The Upper Limb V

Movement of the Shoulder

Anatomy

RHS 241

Lecture 14

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Scapulohumeral rhythm

- Movement at the **shoulder joint proper** (between the humerus & scapula) are normally accompanied by movements of the **scapula** itself

- Coordinated movement of both elements = Scapulohumeral rhythm

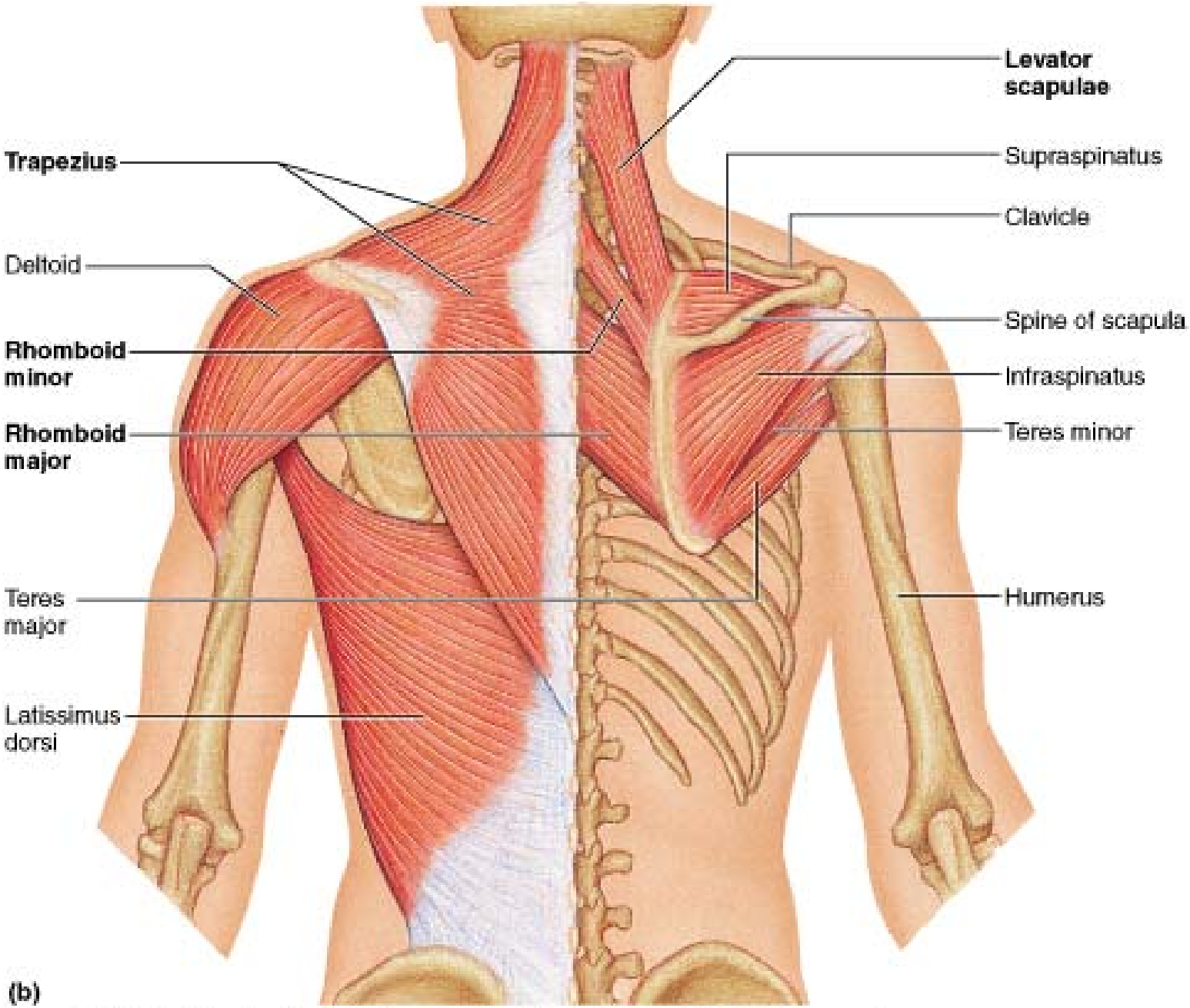
Scapulohumeral rhythm

- Movement of the scapula:
  - ➢increase the **force** of arm movement
  - ➢increase the **range of movement** (by tilting the glenoid cavity in the desired direction)

Elevation of scapula

- **Upper fibers of trapezius** (inserting on the acromion & spine of scapula): responsible for elevating the lateral angle of scapula

- **Levator scapulae & two rhomboids**: elevate the medial border of scapula



Clinical note

Injury to the **accessory** nerve →

paralysis of the **trapezius** muscle →

the lateral angle of the scapula will be dragged downward by the weight of the free limb

(because it has nothing to support it) →

levator scapulae & rhomboids will increase their activity in response to the stretch →

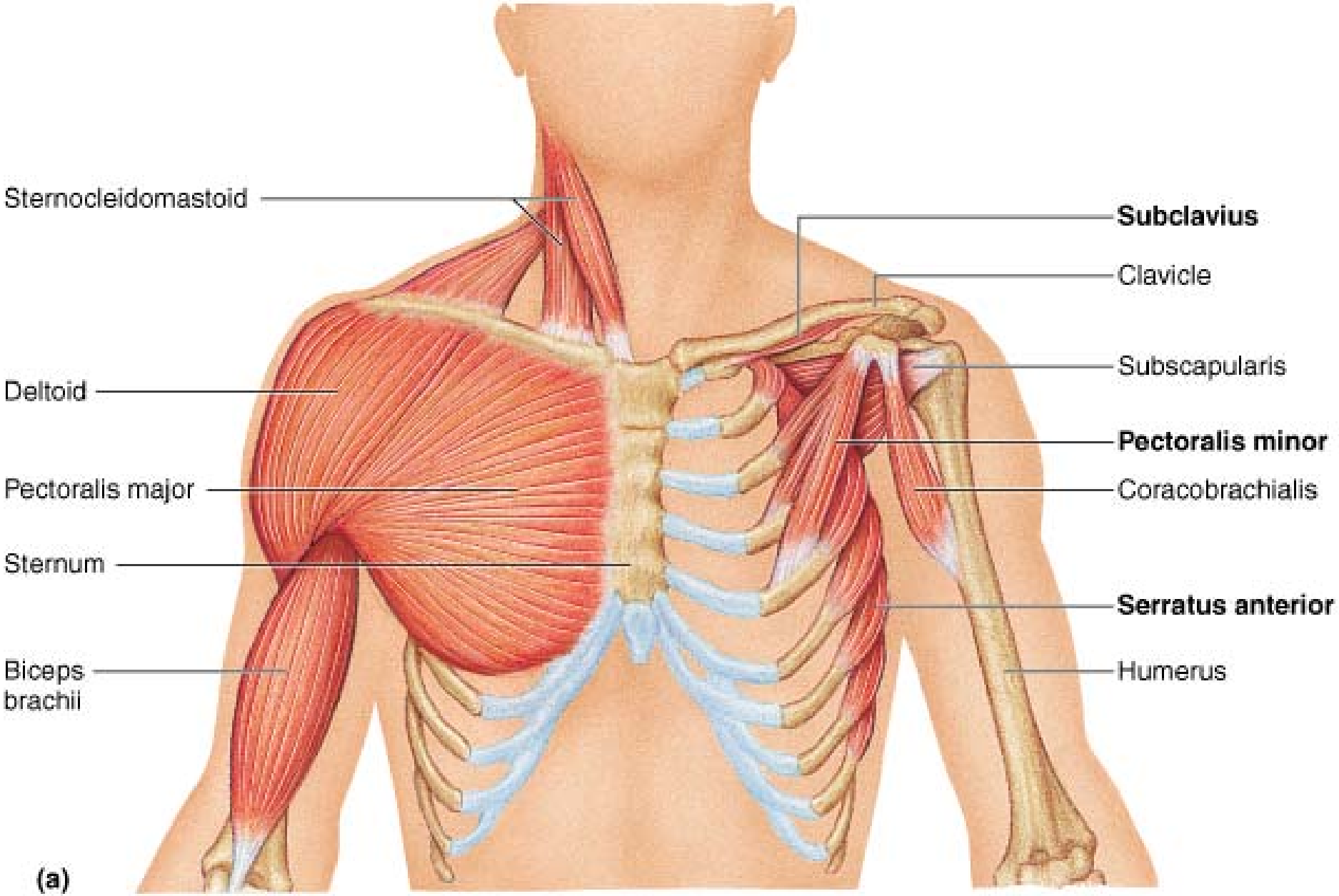
excessive elevation of the superior angle

Depression of scapula

- **Pectoralis minor:** rotate the scapula downward
- **Serratus anterior:** rotate the scapula upward

- **Lower fibers of trapezius & latissimus dorsi:** retract & depress the scapula

- **Inferior fibers of pectoralis major:** protract & depress the scapula



Upward rotation of scapula

- Necessary to allow **abduction** of the arm above the horizontal

- Combined action of the **trapezius & serratus anterior**

Downward rotation of scapula

- Usually associated with depression (like in reaching down to pickup a suitcase)
- **Levator scapulae & rhomboids**: raising the medial border of the scapula
- **Pectoralis minor** & **pectoralis major** & **lattisimus dorsi**: pull down the lateral angle

Protraction of scapula

- **Serratus anterior**
- **Pectoralis major**
- **Pectoralis minor**

Retraction of scapula

- Middle fibers of **trapezius** (or trapezius as a whole)
- **Rhomboids**
- **Latissimus dorsi**

Clinical note

- **Serratus anterior**: responsible for retaining the medial border of scapula against the thoracic wall

- Paralysis of the serratus anterior → projection of the medial border **(winging of scapula)**

Clinical note

- Most shoulder movements involve the cooperation of **several muscles** with widely **separated innervations**

- Therefore, injury to a single nerve is unlikely to greatly affect shoulder movement ……except: *elevation & upward rotation*

Clinical note

- When the **trapezius** is paralyzed: **elevation** will be associated with downward rotation of the lateral angle

- **Upward rotation** is weakened by paralysis of **trapezius** and is almost abolished by paralysis of the **serratus anterior**

Humeral movement

- With the arm by the side, downward displacement of the humerus is resisted by the **coracohumeral ligament** (assisted if necessary by the supraspinatus & posterior fibers of deltoid)

- But the ligament is relaxed during flexion & abduction, so the **rotator cuff** muscles contract to prevent humeral displacement

Flexion of the arm

- Anterior fibers of **deltoid** (most important)
- Clavicular portion of the **pectoralis major**
- **Coracobrachialis** (a muscle of the arm)
- **Biceps brachii** (the prominent muscle on the front of the arm)

Flexion of the arm

- Complete flexion at the shoulder (raising the limb above the head) is impossible when the elbow is straight unless the flexion is accompanied by medial rotation of the humerus

- Such movement can be done with the elbow flexed because the pull of biceps against the front of humerus is diminished (the long head of the biceps lies in the intertubercular groove)

Flexion of the arm

- All the flexors are supplied through **C5 & C6** (except coracobrachialis which receive innervation from C7 as well)

- Therefore, injury to the **upper portion of the brachial plexus** may markedly affect shoulder flexion

Extension of the arm

- Posterior fibers of **deltoid** (makes it possible to reach the hand into a back pocket)

- **Latissimus dorsi**
- Sternocostal fibers of **pectoralis major** (bring the flexed arm down until it reaches the side)
- **Teres major** (against resistance)
- Long head of **triceps brachii** (weakly)

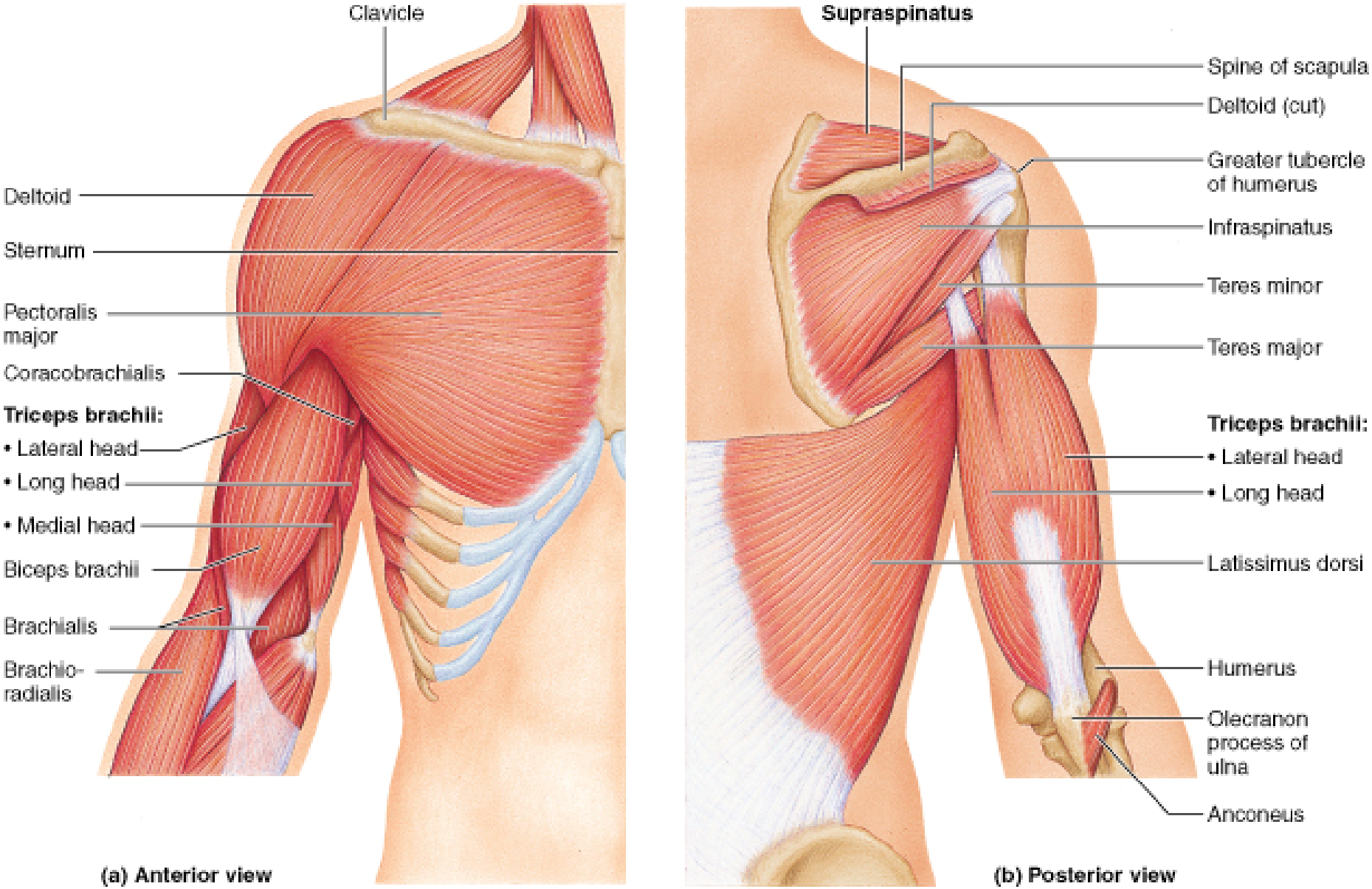
Extension of the arm

- Receives innervation from all segmental nerves contributing to the brachial plexus

Abduction of the arm

- Simultaneous action of **deltoid** (middle fibers) & **supraspinatus**

- The two abductors are innervated exculsively by **C5 & C6**, so abduction is interfered by lesions of the **upper portion of the brachial plexus**



Adduction of the arm

- **Pectoralis major**
- **Latissimus dorsi**
- **Teres major**
- **Coracobrachialis & long head of biceps** (assist)

Adduction of the arm

- Posterior fibers of **deltoid** contract to prevent the pectorlais major & latissimus dorsi from medially rotating or depressing the humerus

- Receives innervation from all segmental nerves contributing to the brachial plexus

Medial rotation

- **Subscapularis**
- **Pectoralis major** (medially rotates as it adducts or flexes)
- **Latissimus dorsi** (medially rotates as it adducts or extends)
- Clavicular fibers of **deltoid** (medially rotate as they flex)
- **Teres major** (weak pure medial rotation)

Medial rotation

- Innervated by all segments contributing to the brachial plexus

Lateral rotation

- **Infraspinatus**
- **Teres minor**
- Posterior fibers of **deltoid** (if extension & lateral rotation are combined)
- Innervated through **C5 & C6**

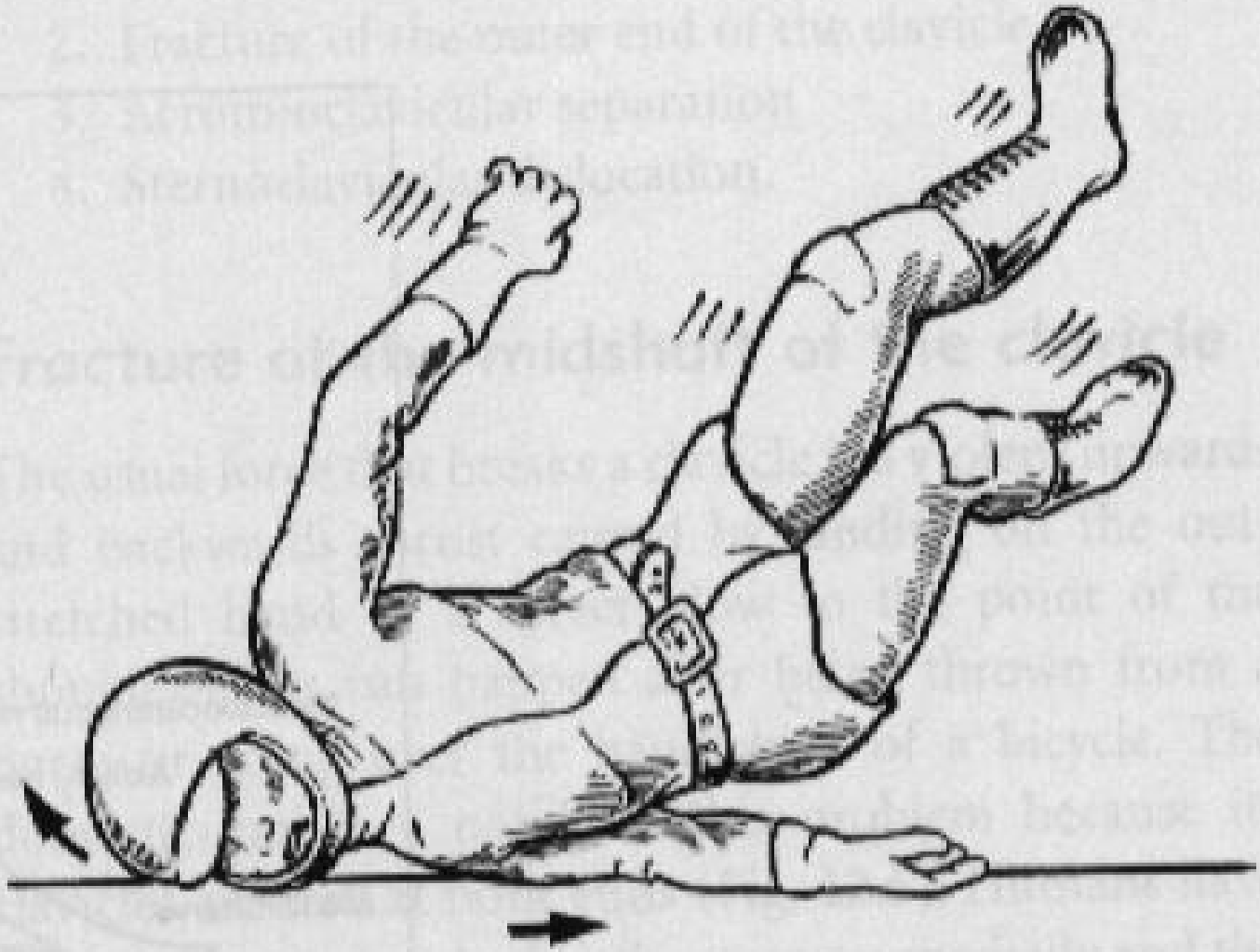


Fig. 12.1 Traction injury of the brachial plexus. Violent abduction of the neck and shoulder can tear the upper cords of the brachial plexus.

Erb’s palsy

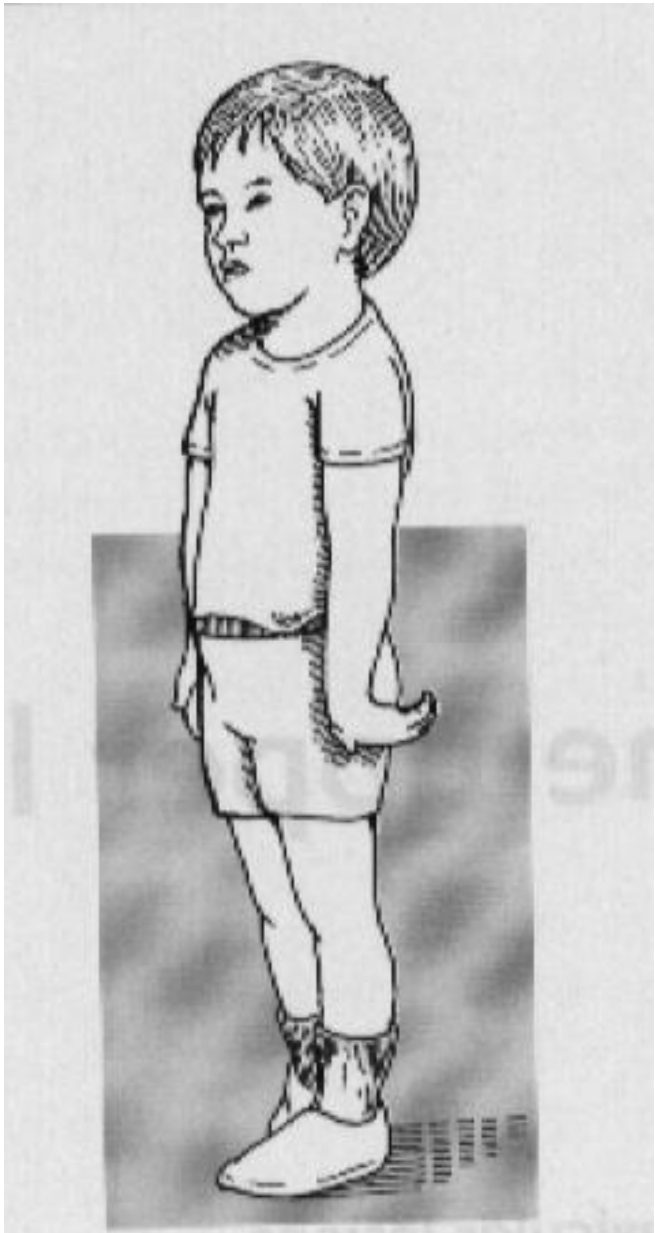
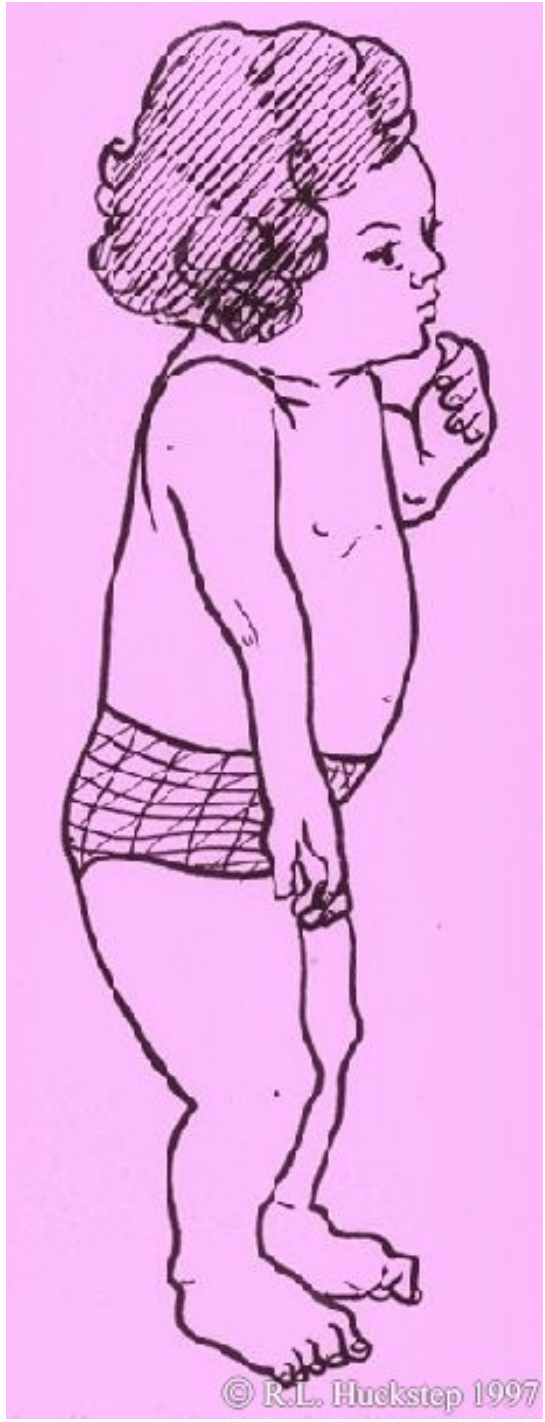


Fig. 12.2 The position of the hand in Erb’s palsy.

Erb’s palsy

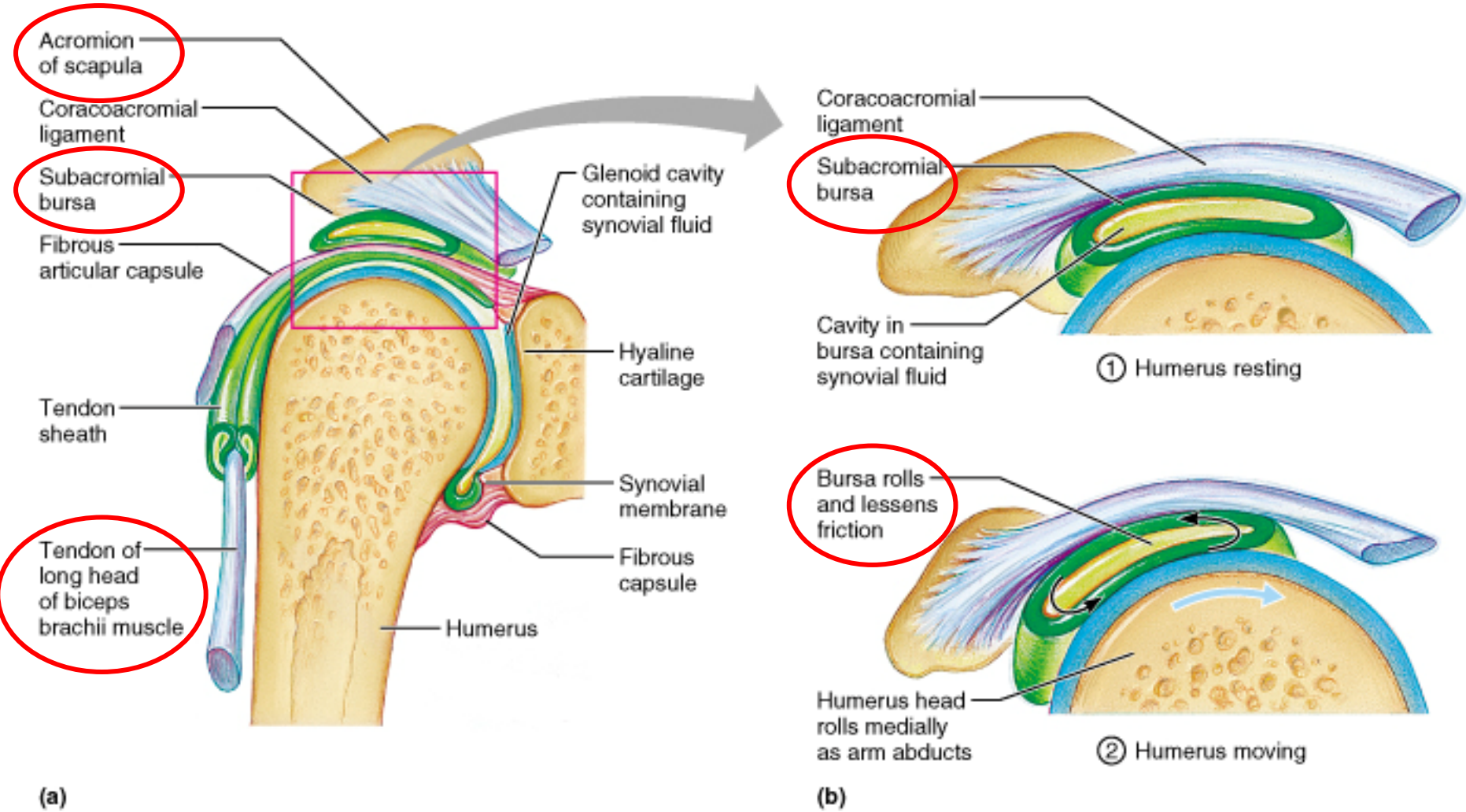


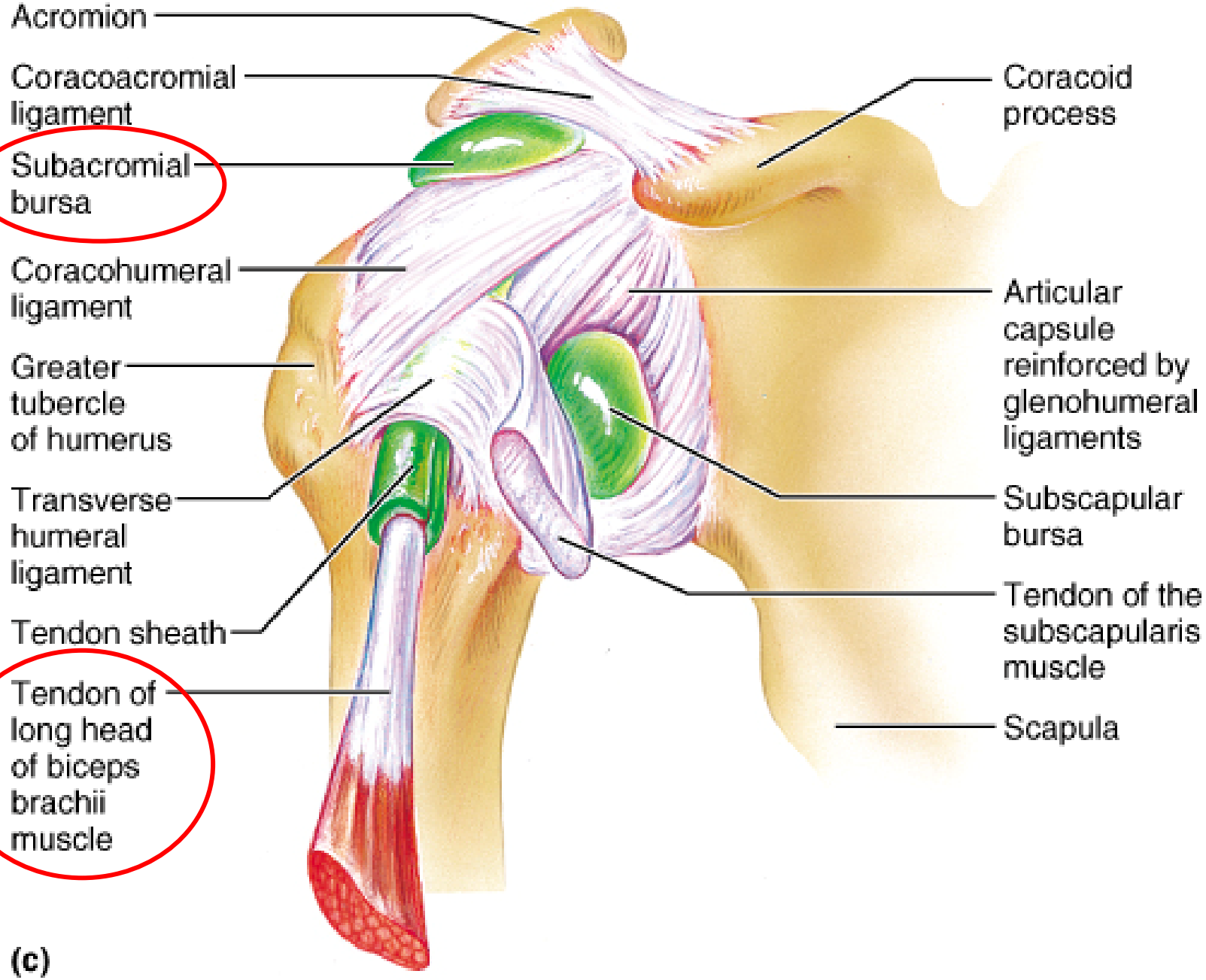
Impingement syndromes

- A common cause of shoulder pain is impingement of the soft tissues in the *subacromial space* with loss of the normal gliding movement

Impingement syndromes

- The most common structures to be entrapped are:
  - The supraspinatus tendon
  - Subacromial bursa
  - The biceps tendon



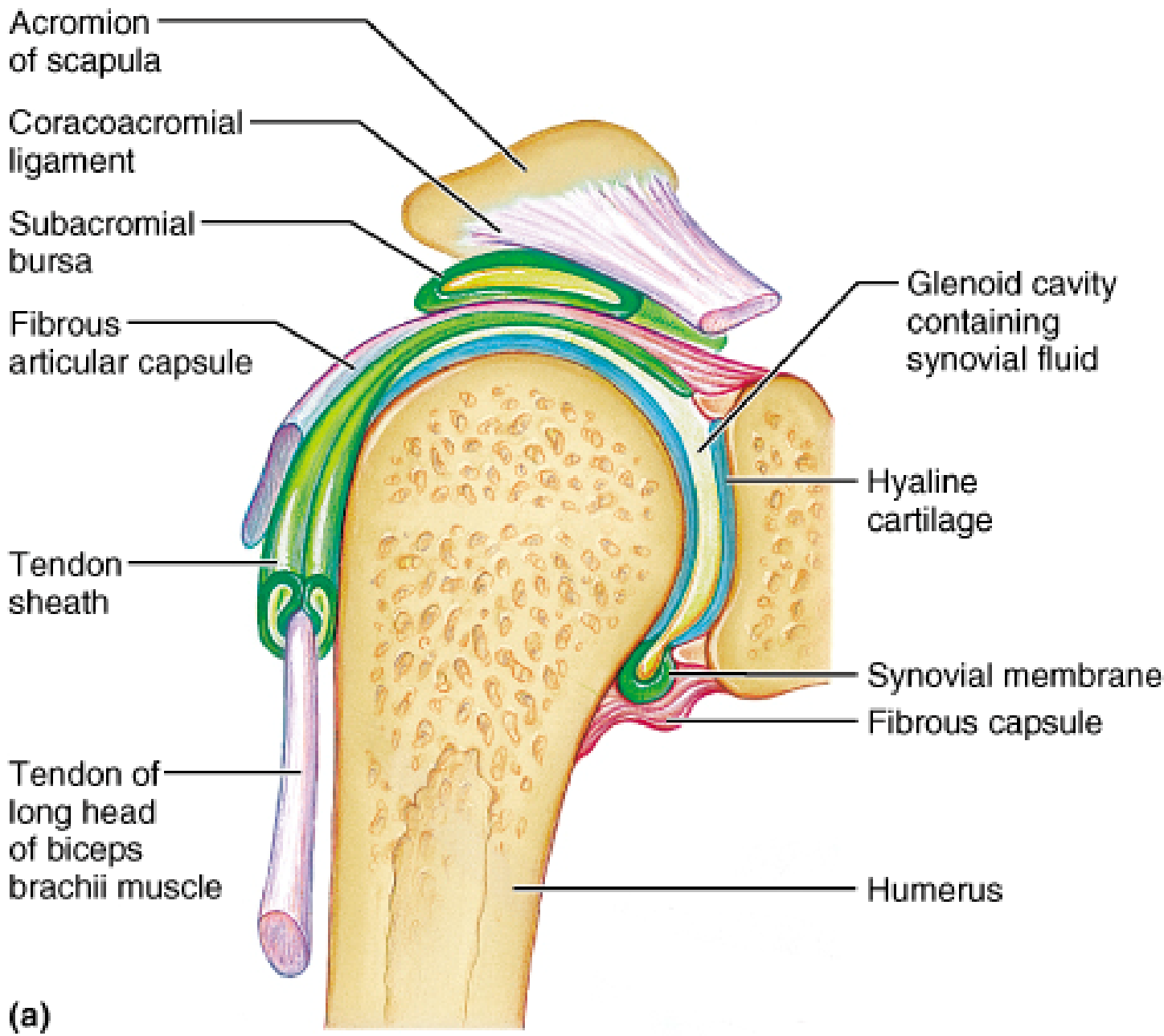


(c)

Impingement syndromes

Most common causes include:

- Prominent anterior acromion
- Bony spurs from under the acromion or arising from the acromioclavicular joint



(a)

Impingement syndromes Symptoms

- Oedema and inflammatory changes in the supraspinatus tendon (the biceps tendon may also be involved)
- Rotator cuff degeneration
- Pain on shoulder movement
- Stiffness and weakness

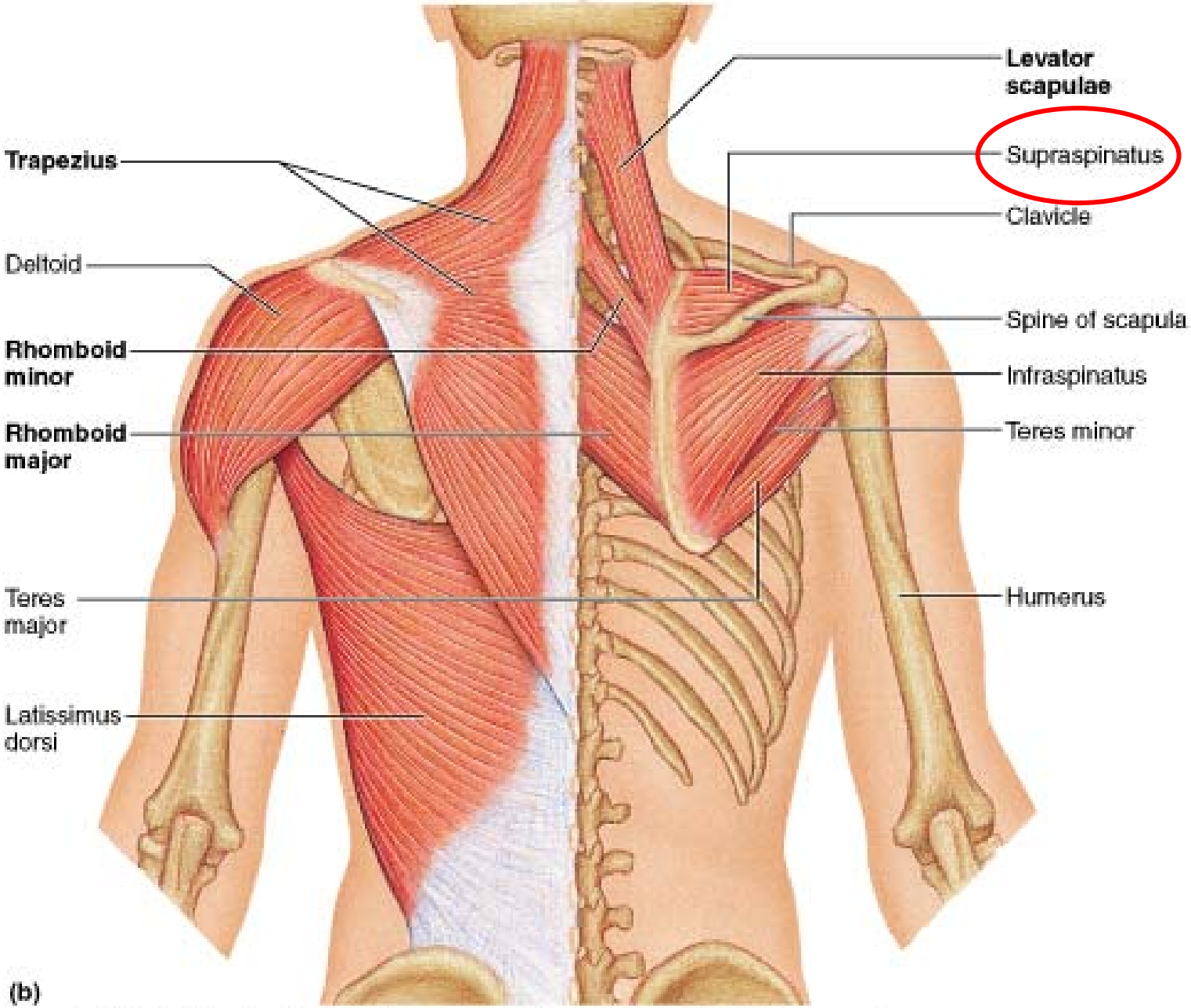
Impingement syndromes
Symptoms

- ***The painful arc***: impingement of the supraspinatus felt in the middle range of abduction

  (as the greater tubercle approaches the acromion, structures between those two bony prominences are impinged producing pain)

Lesions of the supraspinatus tendon

- Supraspinatus tendinitis
- Subacromial bursitis
- Complete or incomplete rupture of the tendon
- Calcification



Supraspinatus tendinitis

- Impingement or overuse → wear and tear with friction of the tendon in the subacromial space → degeneration of the tendon collagen fibers

Supraspinatus tendinitis

- Pain is felt over the outer aspect of the shoulder, and may radiate to the region of deltoid insertion
- Pain may disturb sleep
- Pain may be reproduced on isometric contraction of the supraspinatus muscle

Bicipital tendinitis

- Inflammation of the biceps tendon in the bicipital groove is the 2nd most common cause of shoulder tendinitis

- Due to impingement of the tendon against the acromial arch and overuse

Bicipital tendinitis

- Associated with ***tenosynovitis***: inflammation of its synovial sheath
- Pain in the shoulder is usually localized anteriorly, but may radiate down the arm
- Pain is reproduced by stretching the biceps tendon