



# Joints

## Musculoskeletal block- Anatomy-lecture 2

Editing file



# Objectives

By the end of the lecture, students should be able to:

- ✓ Define the term “Joint” .
- ✓ Describe the classification of the 3 types of joints & give an example of each.
- ✓ Describe the characteristics of synovial joints.
- ✓ Describe the classification of synovial joints & give an example of each.
- ✓ List factors maintaining stability of joints.
- ✓ Recite “Hilton’s law” for nerve supply of joints.

## Color guide :

Only in boys slides in **Blue**

Only in girls slides in **Purple**

important in **Red**

Doctor note in **Green**

Extra information in **Grey**

# Definition:

What is a joint? It is the site where two or more bones meet together.  
**Another def. : union of two or more bones of the body**

# Classification of joints:

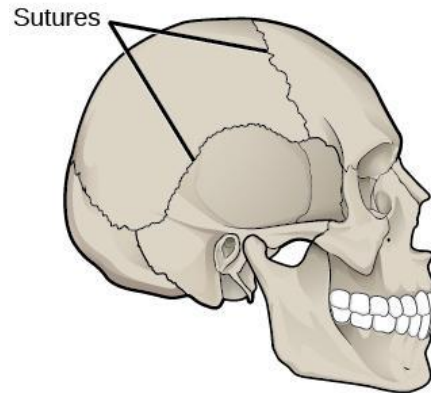
They are classified according to:

tissues that lie between the articulating bones

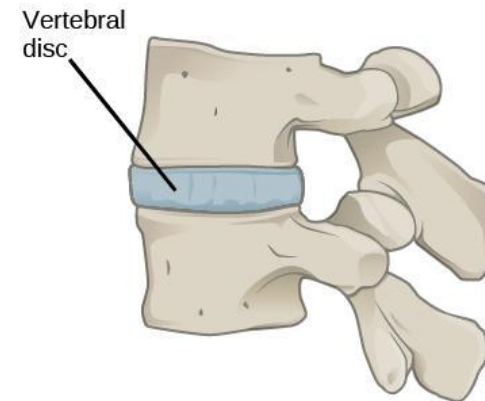
A. Fibrous

B. Cartilaginous

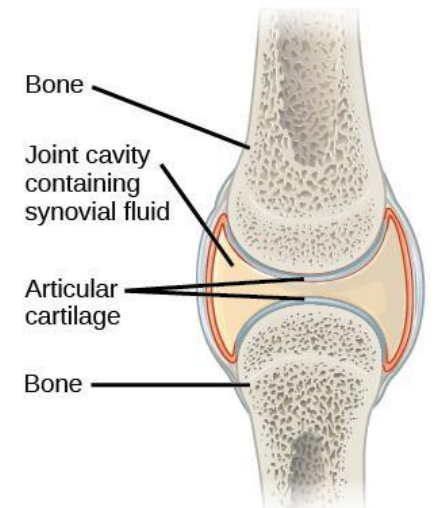
C. Synovial



A



B



C

# 1) Fibrous Joints:

The articulating surfaces are joined by **fibrous connective tissue**, where **No or very mild movement**.

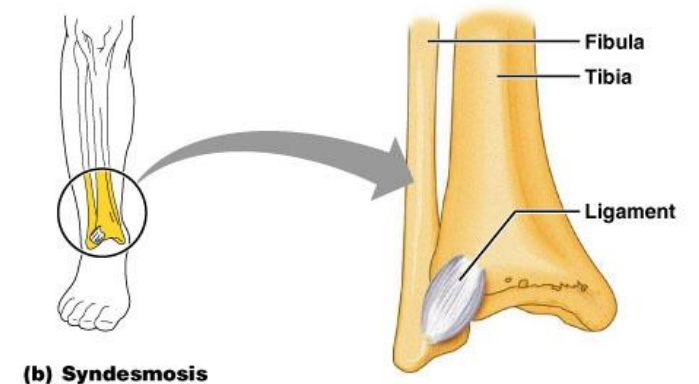
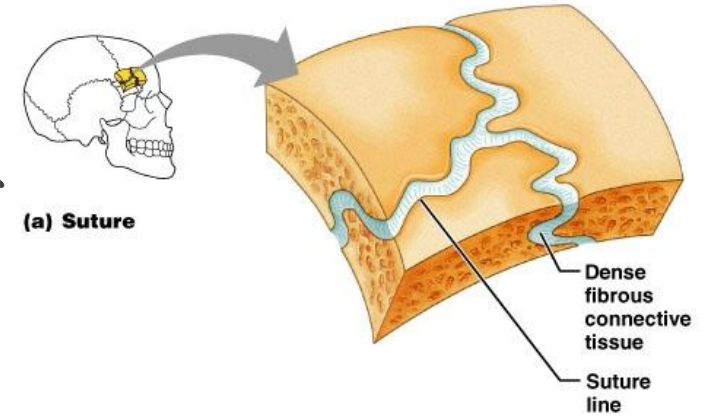
For example:

1. **Skull sutures:** no movement, temporary (as it ossify later) They will become bones

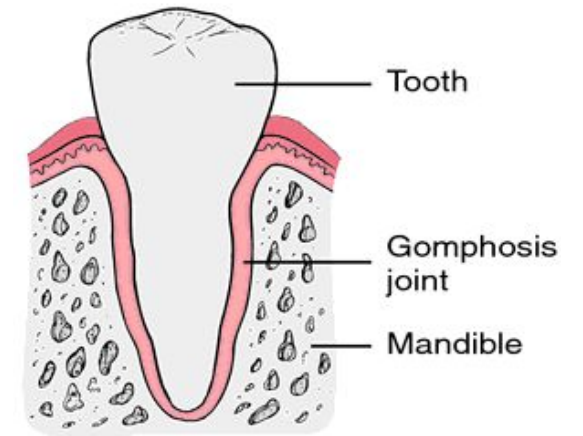
2. **Inferior tibiofibular joints (syndesmosis):** minimal movement, permanent joints.

3. **Gomphosis:** dental alveolar joints. Articulation between root of the tooth with the mandible (between the teeth & their socket)

Examples are very important



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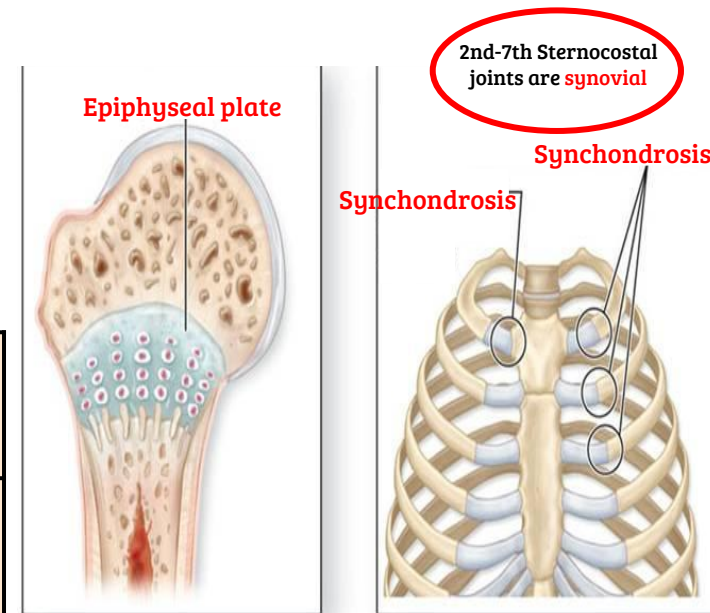
## 2) Cartilaginous Joints:

Happens when two bones are joined by **cartilage**.

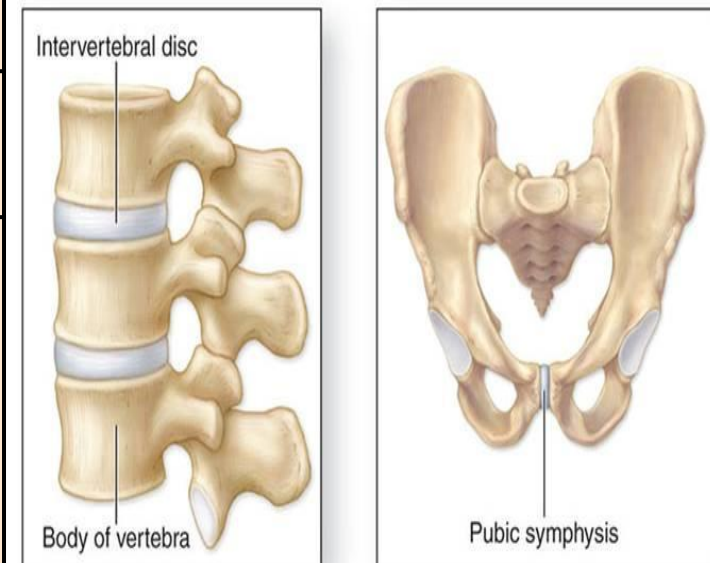
They are classified into 2 types:

	<b>Primary Cartilaginous (synchondrosis):</b>	<b>Secondary Cartilaginous: (midline* or symphysis)</b>
<b>Structure</b>	The bones are united by a plate or a bar of <b>hyaline cartilage</b> . & it's one where <b>bone and cartilage meet</b> . It's a very strong joint	The bones are united by a plate of <b>fibrocartilage</b> . Their <u>articulating surfaces</u> are covered by a thin plate of <b>hyaline cartilage</b> . (Bone-Hyaline-Fibrocartilage-Hyaline-Bone)
<b>Movement</b>	<b>No</b> movement, <b>temporary</b> joints (ossify later).	<b>Little</b> movement, <b>permanent</b> joints.
<b>Examples</b>	→ Between the <b>Epiphysis</b> and the <b>Diaphysis</b> of a growing bone (epiphyseal plate). → Between the <b>First Rib</b> and the <b>Sternum</b> ( <b>1<sup>st</sup> sternocostal joint</b> ). → <b>junctions of ribs with their costal cartilage</b> .	→ Joints between the <b>Vertebral Bodies</b> ( <b>intervertebral discs</b> ). → <b>Symphysis Pubis</b> . between the two hip bones

\*They are called midline, because they are mainly found in the axial skeleton (midline of body)



(a) Synchondroses (contain hyaline cartilage)



(b) Symphyses (contain fibrocartilage)

# 3) Synovial Joints

- **Freely movable joints**. because of the synovial cavity and fluid
- The 2 bones are joined by a **fibrous capsule**, which is attached to the margins of articular surfaces & enclosing the joint.
- The articular surfaces are covered by a thin layer of hyaline cartilage (**articular cartilage**). This can also decrease friction along with the synovial fluid
- A **joint cavity** enclosed within the capsule.  
The internal surface of it is the **synovial membrane**.
- The capsule is reinforced by ligaments both internally and externally.

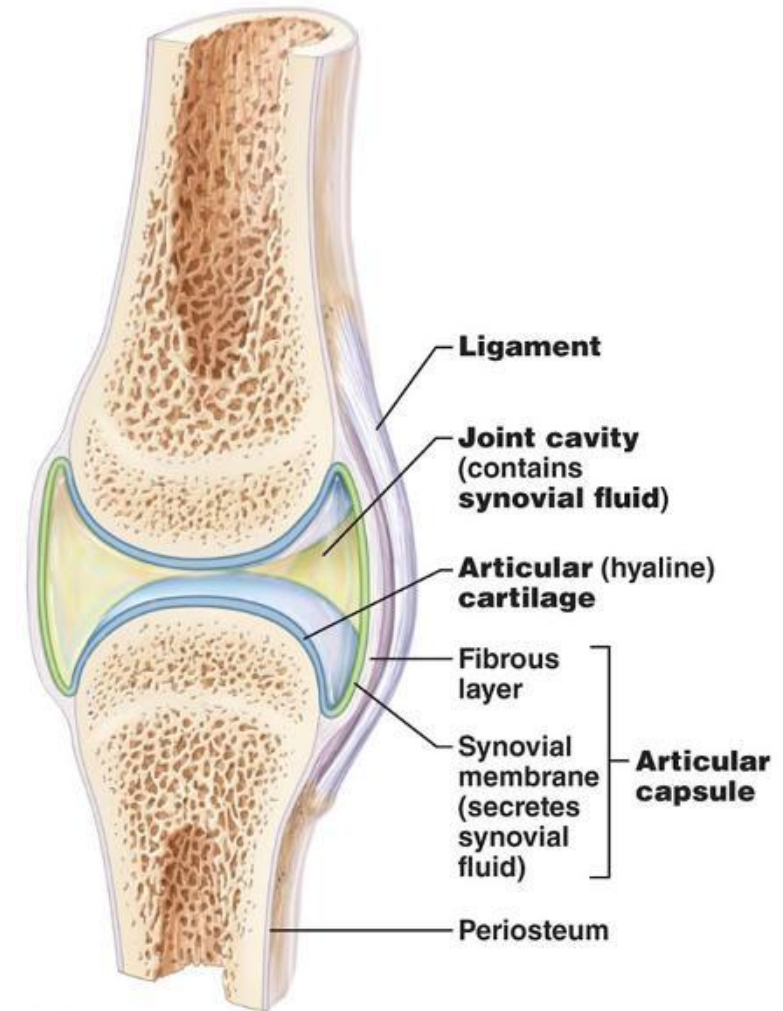
## Synovial membrane:

a thin vascular membrane lining the inner surface of the capsule. It produces the synovial fluid.

## Synovial fluid:

a lubricating fluid produced by the synovial membrane in the joint cavity.

The fluid **minimizes** the friction between the articular surfaces.



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\* if the articular surfaces were covered with hyaline cartilage they're called typical synovial joint. If they were covered with fibrocartilage they're called A-typical synovial joint.



# Classification of Synovial joints:

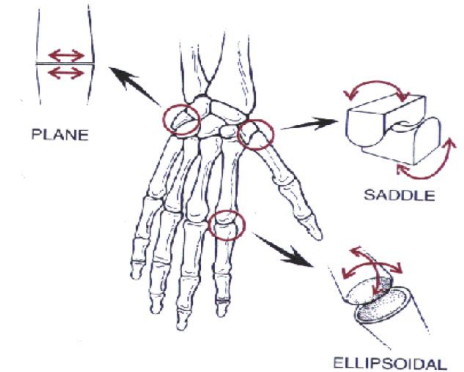
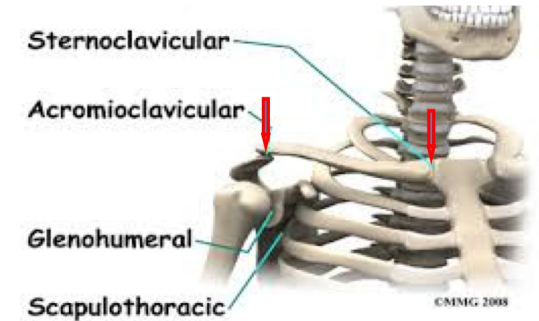
Synovial joints can be classified according to:

- The **arrangement** of the **articular surfaces**.
- The **range of movement** that are possible.

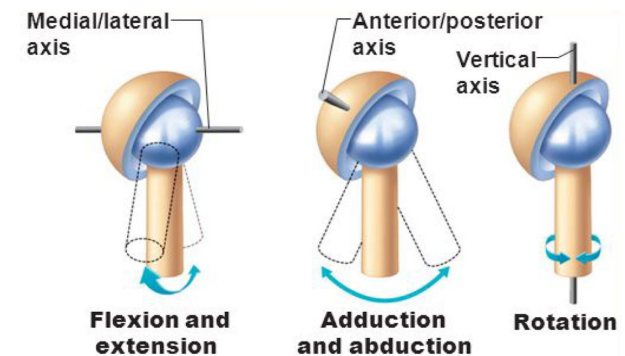
We classify them into:

	<b>Plane synovial joints</b>	<b>Axial synovial joints</b>
<b>Arrangement</b>	The articulating surfaces are <b>flat</b> and the bones slide on one another.	The articulating surfaces occur along <b>axis</b> .
<b>Movement</b>	<b>Gliding</b> Movement (minimal)	<b>Transverse (x-axis):</b> flexion and extension <b>Longitudinal (y-axis):</b> rotation <b>Antero-posterior (z-axis):</b> abduction and adduction
<b>Examples</b>	<ul style="list-style-type: none"> <li>→ Intercarpal &amp; intertarsal joints</li> <li>→ Sternoclavicular joint</li> <li>→ Acromioclavicular joint</li> <li>→ Between the 2nd and 7th sternocostals <small>VERY IMPORTANT</small></li> </ul>	<ul style="list-style-type: none"> <li>→ Elbow joint</li> <li>→ Shoulder joint</li> </ul>

## Plane Synovial Joints:

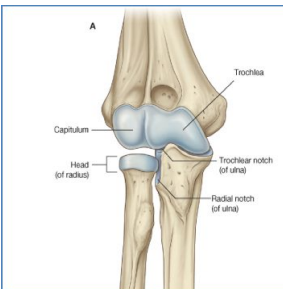
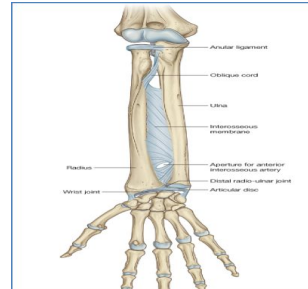
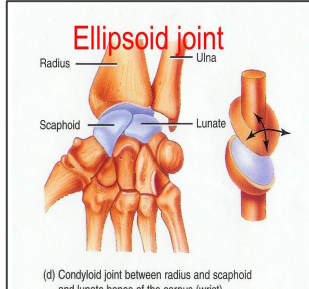
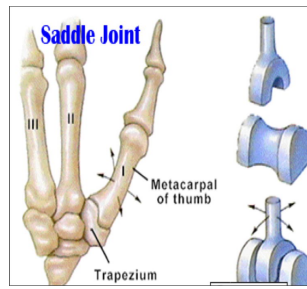
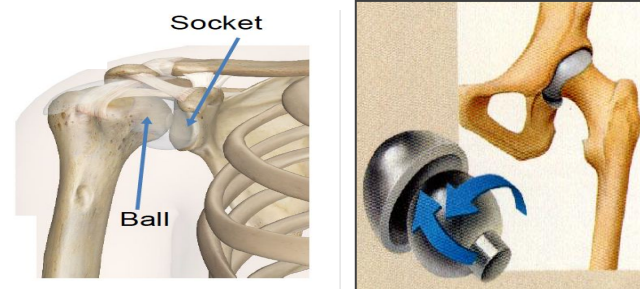


## Axial Synovial Joints:



# Axial synovial joints:

We can divide the axial synovial joints into:

	Uniaxial		Biaxial		Polyaxial
types	Hinge joints	Pivot joints	Ellipsoid joints	Saddle joints	Ball-and-socket joints
Axes & structure	Transverse	Longitudinal	Transverse & antero-posterior an elliptical convex that fits in an elliptical concave articular surfaces	Longitudinal: the surfaces are reciprocally concavoconvex (like a saddle on a horse back)	A ball shaped head that fits into a socket like concavity which allows free movements.
Movements	Flexion & Extension	Rotation (pronation and supination)	Flexion, Extension, Abduction & Adduction (rotation is impossible)	Flexion, Extension, Abduction & Adduction + small rotation	→ Flexion & extension → Abduction & adduction → rotation along a separate axis
Examples	Elbow & ankle joints	Radio-ulnar & atlantoaxial joints	Wrist joint	Carpometacarpal joint of the thumb	Shoulder and hip joints
Pictures					



# Stability of Synovial Joints:

## 1) The shape of articular surfaces:

### For Example:

- The ball and socket shape of the Hip joint is a good example of the importance of bone shape to maintain joint stability.
- The shape of the bones forming the knee joint has nothing to do for stability.

## 2) Strength of ligaments:

### For Example:

- The **cruciate** ligaments of the **knee** joint
- They prevent excessive movement in a joint.

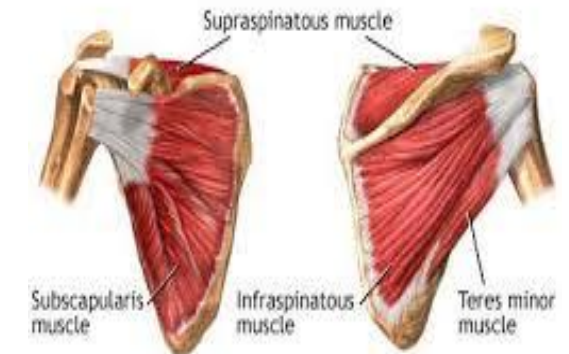
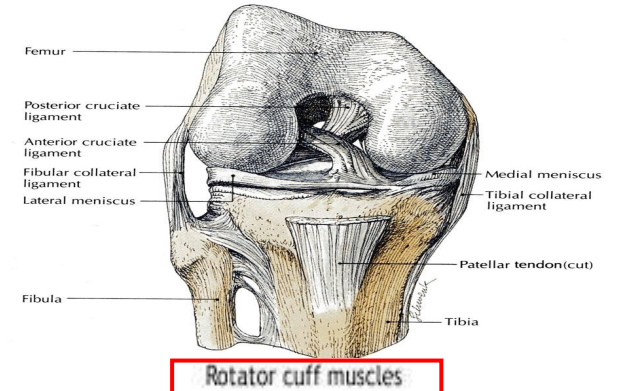
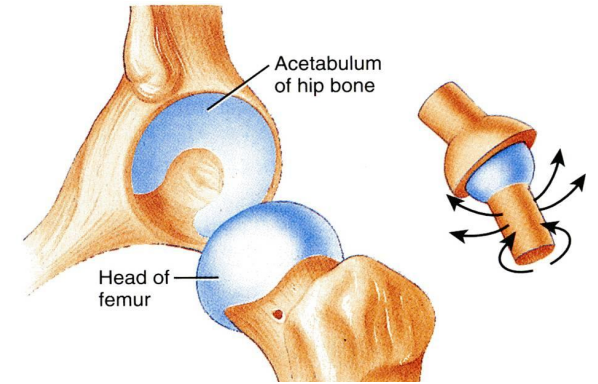
## 3) Tone of muscles around the joint:

### For Example:

- In most joints, it is the major factor controlling stability.
- The short muscles (**rotator cuff muscles**) around the **shoulder** joint keeps the head of the humerus in the shallow glenoid cavity.

Note: the muscle does not have to be contracted the tone is enough to stabilize the joint

## 4) Atmospheric pressure:



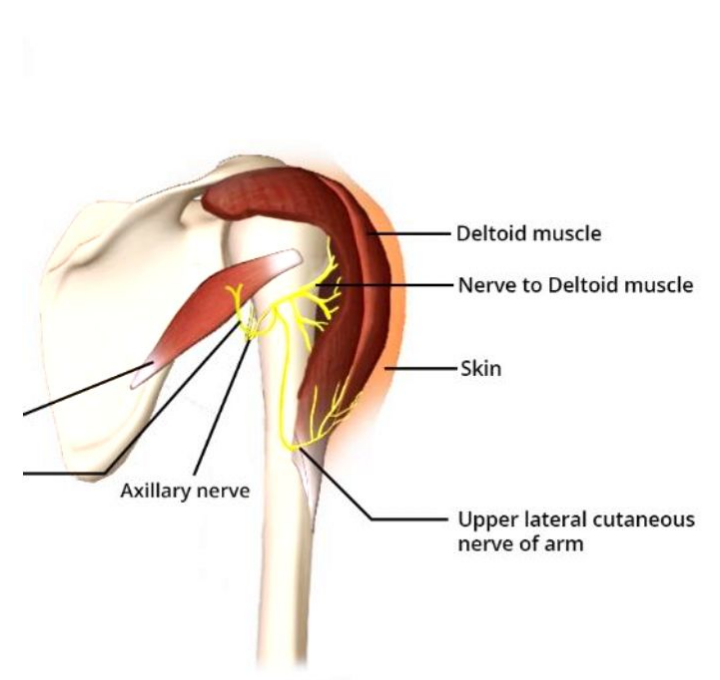
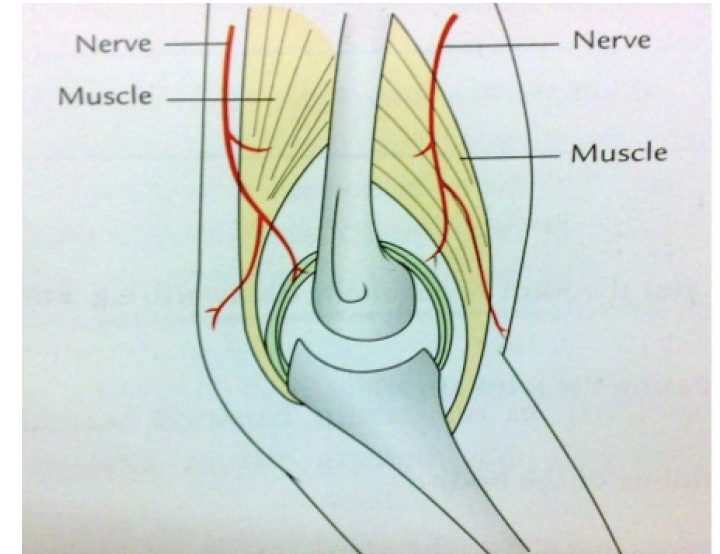
# Nerve supply of joints

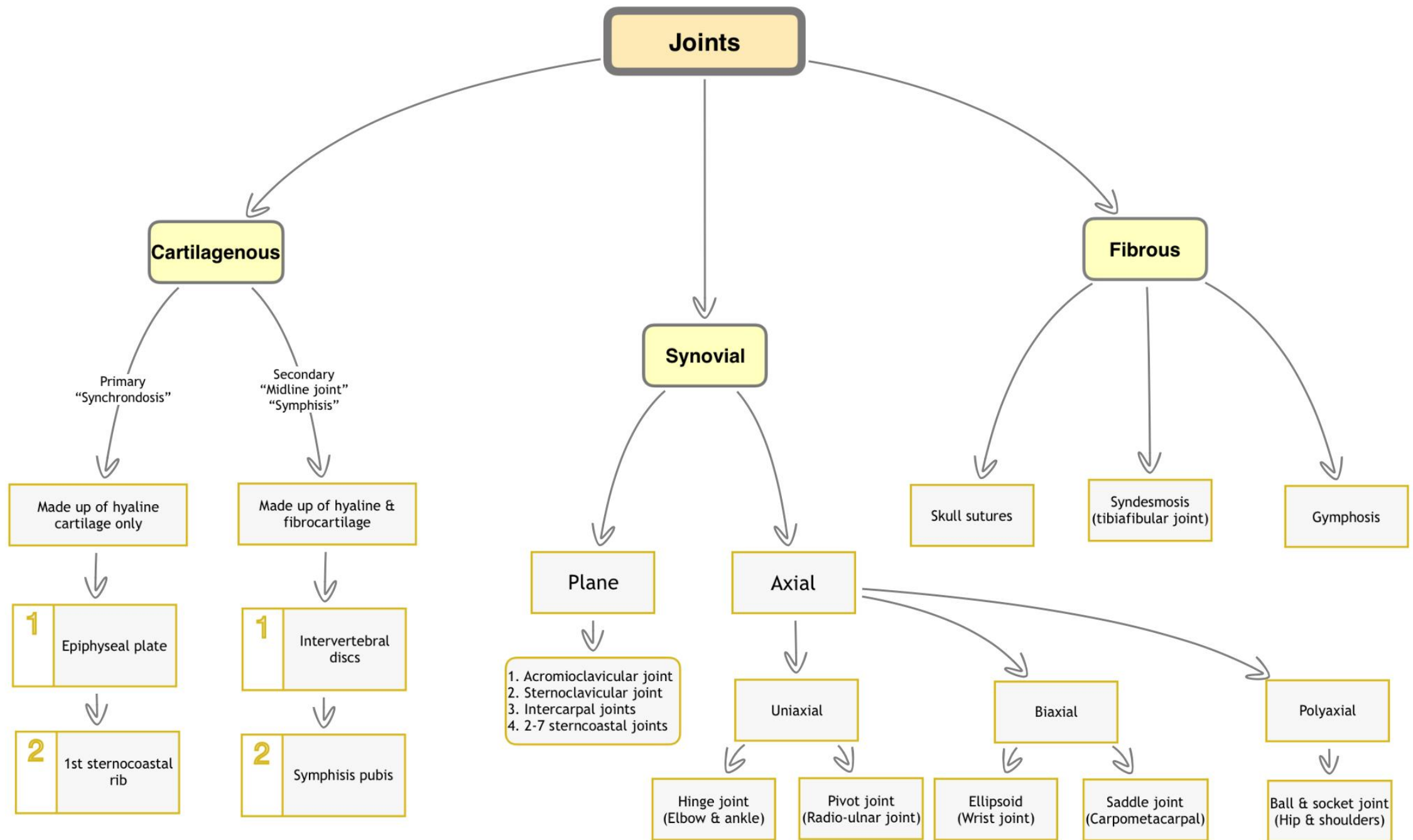
- The **capsule and ligaments** receive an abundant sensory nerve supply.

The sensory nerve receives from both the capsule + ligament but it doesn't enter the cavity of the synovial joint.

## Hilton's Law:

- “A nerve supplying a joint also supplies the muscles moving that joint and the skin overlying the insertions of these muscles.”





# MCQs

**Question 1:** What is the classification of gomphosis?

- A. Fibrous
- B. Cartilaginous
- C. Axial Synovial
- D. Plane Synovial

**Question 2:** Which of the following allows free range of movement?

- A. Fibrous joints
- B. Cartilaginous joints
- C. Synovial joints
- D. Syndesmosis

**Question 3:** Which of the following is a primary cartilaginous joint?

- A. Epiphyseal plate
- B. Symphysis Pubis
- C. Joints between the vertebrae
- D. Hip joint

**Question 4:** Wrist joints are considered which of the following:

- A. Hinge joint
- B. Pivot joint
- C. Ellipsoid joint
- D. Saddle joint

**Question 5:** Which of the following is A-typical synovial joint?

- A. Elbow
- B. Ankle
- C. Acromioclavicular
- D. Inferior radioulnar

**Question 6:** Hilton's law states that the nerve supplying the joint also supplies:

- A. The muscle moving the joint
- B. the skin overlying them
- C. the bones it connects
- D. Both A & B

**Question 7:** The most important factor in joint stability is:

- A. The shape of the articular surfaces
- B. Ligaments
- C. Tone of muscles surrounding
- D. Atmospheric pressure

**Question 8:** Saddle joints allow which of the following movements

- A. Extension
- B. Adduction
- C. Small rotation
- D. All of the above

# Team members

## Boys team:

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

## Team leaders

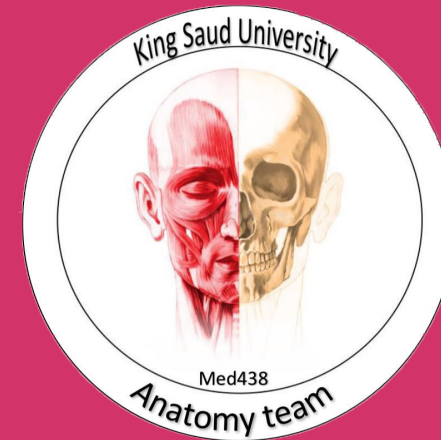
- Abdulrahman Shadid
  - Ateen Almutairi

★ =This lecture done by

## Girls team :

- Ajeed Al Rashoud
- 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:

