Hip, knee joints and ankle joints

Musculoskeletal block- Anatomy-lecture 18

Editing file

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Objectives

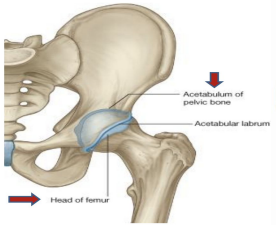
Color guide :
Only in boys' slides in **Green**
Only in girls' slides in **Purple**
Important in **Red**
Doctor's notes in **Blue**
Extra information in **Grey**

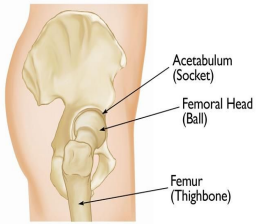
- ✓ List the type & articular surfaces of hip joint , knee joint and ankle joint.
- ✓ Describe the ligaments of hip joints and ankle joint.
- ✓ Describe movements of hip joint, knee joint and ankle joint.
- ✓ Describe the capsule of knee joint, its extra- & intra-capsular ligaments.
- ✓ List important bursae in relation to knee joint.
- ✓ Apply Hilton's law about nerve supply of knee joints.

The Hip Joint

Ligaments:

- Type: a synovial, ball & socket joint
- Articular surfaces:
  -acetabulum of hip (pelvic bone)
  -head of the femur





Intracapsular

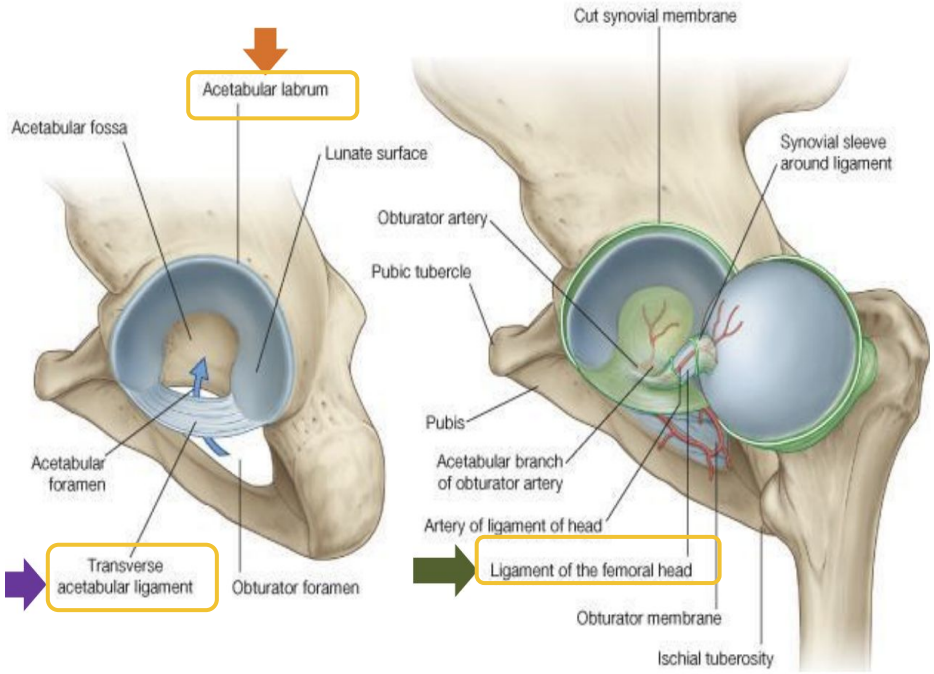
Acetabular labrum	Transverse acetabular ligament	Ligament of femoral head
-Fibro-cartilaginous collar -Attached to margins of acetabulum → increases its depth for better retaining of head of femur	Converts acetabular notch into foramen (acetabular foramen) through which the acetabular vessels pass	Carries vessels to head of femur

Extracapsular

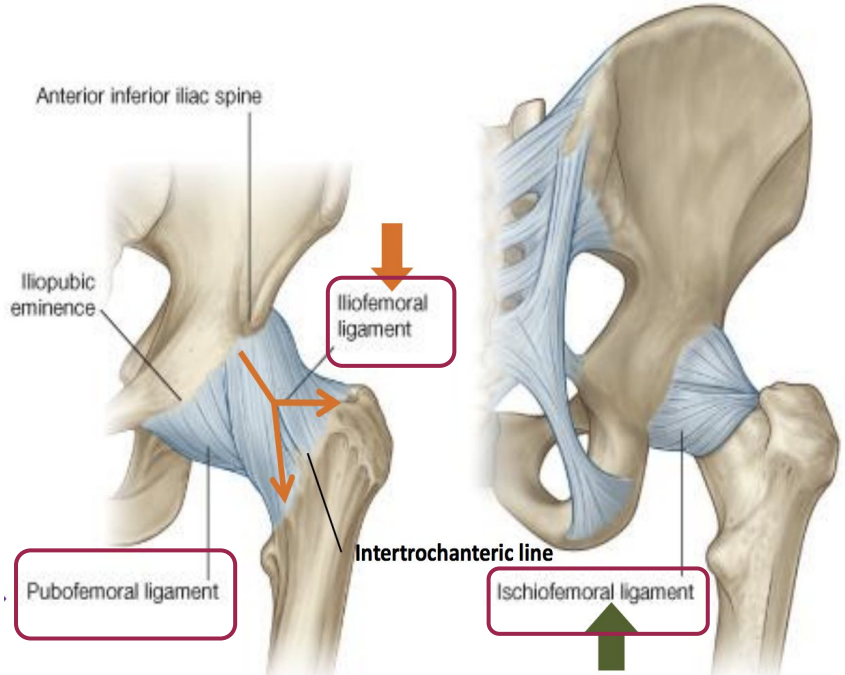
Iliofemoral ligament	Pubofemoral ligament	Ischiofemoral ligament
-Y shaped -Anterior to joint -Limits extension	- Antero- inferior to joint -Limits abduction and lateral rotation	-Posterior to joint -Limits medial rotation

Pictures in the following slide

Intracapsular

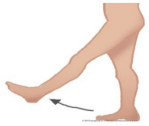


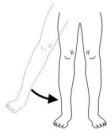
Extracapsular



Movements

Flexion	Extension	Abduction	Adduction	Medial rotation	Lateral rotation
Iliopsoas (main flexor)	Hamstrings (main extensor)	Gluteus medius	Adductors	Gluteus medius	Gluteus maximus
Sartorius		Gluteus minimus			Quadratus femoris
Pectineus	Gluteus maximus (Powerful extensor)	Sartorius	Gracilis	Gluteus minimus	Piriformis
Rectus femoris					Obturator externus and internus (2 muscles)




Hip Dislocations

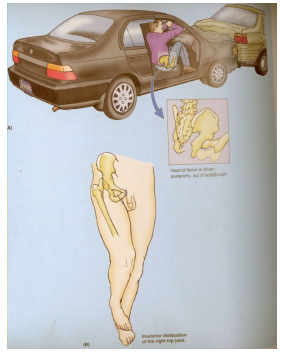
Congenital

- More common in girls and associated with inability to adduct the thigh (so the lower limb is abducted)
- The upper lip of the acetabulum fails to develop adequately
- The head of the femur rides up out of the acetabulum onto the gluteal surface of the ileum


Figure 15.16 Congenital dislocation of left hip – note the extra skin creases in the upper thigh

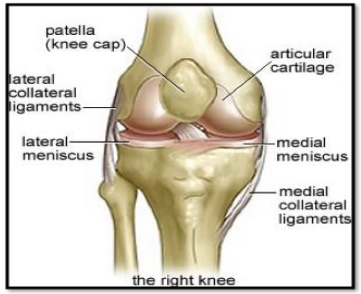
Traumatic

- Common in motor vehicle accidents when the thigh is flexed and adducted
- The dislocated head is displaced posteriorly to lie on the posterior surface of the ileum
- In posterior dislocation the sciatic nerve is liable to be injured



Girls slide only

Knee joint



Knee joint is formed of:
Three bones.
Three articulations.

Femoro-tibial articulations:	Femoro-patellar articulations:
between the 2 femoral condyles & upper surfaces of the 2 tibial condyles.	between posterior surface of patella & patellar surface of femur.
Type: Synovial, **modified hinge**	Type: Synovial, **plane.**

Nerve supply of the knee joint:

HILTON'S LAW: which dictates that:

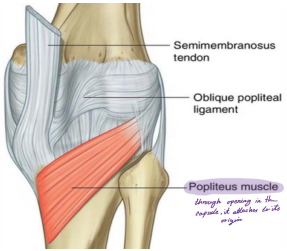
"The joint is supplied by branches from the same nerves supplying muscles acting on it, and also the skin over that joint"

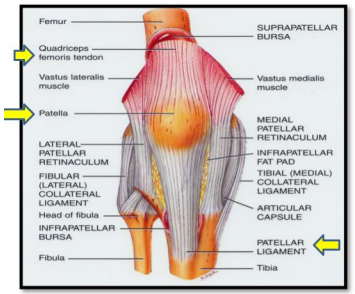
Capsule

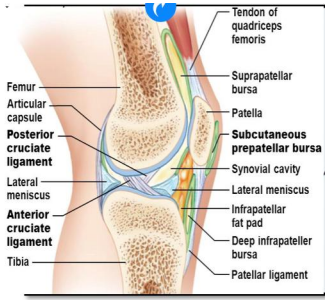
The capsule is deficient anteriorly & is replaced by:
1. quadriceps femoris tendon
2. patella
3. ligamentum patellae.

The capsule also possesses 2 openings:

***one** for popliteus tendon & **one** for communication with suprapatellar bursa.*

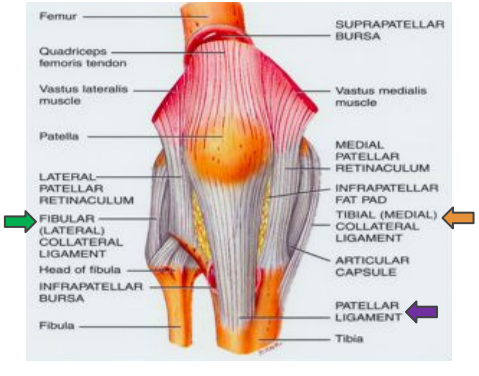


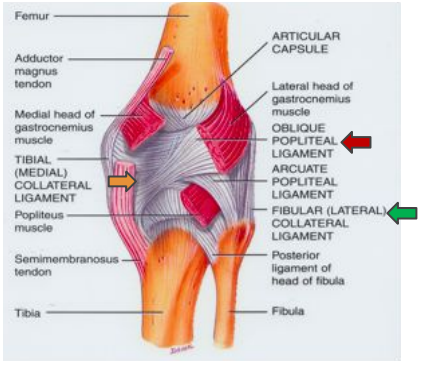




EXTRA-CAPSULAR LIGAMENTS

Ligamentum patellae (patellar ligament)	from patella to tibial tuberosity.
Medial (tibial) collateral ligament	from medial epicondyle of femur to upper part of medial surface of tibia (firmly attached to medial meniscus).
Lateral (fibular) collateral ligament	from lateral epicondyle of femur to head of fibula (separated from lateral meniscus by popliteus tendon).
Oblique popliteal ligament	extension of semimembranosus tendon.



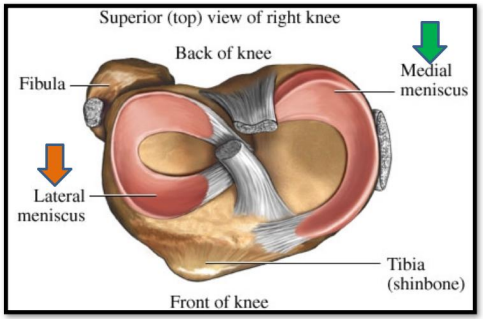


INTRA-CAPSULAR LIGAMENTS

- INTRA-CAPSULAR LIGAMENTS
  - Mensci
  - Anterior cruciate ligament
  - Posterior cruciate ligament

Mensci

ATTACHMENTS :	Each meniscus is attached by anterior & posterior horns into upper surface of tibia. The outer surface of medial meniscus is also attached to capsule & medial collateral ligament: medial meniscus is less mobile & more liable to be injured.
FUNCTIONS:	They deepen articular surfaces of tibial condyles. They serve as cushions between tibia & femur.

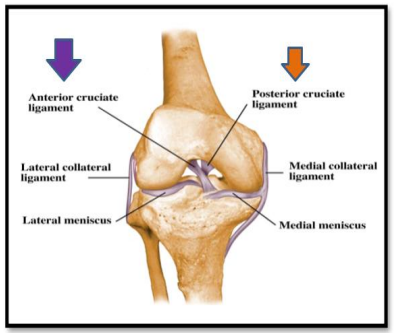


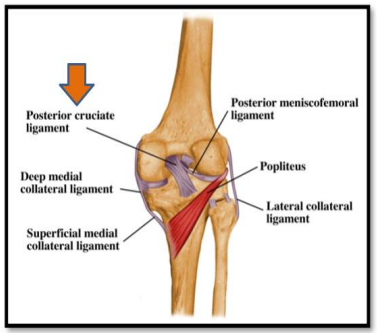
They are 2 C-shaped plates of fibrocartilage:
- The medial meniscus is large & oval.
- The lateral meniscus is small & circular.

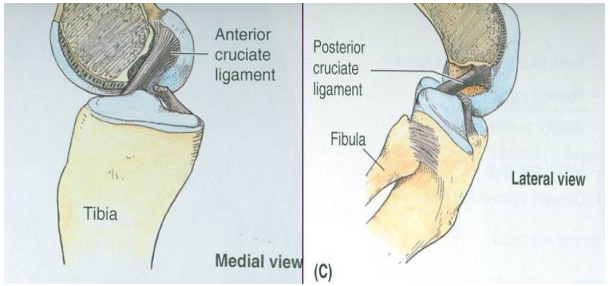
INTRA-CAPSULAR LIGAMENTS

- **INTRA-CAPSULAR LIGAMENTS**
  - Mensci
  - Anterior cruciate ligament
  - Posterior cruciate ligament

	Anterior cruciate	Posterior cruciate
ATTACHMENTS:	from anterior part of intercondylar area of tibia to posterior part of lateral condyle of femur.	from posterior part of intercondylar area of tibia to anterior part of medial condyle of femur.
FUNCTIONS:	prevents **posterior** displacement of femur on tibia.	prevents **anterior** displacement of femur on tibia.



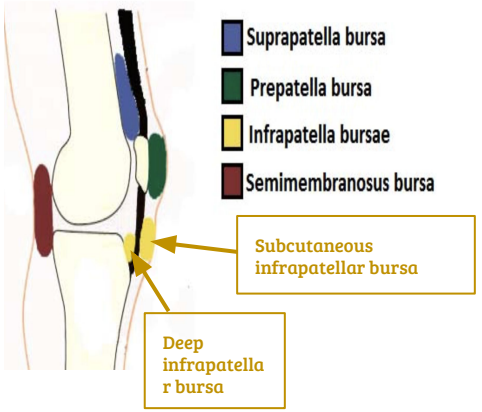


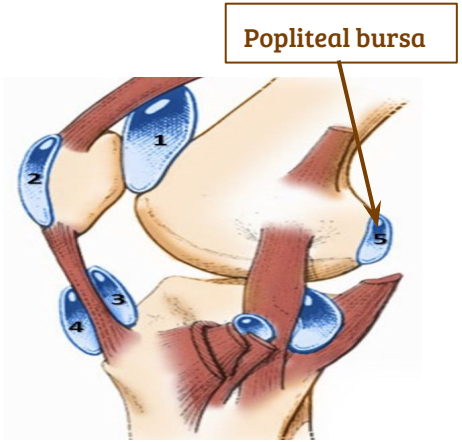


Important bursae in relation to knee joint (5 bursae):

1- Suprapatellar bursa	between femur & quadriceps tendon, communicates with synovial membrane of knee joint
2- Prepatellar bursa	between patella & skin.
3- Deep infrapatellar bursa	between tibia & ligamentum patella.
4- Subcutaneous infrapatellar bursa	between tibial tuberosity & skin.
5- Popliteal bursa	between popliteus tendon & capsule, communicates with synovial membrane of knee joint.

What is its clinical importance?
This bursa commonly gets <u>inflamed</u> and leads to suprapatellar bursitis.

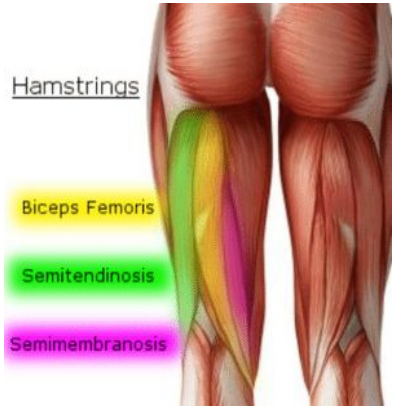


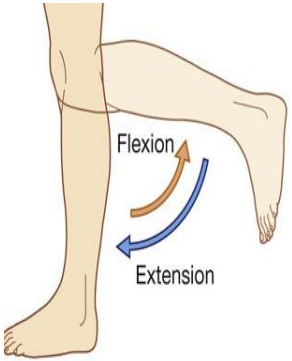


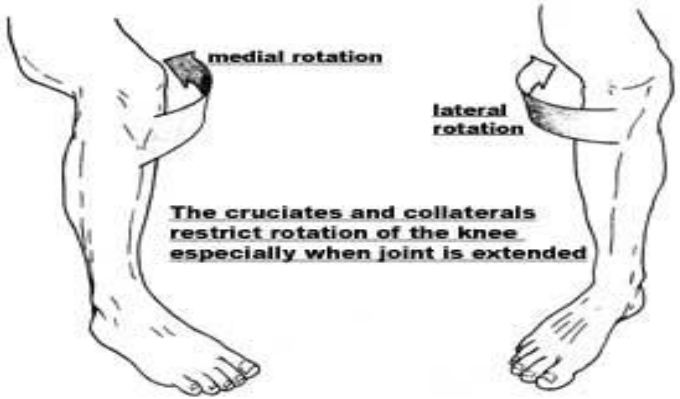
Movement of knee joint

Flexion	Extension	Active rotation (Performed When Knee is flexed)	
		A- medial rotation:	B- lateral rotation:
- Mainly by: hamstring muscles; biceps femoris, semitendinosus & semimembranosus. - Assisted by: sartorius, gracilis & popliteus.	Quadriceps femoris.	- Mainly by: semitendinosus & semimembranosus. - Assisted by: sartorius & gracilis.	Biceps femoris.

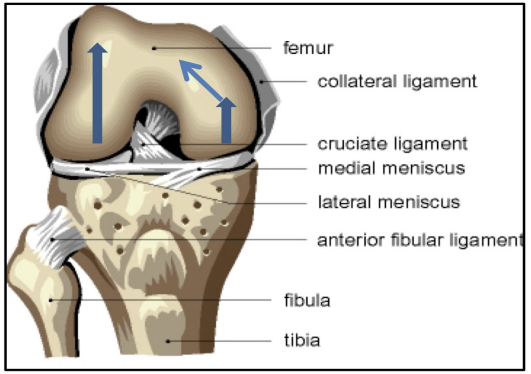
For extra explanation:
A normal hinge joint can only do flexion and extension but since the knee joint can also do some degree of rotation it is considered as a modified hinge joint



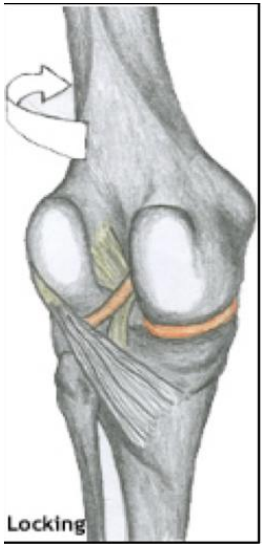




Movement of knee joint:

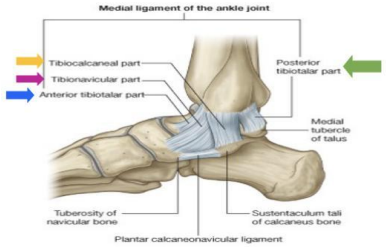
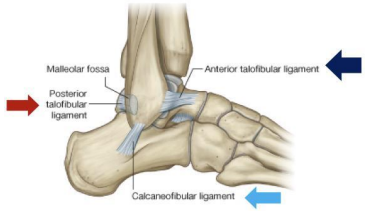


Inactive (dependent) rotation:	
A- Locking of knee:	**B- Unlocking of knee:**
- Slight Lateral rotation of tibia (or medial rotation of femur due to the shape of condyles), at the end of extension. → Results mainly by tension of anterior cruciate ligament. - In a locked knee, all ligaments become tight.	Medial rotation of tibia (lateral rotation of femur), at the beginning of flexion. Performed by **Popliteus** to relax ligaments & allow easy flexion

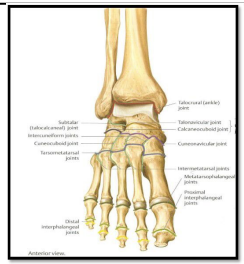
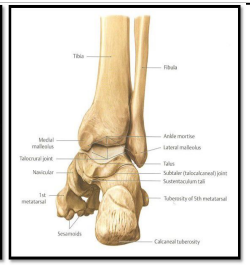


Ankle Joint

Ligaments

Medial (Deltoid Ligament)	Lateral Ligament
Strong triangular ligament	Composed of 3 separate ligaments: 1) Anterior talofibular ligament 2) Calcaneofibular ligament 3) Posterior talofibular ligament
Apex: attached to medial malleolus	
Base: subdivided into **4 parts**: 1) Anterior tibiotalar part 2) Tibionavicular part 3) Tibiocalcaneal part 4) Posterior tibiotalar part	
	

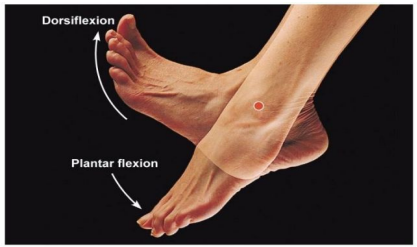
Ankle Joint

Type	Synovial, hinge joint.
Articular Surfaces	**1. UPPER:** A socket formed by the lower end of tibia, medial malleolus & lateral malleolus. **2. LOWER:** Body of talus.
Pictures	 

Ankle Joint

Movements

N.B.
Inversion and **Eversion** movements occur at the **talo-calcaneo-navicular** joint.

DORSIFLEXION	PLANTAR FLEXION
Performed by muscles of **anterior** compartment of leg: 1- Tibialis anterior 2- Extensor hallucis longus 3- Extensor digitorum longus 4- Peroneus tertius  	-**Initiated** by: soleus -**Maintained** by: gastrocnemius -Assisted by other muscles in **posterior** compartment of leg: 1- Tibialis posterior 2-Flexor digitorum longus 3- Flexor hallucis longus -Also the muscles of the **lateral** compartment of the leg: 1- Peroneus longus 2- Peroneus brevis

Muscles that perform **inversion**	Muscles that perform **eversion**
1) Tibialis anterior 2) Tibialis posterior	1) Peroneus longus 2) Peroneus brevis 3) Peroneus tertius

MCQs

Question 1: The hip joint consists of the articulation of the acetabulum and ...?

A. Head of femur

B. Head of tibia

C. Head of fibula

Question 2: Which muscle initiates plantar flexion?

A. Peroneus longus

B. Peroneus brevis

C. Soleus

D. Gastrocnemius

Question 3: What is the lateral ligament of the ankle joint?

A. Tibionavicular

B. Anterior talofibular

C. Tibiocalcaneal

D. Posterior tibiotalar

Question 4: What is the joint type in the femoro-tibial articulation?

A. saddle joint

B. synovial, modified hinge

C. synovial, plane

D. ball and socket

Question 5: An example of extra capsular ligament is:

A. medial collateral ligament

B. meniscus

C. anterior cruciate ligament

D. posterior cruciate ligament

Question 6: The medial meniscus is:

A. more mobile

B. less mobile

C. less liable to be injured

D. loosely attached to knee capsule

Question 7: Bursa between femur and quadriceps tendon

A. Deep Infrapatellar bursa.

B. Suprapatellar bursa.

C. Prepatellar bursa.

D. Subcutaneous Infrapatellar bursa.

SAQ

Question 1: Name 3 important bursae related to knee joint:

Answer:

Suprapatellar, prepatellar, deep infrapatellar , subcutaneous infrapatellar, popliteal

Question 2: What is Hilton's law?

The joint is supplied by branches from nerves supplying muscles acting on it.

Answers: Q1.A- Q2.C -Q3.B -Q4.B- Q5.A- Q6.B-Q7.B

Team members

Boys' team:

- Khalid AL-Dossari
- Naif Al-Dossari
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- Salman Alagla
- Ziyad Al-jofan
- Suhail Basuhail
- Ali Aldawood
- Khalid Nagshabandi
- Mohammed Al-huqbani
- Jehad Alorainy
- Khalid AlKhani
- Omar Alammari

Team leaders

- Abdulrahman Shadid
- Ateen Almutairi

★ =This lecture done by

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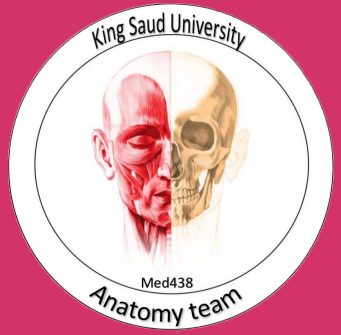
- Taif Alotaibi
- Noura Al Turki
- Amirah Al-Zahrani
- Alhanouf Al-haluli
- Sara Al-Abdulkarem
- ★ Rawan Al Zayed
- Reema Al Masoud
- Renad Al Haqbani
- Nouf Al Humaidhi
- ★ Fay Al Buqami
- Jude Al Khalifah
- Nouf Al Hussaini
- Alwateen Al Balawi
- Rahaf Al Shabri
- ★ Danah Al Halees
- ★ Haifa Al Waily
- Rema Al Mutawa
- Amirah Al Dakhilallah
- Maha Al Nahdi
- Renad Al Mutawa
- ★ Ghaida Al Braithen
- ★ Reham Yousef

Special thank for Anatomy team 436



Good luck

Give us your feedback: