Lecture: 6

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General Anatomy

Lecture 6: Muscular System

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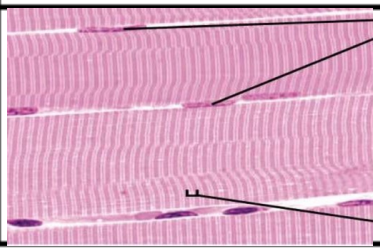
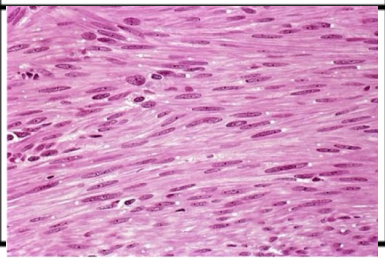
Muscles

**characterized by contraction = the capacity of the muscle fibers to contract

Types of muscles:

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

**We will distinguish them from each other by :
1) contraction 2)Site 3)Striations 4)Nerve supply

	Skeletal	Smooth	Cardiac
contraction	Voluntary & Rapid	Involuntary & Slow.	Involuntary & Has a rhythm
Site	*Main bulk of our bodies. *Attached to skeleton (bones):Muscles of limbs. *Produce movement of skeleton	Muscles in wall of viscera: Muscles of gastro-intestinal tract (GIT) urinary system, respiratory system, genital system & those of blood vessels	Myocardium of heart.
Striations	Striated (show alternating light & dark bands).	Non-striated	Striated
Nerve supply	Somatic nerves	Autonomic nerves	Autonomic nerves
The shape of the muscle under the microscope.			

Skeletal Muscles

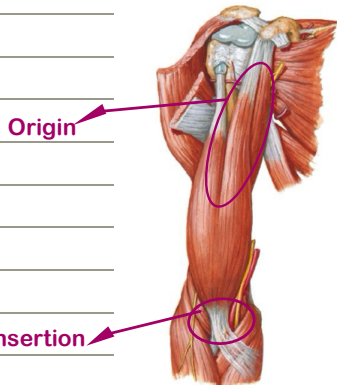
* Usually each muscle has 2 attachments:

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

For example:
The origin of biceps is scapula.
And the insertion is in radius



Way of attachment of muscles:

1. By fleshy fibers : Popliteus muscle.

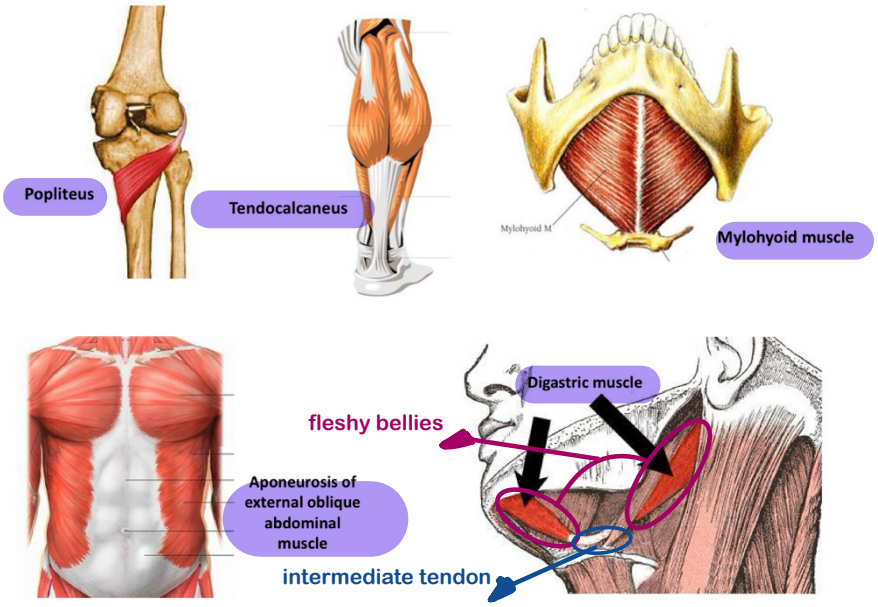
2. By tendon (a long fibrous cord): Tendocalcaneus & biceps

3. By raphe (a fibrous band that separates flesh muscles from each other): eg. Pharyngeal muscles & 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.



Way of attachment of muscles	Examples of muscles
fleshy fibers	Popliteus
tendon	Tendocalcaneus & biceps
raphe	Pharyngeal muscles & mylohyoid muscle
aponeurosis	external oblique abdominal muscle
skin	Facial muscles
intermediate tendon	Digastric muscle

Shape of Muscles

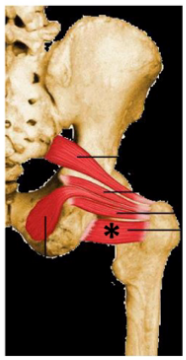
**The muscles can be classified into different types according to the shape of the muscle fibers in relation to the line of pull of the muscle.

A. Parallel Fibers B. Oblique Fibers C. Spiralized Fibers D. Cruciate Fibers
E. Circular Fibers

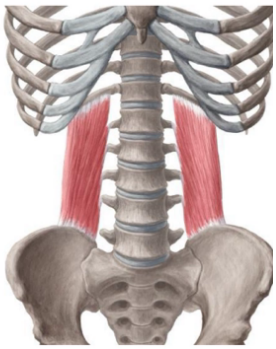
Parallel Fibers:

* May be:

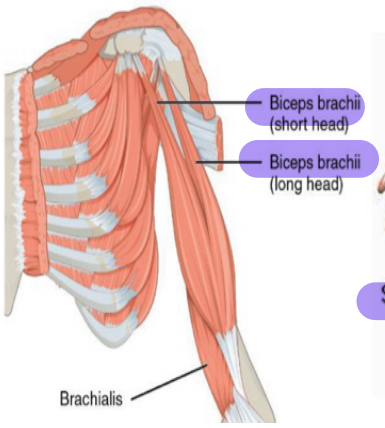
1. Quadrilateral: eg. Quadratus lumborum & quadratus femoris.
2. Fusiform:eg. Biceps brachii.
3. Strap-like:eg. Sartorius.
4. Strap-like with tendinous intersections: eg. Rectus abdominis

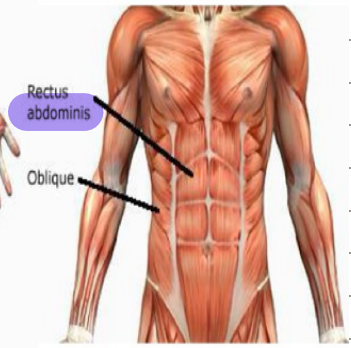


Quadratus Femoris



Quadratus Lumborum





Oblique Fibers:

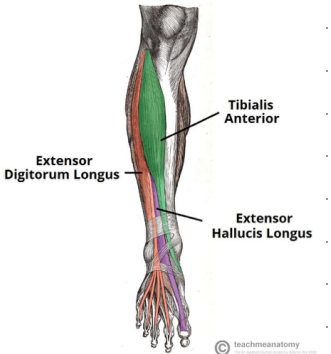
1. Pennate fibers:

A)Unipennate:Fibers run along one side of the tendon (like half a feather).Example: Palmar Interosseii & Flexor pollicis longus.

B)Bipennate: Tendon in the middle & fibers are attached to its 2 sides (like a complete feather).Example: Dorsal Interosseii & Rectus femoris.

C)Multipennate:A series of bipennate fibers (several feathers beside each other). Example: Deltoid.

D)Circumpennate: Fibers converge on a tendon to be attached to the circumference of the tendon.Example: Tibialis anterior



Multipennate (deltoid)

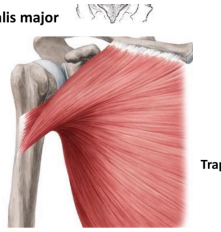
Unipennate (Flexor Pollicis longus)

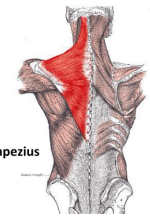
Bipennate (rectus femoris)

2. Triangular fibers:Muscle fibers converge from wide attachment to a narrow terminal tendon.Example: Temporalis

Spiralized Fibers:

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



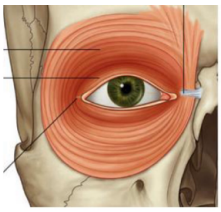


Cruciate Fibers:

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

Circular Fibers:

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



Coordination within Muscle Groups

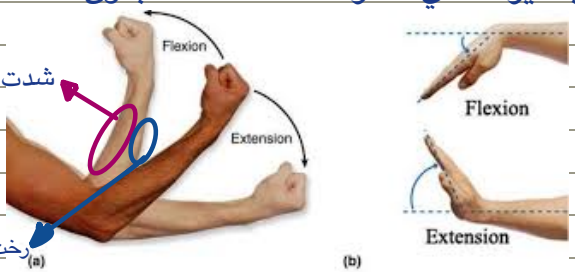
* Movements often are the result of several skeletal muscles acting as a group rather than acting alone.

* 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.

* يعني ما بصير نحكي صار عنا Flexion بدون Extension



Flexion شدت يعني سوت

Extension رخت يعني سوت

* يعني لما يصير عندي action بكون مسؤول عنه اكتر من عضلة وهدول العضلات بكونوا عكس بعض بالشي اللي سوته يعني وحدة رح تشد ووحدة حترخي وعكس بعض بالمكان تاعهم

Quiz

1)which type of muscles is striated :
A)skeletal muscles
B)smooth muscles
C)cardiac muscles
D)A+C

2)the smooth muscles is found in the wall of all of these except:
A)GIT
B)urinary system
C)blood vessels
D)limbs

3)pharyngeal muscles are attached by :
A)raphe
B)tendon
C)fleshy fibers
D)aponeurosis

4)the way of attachment of digastric muscle is:
A)raphe
B)tendon
C)fleshy fibers
D)attached to an intermediate tendon

5)an example of a strap-like shaped muscle is
A)biceps brachii
B)rectus abdominis
C)sartorius
D)rectus femoris

6)an example of muscles formed of spiralized fibers is:
A)sternomastoid muscle
B)temporalis
C)trapezius
D)tibialis anterior

7)usually when the muscle contracts, it gets longer by approximating the insertion to the origin
A)true
B)false

8)a fibrous band that separates flesh muscles from each other is:
A)fleshy fibers
B)tendon
C)raphe
D)insertion

Answers:
1)D
2)D
3)A
4)D
5)C
6)C
7)B
8)C
9)A
10)B
11)A
12)B

9)within opposing pair of muscles, one muscle is called agonist which contracts to cause an action, while the other is called antagonist, stretches to allow the movement caused by the agonist
A)true
B)false

10)smooth muscles are not striated, and their contraction is slow and voluntary, and they are supplied by autonomic nerves
A)true
B)false

11)which of these is the main bulk of muscles of our bodies :
A)skeletal muscles
B)smooth muscles
C)cardiac muscles

12)muscle fibers run in different planes and directions, these are (with an example)
A)cruciate fibers (trapezius)
B)cruciate fibers (sternomastoid)
C)circular fibers (orbicularis oculi)
D)spiralized fibers (sternocleidomastoid)

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