“In order to succeed, we must first believe that we can”.
- Nikos Kazantzakis.

Musculoskeletal Block
ANATOMY
team 435

COLOR CODES
- IMPORTANT NOTES
- EXTRA NOTES
- DEFINITION

objectives:

- 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.

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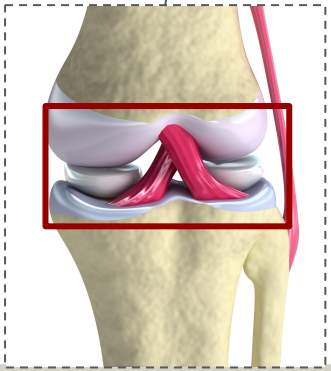
Joints:

What is a joint?

It is the site where two or more bones meet together.

What we mean by "**two or more**" in the definition is that at some articulations, two or more bones might be joined together like the knee joint, where the femur, tibia and patella articulate together by a synovial joint.

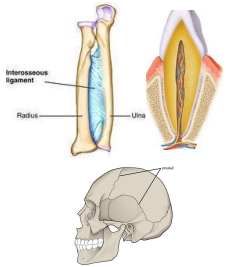


Classification of joints:

According to the tissues that lie between the bones, Joints are classified into:

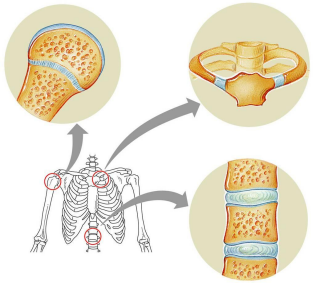
Fibrous

- The articulating surfaces are joined by fibrous tissue



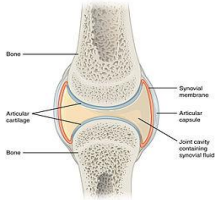
Cartilaginous

- The Two bone are joined by cartilage



Synovial

- The bones are joined by a fibrous capsule.
- The articular surfaces are covered by a thin layer of hyaline cartilage



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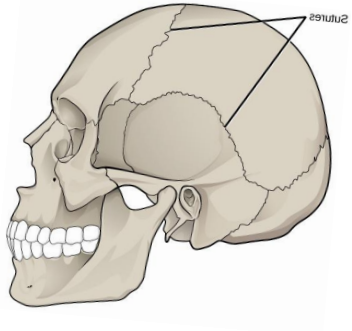
1-Fibrous Joints:

- **The articulating surfaces are joined by :** fibrous tissue
- **Movement:** No or very mild movement
- **Examples:**

-Skull Sutures-

Temporary (ossify later)

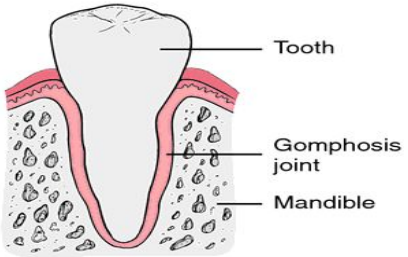


-inferior tibiofibular joints (syndesmosis)-

- Minimal movement
- Permanent joints.

-Gomphosis-

dental alveolar joints. Between the teeth and there socket.



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2-Cartilaginous Joints:

- The two bones are joined by : Cartilage.

- TYPES:

The main difference between the primary and the secondary cartilaginous joints is that the primary is joined by a plate of hyaline cartilage, meanwhile the secondary is joined by a small amount of fibrous tissue forming a plate of fibrocartilage.

-Primary Cartilaginous(Synchondrosis)-

Primary is **temporary** (ossified later.)

- The bones are united by: a plate or a bar of hyaline cartilage.

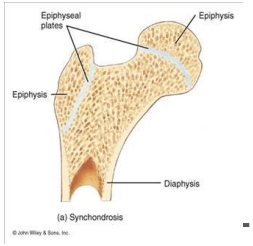
-Movement: no movement

-Temporary (ossify later)

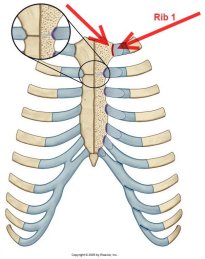
Ossified: turns into bone over time.

-Examples:

1- between the epiphysis and the diaphysis of a growing bones



2- Between the first rib and the sternum (1st sternocostal joint)



*the rest of the sternocostal joints are **synovial plane joints**

-Secondary Cartilaginous-

Secondary is **permanent** (not ossified later.)

- The bones are united by: a plate of fibrocartilage.

-Movement: Little movement.

-Permanent Joints.

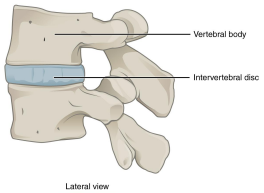
- their articulating surfaces are covered by a thin plate of hyaline cartilage.

-Examples:

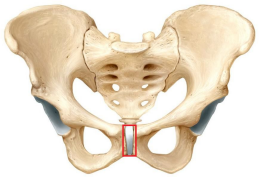
The are called Midline joints :

Midline: axial skeleton

1-Joints between the vertebral bodies (intervertebral discs)



2- Symphysis pubis.



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3-Synovial Joints:

The **most common** joint in terms of distribution throughout the body.

- Characteristics features:

Synovial joints are plane synovial that are **COVERED** with hyaline cartilage (the primary of the previous slide)

1- movement: freely moveable.

2- The two bones are joined by: Fibrous capsule (which is: attached to the margins of articular surfaces and enclosing the joint)

3-A joint cavity enclosed within the capsule.

4-The articular surfaces are covered by:

a thin layer of hyaline cartilage (articular cartilage).

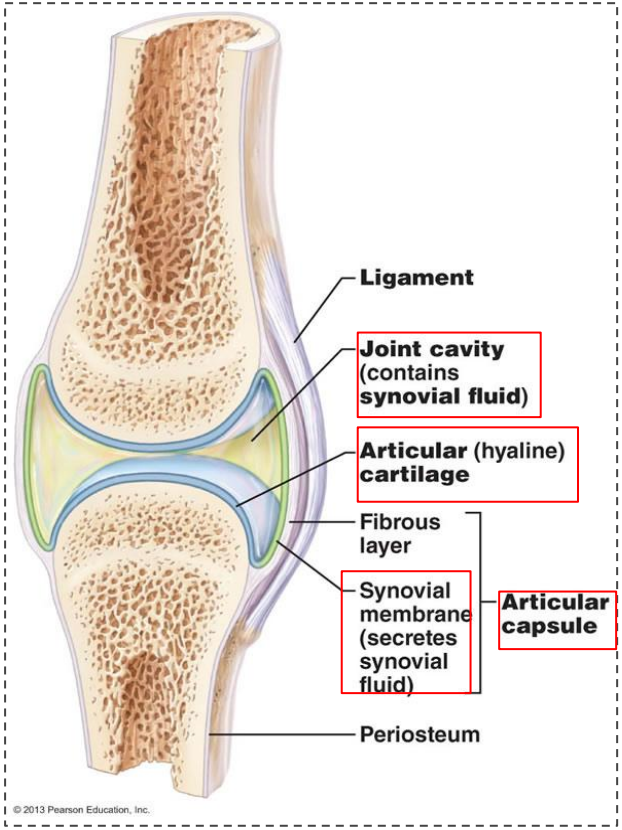
Two articular surfaces lined by articulate cartilage of hyaline, which are enclosed from outside by a fibrous capsule. The capsule has a cavity alined by synovial membrane that secretes synovial fluid inside the cavity.

5- synovial membrane: a thin vascular membrane lining the inner surface of the capsule.

6-Synovial fluid: a *lubricating fluid produced by synovial membrane in the joint cavity, it minimizes the friction between the articular surfaces

*oily,greasy

Reminder: Synovial fluids are good examples for GAG (Glycosaminoglycan) sugars. - **Foundation biochemistry**



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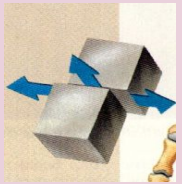
CLASSIFICATION OF SYNOVIAL JOINTS

according to the range of movement synovial joints are classified into:

Synovial Joints can be classified according to:
The **arrangement** of the **articular surfaces.**
The **range of movement** that are possible

Plane synovial joints

- Flat articulating surfaces.
- The bones slide on one another, producing a gliding movement.
- Examples:
  - Intercarpal Joints.
  - Sternoclavicular joint.
  - Acromioclavicular joint.



Axial synovial joints

- movement occur along an axes:

1. Transverse axis = flexion & extension.
2. Longitudinal axis = rotation.
3. Antero-posterior axis = abduction & adduction

Transverse: Laptop opening and closing. (elbow)
Longitudinal: Pronation and supination. (radius and ulna)
Anteroposterior: in and out. (shoulder)

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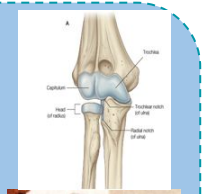
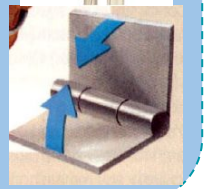
CLASSIFICATION OF SYNOVIAL JOINTS

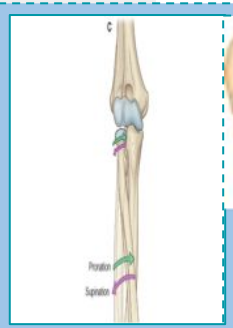
synovial joints

- Plane synovial joints
- Axial synovial joints
  - **Uniaxial**: one axis — Uniaxial
    - **Hinge**: مفصلي
      - **hinge joints:**
      - Axis: transverse.
      - Movements: flexion & extension.
      - Example: elbow joint, ankle joint





    - **Pivot**: محوري
      - **pivot joints:**
      - Axis: longitudinal.
      - Movements: rotation.
      - Example: radio-ulnar joint, atlantoaxial joint



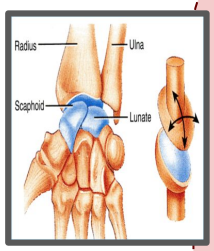
  - Biaxial
  - Polyaxial

CLASSIFICATION OF SYNOVIAL JOINTS

synovial joints
- Plane synovial joints
- Axial synovial joints
  - Uniaxial
  - Biaxial
  - Polyaxial

Biaxial: two axises

Both are convex + concave but they differ in shape.



Ellipsoid joints:

elliptical convex fits into elliptical concave articular surfaces.

Ellipsoid: بيضاوي

Axes:

Transverse & antero-posterior.

Movements:

Flexion & extension + abduction & adduction (rotation is impossible).

Example: Wrist joint.

Saddle joints:

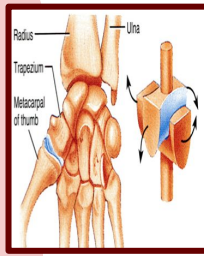
Saddle: سرج الحصان

- **The articular surfaces are reciprocally concave-convex.**
- They resemble a saddle on a horse's back.

Movement:

as ellipsoid joints (Flexion & extension + abduction & adduction) + a small range of rotation.

Example: Carpometacarpal joint of the thumb.



The only difference between the two in terms of movement is in **rotation**.

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CLASSIFICATION OF SYNOVIAL JOINTS

- synovial joints
  - Plane synovial joints
  - Axial synovial joints
    - Uniaxial
    - Biaxial
    - Polyaxial

Polyaxial joints has all ranges of movement.

Ball-and-socket joints

- A ball-shaped head of a bone fits into a socket-like concavity of another.

Movements:
Flexion & extension + abduction & adduction)
+ medial and lateral rotation.

Examples:
1.Shoulder joint.
2.Hip Joint.

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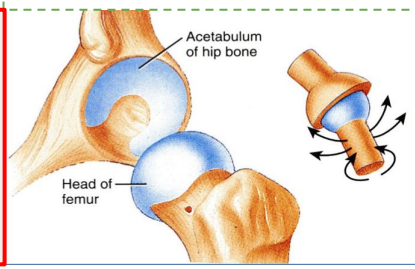
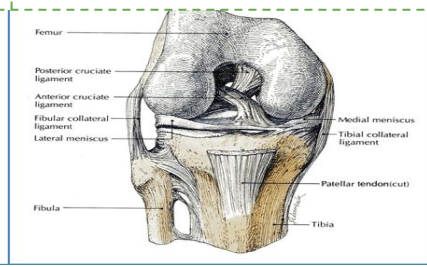
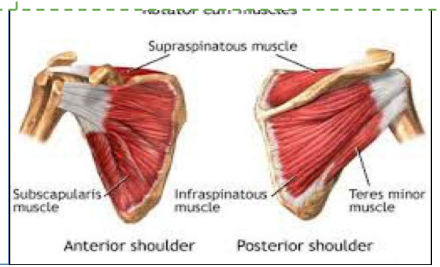
Stability of Synovial Joints

Based On:	1- The Shape of Articular Surface	2- Strength of the ligaments	3- Tone of the surrounding muscles (In most joints, it is the major factor in controlling stability)
Mechanism:	———	They prevent excessive movement in the joint	It keeps the head of the humerus in the shallow glenoid cavity
Example:	The ball and socket shape of the hip bone	cruciate ligaments of the knee joint	The short muscles around the shoulder joint (rotator cuff)

Note that the **shape** of the bones forming the knee joint **has nothing** to do with its stability it all goes back to the **strength of its ligaments**







The hip and shoulder joints differ in stability because
1- The hip is well concave and that itself gives support.
2- The shoulder is shallowly concave and needs more support into it.

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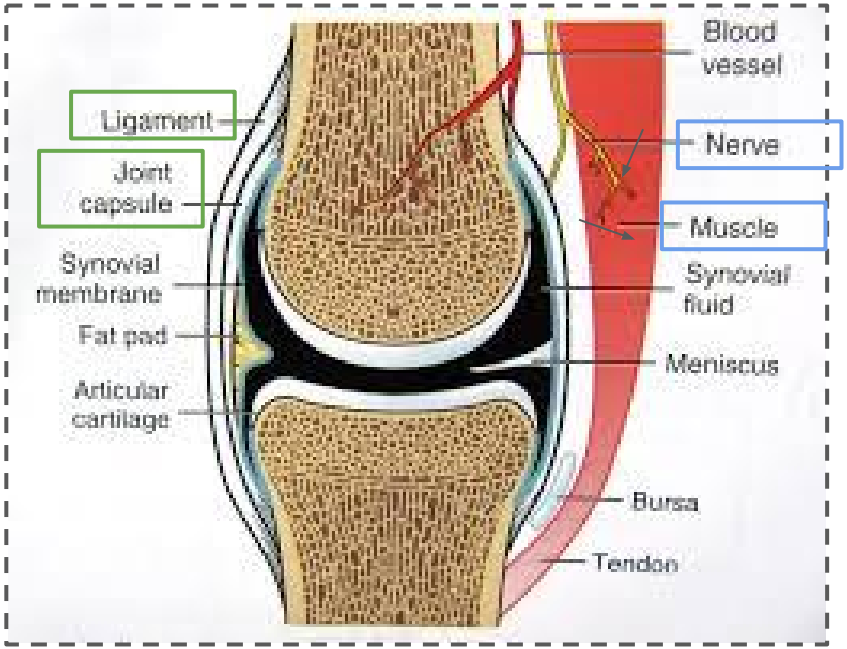
Nerve Supply of The Joints

The Capsule and Ligaments receive an abundant **Sensory** Nerve Supply.

Hilton's Law:

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

**Extra Picture



As the arrows pointed in the picture show, the **same** nerve is supplying both **the muscle and the joint**. It is **also** supplying **the skin**, but it is not showing in this picture.

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Summary

What is Joint?

it is the site where two or more bones come together, whether movement occurs or not between them.

Joints are classified according to the **tissues that lie between the bones** into:

- **fibrous**
- **cartilaginous**
- **synovial**

It's only for revision.

Synovial joints are classified according to the **range of movement** into:

- **Plane synovial joints**
- **Axial synovial joints** divided into:
  - **uniaxial**
  - **biaxial**
  - **polyaxial**

class	United by	Movement	Characteristic	Example
fibrous	fibrous connective	No or very mild	-	-Skull sutures -syndesmosis -gomphosis
cartilaginous	1ry: hyaline cartilage 2ry: fibrocartilage	1ry: no 2ry: Little	-	1ry: 1st sternocostal joint 2ry: Symphysis Pubis
synovial	fibrous capsule	free	-articular cartilage. -synovial membrane. -joint cavity containing synovial fluid.	-

Stability of synovial joints depends on:

1-shape of articular surfaces
2- ligaments
3-muscle tone.

Hilton's Law:

Joints have *same* nerve supply as muscles moving them.

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Video: Joints Crash Course
https://goo.gl/q1pswr

Video: The 6 Types of Joints
https://goo.gl/fha0gU

Game: Joints Explorer
http://goo.gl/Y2Fxi2

Game: The Haunted House!
http://goo.gl/250SG9

Quiz: https://www.onlineexambuilder.com/anatomy2-joints-1/exam-47499
https://www.onlineexambuilder.com/anatomy2-joints-2/exam-47505

هذا العمل إجتهاد من طلاب و طالبات
إن أصبنا فمن الله و إن أخطأنا فمن أنفسنا و من الشيطان

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