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Topic No. Sec - B (1)

Topic Name: Structural Classification of Muscles

Lecture No.: 3

Lecture Title

Structural Classification of Muscles - 1

Script

A muscle is made up of a number of muscle fibres, enclosed with their sarcolemmae, and bound together in bundles or fascicule by a connective tissue sheath named the perimysium; the fascicule are further bound together by a stronger connective tissue sheath known as the epimysium. These bundles of muscle fibres from the fleshy part of the muscle, or the muscle belly, while the connective tissue of the epimysium extends beyond the belly to form a tendon. Where muscles are gliding over one another the epimysium is thickened to form intermuscular septa, thus allowing freedom of movement, and providing support for the blood-vessels and nerves supplying the muscles. All the muscles in the limbs are bound together by a layer of connective tissue known as the deep fascia, which is thickened in some places to form bands or retinacula for the tendons.

When a single voluntary muscle fibre is examined under a micro scope it is found to consist of a number of strands of muscle protein called the myofibrils, which are enclosed in a covering called the sarcolemma; the latter has the muscle cell nuclei lying closely applied to its under surface. Each myofibril appears to be crossed by dark lines or straiation, from which this particular type of muscle tissue gets one of its many names. The individual fibers vary in length, width, diameter and colour, the latter characteristic being used to distinguish two types of skeletal muscle fibers. The first type is known as red muscle, from the presence of the pigment myoglobin in its fiber (myoglobin is closely related chemically to hemoglobin which is found in the red blood corpuscles), while the second type is called white muscle as its fibers do not contain myoglobin. Every muscle contain both types, but the red fibres predominate in muscles

which carry out slower sustained movements, such as the postural muscles of the limds and trunk, while the white fibres are more numerous where rapid action is required.

Diaphragm

It is a dome-shaped, musculfibrous sheet which separates the thoracic from abdominal cavity. Upper aspect is convex and lower is concave one. The muscular fibers may be grouped into 3 parts- sterna, costal and lumber.

The crura are tendinous in structure at their attachments. The right crus is broader and longer than the left.

The diaphragm is pierced for passage of structures between the thoraxes and abdomen, three large openings the aortic, the oesophogeal and the vena cava. There are some smaller openings also.

The diaphragm is supplied with motor fibers by phrenic nerves. The lower six or seven intercostals nerves distribute sensory fibers to the peripheral part of muscle.

Superficial fascia of abdomen

Most of abdomen consists of a single layer containing a variable amount of fat but in obese people lower part consists of many layers. Superficial fascia is divisible into two layers between which are superficial vessels, nerves and superficial inguinal lymphnodes.

Superficial layer is thick, areolar in texture and contains meshes. Below it passes over as superficial fascia of thigh. Deep layer is more membranous than superficial and contains elastic fibers.

Oblique externus abdominis

It is the largest and most superficial of the three flat muscles of region. It arises from external surfaces and inferior borders of lower eight ribs as eight fleshy slips. These are arranged in oblique line extending downwards and backwards. Aponeurosis of external oblique is a strong tendinous sheet directing downwards and medially. In median plane its fibers end in the linea alba.

Nerve supply is from lower six thoracic spinal nerves.

Oblique internus abdominis

It is less bulky and thinner. It arises by muscular fibres from upper surface of inguinal ligament, from ventral segment of iliac crest and thoraco lumber fascia. The anterior layer blands with the aponeurosis of transverses abdominis.

Nerve supply is by ventral rami of lower six thoracic and first lumbers spinal nerve.

Cremaster

It consists of a number of loosely arranged muscle fascicule lying along spermatic cord. They are united by alveolar tissue to form the sac-like cremastric fascia around the cord and testics within external spermatic fascia.

Nerve supply is from genital branch of genitor femoral nerve which is derived from first and second lumber spinal nerves.

Cremaster pulls up the testis towards the superficial inguinal ring.

Pyramidalis

It is a triangular muscle in front of lower part of rectus adbominis and within its sheath. The muscle passes upwards, diminishing in size as it ascends and ends in a pointed extremity attached to linea alba.
It is supplied by subcostal nerve. Function of it is to provide a firm but elastic wall to retain the abdominal viscera in position.

Linea alba

It is a tendinous raphe between the xiphoid process and symphysis pubis. It is between the recti formed by interplacements of fibres of aponeurosis of oblique and transverse. In its infra-umbilical part linea alba is narrow.

Transversalis fascia

It is a connective tissue stratum between internal surface of transverses and extraperitoneal fat. It is a part of geneal layer of fascia between the peritoneum and abdominal wall. In inguinal region it is thick and dense.

Deep inguinal ring

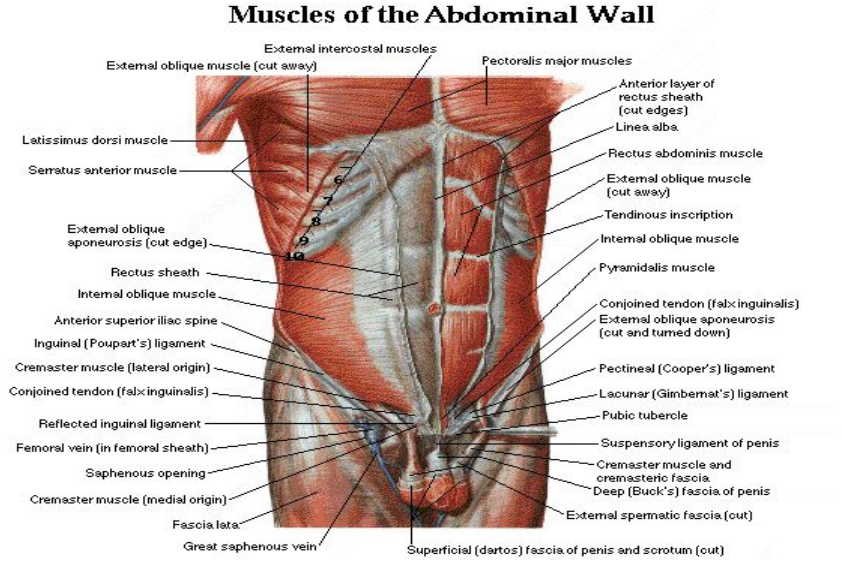
It is situated in the transversalis facia. It is in mid way between the anterior superior iliac spine and symphysis pubis, about 1.25 cms above inguinal ligament. It is oval and long axis is vertical. It is larger in males.

Inguinal canal

It contains spermatic cord or the round ligament of uterus and ilio inguinal. It is oblique and 4 cms long going downwards and medially. It extends from deep to the superficial inguinal ring.

Quadrates lumborum

It is an irregularly quadrilateral posteriors muscle of abdomen. It is broader inferiorly. It is attached below by aponeurotic fibres to the iliolumbar ligament. Anterior to quadrates lumborum are colon, kidney, psoas major or minor and diaphragm.
Nerve supply is from ventral rami of twelfth thoracic and upper 3-4 lumber spinal nerves.
The quadratus lumborum fixes the last rib and acts as a muscle of inspiration.

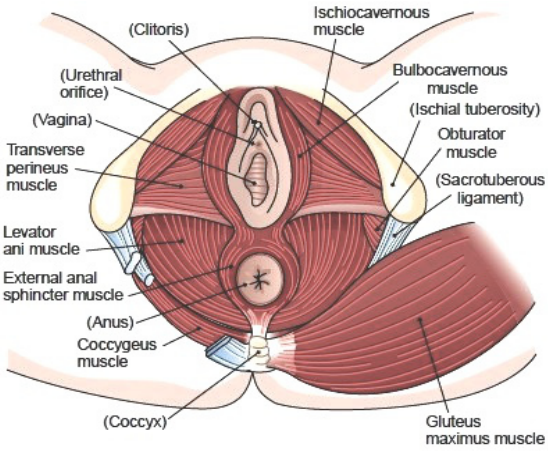


Levator ani

It is a broad, thin muscle attached to inner surface of true pelvis and unites with the opposite muscle to form the greater part of floor of pelvis. In front it is attached to the pelvic surface of body of pubis, behind to the medical surface of ischium. The muscle fibers pass towards the median plane with varying degrees of obliquity. Morphologically it can be divided into pubococcygeus and iliococcygeus.

Levator ani constricts the lower end of rectum and vagina and perineal body.

Muscles of pelvic floor



Sphinter ani externus

It surrounds the lowest part of anal canal. Below it is adherent to skin, above it overlaps the sphincter ani internus.

Bulbospongiosum

It is in the median line of perineum infront of anus. It arises from median tendinous raphe. Its fibre diverges like two halves which helps in emptying the urethra, after the bladder has expelled its contents.

Inshiocavernosus

It covers the crus penis. It is attached by tendinous and fleshy fibers to the inner surface of ischial tuberosity. The muscular fibers end in aponeurosis attached to crus penis.

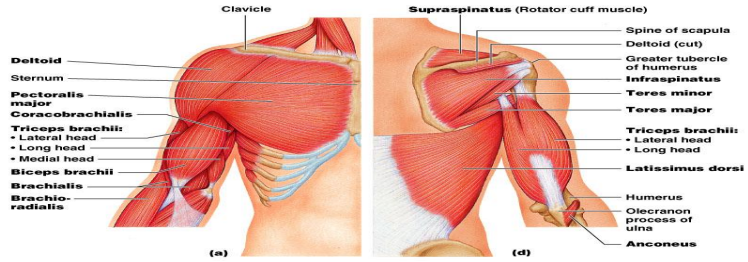
It compresses the crus penis and so many plays a part a part in maintaining erection of penis.

Trapezius

It is a flat, traigular muscle extending over the back of neck and upper thorax. The superior fibers precede downwards, the inferior upwards and the middle horizontally.

It is supplied by accessory nerve and by sensory branches from ventral rami 3rd and 4th cervical spinal nerve. Acting with outer muscles attached to the scapula, the trapezius steadies scapulae and controls its position.

Muscles of upper limb



Latissimus dorsi

It is a large, triangular, flat muscle extended over lumbar region and lower half of thrax from spine of lower six thoracic vertebra anterior to trapezius. Latissimus dorsi with teres major forms posterior fold of axilla. Nerve supply is from thoracodorsal nerve from posterior cord of brachial plexus C6, C7 and C8.

This muscle is active in movements of adduction, extension and especially medial rotation of the humerus. It takes part in all violent expiratory movements.

Pectoralis major

It is a thick, triangular muscle arising from the anterior surface of sterna half of clavicle and anterior surface of sternum clavicular fibres are separated by sterna fibres by a gap. Muscle is attached to humerus. The number of costal attachments varies. The rounded lower border of muscle forms the anterior axillary fold.

Nerve part of pectoralis major may act together or separately in adduction and medial rotation of humerus.

Levator scapulae

It is attached by tendinous slips to the transverse process of the atlas and axis and to the 3rd and 4th cervical vertebrae. It descends diagonally to be attached to the medial border of scapulae. It is supplied by 3rd and 4th cervical nerves. It descends diagonally to be attached to the medial border or scapulae. It is supplied directly by 3rd and 4th cervical nerves and from 5th cervical through dorsal scapular nerve. In association with other muscles it helps in movements during active use of upper limb.

Serratus anterior

It is a muscular sheet which passes backwards around the thorax from large costal attachment to a limited attachment of scapula. Nerve supply is from C5, C6 and C7 which descends on external surface of muscle.

It draws the scapule forward. When muscle is paralysed the lower angle of scapula stands out prominently.

Deltoid muscle

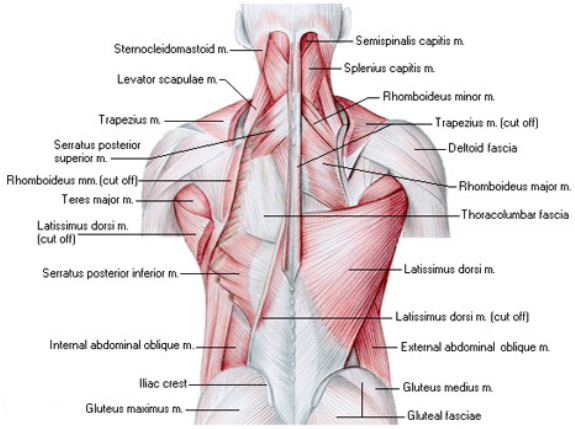
It is a thick muscle-like Greek letter delta. It we attached to lateral third of clavicle. The muscle converges into a short and substantial tendon attached to the deltoid tuberosity.

Nerve supply is from axillary nerve, C5 and C6. Muscle is able to act in a part or as whole, anterior fibres cooperate with pectoralis major in drawing arm forward, posteriors fibers draw arm backwards.

Infraspinatous muscle

It is a thick triangular muscle occupying most of infraspinatous fossa. It arises from medial 2/3 of fossa. The fibres converge to a tendon which glides over lateral border of spine of scapula. It is supplied by supraclavicular nerve, C4, C5 and C6.

Muscles of back



Teres major

It is a thick, flattened muscle which arises from inferior angle of scapula. The fibers are directed upwards and laterally ending in a flat tendon.

Nerve supply is from lower subscapular nerve C6, C7. The teres major draws the humerus medically and backwards and rotates medically.

Biceps brachii

It is a large, fusiform muscle in the flexor compartment of upper arm. Short head arises by a thick flattened tendon from apex of coracoid process. Long head starts with in fibrous capsule of shoulder joint. Each tendon is elongated muscular belly and the two bellies closely attached.

Nerve supply is from C5 and C6. The biceps is a powerful supinator.

Triceps

It is a large size and arises by three heads long lateral medial. Long head arises from infraglenoid tubercle of scapula. Lateral head arises from shaft of humerus. Medial head is narrow and arises from humerus.

Nerve supply is from C6, C7 and C8. Separate branch supplies a separate head. Triceps is a muscle of extension of forearm at the elbow joints.

Pronator teres

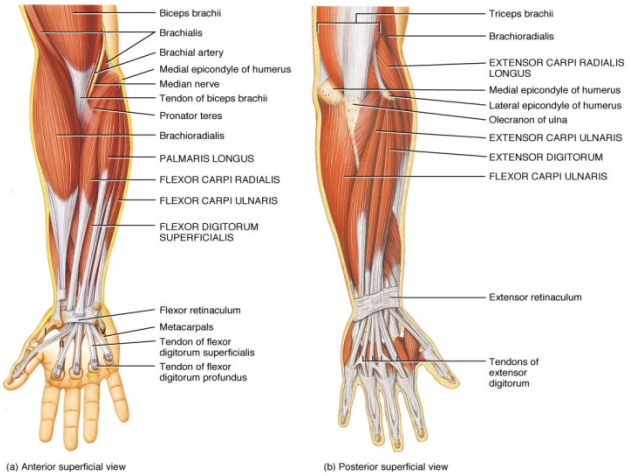
It has humeral and ulnar attachment. The humeral head is larger, more superficial and arises from medial epicondyle. Much smaller ulnar head arises from medial side of ulna.

Nerve supply is from C6 and C7. It rotates the radius upon ulna turning the palm of hand backwards. It is also a weal flexor of elbow joint.

Flexor carpi radialis

It arises from the medial epicondyle by the common flexor tendon its body is fusiform. In lower part of forearm radial artery is between the tendon of this muscle and that of brachioradialis.

Muscles of forearm



Nerve supply is by median nerve, C6 and C7. It flexes the wrist. Acting with the radial extensors of wrist helps to abduct the hand.

Palmaris longus

It is slender, fusiform and medial to flexor carpiv radialis. It arises from the medial epicondyle. It ends in long slender tendon. Nervr supply is median nerve, C7 and C8. This muscle flexes the wrist and may act as a extensor of palmar fascia.

Flexor carpi ulnaris

It arises by two heads, humeral and ulnar connected by tendinous arch. Humeral head is small and arises from the medial epicindyle of humerus, ulnar head from medial margin of epicondyle. Nerve supply is from C7 and C8.

Flexor digitorum profundus

It arises from ulna. Muscle ends in four tendons. It forms most of muscular elevation felt on dorsum of forearm nerve supply is C8, T1 and interosseous branch of median nerve.

The flexor digitorum profindus flexes the distal phalanges.

Brachioradials

It is the most superficial muscle of forearm. It arises from upper two thirds of lateral supracondylar ridge.

Nerve supply is from radial nerve C5, C6 and C7.

It is a flexor of elbow joint.

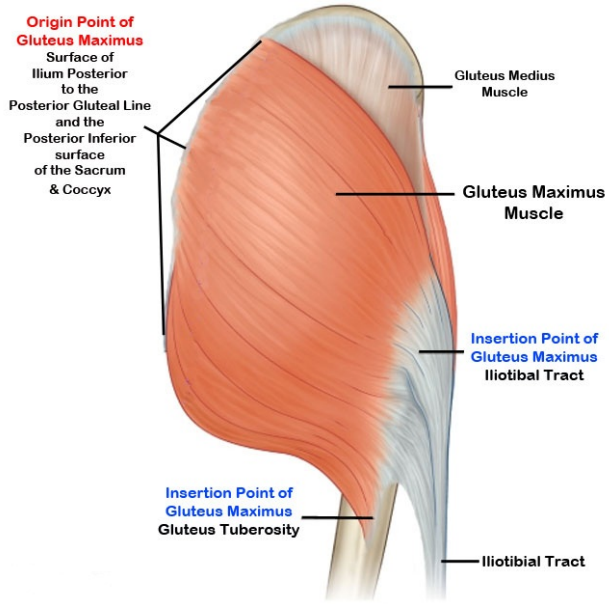
Psoas major

It is a long fusiform muscle lateral to the lumbar region of vertebral nerve L1, L2 and L3. It flexes the thigh.

Gluteus maximus

It is the largest and most superficial muscle in the region it is a broad and thick quadrilateral mass. It forms prominence of buttock. Nerve supply is from inferior gluteal nerve L5 and S1 and S2. It can extend the flexed thigh and bring it into line with the trunk.

Gluteus maximus



Gastrocnemius

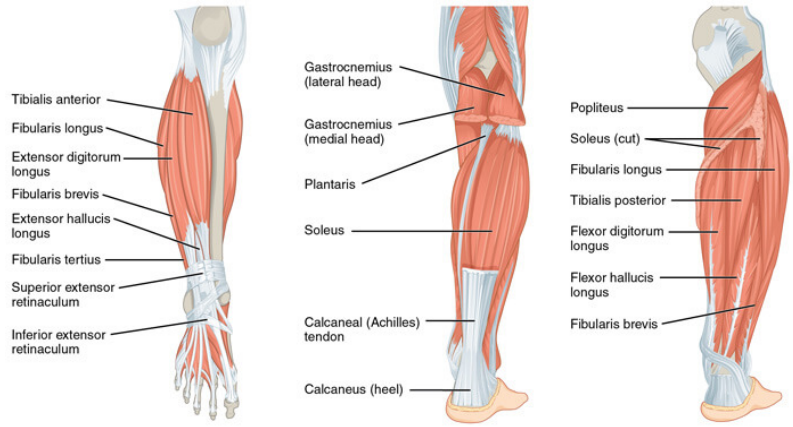
It forms the belly of calf. It arises by two heads. Nerve supply is from tibial nerve, S1 and S2.

Flexor hallucis longus

It arises from the inferior two thirds of posterior surface of fibula.

The fibres pass obliquely down to a tendon which occupies nearly the whole of posterior of muscle. Nerve supply is from S2 and S3.

Calf muscles



Flexor digitorum longus

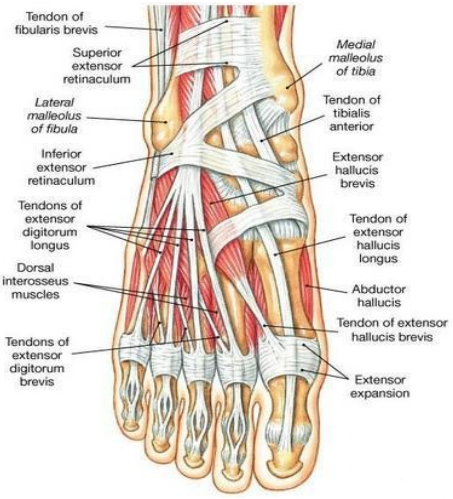
It lies medial to flexor hallucis longus, is thin and pointed proximally. It gradually widens as it descends. It arises from posterior surface of tibia. Nerve supply is from S2 and S3.

It is a planter flexor.

Superior extensor retinaculum it binds down the tendon of tibialis anterior, extensor hallucis longus, extensor digitorum longus and peroneus tertius. It is attached laterally to lower end of fibula and medially to anterior border of tibia.

Inferior extensor retinaculum

It is y shaped band anterior to the talocrural joint. Its stem is attached to the upper surface of calcaneus.



Summary

Knowledge of the position and action of the various muscle groups is of extreme importance to physical education students as unequal muscle pull is one of the commonest causes of deformity. Paralysed muscles must always be supported in the position of function, which also prevents contractures in the unaffected groups. The practical application of efficient splint age can only be achieved by an intelligent understanding of muscle action.