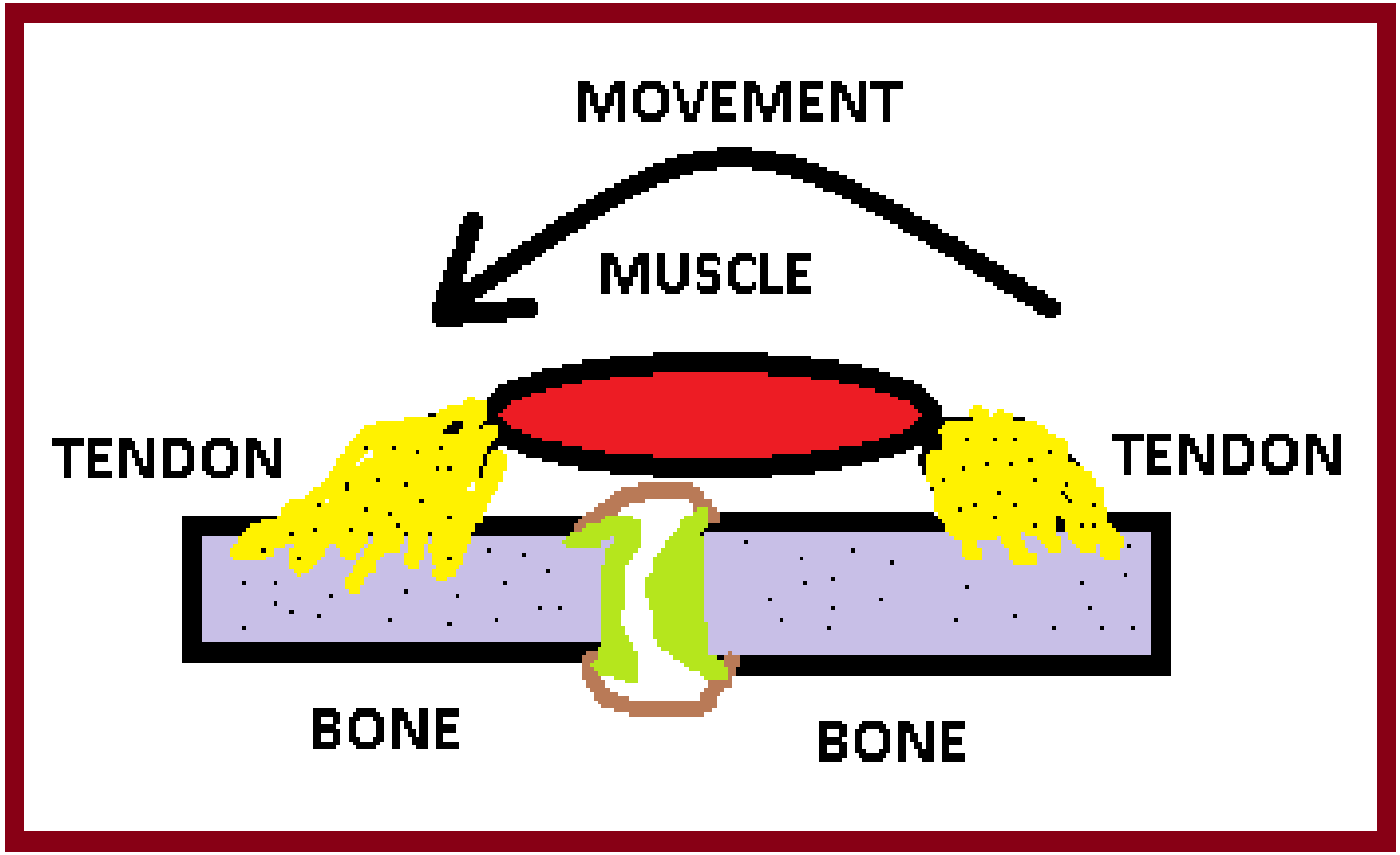

بسم الله الرحمن الرحيم

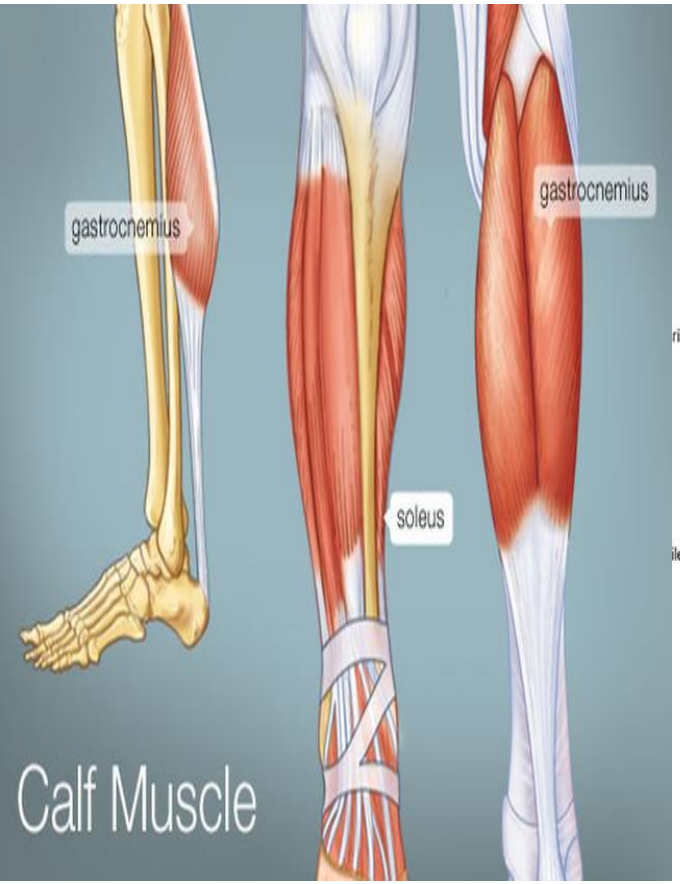

لا إله إلا الله محمد رسول الله

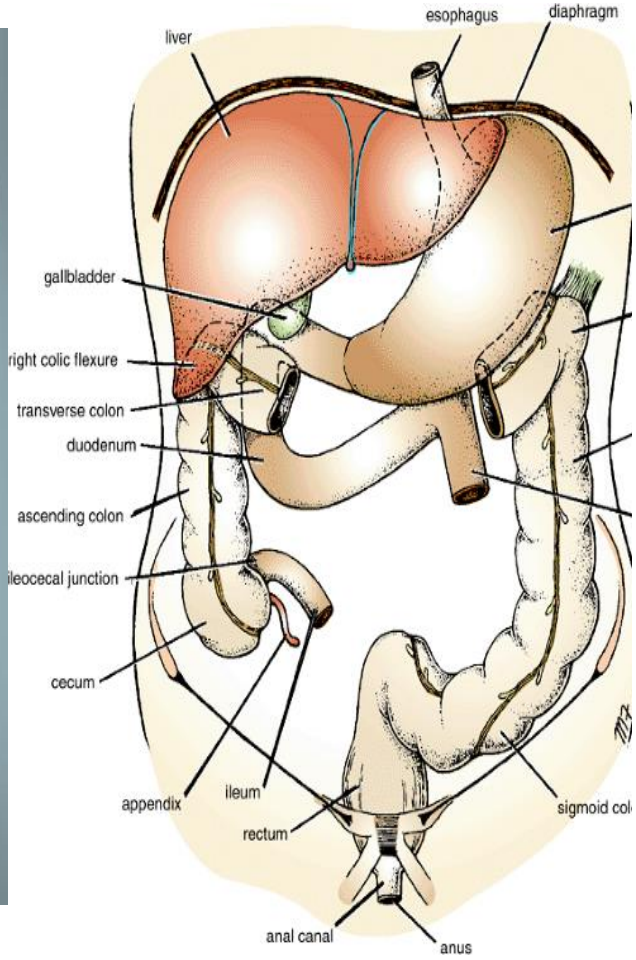

MOVEMENT
MUSCLE
TENDON
TENDON
BONE
BONE

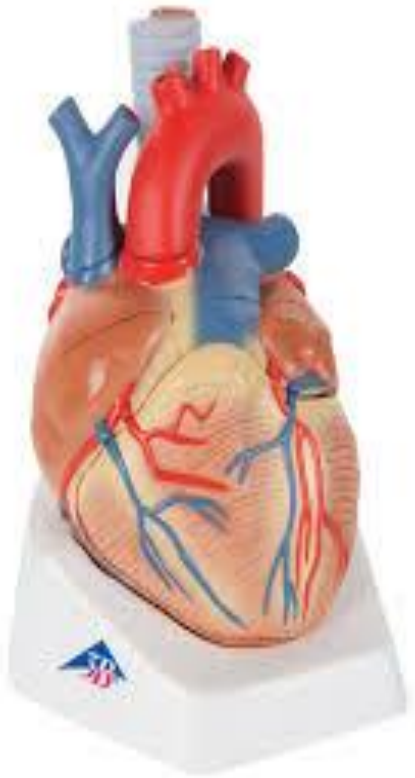
4. MUSCLE

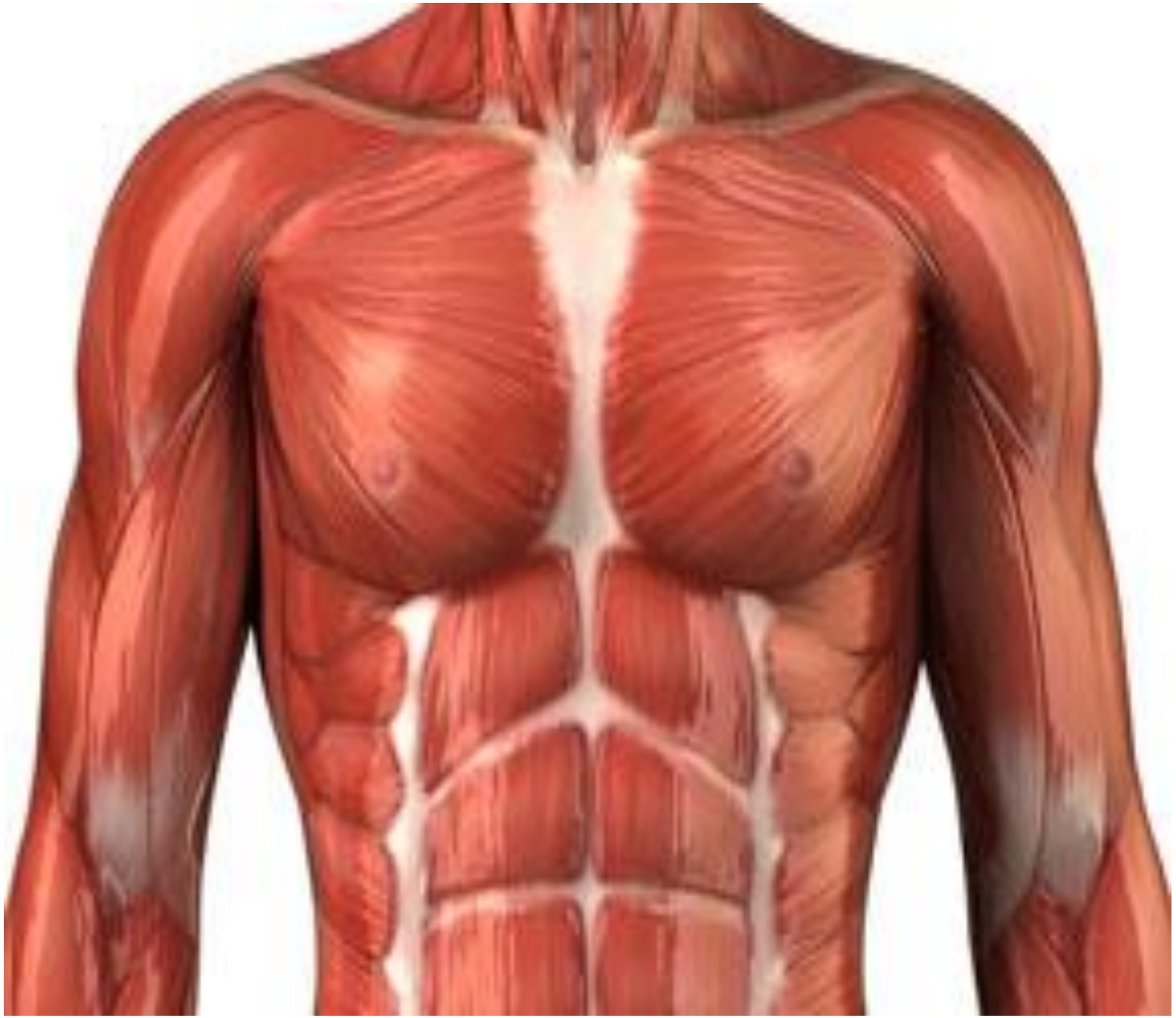
Main function of muscle is movements which could lead to maintenance of body posture. During contraction of muscle energy is utilized for different movements which also raise body temperature.

There are three types of muscles, skeletal, cardiac and smooth. The skeletal muscles are related to body wall, smooth muscles mainly lie in abdomen and cardiac muscles present in heart.


gastrocnemius
gastrocnemius
soleus
Calf Muscle

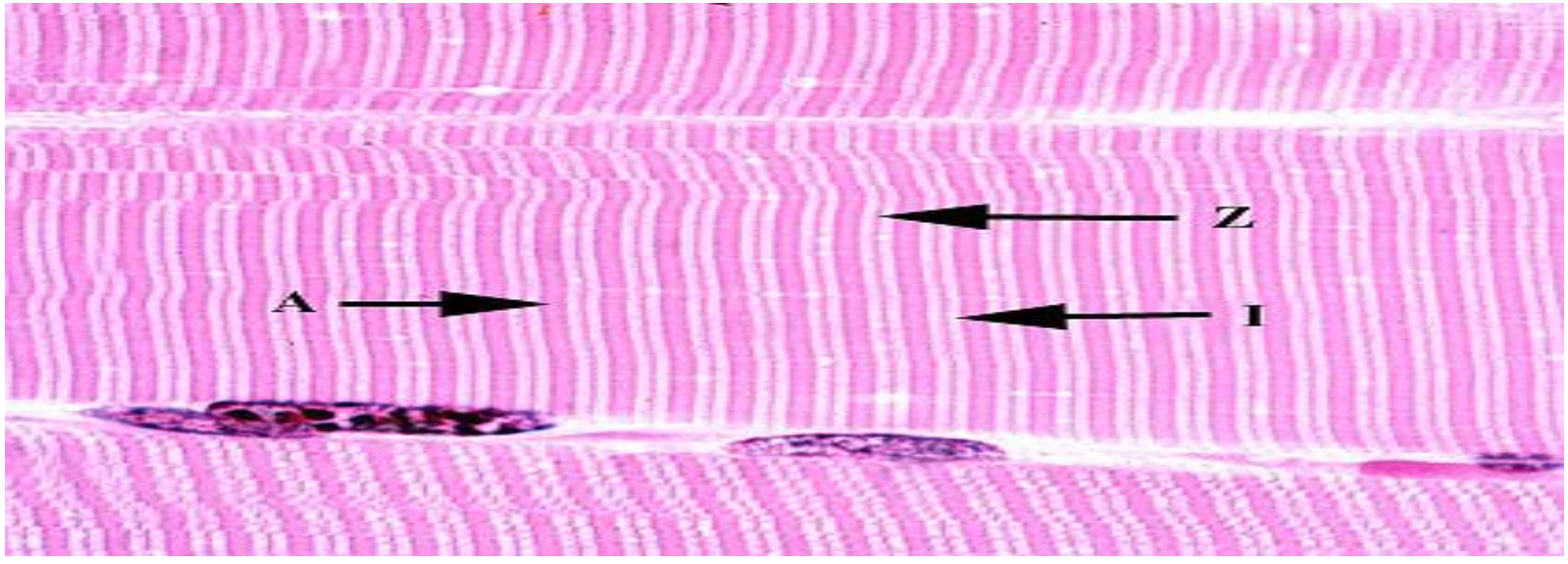

liver
esophagus
diaphragm
gallbladder
right colic flexure
transverse colon
duodenum
ascending colon
ileocecal junction
cecum
appendix
ileum
rectum
anal canal
anus
sigmoid col





Skeletal muscle: They are sometimes called voluntary, striped, striated or somatic muscles which constitute about half of the body weight. A skeletal muscle is attached to bones proximally as well as distally. In limb the proximal attachment is usually called origin and distal attachment the insertion. Origin is the part which remains fixed and insertion is that part which moves during contraction.

When examined under microscope skeletal muscle has elongated, non-branching, multinucleated fibers which are arranged peripherally in the muscle fiber. The striated appearance is most important feature of skeletal muscle. The muscles are commonly named according to their size, shape, position, attachments or actions. The nerve supply to a muscle is a mixed (sensory and motor) nerve containing some sympathetic autonomic fibers also which supply the muscle at the motor point. The fallowing are structures related to skeletal muscles .



Belly: The fleshy part of the muscle is called belly.

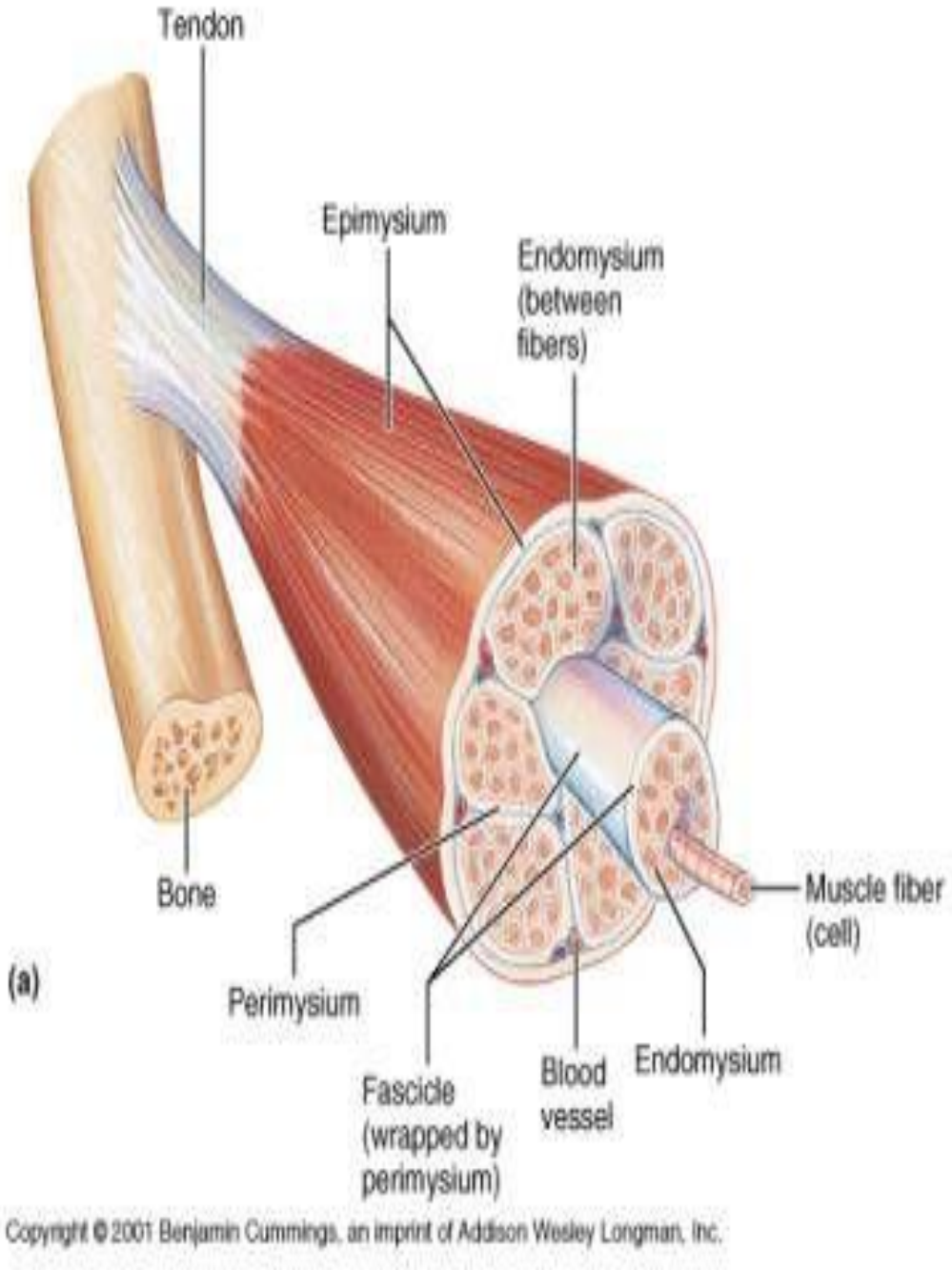
Tendon: The ends of a muscle are called tendons.

Epimysium: Connective tissue sheath covering the muscle as a whole is called epimysium.

Perimysium: Connective tissue sheath covering a group of muscle fibers called fasciculus.

Endomysium: Connective tissue sheath covering each fiber of muscle

Aponeurosis: A flattened muscle sheet of fibrous tissue is called an aponeurosis (aponeurosis of external oblique).



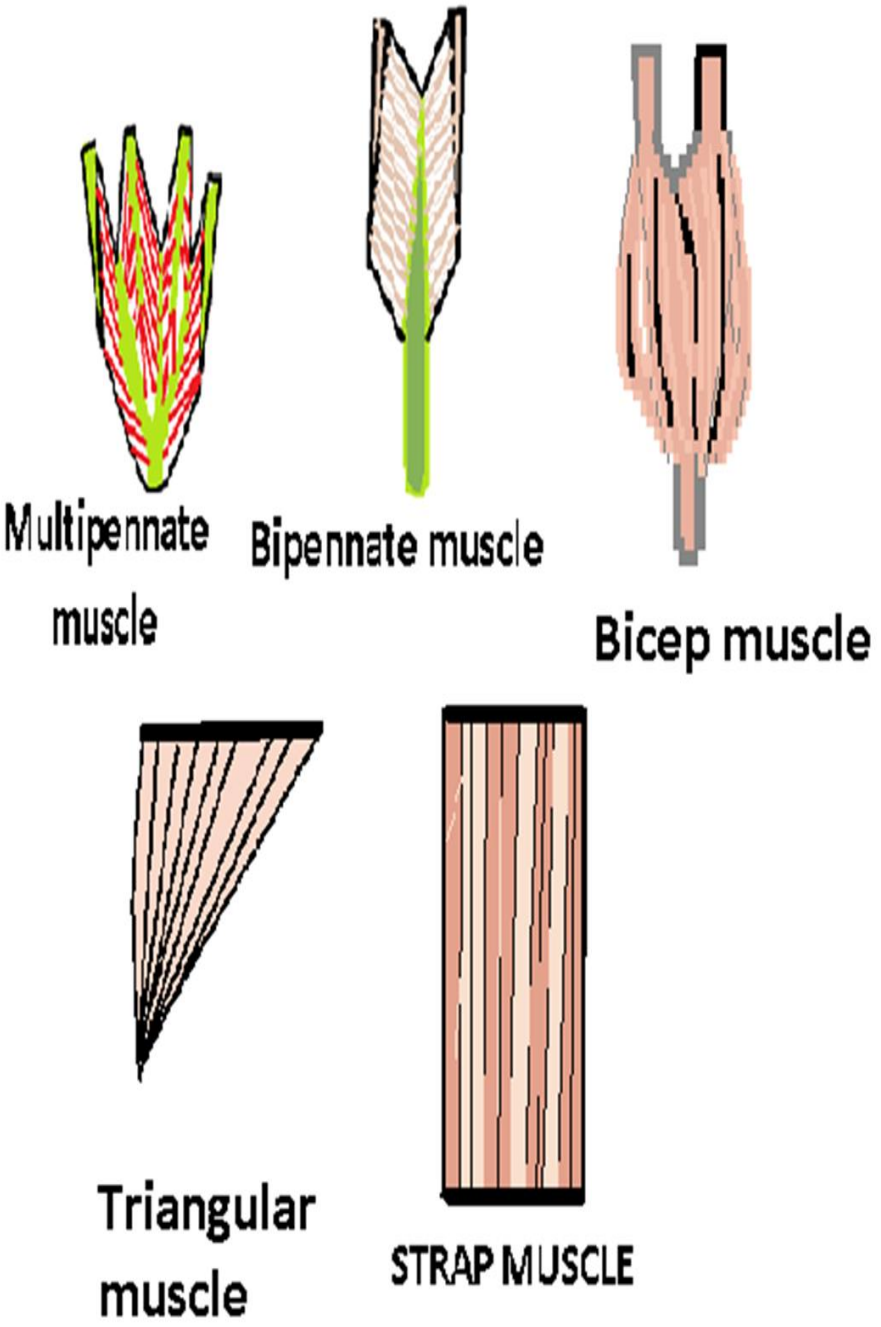
Raphe: It is the interdigitation of the tendinous ends of muscle fibers. It occur when muscles of right side interdigitate with those of left side, in the mid line.

Unipennate muscle: Unipennate muscle is one in which the muscle fibers pass oblique to the tendon along one side of the muscle as the extensor digitorum longus muscle. It is just like half of a feather.

Bipennate muscle: The bipennate muscle is like a feather, in which the tendon lies in the center of the muscle and the muscle fibers pass to it from both sides as in rectus femoris muscle.

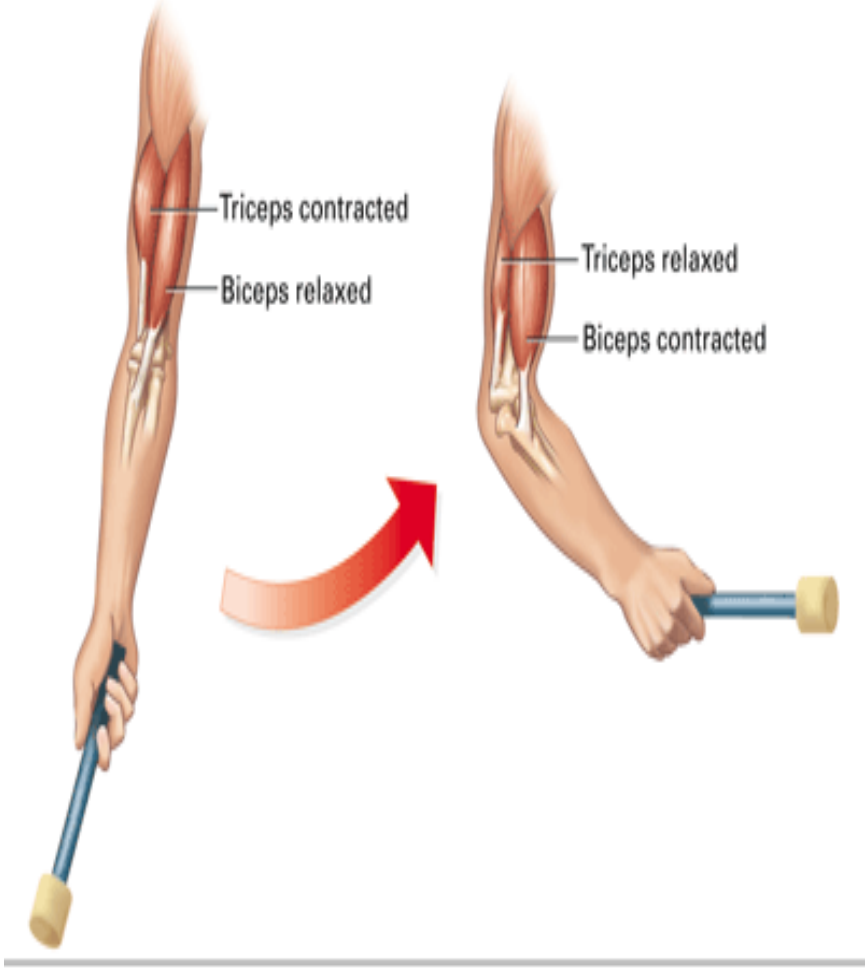
Multipennate muscle: A multipennate muscle contains many tendinous septa which allow many pennate muscle masses as in deltoid muscle.

Motor unit: Alpha motor neuron, together with muscle fibers it supplies, is called motor unit.



Skeletal muscle group action:
All movements are the result of the coordinated muscles action. According to group action the muscles are classified into four types: Prime mover, agonists, antagonists, synergists, fixators.

1. Prime mover: A muscle is a prime mover when it is the chief muscle responsible for a particular movement. As the quadriceps femoris is a prime mover in extending the knee joint and bicep muscle is also a prime mover in flexion of elbow joint.



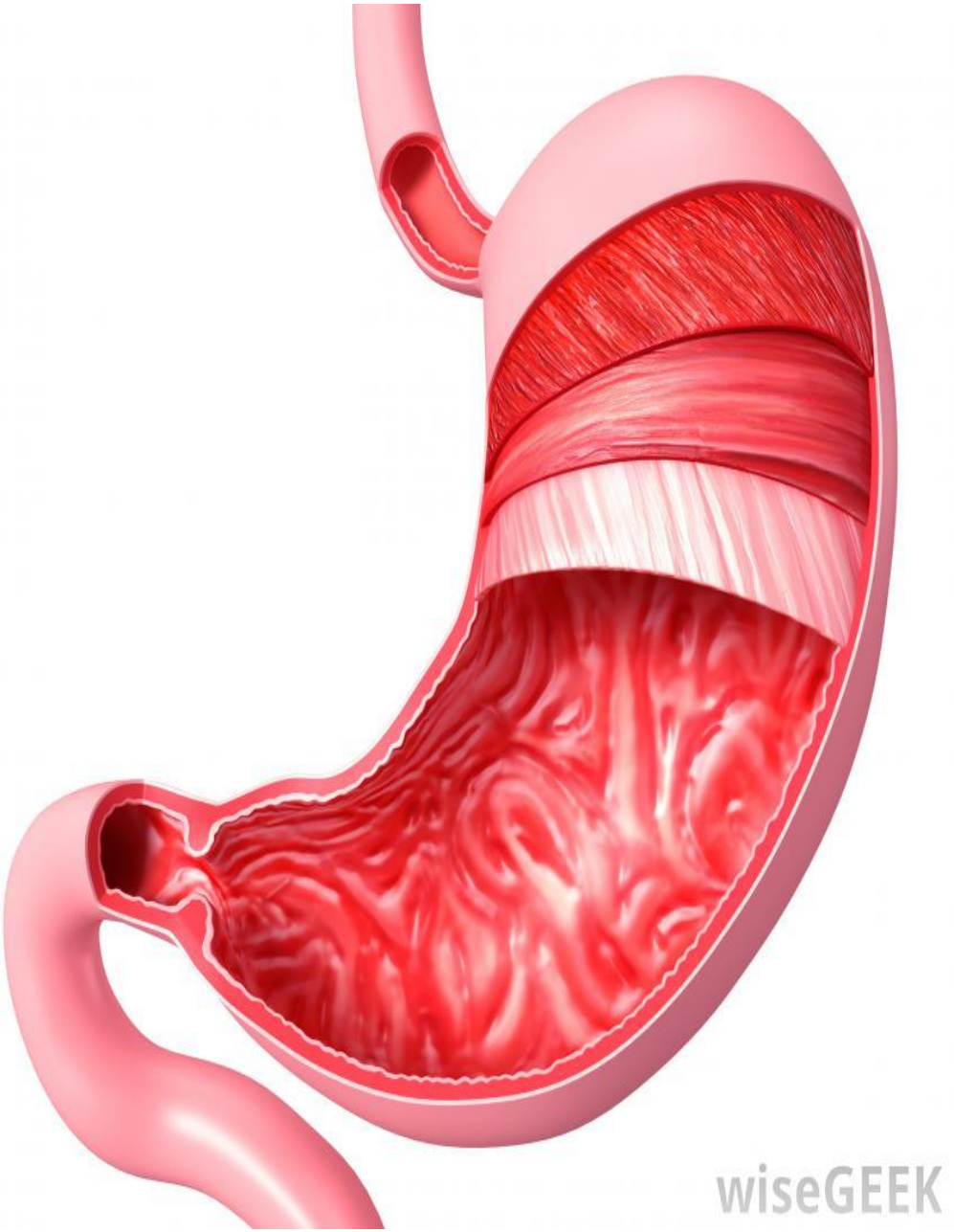
Antagonist: The muscle that relaxes to allow prime mover to perform its action smoothly. For example the biceps femoris must be relaxed to allow the quadriceps femoris to extend the knee joint which is brought about by refle inhibition of opposing muscles.

Synergist: When prime mover crosses several joints before it reaches the joint where its main action is required. The muscles which contract to stabilize the intermediate joints are called the synergists. For example, the flexor and extensor muscles of wrist joint contract to stabilize this intermediate joint to allow the long flexor or extensor muscles of the fingers to move the fingers.

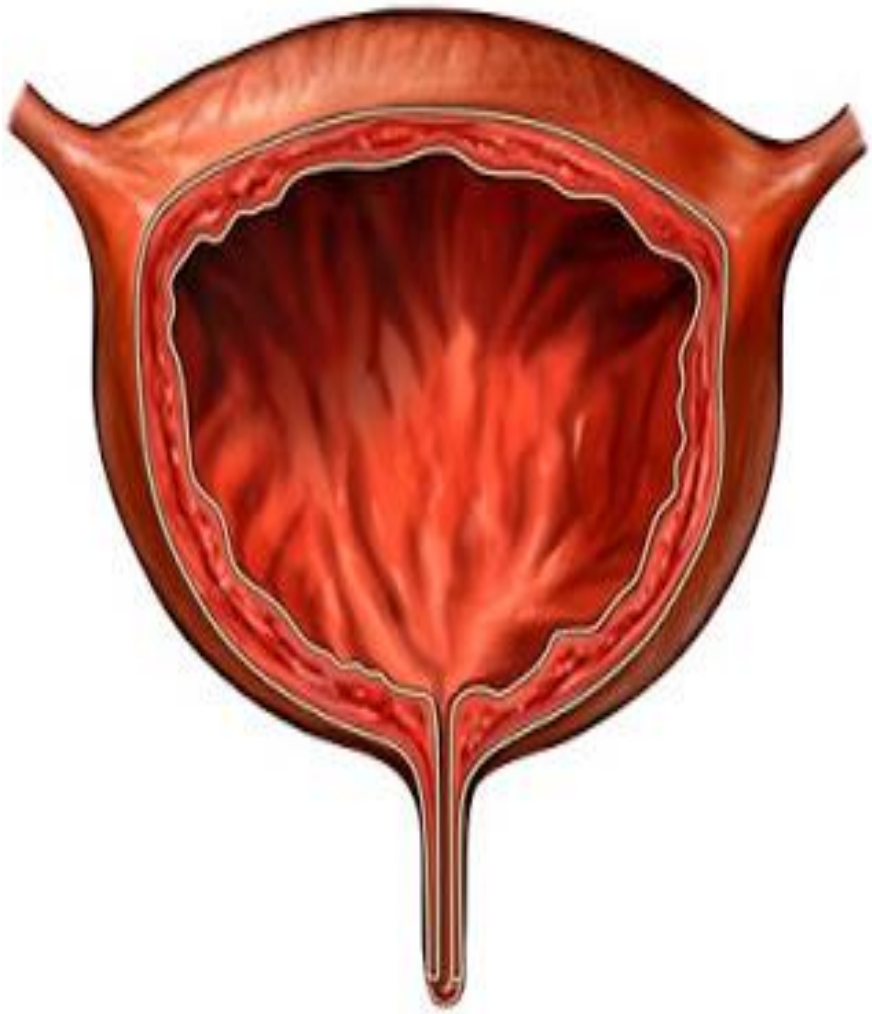
Fixator: A fixator contracts to stabilize the origin of the prime mover so that it can act effectively. For example, the proximal muscles of upper limb contract to stabilize the proximal part of upper limb to allow the deltoid muscle to abduct the shoulder joint properly.

Smooth Muscle:

Smooth muscles are also called involuntary muscles, are present in hollow organs, such as the gastrointestinal tract, the bladder, or the uterus. It propels the contents of these viscera distally during process of digestion in case of gastrointestinal tract.



Smooth muscles present in urinary bladder are arranged in a way to help in the process of micturition. In the digestive system it thoroughly mixes the food with the digestive juices. In case of uterus the smooth muscle fibres are arranged in such a way to help in expulsion of content forcefully outside. This function is very helpful in child delivery.



The smooth muscle fibers may be made to contract in response to local stretching of the fibers or by nerve impulses from autonomic nerves. Hormones can also stimulate the smooth muscle actions.

The smooth muscle fibers are smaller than skeletal muscle fibers. The plasma membranes of two neighboring fibers form gap junctions that act as a pathway for the spread of electrical signals to help in contraction and to push the contents to intestine distally. This well organized movement of gut is called peristalsis, to push the content distally.

Under microscope smooth muscle fibers are spindle shaped long cells with centrally located a single nucleus in each cell. It has no striations hence called unstrained or unstriped muscles.

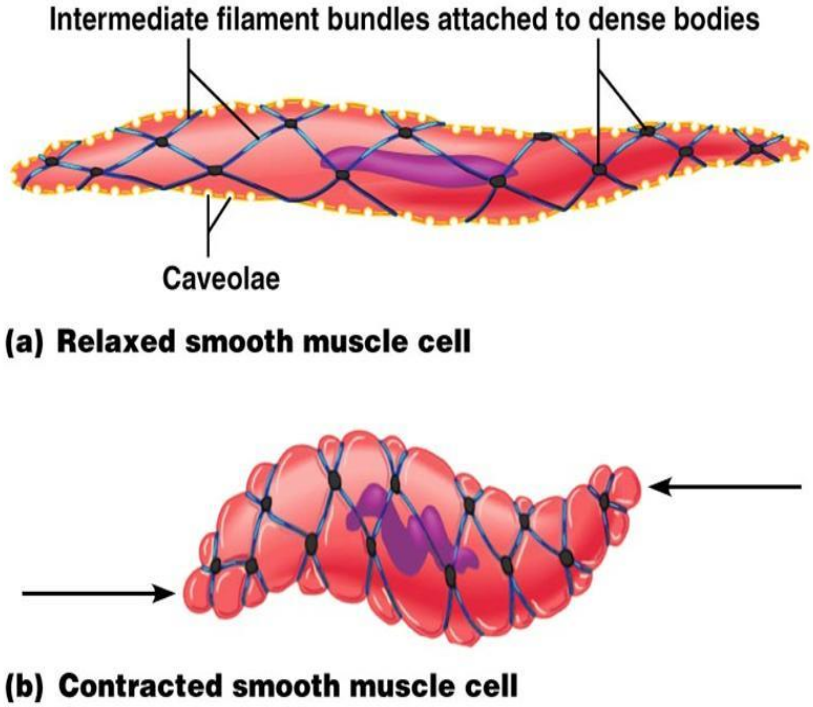
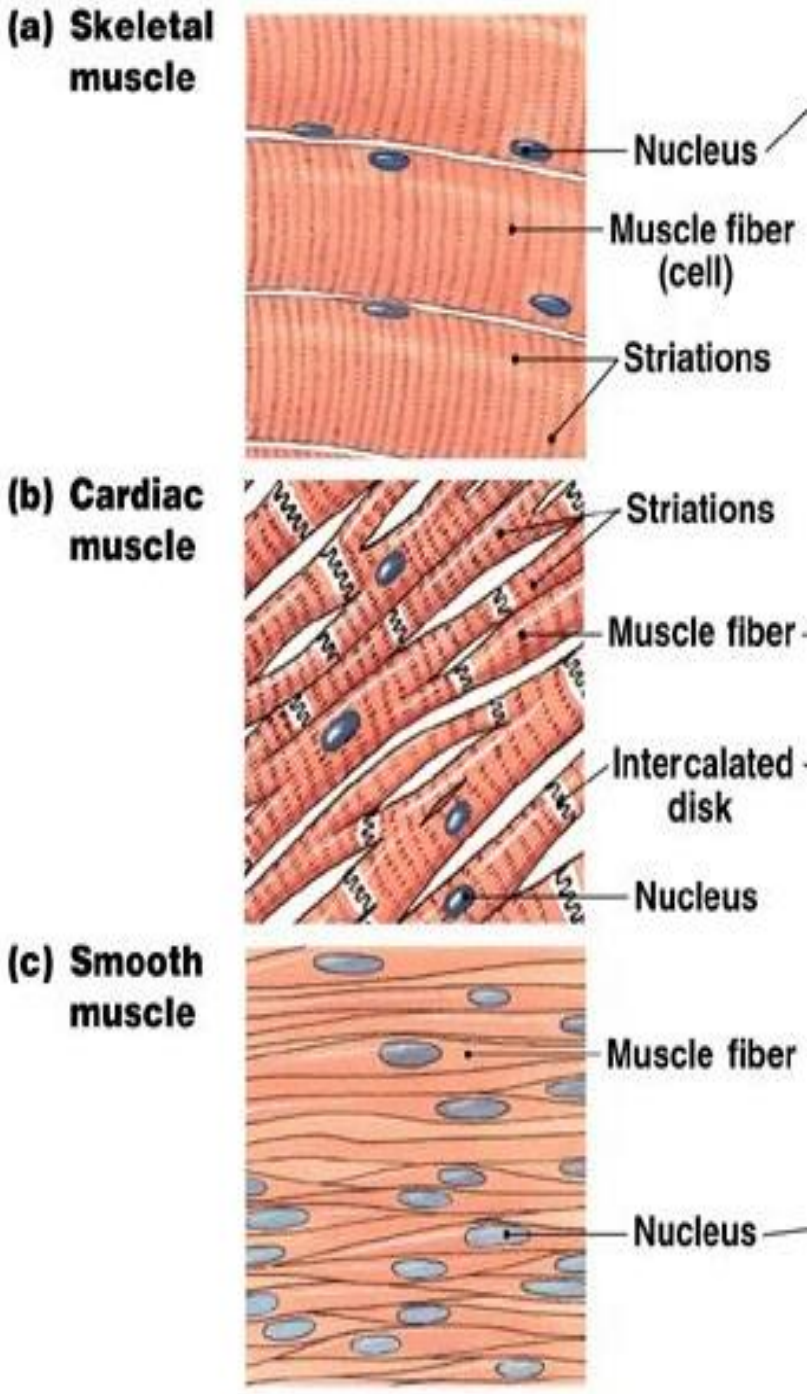


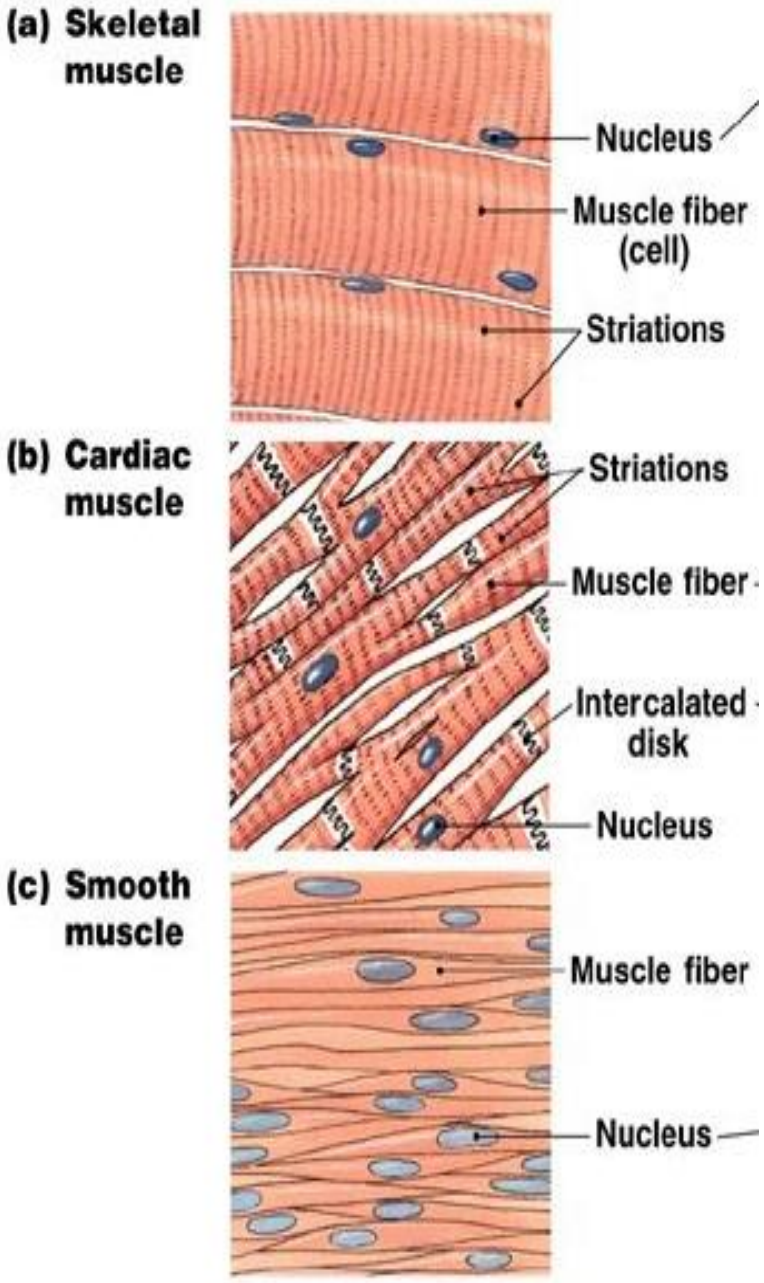
Figure 9.26

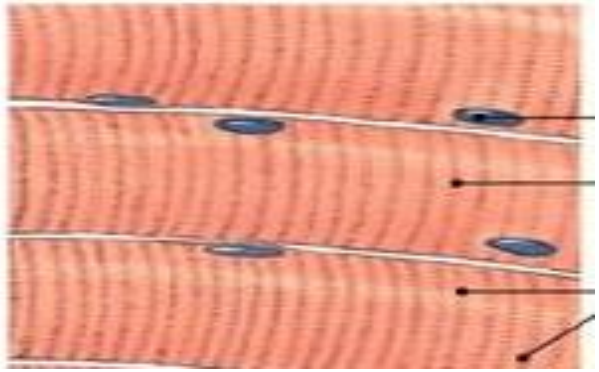
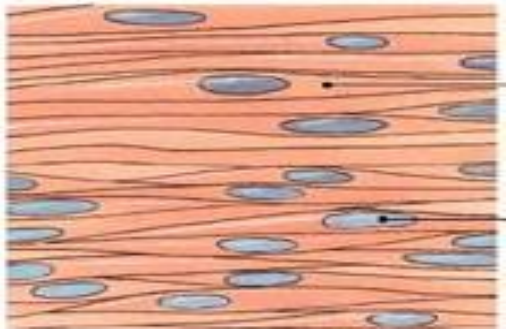
Cardiac muscle:

Cardiac muscle is located in the walls of the heart. It has striation like skeletal muscles and each cardiac muscle fiber has a single nucleus like smooth muscle fiber. Cardiac muscle fibers are broader, shorter and branched along with intercalated disc which is not a feature of smooth or skeletal muscle fibers. It is under the control of the sympathetic and parasympathetic nervous system and hence not under voluntary control.



A cardiac muscle fiber are resistant to fatigue due to continuous aerobic metabolism as the contraction of heart is life. It has specialized cardiac muscle fibers which form the conducting system of the heart, causing a well-organized contraction of both atria followed by contraction of ventricles. The difference between these three types of muscles is given in .




	DIFFERENCE BETWEEN THREE TYPES MUSCLE		
1	Skeletal	Smooth	Heart
2	Limbs	GIT	Heart
3	Cylibrical	Spindle	Cylindrical
4	Non	Non	Branched fibers
5	Multynucleated	Single	Single
6	Periphery Nuc.	Center	Center
7	Sarcolemma	Plasmalemma	Plasmalemma
8	Striated	Non	Non
9	No	No	IC DISCS
10	No	ANS	ANS
11	Fast	Slow	Inbetween

CLINICAL ANATOMY

Paralysis:

Loss of contraction in a muscle is called paralysis. The root cause of paralysis is commonly due to loss of nerve supply or it may be due to certain pathological conditions of muscle. In upper motor neuron type of paralysis the muscle reflexes are increased as compared to lower neuron lesion.

Atrophy of muscle:

A muscle which is not used for longer time will become thin and weak due to decrease in size of muscle cells. This is commonly due to loss of nerve supply.

Hypertrophy:

Excessive use of a muscle causes hypertrophy due to increase in size of muscle fibers. The cardiac hypertrophy is a pathological condition due to increased workload on heart muscle. It may be due to hypertension.

Muscle damage:

Skeletal muscles have no power of regeneration. Hence once muscle is damaged it heals by fibrosis and cardiac muscle is similarly replaced by scar tissue and not by muscle cells. But smooth muscle has the ability of regeneration after injury which is seen in muscles of uterus during pregnancy which is also associated with hyperplasia. But as a whole muscle and nerve do not regenerate.

Myocardial infarction:

It is due to blockage of artery supplying a particular region of heart resulting in necrosis of a part of cardiac muscle. The patient has severe pain in the chest referred to medial aspect of left arm and forearm.

Poliomyelitis:

The polio virus damages neuron in the ventral horn of spinal cord which results in paralysis of concerned muscles of trunk or lower limb. These muscles without nerve stimulation for prolong time become weak and degenerated which is called atrophy.

Practical:

(1) Write short note on primemover, antagonist, synergist and fixator. (You should also note that whenever a question is asked always give example and draw a simple diagrams along with your answer).

(2) Draw Unipennate muscle, bipennate muscle and multipennate muscle and give examples.

(3) Write the difference between skeletal, cardiac and smooth muscles. Draw label diagram of all these 3 types, from histology book.

(4) Write the benefits of exercise. Would it cause atrophy or hypertrophy of muscles?

(5) What is contraction of a muscle and what is peristalsis. Write benefit of contraction and peristalsis.

(6) Fill in the blanks.

Muscle and nerves ----------regenerate.

Epithelium and connective tissue------regenerate.

Muscle wound heals by ----------

Epithelial wound heals by ----------

THANKS