بسم الله الرحمن الرحيم

RHS 221
Manual Muscle Testing
Theory – 1 hour
practical – 2 hours

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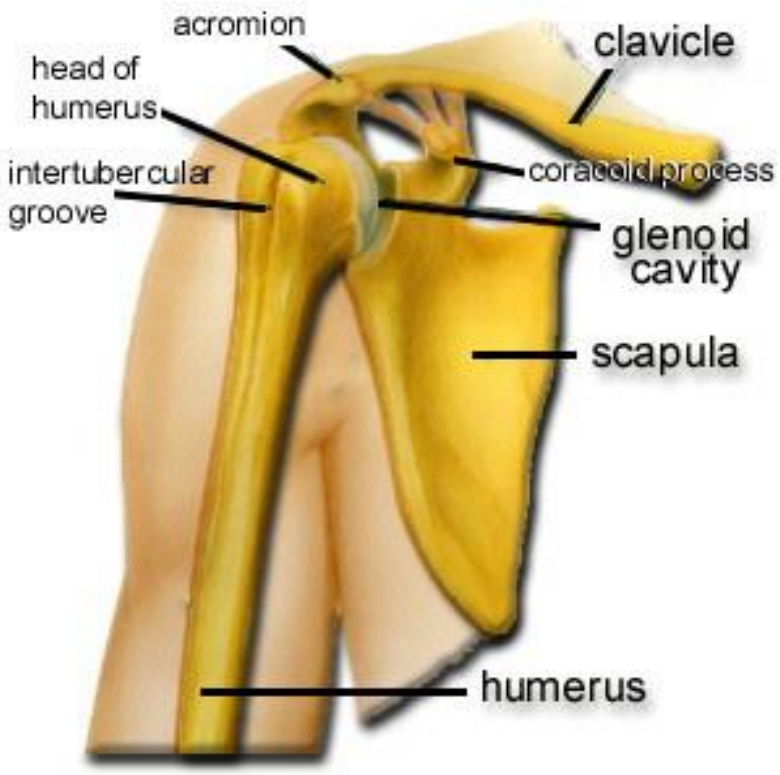
Shoulder Anatomy



- Bones
  - Clavicle
  - Scapula
  - Humerus
- Shoulder vs Shoulder Girdle

Shoulder Girdle

- The shoulder girdle is a complex structure.
- It is first necessary to identify certain commonly used terms:

Sterno— sternum

Costal— rib

Clavicular— clavicle

Acromial —acromion (process on the scapula)

Gleno— glenoid cavity of scapula

Humeral— humerus, long bone of upper arm

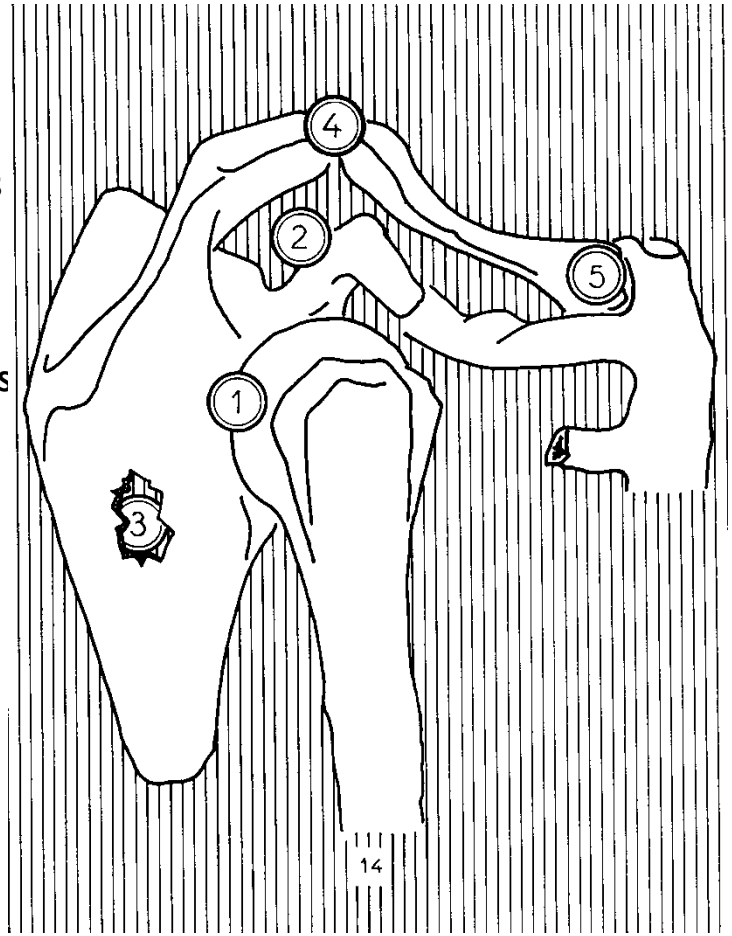
Vertebral— vertebrae, spinal column

Chondro— cartilage

Shoulder Girdle

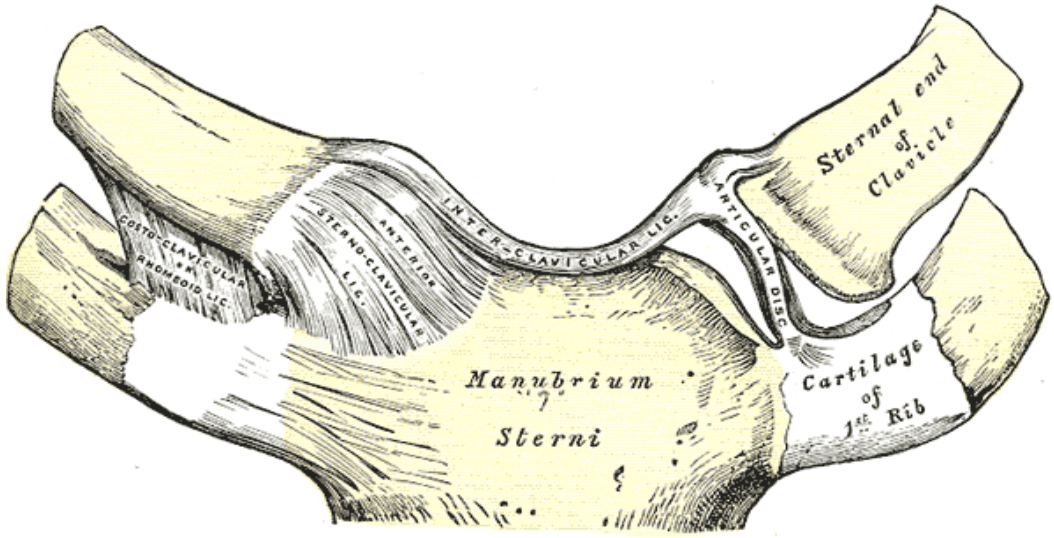
Joints of the shoulder girdle Includes:

- G-H joint(connect the head of humerus and the socket of glenoid)-a ball and socket joint.
- A-C joint(connects the acromial process of the scapula with the lateral end of the clavicle).
- S-T articulation
- S-C joint(sternocostal-connect the sternum with sternal ends of 10 ribs).
- S-C joint(sternoclavicular-connect the manubrium of the sternum with the medial end of the clavicle).
- Subacromial space

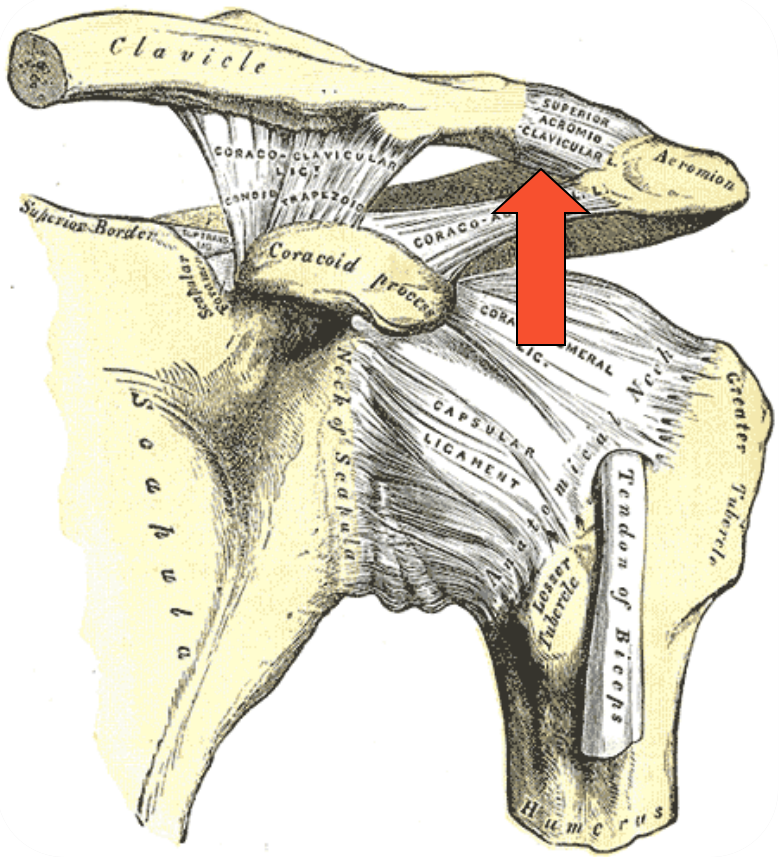


Shoulder Anatomy

- Joints
  - Sternoclavicular

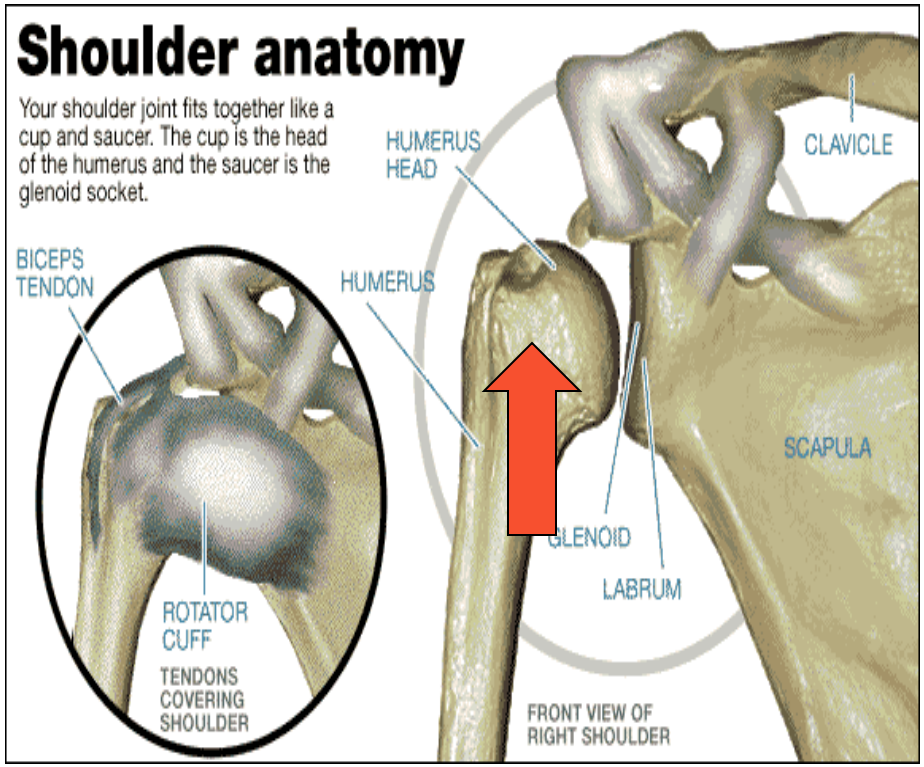


Shoulder Anatomy



- Joints
  - Sternoclavicular
  - Acromioclavicular

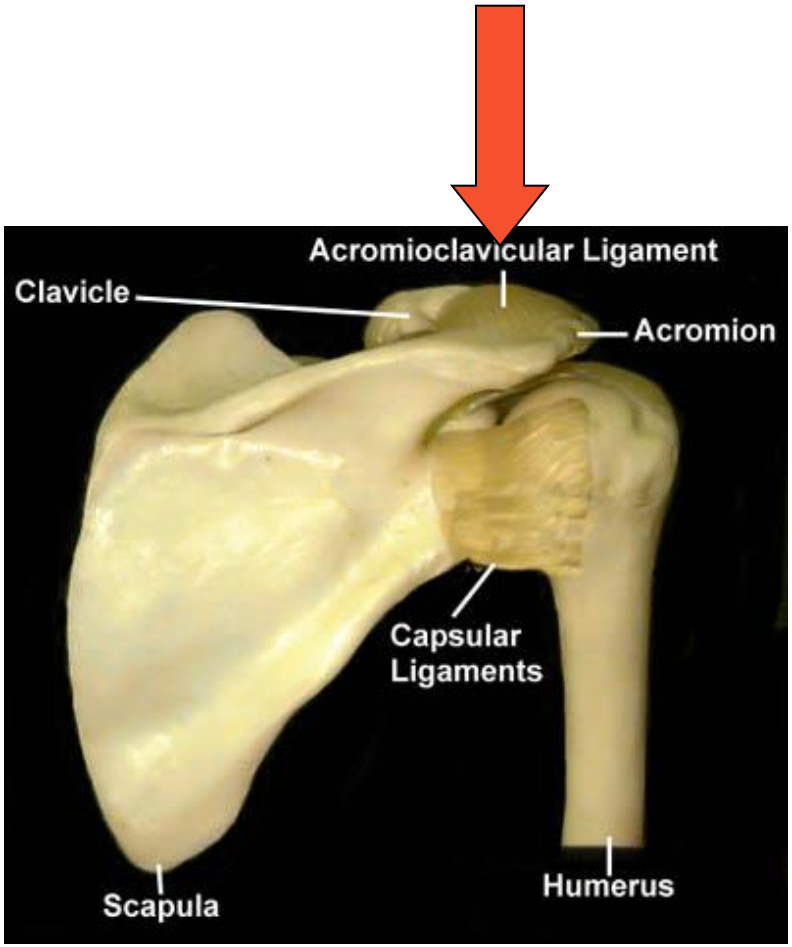
Shoulder Anatomy



- Joints
  - Sternoclavicular
  - Acromioclavicular
  - Glenohumeral

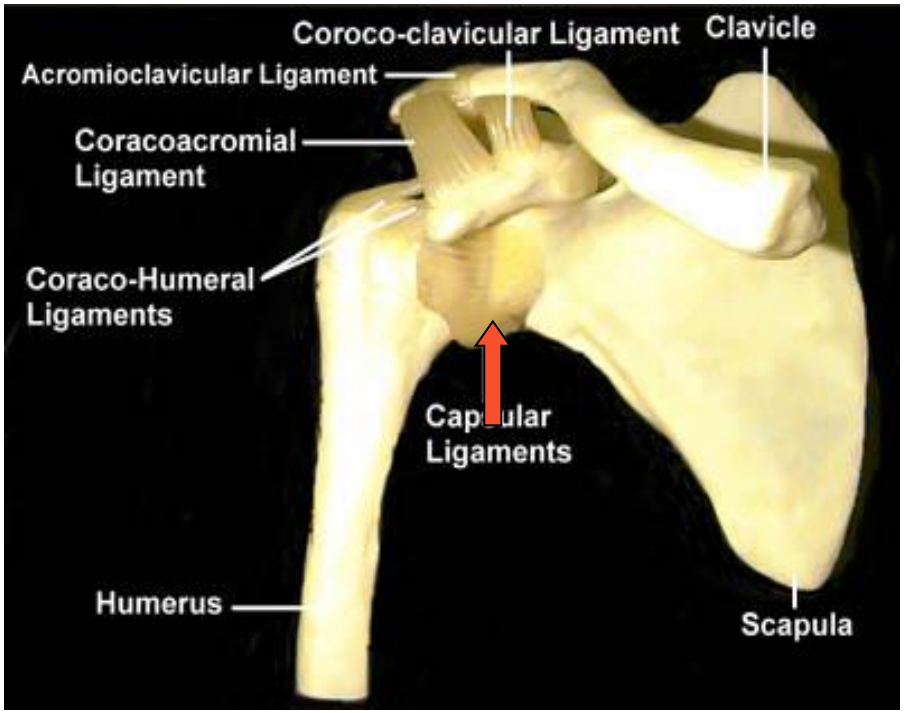
Shoulder Anatomy

- Ligaments
  - Acromioclavicular Joint
    - Acromioclavicular Ligament



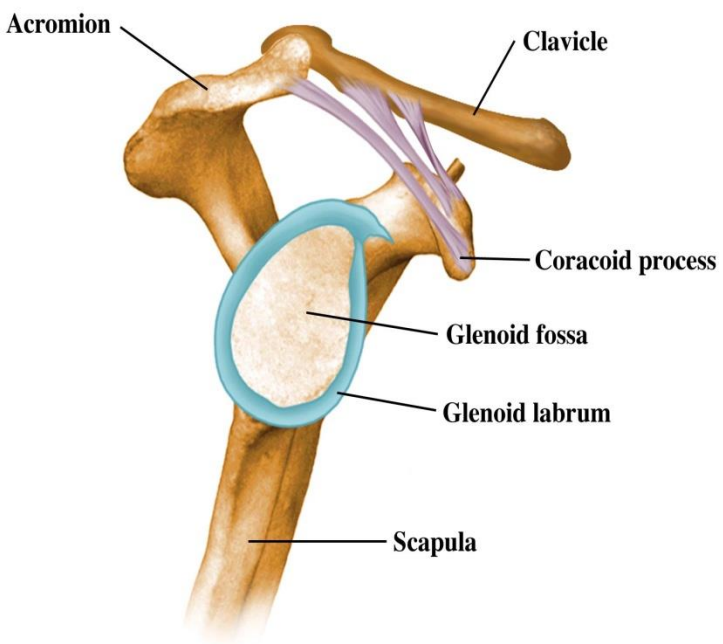
Shoulder Anatomy

- Ligaments
  - Glenohumeral Joint
    - Glenohumeral ligaments
      - Superior
      - Middle
      - Inferior

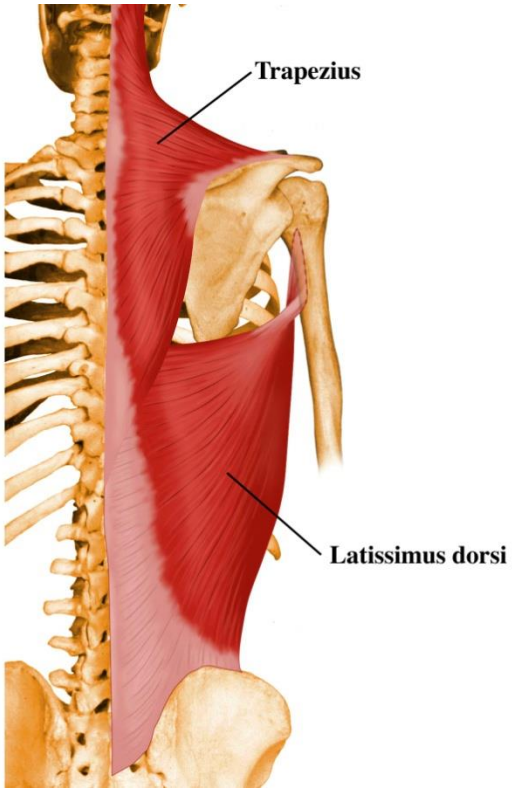


Shoulder Anatomy

- Cartilage
  - Glenoid labrum

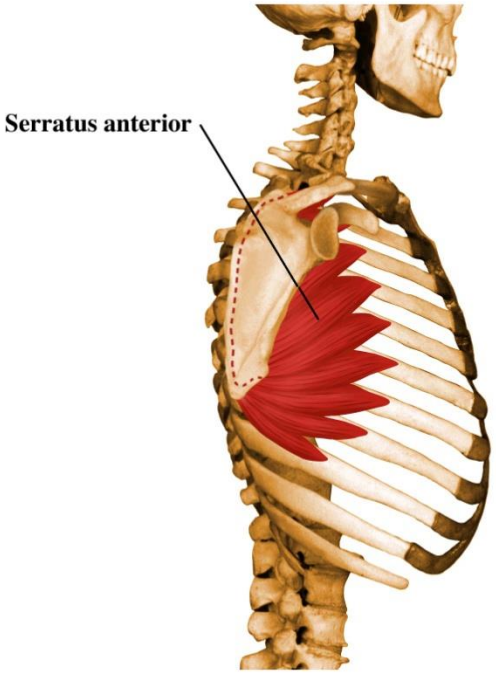


Shoulder Anatomy



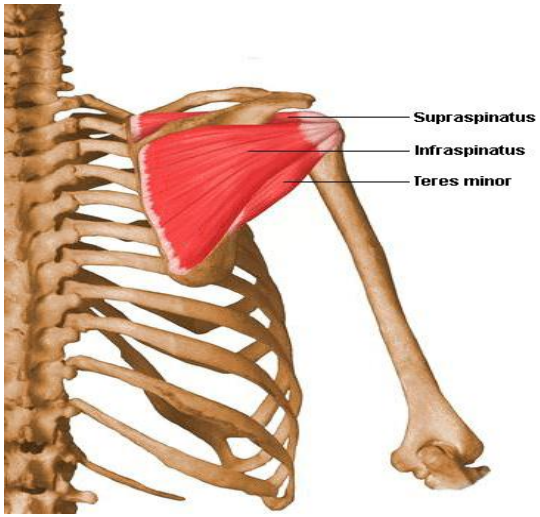
- Shoulder Girdle Muscles
  - Trapezius

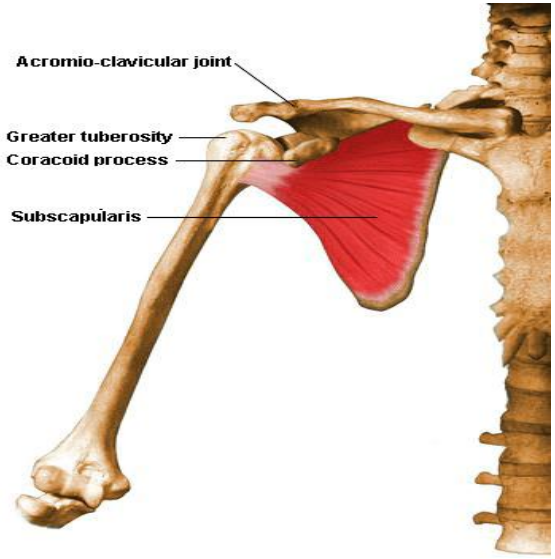
Shoulder Anatomy



- Shoulder Girdle Muscles
  - Trapezius
  - Serratus Anterior

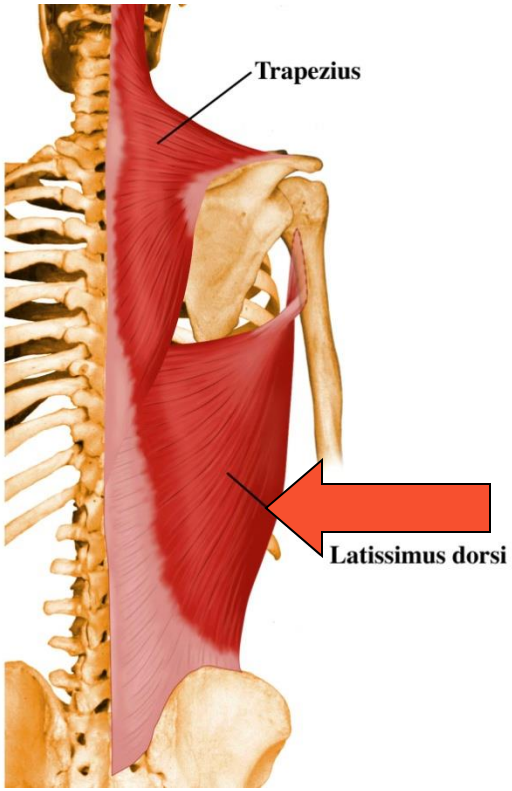
Shoulder Anatomy





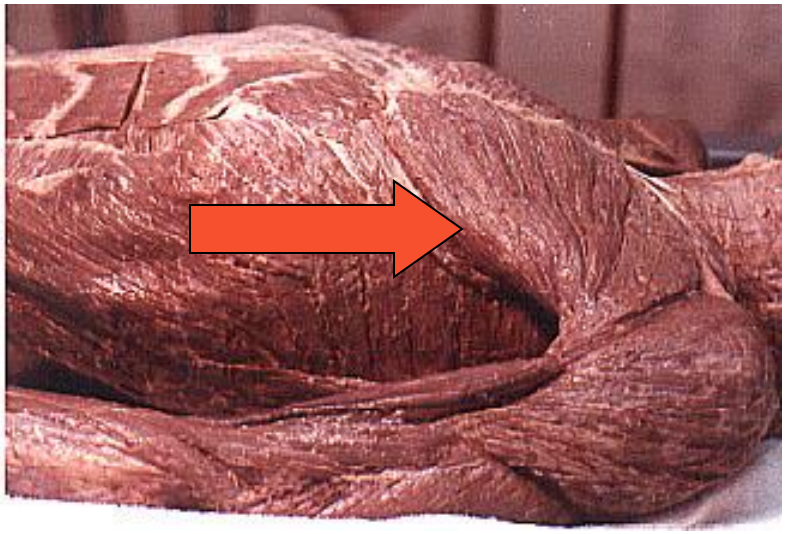
- Glenohumeral Muscles
  - Rotator Cuff
    - Suprispinatus
    - Infraspinatus
    - Teres Minor
    - Subscapularis

Shoulder Anatomy



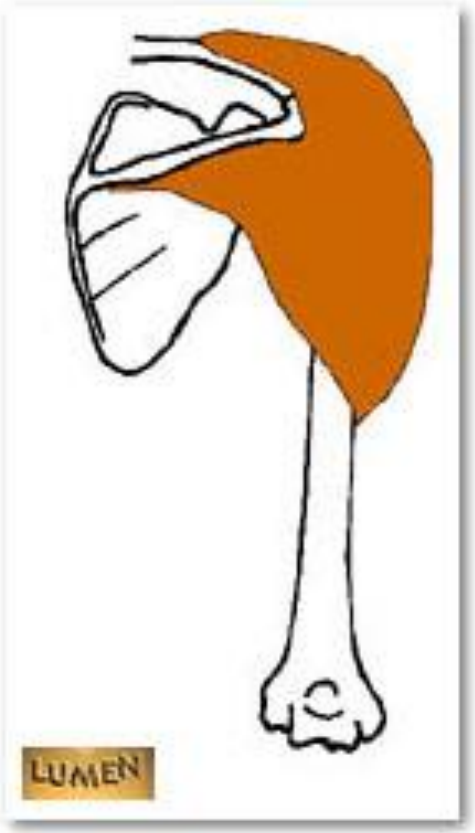
- Glenohumeral Muscles
  - Latissimus Dorsi

Shoulder Anatomy



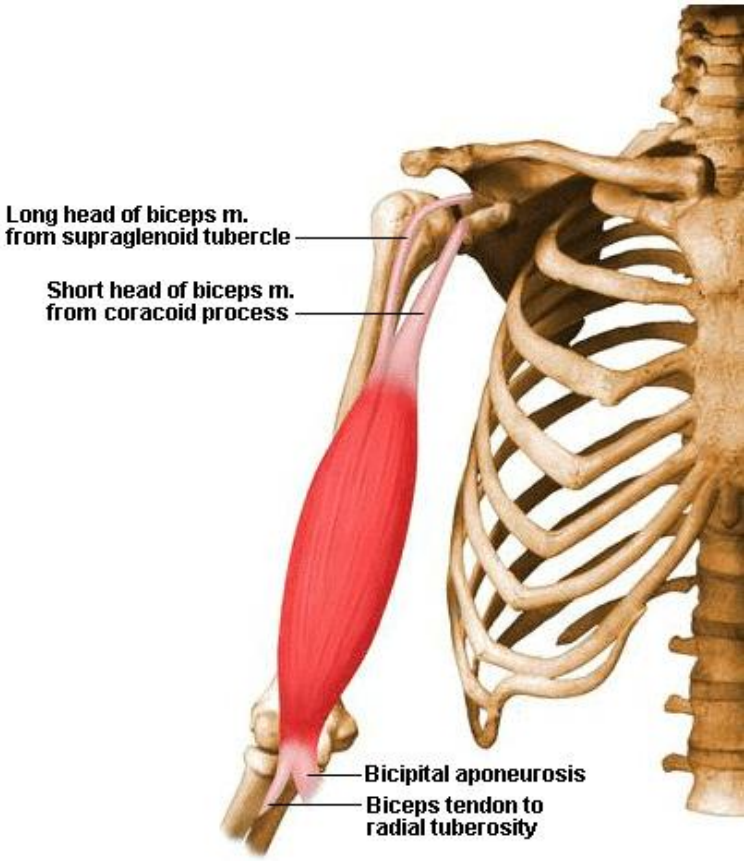
- Glenohumeral Muscles
  - Latissimus Dorsi
  - Pectoralis Major

Shoulder Anatomy



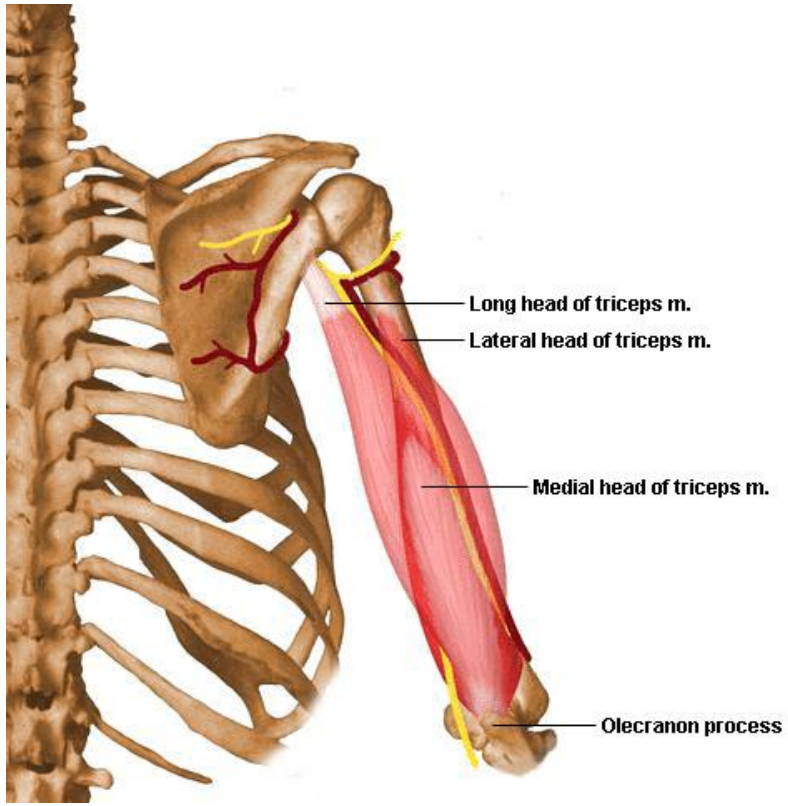
- Glenohumeral Muscles
  - Latissimus Dorsi
  - Pectoralis Major
  - Deltoid

Shoulder Anatomy

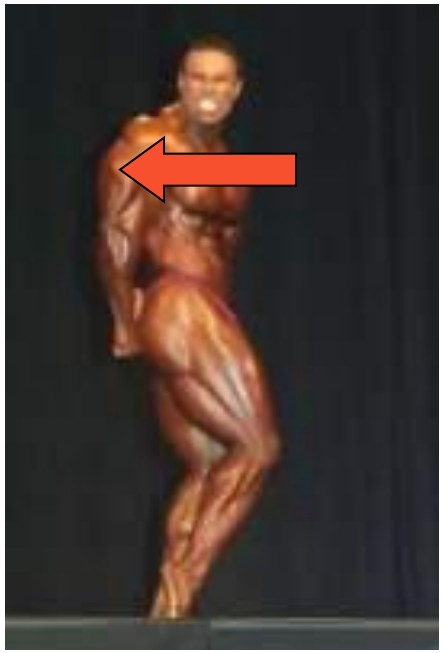


- Glenohumeral Muscles
  - Latissimus Dorsi
  - Pectoralis Major
  - Deltoid
  - Biceps

Shoulder Anatomy



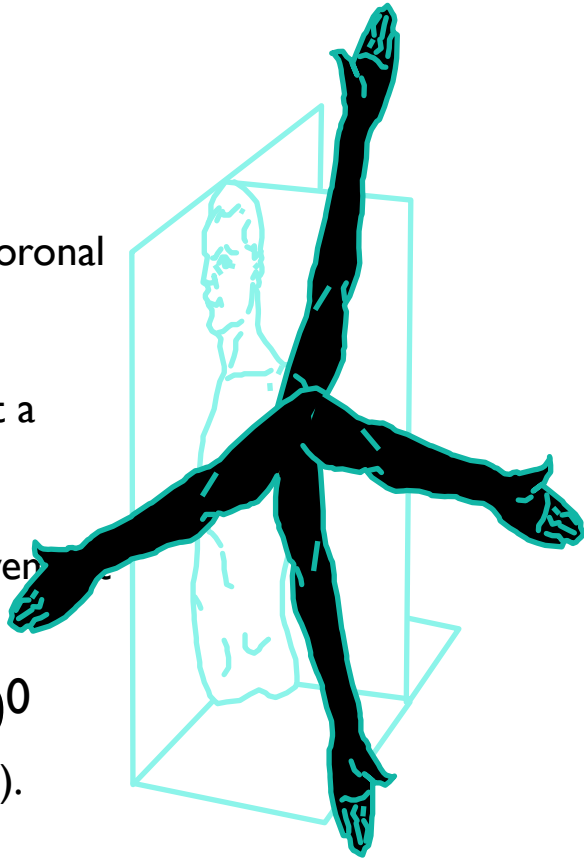
- Glenohumeral Muscles
  - Latissimus Dorsi
  - Pectoralis Major
  - Deltoid
  - Biceps
  - Triceps



Shoulder Motion

Combined Movements:

- Flexion -150 – 180^0 (movement about a coronal axis)
- Extension - 50 – 60^0 (movement about a coronal axis)
- Abduction -150 – 180^0 (movement about a sagittal axis)
- External/lateral rotation – 90^0 (movem about a longitudinal axis through the humerus).
- Internal/medial rotation - 70 – 90^0 (movement about a longitudinal axis through the humerus).
- Horizontal abduction
- Horizontal adduction



Shoulder Girdle Motion

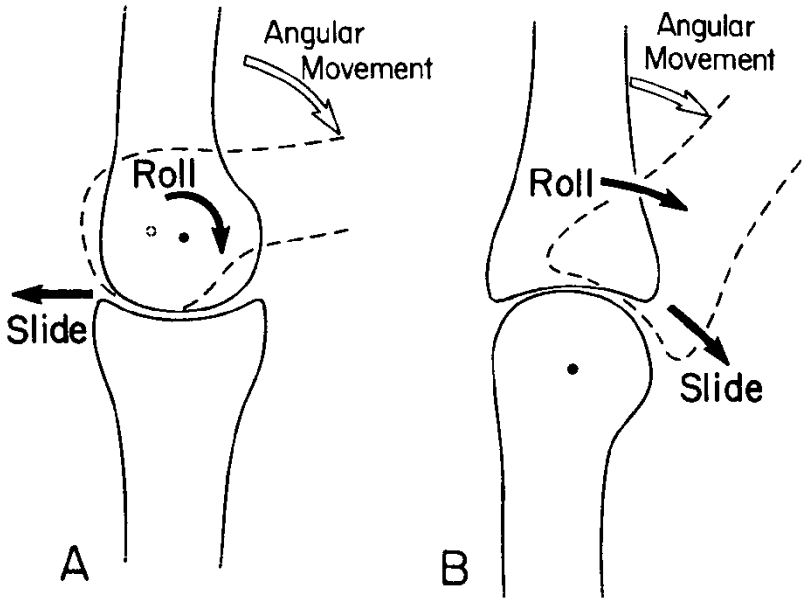
Coordinated Motion of:

- G-H joint
- A-C joint
- S-C joint
- S-T joint

Arthrokinematics of Glenohumeral Joint

Glenohumeral Motion

Convex - Concave Rule:



Glenohumeral Motion

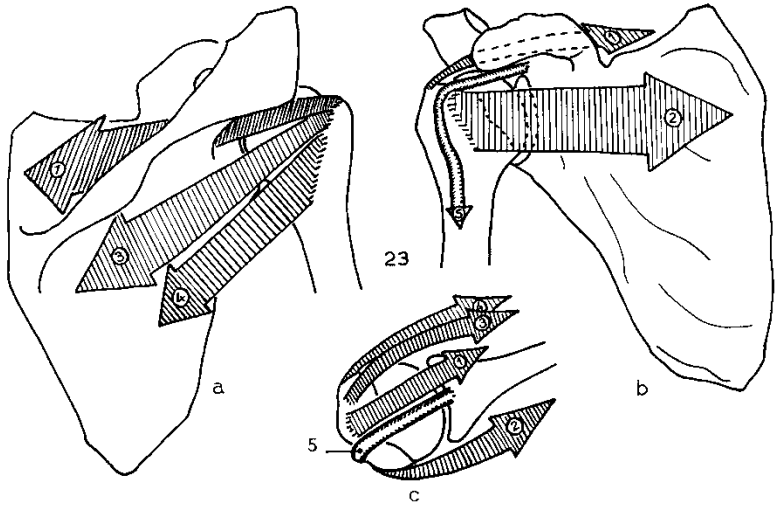
Arthrokinematics:

- Abduction
- Flexion
- Extension
- External rotation
- Internal rotation

Scapulohumeral Muscles

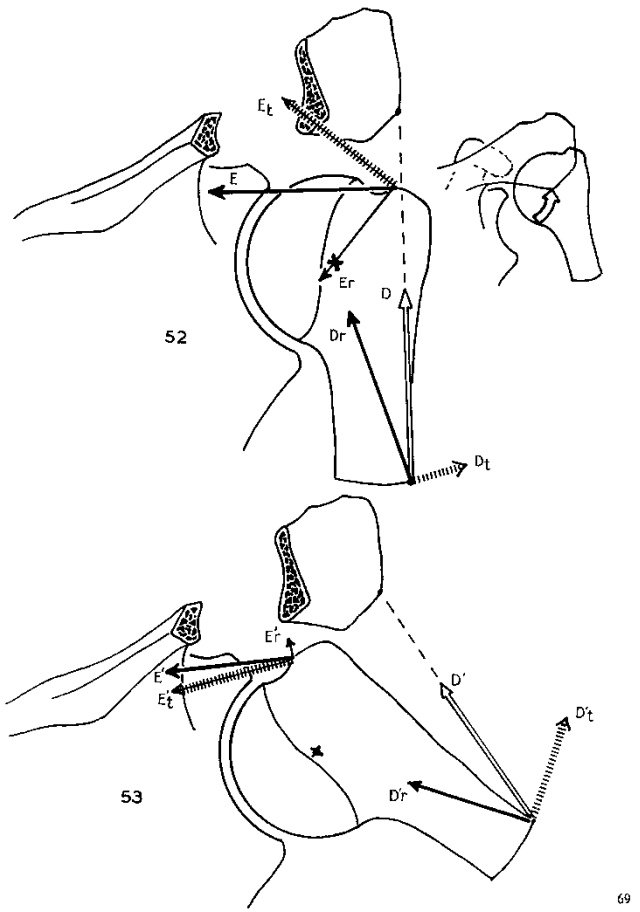
Rotator Cuff muscles:

- Subscapularis
- Supraspinatus
- Infraspinatus
- Teres Minor



Rotator Cuff Function

- Approximates humerus to function
- Supraspinatus assists deltoid in abduction
- Subscapularis, infraspinatus & teres minor depress humeral head

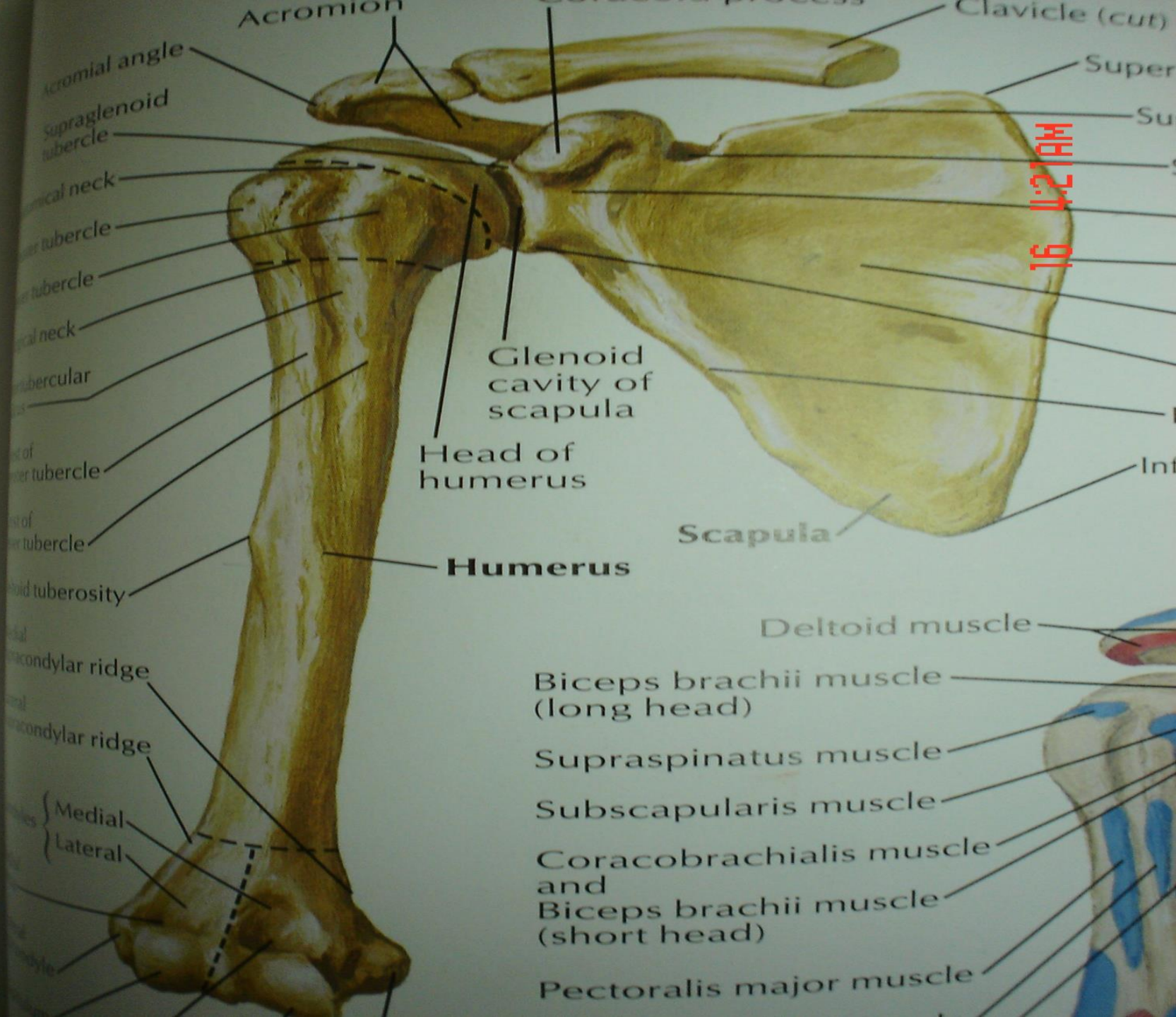


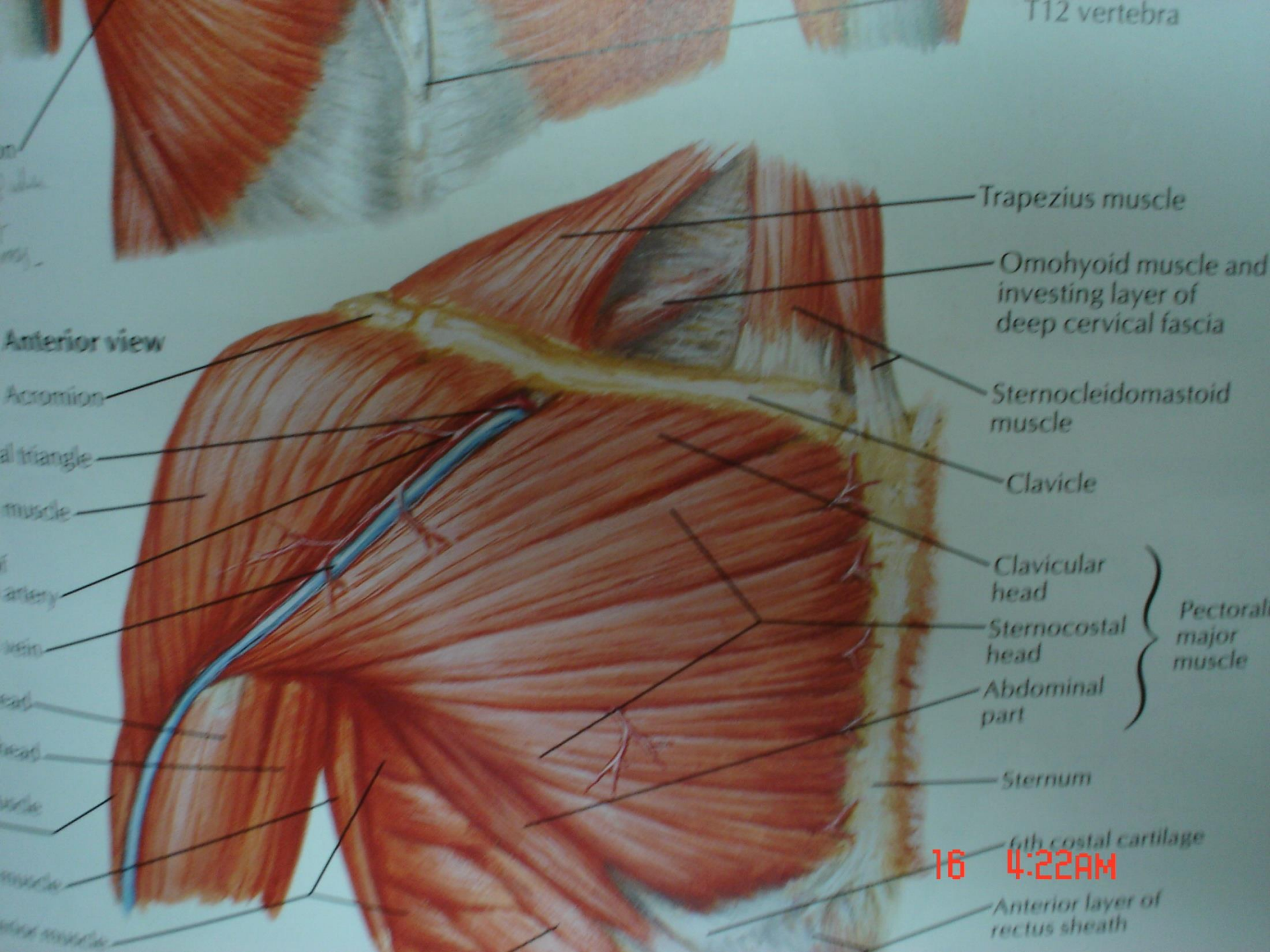
Rotator Cuff Function

- Supraspinatus:
  - abductor
  - external rotator
- Infraspinatus
  - external rotator
  - abductor
- Teres minor
  - external rotator
  - weak adductor
- Subscapularis
  - internal rotator
  - abductor

Laboratory

1. **Shoulder flexion**
2. **Shoulder extension**
3. **Shoulder Scaption, abduction**
4. **Shoulder horizontal abduction**
5. **Shoulder horizontal adduction**


Acromion
Clavicle (cut)
Acromial angle
Supraglenoid tubercle
Glenoid cavity of scapula
Head of humerus
Scapula
Humerus
Deltoid muscle
Biceps brachii muscle (long head)
Supraspinatus muscle
Subscapularis muscle
Coracobrachialis muscle and Biceps brachii muscle (short head)
Pectoralis major muscle
Medial
Lateral

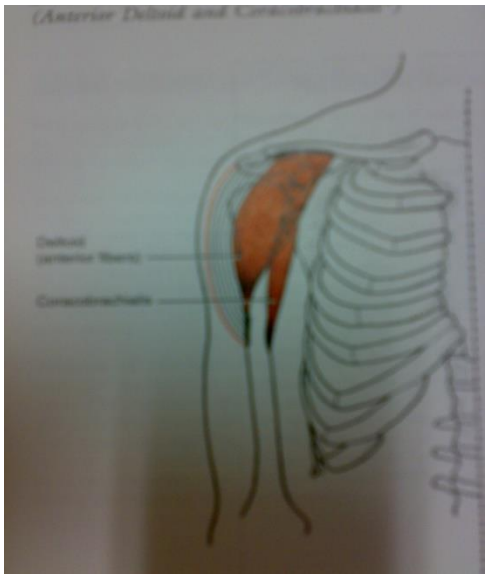

T12 vertebra
Trapezius muscle
Omohyoid muscle and investing layer of deep cervical fascia
Anterior view
Acromion
Sternocleidomastoid muscle
Clavicle
Clavicular head
Sternocostal head
Abdominal part
Pectoralis major muscle
Sternum
6th costal cartilage
Anterior layer of rectus sheath

Shoulder flexion

1. Prime mover/agonist:

	origin	insertion
Anterior Deltoid	clavicle (ant. Super of lat 1/3)	humerus (deltoid tuberosity)
Coracobrachialis	scapula (coracoid process)	humerus (shaft, medial surface of middle 1/3)

2. Synergist/ Accessory muscles:
   Pectoralis minor (upper), deltoid (middle), serratus anterior
3. Nerve supply:
   Deltoid →Axillary n.(C5-C6)
   Coracobrachialis →Musculocutaneous n.(C5-C7)
4. Range of motion:
   0 to 80 up to 90



Shoulder flexion

5. Fixation:

a. By Contraction of trapezius and serratus anterior muscles.

6. Effect of weakness/contracture/shortening:

Effect of weakness result in:

- Decrease the strength of shoulder flexors.

7. Factor limited range of motion:

a. Contact of greater tubercle and humerus with anterior surface of acromion.

b. Tension of shoulder extensor muscles.

8. Substitution:

by:

a. in the absence of a Deltoid the patient may attempt to flex the shoulder with the Biceps brachii by first externally rotating the shoulder then flex it.

b. the upper Trapezius results in shoulder elevation.

c. the Pectoralis major results in horizontal adduction.

d. the patient may lean backward or try to elevate the shoulder girdle to assist in flexion.

Shoulder flexion

9. Procedures:

a- observation for the shoulder and scapula position:

At Rest and with motion.

b- patient position (pt):

c- Therapist Position:

inner hand:

Outer hand: Direction of Resistance :

Instruction to patient:

c- grading system:

Normal(5), Good(4), Fair(3), Poor(2), Trace(1), Zero(0)

make sure patient tolerates maximal resistance plus hold 3 sec.

e. Palpation site:

Shoulder extension

1. **Prime mover/agonist:**

	origin	insertion
Latissimus dorsi	from T6-T12, L1-L5, and sacral vert Spinous process ilium (iliac crest posterior)	humerus (intertubercular sulcus)
Deltoid (posterior fiber)	scapula (spine on lower lip of lat and post borders)	humerus (deltoid tuberosity)
Teres major	scapula (dorsal surface of inferior angle)	humerus (intertubercular sulcus)

2. Synergist/ Accessory muscles:

   Triceps brachii (long head).

3. Nerve supply:

   Latissimus dorsi → Thoracodorsal n.(C6-C8)

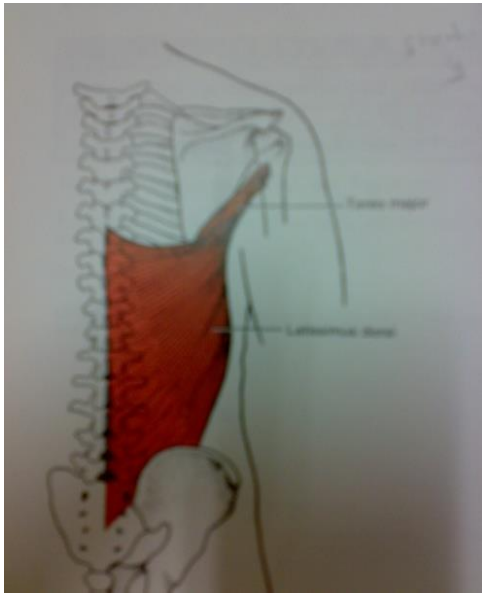
   Deltoid → Axillary n. (C5-C6)

   Teres major → Subscapular n.(C5-C6)

4. Range of motion:

from 90 to 0 from prone lying position (pure shoulder extension)

from 0 to 45 up to 60 is hyperextension



Shoulder extension

5. Fixation:

   a. By contraction of rhomboideus major and minor, and trapezius muscles.

   b. By weight of trunk.

6. Effect of weakness/contracture/shortening:

   Effect of weakness result in:

   - Weakness of latissimus dorsi result in: diminishing the strength of shoulder extension and lateral trunk flexion.

   - Weakness of teres major result in: diminishing the strength shoulder extension and medial rotation.

7. Factor limited range of motion:

   a. Tension of shoulder flexor muscles.

   b. Contact of greater tubercle and humerus with acromion posteriorly.

8. Substitution:

   by Rhomboids (scapula adduction and downward rotation)

   inferior angle will move medially.

Shoulder extension

9. Procedures:

a- observation for a shoulder position: At Rest and with motion.

b- patient position (pt):

c- Therapist Position:

inner hand:

Outer hand: Direction of Resistance :

Instruction to patient:

c- grading system:

Normal(5), Good(4), Fair(3), Poor(2), Trace(1), Zero(0)

make sure patient tolerates maximal resistance plus hold 3 sec.

e. Palpation site:

Shoulder abduction/ Scaption

1. Prime mover/agonist:

	origin	insertion
Deltoid (medial fibers)	scapula (crest of spine and acromium)	humerus (deltoid tuberosity)
Supraspinatus	scapula(supraspinatus fascia)	humerus (greater tubercle)

2. Synergist/ Accessory muscles:

   None

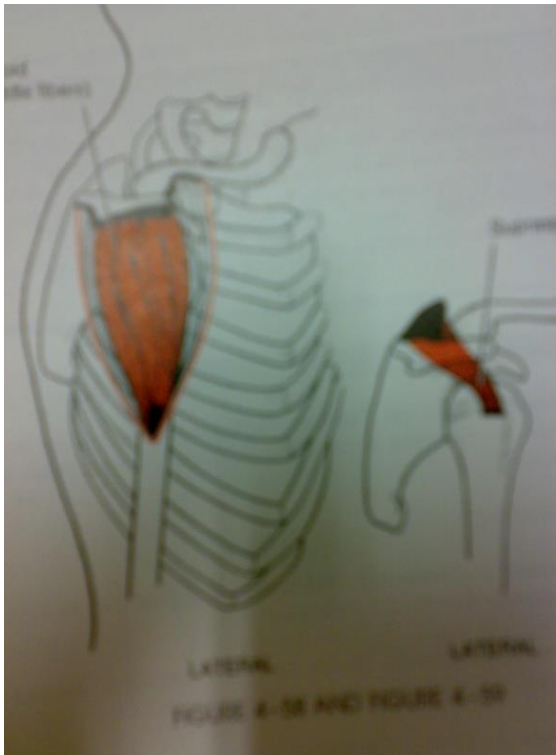
3. Nerve supply:

   Deltoid → Axillary n.(C5-C6)

   Supraspinatus → Suprascapular n. (C5-C6)

4. Range of motion:

   from 0° to 170° (0° to 90° is pure abduction- then surgical neck will impact with glenoid cavity so to do up to 180° the arm must lateral rotate).



Shoulder abduction

5. Fixation:

   a. By contraction of trapezius and serratus anterior muscles.

6. Effect of weakness/contracture/shortening:

   Effect of weakness result in:

   - Weakness of Deltoid results in: inability to lift arm in abduction.
   - **Paralysis** of Deltoid tends to **sublax** the shoulder **downward**.
   - Weakness of supraspinatus or rupture of its tendon: decreases the shoulder joint stability.

7. Factor limited range of motion:

   a. Contact of greater tubercle and humerus with lateral surface of acromion.

   b. Tension of shoulder adductor muscles.

8. Substitution:

   None.

Shoulder abduction

9. Procedures:

a- observation for a shoulder position: At Rest and with motion.

b- patient position (pt):

c- Therapist Position:

inner hand:

Outer hand: Direction of Resistance :

Instruction to patient:

c- grading system:

Normal(5), Good(4), Fair(3), Poor(2), Trace(1), Zero(0)

make sure patient tolerates maximal resistance plus hold 3 sec.

e. Palpation site:

Shoulder horizontal abduction

1. Prime mover/agonist:

	origin	insertion
Deltoid (posterior fibers)	scapula (spine)	humerus (deltoid tuberosity)

2. Synergist/ Accessory muscles:

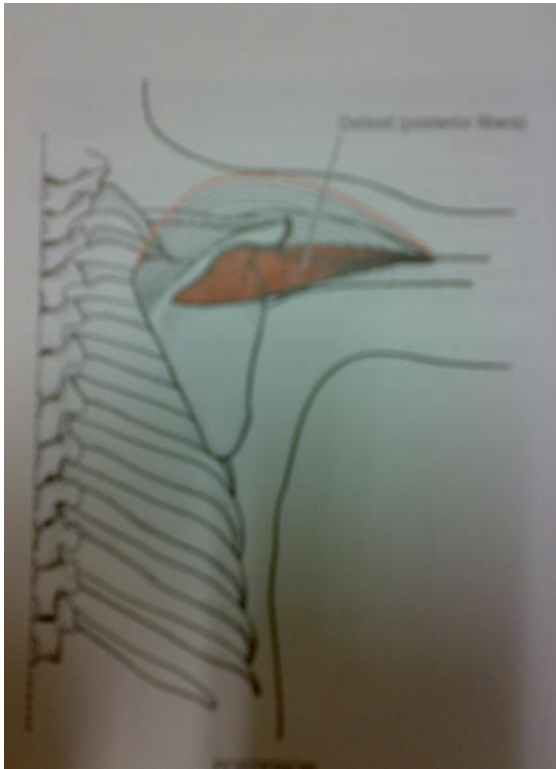
   infraspinatus and teres minor.

3. Nerve supply:

   Deltoid →Axillary n.(C5-C6)

4. Range of motion:

   measure the distance between spine process of vertebra and vertebra border of scapula



Shoulder horizontal abduction

5. Fixation:

a. By contraction of rhomboid major and minor, and trapezius muscles.

6. Effect of weakness/contracture/shortening:

Effect of weakness result in:

- Inability to perform horizontal abduction of the shoulder against gravity.

7. Factor limited range of motion:

a. Tension of anterior fibers of capsule of glenohumeral joint.

b. Tension of pectoralis major and deltoid (anterior fibers) muscles.

8. Substitution:

by triceps brachii (long head).

Shoulder horizontal abduction

9. Procedures:

a- observation for a shoulder position: At Rest and with motion.

b- patient position (pt):

c- Therapist Position:

inner hand:

Outer hand: Direction of Resistance :

Instruction to patient:

c- grading system:

Normal(5), Good(4), Fair(3), Poor(2), Trace(1), Zero(0)

make sure patient tolerates maximal resistance plus hold 3 sec.

e. Palpation site:

Shoulder Horizontal Adduction

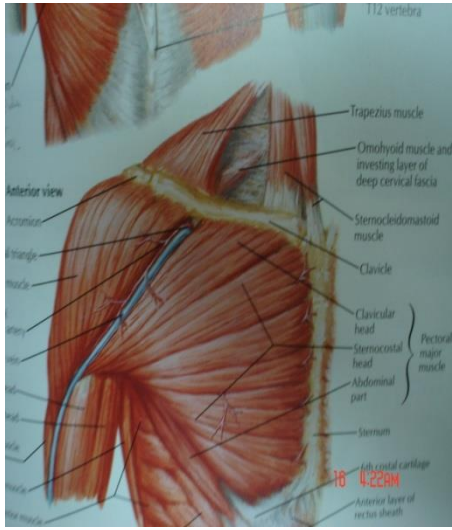
1. **Prime mover/agonist:**

	origin	insertion
Pectoralis Major		
clavicular part	**clavicle** (ant surface)	**humerus** (intertubercular sulcus, lat lip).
sternal part	**sternum** (ant surface)	**humerus** (intertubercular sulcus, lat lip).

2. **Synergist/ Accessory muscles:**
   Deltoid (anterior fibers)
3. Nerve supply:
   clavicular part: Lateral Pectoral n.(C5-C6)
   sternocostal part: Medial pectoral n.(C6-T1)
4. **Range of motion:**
   0 to 130°

- when starting with the arm in a position of 90 of foreword flexion. 0 to 40°.

- when starting with the arm in full horizontal abduction: 0 to130° -passing across the midline.



Shoulder Horizontal Adduction

5. **Fixation**:

   a. In forceful horizontal adduction, Contraction of oblique external abdominal muscle on same side.

6. **Effect of weakness/contracture/shortening:**

   Effect of weakness result in:

   - Inability to perform shoulder horizontal adduction

7. **Factor limited range of motion:**

   a. Tension of shoulder extensor muscles and horizontal abductor muscle.

   b. Contact of arm with trunk.

8. **Substitution**:

   None.

Shoulder Horizontal Adduction

9. Procedures:

a- observation for a shoulder position: At Rest and with motion.

b- patient position (pt):

1. clavicular part → 60° shoulder abduction

2. sternocostal part → 120° shoulder abduction

c- Therapist Position:

inner hand:

Outer hand: **Direction of Resistance :**

Instruction to patient:

c- grading system:

Normal(5), Good(4), Fair(3), Poor(2), Trace(1), Zero(0)

make sure patient tolerates maximal resistance plus hold 3 sec.

e. Palpation site:

Thank You