

# Musculoskeletal system

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# Course contents

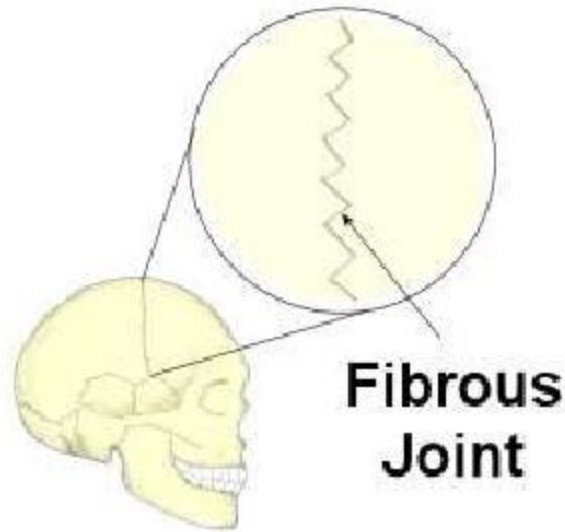
- Definition of joints
- Classification of joint
- Type of synovial joint
- Function of joint
- Characteristics of synovial joint
- Definition of ligaments, tendon and cartilage
- Types of cartilage and its function
- Definition of muscles
- Types of muscle
- Some important muscles of the body

# THE JOINTS

A **Joint** is the point where two or more bones meet. There are three main types:

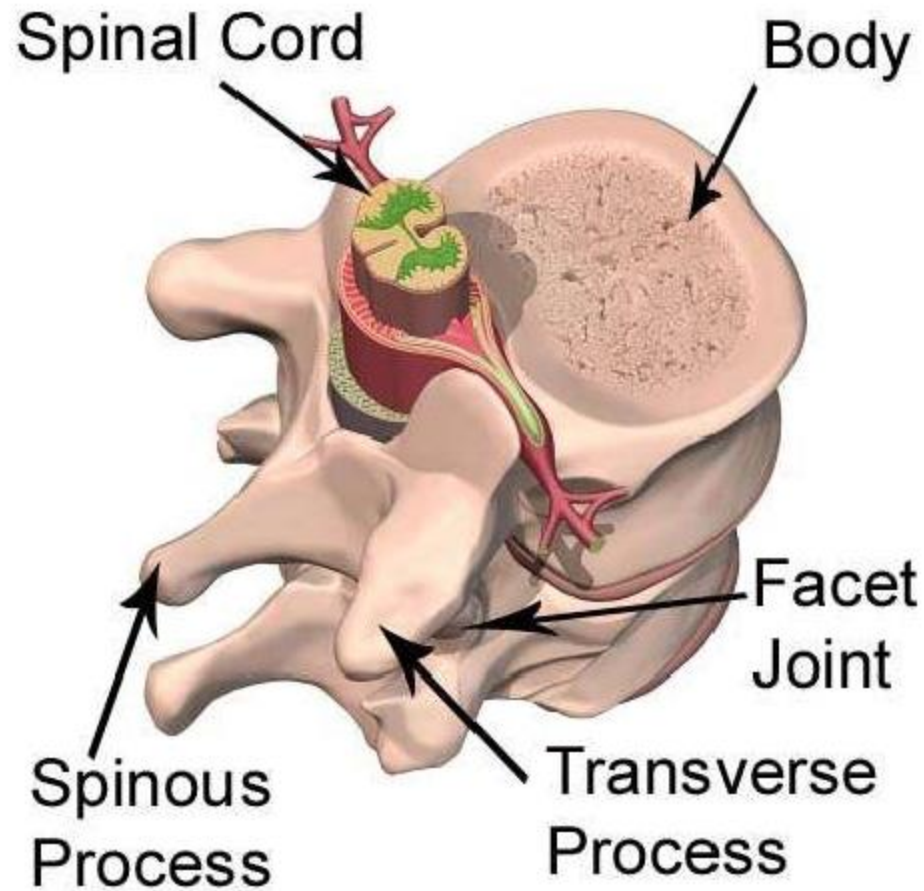
- ✓ **Fibrous** (immoveable)- Eg:-Skull Joint.
- ✓ **Cartilagenous** (partially moveable)-  
Eg:- Intervertebral disc of spinal column.
- ✓ **Synovial** (freely moveable) joint.

# FIBROUS JOINT



This type of joint is held together by only a ligament.

# CARTILAGENOUS JOINT



# SYNOVIAL JOINT

There are six types of synovial joints:

- 1) Pivot joint,
- 2) Ball-and-socket joint,
- 3) Hinge joint,
- 4) Condyloid joint,
- 5) Saddle joint,
- 6) Gliding joint.

# SYNOVIAL JOINT

- **Pivot joint**

Enables rotation around a lengthwise axis: the cylindrical terminal part of a bone is encased in a hollow cylinder. Examples include the tibia and the fibula.

- **Ball-and-socket joint**

Allows movement along three axes, such as in the shoulder: flexion and extension, rotation, and adduction (arm drawing near the trunk) and abduction (arm drawing away from the trunk). Eg:- Shoulder and Hip Joint.

- **Hinge joint**

Enables flexion and extension along a single axis. Eg:- Elbow, Knee, Ankle joint.

- **Condylloid joint**

An example is the wrist, which the hand can move on two axes: flexion and extension; it can also be tilted sideways. Eg:- Wrist joint.

- **Saddle joint**

Resembles the condylloid joint but allows a wider range of motion; this type of joint is rare. Eg:- Thumb.

- **Gliding joint**

Surfaces of these joints are relatively flat and not very mobile; they allow only a narrow gliding range.

Eg:- Vertebrae, certain bones of the wrist and ankle).



# THE TENDONS

- A **Tendon** is a tough but flexible structure made of fibrous tissue that joins a bone to a muscle.
- When a muscle contracts it pulls on a bone to cause movement. The tendon transmits the force from the muscle to the bone.
- The **tendonitis** is the inflammation of a tendon.

## **Function of Joints :**

- Connects bones together
- Allow the skeleton to move
- Bear weight

**Synovial joints:** Joint in which the articulated bones are separated by a fluid filled joint cavity and permit free bone movement are called synovial joint

## **Characteristics/features of synovial joints**

- A layer of articular cartilage, usually hyaline cartilage, covers the articular surface of the opposing bone ends
- Presence of a joint capsule consisting of an inner synovial membrane and an outer fibrous membrane
- The capsule encloses the joint cavity, which is a narrow cavity around the bone ends. This is also called articular cavity

- The joint cavity contains lubricant synovial fluid secreted by synovial membranes.
- Presence of additional structures within the joint cavity, such as articular discs, meniscus
- Reinforcing ligaments: a number of band like ligaments that blend with the capsule provide additional stability at most synovial joints,
- Varying degrees of movements are allowed at synovial joints.

# Synovial joint

Bone

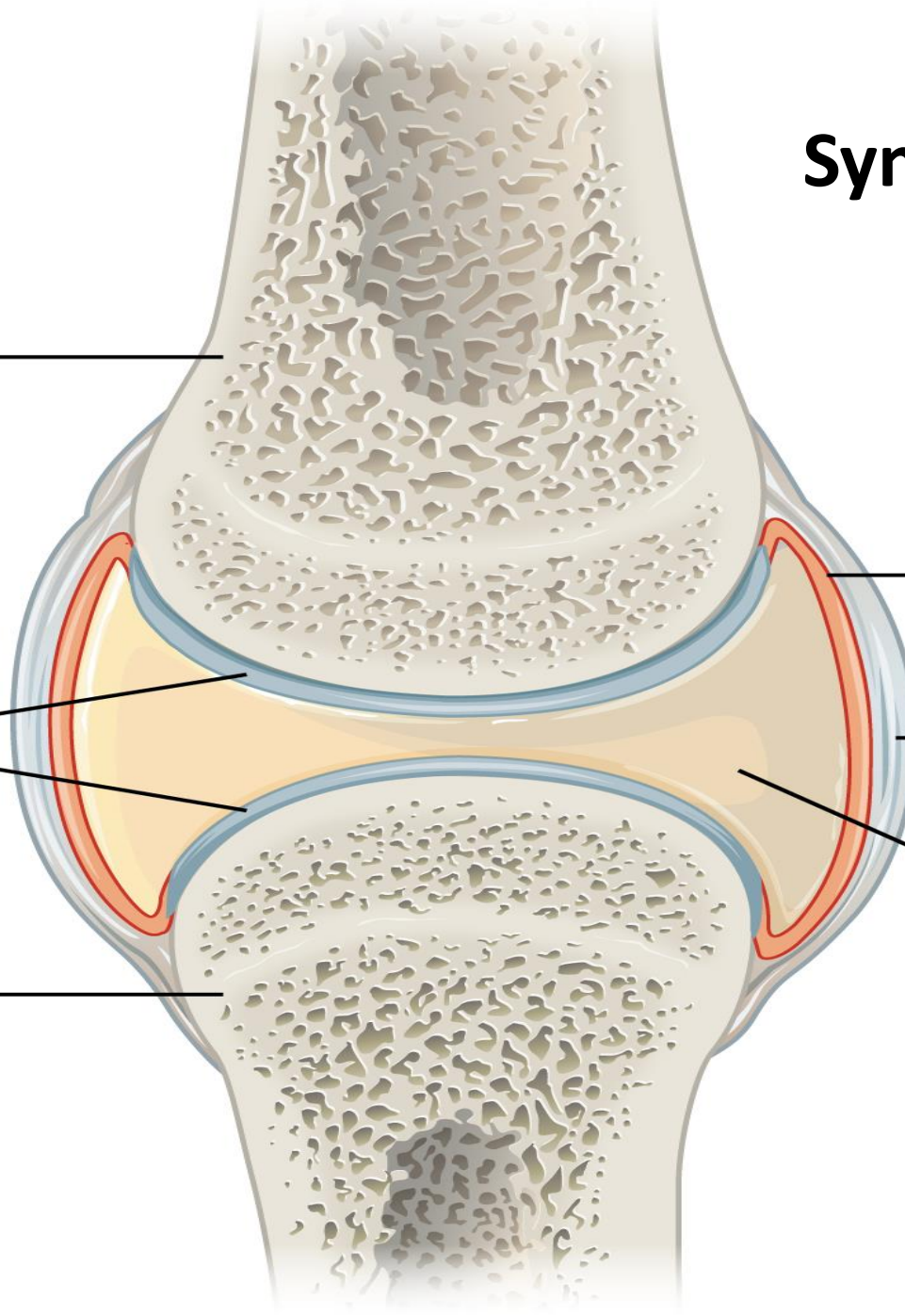
Articular  
cartilage

Bone

Synovial  
membrane

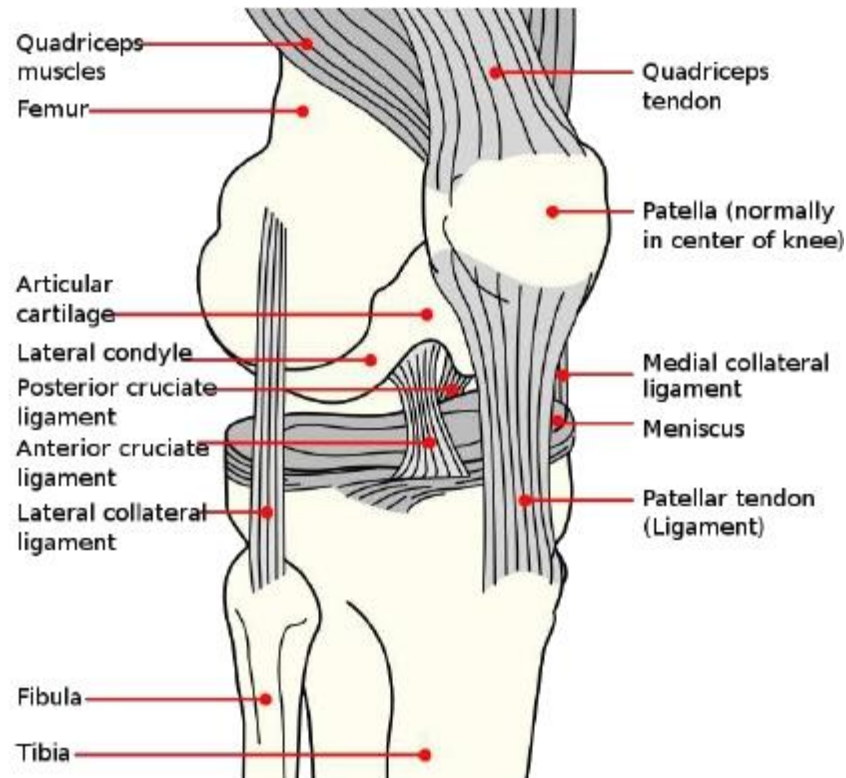
Articular  
capsule

Joint cavity  
containing  
synovial fluid



# THE LIGAMENTS

**Ligaments** are bands of connective tissues that link two or more bones to make joints stable and prevent from excessive movements.



# **CARTILAGE**

Cartilage is a specialized form of connective tissue

Mesodermal in origin

## Types Of Cartilage

3 types:

1. Hyaline cartilage
2. Yellow Elastic cartilage
3. White Fibro cartilage

Examples of Hyaline Cartilage: It is located throughout the body in places such as

- the ends of bones at many joints
- part of the nose
- the rings of the trachea
- bronchial tubes.

It is also the type of cartilage that makes up a great deal of the thoracic cage and the entire fetal skeleton



Examples of Elastic cartilage - elastic cartilage can be found is in :

- the external part of the ear and
- the epiglottis

## **Examples of fibrocartilage**

- The intervertebral discs of the spinal column
- the meniscus cartilage of the knee
- the cartilage of the symphysis pubis joint

## **Cartilage functions to:**

- (1) support the body
- (2) provide a framework
- (3) provide attachment sites for muscles
- (4) protect underlying tissues

# The Muscular System

The **muscular system** is an organ system consisting of skeletal, smooth, and cardiac muscle. It permits movement of the body, maintains posture, and circulates blood throughout the body.

The muscular systems in vertebrates are controlled through the nervous system

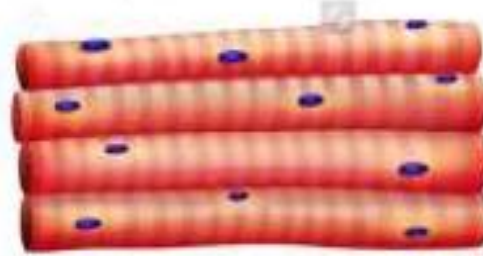
Together with the skeletal system in the human, it forms the musculoskeletal system, which is responsible for the movement of the body.

# TYPES OF MUSCLES

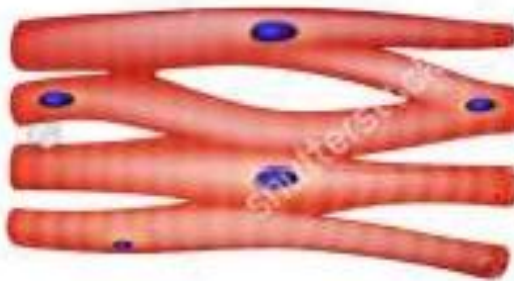
There are three types of muscles:

- Skeletal Muscle
- Cardiac Muscle
- Smooth Muscle

## Types of Muscle Cells



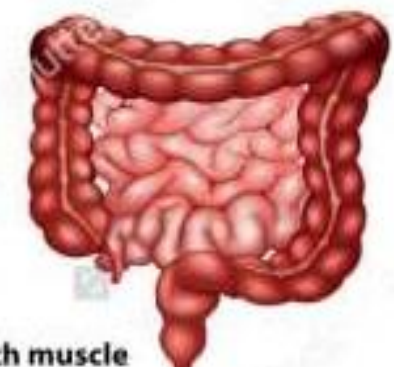
skeletal muscle

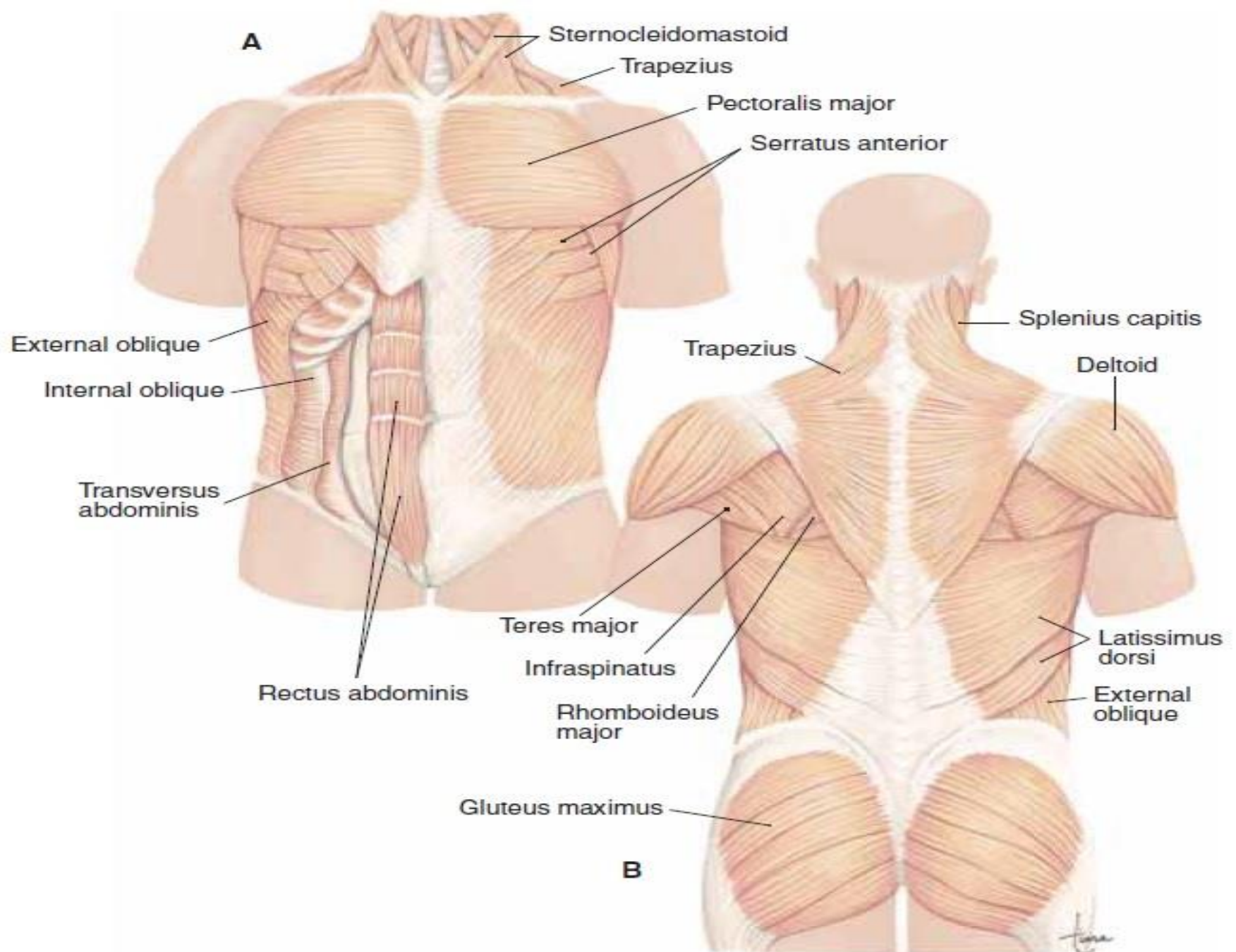


cardiac muscle

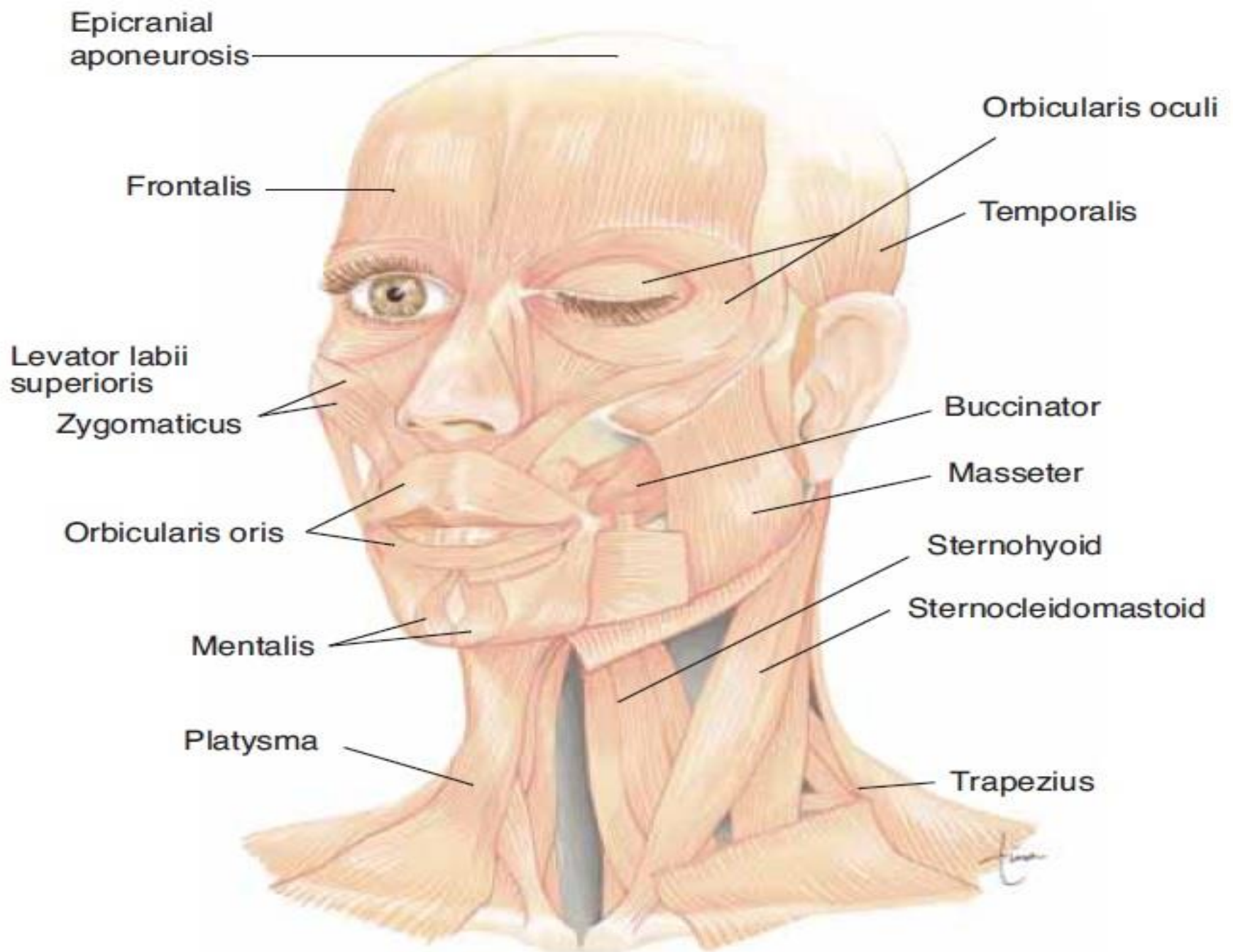


smooth muscle



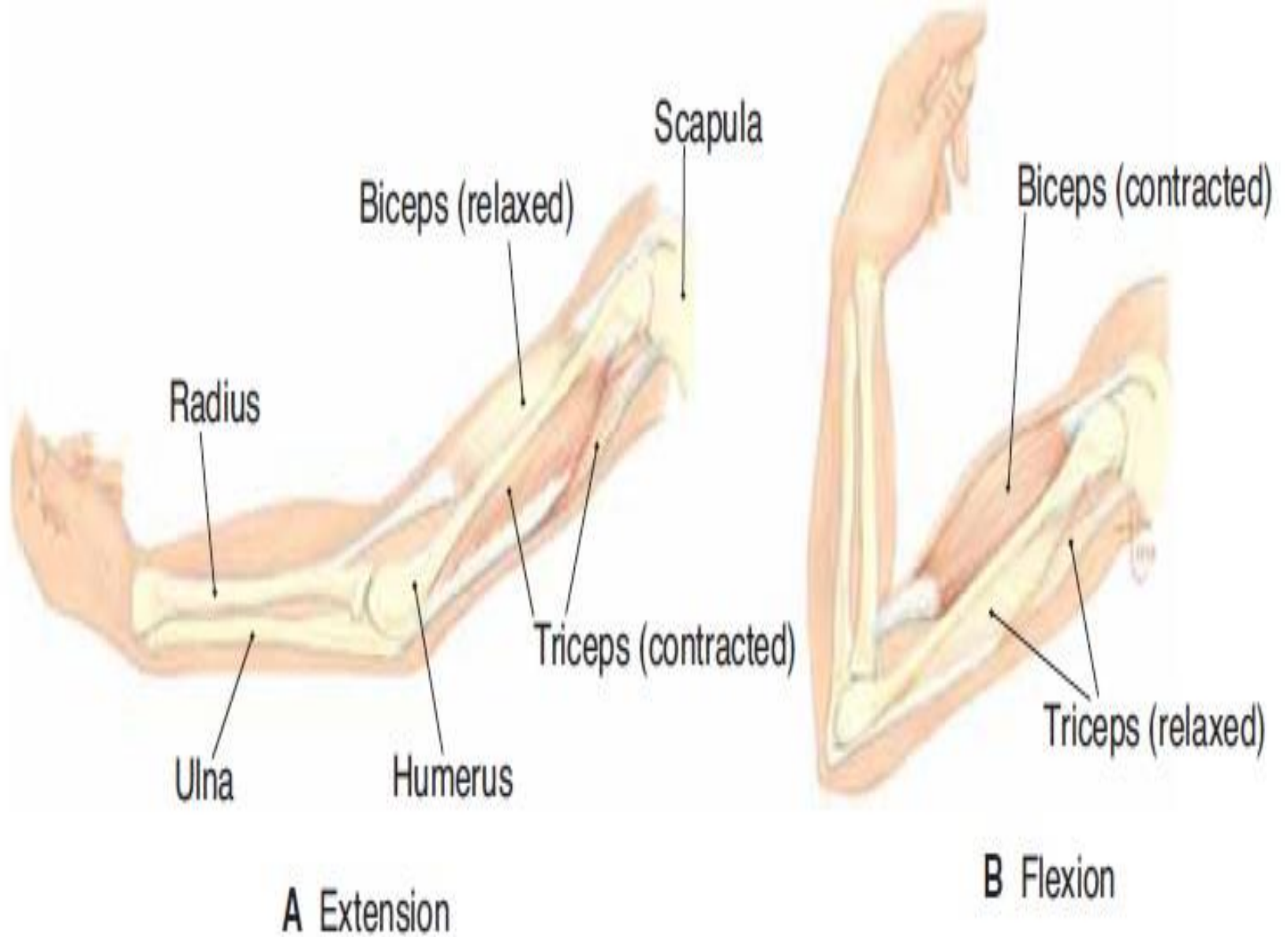


Muscles of the trunk anterior & posterior view

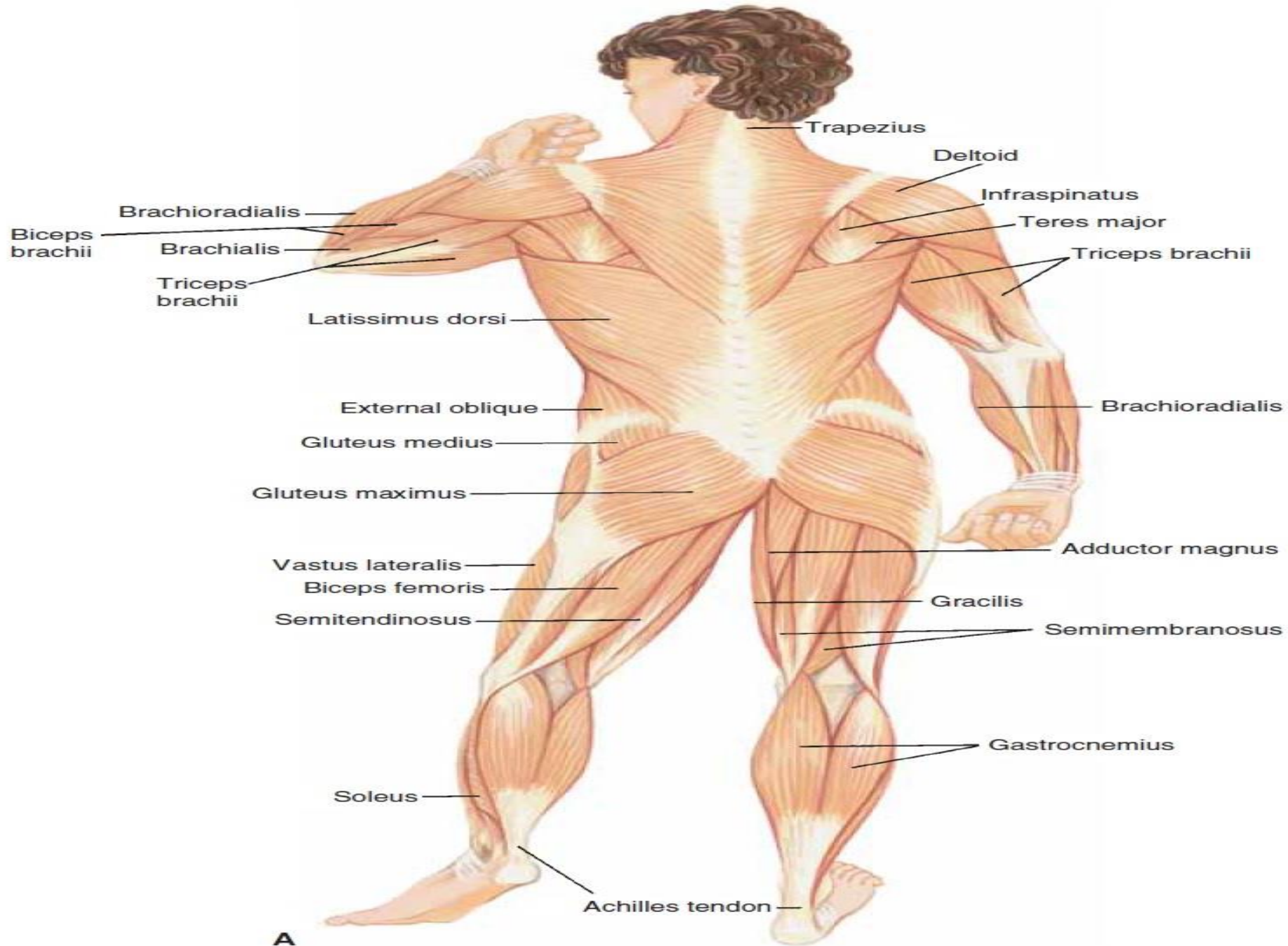


Muscles of the head & neck in anterior & left lateral view



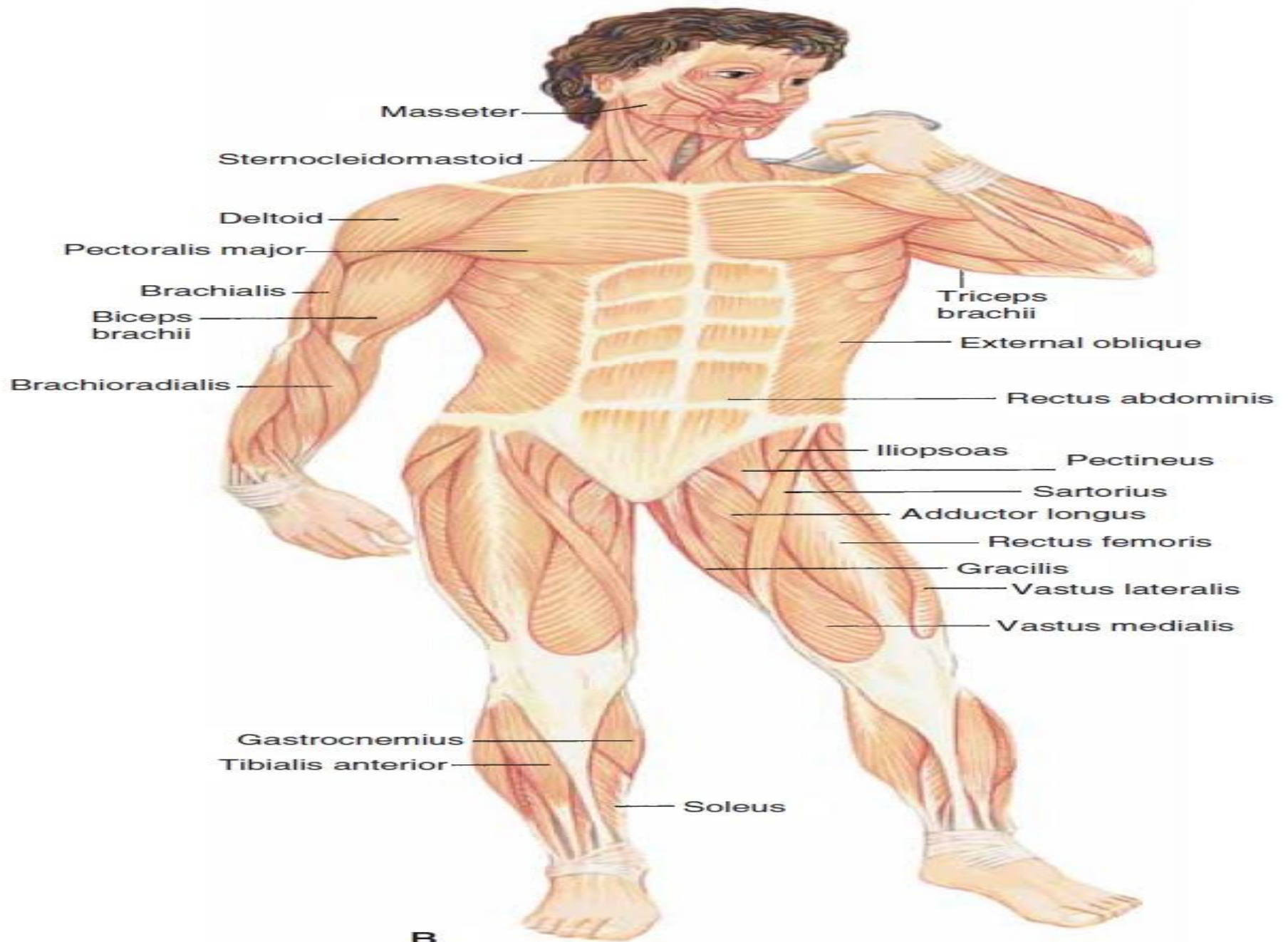


## Muscles of the upper arm



**A**  
Major muscles of the the body posterior view





Major muscles of the the body anterior view

## **Major functions of the muscular system:**

**1. Movement of the body.** Contraction of skeletal muscles is responsible for the overall movements of the body, such as walking, running, and manipulating objects with the hands.

**2. Maintenance of posture.** Skeletal muscles constantly maintain tone, which keeps us sitting or standing erect

**3.Respiration.** Muscles of the thorax carry out the movements necessary for respiration.

4.Production of body heat. When skeletal muscles contract,heat is given off as a by-product. This released heat is critical to the maintenance of body temperature

**5. Communication.** Skeletal muscles are involved in all aspects of communication, including speaking, writing, typing, gesturing, and facial expressions.

**6.Constriction of organs and vessels.** The contraction of smooth muscle within the walls of internal organs and vessels causes those structures to constrict. This constriction can help propel and mix food and water in the digestive tract, propel secretions from organs, and regulate blood flow through vessels.

**7.Contraction of the heart.** The contraction of cardiac muscle causes the heart to beat, propelling blood to all parts of the body

# **Characteristics Of Skeletal Muscle.**

- 1.Contractility
- 2.Excitability
- 3.Extensibility
- 4.Elasticity

# MUSCLES OF THE TRUNK AND EXTREMITIES

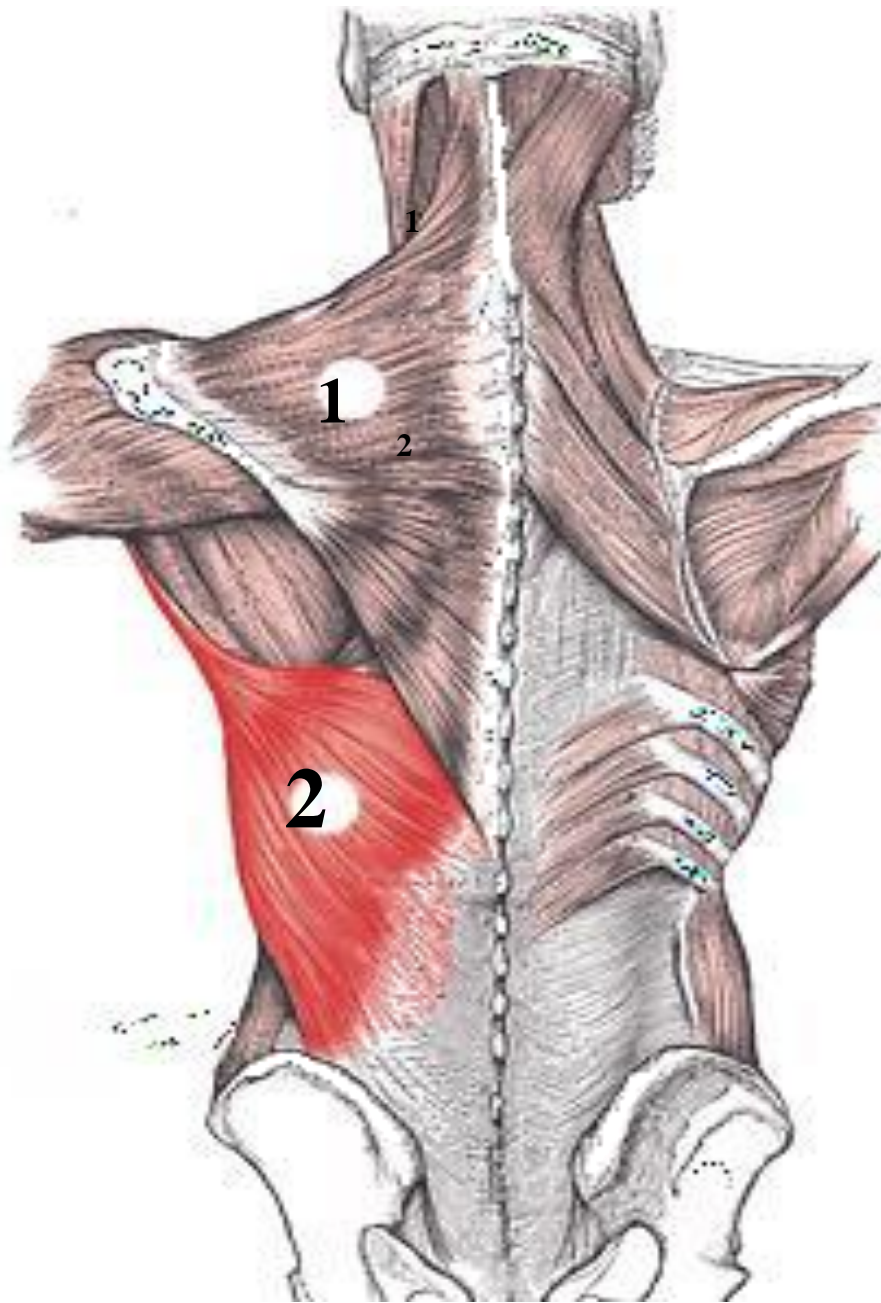


# BACK MUSCLES

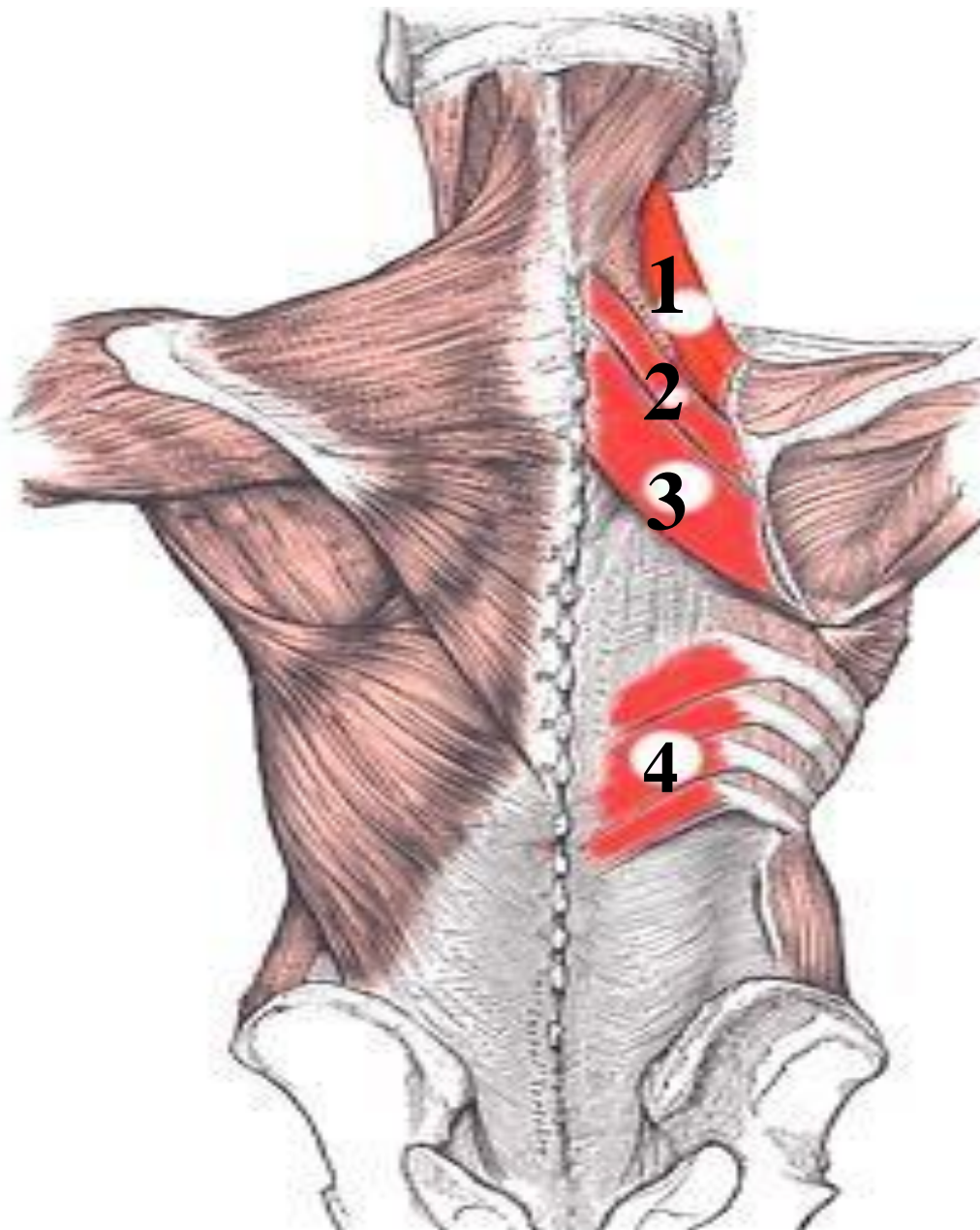
**Fig. 1. The superficial back muscles.**

1 - trapezius

2 – latissimus dorsi.







**Fig. 2. The intermediate back muscles.**

- 1 – levator scapulae;
- 2 – rhomboid minor;
- 3 – rhomboid major;
- 4 – serratus posterior inferior.



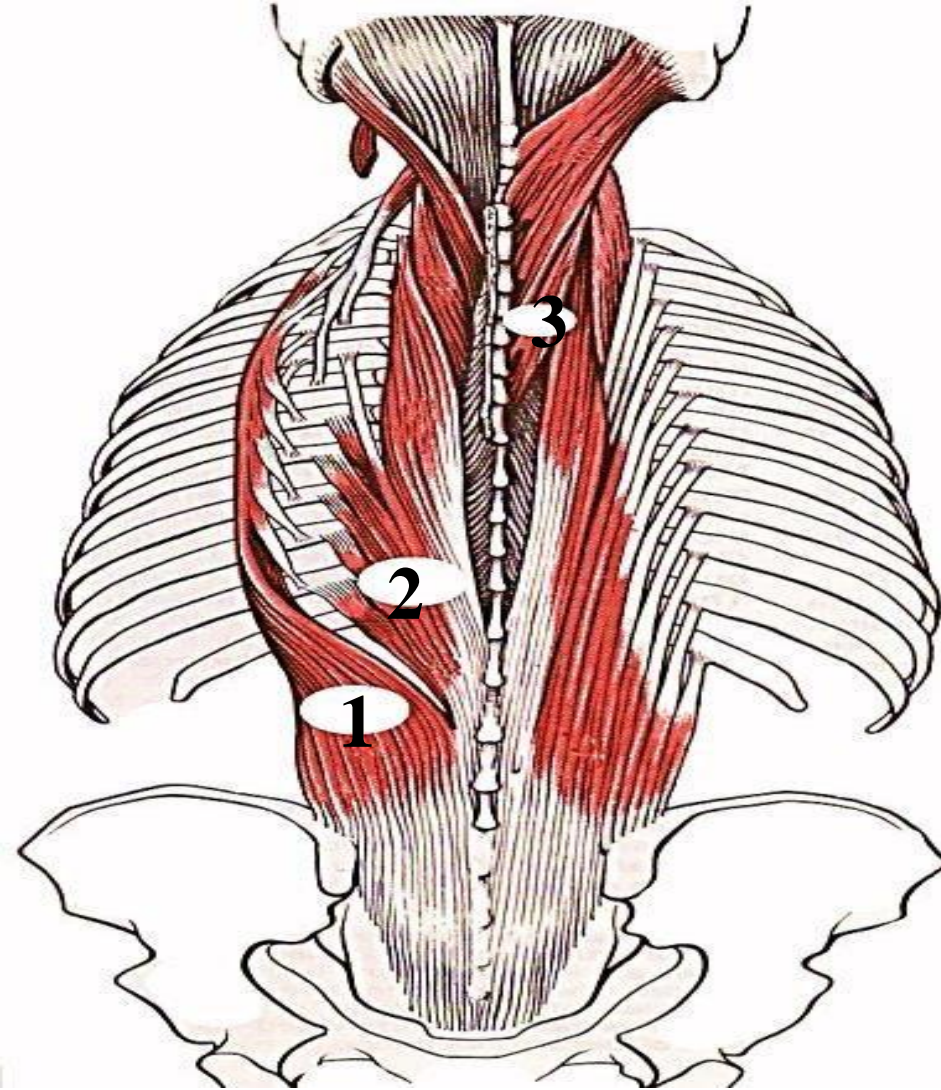
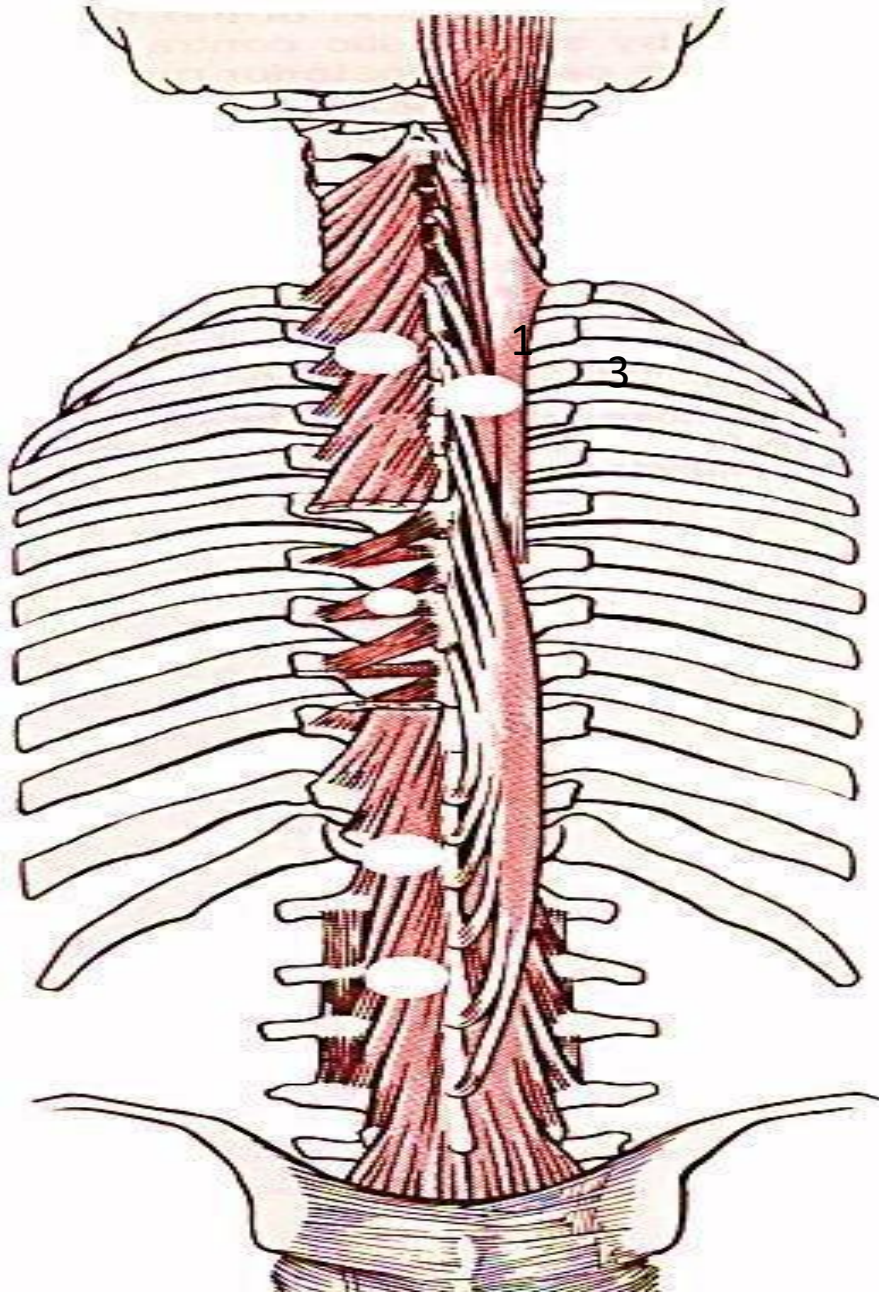


Fig. 3. Deep muscles of the back.Lateral tract.

1– ilicostalis;  
2– longissimus;  
3– spinalis.



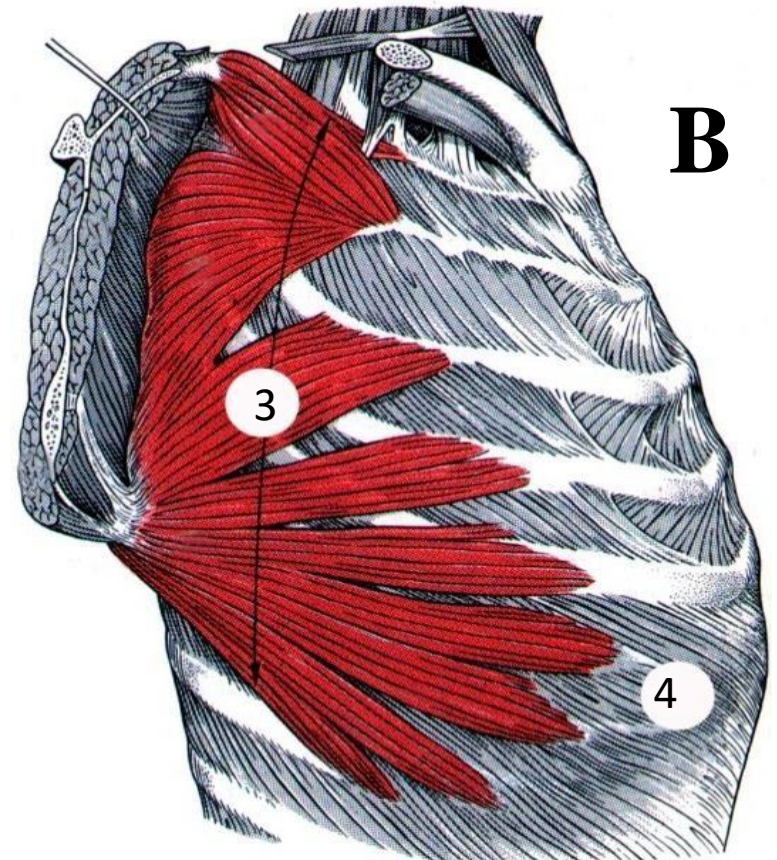
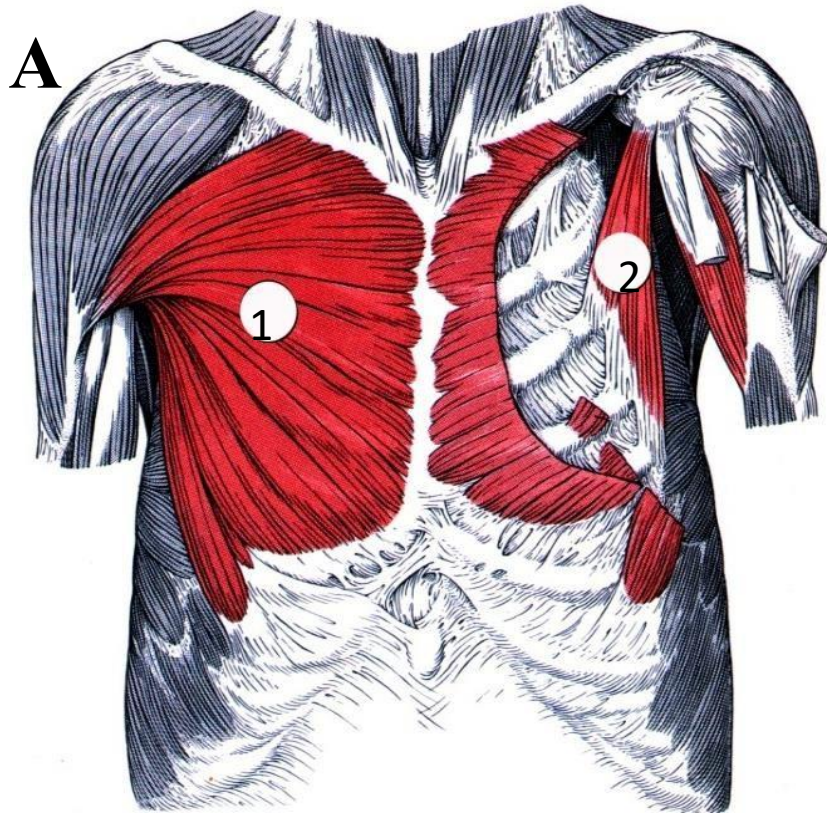
## **Deep muscles of the back.**

1– multifidus

2– rotatores

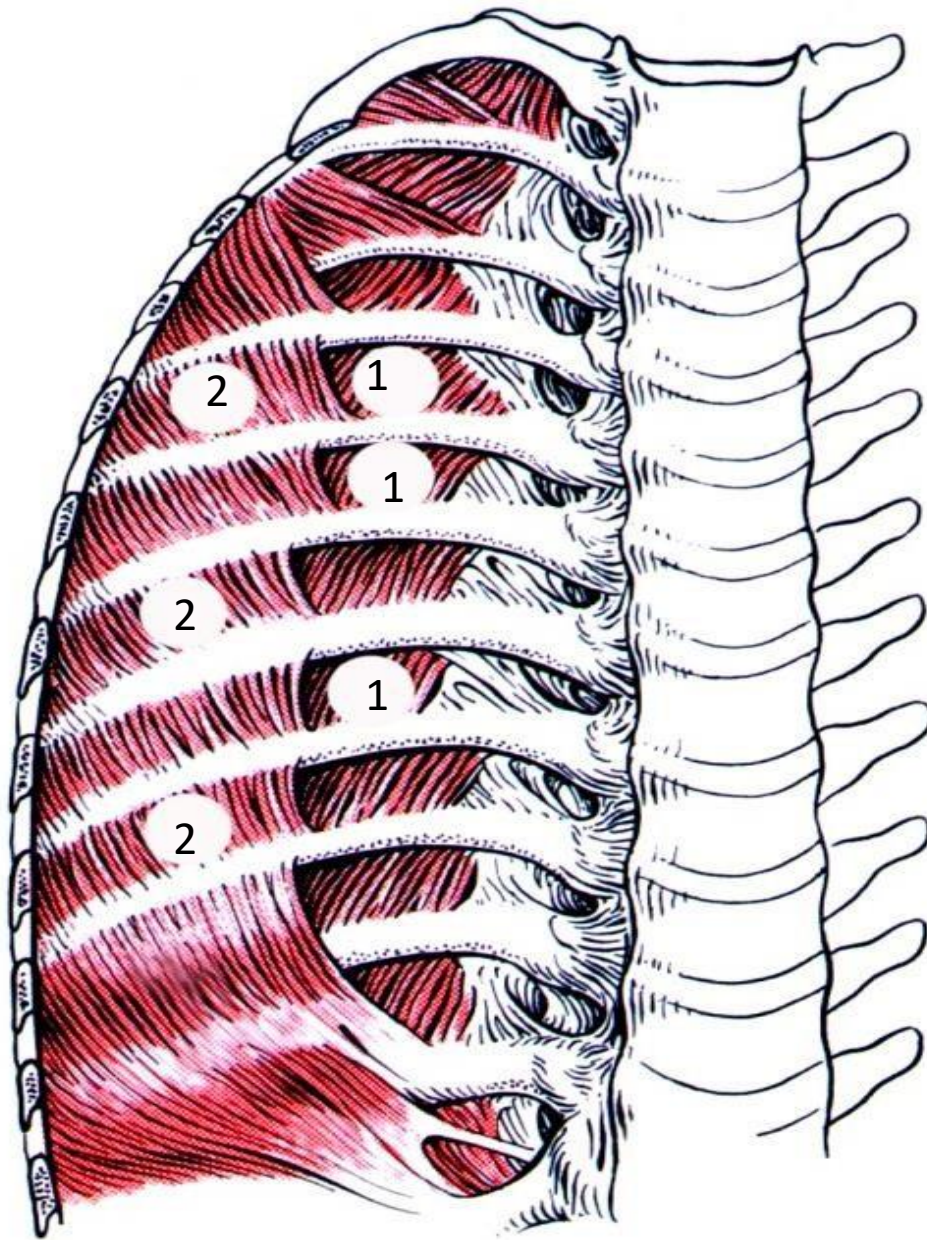
3– semispinalis





## Muscles of the chest

- 1 - pectoralis major
- 2 - pectoralis minor
- 3 - serratus anterior
- 4 - obliquus externus abdominis.



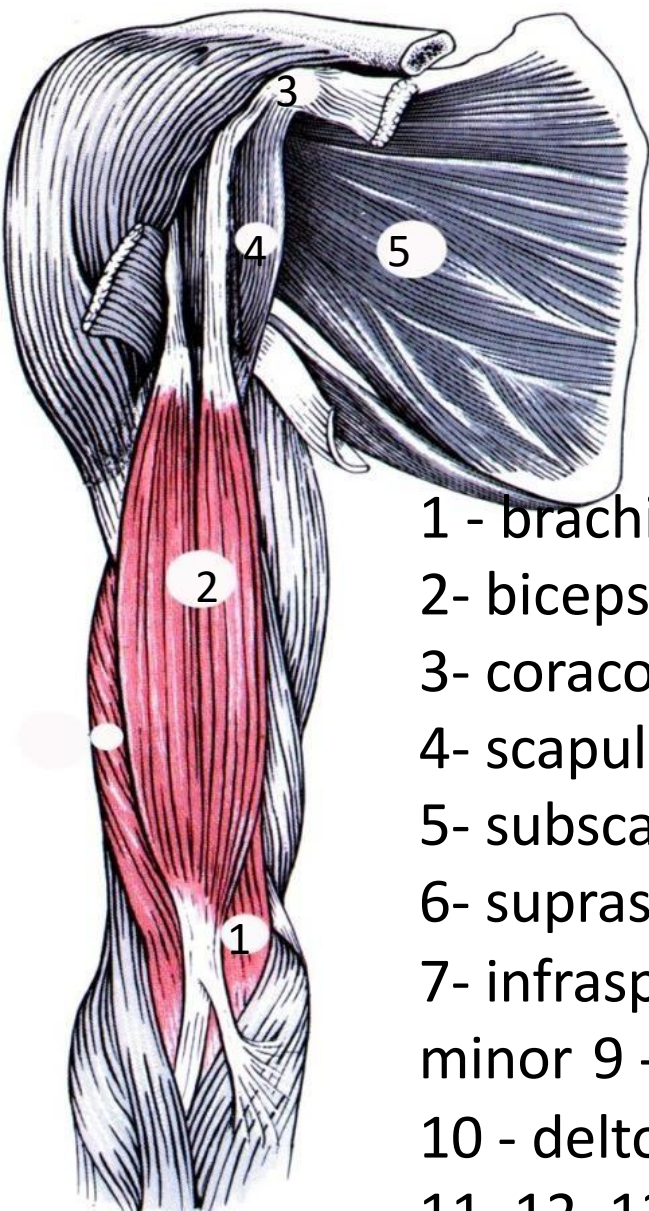
## **Intercostal muscle.**

1 - external intercostal;

2 - internal intercostal.

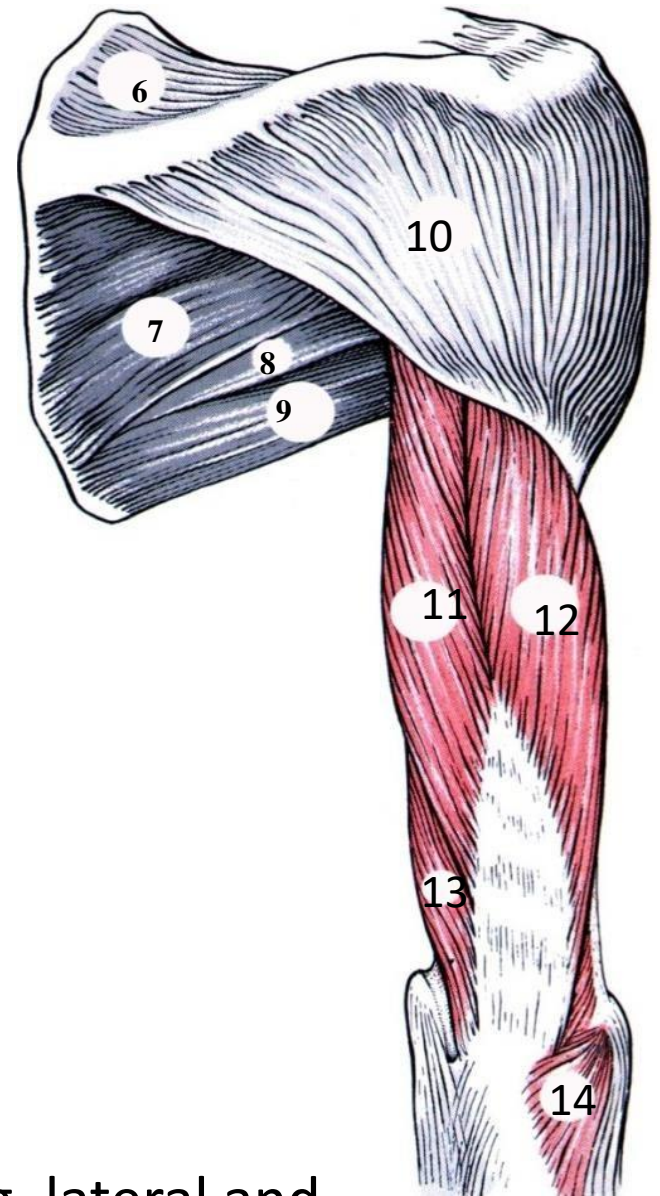


## Muscle of the shoulder and arm.



**Anterior**

- 1 - brachialis
- 2- biceps brachii
- 3- coracobrachialis
- 4- scapula
- 5- subscapularis
- 6- supraspinatus
- 7- infraspinatus
- 8 - teres minor
- 9 - teres major
- 10 - deltoid
- 11, 12, 13 - triceps brachii long, lateral and medial head
- 14 - anconeus.



**Posterior**

## **Muscle of the shoulder and arm.**

1 - brachialis

2- biceps brachii

3- coracobrachialis

4- scapula

5- subscapularis

6- supraspinatus

7- infraspinatus

8- teres minor

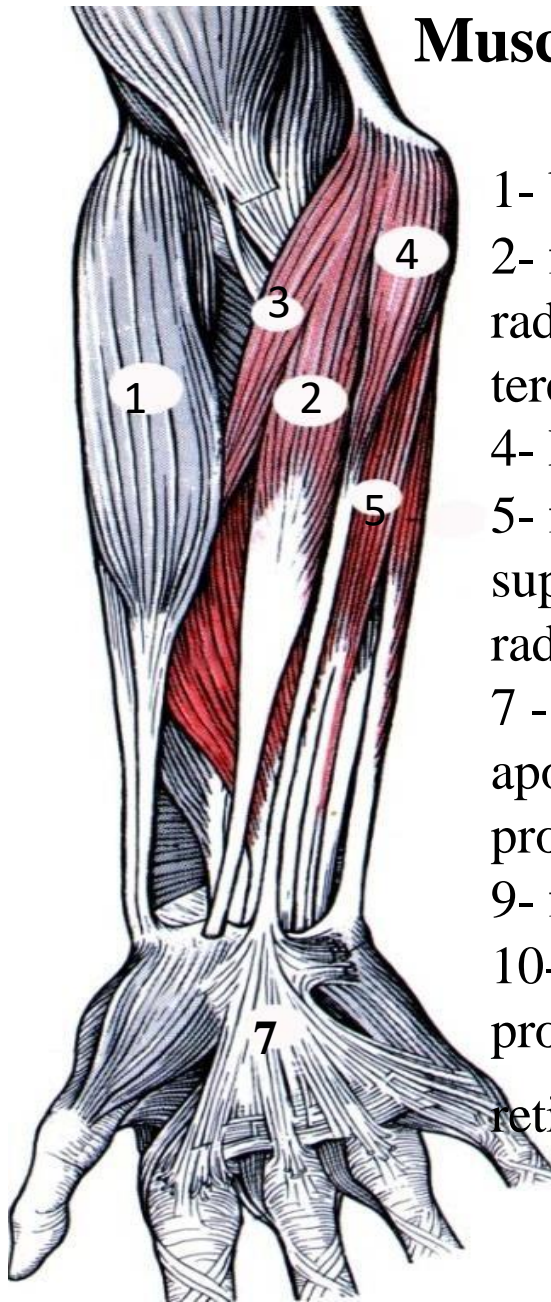
9 - teres major

10 - deltoid

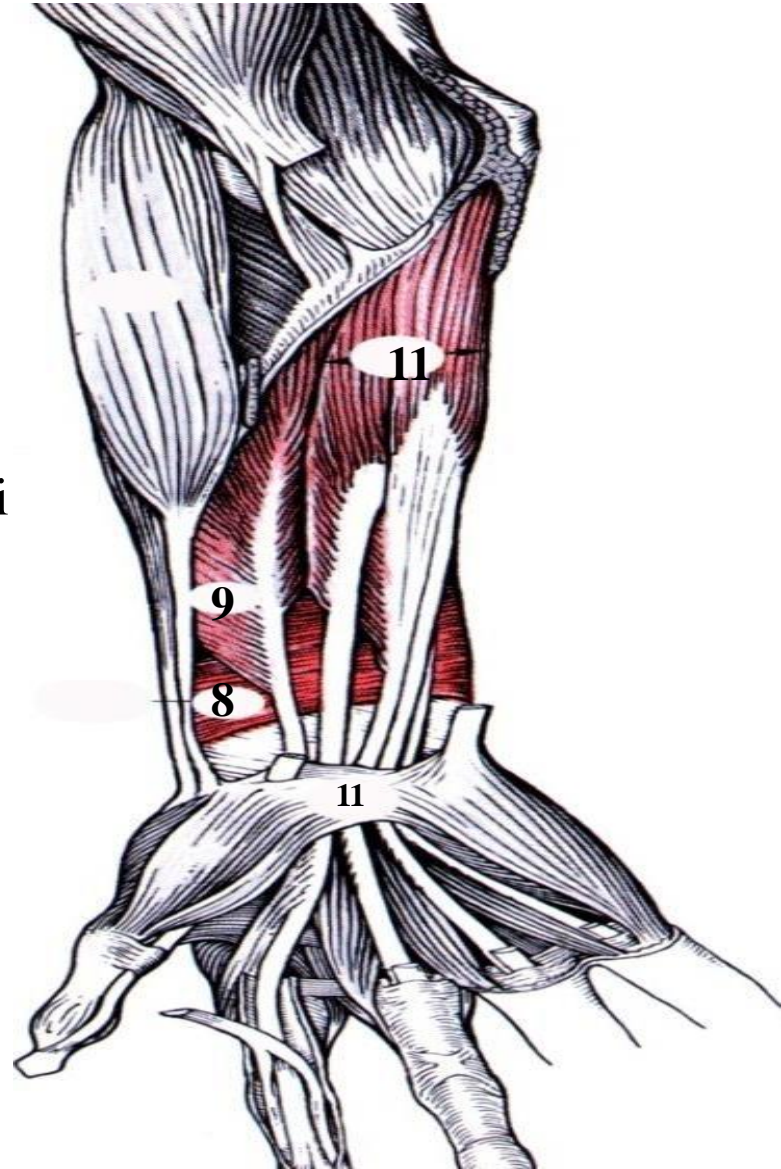
11, 12, 13 - triceps brachii long, lateral and medial head

14 - anconeus.

## Muscle of the forearm, anterior view.



- 1- brachioradialis;  
2- flexor carpi  
radialis; 3 - pronator  
teres;  
4- Palmaris longus;  
5- flexor digitorum  
superficialis; 6 - flexor carpi  
radialis;  
7 - palmar  
aponeurosis; 8 -  
pronator quadratus;  
9- flexor pollicis longus;  
10- flexor digitorum  
profundus; 11 - flexor  
retinaculum.



**THANK YOU**