ANATOMY

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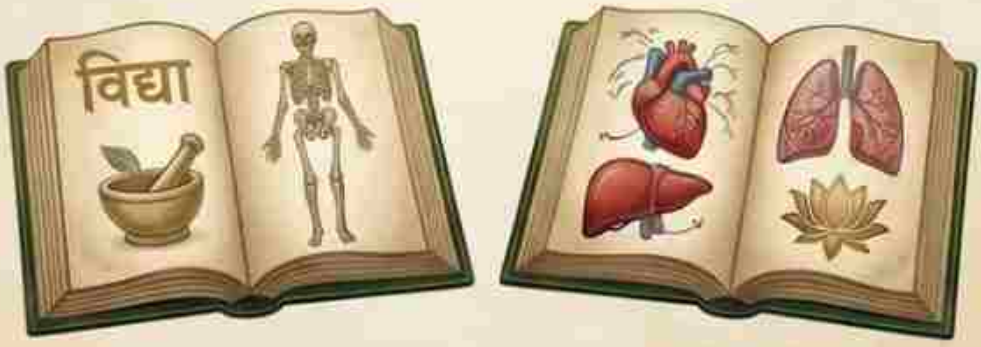
Ayur Hub

EXAM NOTES • 1ST YEAR

धैर्य सर्वस्य साधनं।



* Arthrology *

→ A Joint is the location at which two or more bones make contact.

→ They are constructed to allow movement and provide mechanical support, and are classified <u>structurally</u> and <u>functionally</u>.

i) <u>structurally</u> classification is determined by how the bones connect to each other.

ii) functional classification is determined by the degree of movement b/w the articulating bones.

• Joints — •

• Synarthroses (Immovable Joints) [स्थिर [illegible] अस्थि [illegible]]

1) Fibrous Joint
   - Sutures
   - Gomphoses
   - Syndesmoses

2) Cartilaginous Joint
   - Synchondroses
   - Symphyses.

• Diarthroses (movable Joints) [चलायमान [illegible] अस्थि [illegible]]

1) Synovial Joint
   1) Plane
   2) Spheroid
   3) Ellipsoid
   4) Ginglymus
   5) Bicondylar
   6) Trochoid
   7) Sellar

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* Synarthroses / Immovable Joint.

1) Fibrous Joint.

→ No Joint cavity.
→ connected by fibrous connective tissue.

a) sutures.
- occurs only in the skull.
- No active movement

b) Gomphoses
- Peg - and - Socket Joint
- Roots of the teeth (Pegs) fit into their sockets in the Mandible & Maxilla

c) Syndesmoses.
- allows little movements
- opposing bone surface are comparatively far apart and are united by ligaments or interosseous membrane.

ex. Inferior tibiofibular Joint.

2) Cartilaginous Joint.

→ allow more movement than fibrous joints but less them that of synovial joints.

a) Synchondroses.
- which the cartilage (flexible connective tissue that provides support and cushioning in the (jelly) Body).
- usually converted into bone during early adult life and that serves to allow growth.

ex. first sternocostal Joint.

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b) Symphyses.
- fibro cartilaginous fusion. b/w two bones o/l. fibro cartilaginous disc
ex. - Pubic symphysis
- joints b/w the bodies of the vertebrae.

* Diarthoses / movable joint.

1) Synovial joint.
→ movable joint.

a) Plane joint.
- opposing joint surface are nearly flat and in which there is only a slight
- sliding motion
ex:- Acromioclavicular joint
:- metatarsal bones. etc.

b) Spheroid (ball & socket) joint. (बॉल सॉकेट)
- Head of one bone fits into a Rounded cavity in the other bone
ex:- Hip bone
:- Shoulder joint.

c) Ellipsoid joint. (दीर्घवृत्तीय जोड़)
- one bone has an oval & convex surface while the other bone has an elliptical concavity
ex. :- Radio - carpal joint
:- Metacarpo - Phalangeal joint.

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↱ મિજાગરા નો સાંધો.

d) Ginglymus (Hinge) Joint (કાર)
- Movement of Joints is limited in one Plane
ex. elbow, Knee etc.

E) Bicondylar & condylar joint
- an ovoid articular surface, or condyle that fits into an elliptical cavity
- This Permits movements in two Planes allowing Flexion - extension - adduction - abduction and circumduction
ex. - Metacarpo - Phalanges Joint
 - temporo - mandibular Joint.

F) Trochoid (Pivot) Joint.
- Provides Rotatory movement in single axis.
ex. Radio - ulnar Joint of dens & atlas.

g) sellar (saddle) Joint
- opposing surfaces are Reciprocally concave - convex
ex. carpometacarpal Joint of thumb.

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• Structures of Synovial Joints.

1) Fibrous capsule - (सौत्रिक सम्पुट)

- It completely encloses the joint.
- Fibrous structure composed of parallel bundles of collagen fibres.
- capsule is perforated by blood vessels and Nerves.
- various associated ligaments are fused with capsule.

2) Synovial membrane (श्लेष्मिक कला)

- It lines the fibrous capsule.
- It also covers the exposed articular surfaces, Intracapsular ligaments, tendon sheath and bursa etc.
- It secretes and absorb the synovial fluid.

3) Synovial cavity (श्लेष्मा गुहा)

- cavity enclosed by synovial membrane is called synovial cavity.

4) Synovial fluid (सन्धि श्लेष्मा)

- It is a yellow, viscous fluid found in synovial cavity.
- It lubricates the joint and prevent friction.
- It is composed of Hyaluronic acid, synovial proteins & Phagocytic cells.

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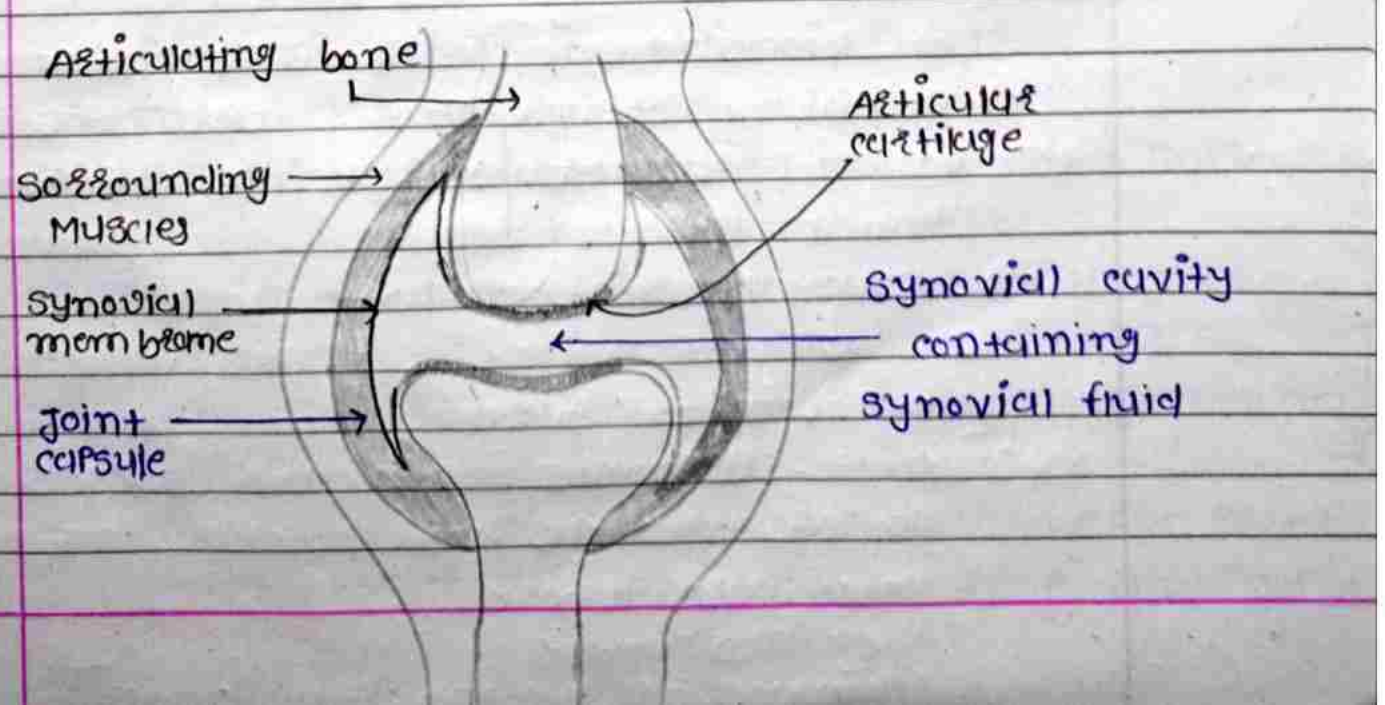
⇝ Ligaments :- These are bone to bone attachments of connective tissue.
:- They may be Intracapsular (inside capsule) and extracapsular (outside capsule).

⇝ Bursa :- These are Pouches filled with Synovial fluid
:- They Prevent friction.

⇝ Articular disc o/. Menisci :- These are fibrocartilaginous discs compressed b/w articular surface.
:- These are found in knee joint & temporo-mandibular joint.

⇝ Fat Pad :- Fat Pads are Soft and shape changing structures in joint.
:- They can change shape according to joint position.



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* Shoulder Joint :-

→ also called as Scleno-humeral Joint.
→ The Shoulder Joint is the Most mobile Joint in the Body.

- Name of Joint AS Per Modern :- Shoulder Joint
- Name of Joint AS Per Ayurveda :- अंस संधि or. कक्ष संधि
- classification of Joint AS Per Modern -
  Anatomically :- Ball and Socket Joint
  Functionally :- Synovial Joint.
- classification of Joint AS Per Ayurveda :- वेलूखल संधि
- Number :- two
- Articulating Bones :- 1. Head of Humerus
  2. Glenoid cavity of Scapula

→ Weak Joint bcz glenoid cavity is small & shallow.

- Stability of Joint is Maintain By -
  1) Coraco - Acromial Arch (ligament)
  2) Rotator cuff [group of tendons that surround the Shoulder Joint]
  3) Glenoid Labrum [It is fibro - cartilaginous Rim. It is attached to Peripheral edge of glenoid cavity]

:- Due to Genoid Labrum Joint cavity become deep and Joint become stable.

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- Ligaments

1) Join capsule or/. capsular ligament.
→ Encircles entire gleno-humeral Joint.
→ Attached :- Medially - Peripheral margin of glenoid cavity and supra-glenoid tubercle.
:- Laterally - Below to Anatomical Neck of the Humerus.

* → It is lax at the Inferior side, 1 cm
(ढीला)
below the surgical Neck of Humerus.

→ It is strengthened by Rotator cuff
1) supraspinatus
2) Infraspinatus
3) Teres Minor
4) subscapularis.

[(group of tendons) that surround the shoulder Joint]

i) Tendon of long Head of biceps muscle
ii) Ascending Branch of anterior circumflex Humeral artery.
iii) Synovial sheat
↓
[a specialized bursa that surrounds & protects tendons, particulary where they pass under ligaments or through bony canals.]

That structures are passing to Bicipital groove.

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2) Gleno-humeral Ligament.
→ It has 3 parts.
i) Superior :- It Extend from Superior Part of glenoid Labrum to Upper end of lesser tubercle.

ii) Middle :- It Extend From Anterior Part of Glenoid Labrum to Lesser tubercle

iii) Inferior :- It extend From Anterior, Middle and Posterior Part of the Glenoid Labrum to Lower Part of Anatomical Neck of Humerus.

3) Coraco-Humeral ligament -
→ It extends from the Root of coracoids Process to the greater tubercle

4) Transverse-Humeral ligament —
→ It is bridges the greater and lesser tubercle.

- Synovial Membrane —

→ Reflected from margin of glenoid cavity over fibro-cartilaginous rim surrounding it.
→ over internal surface of capsular ligaments.
→ It is continuous with synovial membrane of subscapular bursa.

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- **Bursae**

1) Subacromial bursa.
2) Subscapularis bursa.
3) Infraspinatus bursa.
4) Subcoracoid bursa.

- **Relations**

i)	Superiorly.	- coraco-acromial arch, Subacromial bursa, Supraspinatus and deltoid Muscle.
ii)	Inferiorly	- Long Head of triceps, Posterior circumflex Humeral artery and axillary nerve.
iii)	Anteriorly	- Subscapularis, coracobrachialis, Short head of biceps and deltoid Muscles.
iv)	Posteriorly	- Infraspinatus, teres minor and deltoid Muscles.

→ Inside the joint cavity :- Tendon of Long Head of biceps.

- **Arteries** :- Anterior & Posterior circumflex Humeral artery.
  :- Supra-scapular artery.
  :- circumflex scapular artery.

- **Nerves** :- Branches from the Suprascapular
  :- axillary and Lateral Pectoral Nerves.

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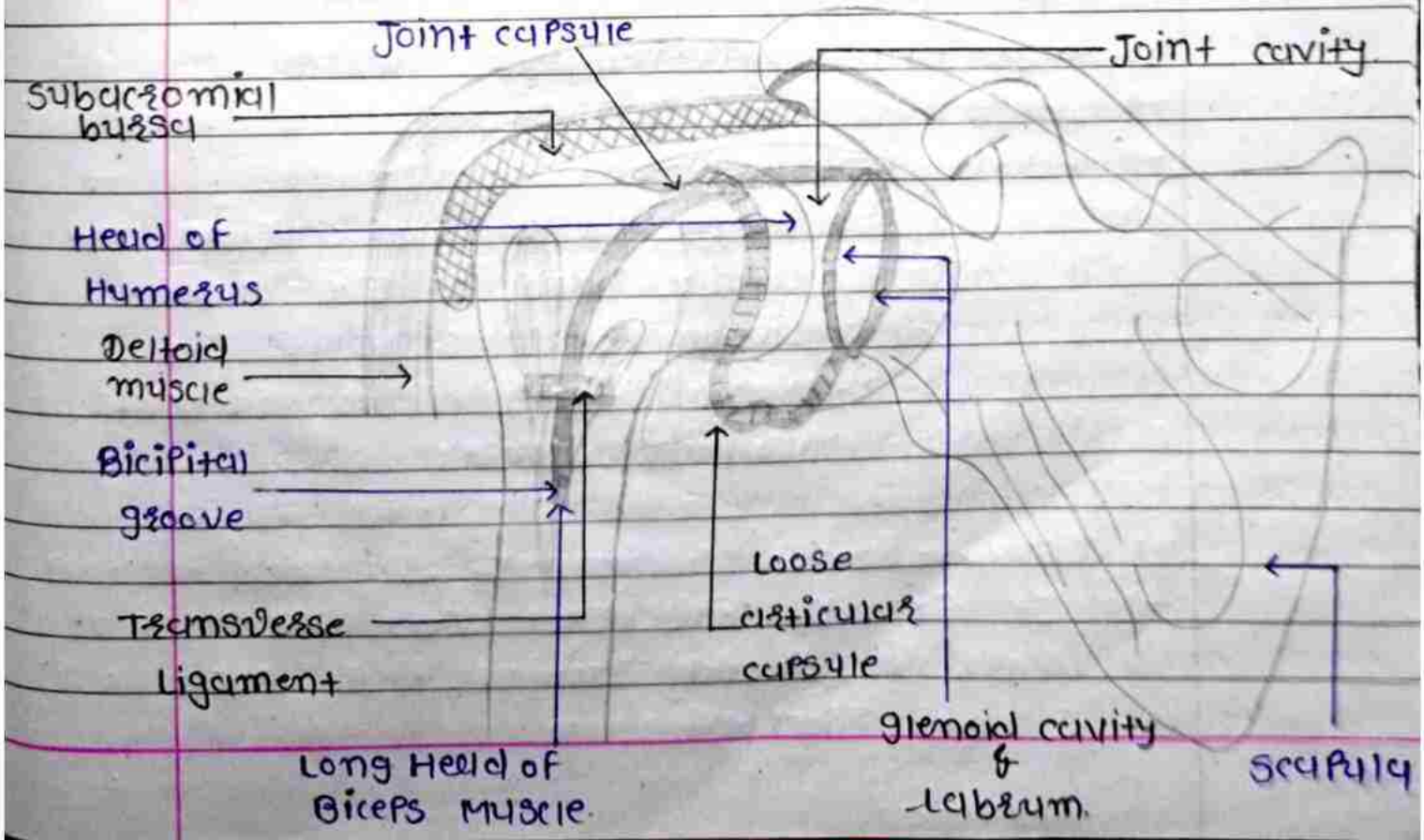
- **Movement** :- 1) Flexion
  2) Extension
  3) abduction
  4) adduction
  5) Medial Rotation
  6) Lateral Rotation
  7) circumduction

- **clinical significance** :-

i) Dislocation :- Shoulder Joint is more likely to Dislocate due to laxity of capsule and Shallow Socket due to disproportionate articular surface.
:- Generally, the Head dislocates downward. It can Injure axillary nerve.

ii) Shoulder tip Pain :- Irritation of the diaphragm bcz adjacent organs can cause Referred Pain in the Shoulder
:- C3, C4 nerve Roots of Phrenic nerve & Supraclavicular nerves.



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* Hip Joint :-

→ It is designed for stability, weight bearing and a large range of movement.
→ connects the axial skeleton with the lower extremity.

- Name of Joint AS per Modern :- Hip Joint.
- Name of Joint AS per Ayurveda :- संक्षिप्त सन्धि
- classification AS per Modern :-
  - Anatomically :- Ball and Socket Joint
  - Functionally :- Synovial Joint
- classification AS per Ayurveda :- उलूखल सन्धि

Number :- two
Articulating Bones :- 1. Head of Femur bone.
2. Acetabulum of Hip bone

- Stability of Joint is Maintain By -
1. Strong Joint capsule and arrangement of Muscles surrounding the Joint.
2. Joint is encircled with ligaments forming a dense and fibrous structure around the Joint capsule.
3. The Acetabular Labrum deepens the cavity and Mouth becomes narrow.
4. Neck of the Femur is long and having specific Angle with shaft (125°)
5. External Atmospheric Pressure.

- Articular Surface :- Head of the femur and horse shoe-shaped Lunate surface of the Acetabulum (both covered with cartilage)

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Ligaments

1) Joint capsule
→ Attached :- Medially - acetabular margin, acetabular labrum & transverse ligament.
:- Laterally - Intertrochanteric line, base of Neck, above the Intertrochanteric crest

2) Ilio - Femoral Ligament -
→ Shape :- Triangular or Y-Shaped.
→ Attached :- Apex → Anterior - Inferior iliac spine and Acetabular Rim.
:- Base → Intertrochanteric line.

→ Present Anteriorly and one of the Strongest ligament in Body.

3) Pubo - Femoral Ligament.
→ Shape :- Triangular
→ Attached :- Apex → or (Inferiorly) → merges with the capsule and lower band of Ilio-Femoral ligament.
:- Base → Iliopubic eminence & obturator crest.

4) Ischio - Femoral Ligament -
→ It Extends Posteriorly along the Acetabulum and Ischium to the Greater Trochanter.

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5) Transverse Acetabular Ligament.
→ It is attached to the acetabular Labrum and Bridges the Acetabular Notch.

6) Ligamentum Teres –
→ It is a Head of the Femur Ligament.
→ also known as Round Ligament.
→ Shape :- flat and triangular.
→ Attached :- Apex → Fovea capitis.
:- Base → transverse ligament & Margins of Acetabular notch.

- Acetabular Labrum –
→ It is a Fibro-cartilaginous Rim.
→ Attached to the Margin of Acetabulum.
→ Due to the Labrum the Joint cavity becomes deep with Narrow opening.

- Synovial Membrane –
→ It covers - 1) Internal Surface of the fibrous capsule
2) Intracapsular Part of the Neck of Femur.
3) Acetabular Labrum.
4) Transverse Ligament & fat in the acetabular Fossa.
5) Ligament of the Head of the Femur.

- Bursae
i) Trochanteric Bursae :- located on the tip of greater trochanter.
ii) Ischial Bursae :- located on Ischial tuberosity.
iii) Gluteal - Femoral Bursae :- 2 or 3 small Bursae.
→ located b/w tendon of gluteus maximus and Rough line of Femur Shaft.

iv) Iliopsoas Bursae :- Located b/w Iliacus and Psoas major.

- **Relations.**

i)	Superiorly.	- Gluteus Minimus, Pirifomis & Head of Rectus Femoris Muscle.
ii)	Inferiorly.	- Lateral Fibres of Pectineus & obturator externus Muscle.
iii)	Anteriorly.	- Iliopsoas, Pectineus & Rectus Femoris Muscle.
iv)	Posteriorly.	- Tendon of obturator externus, Pirifomis, Quadratus femoris, Tendon of obturator Internus Muscle and Gemelli, Medial circumflex femoral Artery.

- **Arteries** :- Obturator artery
  :- Medial Circumflex Femoral artery.
  :- Superior & Inferior gluteal arteries.

- **Nerves** :- Obturator Nerve.
  :- Femoral Nerve.
  :- Accessory Obturator Nerve.
  :- Nerve to Quadratus Femoris.
  :- Superior gluteal Nerve.

- **Movements** :- 1) Flexion
  2) Extension
  3) Adduction
  4) Abduction
  5) Medial Rotation
  6) Lateral Rotation
  7) Circumduction.

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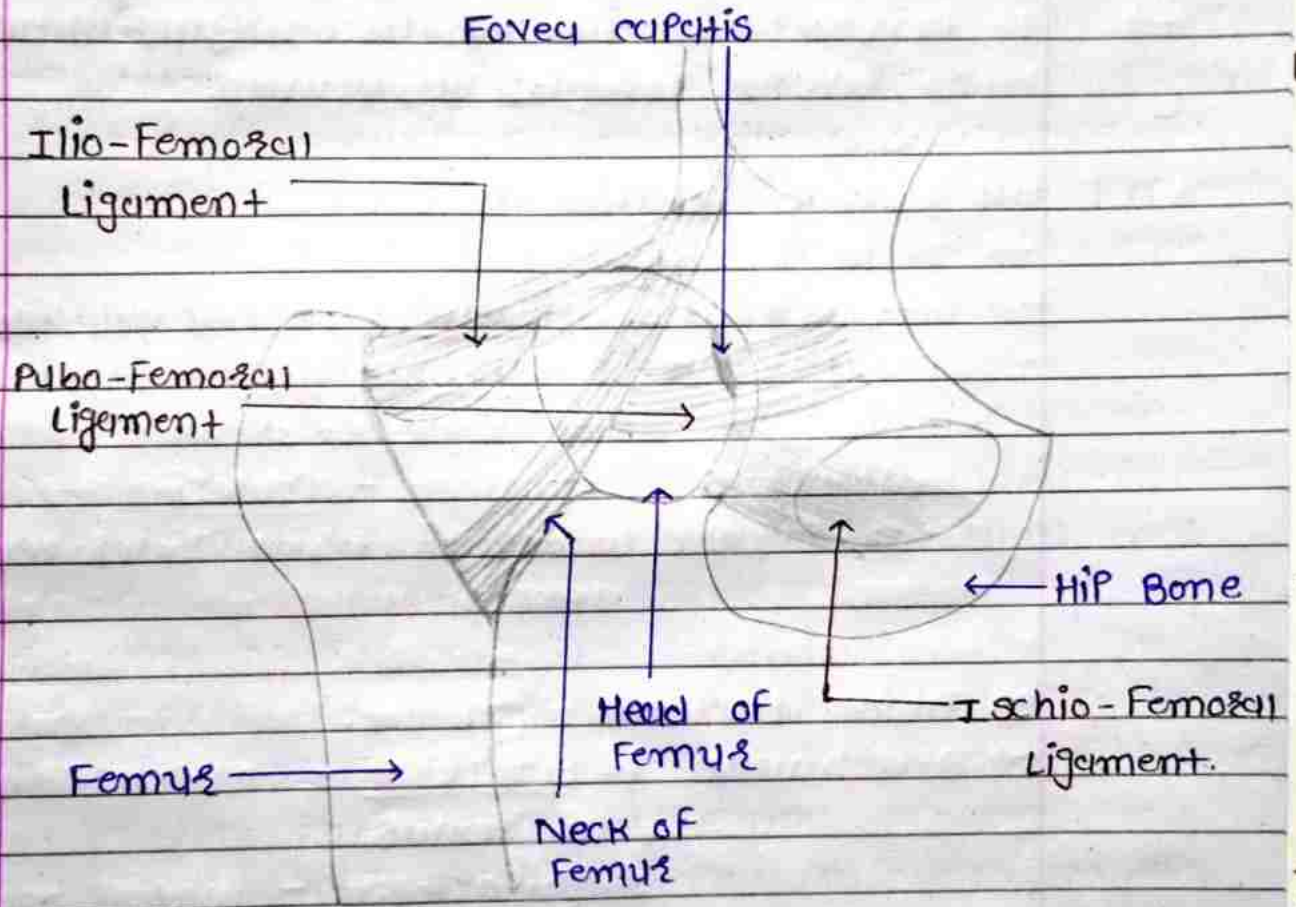
- **Clinical Significance :-**

→ Referred Pain from Hip Joint - Due to the common nerve supply by Femoral and obturator Nerves, the pain originating in the hip joint is Referred to the thigh and knee.



Right Hip Joint
Anterior Aspect

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* Knee Joint :-

→ Knee Joints is the largest Joint among the all the Joints.
→ one of the strongest Joints of the Body.

- Name of Joint AS per Modern :- Knee Joint
- Name of Joint AS per Ayurveda :- जानु संधि
- classification AS per Modern :-
  - Anatomically :- compound & condylar Joint
  - Functionally :- synovial Joint.
- classification AS per Ayurveda :- कोर संधि

- Number :- two
- Articulating Bones :- i) Femur.
  ii) Patella.
  iii) Tibia.

→ condyles of Femur, condyles of Tibia and Posterior surface of Patella.

- Ligaments

1) Fibrous capsule or Joint capsule.
→ It is absent Anteriorly. due to presence of quadriceps Femoris, Patella and ligamentum Patellae.
→ Attachment —

• Femur •	• Tibia •
M :- medial condyle.	M :- medial condyle.
L :- Lateral condyle.	L :- Lateral condyle & Fibular ——
P :- articular margin of condyle of Femur & Intercondylar notch.	P :- Intercondylar area. & Post. margin of tibial condyles.

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7) Anterior cruciate ligament —
→ Attached :- Medially - anterior part of Inter-condylar area of tibia → Posterior part of Medial surface of Femoral lateral condyle.

8) Posterior cruciate ligament —
→ Attached :- Laterally - Posterior part of Inter-condylar area of tibia → anterior part of Lateral surface of Femoral Medial condyle.

9) Menisci :- 2 Semilunar Fibro-cartilaginous disc
→ 2 Menisci → Medial and Lateral.
→ Attached :- on the articular surface of condyles of tibia.
→ Significance :- Deepening the Joint cavity.
:- Load transmission & distribution.
:- Shock absorption & Joint Stability.
:- Providing Lubrication to Joint.

→ Structure :-
i) 2 ends :- attached to tibia
:- Known as Horn of. Cornu.
ii) 2 Borders :- i) outer → thick & convex
ii) Inner → thin & concave & free.
iii) 2 surfaces :- i) upper → Smooth & concave
ii) lower → flat & Rests on tibial condyles.

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Synovial membrane

→ It lines the capsule and at the proximal borders of patella. it forms the suprapatellar bursa.

→ It is present along the sides of patella below the aponeuroses of vasti muscles.

→ ~~It covers the deep surface of infrapatellar fat of fat & extends posteriorly~~

Bursae.

i) Anterior Bursae.	ii) Lateral Bursae.	iii) Medial Bu-
- Supra-patellar Bursae.	- Lateral gastro-cnemius bursae	- Brodie's Bursae.
- Subcutaneous Infra-patellar Bursae.	- biceps femoris bursae.	- anserine bursae.
- deep - Infra-patellar Bursae.	- Lateral Popliteal bursae.	- Inter-tibial bursae.
	- Sub Popliteal bursae.	- Semi-membranous Burs

Relations.

i)	Anteriorly	- tendon of quadriceps.
ii)	Posteriorly	- oblique popliteal ligament, Popliteal artery, Popliteal vein & tibial nerve.
iii)	Laterally	- ilio-tibial tract.
iv)	Antero-medially	:- medial patellar retinaculum.
v)	Antero-laterally	:- Lateral Patellar retinaculum
vi)	Postero-laterally	:- biceps femoris & common peroneal nerve.

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- **Arteries** :- Popliteal artery.
  :- Femoral artery.
  :- Lateral circumflex femoral artery.
  :- anterior tibial artery.
  :- circumflex fibular artery.

- **Nerves** :- Femoral nerve.
  :- common peroneal nerve.
  :- obturator nerve.
  :- tibial nerve

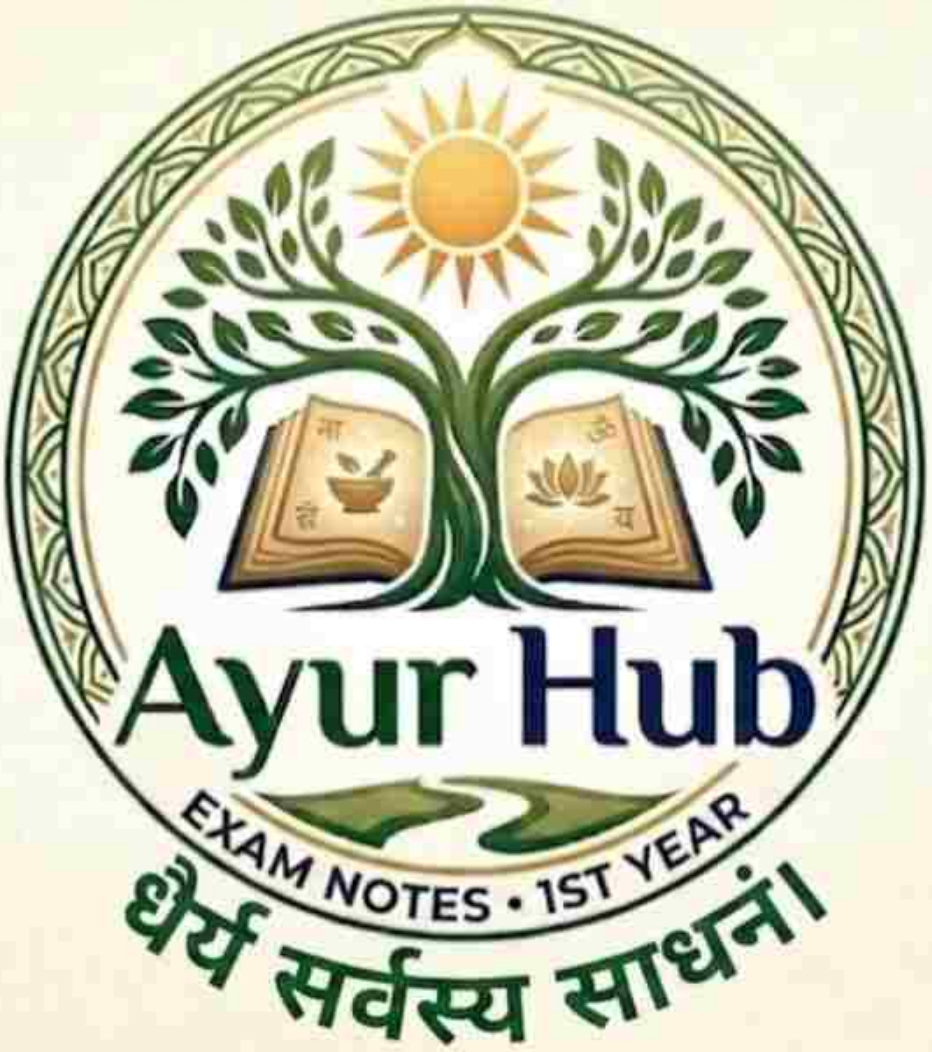
- **Movement** :- 1) Flexion 3) Slight Medial & lateral Rotation.
  2) Extension

- **Clinical Significance.**

i) Knee Jerk :- Striking the Patellar tendon with a Reflex hammer just below the Patella. → contracts the quadriceps muscle and knee joint gets extended.
→ This test assesses the Femoral nerve and nervous tissue blw and including the L2 and L4 segments of spinal cord.

ii) Obturator nerve supplies the Hip and knee joints. Hence the pain of one joint may Refer to other joint.

iii) Osteoarthritis :- common knee pain found in people 50 years of age and older.
→ It is degenerative disease
→ may occur in younger people.



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