MED439
KING SAUD UNIVERSITY

Arm and elbow

Musculoskeletal Block - Lecture 7

Objective:

✓ Describe the attachments, actions and innervations of:

a. Biceps brachii

b. Coracobrachialis c. Brachialis

d. Triceps brachii

✓ Define the boundaries of the cubital fossa and enumerate its contents.

✓ Demonstrate the following features of the elbow joint:

a. Articulating bones

b. Capsule

c. Lateral & medial collateral ligaments

d. Synovial membrane

✓ Demonstrate the movements; flexion and extension of the elbow.

✓ List the main muscles producing the above movements.

✓ Define the boundaries of the cubital fossa and enumerate its contents.

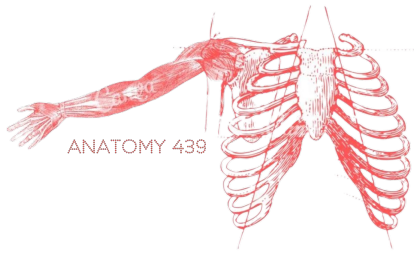
Color index:

Important

In male's slides only

In female's slides only

Extra information, explanation



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The Arm

An aponeurotic sheet separating various muscles of the upper limbs, including lateral and medial humeral septa.

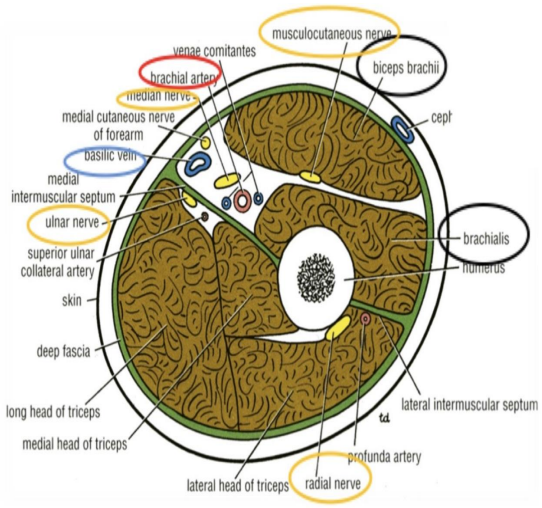
The lateral and medial intermuscular septa divide the distal part of the arm into two compartment : **Anterior (** flexor compartment **), Posterior (** extensor compartment **)**

1- Anterior Fascial Compartment

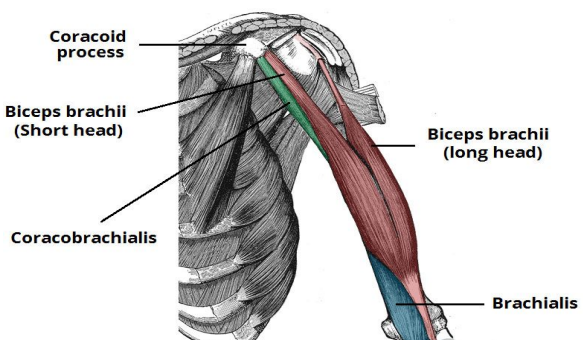
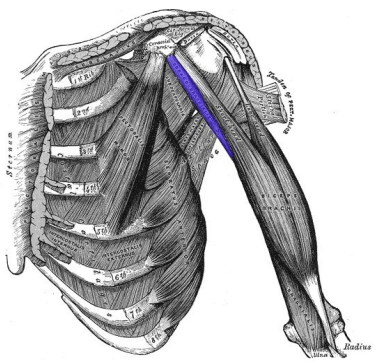
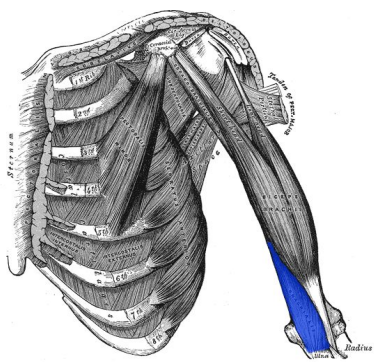
2- nerves:
- Musculocutaneous
- Median
- Radial
- Ulnar

1- muscle:
- Biceps Brachii
- Coracobrachialis
- Brachialis

3- Blood vessels :
- Brachial artery
- Basilic vein



Muscles Of Anterior Compartment

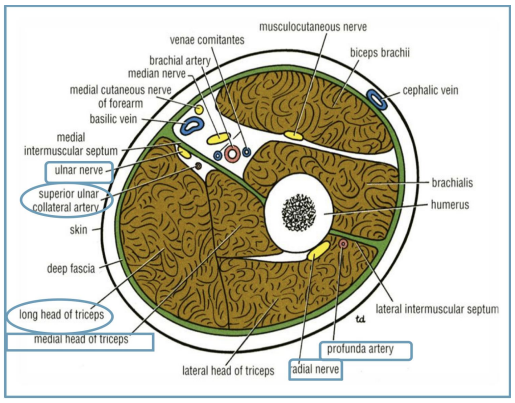
Muscle	★ Biceps Brachii	Coracobrachialis	Brachialis
Origin	-**Long Head** (lateral head): from supraglenoid tubercle of **scapula** (intracapsular). -**short Head**: from the tip of coracoid process of scapula. -The two heads join in the **middle** of the arm brachii)	Tip of the **coracoid process** of **scapula** (with short head of biceps brachii)	**Front** of the lower half of humerus
Insertion	-Into the **posterior** part of the radial tuberosity. -Into the deep fascia of the **medial** aspect of the **forearm** through bicipital aponeurosis	**Middle** of the medial side of the shaft of the humerus	**Anterior** surface of coronoid process of ulna
Nerve supply	Musculocutaneous		-**musculocutaneous** (medial part) -**Radial** (lateral part)
Action	-**Strong supinator** of the forearm - **powerful Flexor** of elbow (**the main elbow flexor**) -Weak flexor of shoulder -used in screwing	-flexor -weak adductor of the arm	**Strong flexor** of the forearm
Picture			

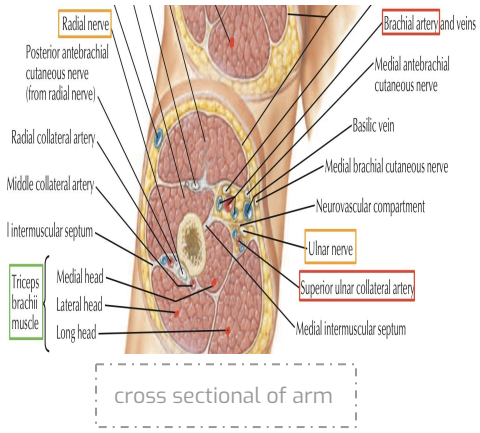
2- Posterior Fascial Compartment:

2- nerves:
-ulnar nerve.
-radial nerve.

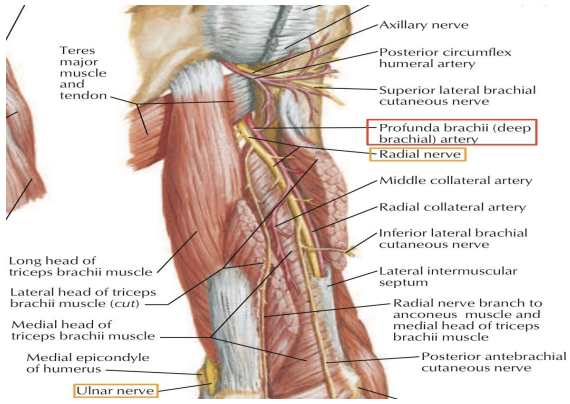
1- muscle:
- triceps brachii.

3- Blood vessels :
- Profunda brachial
Ulnar collateral arteries.

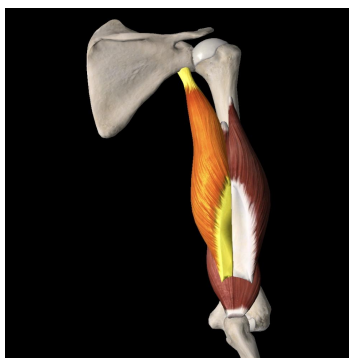
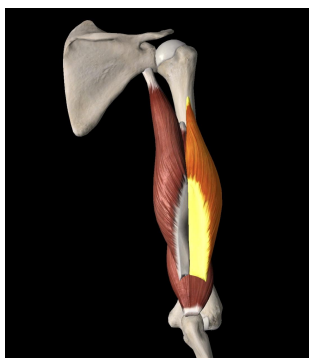
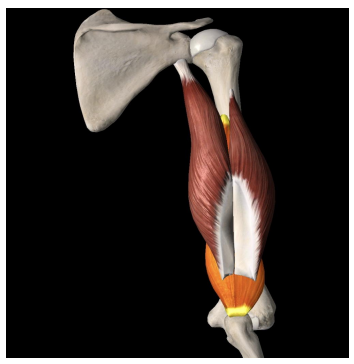




cross sectional of arm



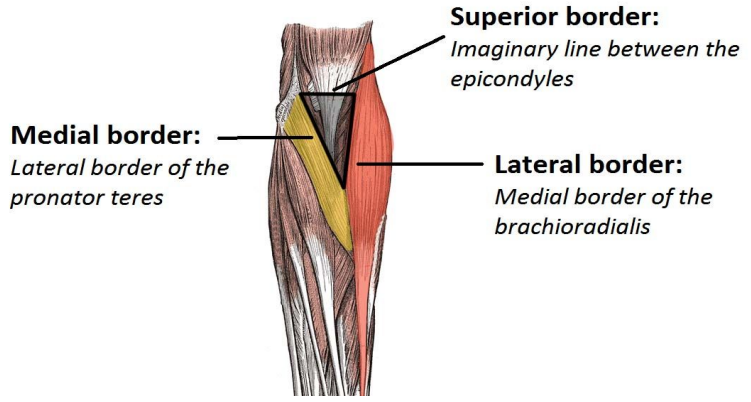
Muscles Of posterior Compartment

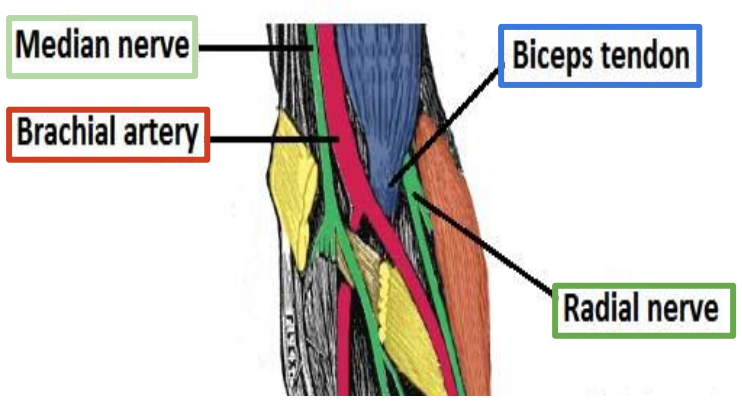
Muscle	Triceps Brachii
Origin	• **Long head**: from infraglenoid tubercle of the scapula.(1) (remember the origin of the long head of the biceps head is supraglenoid tubercle). • **lateral head**: from the upper half of the posterior surface of the shaft of the humerus above the spiral groove. (2) • **Medial head**: from the lower half of the posterior surface of the shaft of the humerus below the spiral groove. (3)
Insertion	Common tendon inserted into the upper surface of the olecranon process of ulna.
Nerve supply	Radial nerve.
Action	Strong extensor of **elbow joint**.
Picture	(1)  (2)  (3) 

Cubital fossa:

- is a an area of transition between the anatomical arm and the forearm, located as **triangular depression** on the anterior surface of the elbow joint.
- It is a **triangular depression** that lies in front of the elbow.

Boundaries	• **Base**: Line drawn through the two epicondyles of humerus.
	•**Laterally**: Brachioradialis.
	• **Medially**: Pronator teres.
	• **Roof**: Skin, superficial & deep fascia and bicipital aponeurosis.
	• **Floor**: Brachialis Medially and supinator Laterally.
Content (From the **medial** to the **lateral**)	1. Median nerve. 2. Brachial artery divides into radial & ulnar arteries. 3. Biceps brachii tendon. 4. Deep branch of radial nerve.





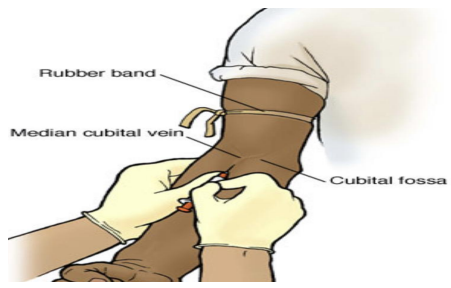
Clinical relevance:

Only in boys slide

• The **brachial pulse** can be felt by palpating immediate medial to the biceps tendon in the cubital fossa.

• The median cubital vein is located superficially within the roof of the cubital fossa.

• It connects the basilic and cephalic veins. And ce be accessed easily-this makes it a common site for **venipuncture**.

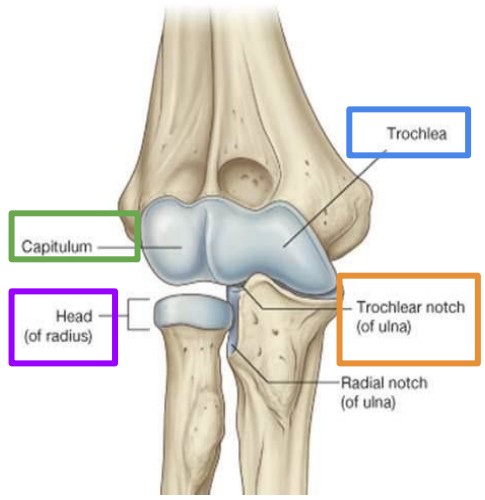


Elbow joint:

It is the joint connecting the upper arm with the forearm, and is classified as a Uniaxial Synovial Hinge Joint

Consists of two **separate** Articulations:

- **Above**: Trochlea and the capitulum of the humerus.
- **Below**: Trochlear notch of the ulna and the head of the radius.



As all bone articulations, The articular surfaces of the elbow joint are covered with **articular (hyaline) cartilage**

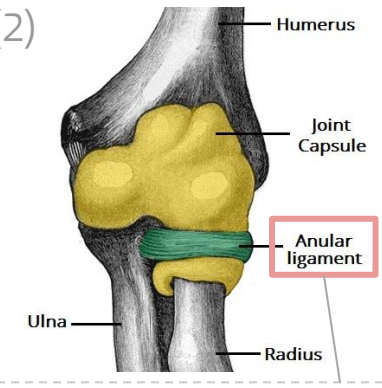
Capsule :

Capsule	Above	Below
Anteriorly Attached:	To the humerus along the upper margins of the coronoid and radial fossa and to the front of the medial and lateral epicondyles (1)	To the margin of the coronoid process of the ulna and to the **annular ligament**, which surrounds the head of the radius. (2)
Posteriorly attached:	To the margins of the **olecranon fossa** of the humerus (3)	To the upper margin and sides of the **olecranon process** of the ulna and to the annular ligament. (3)

- The elbow joint has a capsule enclosing the joint. This in itself is strong and fibrous, strengthening the joint.
- The joint capsule is thickened medially and laterally to form collateral ligaments, which stabilize the flexing and extending motion of the arm.

(1)

(2)



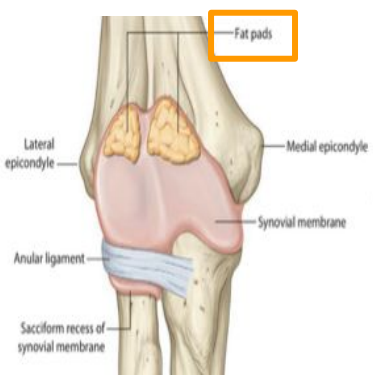
annular ligament, which surrounds the head of the radius.

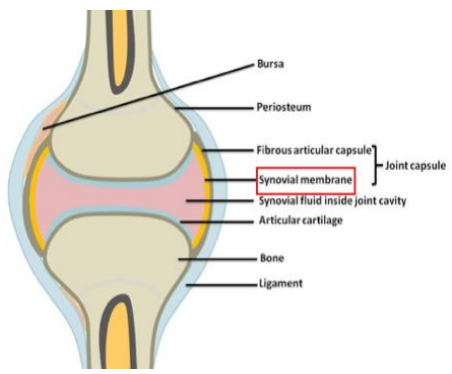
(3)

Synovial membrane :

-This lines the **inner** surface of the capsule and covers fatty pads in the floors of the coronoid, radial, and olecranon fossa.

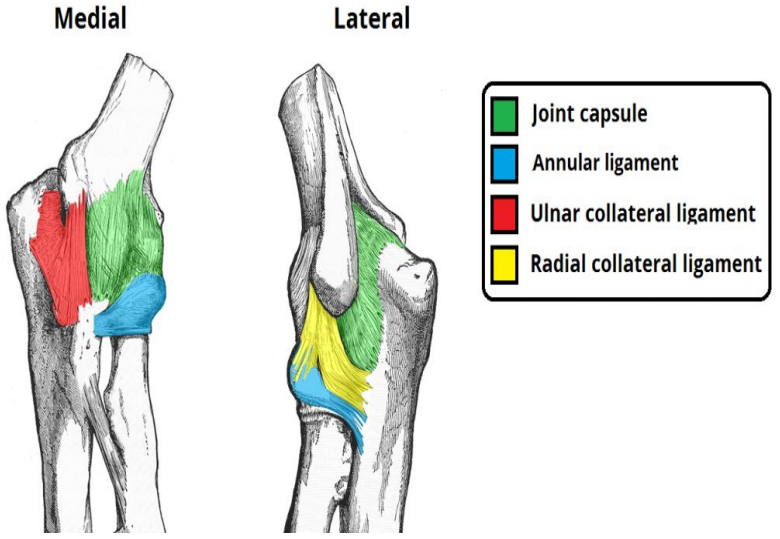
-Is continuous below with synovial membrane of the superior radioulnar joint (Contains the synovial fluid)





ligaments of the elbow

1- Lateral ligament (**radial** collateral ligament)		
shape	**apex**	**base**
Triangular	attached to the Lateral epicondyle of humerus.	attached to the upper part of the annular ligament.
2- Medial ligament (ulnar collateral ligament)		
Anterior strong cord-like band	**Posterior** weaker fan-like band	**Transverse band**
Between Medial epicondyle and the coronoid process of ulna.	Between Medial epicondyle and the olecranon process of ulna.	Passes between the anterior and posterior bands.

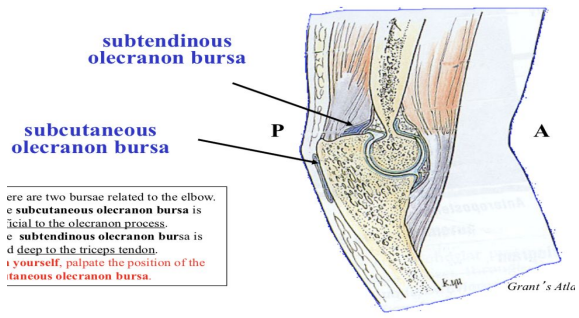


BURSAE

- bursa is a membranous sac filled with synovial fluid.
- It acts as a cushion to reduce friction between the moving parts of a joint, limiting degenerative damage.

Bursae around the elbow joint:

- Intratendinous – located within the tendon of the triceps brachii.
- Subtendinous – between the olecranon and the tendon of the triceps brachii, reducing friction between the two structures during extension and flexion of the arm.
- Subcutaneous (olecranon) bursa – between the olecranon and the overlying connective tissue (implicated in olecranon bursitis).

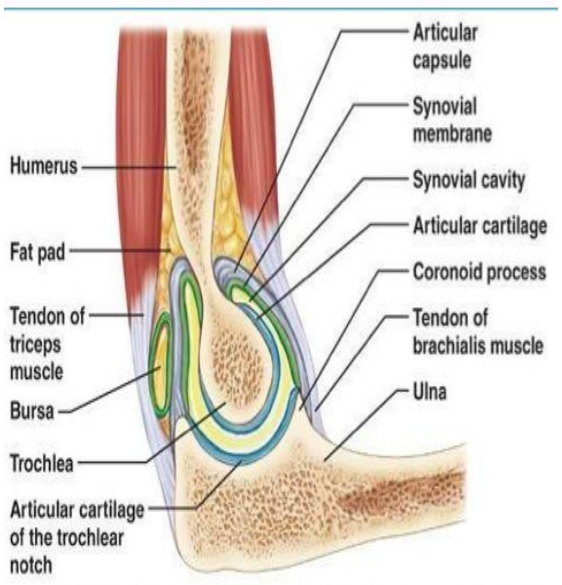


Elbow joint articulations

- Strong medial and lateral ligaments.
- Wrench-shaped articular surface of the **olecranon** and the pulley-shaped **trochlea** of humerus
- These help to **stabilize** the elbow joint

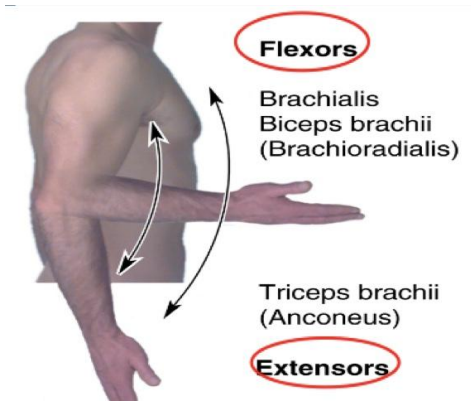
Relation

Anterior	Posterior	Medial	Lateral
-Brachialis -Tendon of biceps -Median nerve -Brachial artery	- Small bursa intervening -Triceps muscle	Ulnar nerve **“ Considered the largest unprotected nerve by muscle or bone”.**	-Common extensor tendon (attached to Lateral epicondyle of the humerus) -Supinator



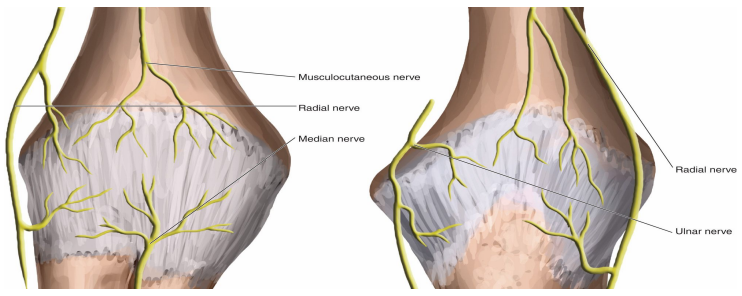
Movement

Extension	Flexion
Is limited by the tension of the **anterior** ligament (**medially**) and the **brachialis muscle.**	limited by the **anterior** surfaces of the **forearm** and **arm** coming into contact.



The joint is supplied by branches from the (nerves and arteries):

- **median** nerve
- **ulnar** nerve (posteriorly)
- **radius** nerve (anteriorly)
- **musculocutaneous** nerve
- **recurrent and collateral branches** from the deep brachial arteries (profunda brachii)



Carrying Angle

1 Angle

Between the **long axis** of the **extended forearm** and **the long** axis of the **arm**.

2 Opens

Laterally .

3 About

- 170 degrees in **male**
- 167 degrees in **female**

4 Disappears

When the **elbow** joint is **flexed**.

5 Permits

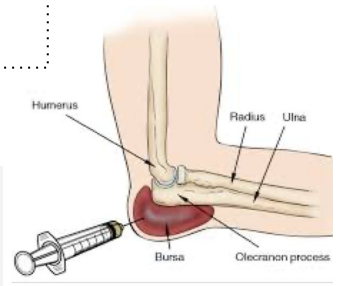
The forearms to **clear the hips** in **swinging movements** during **walking**, and is important when **carrying objects.**

Clinical correlations

Wrench-shaped articular surface of the olecranon and the pulley-shaped trochlea of humerus

The elbow joint is stable because of the:

Strong medial and lateral ligaments.



1

BURSITIS

1- Subcutaneous bursitis:

*Repeated friction and pressure on the bursa can cause it to become inflamed.

*Because this bursa lies relatively superficially, it can also become infected (e.g cut from a fall on the elbow)

2- Subtendinous bursitis

*This is caused by repeated flexion and extension of the forearm, commonly seen in assembly line workers.

*Usually flexion is more painful as more pressure is put on the bursa.

2

Avulsion of the epiphysis of the medial epicondyle

- is also common in childhood because the medial ligament is much stronger than the bond of union between the epiphysis and the diaphysis.
- They are usually a result from an avulsion (pull off) injury caused by :
  a valgus stress at the elbow and contraction of the flexor muscles as in :

1. fall on an outstretched hand with the elbow in full extension
2. posterior elbow dislocation 3. direct blow

3

Dislocation

- -Elbow dislocations are common & most are posterior.
- -Posterior dislocation usually follows falling on the outstretched hand with the elbow flexed
- -Posterior dislocations of the joint are common in children because the parts of the bones that stabilize the joint are incompletely developed
- The distal end of the humerus is driven through the weakest part of the joint capsule, which is the anterior side.
- -The ulnar collateral ligament is usually torn and there can also be ulnar nerve involvement
- -Most elbow dislocations are posterior, and it is important to note that elbow dislocations are named by the position of the ulna and radius, not the humerus.

*The radius/ulna is dislocated posteriorly NOT the humerus *
valgus : a deformity involving oblique displacement of part of a limb away from the midline.

Summary med435

Muscle:	Compartment:	Origin:	Insertion:	Nerve supply:	Action:
Biceps brachii	Anterior compartment (flexor compartment)	**Two heads:** - **Long head:** From supraglenoid tubercle of the scapula - **Short head:** from the tip of the coracoid process of the scapula **The two heads are joined in the middle of the arm**	- In the Posterior part of the radial tuberosity. - Into the deep fascia of the medial aspect of the forarm through bicipital aponeurosis	Musculocutaneous	- Strong flexor of **the elbow**. - Weak flexor of **the shoulder**. - Supinator of **the forearm** .
Coracobrachialis	Anterior compartment (flexor compartment	from the tip of the coracoid process of the scapula	Middle of the medial side of the shaft of the humerus	Musculocutaneous	- flexor. - Weak adductor of **the arm**
brachialis	Anterior compartment (flexor compartment	Front of the lower half of humerus	Anterior surface of coronoid process of ulna	Musculocutaneous & radial	Strong flexor **of the forearm**
Triceps	posterior compartment (extensor compartment	**Three heads:** **- Long head:** infraglenoid tubercle of the scapula. - **Lateral head:** upper half of the posterior surface of the shaft of humerous above the spiral groove. - **medial head:** lower half of the posterior surface of the shaft of humerous below the spiral groove.	Common tendon inserted into the upper surface of the olecranon process of ulna	Radial nerve	Strong extensor **of the elbow joint**

CUBITAL FOSSA

What is it? The cubital fossa is a triangular depression that lies in front of the elbow

Boundaries:

- **Base:** Line drawn through the two epicondyles of humerus
- **Laterally:** Brachioradialis
- **Medially:** Pronator teres
- **Roof:** Skin, superficial & deep fascia and bicipital aponeurosis
- **Floor:** Brachialis medially and supinator laterally.

CONTENT OF CUBITAL FOSSA (From medial to lateral side)

1. **Median nerve**
2. **Brachial artery divides into radial & ulnar arteries.**
3. **Biceps brachii tendon**
4. **Deep branch of radial nerve**

The lateral and medial intermuscular septa divide the distal part of the arm into two compartments:

Anterior compartments
known as the flexor compartment

- **Muscles:**
  1- Biceps brachii
  2- Coracobrachialis
  3- Brachialis.
- **Blood Vessels:**
  Brachial artery & Basilic vein.
- **Nerves:**
  Musculocutaneous and Median.

Posterior compartments
known as the extensor compartment

- **Muscles:**
  1- Triceps
- **Blood Vessels:**
  Profunda brachii & Ulnar collateral arteries
- **Nerves:**
  Radial & Ulnar.

Elbow Joint

- **Type:** Synovial Joint, Hinge
- **Articulation :**

Above → Trochlea and capitulum of the humerus
Below → Trochlear notch of ulna and the head of radius below

- **Synovial Membrane:**

- It lines the capsule and covers fatty pads in the floors of the coronoid, radial, and olecranon fossae.

- **Elbow joint is stable** because of the shapes of the the olecranon and trochlea, in addition tom Strength of medial and lateral ligaments .

- **Capsule :**

	Above	Below
Posterior	To the humerus along the upper margins of the coronoid and radial fossae and to the front of the medial and lateral epicondyles.	To the margin of the coronoid process of the ulna and to the anular ligament, which surrounds the head of the radius.
anterior	To the margins of the olecranon fossa of the humerus.	To the upper margin and sides of the olecranon process of the ulna and to the anular ligament.

- **Relations:**

Medial	Lateral	Anterior	Posterior
Ulnar nerve	- Common extensor tendon - The supinator	- Brachialis - Tendon of Biceps - Median nerve - Brachial artery	- Triceps muscle - Small bursa intervening

- **Movement:**

Flexion	extension
Is limited by the anterior surfaces of the forearm and arm coming into contact.	Is limited by the tension of the anterior ligament and the brachialis muscle

- **The joint is supplied by branches from the:**
  - Median
  - Ulnar
  - Radial nerves
  - Musculocutaneous

- **Carrying angle:**

- It is an angle that is located Between the long axis of the extended forearm and the long axis of the arm, and opens laterally, Disappears when the elbow is flexed .
- **170 degrees** in male and **167 degrees** in females.
- Permits The forearms to clear the hips in swinging movements during walking, and is important when carrying objects.

- **Elbow dislocations are common & most are posterior.**

- Posterior dislocation usually follows falling on the outstretched hand and it's common in children

- Avulsion of the epiphysis of the medial epicondyle is also common in childhood

MCQs

Q1: which of the following is not a part of the flexor compartment?
A.Biceps
B.median nerve
C.brachial artery
D.triceps

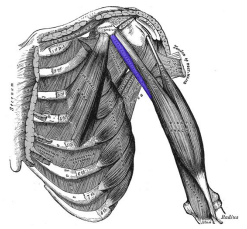
Q2: what is the muscle that is responsible in “screwing”?
A.coracobrachialis
B.biceps brachii
C.brachialis
D.triceps

Q3:brachialis origin is in front of the …… half of humerus?
A.meddle
B.lower
C.upper

Q4:what is the origin of coracobrachialis?
A.supraglenoid tubercle of scapula
B.tip of the coracoid process of scapula
C.anterior surface of coracoid process of ulna
D.middle of the medial side of the shaft of the humerus

Q5:Nerve that supply the triceps muscle?
A.radial nerve
B.ulnar nerve
C.median nerve
D.axillary nerve

Q6:the vessel in posterior fascial?
A.profunda brachii.
B.Basilic vein.
C.genicular artery.
D.fibular artery .



Q7:what’s shape of cubital fossa?
A.circular.
B.triangular.
C.square.
D.cubic.

Q8:what’s the action of triceps muscle?
A.extensor of shoulder joint.
B.flexion of elbow joint.
C.extensor of elbow joint.
D.flexion of shoulder joint.

Q9: identify the muscle above?

A. Biceps brachii
B. Brachioradialis
C. Coracobrachialis
D. Triceps

Q10: which of the following doesn’t supply the elbow joint?

A. median nerve
B. ulnar nerve
C. radius nerve
D. Axillary nerve

Q11:subcutaneous bursitis is caused by?

A.Repeated friction and pressure
B.avulsion (pull off) injury
C.repeated flexion and extension
D.bone fractures

Q12:which one of the following arteries supply the elbow joint?

A.highest thoracic artery
B.axillary artery
C.superior ulnar collateral artery
D.brachiocephalic artery

Q1)D
Q2)B
Q3)B
Q4)B
Q5)A
Q6)A

Q7)B
Q8)C
Q9)C
Q10)D
Q11)A
Q12)C

SAQs

Q1: What is the content of cubital fossa?

~~A: 1. Median nerve.~~
~~2. Brachial artery divides into radial & ulnar arteries.~~
~~3. Biceps brachii tendon.~~
~~4. Deep branch of radial nerve~~.

Q2: What's the Posterior Fascial Compartment?

~~A: 1- muscle:triceps brachii~~
~~2- vessels:profunda brachii artery./ulnar collateral arteries.~~
~~3-nerves:ulnar nerve./radial nerve~~.

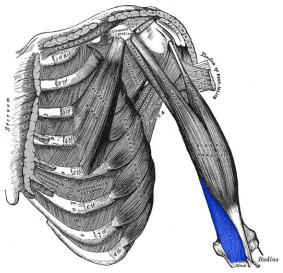
Q3: Compare between Flexion and Extension?

~~A: Slide6 :~~
~~Extension: Is limited by the tension of the anterior ligament (medially) and the brachialis muscle.~~
~~Flexion : limited by the anterior surfaces of the forearm and arm coming into contact~~.

Q4: What is the nerve supply of biceps brachii and coracobrachialis?

~~A: slide3 : Musculocutaneous~~

Q5: Identify the muscle? supplied by ?



~~A: brachialis~~
~~-musculocutaneous (medial part)~~
~~-Radial (lateral part)~~

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