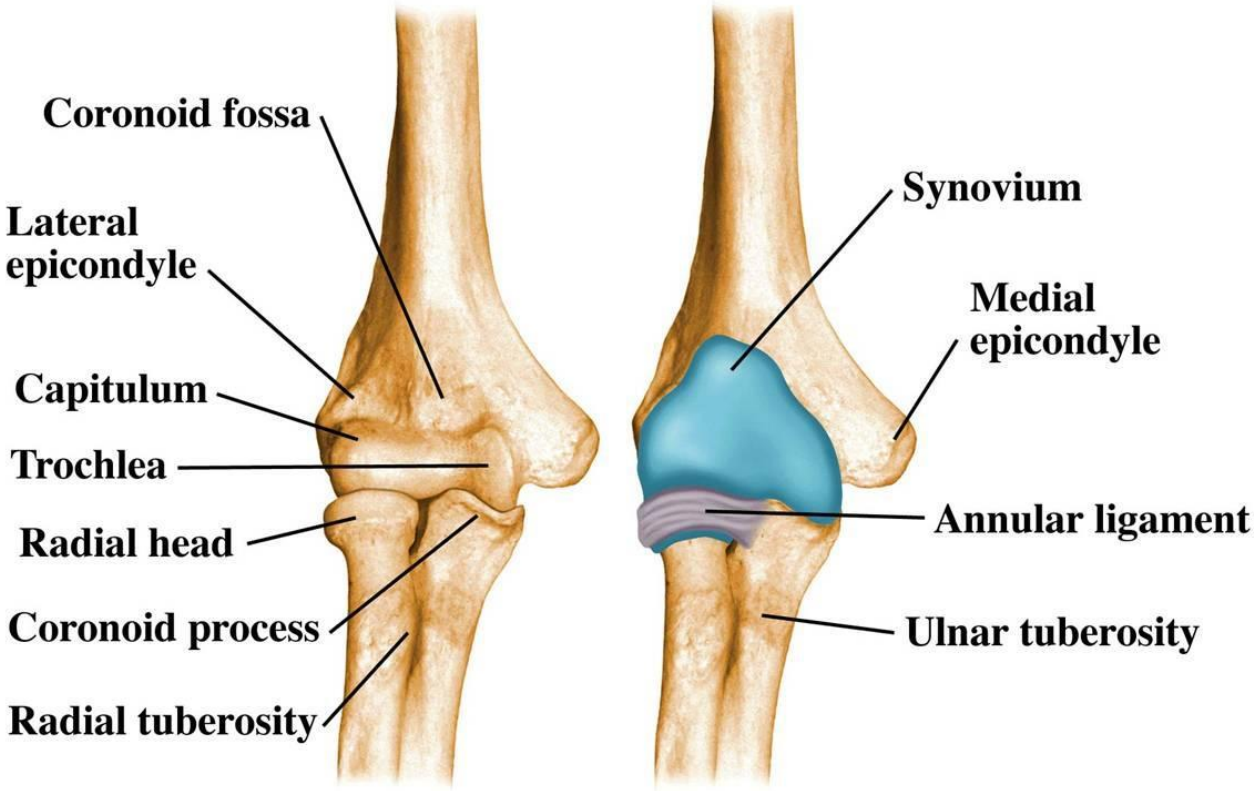
Elbow pain – but I don’t play tennis or golf

Functional Anatomy of the Elbow

Anatomy

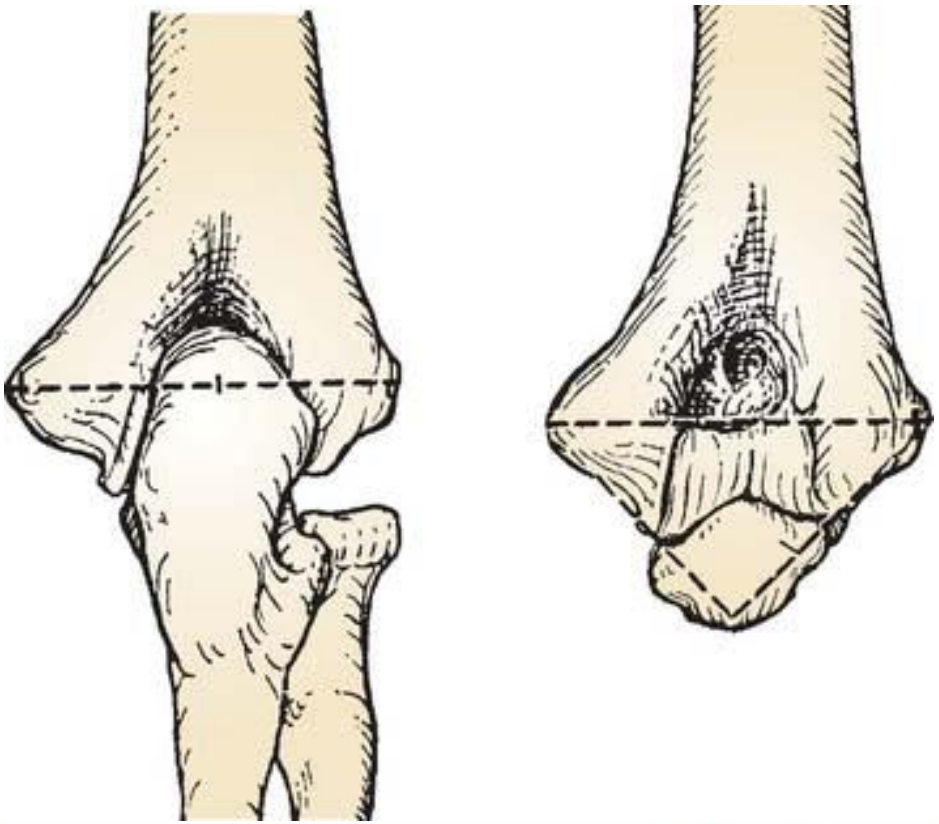
2 joints
- Humero-ulna
- Proximal Radio-ulna

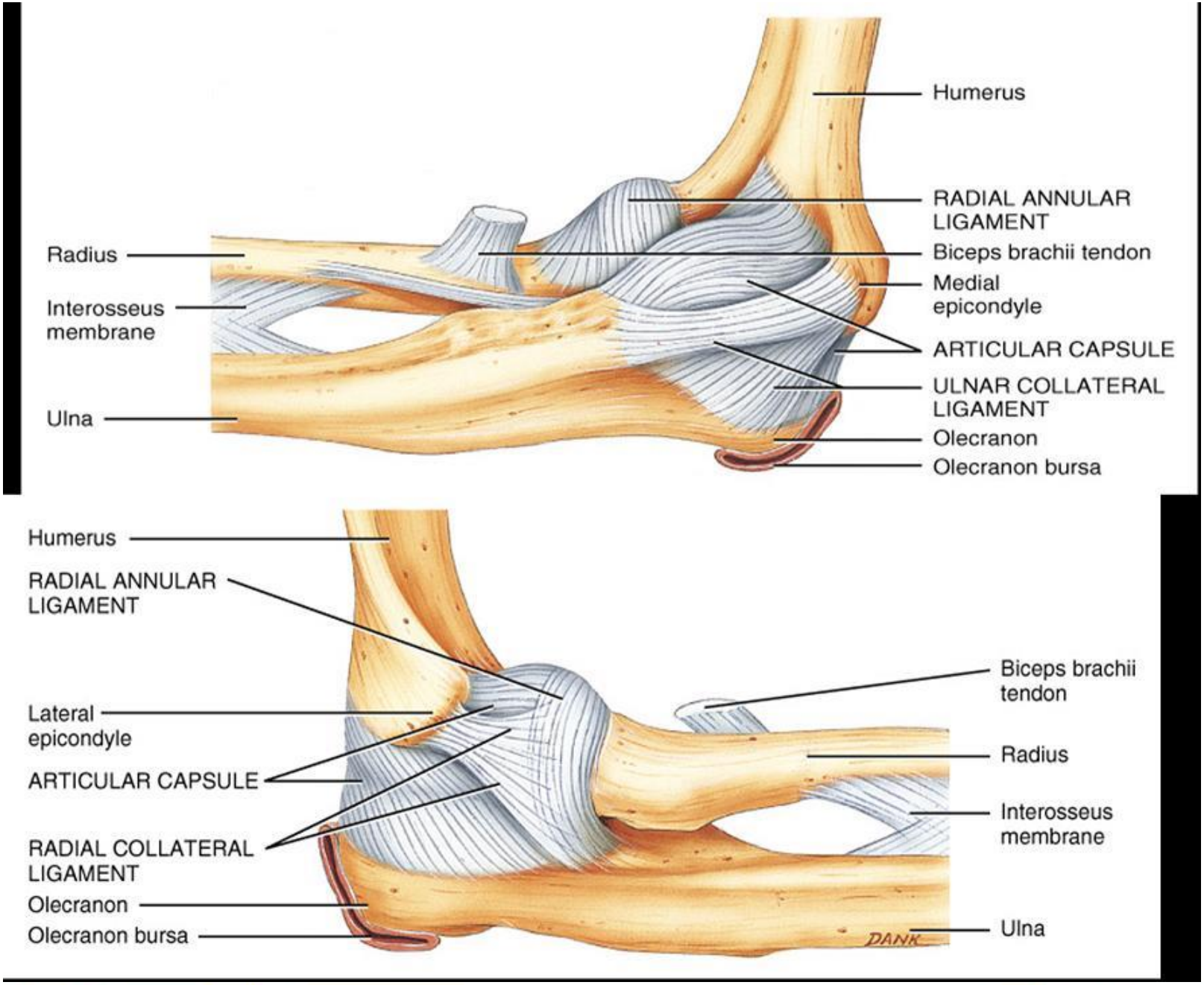
Surface markings
- Medial epicondyle
- Olecranon
- Lateral epicondyle
- Ulna nerve



Anatomy

In extension all 3 lie in a horizontal line
In flexion forms an equilateral triangle
In dislocation / fracture landmarks are disturbed




Humerus
RADIAL ANNULAR LIGAMENT
Biceps brachii tendon
Medial epicondyle
ARTICULAR CAPSULE
ULNAR COLLATERAL LIGAMENT
Olecranon
Olecranon bursa
Radius
Interosseus membrane
Ulna
Humerus
RADIAL ANNULAR LIGAMENT
Lateral epicondyle
ARTICULAR CAPSULE
RADIAL COLLATERAL LIGAMENT
Olecranon
Olecranon bursa
Biceps brachii tendon
Radius
Interosseus membrane
Ulna
DANK

Muscles of the upper arm

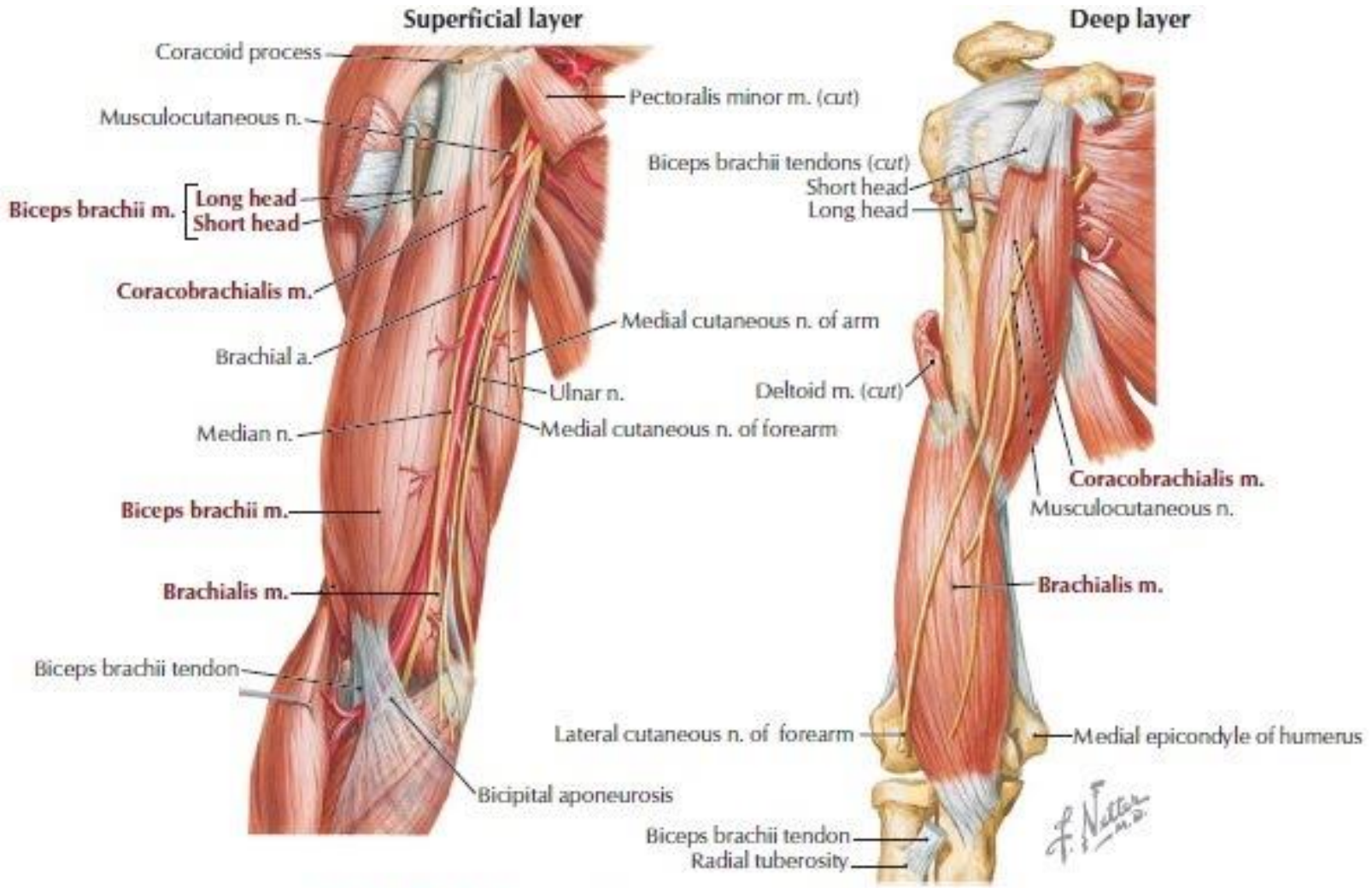
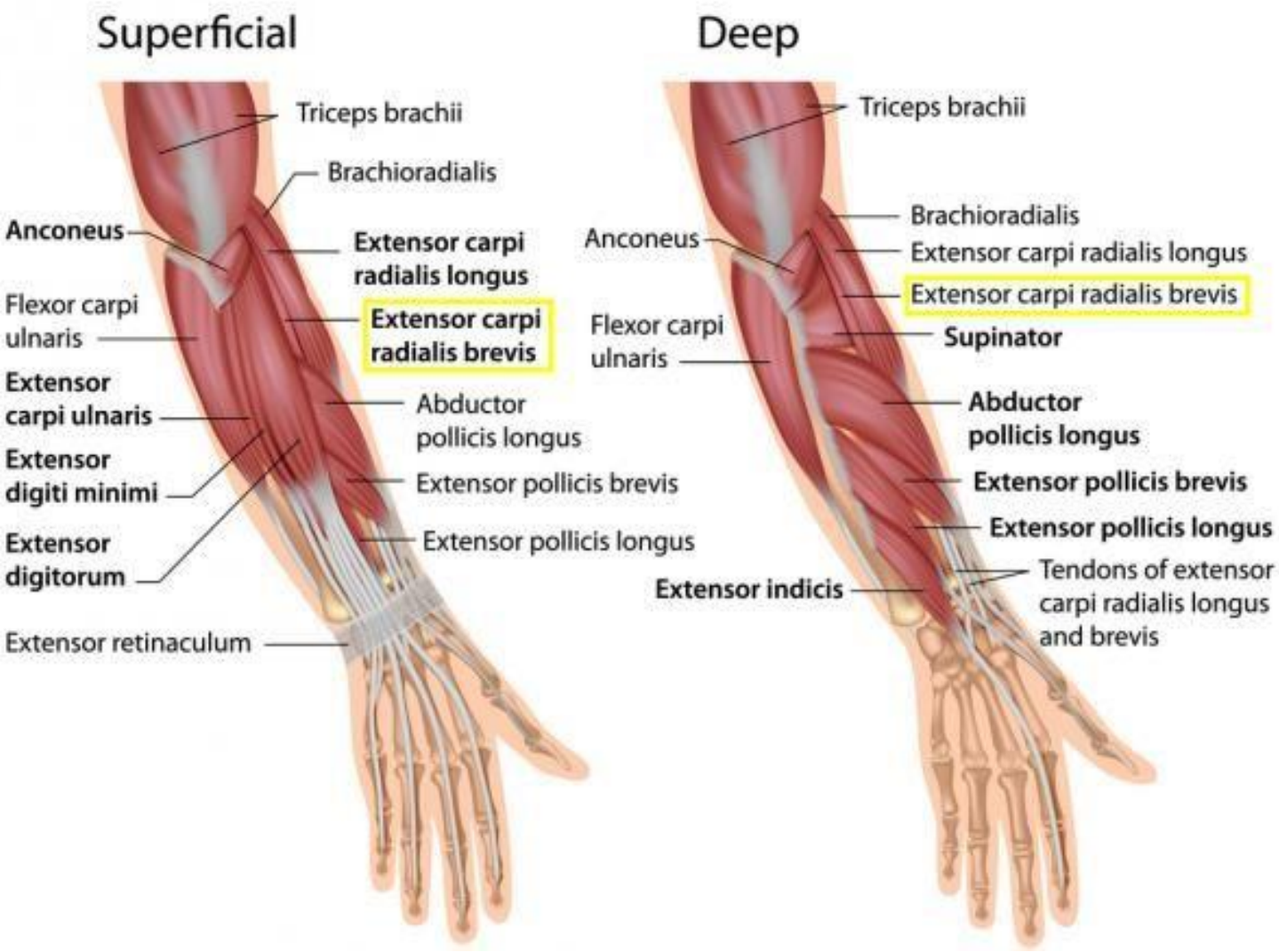


FIGURE 7-12 Anterior Compartment Arm Muscles and Nerves

Muscles of the forearm



Elbow pain – but I don’t play tennis or golf

Common Elbow Injuries

Fractures around Elbow

Common in children in falls from gymnastic / playground equipment, or in riding & cycling falls

Supra-condylar

Most common # in this area

Mechanism

Falling on an outstretched hand

Signs & Symptoms

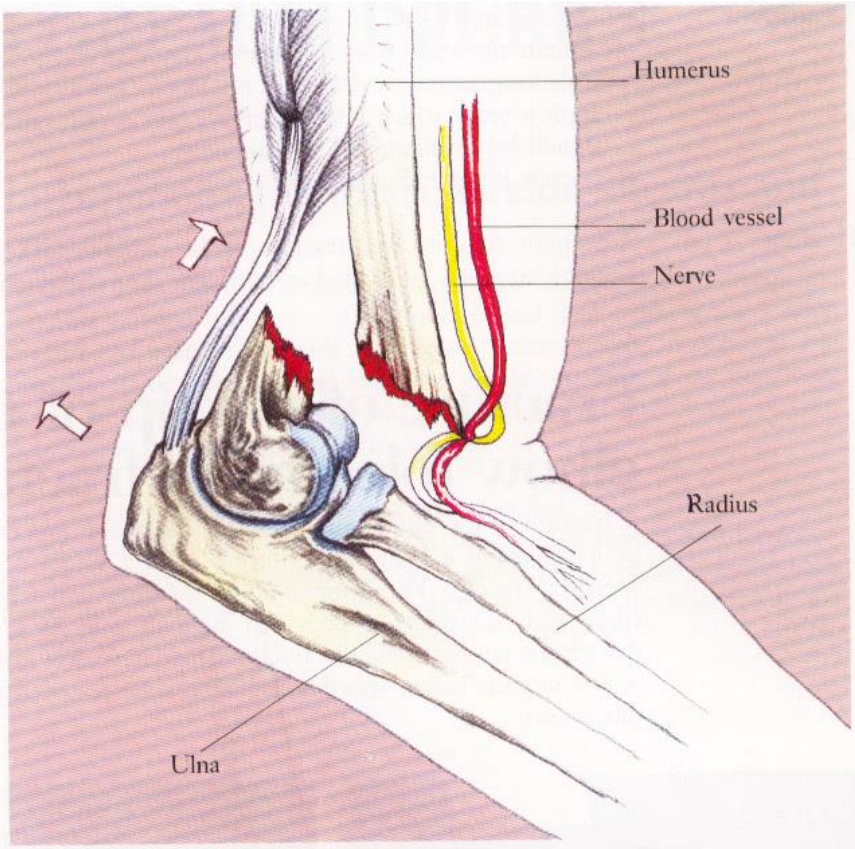
Intense pain

Unwilling to move arm

Rapid swelling & bruising

Deformity

Supracondylar fracture



Fracture of the lower end of the humerus. Fractured bone fragments may press against and possibly damage blood vessels and nerves.

Fracture dislocation

Fig.65 Lateral view of the elbow of a 10-year-old gymnast injured whilst trampolining. Note the grossly displaced supracondylar fracture.

Fracture - treatment

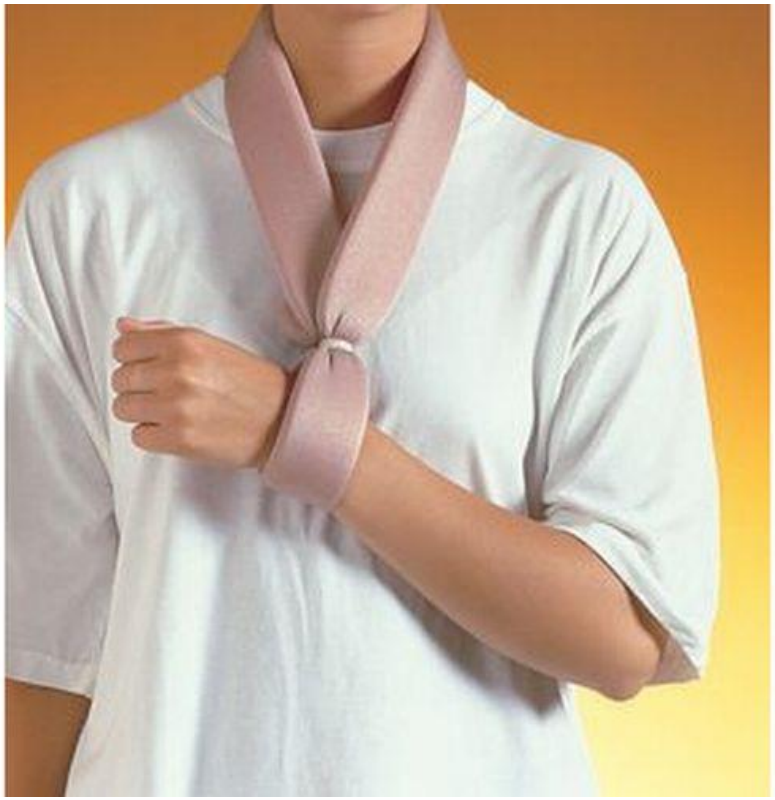
Sling

Check pulse & sensation below # (nerve & blood vessel damage)

Medical advice and X-ray

Reduced under anaesthetic

Collar & cuff immobilisation



Fractured Head of Radius

Mechanism

Fall on an outstretched hand

Signs & Symptoms

Pain

Pronation &/or supination very painful

* Ability to flex and extend elbow

Tenderness over site

Treatment

Ice and splint

Plaster

If alignment not good

- decreased range of motion on supination and pronation

Olecranon

Mechanism

Direct blow to olecranon process of ulna

Fall on flexed elbow

Signs & Symptoms:-

Swelling & tenderness over elbow

Cannot straighten elbow

Treatment

Usually surgically pinned due to triceps action to pull fragment away

Olecranon fracture

Fig.66 Bruising around the extensor aspect of the elbow in this tennis player has been produced by the bleeding which has occurred secondary to a fracture of the olecranon.

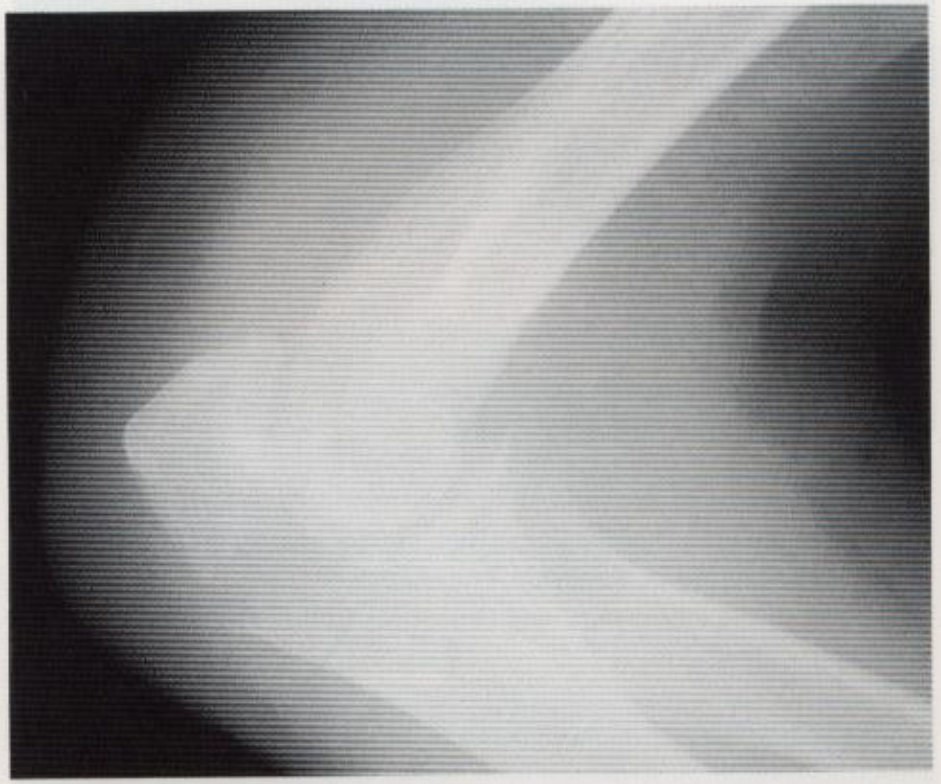
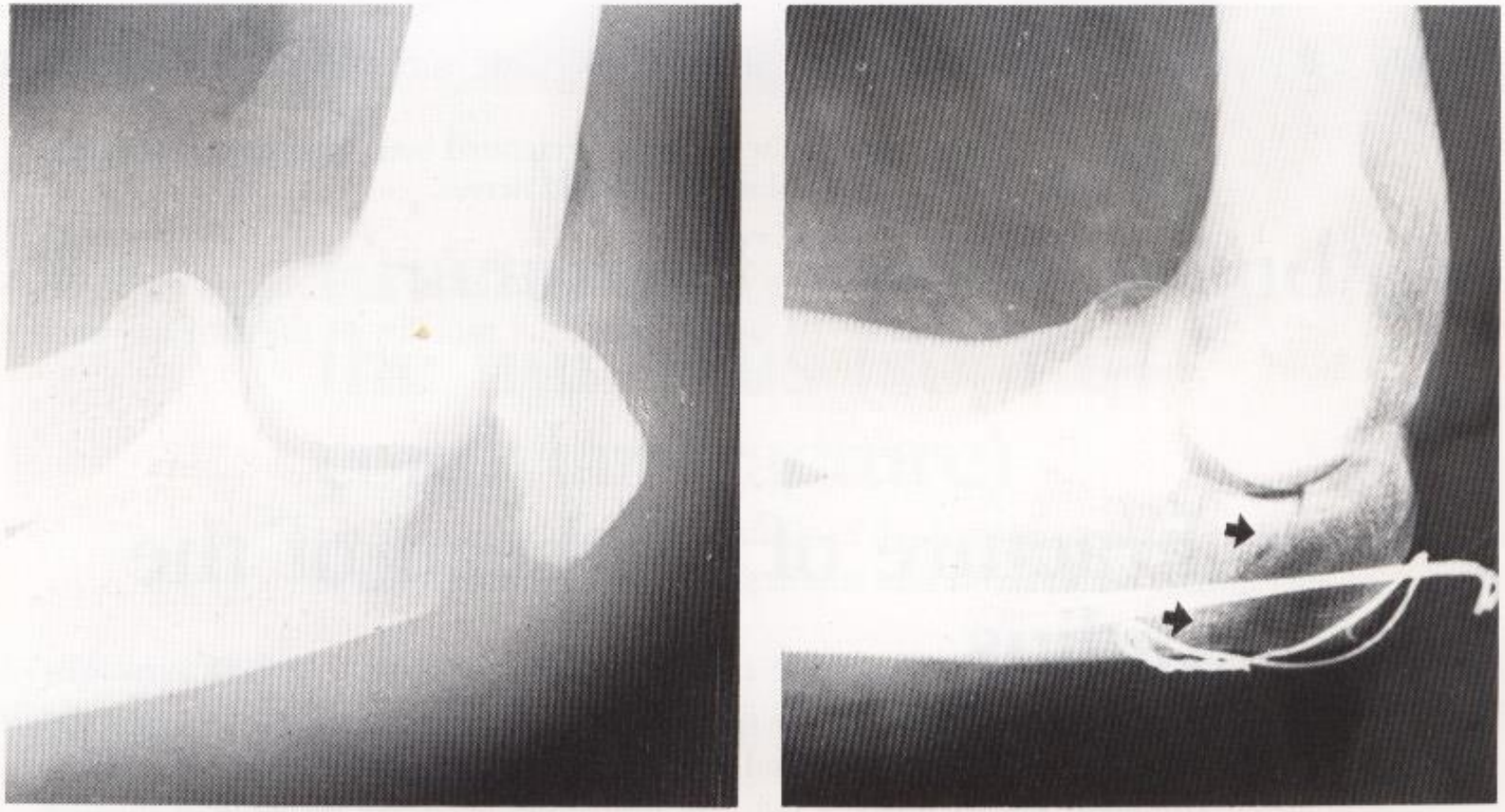


Fig.67 Lateral view of the X-ray of the elbow illustrated in Fig.66. The fractured olecranon is clearly demonstrated.

Surgical fixation



X-rays of fractures to the tip of the elbow. In the right-hand picture the displaced fragment has been fixed with a pin and steel wire (cerclage).

Elbow Dislocation

Mainly in contact sports eg. football, squash, skiing, cyclists, wrestling, weight- lifters.

Mechanism

Falling on an outstretched hand with elbow bent

Hyperextension of the elbow

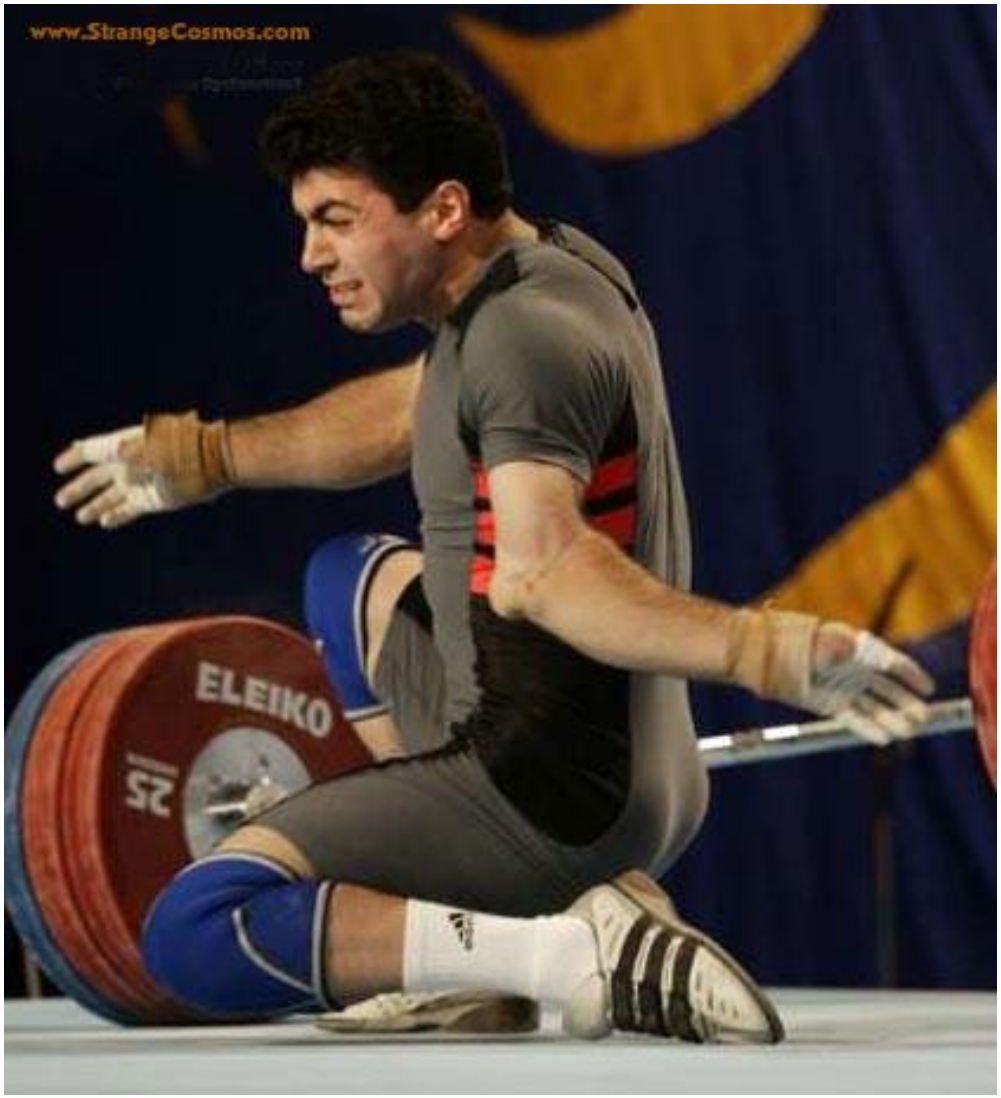
Common site

- Radius and Ulna forced posteriorly

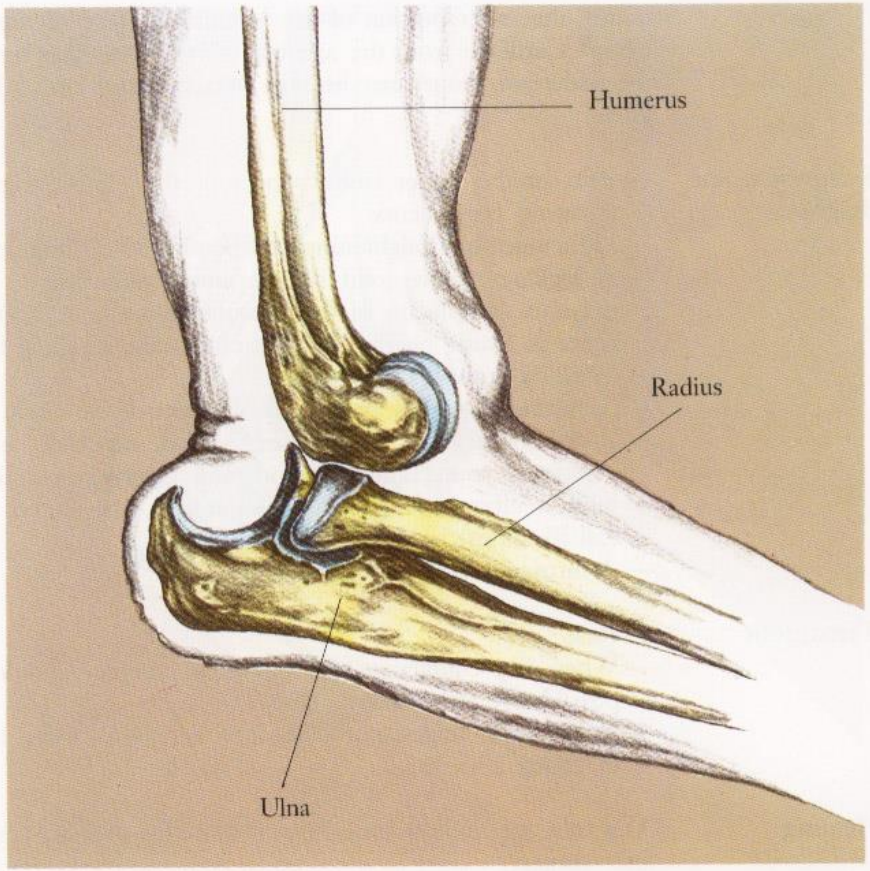
Elbow dislocation

Signs & Symptoms

Intense pain
Swelling
Limited mobility
Deformity
- olecranon prominent posteriorly



Elbow dislocation



Dislocation of the elbow joint.

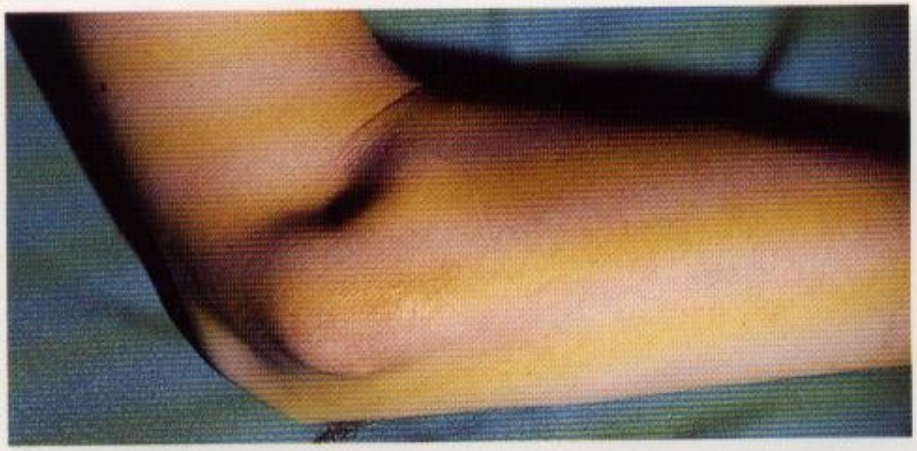
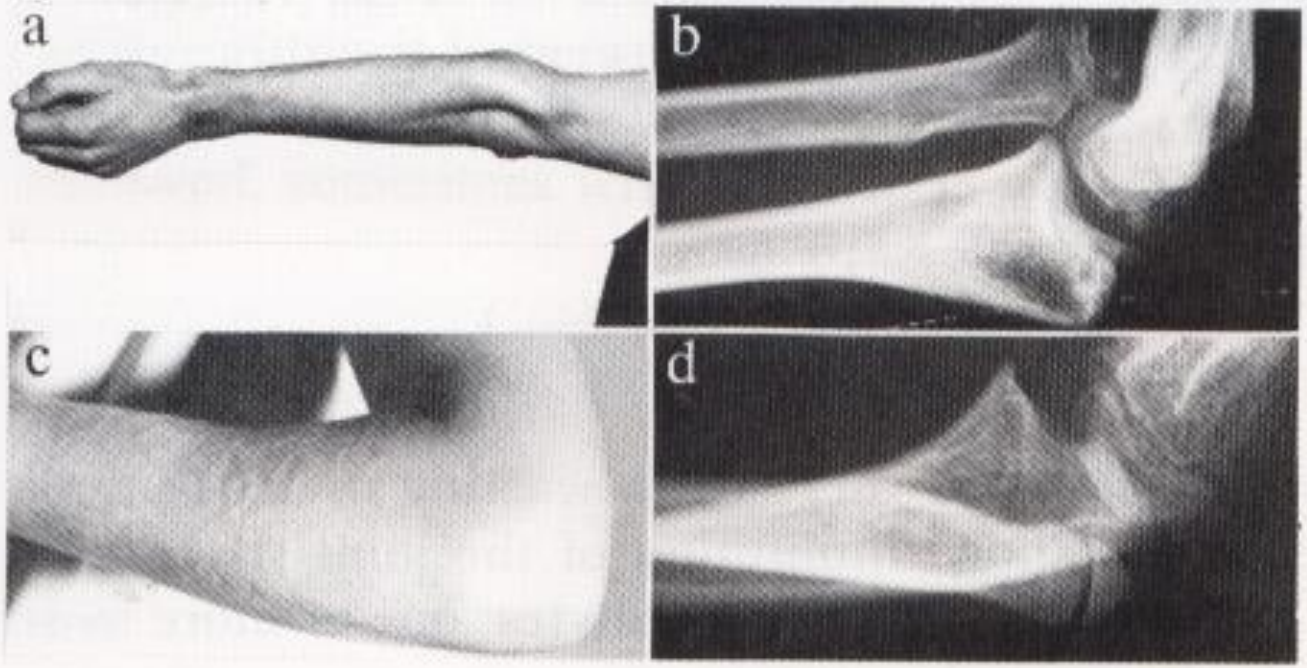


Fig.69 Close-up of the characteristic appearance of a dislocation of the elbow. Reduction should only be undertaken under adequate anaesthesia/analgesia. Recovery is normally complete, although extension of the elbow may take some time to return to normal.

Head of radius dislocation



14.5 Dislocated head of radius (a, b) Anterior dislocation, from an old Monteggia fracture; (c, d) posterior dislocation – the radial head is dome-shaped, suggesting that the dislocation was congenital.

Complications

Problems with ligaments healing
- takes a long time

Injuries to blood vessels and nerves

May become recurrent if treatment is inadequate

Accompanying #

Myositis Ossificans
- calcification of soft tissue around elbow

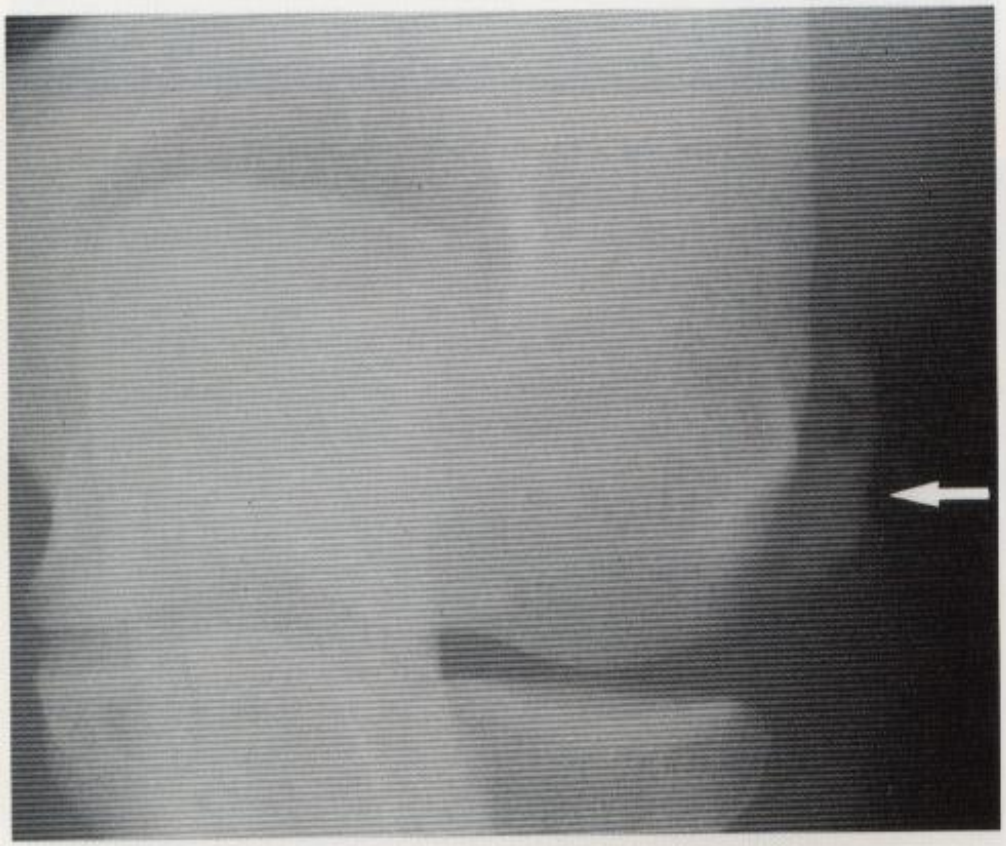


Fig.70 Heterotopic calcification around the joint is a complication of a dislocation of the elbow and indeed of other elbow injuries. It is demonstrated in this view of the elbow of a 26-year-old rugby player who dislocated the elbow whilst making a tackle with his arm extended. Note the small, calcified mass adjacent to the lateral epicondyle which has developed in the two months following the dislocation. The concern often expressed about this uncommon condition is misplaced, since, unless it is severe, it is normally asymptomatic.

Overuse Injuries to the Elbow

Common Injury Sites - Medial and Lateral Epicondyles

More commonly known as :-

"Pitcher's Elbow" "Little League Elbow"

"Tennis Elbow" "Golfer's Elbow“

These types of injury occur in golf, baseball, racquet sports, rowing, weightlifting, wrestling.

Causes

- Unaccustomed use (Sports, ADLs, tools)
- Improper technique
- Improper or unsuitable equipment
  - eg. tennis racquet
    - grip too large
    - strings too tight
- Lack of strength in forearm muscles
- Lack of flexibility in wrist and elbow

Medial Epicondylitis

- **Pitcher's, Golfer's elbow**

Mechanism

Results from overload causing excessive stress on medial side

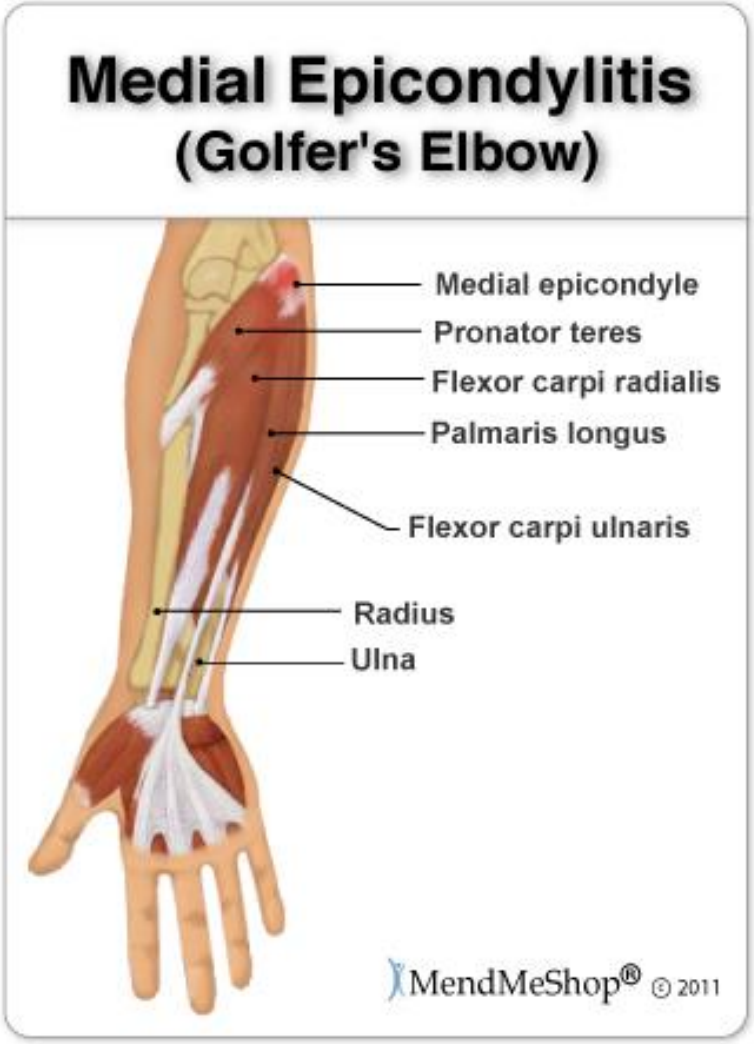
Medial Epicondylitis

Caused by strain of origin of medial wrist flexor muscle group

Tenderness over medial epicondyle

"Little League Elbow"
- last epiphysis of elbow to fuse therefore the weakest

Flexor carpi ulnaris
Flexor carpi radialis
Pronator teres
Palmaris longus



Avulsion

Caused by excessive force of contraction of flexors

Possible also to have medial pain from playing tennis

- less common
- mostly in expert players cutting / slicing ball esp. on serve

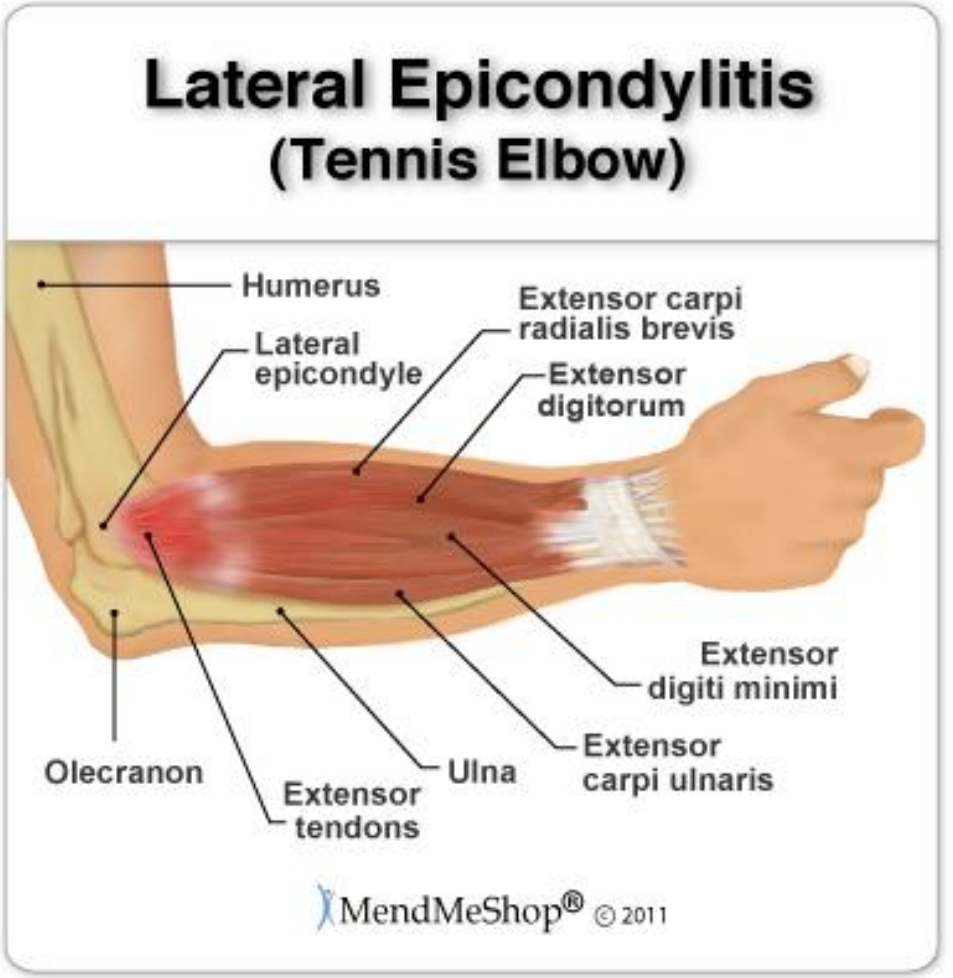
Fig.64 AP view of the elbow of an 11-year-old baseball pitcher. Note the fragmentation around the medial epiphysis (arrowed). This is the so-called Little League elbow.

Lateral Epicondylitis

Small site of origin for extensor muscle group

- extensor carpi radialis brevis
- extensor carpi radialis longus
- extensor digitorum longus
- extensor carpi ulnaris

Large load per unit area
"tennis elbow"



Lateral Epicondylitis

Mechanism

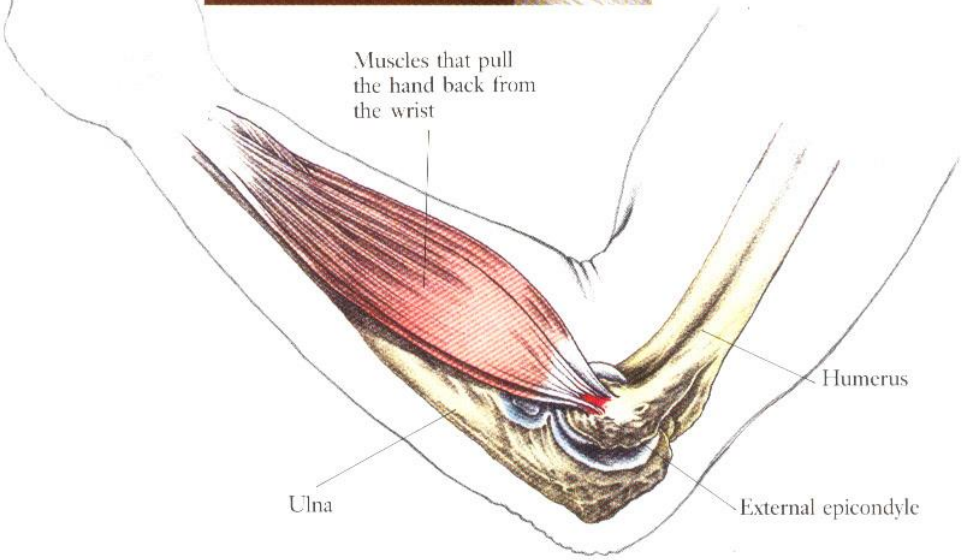
- Poor technique esp. backhand
- Off centre ball contact
- Activities of daily living – gripping, hammer

Signs & Symptoms

- Pain on lateral side of elbow
- Weakness in wrist
- Point tenderness on lateral epicondyle
- Pain when attempting resisted wrist extension

Treatment

Tennis elbow. **Left:** examples of protective devices that prevent and treat the injury.



RICER

Avoid painful tennis shots

Sub-acute - apply heat

Forearm brace - dissipates forces before they reach the epicondyle

Activities That Cause Pain and Symptoms

- Forced and repetitive gripping an object (hammer,tennis racket, pen / pencil)
- Repetitive bending and straightening of the elbow
- Playing an instrument with a bow, piano (orchestra)
- Golfing
- Typing
- Tennis
- Writer's Cramp – writing or gripping other small instruments.
- Knitting and crocheting, sewing
- Twisting motions such as using a screwdriver or twisting a doorknob.

Prevention

Correct playing technique

Forearm brace

Correct racquet size (per person)

Tight strings - impact forces

Gut strings better than nylon (vibrations)

Larger headed racquets (larger "sweet" spot)

Progressive resistance exercise program

Progress gradually with unfamiliar skills or activities

Grip Measurements

General Rule

Measure the distance between midline of palm and tip of middle finger

= size of grip circumference

Type of grip	Type of shot used for…
Continental	Serves, volleys, overheads, slices, and defensive shot
Eastern Forehand	Learning how to hit a forehand
Semi-Western Forehand	Forehand
Western Forehand	Forehand
Eastern Backhand	Backhands, Kickserve
Extreme Eastern/Semi-Western Backhand	Backhand
Two-Handed Backhand	Backhand

Grips

Activities require different grips and therefore different combinations of muscles become strained

Power Grips

Cylindrical Grip

Spherical Grip

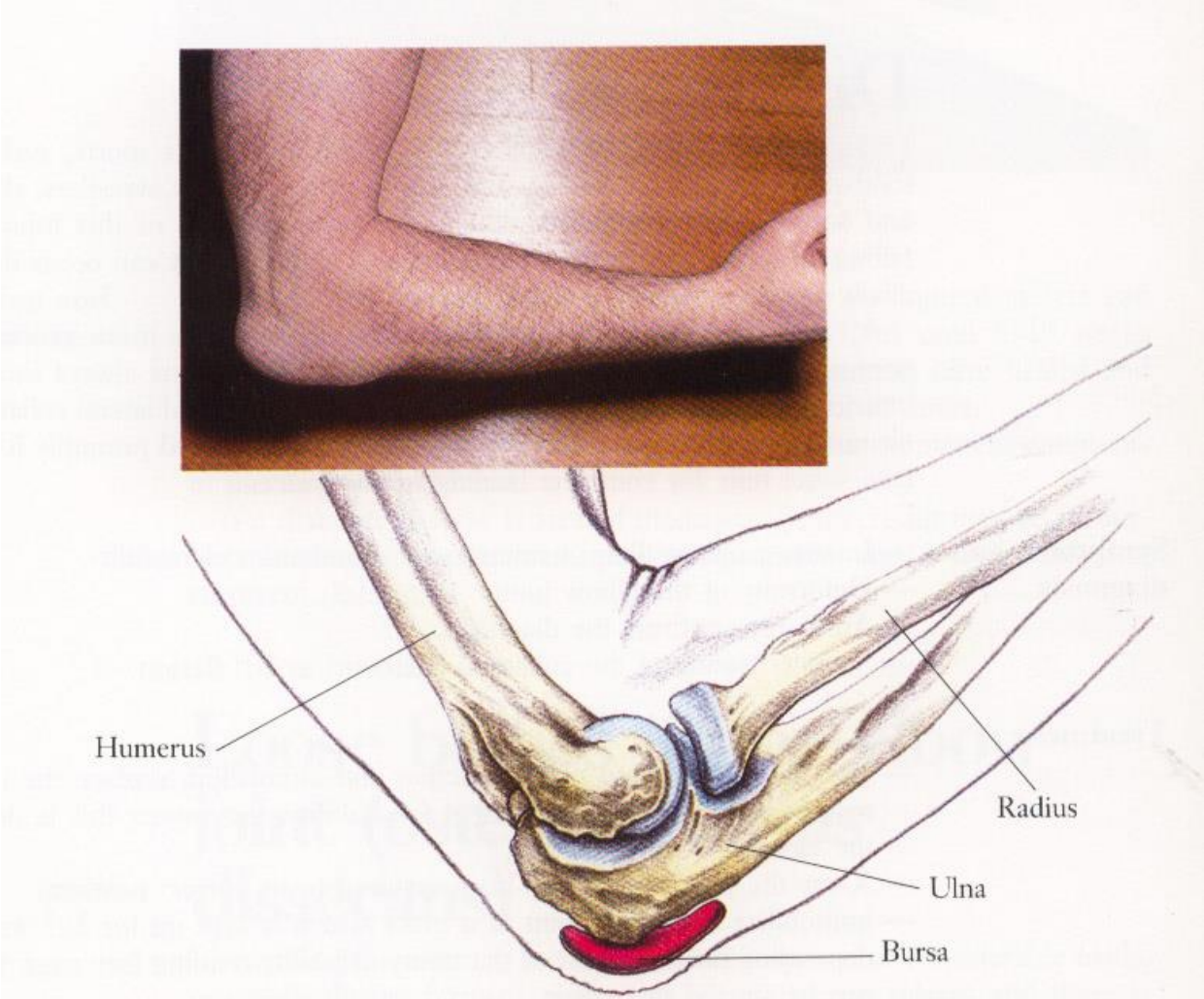
Hook Grip

Lateral Prehension

Precision Grips

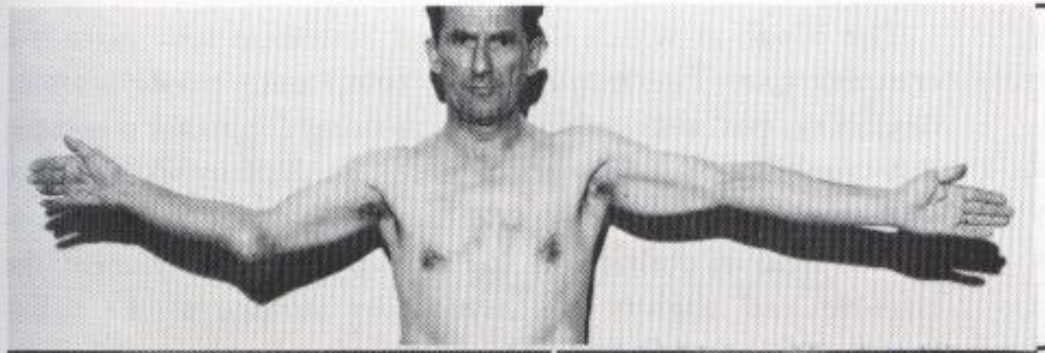
Pinch Grip

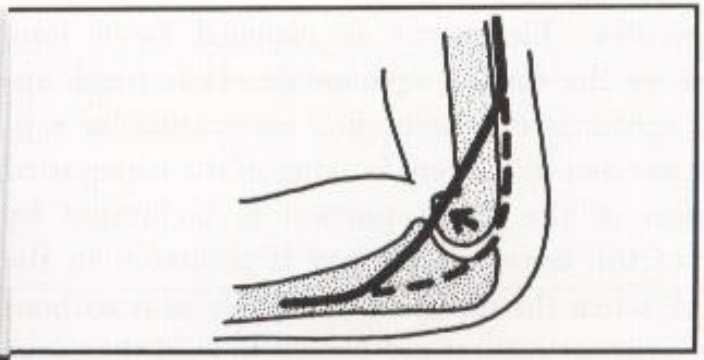
Olecranon Bursitis

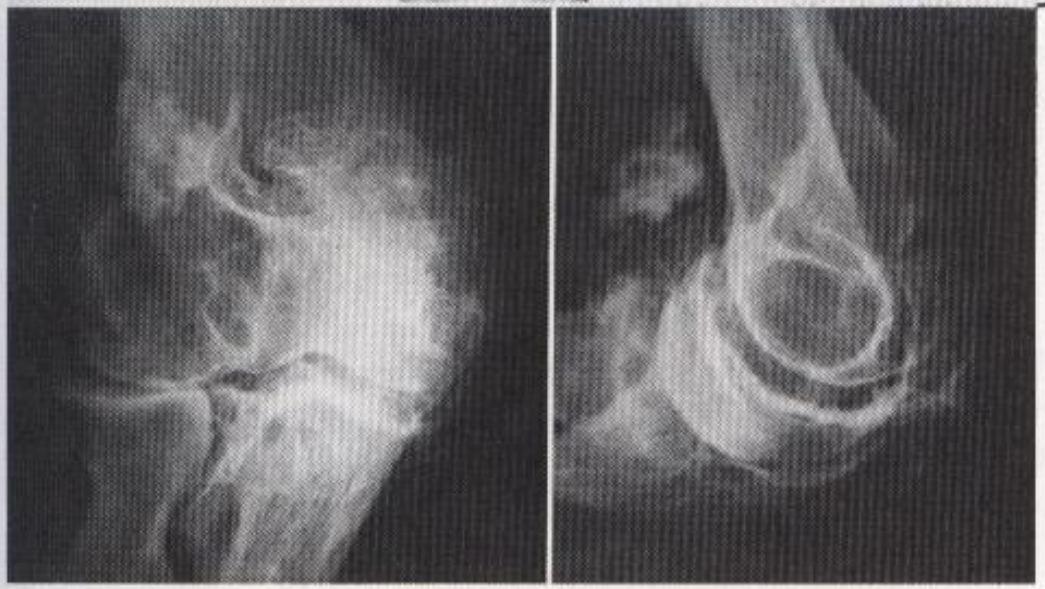


Inflammation of the bursa at the tip of the elbow, 'student's elbow'.

Loose Bodies







14.10 Loose bodies This patient had osteoarthritis and loose bodies in the elbow; the associated ulnar palsy was treated by transposing the nerve (diagram).

Loose bodies / degenerative changes

Fig.72 Lateral view of the elbow of a 41-year-old ex-javelin thrower. Note the extensive degenerative changes, with numerous loose bodies.

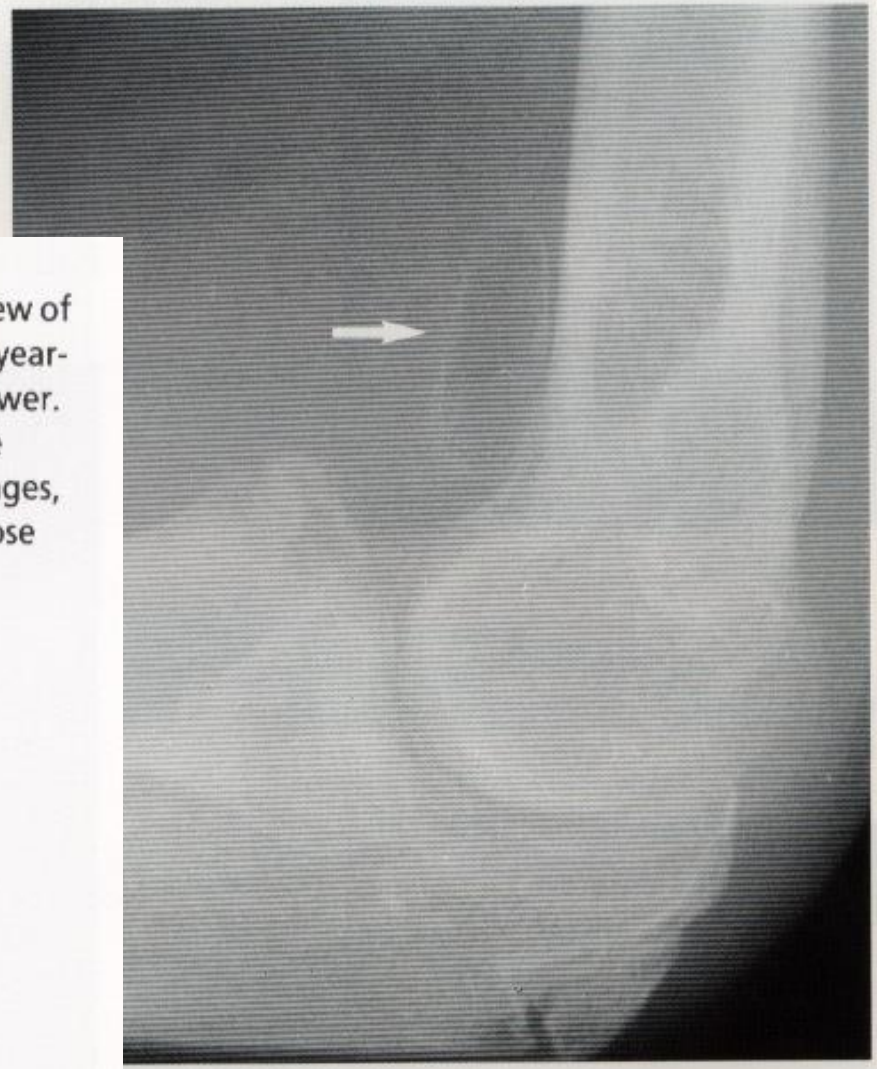
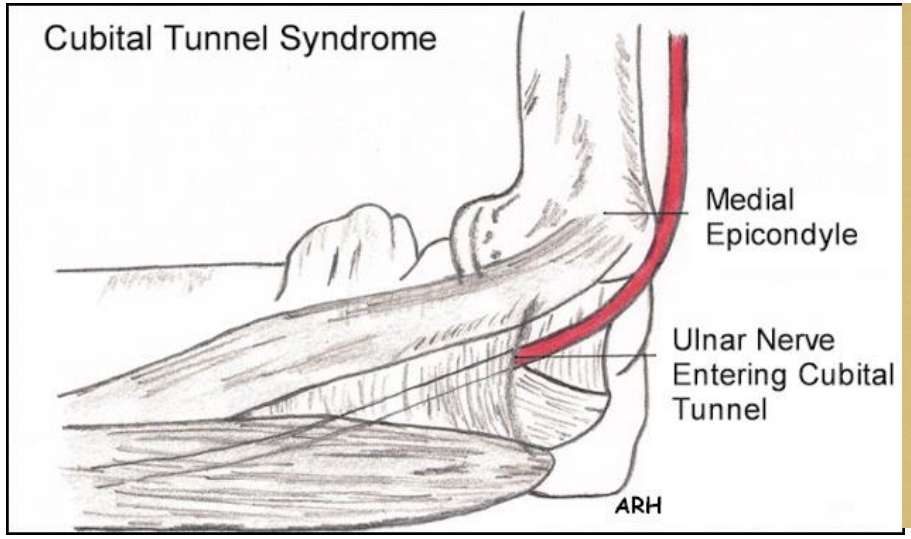


Fig.71 Lateral view of the elbow of a 13-year-old tennis player with a large loose body (arrowed) in the joint. This was secondary to an osteochondritis of the radial head and was later removed at operation.

Cubital Tunnel Syndrome

- also known as ulnar neuropathy
- is caused by increased pressure on the ulnar nerve, which passes close to the skin's surface in the area of the elbow commonly known as the "funny bone."



Elbow pain – but I don’t play tennis or golf

Assessment of the Elbow

ELBOW ASSESSMENT

SUBJECTIVE

OBJECTIVE

Observation

Shoulder position
Carrying angle - cubitus valgus
- cubitus varus
Swelling - olecranon bursa
Scars

ELBOW ASSESSMENT

Bony Palpation

- Medial epicondyle
- Medial supracondylar line of the humerus
- Olecranon
- Ulnar border
- Olecranon fossa
- Lateral epicondyle
- Lateral supracondylar line of the humerus
- Radial head

Soft Tissue Palpation

Medial aspect

- Ulnar nerve
- Wrist flexor / pronator group
  - Pronator teres
  - Palmaris longus
  - Flexor carpi radialis
  - Flexor carpi ulnaris
- Medial collateral ligament
- Supracondylar lymph nodes

Posterior aspect

- Olecranon bursa
- Triceps muscle
  - Long head
  - Lateral head
  - Medial head

Soft Tissue Palpation

Lateral aspect

- Wrist extensors
  - Brachioradialis
  - Extensor carpi radialis longus
  - Extensor carpi radialis brevis
- Lateral collateral ligament
- Annular ligament

Anterior aspect Cubital fossa Biceps tendon
Brachial artery Median nerve
(Musculocutaneous nerve)

ELBOW ASSESSMENT

RANGE of MOTION TESTS

Two joints involved at the elbow

i. humero-ulnar joint
   - elbow flexion / elbow extension

ii. proximal radio-ulnar joint
   - forearm supination / forearm pronation

ELBOW ASSESSMENT

Active Range of Motion

Elbow Flexion	135° +
Elbow Extension	0° / -5°
Forearm Supination	90° (from neutral)
Forearm Pronation	90° (from neutral)

Resisted Range of Motion

Flexion Extension
Supination Pronation

Passive Range of Motion

Flexion / Extension
Supination / Pronation

ELBOW ASSESSMENT

NEUROLOGICAL TESTING

Manual Muscle Testing

Flexion	-	Brachialis	
	-	Biceps	(Brachioradialis, supinator)
Extension	-	Triceps	(Anconeus)
Supination	-	Biceps	
	-	Supinator	(Brachioradialis)
Pronation	-	Pronator teres	
	-	Pronator quadratus	(Flexor carpi radialis)

Reflex Testing Biceps reflex
Triceps reflex
Brachioradialis reflex

Sensation Testing

SPECIAL TESTS

Collateral Ligament Tests

- Valgus Stress Test - medial collateral ligament
- Varus Stress Test - lateral collateral ligament

Tennis Elbow Test

Golfer's Elbow Test

Tinel Sign (ulnar nerve)

EXAMINATION of RELATED AREAS

- Thoracic outlet syndrome
- Cervical spine

Tennis Elbow Tests

Test for Lateral epicondylitis

- Resist wrist extension
- Resist extension of the 3rd digit
  This causes stress to the extensor digitorum muscle and tendon.

A positive sign would be pain or discomfort in the region of the lateral epicondyle

Mills Test – passive pronation and wrist flexion

Konin JG, Wiksten DL, Isear Jr. JA, Brader H. *Special Test for Orthopedic Examination* 3rd ed. Thorofare, NJ: SLACK incorporated; 2006.

Magee DJ. *Orthopedic Physical Assessment.* 5th ed. St. Louis, MO: Saunders Elsevier; 2008

Golfer's Elbow tests

Cozen's Test

- Resisted wrist flexion (elbow bent / straight arm)

Golfer's elbow test

- Fingers flexed into fist
- Passively extend wrist and elbow and supinate forearm

Cook CE, Hegedus EJ. *Orthopedic Physical Examination Tests: An Evidence-Based Approach*. Magee DJ. *Orthopedic Physical Assessment.* 5th ed. St. Louis, MO: Saunders Elsevier; 2008.

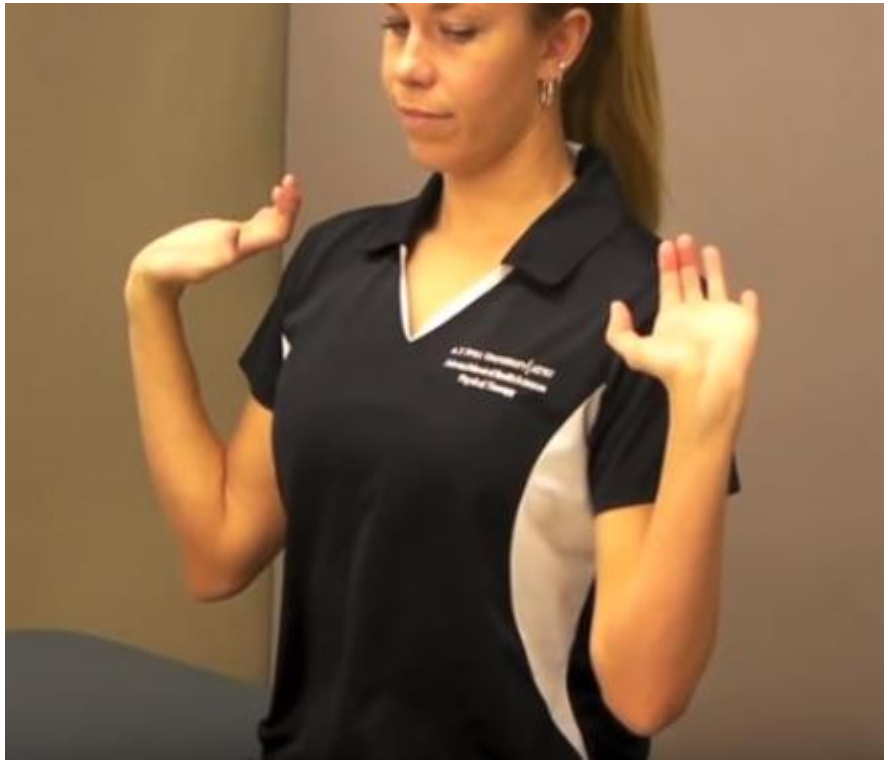
Nerve Tests

Cubital tunnel test

- Elbow flexion test

Tinel's sign

- Ulnar nerve sensitivity test



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Soft Tissue Management of the Elbow

Massage & Exercises for Elbow

Stretch & Massage & Strengthen

Extensor Carpi Radialis Brevis

Extensor Carpi Radialis Longus

Extensor Digitorum

Supinator

Flexor carpi ulnaris

Flexor carpi radialis

Palmaris longus

Pronator teres

Stretch & Massage

Biceps Brachii

Triceps brachii

Brachialis

Coracobrachialis

Brachiaradialis

Forearm flexors and extensors and intrinsic hand muacles

Massage Treatment - supine

Effleurage / Petrissage / Deep Tissue Techniques

- Upper arm – deltoid, biceps and triceps (brachialis, coracobrachialis, brachioradialis)
- Forearm – wrist and finger extensors and flexors
- Hand – intrinsic muscles

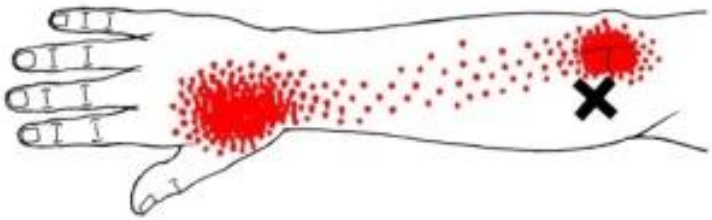
Triggers Points ECRB, ECRL, ED, Sup
FCR, FCU, PL, PT

Friction massage – tendon only

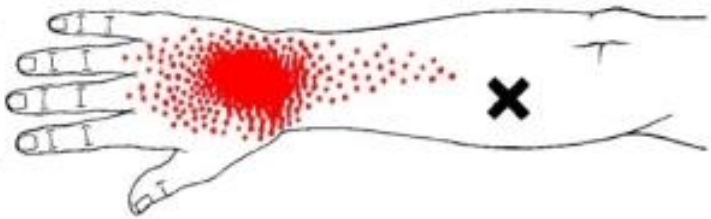
Myofascial Release Forearm extensors
Forearm flexors

Trigger points therapy - extensors

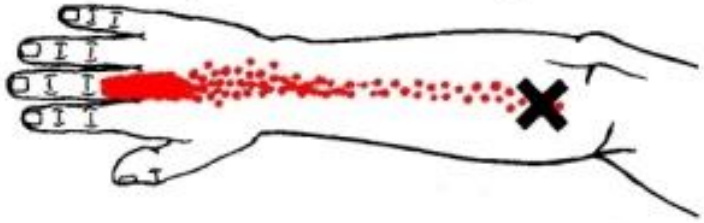
EXTENSOR CARPI RADIALIS LONGUS:



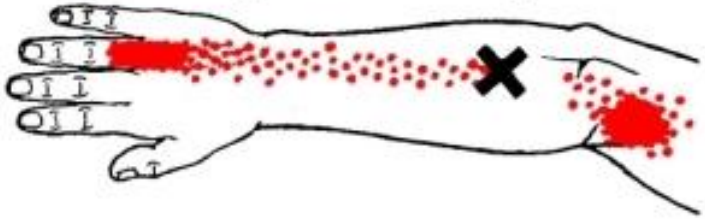
EXTENSOR CARPI RADIALIS BREVIS:



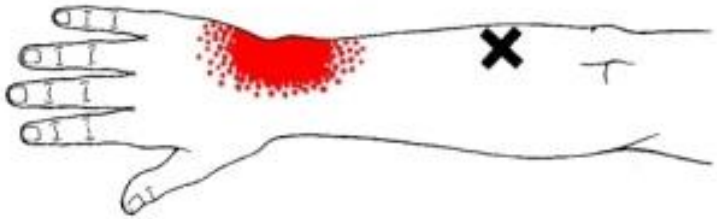
EXTENSOR DIGITORUM (MIDDLE FINGER):



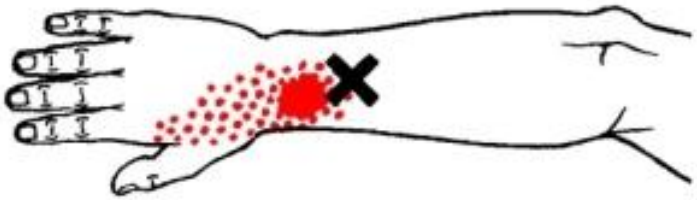
EXTENSOR DIGITORUM (RING FINGER):



EXTENSOR CARPI ULNARIS:

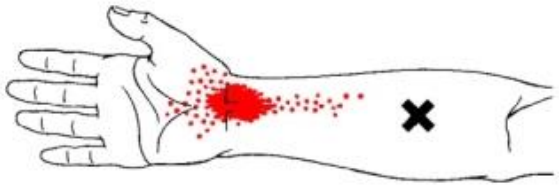


EXTENSOR INDICIS:

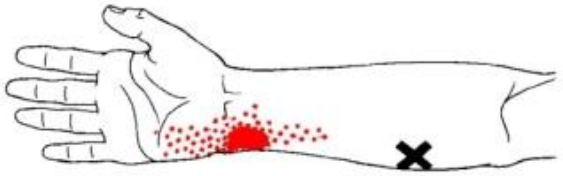


Trigger points therapy - flexors

FLEXOR CARPI RADIALIS:



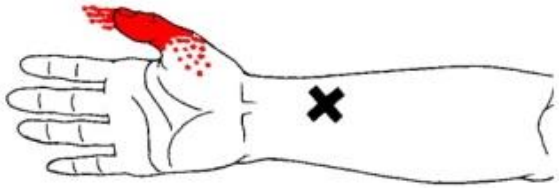
FLEXOR CARPI ULNARIS:



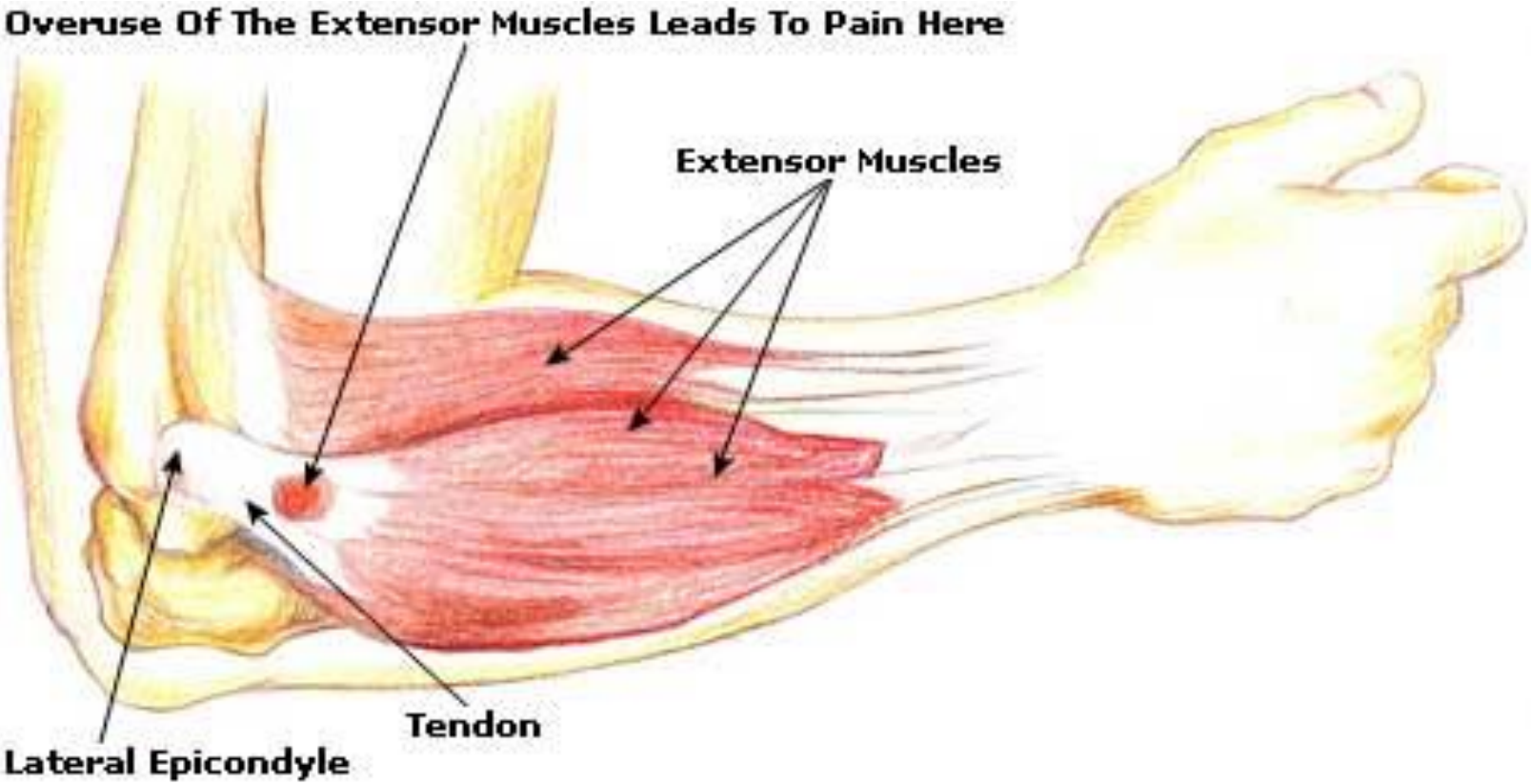
FLEXOR DIGITORUM SUPERFICIALIS (HUMEROULNAR HEAD):

FLEXOR DIGITORUM SUPERFICIALIS (RADIAL HEAD):

FLEXOR POLLICIS LONGUS:



Deep Transverse frictions



Elbow pain – but I don’t play tennis or golf

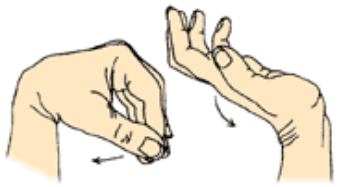
Exercises and Stretches to Complement Soft Tissue Treatment

Stretches

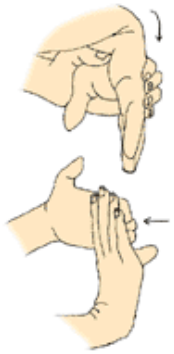
Stretching – static, PNF

- Biceps briachii
- Triceps brachii
- Forearm extensors (elbow bent / straight arm)
- Forearm flexors (elbow bent / straight arm)

Lateral Epicondylitis (Tennis Elbow) Exercises



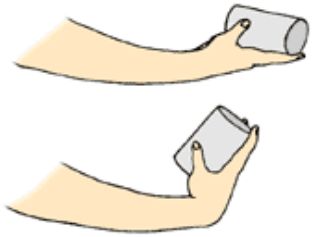
Wrist range of motion



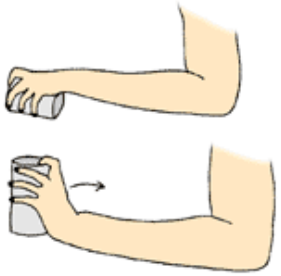
Wrist stretch

Pronation and supination of the forearm

Elbow range of motion

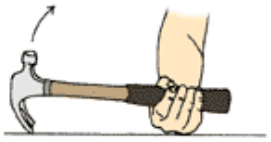


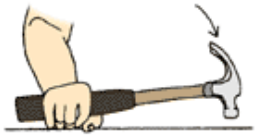
Wrist flexion exercise



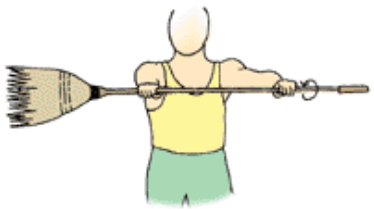
Wrist extension exercise

Wrist radial deviation strengthening



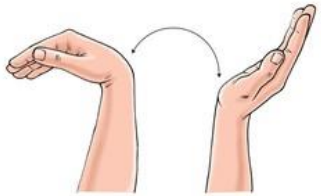


Forearm pronation and supination strenghening



Wrist extension (with broom handle)

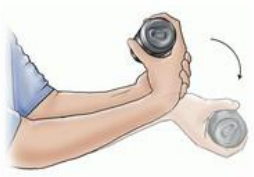
Medial Epicondylitis (Golfer's Elbow) Rehabilitation Exercises



Wrist active range of motion: Flexion and extension

Wrist stretch

orearm pronation and supination



Eccentric wrist flexion

Eccentric wrist extension

Grip strengthening

Forearm pronation and supination strengthening

Resisted elbow flexion and extension

Elbow pain – but I don’t play tennis or golf

The Research

Progressive Strengthening and Stretching Exercises and Ultrasound for Chronic Lateral Epicondylitis

Physiotherapy, September 1996, vol82, no 9

Tuomo T Pienimaki Tuula K Tarvainen Pertti T Siira Heikki Vanharanta

Thirty-nine patients suffering from chronic lateral epicondylitis were randomised into two treatment groups..

All clinical manual provocation tests for tennis elbow improved within the exercise group.

The results indicate that progressive exercise therapy is more effective than ultrasound in treating chronic lateral epicondylitis, reducing pain and improving patients' ability to work.

Progressive exercise program

Step 1

Clenching fist strongly

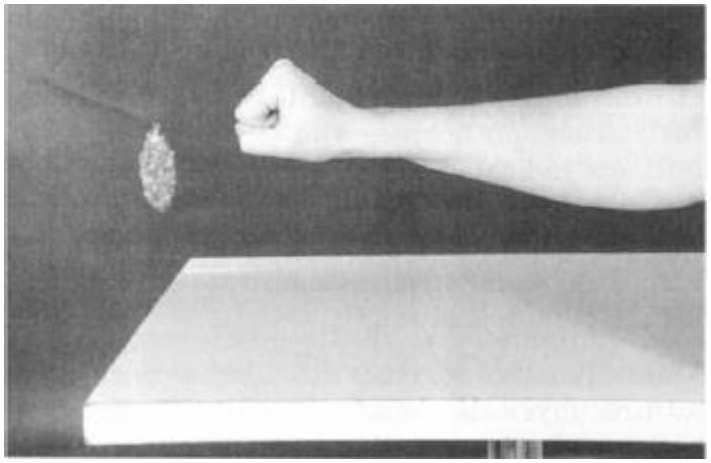
Resisted wrist extension

Resisted wrist flexion

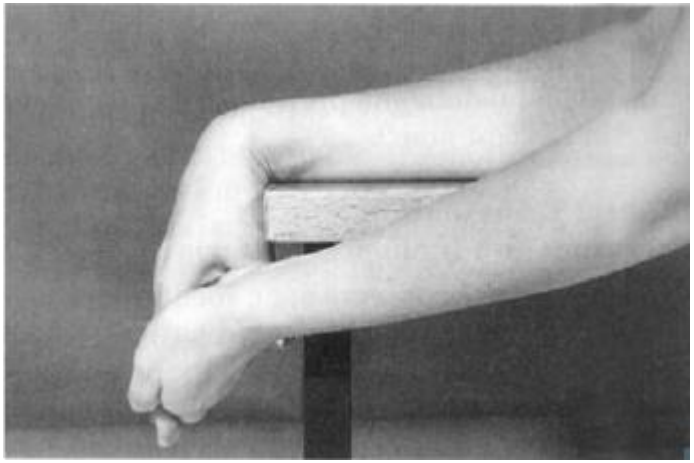
Wrist rotation with a stick

- Towards the little finger
- Towards the thumb

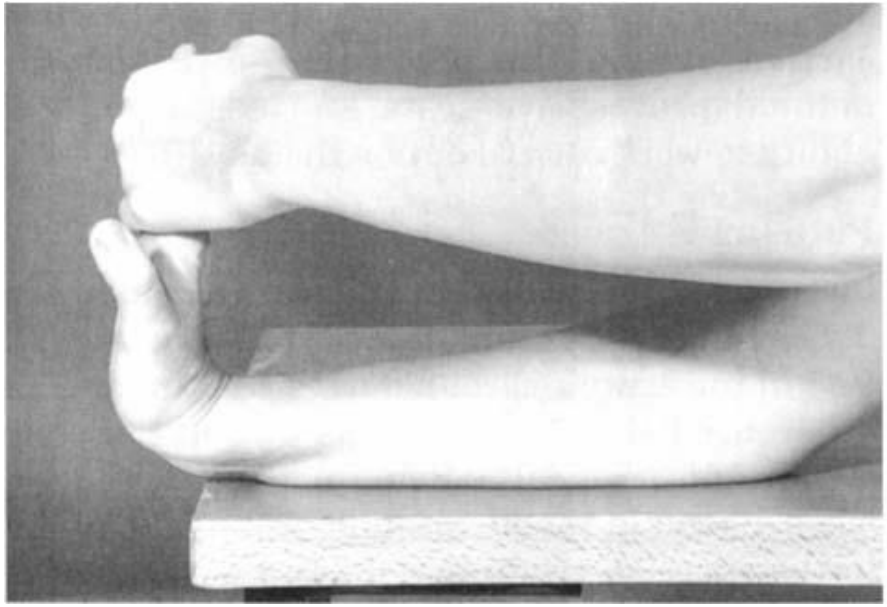
End: stretching at least 30 seconds to flexion and extension



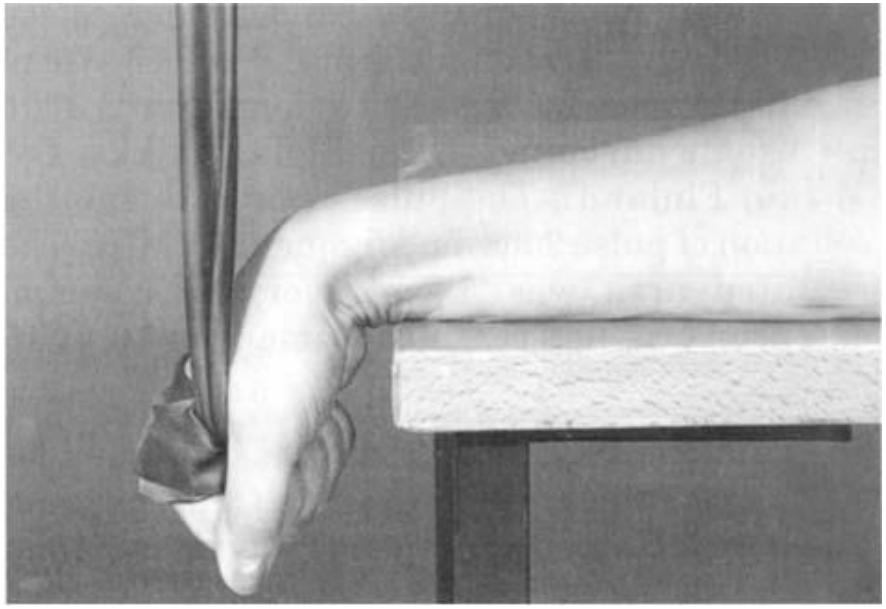
Clenching fist strongly



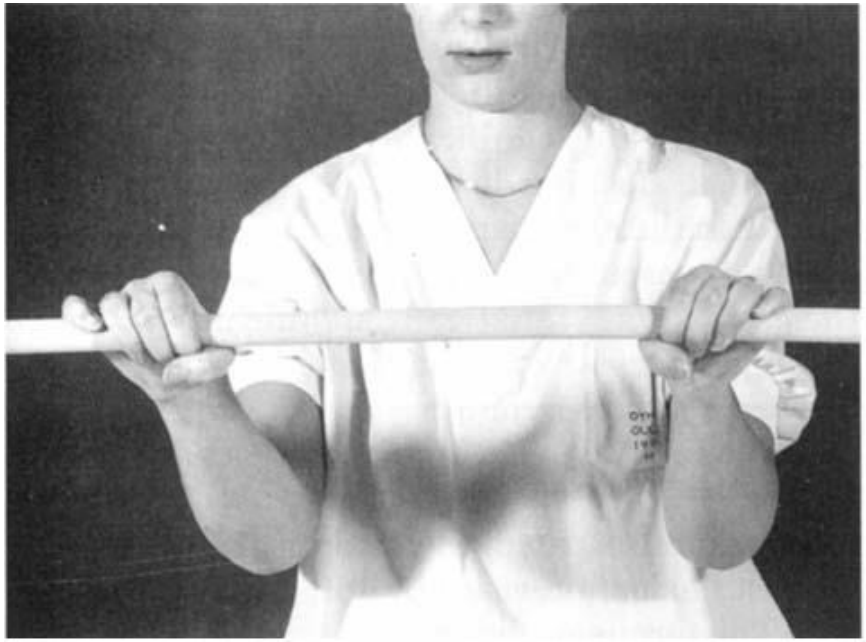
Resisted wrist extension exercises



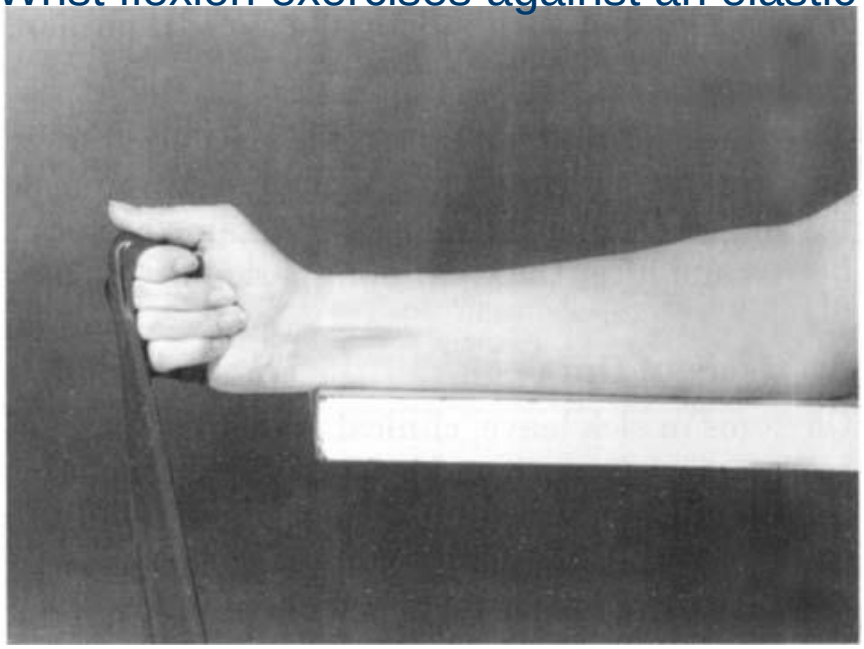
Resisted wrist flexion exercises



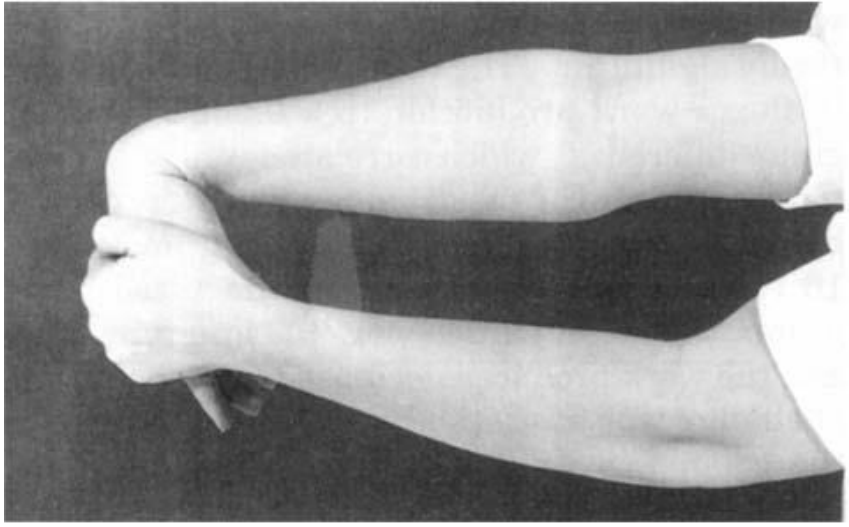
Wrist flexion exercises against an elastic band



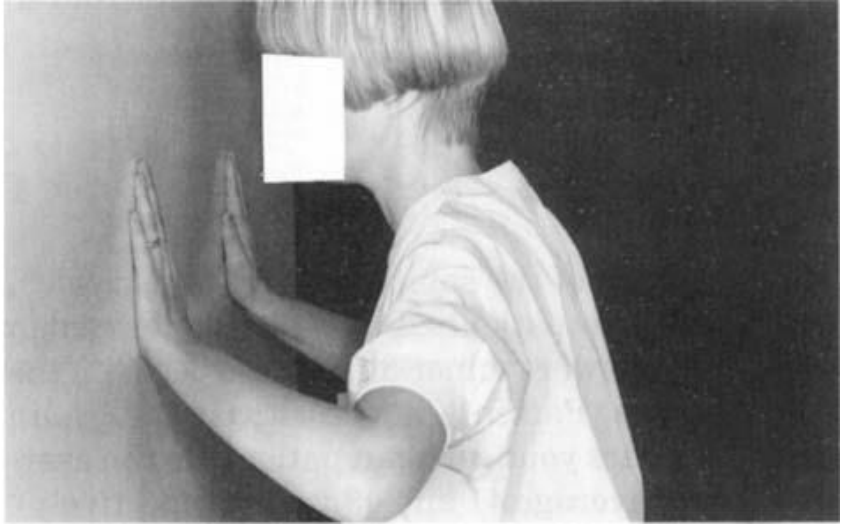
Wrist rotation with a stick towards the little finger



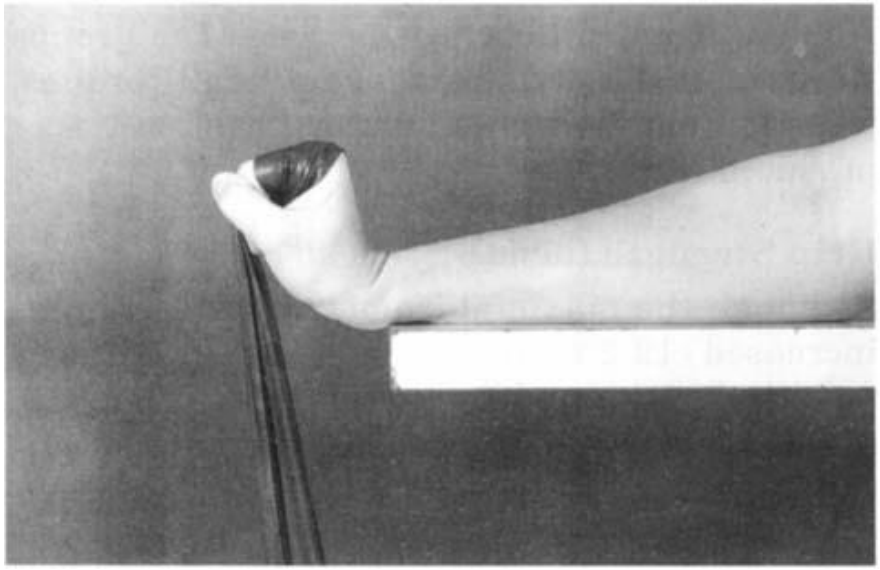
Exercises **for** radial deviation



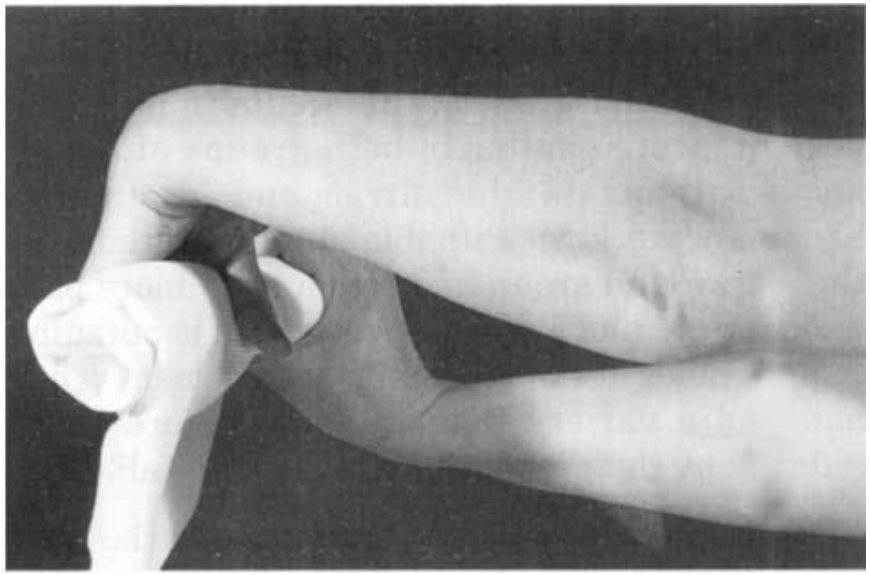
Stretching to flexion



Pressing hands against a wall



Wrist extension exercises against an elastic band



Twisting a towel into a roll

Rehabilitation for Patients with Lateral Epicondylitis: A Systematic Review **J HAND THER. 2004;17:243–266.** Daniel Trudel, Jennifer Duley,Ingrid Zastrow, Erin W. Kerr, Robyn Davidson, Joy C. MacDermid,

To determine the effectiveness of conservative treatments for lateral epicondylitis and to provide recommendations based on this evidence.

- a number of treatments, including acupuncture, **exercise therapy, manipulations and mobilizations,** ultrasound and phonophoresis
- show positive effects in the **reduction of pain or improvement in function** for patients with lateral epicondylitis.
- Practitioners should use the treatment techniques that have strongest evidence and ensure that studies findings are generalized to patients who are similar to those reported in primary research studies in terms of patient demographics and injury presentation.

Tendinosis of the extensor carpi radialis brevis: An evaluation of three methods of operative treatment ***J Shoulder Elbow Surg 2006;15:721-727.)***

S. Joshua Szabo, MD,a Felix H. Savoie III, MD,b Larry D. Field, MD,b J. Randall Ramsey, MD,b and
Chad D. Hosemann, BA,b *Gastonia, NC, and Jackson, MS*

Compare 3 operative methods for treatment of recalcitrant lateral epicondylitis—open, orthroscopic, and percutaneous.

All patients with lateral epicondylitis who were operated on over a 7-year period were retrospectively reviewed.

The outcomes were evaluated preoperatively and postoperatively with a visual analog scale scores for pain at rest, worst pain, and pain with activity.

Open, arthroscopic, and percutaneous treatments of lateral epicondylitis offer 3 highly effective ways for the clinician to address this common clinical problem.

Corticosteroid or placebo injection combined with deep transverse friction massage, Mills manipulation, stretching and eccentric exercise for acute lateral epicondylitis: a randomised, controlled trial Olaussen et al. BMC Musculoskeletal Disorders (2015) 16:122

1. Physiotherapy with two corticosteroid injections,
2. Physiotherapy with two placebo injections or wait-and-see (control).
3. Physiotherapy consisted of deep transverse friction massage, Mills manipulation, stretching, and eccentric exercises.

The main outcome measure was treatment success defined as patients rating themselves completely recovered or much better on a six-point scale.

Conclusions:

- Acute lateral epicondylitis is a self-limiting condition where 3/4 of patients recover within 52 weeks.
- and corticosteroid injection gave no added effect. Physiotherapy with deep transverse friction massage, Mills manipulation, stretching, and eccentric exercises showed no clear benefit,
- Corticosteroid injections combined with physiotherapy might be considered for patients needing a quick improvement, but intermediate (12 to 26 weeks) worsening of symptoms makes the treatment difficult to recommend.

Arthroscopic tennis elbow release

Felix H. Savoie, Wade VanSice, Michael J. O'Brien, Shoulder Elbow Surg (2010) 19, 31-36

Although it was first thought lateral epicondylitis was caused by an inflammatory process, most microscopic studies of excised tissue demonstrate a failure of reparative response in the extensor carpi radialis brevis tendon and in any of these associated structures.

Most cases of lateral epicondylitis respond to appropriate non-operative treatment protocols.

Non-operative management includes medication, bracing, physical therapy, corticosteroid injections, shock wave therapy, platelet-rich plasma, and low-dose thermal ablation devices. When these are unsuccessful, however, surgical measures may be performed with a high rate of success.

Satisfactory results of the arthroscopic surgical procedures have been documented, with reported improvement rates of 91% to 97.7%.

The recent advances in arthroscopic repair and plication of these lesions, along with the recognition of the presence and repair of coexisting lesions, have allowed arthroscopic techniques to provide results superior to other measures.

Does effectiveness of exercise therapy and mobilisation techniques offer guidance for the treatment of lateral and medial epicondylitis? A systematic review

Peter Hoogvliet, Manon S Randsdorp, Rudi Dingemanse, Bart W Koes, Bionka M A Huisstede Hoogvliet P, et al. Br J Sports Med 2013;47:1112–1119

- Owing to the change in paradigm of the histological nature of epicondylitis, therapeutic modalities as exercises such as stretching and eccentric loading and mobilisation are considered for its treatment.
- Assess the evidence for effectiveness of exercise therapy and mobilisation techniques for both medial and lateral epicondylitis.

Moderate evidence for the short-term effectiveness was found in favour of stretching plus strengthening exercises versus ultrasound plus friction massage.

Moderate evidence for short-term and midterm effectiveness was found for the manipulation of the cervical and thoracic spine as add-on therapy to concentric and eccentric stretching plus mobilisation of wrist and forearm.

Conclusions:

- Strength training decreases symptoms in tendinosis.
- The short-term analgesic effect of manipulation techniques may allow more vigorous stretching and strengthening exercises resulting in a better and faster recovery process of the affected tendon in lateral epicondylitis.

Chronic Lateral Epicondylitis: Comparative Effectiveness of a Home Exercise Program Including Stretching Alone versus Stretching Supplemented with Eccentric or Concentric Strengthening

Julio A. Martinez-Silvestrini,Karen L. Newcomer, Ralph E. Gay, Michael P. Schaefer, Patrick Kortebein, Katherine W. Arendt, **J HAND THER. 2005;18:411–420.**

To evaluate the effectiveness of eccentric strengthening in subjects with chronic lateral epicondylitis

- stretching,
- concentric strengthening with stretching, and
- eccentric strengthening with stretching.

Subjects performed an exercise program for six weeks.

All three groups received instruction on icing, stretching, and avoidance of aggravating activities.

Although there were no significant differences in outcome among the groups, eccentric strengthening did not cause subjects to worsen.

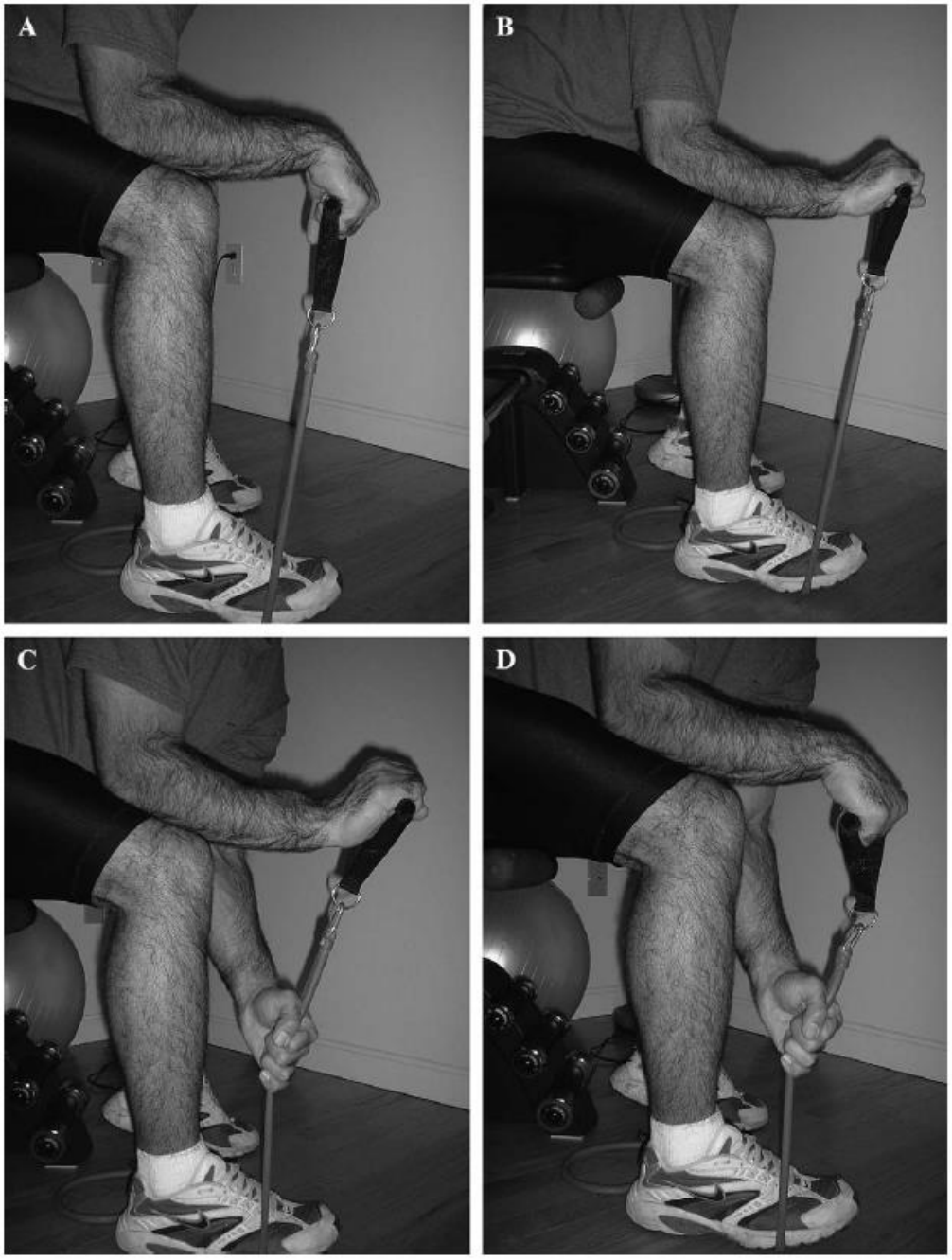


FIGURE 1. *(**A** and **B**) Concentric contraction against resistance. (**C** and **D**) The band remains lax by lengthening with the opposite hand during return to wrist flexion so that a resisted eccentric contraction does not occur.*

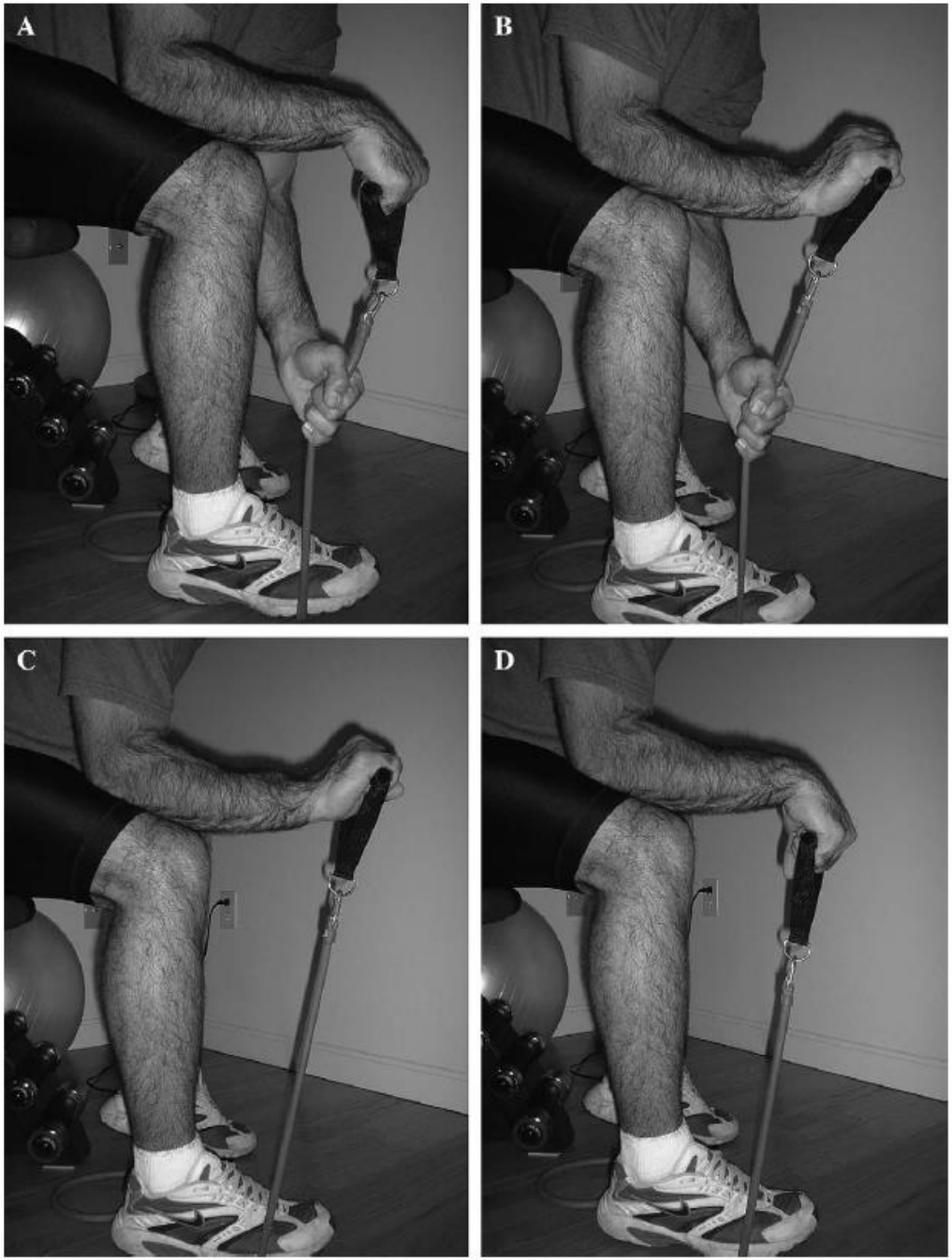


FIGURE 2. *Eccentric contraction against resistance. (**A** and **B**) The wrist is extended while the band is lengthened with the other hand so that it is lax. (**C** and **D**) The eccentric contraction then occurs against resistance.*


David


MedSpec