Anatomy of muscular system

OBJECTIVES:

By the end of this lecture, student should understand:

- Characteristics of Muscle Tissue
- Types of muscles
- Nomenclature of muscles

<u>Muscle tissue</u> is a one of the four fundamental types of <u>tissue</u> present in animals which include:

- Epithelial tissue
- Connective tissue
- Muscular tissue
- Nervous tissue

Characteristics of Muscle Tissue

Excitability :ability to receive and respond to stimuli

Contractility : ability to shorten and thicken

Extensibility : ability to stretch

Elasticity : ability to return to the original shape

The characteristics of muscle tissue enable it to perform some important functions, including:

- Movement both voluntary & involuntary
- Maintaining posture
- Supporting soft tissues within body cavities
- Guarding entrances & exits of the body
- Maintaining body temperature

Types of muscles

There are three types of muscle tissue recognized in <u>vertebrates</u>:

Skeletal muscle or "voluntary muscle" (used to effect skeletal movement such as locomotion and in maintaining posture).

In at least one place.
It is name from the fact that

Skeletal muscle is controlled consciously.

- Every physical action that a person consciously performs (e.g. speaking, walking, or writing) requires skeletal muscle.
- The function of skeletal muscle is to contract to move parts of the body closer to the bone that the muscle is attached to.
- An average adult male is made up of 42% of skeletal muscle and an average adult female is made up of 36% (as a percentage of body mass)

Skeletal Muscle

- striated, voluntary
- Multi-nucleated fibers in bundles
- 1-40 mm long, 10-100 microns thick
- 42% of male body weight, 36% in females
- General
 - 1. sarcoplasm cytoplasm of muscle fibers
 - 2. sarcolemma plasma membrane covering the muscle fibers
 - 3. location any muscle attached to bones as well as in the tongue, the pharynx, and certain muscles of the eye
 - 4. functions locomotion, posture, transport of blood and lymph, and heat production (85% of the body's heat)

- <u>Smooth muscle</u> or "involuntary muscle" is found within the walls of organs and structures such as the <u>esophagus</u>, <u>stomach</u>, <u>intestines</u>, <u>bronchi</u>, <u>uterus</u>, <u>urethra</u>, <u>bladder</u>, <u>blood vessels</u>.
- Unlike skeletal muscle, smooth muscle is not under conscious control.

Smooth Muscle

- Involuntary maintenance of the body's internal environment
- Nonstriated
- Spindle shaped
- 15-500 microns long
- contractions are slow
- Location in the walls of internal organs such as digestive organs, trachea, gall bladder, blood vessels, urinary and genital ducts, and the iris of the eye
- Functions propulsion, expulsion, regulation of openings, and regulation the diameter of tubes / blood vessels

 <u>Cardiac muscle</u> (myocardium), is also an "involuntary muscle" but is more akin in structure to skeletal muscle, and is found only in the heart.

Cardiac Muscle

- heart muscle, involuntary
- branched fibers & striated
 - Similar to skeletal muscles
 - Involuntary control
- Functions
 - Move blood through the heart and through the vessels

 Cardiac and skeletal muscles are "striated" in that they contain <u>sarcomeres</u> that are packed into highly regular arrangements of bundles; the myofibrils of smooth muscle cells are not arranged in sarcomeres and so are not striated.

Nomenclature of Muscles

- Muscles are named according to:
 - Location: pectoralis gluteus, brachial
 - Size: maximus, minimus, longus, brevis
 - Shape: deltoid, quadratus, teres
 - Orientation: rectus
 - Origin and insertion: sternocleidomastoid, brachioradialis
 - Number of heads: biceps, triceps
 - Function: abductor, adductor, masseter

MUSCLES OF MASTICATION

Masseter



- Origin:
 - Maxilla and Zygomatic Arch
- Insertion:
 - Mandible
- Action:
 - Elevates Mandible (closing mouth), Protracts Mandible

Temporalis



- Origin:
 - Temporal Bone
- Insertion:
 - Mandible
- Action:
 - Elevates and Retracts Mandible

Digastric



- Origin:
 - Mandible and Mastoid Process
- Insertion:
 - Hyoid Bone
- Action:
 - Depresses Mandible

Mylohyoid



- Origin:
 - Mandible
- Insertion:
 - Hyoid Bone
- Action:
 - Raises Floor of Mouth and Pulls Hyoid Forward

NECK MUSCLES THAT MOVE THE HEAD

Sternocleidomastoid



- Origin:
 - Clavicle and Sternum
- Insertion:
 - Mastoid Process
- Action:
 - Flexes and Laterally rotates head

MUSCLES OF HYOID, LAYRNX, & TONGUE

Sternohyoid



• Origin:

- Sternum
- Insertion:
 - Hyoid Bone
- Action:
 - Depresses Hyoid Bone

Sternothyroid



- Origin:
 - Sternum
- Insertion:
 - Thyroid Cartilage of Larynx
- Action:
 - Depresses thyroid cartilage

Thyrohyoid



• Origin:

- Thyroid Cartilage of Larynx
- Insertion:
 - Hyoid Bone
- Action:
 - Elevates Thyroid Cartilage, Depresses Hyoid Bone

Geniohyoid (deep to Mylohyoid)

- Origin:
 - Mandible
- Insertion:
 - Hyoid Bone
- Action:
 - Pulls Hyoid Bone Anteriorally



MUSCLES THAT ATTACH PECTORAL APPENDAGES TO THE VERTEBRAL COLUMN

Trapezius



- Origin:
 - Occipital Bone and Cervical and Thoracic Vertebrae
- Insertion:
 - Scapula and Clavicle
- Action:
 - Raises Clavicle, Adducts, Elevates and Depresses Scapula

Latissimus Dorsi



- Origin:
 - Thoracic and Lumbar Vertebrae, Sacrum and Ilium and last 4 Ribs
- Insertion:
 - Humerus
- Action:
 - Extends, Adducts, Rotates Arm medially, Pulls Shoulder Down and Back

Rhomboideus Minor



- Origin:
 - Cervical and Thoracic Vertebrae
- Insertion:
 - Scapula
- Action:
 - Adducts Scapula



Rhomboideus

Major



- Origin:
 - Thoracic Vertebrae
- Insertion:
 - Scapula
- Action:
 - Moves Scapula Back and Up and Rotates Downward
- DEEP SUPERFICIAL Semispinalis capitis Splenius capitis Sternocleidomastoid Levator scapulae Cut edge of right trapezius Rhomboideus minor (cut) Trapezius Supraspinatus Deltoid Infraspinatus Serratus posterior (superio Rhomboideus major (cut and reflected) Teres minor Teres major Infraspinatus Triceps brachii Teres major Serratus anterior Latissimus dorsi Latissimus dorsi (cut and reflected) **Erector** spinae (spinalis, longissimus, iliocostalis; Serratus posterior see Figure 10-12) (inferior) Lumbodorsal fascia External abdominal oblique External abdominal oblique Internal abdominal oblique lliac crest Gluteus medius Latissimus dorsi (cut and reflected) Gluteus maximus

Levator Scapulae





- Origin:
 - Cervical Vertebrae
- Insertion:
 - Scapula
- Action:
 - Elevates Scapula

MUSCLES THAT ATTACH PECTORAL APPENDAGES TO VENTRAL AND BODY WALL

Pectoralis Major





- Clavicle, Sternum and Cartilage of 2nd through 6th Ribs
- Insertion:
 - Humerus
- Action:
 - Flexes, Adducts, Rotates Arm-Medially



Pectoralis Minor



- Origin:
 - 3rd through 5th Ribs
- Insertion:
 - Scapula
- Action:
 - Depresses Scapula, Rotates Shoulder Upward



Serratus Anterior



- Origin:
 - First 8 or 9 Ribs
- Insertion:
 - Scapula
- Action:
 - Pulls Scapula Forward, Rotates Scapula Upward
MUSCLES OF THE SHOULDER

Deltoid





- Origin:
 - Clavicle and Scapula
- Insertion:
 - Humerus
- Action:
 - Abducts Arm

Supraspinatu



- Origin:
 - Scapula
- Insertion:
 - Humerus
- Action:
 - Abducts Arm



Infraspinatus



- Origin:
 - Scapula
- Insertion:
 - Humerus
- Action:
 - Rotates Humerus Laterally



Teres Major



- Origin:
 - Scapula
- Insertion:
 - Humerus
- Action:
 - Extends Humerus, Adducts and Rotates Arm



Sub-Scapularis



Anterior View

- Origin:
 - Scapula
- Insertion:
 - Humerus
- Action:
 - Rotates humerus medially



MUSCLES OF UPPER ARM

Triceps Brachii

Posterior View

- Origin:
 - Long Head: Scapula
 - Lateral Head: Humerus
 - Medial Head: Humerus
- Insertion: Ulna
- Action: Extends Forearm



Biceps Brachii

lumerus Coracobrachialis Biceps brachili, short head Biceps brachii long head Triceps brachii. medial head Brachialis Pronator teres Medial epicondyle of humerus Brachioradialis Flexor carpi radialis Palmaris longus Flexor carpi ulnaris Flexor digitorum superficialia Pronator quadratus

Coracoid process of scapula

- Origin:
 - Scapula
- Insertion:
 - Radius
- Action:
 - Flexes and Supinates Forearm

Brachialis

- Origin:
 - Humerus
- Insertion:
 - Ulna
- Action:
 - Flexes forearm



MUSCLES OF THE TRUNK

Thoracic Region

External Intercostals

Internal Intercostals

- Origin:
 - Inferior border of rib above
- Insertion:
 - Superior border of rib below
- Action:
 - Raises Rib (Inhalation)

- Origin:
 - Superior border of rib below
- Insertion:
 - Inferior border of rib above
- Action:
 - Draw Adjacent Ribs
 Together and Lower
 Rib (Exhalation)

Rectus Abdominis



- Origin:
 - Pubic Bone
- Insertion:
 - Costal Cartilage of 5th through 7th Ribs and Sternum
- Action:
 - Flexes Vertebral Column

External Abdominal Oblique

- Origin:
 - Last eight Ribs
- Insertion:
 - Ilium and Linea Alba
- Action:
 - Compresses Abdomen



Transversus Abdominis

- Origin:
 - Ilium, lumbar fascia,
 and Costal Cartilage of
 Last 6 Ribs
- Insertion:
 - Sternum, linea alba, &
 Pubis
- Action:
 - Compresses the Abdomen



Erector Spinae

- Muscle groups
 - Spinalis
 - Longissimus
 - Iliocostalis

• Action:

Extends the vertebral column



MUSCLES OF THE HIP REGION

Tensor fascia latae

- Origin:
 - Ilium
- Insertion:
 - Iliotibial Tract
- Action:
 - Flexes and Abducts Femur



Gluteus Maximus

- Origin:
 - Ilium, Sacrum, Coccyx
- Insertion:
 - Femur
- Action:
 - Extends and Rotates Femur Laterally



Gluteus Medius



- Origin:
 - Ilium
- Insertion:
 - Femur
- Action:
 - Abducts and rotates Femur Laterally



MUSCLES OF THE THIGH

Dorsal Femoral Group (Flexors)

Biceps Femoris

- Origin:
 - Ischium and Femur
- Insertion:
 - Fibula and Tibia
- Action:
 - Flexes Knee, Extends Thigh



Semimembranosus

- Origin:
 - Ischium
- Insertion:
 - Tibia
- Action:
 - Flexes Knee, Extends Thigh





Semitendinosus

- Origin:
 - Ischium
- Insertion:
 - Tibia
- Action:
 - Flexes Knee, Extends Thigh





MUSCLES OF THE THIGH

Ventral Femoral Group (Extensors)

Sartorius

- Origin:
 - Ilium

• Insertion:

- Tibia
- Action:





- Flexes Knee, Flexes Thigh, Rotates Thigh Laterally

Quadriceps

Rectus Femoris

- Origin:
 - Ilium
- Insertion:
 - Patella
- Action:
 - Extends Knee and
 Flexes Thigh



Quadriceps

Vastus Lateralis

- Origin:
 - Femur
- Insertion:
 - Patella and Tibia

lat

- Action:
 - Extends Knee



Quadriceps

Vastus **Medialis**

- Origin:
 - Femur
- **Insertion**:
 - Patella and Tibia
- Action:
 - **Extends Knee**



v.

lat

MUSCLES OF THE THIGH

Medial Femoral Group

Gracilis

- Origin:
 - Pubic Bone
- Insertion:
 - Tibia
- Action:
 - Flexes Knee, Adducts Thigh



Adductor Longus

- Origin:
 - Pubic Bone
- Insertion:
 - Femur
- Action:
 - Adducts, Rotates and Flexes Femur



Adductor Femoris (Magnus)

- Origin:
 - Pubis & Ischium
- Insertion:
 - Femur
- Action:
 - Adducts, Flexes and Extends Femur
- Iliac crest Gluteal aponeurosis over gluteus medius Tensor fasciae latae Gluteus maximu magnus femoris, long head Gracilis Semitendinosus Semimembranosus lliotibial tract Biceps femoris, short head Sartorius Semimembranosus Popliteal artery (red) and vein (blue) **Tibial** nerve Medial heac of gastrocnemius Lateral head of gastrocnemius (a) Hip and thigh, posterior view

MUSCLES OF THE LOWER LEG

Gastrocnemius

- Origin:
 - Femur
- Insertion:
 - Calcaneus
- Action:
 - Plantar Flexes Foot



Soleus (deep to Gastrocnemius)

- Origin:
 - Fibula and Tibia
- Insertion:
 - Calcaneus
- Action:
 - Plantar Flexes Foot


Tibialis Anterior

- Origin:
 - Tibia
- Insertion:
 - First Metatarsals, and 1st
 Cuneiform (tarsal)
- Action:
 - Flexes Foot Dorsally and Inverts Foot



Thank you