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JOINTS AND LIGAMENTS

When looking at joints and ligaments in anatomy, they are relatively easy to name if you understand the bones. The names are usually from the projections of bone which contact each other. We have addressed the suture joints in the skull with relative depth and mentioned the ball and socket, hinge, pivot, and saddle joints as well as their modifications. Most bones are held in place by ligaments or capsules.

There are two major classifications of joints with each type having subdivisions. Fibrous joints are relatively fixed and synovial joints allow some movement. There are three types of fibrous joints: suture joints as seen in the skull, Synarthrosis joints have cartilage holding them in place such as the pubic symphysis and gomphosis found holding teeth into the alveolar processes.

The other major classification of joints is synovial joints. All synovial joints will have articular cartilage and a capsule made up of dense connective tissue (sometime regular sometime irregular) surrounding the joint. The joint capsule holds synovial fluid in place which will help maintain the health of the articular cartilage. Each type of synovial joint allows a variety of movements.

Listing the joint type in based on less to more movement, we have the plane joints, found within the joints of the wrist, allows a sliding limited movement. Hinge joints, such as the humeroulnar joint (humero-humerus) allows for an increasing and decreasing angle. Pivot joints, found in places such as the proximal radioulnar joint, distal radioulnar joint, and atlantoaxial joint allow a bone to move around another. The condylar joint allows for some movement in different axis such as found in the radiocarpal joint and the atlanto-occipital joint. The Saddle joint, found in the trapeziometacarpal joint allows for more movement than a typical condylar joint. Then we move to the ball and socket joint found in the glenohumeral and the acetabulofemoral joints the these tend to allow the most movement but for the mobility, we sacrifice stability.

1. Fill out the table below:

Joint type	**Example of joint type**	**Movement in joints**
Suture joint		
Synarthrosis		
Gomphosis		
Plane joint		
Hinge joint		
Pivot joint		

Many joints are held in place by ligaments, bands of connective tissue that hold bones to other bones around joint. Many of them have names that suggest specific locations, while others describe the ligaments. At the head, one of the most important ligaments to consider stabilizes the hinge joint of the temporo-mandibular joint made up of the mandibular condyle and the temporal fossa. This joint is a modified hinge joint which is covered by a ligament named the capsular ligament.

2. Based on the name, what does the capsular ligament do?

The temporomandibular joint is also supported by three other ligaments. By looking at their name,

determine their locations.

3. Stylomandibular ligament
4. Lateral ligament
5. Sphenomandibular ligament

As you move to the spine there are many ligaments that to know. The first is the Alar ligaments which connect the lateral sides of the dens to the condyles of the occipital bone. This ligament helps maintain the safe range of motion in the head but can be torn when the head is flexed and rotated. It is interesting to note that Ala is wing in Latin.

6. Suggest a reason for the name of the Alar ligament

Continuing down the spine, we can find ligaments that run the entire length of the spine. The joints of the spine are cushioned by the intervertebral discs. In development, these disks are derived from the notochord which will become the nucleus pulposus of the intervertebral disc. The center nucleus pulposus is covered by fibrocartilage which will allow the joint to be weight barring. The structure of the spinal column works well but sometimes with movement, the disc can herniate or slip out. When this occurs, it can cause pain as it will rest on nerves coming from the spine.

7. Based on the stability which two regions of the back would you expect to have a higher chance of herniating?

8. Which discs would you expect to herniate based on normal body motions?

There are sets of ligaments which hold the vertebral column together. These carry names which explain what where the ligaments are if you have a basic understanding of the parts of each vertebra. Based on your knowledge of the bones, and bony projections determine the position of the following:

9. Anterior longitudinal ligament

10. Interspinous ligament

11. Supraspinous ligament

12. Posterior longitudinal ligament

13. Intertransverse ligament

14. Facet capsular ligament

Connecting the laminae of adjacent vertebrae, we have a ligament with a name which is not based on the location called the Ligamentum flavum. Flavum usually refers to yellow.

15. Search for three words which have the root flavum within it and define them:
    1:

    2:

    3:

16. What does each word you found have in common?

On the top of the thorax, there is a joint between the clavicle and the sternum called the sternoclavicular joint. Feel the sternoclavicular joint on yourself and notice how it moves when you rotate your arm. The ligaments that hold this joint in place are named for where they come from. Using your knowledge of Anatomy, determine the location of the following ligaments.

17. Sternoclavicular ligament

18. Interclavicular ligament

19. Costoclavicular ligament

The clavicle articulates at the lateral end with the acromion of the scapula. This joint is relatively lose requiring many ligaments to hold it the bones in place. Again, consider the names and determine the location of the ligaments.

20. Coracoclavicular ligament

21. Coracoacromial ligament

22. Acromioclavicular ligament

Between the humerus and scapula is the glenohumeral joint. This ball and socket joint has a lot of mobility but very little stability. Even the ligaments involved are not sufficient to keep this joint in place so it will use the muscles of the rotator cuff. Within the joint is a fibrocartilage lip called the labium. Looking at the name of the ligaments it can be determined where they are.

23. Glenohumeral ligament

24. Coracohumeral ligament

25. What does labium mean and what is it composed of?

Distal to the glenohumeral joint is the elbow joint, a compound joint. This means it has two different joints. The entire elbow is covered by a synovial capsular ligament. As this joint is composed of a few different joints each is held in place by one of three ligaments. The first joint is the basic hinge joint of the humeroulnar joint which is obviously made up by the humerus and Ulna. The main ligament that holds that joint together is the Ulnar collateral ligament. The humeroradial joint is a ball and socket joint which is held in place by the radial collateral ligament. The last joint in the area is the superior radioulnar joint held together by the annular ligament.

While the tendons of the muscles that work on this area have some clinical significances, there is one of these ligaments that can present in pediatric clinic called a Nurse-maid's dislocation. That dislocation happens when a young child is running and is yanked by the forearm.

26. Which bone would you expect to be dislocated in a "Nursemaid's" sublocation and why?

At the wrist, there are many ligaments that hold this structure together. Many of these have names based on the bones. Determine the location of each ligament based on its name.

27. Palmar radiocarpal ligament

28. Dorsal radiocarpal ligament

29. Ulnar collateral ligament

30. Radial collateral ligament

31. Transverse carpal ligament

The lower limb has ligaments that hold the sacrum and ilium together. One of the most important ligaments because it acts as a landmark is the inguinal ligament which runs from the pubic bone to the anterior superior iliac spine. This ligament is an important landmark which is used for everything, from surgery to recognizing certain muscles of the leg.

There is also an acetabulofemural joint, made of the head of the femur which fits in perfect into the acetabulum of the coxa or hip bone. Within it is a labium, or lip made of fibrocartilage. If you remember the bones in the area, you can determine the ligaments that hold the joint in place.

32. Iliofemoral ligament

33. Pubofemoral ligament
34. Ischiofemoral ligament

35. Transverse acetabular ligament

36. Ligamentum teres of the femoral head

At the human knee, it is important to notice that it is held together mostly by ligaments. This means that even though it is a hinge joint, it is susceptible to many injuries which can interfere with function. It is also a weight barring joint meaning that relies on fibrocartilage to keep from wearing out. There are some ligaments that can be determined by the name while others can be described by their names. If one were to look at the two collateral ligaments of the knee, are the Tibial (or Medial) collateral ligament and the fibular (lateral) collateral ligament. Based on the name we can tell that the Tibial collateral ligament would be between the femur and tibia while the Fibular collateral ligament would run from the femur to the fibula.

There are other ligaments that are named for the region where they are found. If we look at the patellar ligament, we see that it is between the patella and the tibia. There is also one more specific which is called the Popliteal Ligaments. One is called the oblique popliteal ligament the other is the arcuate popliteal ligament. As Popliteal is the area behind the knee, we can see that these two ligaments are in the back of the knee where one runs obliquely and the other forms an arch.

There are two important ligaments which have the name Cruciate ligaments. These ligaments cross each other and keep the tibia from sliding forward or backwards. The Anterior cruciate ligament can be found on the anteromedial aspect of the tibial plateau and run to the posterior side of the of the posteromedial aspect of the lateral condyle of the femur. Posterior to the ACL is the Posterior Cruciate ligament which begins at the Posterolateral aspect of the tibial plateau to the anterolateral aspect of the of the Medial epicondyle.

Determine the location of the following:

37. Tibial (Medial) collateral ligament

38. Fibular (Lateral)collateral ligament

39. Patellar ligament

40. Patellar retinaculum

41. Popliteal ligaments

42. Anterior cruciate ligament (ACL)

43. Posterior cruciate ligament (PCL)

44. In diabetics, the sensation of pain sometimes is lacking so sometimes they can walk beyond normal levels causing damage to the cartilage and bones. This is called Charcot's Joints. Why might this be problematic?

45. In football, clipping is illegal due to injuries that cause destabilization of the knee. Usually causing what is called the "Unhappy Knee Triad" which tears the medial meniscus, medial collateral ligament, and anterior cruciate ligaments. Why are these ligaments damaged in clipping?

The foot has many ligaments which can be damaged especially when rolling the ankle. Besides the Deltoid ligament of the ankle, most have locations that can be easily deduced from the names. The Deltoid ligaments connect the tibia to the navicular, calcaneus, and the talus on the medial side.

Looking at the names of the ligaments, where might the following ligaments be found?

46. Calcaneofibular

47. Anterior talofibular:

48. Posterior talofibular

The most important thing to remember about the ligaments is that clinically they can present with trauma leading to a sprain. Due to the location and cause of the sprain two ligaments tend to present with damage more frequently. Determine what movement might cause a sprain in the following.

49. Anterior talofibular ligament

50. Calcaneofibular ligament