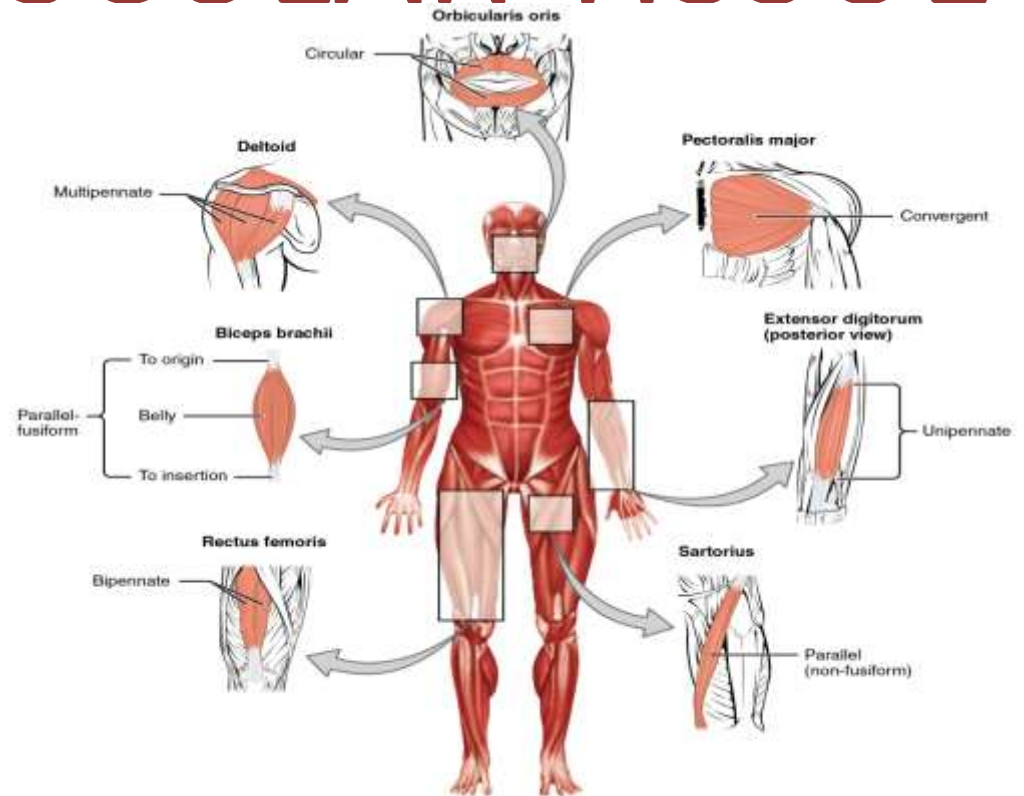
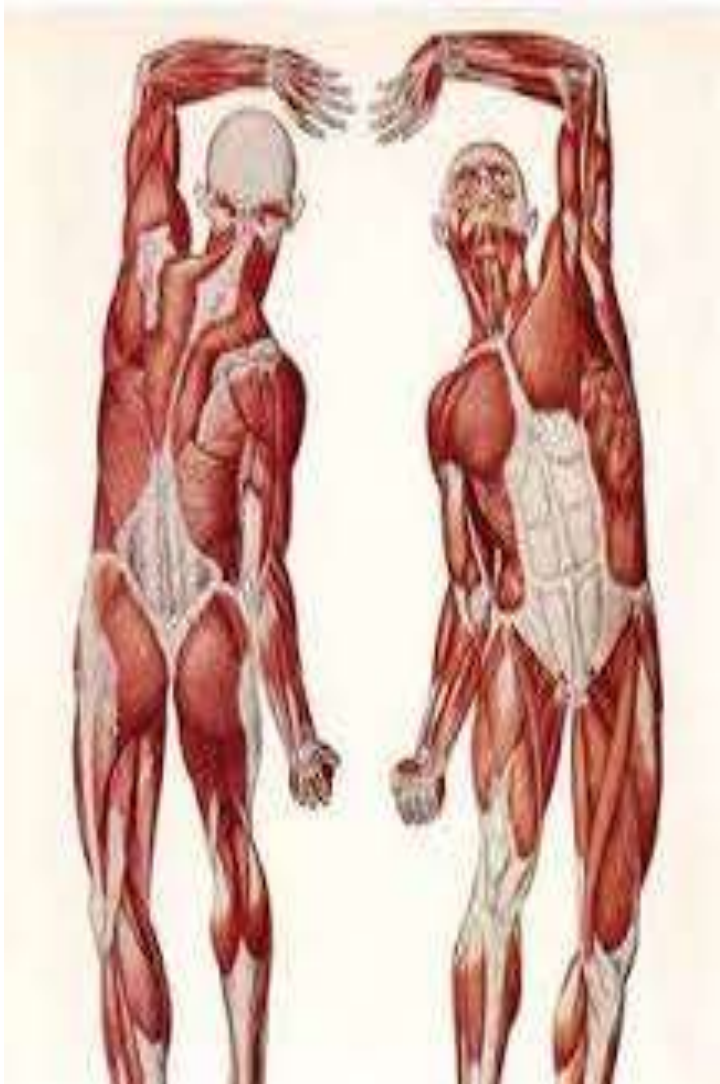


THE MUSCULAR TISSUE



Dr. Rajeev Kr Mukhia

MUSCLE

Contractile tissue of the body which brings about movement.

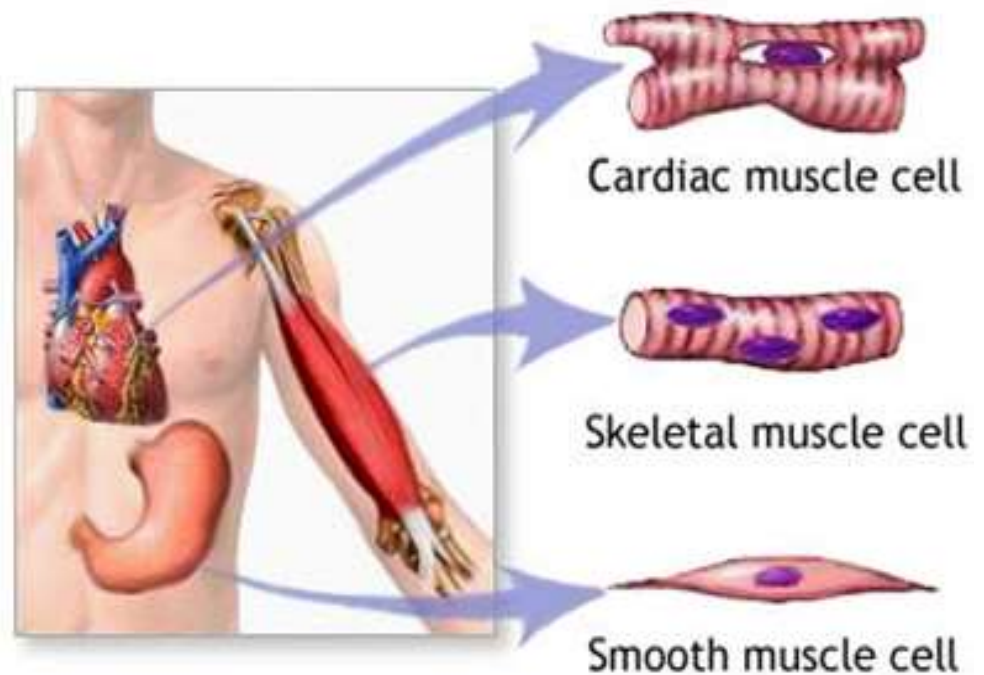
- The word “muscle” is derived from the Latin word- **musculus** which means little mouse (mus) & their fleshy part represents the body & tendon represents the tail.
- Muscles can be regarded as motors of the body and are derived by the mesodermal layer of embryonic germ cells.
- It forms red flesh of the body about 40 % of the body weight.

Four characteristics of muscular tissue

- Contractability: ability to shorten & thicken.
- Extensibility: ability to lengthen.
- Elasticity: ability to return back to normal size.
- Excitability :Tissue can receive & respond to stimulation.

Types of Muscle

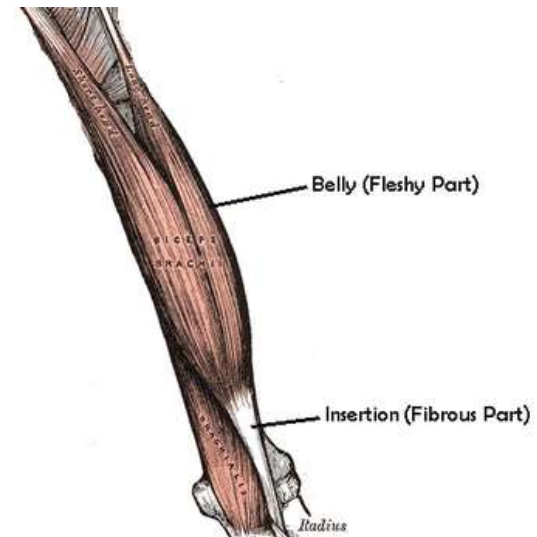
1. **Skeletal / Somatic/ Striated / Voluntary.**
2. **Smooth / Non-striated / Involuntary.**
3. **Cardiac / Involuntary Myocardium.**



Skeletal / Striated / Voluntary

- The skeletal muscle are more abundant & those which attach to the bones & have the **main function** of contracting to facilitate movement of our skeletons.
- Muscle contract rapidly & fatigue more easily
- Serve to adjust with external environment
- Distributed through out body wall, limb, head neck.

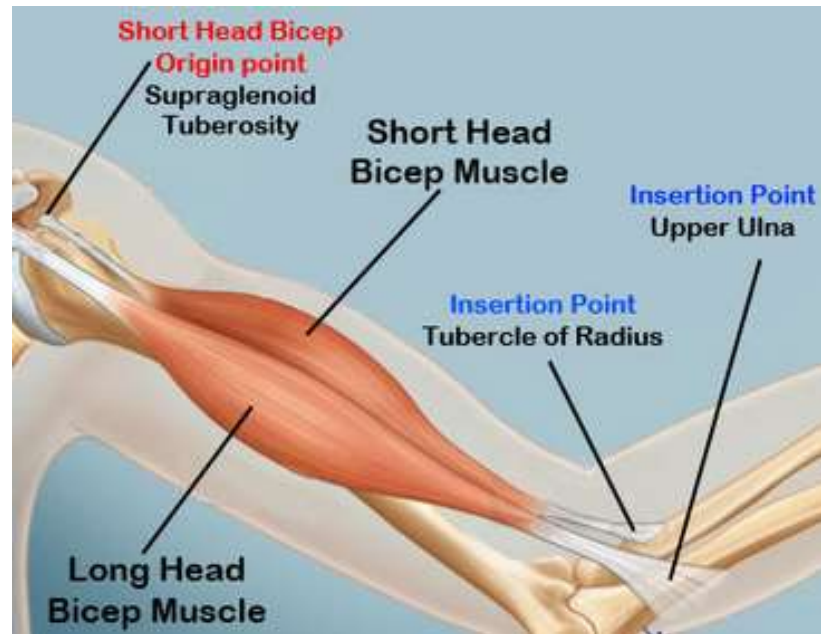
Mostly used for intramuscular injections.



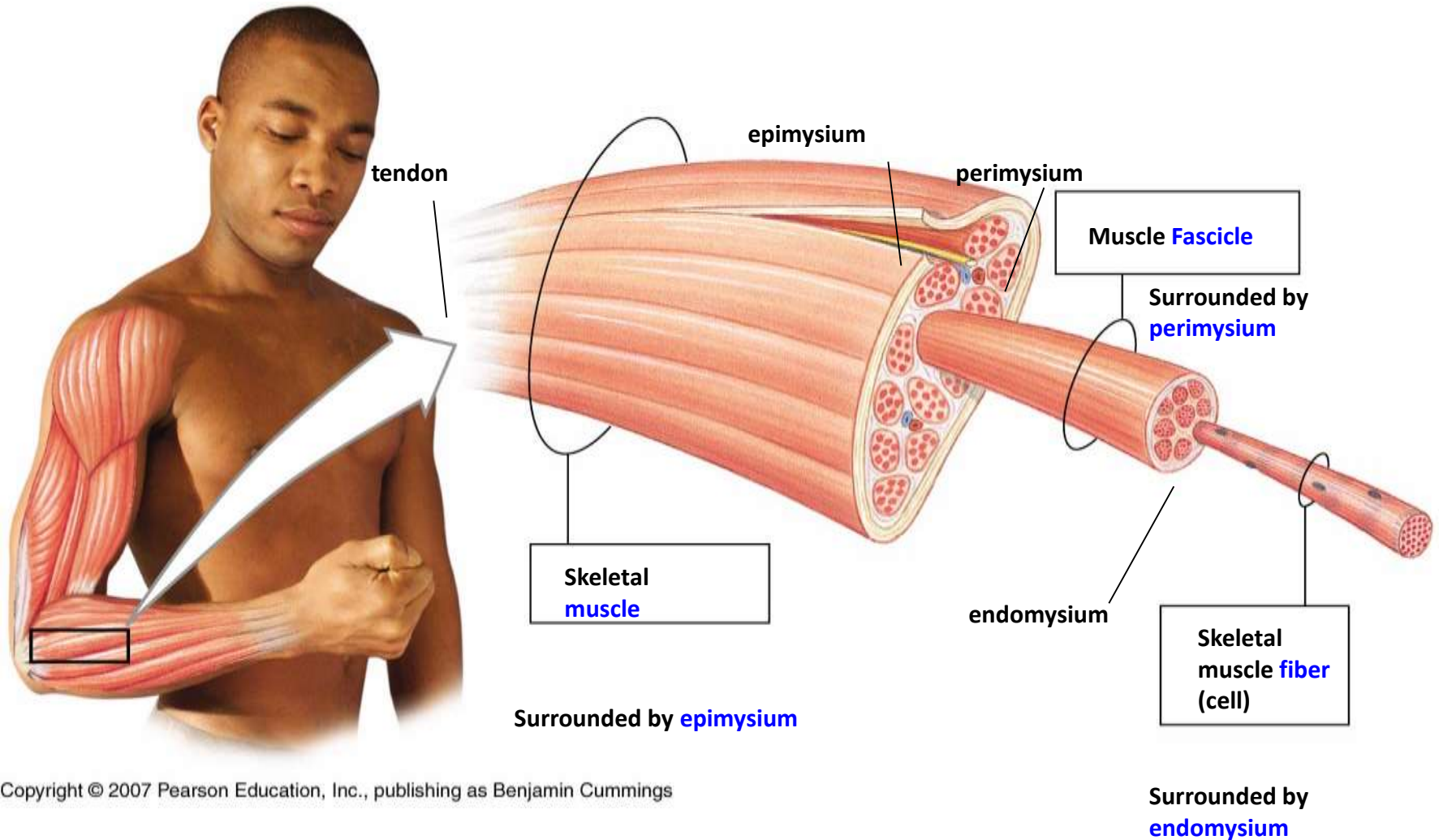
- **2 parts:**
 - i. Fleshy part: contractile, highly vascular called belly.
 - ii. Fibrous part: non contractile, inelastic & less vascular.
 - Tendon: cord-like or rope-like.
 - Aponeurosis: flatten.

2 Ends:

- I. **Origin:** one end of muscle which remains fixed.
- II. **Insertion:** other end which moves.



Anatomy of skeletal muscles



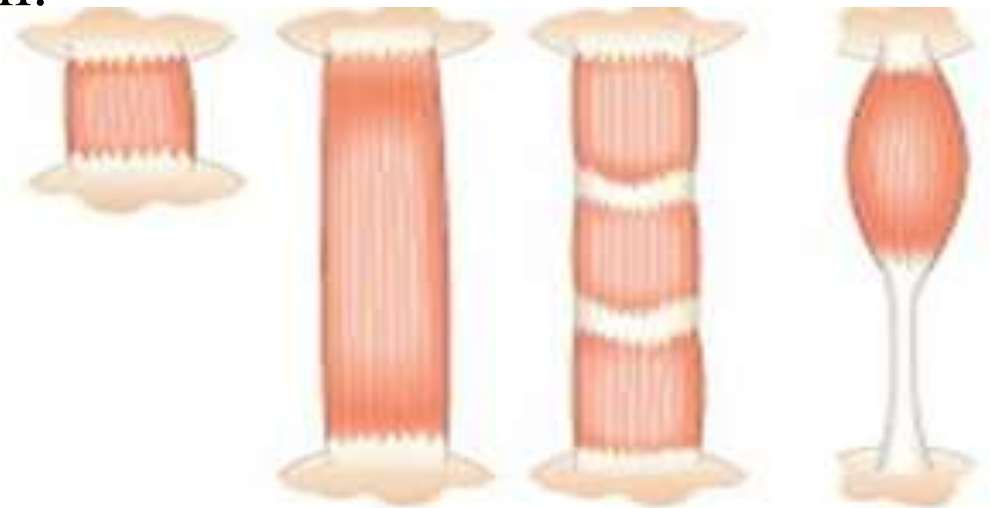
Classification of skeletal muscle

1. According to the direction of muscle fibres:

a) **Parallel:** muscle fibres are parallel to the line of pull.

sub-types;

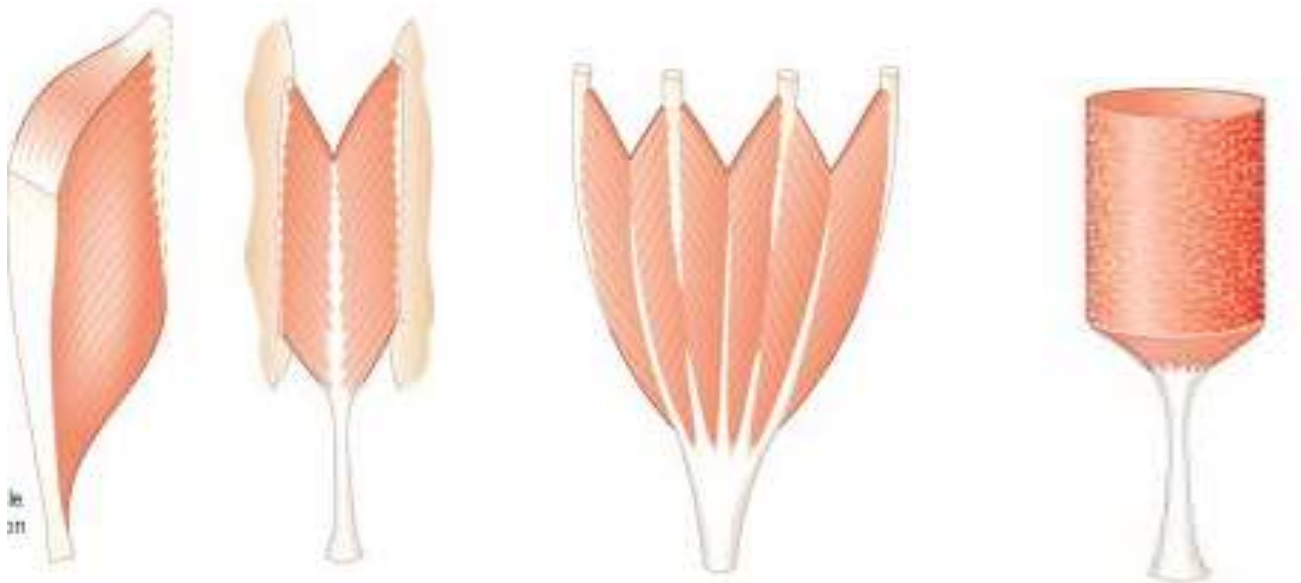
- i. quadrilateral (e.g. thyrohyoid)
- ii. Strap muscle: e.g. sternohyoid
- iii. strap like with tendinous intersections (e.g. rectus abdominis).
- iv. Fusiform: biceps brachii.



b) Pennate muscle: fleshy fibres are oblique to line of pull.

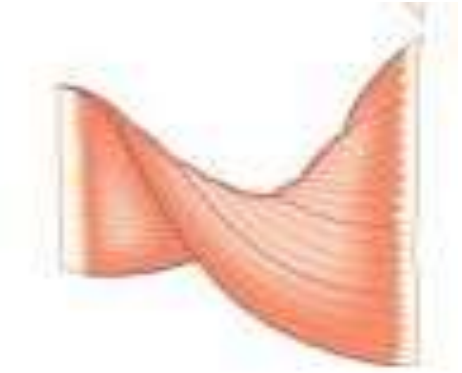
Sub-type;

- i. Unipennate: all fleshy fibres slope into one side of the tendon.
Eg; flexor pollicis longus, extensor digitorum longus.
- ii. Bipennate: rectus femoris, dorsal interossei
- iii. Multipennate: deltoid
- iv. Circumpennate: tibialis anterior



c) **Spiral muscle:**

- twisted close to their insertion.
- Eg; pectoralis major and latissimus dorsi.



d) **Cruciate muscle:**

- Fibres are arranged in superficial & deep plane crossing like 'X'.
- Eg; masseter & sternocleidomastoid.



2. According to the colour:

I. Red Muscles:

- abundant myo-haemoglobin.
- Found in deep muscles.
- Eg; soleus, brachialis.

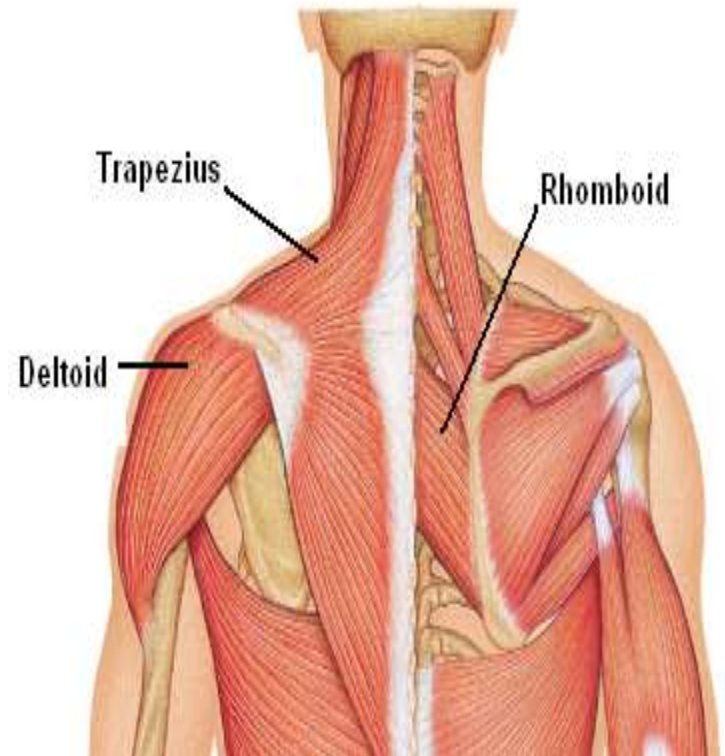
II. White Muscles:

- Less myo-haemoglobin.
- Found in superficial muscles.
- Eg; Biceps brachii, hamstring muscle, gastrocnemius.

Nomenclature of muscles

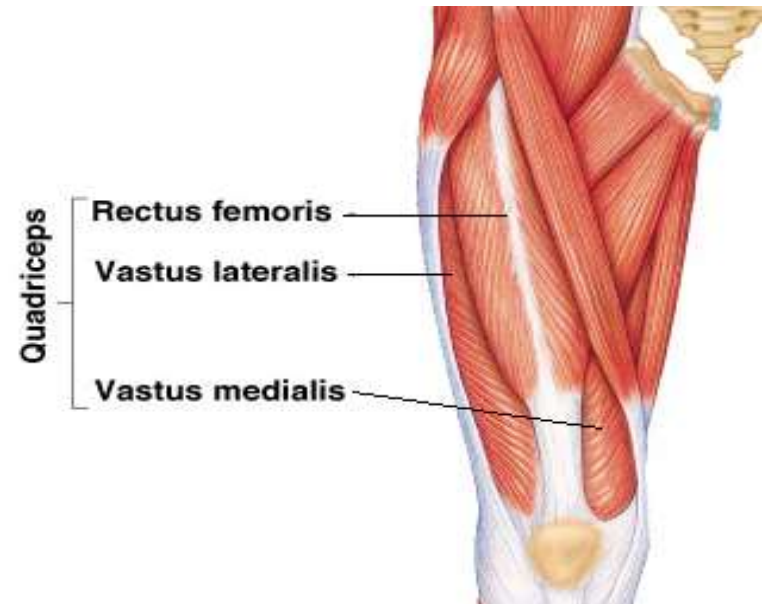
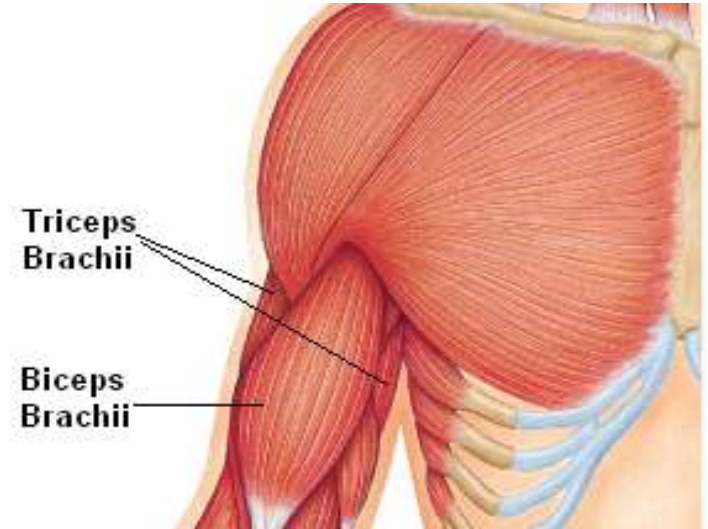
1. Acc to the shape:

- Deltoid = Δ
- Trapezius = \diamond
- Serratus = saw-toothed \approx
- Rhomboideus = rhomboid shape
- Teres = \circ



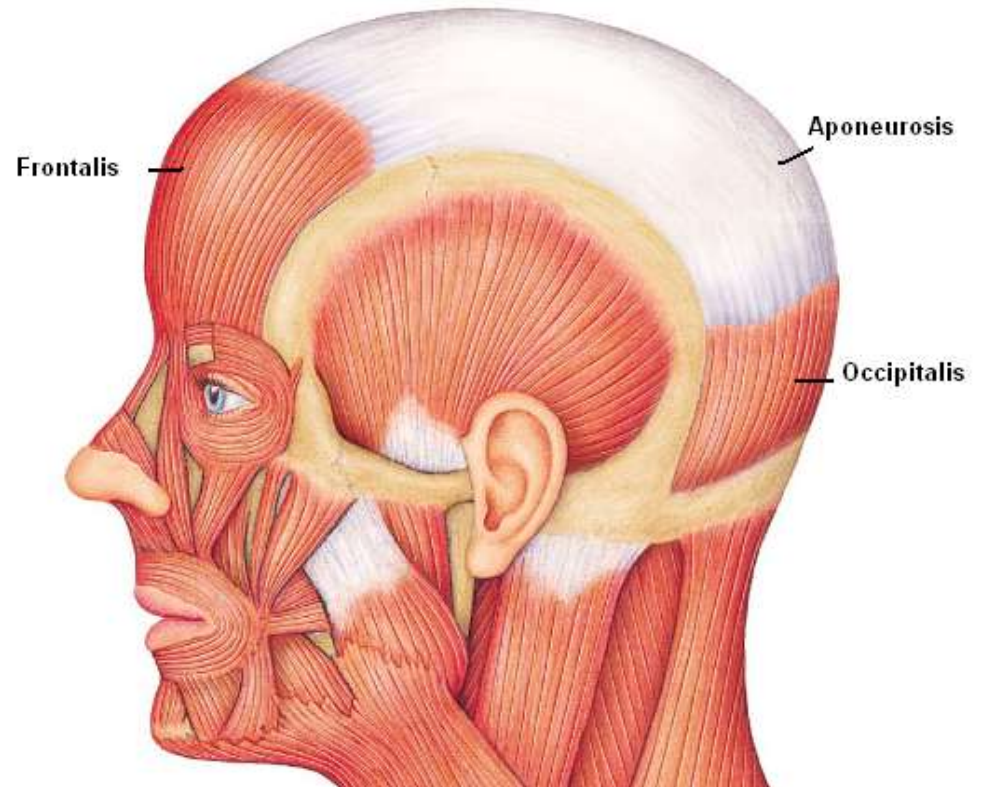
2. Acc to the number of head of origin

- **BICEPS** = Two
 - *Biceps Brachii*
 - *Biceps Femoris*
- **TRICEPS** = Three
 - *Triceps Brachii*
- **QUADRICEPS** = Four
 - *Quadriceps Femoris*



3. Acc to the location

- **Frontalis** = near frontal bone
- **Occipitalis** = near occipital bone

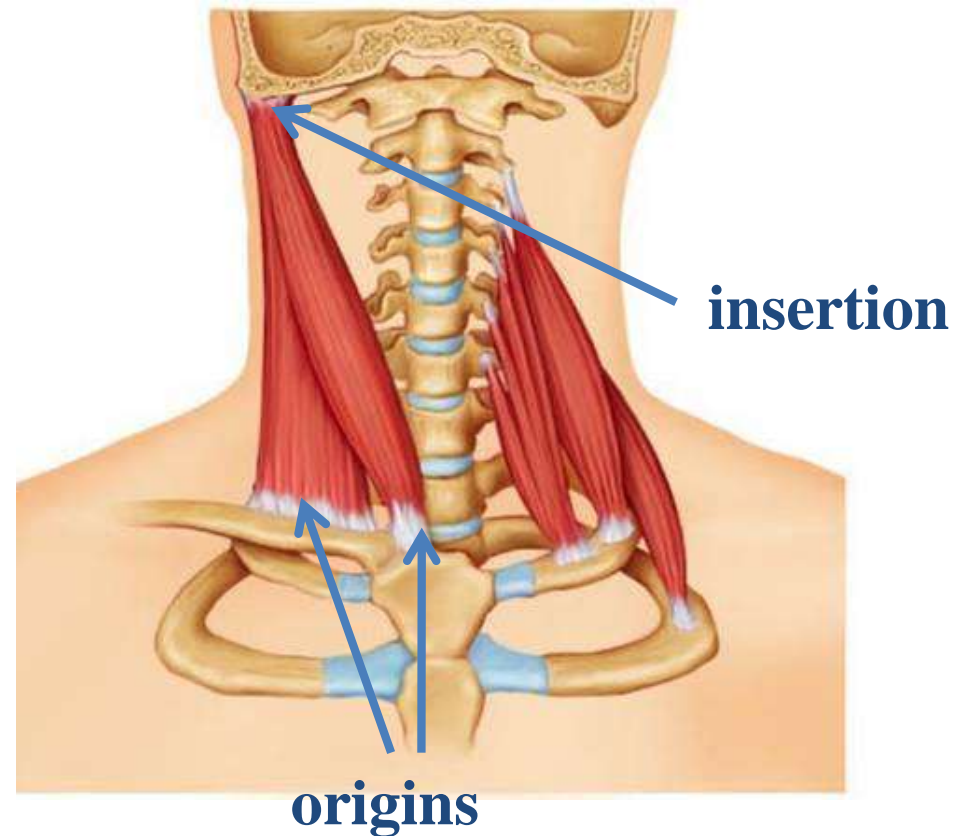


4. Acc to the Attachements

Sternocleidomastoid

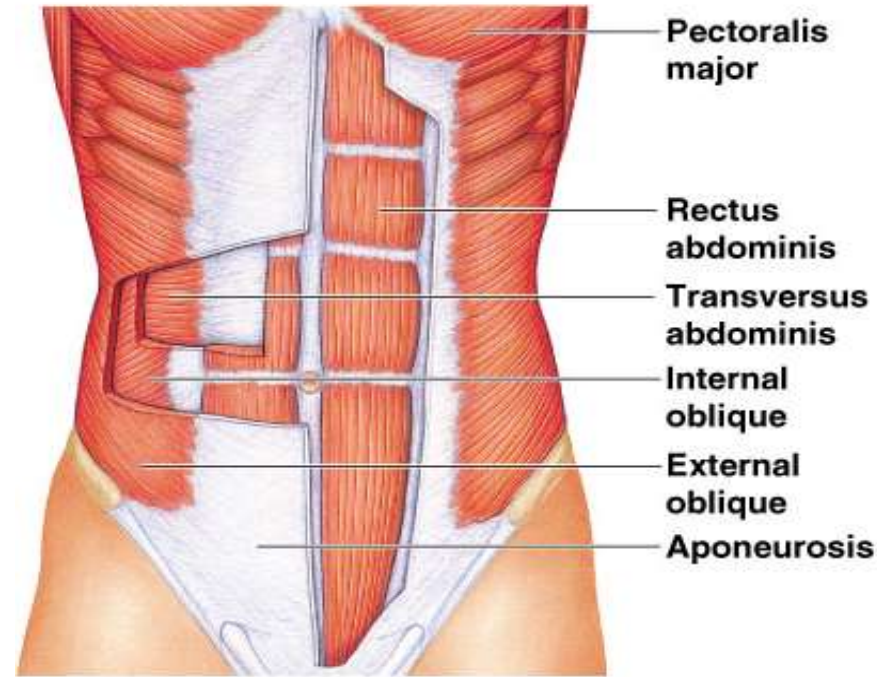
Stylohyoid

Cricothyroid



5. Acc to the action

- Flexor carpi radialis
 - flexes wrist
- Abductor magnus
 - abducts thigh
- Extensor digitorum
 - extends fingers

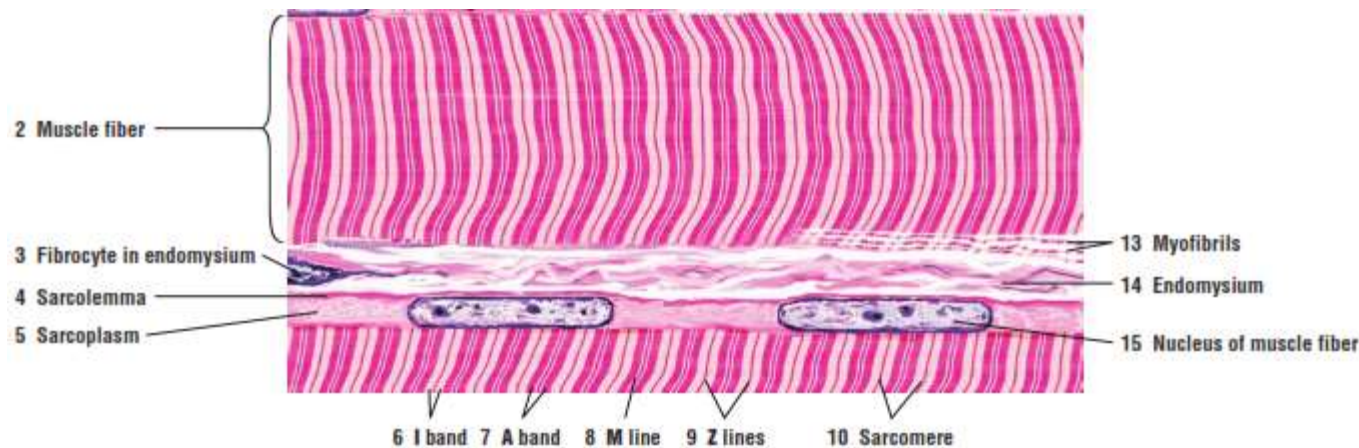
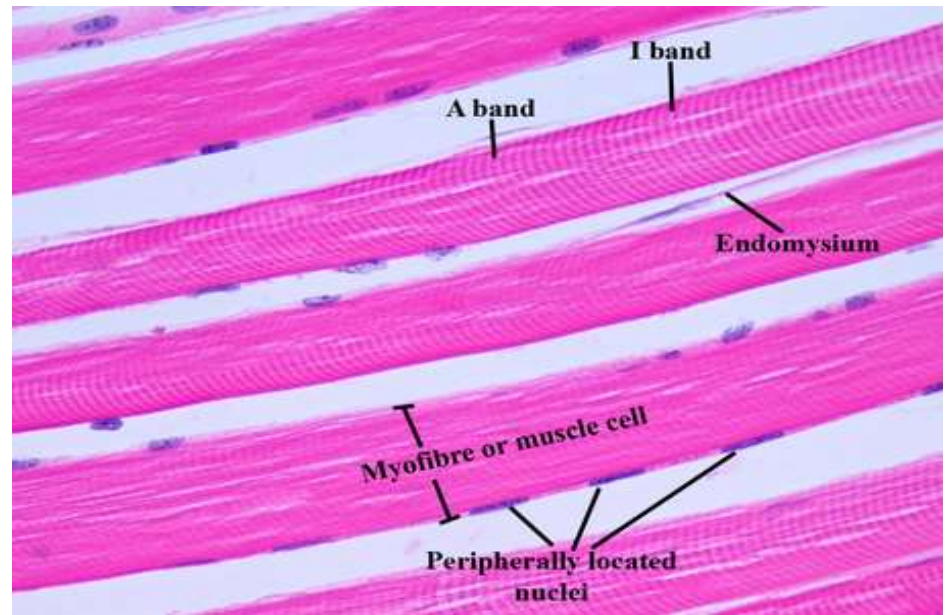


6. Acc to the direction of muscle fibres

- Rectus : parallel to the midline eg; Rectus Abdominis
- Transverse : perpendicular to midline eg; Transverse Abdominis
- Oblique = diagonal to midline eg; External Oblique

Histology of skeletal muscle

- long, parallel, cylindrical fibres without branching.
- multinucleated cells, with peripheral nuclei.
- Cross striations (prominent), dark 'A' band & light 'I' band.
- regulated by somatic nervous system.



Smooth Muscle / Non-striated / Involuntary

- Present in the walls of hollow tubular & saccular viscera, duct of exocrine glands, blood vessels, tracheobronchial tree, iris & ciliary body, arrectores pilorum & sweat gland of the skin.
- Development: splanchnic mesoderm, except the muscles of the iris & arrectores pilorum of skin which are ectodermal origin.
- Function in the movement of viscera.

- **Histology of Smooth muscle**

- Fibers are fusiform or spindle in shape.
- Single elongated central nucleus.
- Contain actin and myosin filaments without cross-striation patterns.
- regulated by autonomic nervous system.



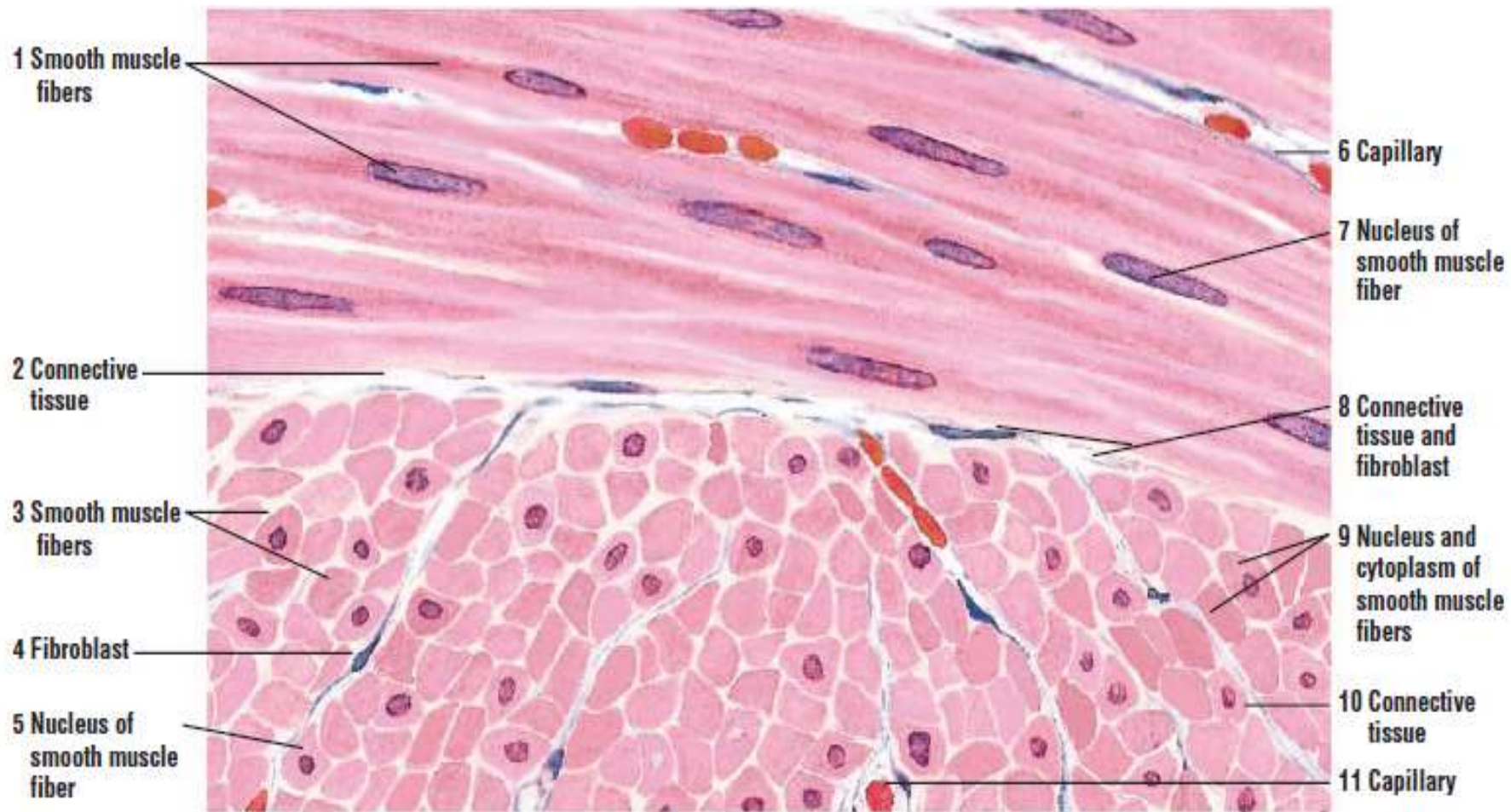


Fig: Longitudinal and transverse sections of smooth muscle

Cardiac Muscle

- Located in heart & large vessels attached to heart.
- Function to pump the blood from heart.

Histology of Cardiac muscle

- Muscle fibers shows branching pattern are shorter than skeletal muscle fibers and contains one or two central nuclei.
- Cross striation with 'A' & 'I' bands (less prominent).

- **Intercalated disks:**

These are darkly-staining transverse lines at irregular intervals in the cardiac muscles.

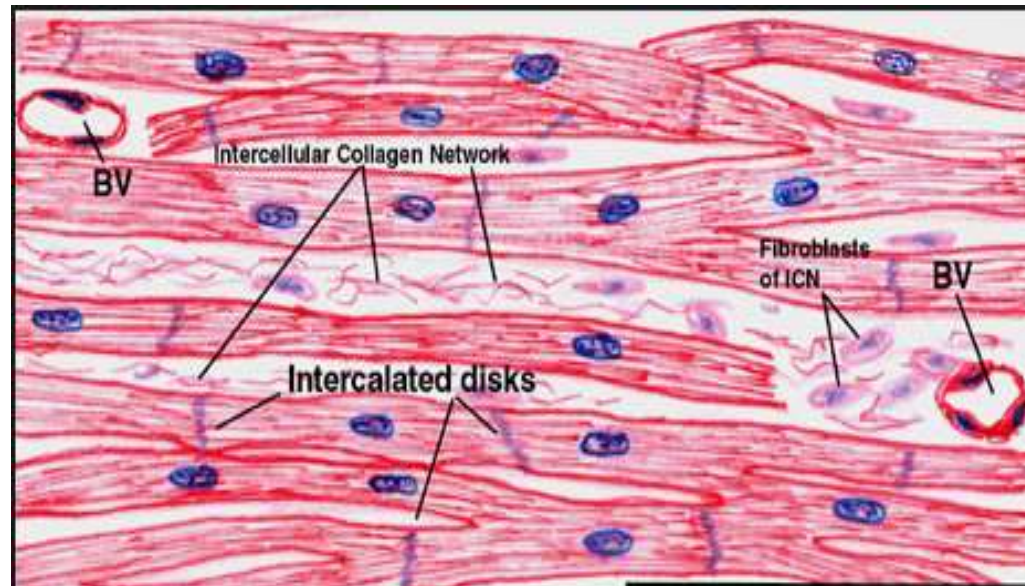

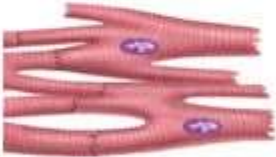





Fig: Longitudinal and transverse sections of cardiac muscle

Three Types of Muscular Tissue

	Location	Function	Appearance	Control
Skeletal 	skeleton	movement, heat, posture	striated , multi-nucleated (eccentric), fibers parallel	voluntary
Cardiac 	heart	pump blood continuously	striated , one central nucleus	involuntary
Visceral (smooth muscle) 	G.I. tract, uterus, eye, blood vessels	Peristalsis, blood pressure, pupil size, erects hairs	no striations , one central nucleus	involuntary