بسم الله الرحمن الرحيم



# **FINAL | Lecture 1 Back, Pectoral & Scapular Regions** Written by:

﴿ وَإِن تَنَوَلَوْا يَسْتَبْدِلْ قَوْمًا غَيْرَكُمْ ثُمَّ لَا يَكُونُوَا أَمْتَكَكُم ﴾ اللهم استعملنا ولا تستبدلنا

Ahmad Abu Aisha

Abdalrahman Qatatsheh

Reviewed by: Ahmad Abu Aisha





ANATM

**Color Code:** Slides + Dr. doesn't mention Slides + Dr. mentions

Extra from Dr.

# some advices regarding anatomy files and prof.Muhtaseb material:

- Anatomy is a descriptive science, looking carefully and closely to the figures will ease your study
- In this material we focus on learning muscles, for each muscle you should master the following :
  Insertion, Origin, Nerve supply and Action. → Iona (google it)

Also revising bones of upper limb will make it easier to keep origin and insertion in mind.

• Although DST files are super-comprehensive and the best in milky way, attending lectures of the great professor Mohammed.H.Al-muhtaseb will make your life easier

# The Back and Scapular region

By Prof.M.H.Al-Muhtaseb

# Muscles Connecting the Upper Limb to the Vertebral Column

## Trapezius Named after its shape

#### Origin:

 Occipital bone (external occipital protuberance), superior nuchal line, ligamentum nuchae, spine of seventh cervical vertebra, spines of all thoracic vertebrae and their supraspinous ligament i.e.: axial origin

#### Insertion (opposite to origin of deltoid)

- Upper fibers into lateral third of clavicle
- middle and lower fibers into acromion and spine of scapula

#### Nerve Supply

- Spinal part of accessory nerve (motor)
- C3 and C4 (sensory)
- XI cranial nerve (spinal part)

#### Action

- Upper fibers elevate the scapula
- middle fibers pull scapula medially (retracts)
- lower fibers pull medial border of scapula downward
- anterior fibers rotates the scapula

=raising hand beyond 90<sup>o</sup>degrees along with serratus anterior



## Clinical knowledge: a patient with an injury in nerves suppling trapezius or serratus ant. is not able to raise his hand above his head level.



# Latissimus dorsi

## Origin

 Iliac crest, lumbar fascia, spines of lower six thoracic vertebrae(T7-T12), lower three or four ribs, and inferior angle of scapula i.e: has an axial origin

## Insertion

• Floor of bicipital groove of humerus

## **Nerve Supply**

- Thoracodorsal nerve
- arises from the posterior cord of the brachial plexus roots C6, 7, 8

## Action

- Extends, adducts, and medially rotates the arm
- It's called the climbing/swimming muscle
- Raising of the trunk above the arm



## **Levator Scapulae**

## Levator scapulae

## Origin

• Transverse processes of first four cervical vertebrae

#### Insertion

Medial border of scapula

## Nerve supply

- C3 and 4 and dorsal scapular nerve Leva
- C3, 4, 5

## Action

• Raises medial border of scapula



# Rhomboid minor It's smaller and upper

## Origin

 Ligamentum nuchae and spines of seventh cervical and first thoracic vertebrae

### Insertion

• Medial border of scapula

### Nerve supply

 Dorsal scapular nerve (from brachial plexus) C4, C5

### Action

• Raises/pulls medial border of scapula upward and medially





## Rhomboid major It's bigger and lower

## Origin

• Second to fifth thoracic spines

## Insertion

• Lower Medial border of scapula

### Nerve supply

• Dorsal scapular nerve C4, 5

#### Action

• Raises **/pulls** medial border of scapula upward and medially



# Muscles Connecting the Scapula to the Humerus

# Deltoid

**Origin** (opposite to insertion of trapezius)

• Lateral third of clavicle, acromion, spine of scapula

#### Insertion

Deltoid tuberosity located at Middle of lateral surface of shaft of humerus

#### Nerve supply

• Axillary nerve (a branch of posterior cord of brachial plexus) C5, 6

#### Action

- Abducts arm;
- anterior fibers flex and medially rotate arm
- posterior fibers extend and laterally rotate arm
- Middle fibers Abduction from 15-90 degrees

Initiation of abduction is done by supraspinatus muscle (O<sup>o</sup>-15<sup>o</sup>) Clinical knowledge:

• A patient with axillary nerve injury can initiate arm abduction (0°-15°) however, he can't abduct further.



Deltoid tuberosity of humerus

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# Supraspinatus

## Origin

• Supraspinous fossa of scapula

## Insertion

• Greater tuberosity of humerus; capsule of shoulder joint

## Nerve supply

 Suprascapular nerve araising from Cervical spinal nerves: 4, 5, 6

## Action

- Abducts arm and stabilizes shoulder joint
- Initiation of abduction 0-15 degrees

Clinical knowledge:

• A patient with an injury in supraspinatus would overcome abduction initiation problem by raising his are using the other about 15 degree then further abduction is possible.

## Supraspinatus



# Infraspinatus

## Origin

• Infraspinous fossa of scapula

## Insertion

• Greater tuberosity of humerus; capsule of shoulder joint

## Nerve supply

• Suprascapular nerve C4, 5, 6

## Action

Laterally rotates arm/shoulder and stabilizes shoulder joint



# Teres major

## Origin

- <u>Lower</u> third of lateral border of scapula **Insertion**
- <u>Medial lip of bicipital groove of humerus</u>

## Nerve supply

• Lower subscapular nerve C6, 7

#### Action

• Medially rotates (as it is inserted to medial lip of bicipital groove, i.e. towards anterior of humerus) and adducts arm and stabilizes shoulder joint

There are 3 muscles that insert in the bicipital groove:

Pectoralis major  $\rightarrow$  lateral lip

Latissimus dorsi  $\rightarrow$  floor

Teres major  $\rightarrow$  medial lip



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# Teres minor

## Origin

• Upper two thirds of lateral border of scapula

#### Insertion

• Greater tuberosity of humerus; capsule of shoulder joint

### Nerve supply

• <u>Axillary</u> nerve (C4), **C5**, 6

## Action

 Laterally rotates arm and stabilizes shoulder joint



# Subscapularis

## Origin

• Subscapular fossa

## Insertion

• Lesser tuberosity of humerus

## Nerve supply

 Upper and lower subscapular nerves (from posterior cord of brachial plexus) C5, 6, 7

## Action

 Medially rotates (as it is going toward the anterior of humerus) arm and stabilizes shoulder joint



## $Rotator \ Cuff \ {\rm The \ muscles \ surrounding \ and \ acting \ on \ should er \ joint}$

- The rotator cuff is the name given to the tendons of the subscapularis, supraspinatus, infraspinatus, and teres minor muscles. Teres major is not included because it is far relatively from the joint and doesn't surround it
- are <u>fused to the underlying capsule</u> of the shoulder joint
- The cuff plays a very important role in stabilizing the shoulder joint
- The tone of these muscles assists in holding the head of the humerus in the glenoid cavity of the scapula during movements at the shoulder joint
- The cuff lies on the anterior, superior, and posterior aspects of the joint
- The cuff is deficient inferiorly, and this is a site of potential weakness.



# Quadrangular Space

For each space know the boundaries and contents

• The quadrangular space is an intermuscular space, located immediately below the shoulder joint

It is bounded:

- above by the subscapularis and capsule of the shoulder joint
- below by the teres major muscle
- medially by the long head of the triceps and
- laterally by the surgical neck of the humerus.

#### **Contents**:

 The axillary nerve and the posterior circumflex humeral vessels pass backward through this space



# Triangular spaces

• The triangular space is an area of communication between the axilla and the posterior scapular region

Boundaries of triangle 1 (Triangular interval) :

- The humerus
- Lateral margin of the long head of triceps
- The inferior margin of teres major
- Boundaries for triangle 2 (Triangular space) :
- Posteriorly, when viewed from the posterior scapular region, the triangular space is formed by:
- the medial margin of the long head of triceps brachii;
- the superior margin of teres major;
- the inferior margin of teres minor.

#### contents

- For triangle 1: Radial nerve and the profunda brachii artery also passes
- For triangle 2: The circumflex scapular artery and vein pass through this gap to the infraspinous fossa



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# **Axillary Nerve**

- The axillary nerve arises from the posterior cord of the brachial plexus (C5 and 6) in the axilla
- It passes backward and enters the <u>quadrangular space</u> with the posterior circumflex humeral artery
- As the nerve passes through the space, it comes into close relationship with the inferior aspect of the capsule of the shoulder joint and with the medial side of the surgical neck of the humerus
- It terminates by dividing into anterior and posterior branches



The axillary nerve has the following branches:

- An articular branch to the shoulder joint
- An **anterior terminal branch**, which winds around the surgical neck of the humerus beneath the deltoid muscle; it supplies the deltoid and the skin that covers its lower part. **So it is motor and sensory**
- A **posterior terminal branch**, which gives off a branch to the <u>teres minor</u> muscle and a few branches to the <u>deltoid</u>, then emerges from the posterior border of the deltoid as the upper lateral cutaneous nerve of the arm
- It is thus seen that the axillary nerve supplies the shoulder joint, two muscles, and the <u>skin covering the</u> <u>lower half of the deltoid muscle</u>
- The axillary nerve can be injured in dislocations of the shoulder joint or in people who use crutch (عكاز) that apply pressure on axilla, Which lead injury of the nerve then to atrophy and loss of muscle function (raising the arm within 15°-90°)



# Suprascapular nerve

- The **suprascapular nerve** originates in the base of the neck from the superior trunk of the brachial plexus
- It passes posterolaterally from its origin, through the <u>suprascapular foramen</u> to reach the posterior scapular region
- Innervates the <u>supraspinatus muscle</u>,
- then passes through the greater scapular (spinoglenoid) notch, between the root of the spine of the scapula and the glenoid cavity,
- terminate in and innervate the infraspinatus muscle.
- the suprascapular nerve has no cutaneous branches
- The nerve walk along with suprascapular artery, when they reach the suprascapular notch a ligament there let the nerve pass under it, whereas the artery passes above it to avoid compression on the artery.



# Arterial Anastomosis Around the Shoulder Joint

- Anastomosis: Arteries which give a branches that connected with each other
- The extreme mobility of the shoulder joint may result in kinking of the axillary artery and a temporary occlusion of its lumen
- To compensate for this, an important arterial anastomosis exists between the branches of the subclavian artery and the axillary artery
- ensuring that an adequate blood flow takes place into the upper limb irrespective of the position of the arm
- Axillary artery branch from subclavian and starts at the outer border of first rib and ends at lower border of teres major where it becomes brachial artery

anastomosis occur between:

- circumflex scapular artery (the branch of axillary artery) and
- transverse cervical artery and suprascapular artery (branches of thyrocervical trunk (( a branch of subclavian artery))
- Which anastomose around scapula



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#### **Branches from the Subclavian Artery:**

- The suprascapular artery, which is distributed to the supraspinous and infraspinous fossae of the scapula
- The superficial cervical artery, which gives off a deep branch that runs down the medial border of the scapula

#### **Branches from the Axillary Artery**

- The subscapular artery and its circumflex scapular branch supply the subscapular and infraspinous fossae of the scapula, respectively.
- The anterior circumflex humeral artery
- The posterior circumflex humeral artery
- Both the circumflex arteries form an anastomosing circle around the surgical neck of the humerus



# The Breast and Pectoral region

## The Breast

- The breasts are specialized accessory glands of the skin that secrete milk
- They are present in both sexes
- In males and immature females, they are similar in structure.
- The nipples are small and surrounded by a colored area of skin called the areola
- The breast tissue consists of a system of ducts embedded in connective tissue that does not extend beyond the margin of the areola.



- At puberty in females, the breasts gradually enlarge and assume their hemispherical shape under the influence of the ovarian hormones (estrogen and progesterone)
- The ducts elongate, but the increased size of the glands is mainly from the deposition of fat
- The base of the breast <u>extends from the</u> <u>second to the sixth rib</u> and from the lateral margin of the sternum to the midaxillary line
- The breast is located in superficial fascia lays on two muscles: pectoralis major and serratus anterior.
- The greater part of the gland lies in the superficial fascia



- A small part, called the axillary tail extends upward and laterally, pierces the deep <u>fascia at the lower border of the pectoralis</u> <u>major muscle</u>, and enters the axilla.
- Each breast consists of 15 to 20 lobes, which radiate out from the nipple
- The main duct (**lactiferous ducts)** from each lobe opens separately on the summit of the nipple and possesses a dilated ampulla just before its termination
- The base of the nipple is surrounded by the areola. Before pregnancy it is pink colored, after delivery it becomes dark brown due to accumulation of melanin substance.
- Tiny tubercles on the areola are produced by the underlying areolar glands.



- The lobes of the gland are <u>separated by fibrous septa</u> <u>that serve as suspensory ligaments</u> which attach to skin. It is significant in diagnosis of some disease, an ex: if there's is an abscess in breast in a certain lobe, ultimately swealing would occur leading to skin being dent downward and showing redness, rather than being smooth skin.
- The treatment of abscess is drainage by incision, but there is some thing to note the incision should be radial along with lactiferous ducts to keep them intact
- Behind the breasts is a space filled by loose connective tissue called the retromammary space
- In young women the breasts tend to protrude forward from a circular base



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# Mammary Glands

- Lactiferous duct before arriving the nipple makes a sinus bulge.
- Each mammary gland consists of 15–25 **lobes** of the compound tubuloalveolar type whose function is to secrete milk to nourish newborns
- Each lobe, separated from the others by dense connective tissue and much adipose tissue, is really a gland in itself with its own **excretory lactiferous duct**
- These ducts, 2–4.5 cm long, emerge independently in the **nipple,** which has 15–25 openings, each about 0.5 mm in diameter
- The histological structure of the mammary glands varies according to sex, age, and physiological status.



# Breast Development in Puberty & in the Adult

- Before puberty, the mammary glands are composed of **lactiferous sinuses** and several branches of these sinuses, the **lactiferous ducts**
- We could say that for any non-pregnant female there are no mammary glands
- The characteristic structure of the gland—the lobe—in the adult pregnant woman is developed at the tips of the smallest ducts
- At the ninth month of pregnancy, lactation starts
- At first <u>the duct is (simple columnar</u> epithelium)→ (stratified columnar or cuboidal)→ large ducts (stratified squamous)
- A lobe consists of several ducts that empty into one terminal duct.
- Each lobe is embedded in loose connective tissue.
- A denser, less cellular connective tissue separates the lobes



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- Near the opening of the nipple, the lactiferous ducts dilate to form the lactiferous sinuses
- The <u>lactiferous sinuses</u> are lined with <u>stratified squamous epithelium at their</u> <u>external openings</u>
- This <u>epithelium very quickly changes to</u> <u>stratified columnar or cuboidal epithelium</u>
- The lining of the lactiferous ducts and terminal ducts is formed of simple cuboidal epithelium covered by closely packed myoepithelial cells.

#### Inactive



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# **Blood Supply**

#### Arteries

- The branches to the breasts include the perforating branches of the internal thoracic artery and the intercostal arteries (a branch of subclavian)
- <u>The axillary artery</u> also supplies the gland via its lateral thoracic and thoracoacromial branches

#### Veins

• The veins correspond to the arteries.

Tributaries gathering  $\rightarrow$  internal thoracic vein  $\rightarrow$  subclavian



# Lymph Drainage

- The lymph drainage of the mammary gland is of great clinical importance because of the frequent development of cancer in the gland
- The lateral quadrants of the breast drain into the anterior axillary or also called pectoral group of nodes
- pectoral group is situated just posterior to the lower border of the pectoralis major muscle.
- The medial quadrants drain by means of vessels that pierce the intercostal spaces and enter the internal thoracic group of nodes (A.K.A internal mammary lymph nodes)
- This group is situated within the thoracic cavity along the course of the internal thoracic artery



- A few lymph vessels follow the posterior intercostal arteries and drain posteriorly into the posterior intercostal nodes (situated along the course of the posterior intercostal arteries)
- some vessels communicate with the lymph vessels of the opposite breast and with those of the anterior abdominal wall.



# Muscles

## Muscle

- The three types of muscle are skeletal, smooth, and cardiac.
- Skeletal Muscle what we care about in MSS
- Skeletal muscles produce the movements of the skeleton;
- they are sometimes called voluntary muscles and are made up of striped muscle fibers



- A skeletal muscle has two or more attachments
- The attachment that moves the least is referred to as the origin,
- and the one that moves the most, the insertion
- Under varying circumstances the degree of mobility of the attachments may be reversed
- therefore, the terms origin and insertion are interchangeable.
- The fleshy part of the muscle is referred to as its belly



- The ends of a muscle are attached to bones, cartilage, or ligaments by cords of fibrous tissue called <u>tendon</u>s
- Occasionally, flattened muscles are attached by a thin but strong sheet of fibrous tissue called an <u>aponeurosis</u>
- A <u>raphe</u> is an interdigitation of the tendinous ends of fibers of flat muscles



common tendon for the insertion of the gastrocnemius and soleus muscles



raphe of mylohyoid muscles

## **Skeletal Muscle Action**

• A muscle may work in the following four ways:

#### Prime mover: (essential for action)

- A muscle is a prime mover when it is the chief muscle or member of a chief group of muscles responsible for a particular movement.
- For example, the quadriceps femoris is a prime mover in the movement of extending the knee joint

Also, brachialis muscle flexes the elbow joint



#### **Antagonist:**

- Any muscle that opposes the action of the prime mover is an antagonist
- For example, the biceps femoris opposes the action of the quadriceps femoris when the knee joint is extended
- Before a prime mover can contract, the antagonist muscle must be equally relaxed; this is brought about by nervous reflex inhibition.



#### **Fixator:** (surrounding muscles)

- A fixator contracts isometrically (i.e., contraction increases the tone but does not in itself produce movement)
- to stabilize the origin of the prime mover so that it can act efficiently
- For example, the muscles attaching the shoulder girdle to the trunk contract as fixators to allow the deltoid to act on the shoulder joint



#### Synergist:

- In many locations in the body the prime mover muscle crosses several joints before it reaches the joint at which its main action takes place
- To prevent unwanted movements in an intermediate joint, groups of muscles called synergists contract and stabilize the intermediate joints
- For example, the flexor and extensor muscles of the carpus contract to fix the wrist joint, and this allows the long flexor and extensor muscles of the fingers to work efficiently



- These terms are applied to the action of a particular muscle during a particular movement;
- many muscles can act as a prime mover, an antagonist, a fixator, or a synergist, depending on the movement to be accomplished.
- Muscles can even contract paradoxically,
- for example, when the biceps brachii, a flexor of the elbow joint, contracts and controls the rate of extension of the elbow when the triceps brachii contracts.

## **Skeletal muscles Levers**

#### Muscles work on bones as a levers



# Naming of Skeletal Muscles

- Individual muscles are named according to their shape (e.g :Teres (round),
- size (gluteus maximus),
- number of heads or bellies (Biceps),
- position (supraspinatous),
- Depth (Externus),
- Attachments (sternocleidiomastoid),
- Actions (flexors and extensors)

## Muscles of the pectoral region

- Each pectoral region contains the pectoralis major, pectoralis minor, and subclavius muscles
- All originate from the anterior thoracic wall and insert into bones of the upper limb.

# Pectoralis major

- The pectoralis major muscle is the <u>largest</u> and most superficial of the <u>pectoral region</u> muscles (named after its size and location)
- It directly underlies the breast and is separated from it only by deep fascia and the loose connective tissue of the retromammary space.

#### Origin:

 Pectoralis major has a broad origin that includes the anterior surfaces of the medial half of the clavicle, the sternum, and related costal cartilages (upper six)

#### Insertion:

• The muscle fibers converge to form a flat tendon, which inserts into the proximal end of the humerus (Lateral lip of bicipital groove ).

#### Action:

• Pectoralis major adducts, flexes, and medially rotates the arm.

#### Nerve supply:

- Medial and lateral pectoral nerves
- The lateral from lateral cord of brachial plexus. The medial from medial cord of brachial plexus



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# Subclavius and pectoralis minor

- The **subclavius** and **pectoralis minor muscles** underlie pectoralis major
- subclavius is small and passes laterally from the anterior and medial part of rib I to the inferior surface of the clavicle
- pectoralis minor passes from the anterior surfaces of ribs III to V (The doctor said from II,III,IV) to the coracoid process of the scapula

#### Action:

- Both subclavius and pectoralis minor pull the tip of the shoulder inferiorly.
- Subclavius Pulls clavicle medially and downward to stabilize sternoclavicular joint.
- A continuous layer of deep fascia, **clavipectoral fascia**, encloses subclavius and pectoralis minor and attaches to the clavicle above and to the floor of the axilla below.

#### Innervation:

Nerve to sub-clavius, Medial pectoral nerves



#### Click at the image of IONA isle to test your knowledge





## For any feedback, scan the code or click on it.

#### Corrections from previous versions:

Versions	Slide # and Place of Error	Before Correction	After Correction
V0 → V1	12; down	however, he can't adduct further	however, he can't abduct further
V1 → V2			

رسالة من الفريق العلمي:

الله أنجح ما طلبت به والبرُّ خير حقيبةِ الرجلِ

لا تنسونا وأخوتنا وأهلينا في غزة من صالح دعائكم في هذه الليالي المباركة.

