General Anatomy

Lecture 6: Muscular System

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Muscles

* **Muscles are characterized by contraction** which means the capacity of the muscle fibers to contract.

* **Types of muscles:**

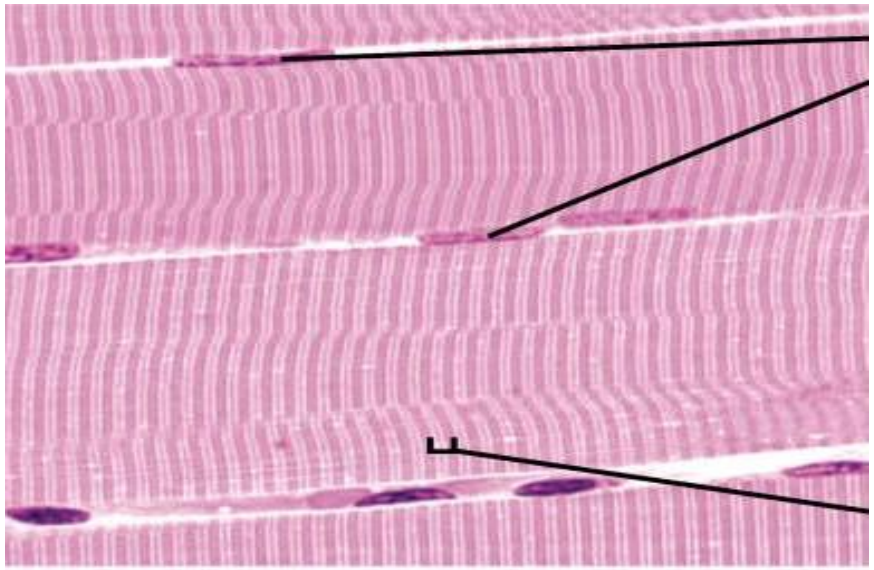
1. Skeletal muscle.
2. Smooth muscle.
3. Cardiac muscle.

I. Skeletal Muscles

1. Contraction: **Voluntary.**

2. Site:
* Main bulk of our bodies.
* Attached to skeleton (bones) eg. Muscles of limbs.
* Produce movement of skeleton.

3. Striations:
* Striated (show alternating light & dark bands).



4. Nerve supply: Somatic nerves.

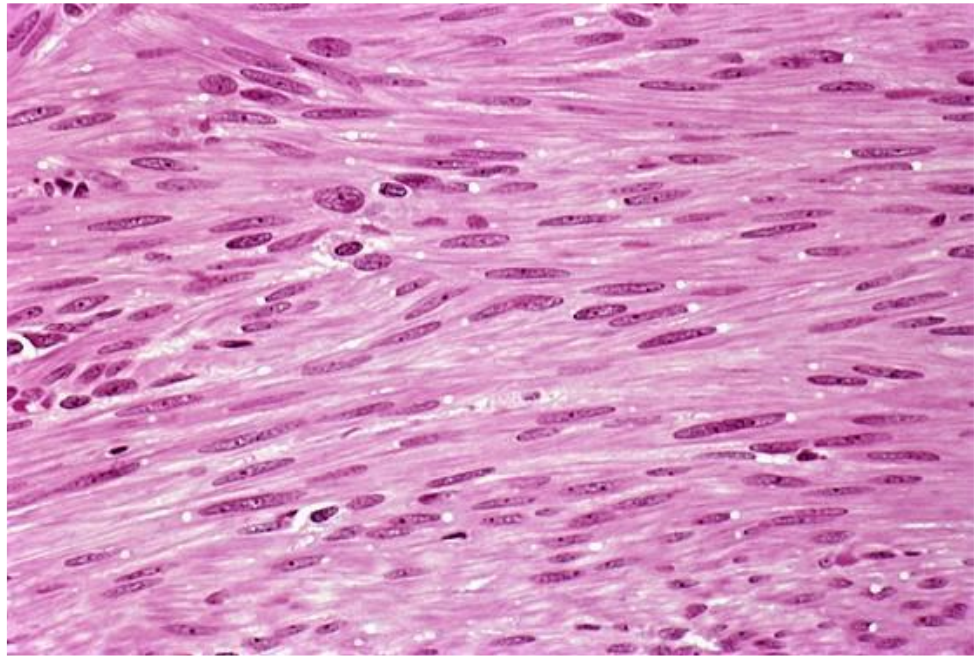
5. Contraction: Rapid.

II. Smooth Muscles

1. Contraction: **Involuntary.**

2. Site: * Muscles in wall of viscera eg. Muscles of gastro-intestinal tract (GIT), urinary system, respiratory system, genital system & those of blood vessels.

3. Striations: Non-striated.

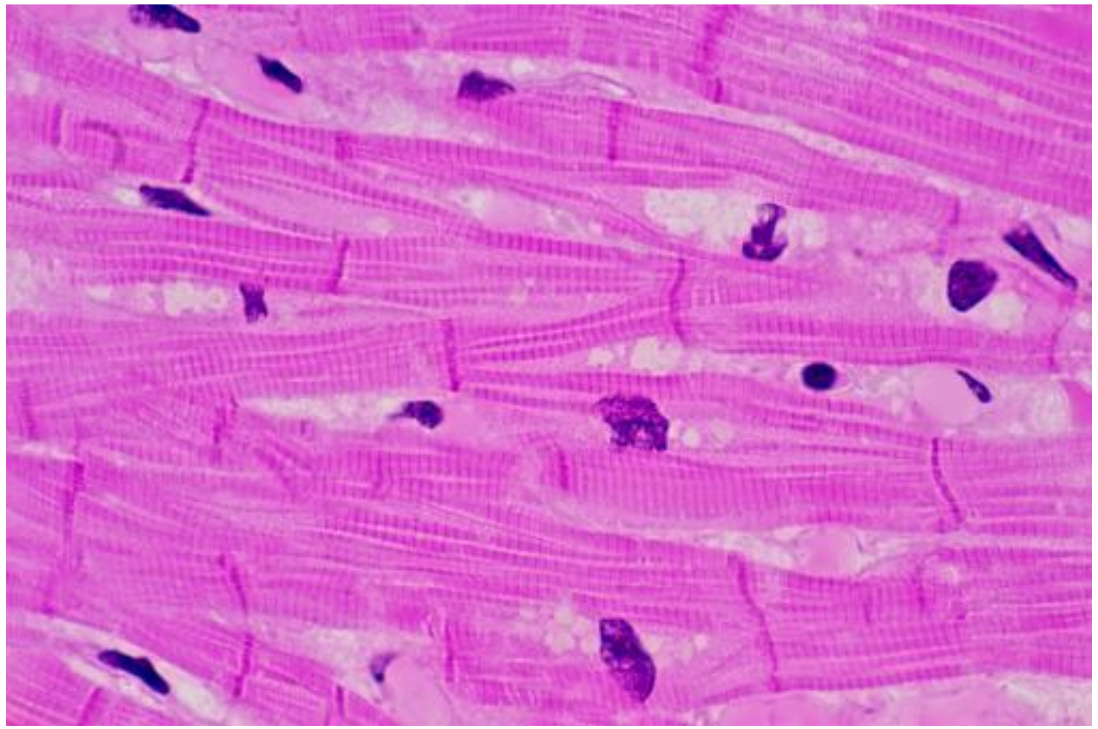


4. Nerve supply: Autonomic nerves.

5. Contraction: Slow.

III. Cardiac Muscles

1. **Contraction:** **Involuntary.**
2. **Site:** Myocardium of heart.



3. **Striations:** Striated.

4. **Nerve supply:** Autonomic nerves.

5. **Contraction:** Has a rhythm.

Skeletal Muscles

* **Usually each muscle has 2 attachments:**

1. Origin: The most fixed attachment (usually proximal).

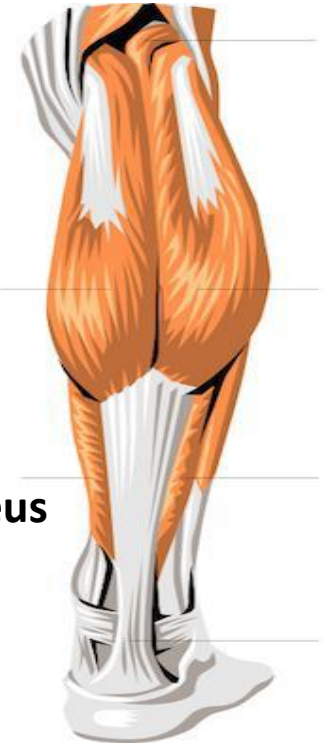
2. Insertion: The most mobile attachment (usually distal).

* **Usually when the muscle contracts** → it gets shorter by approximating the insertion to the origin.

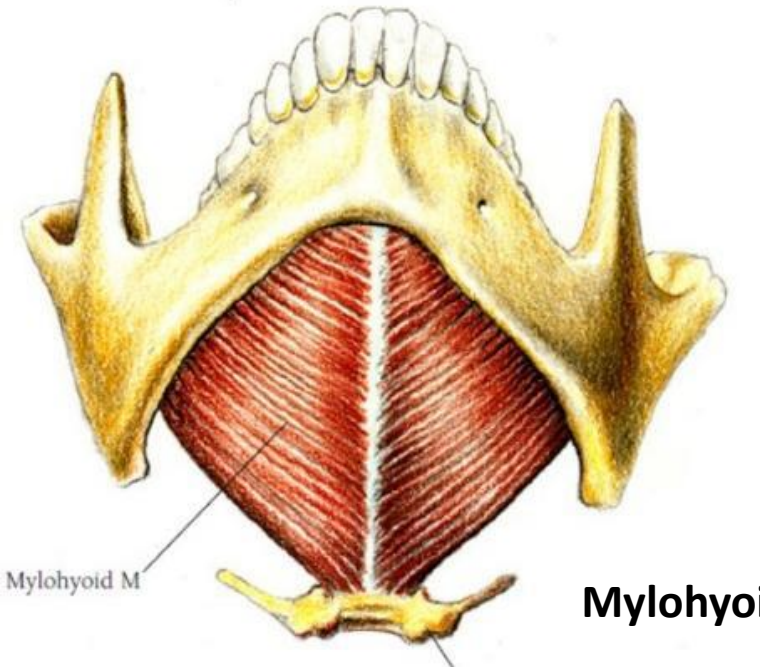
* Way of attachment of muscles:

1. **By fleshy fibers** :eg. Popliteus muscle.
2. **By tendon** (a long fibrous cord): eg. Tendocalcaneus & biceps.
3. **By raphe** (a fibrous band that separates flesh muscles from each other): eg. Pharyngeal muscles & mylohyoid muscle.

Popliteus



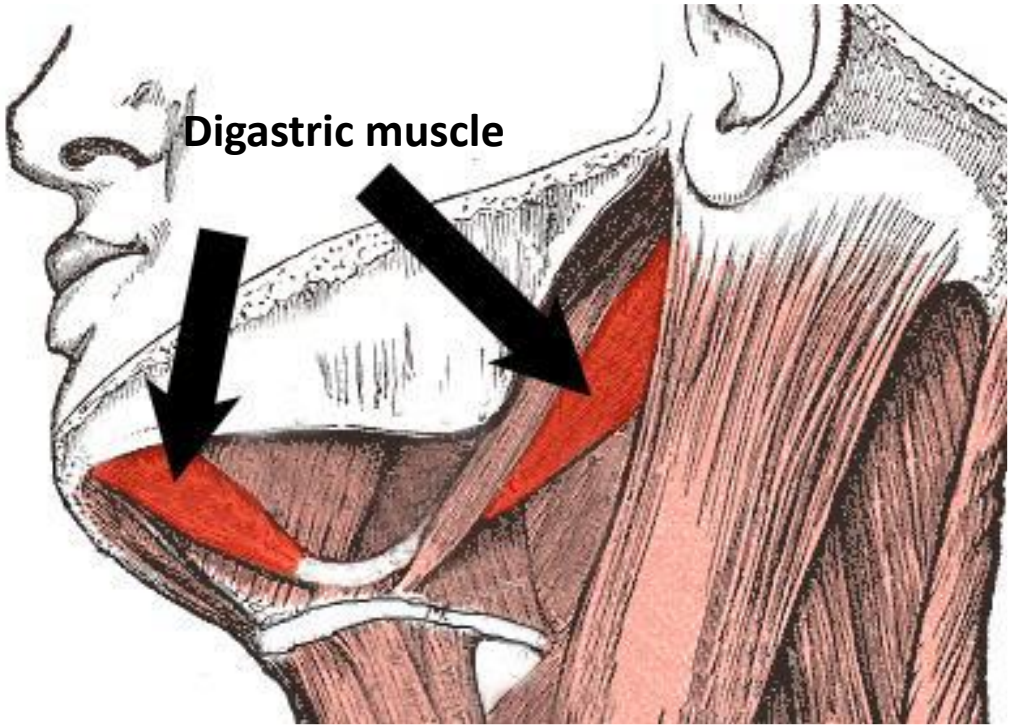
Tendocalcaneus



Mylohyoid muscle

4. **By aponeurosis** (flat fibrous sheet): eg. Aponeurosis of external oblique abdominal muscle.
5. **Attached to skin**: eg. Facial muscles.
6. **Attached to an intermediate tendon**: A muscle may have 2 fleshy bellies & an intermediate tendon in between & so the 2 bellies are inserted into this tendon eg. Digastric muscle.

Aponeurosis of external oblique abdominal muscle



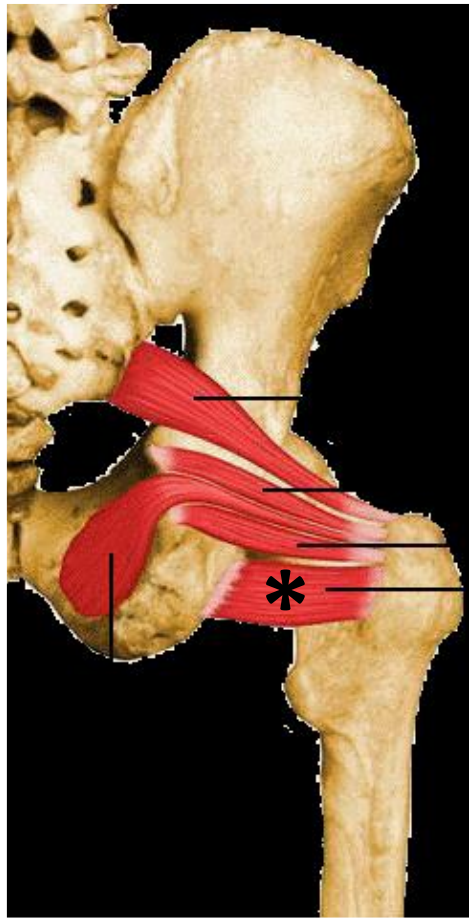
Shape of Muscles

The muscles can be classified into different types according to the shape of the muscle fibers in relation to the line of pull of the muscle.

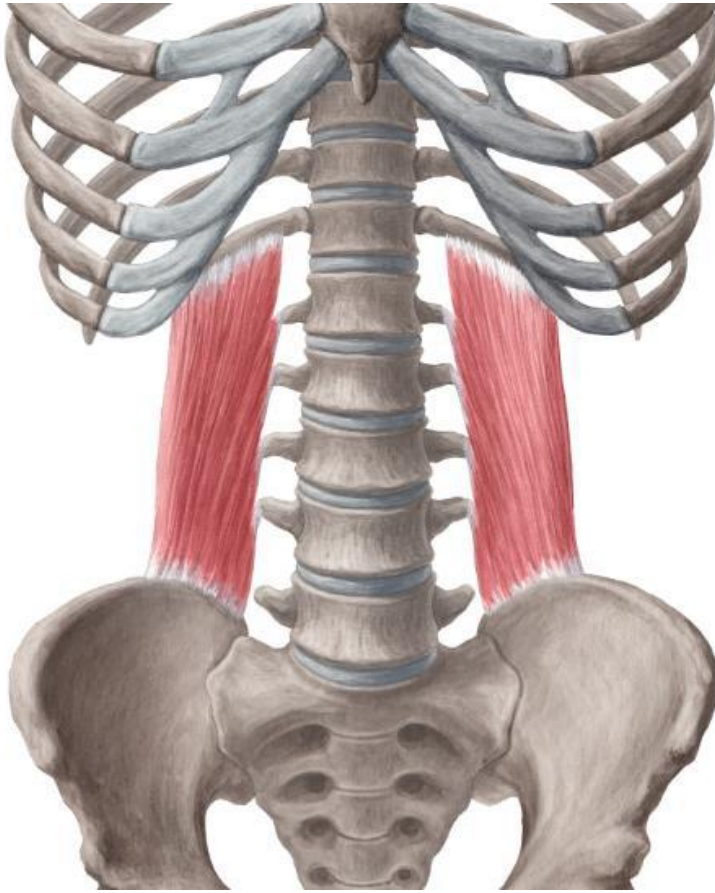
A. Parallel Fibers:

* May be:

1. Quadrilateral: eg. Quadratus lumborum & quadratus femoris.



Quadratus Femoris

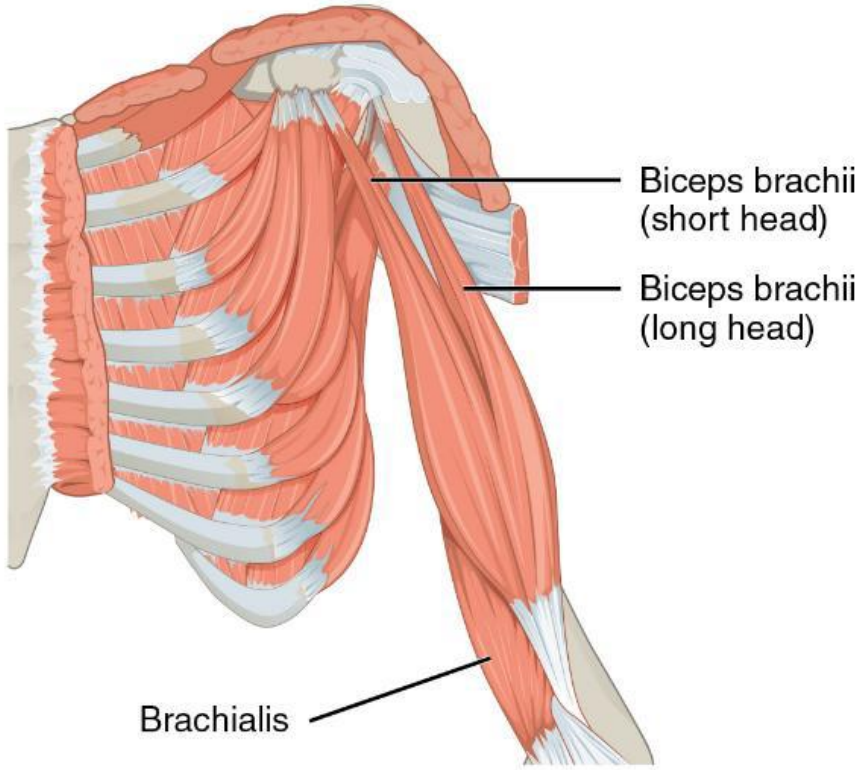


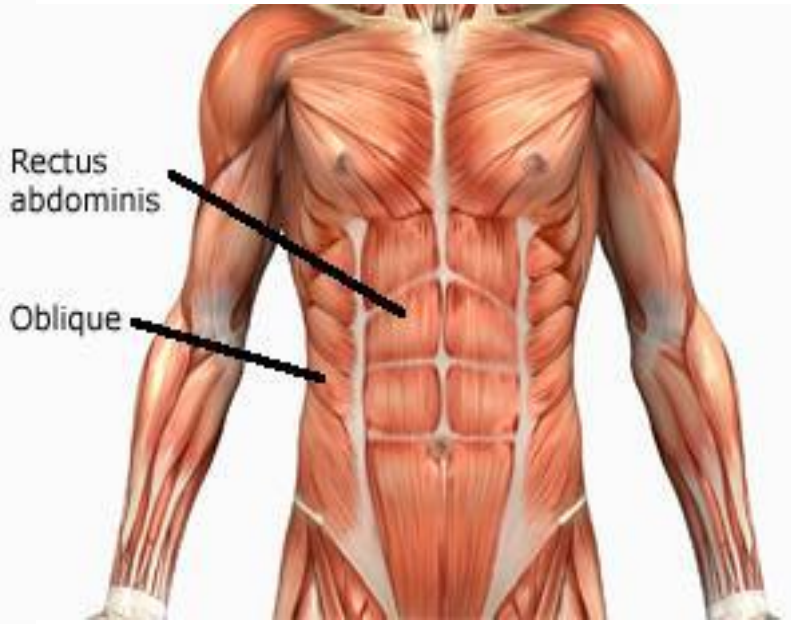
Quadratus Lumborum

2. Fusiform: eg. Biceps brachii.

3. Strap-like: eg. Sartorius.

4. Strap-like with tendinous intersections: eg. Rectus abdominis.





B. Oblique Fibers:

1. Pennate fibers:

i. Unipennate:

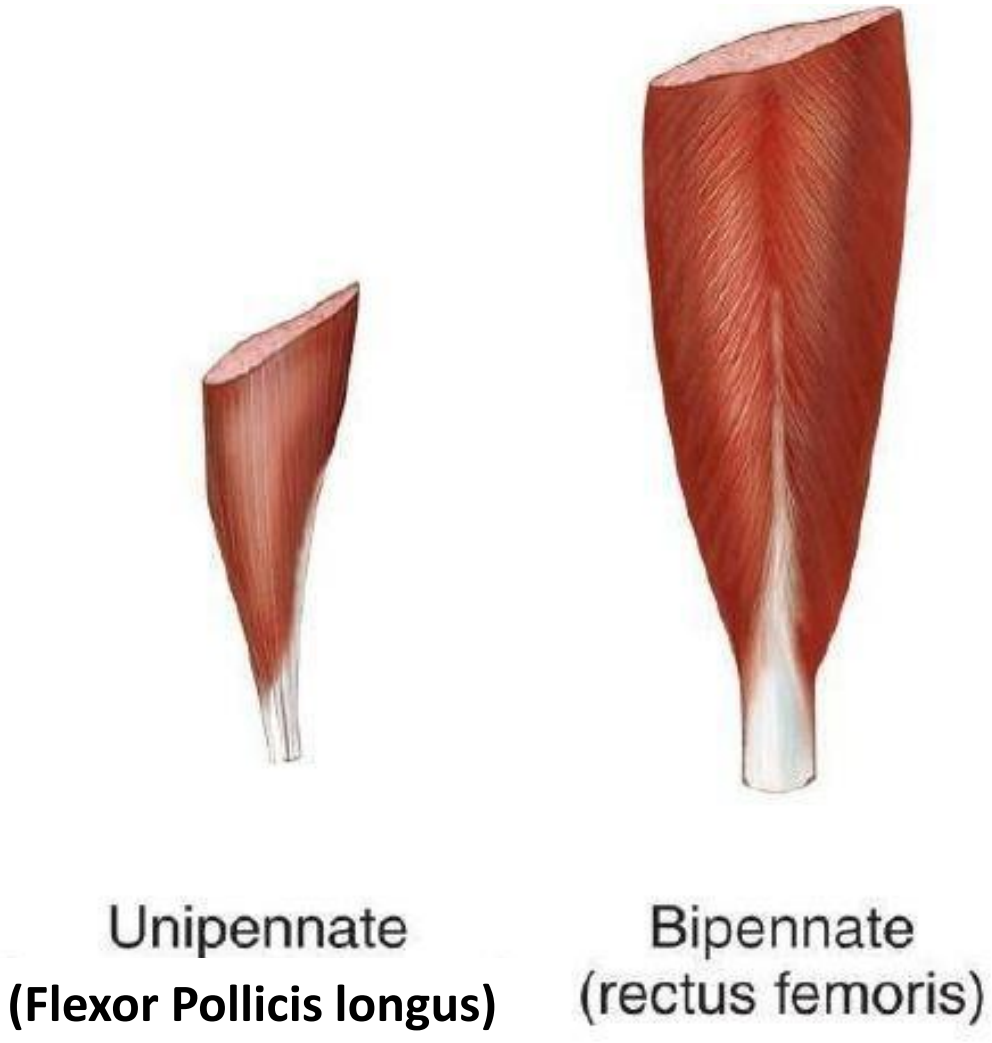
* Fibers run along one side of the tendon (like half a feather).

* Example: Palmar Interosseii &
  Flexor pollicis longus.

ii. Bipennate:

* Tendon in the middle & fibers are attached to its 2 sides (like a complete feather).

* Example: Dorsal Interosseii &
  Rectus femoris.



Unipennate
(Flexor Pollicis longus)

Bipennate
(rectus femoris)

iii. Multipennate:

* A series of bipennate fibers (several feathers beside each other).

* Example: Deltoid.

Multipennate
(deltoid)

iv. Circumpennate:

* Fibers converge on a tendon to be attached to the circumference of the tendon.

* Example: Tibialis anterior.

2. Triangular fibers:

* Muscle fibers converge from wide attachment to a narrow terminal tendon.

* Example: Temporalis.

Temporalis

C. Spiralized Fibers:

* When the muscle contracts → the fibers become spiral.
* Examples: Trapezius & Pectoralis major.

D. Cruciate Fibers:

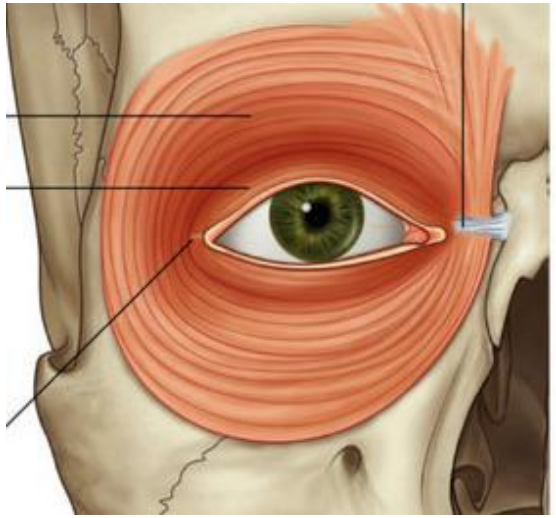
* Muscle fibers run in different planes & directions.
* Example: Sternocleidomastoid.

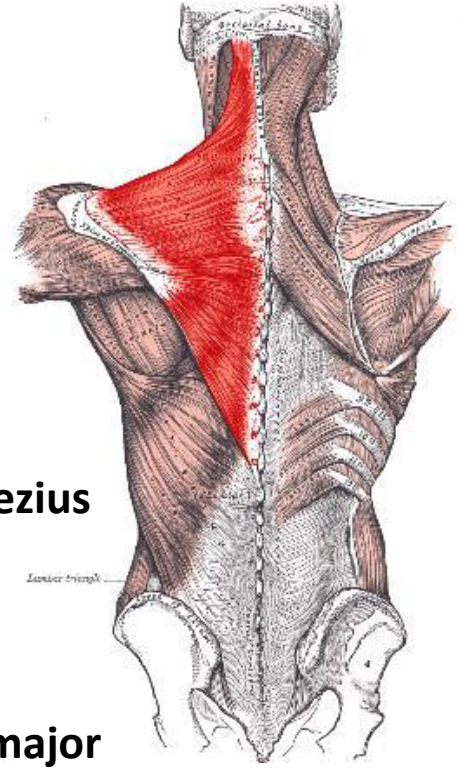
E. Circular Fibers:

* Muscle fibers form complete circles.
* Example: Orbicularis oculi muscle.

Sternocleidomastoid

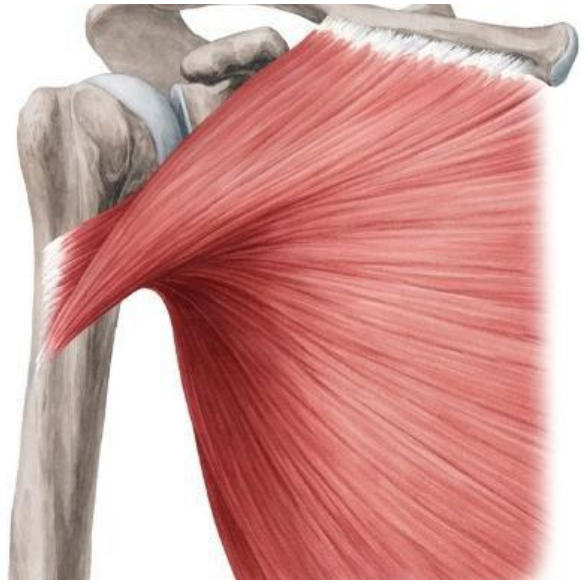
Orbicularis oculi





Trapezius

Pectoralis major



Coordination within Muscle Groups

* Movements often are the result of several skeletal muscles acting as a group rather than acting alone.

* Most skeletal muscles are arranged in opposing (antagonistic) pairs at joints: eg. flexors & extensors; abductors & adductors, and so on.

* Within opposing pairs, one muscle, is called the prime mover or agonist, which contracts (gets shorter) to cause an action while the other muscle, the antagonist, stretches (relaxes) to allow the movement caused by the prime mover.

* The antagonist and prime mover are usually located on the opposite sides of the bone or joint.


Thank You
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Thank You!!!!