

Classification of Bone Joints

*Kattaxodjayeva Dinara Utkurxodjayevna*¹, *Samatov Akmal Xushbakovich*²,
*G'ulomov Fazliddin Olimovich*³, *Elmurotova Dilnoza Baxtiyorovna*⁴

Abstract: This paper examines two types of bone connections: continuous connections and discontinuous (synovial) connections. It demonstrates that the articular disc and meniscus are cartilaginous plates of varying shapes located between the articular surfaces of the articulating bones, which do not quite match each other. The discs and menisci shift during joint movement, smoothing out the unevenness of the articulating surfaces, and also act as shock absorbers.

Key words: labrum, concave joint, hip, shoulder, bones, membrane, capsule, mobility.

One of the primary methods for studying organ structure, as in the descriptive stage of anatomy's development, is cadaver dissection. Anthropometry is used to measure external anatomical structures and their relationships, to identify individual structural features.

Corrosion is the melting of tissue around hollow organs previously filled with a hardening mass of acid or alkali.

Fluoroscopy is the examination of structures using X-rays; radiography is the recording of structures on X-ray film to study the shape of organs and their functional characteristics in a living person.

Endoscopy is an examination of the surface of the mucous membranes, color and relief of many internal organs in a living person after the introduction of special optical instruments.

Ultrasound scanning is used mainly in living people to detect changes in the shape and structure of internal organs.

Electromagnetic scanning (magnetic resonance) is a detailed study of the structures of organs of a living person, based on different intensities of magnetic fields.

Mathematical method – for calculating various quantitative indicators in the relationships of anatomical structures and for obtaining average data.

These methods are often used in combination in anatomical studies. For example, injection of a contrast medium into vessels, followed by radiography, dissection, morphometry, mathematical processing, etc. One of the fundamental concepts of anatomy is morphological structure or form, which represents the organization of a morphological substrate in space and has a specific function. Just as there can be no function without structure, there can be no morphological structure without function.

From a morphological standpoint, the following levels of organization of the human body structure can be distinguished:

- 1) organismic (the human body as a single whole);
- 2) system-organ (organ systems);
- 3) organ (organs);

¹ Senior Lecturer, Tashkent State Medical University

² Asistent, Tashkent State Medical University

³ Student, Tashkent State Medical University

⁴ PhD, Associate Professor, Tashkent State Medical University



- 4) fabric (tissue);
- 5) cellular (cells);
- 6) subcellular (cellular organelles and corpuscular-fibrillar -membrane structures).

It should be noted that the presented hierarchical diagram of the structural organization of the human body demonstrates a clear hierarchy. The organismal, system-organ, and organ levels of human body structure are the anatomical objects of study. The tissue, cellular, and submicroscopic levels are the objects of histological, cytological, and ultrastructural studies. It is advisable to begin the study of the structural organization of the human body with the simplest morphological level—the cellular level, the fundamental element of which is the cell. The adult human body consists of a huge number of cells (approximately 10¹²-14). The central nervous system alone contains over 14 billion.

There are two types of bone connections:

1. Continuous joints – there is a layer of connective tissue or cartilage between the bones, they are slightly mobile or completely immobile.
2. Discontinuous (synovial) joints, or joints, are characterized by the presence of a cavity between the bones and a synovial membrane lining the inside of the joint capsule, and have sufficient mobility.

Symphyses, or semi-joints, have a small gap in the cartilaginous or connective tissue layer between the connecting bones, occupy a transitional position from continuous connections to discontinuous ones, are strengthened by ligaments, and are relatively mobile (pubic symphysis, connections of a number of vertebral bodies, the manubrium of the sternum with the body).

Continuous bone connections (synarthroses). Continuous bone connections have greater elasticity and strength; movement in such connections is limited.

Depending on the nature of the connective tissue between the bones, three types of continuous connections are distinguished:

- 1) syndesmosis – fibrous connection;
- 2) synchondrosis (synchondrosis) – cartilaginous connection;
- 3) synostosis – bone connection.

Fibrous junctions are strong connections between bones made of dense fibrous connective tissue. Several types of fibrous junctions are distinguished: syndesmosis proper, suture, and impingement. Syndesmosis is formed by connective tissue whose fibers fuse with the periosteum of the connecting bones and merge into it without a distinct boundary.

A typical syndesmosis is the distal tibiofibular joint. Syndesmoses also include ligaments and interosseous membranes. Ligaments, or ligamentum, are thick bundles, bands, or plates of fibrous connective tissue. They can be independent structures or, most commonly, are associated with joints. By crossing from one bone to another, ligaments strengthen joints, supporting and guiding their movement.

Ligaments, which complement virtually every joint, follow specific patterns in their location—whether outside the joint or within its cavity. In addition to dense fibrous tissue, in some areas, ligaments are composed of elastic tissue called synelastoses. An example of this is the ligaments of the spinal column, stretched between the vertebral arches and having a yellow color, hence the name "yellow ligaments."

Interosseous membrane, membrana interossea, stretched between the bodies (diaphyses) of long tubular bones (forearm and lower leg), closes the natural openings of the bone (obturator membrane of the pelvis), often it serves as the origin of muscles.

A suture, or sutura, is a type of fibrous joint in which a thin layer of connective tissue separates the bones joining the bones. Sutures connect bones only in the skull.



Depending on the configuration, a distinction is made between the serrated suture, in which the edges of the bones are connected by means of small or large teeth (between the bones of the cranial vault); the squamous suture, in which the bones are connected as if their edges overlap each other, like fish scales (between the parietal and temporal bones); and the flat suture, in which the bones are connected by even edges with the help of a narrow layer of connective tissue (between the bones of the facial skull).

A special type of suture is schindylolysis . Impaction, or gomphosis , is the connection of teeth with the bone tissue of the alveolar sockets. Between the tooth and the bone is a thin layer of connective tissue—the periodontium.

Cartilaginous joints between bones are characterized by strength, elasticity, and limited mobility. If the cartilage in the area where the bones connect persists throughout life, these synchondroses are permanent (such as those between several bones at the base of the skull and some costosternal joints). When the cartilaginous plate between the bones is replaced by bone tissue with age, the joint is called a synostosis (such as those between different parts of the bones at the base of the skull, the sacrum, and the pelvic bone).

Discontinuous joints of bones (diarthroses) Discontinuous or synovial joints of bones – joints (Latin – articulationes) – are part of the musculoskeletal system.

Each joint necessarily contains:

- 1) articular surfaces of bones covered with cartilage;
- 2) joint capsule;
- 3) joint cavity with a small amount of synovial fluid.

Some joints contain accessory structures, such as intra-articular discs and menisci, synovial bursae, and labrums. Ligaments are also accessory structures.

Articular surfaces, faceis The articular surfaces of most articulating bones correspond to each other—they are congruent. If one articular surface is convex (the glenoid), the other is concave (the glenoid cavity).

Articular cartilage ranges in thickness from 0.2 to 5 mm. It is smooth, cushioning the uneven surfaces of the bones and acting as a shock absorber within the joint. Joint capsule articularis , forms a cavity around the joint, attaching to the articulating bones near the articular surfaces or slightly receding from them.

The joint capsule has two layers: an outer layer—the fibrous membrane—and an inner layer—the synovial membrane. The fibrous membrane is quite thick and strong. In places, it forms ligaments—strands similar to bands. These ligaments provide additional strength to the joints.

If the ligament is located outside the joint capsule, it is called an extracapsular ligament; if the ligament is located within the joint capsule, it is called an intracapsular ligament.

The thickness and shape of the ligaments depend on the functional characteristics and structure of the joint. Ligaments Articular surfaces, faceis The articular surfaces of most articulating bones correspond to each other—they are congruent. If one articular surface is convex (the glenoid), the other is concave (the glenoid cavity).

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These ligaments provide additional strength to the joints. If a ligament is located outside the joint capsule, it is called an extracapsular ligament; if a ligament is located within the joint capsule, it is called an intracapsular ligament.

The thickness and shape of the ligaments depend on the functional characteristics and structure of the joint. Ligaments act as passive brakes, limiting joint movement and also protecting it from movements that could damage the joint. The synovial membrane is a thin layer of cells that lines the inside of the joint capsule and extends to the bone areas of the joint not covered by cartilage. The synovial membrane contains microscopic villi rich in small blood vessels. The inner surface of the joint capsule, lined by the synovial membrane, is always moistened with synovial fluid, secreted by the cells of the synovial membrane. Synovial fluid is viscous and acts as a lubricant in the joint. The joint cavity, or *cavita*, The articularis is a slit-like space between the articular surfaces of bones, bounded by the joint capsule. The shape of the joint cavity depends on the shape of the joint. A normal joint cavity always contains a small amount of synovial fluid (1-3 ml).

Articular disc and meniscus, *discus* , *meniscus articularis* - cartilaginous plates of various shapes located between the articular surfaces of the articulating bones, which do not quite correspond to each other.

A disc is usually a solid cartilaginous plate fused along its outer edge with the joint capsule. The disc typically divides the joint cavity into two chambers—two floors.

Menisci are semilunar-shaped, non-solid cartilaginous plates wedged between articular surfaces. The discs and menisci shift during joint movement, smoothing out irregularities in the articulating surfaces , and also act as shock absorbers. The *labrum articulare* , located along the edge of the concave articular surface, complements and deepens this surface (hip, shoulder joint).

The *labrum* is attached at its base to the edge of the articular surface. The inner, concave edge of the *labrum* faces the joint cavity. In the thinned portion of the fibrous membrane, a protrusion of the synovial membrane from the joint capsule occurs. This protrusion is called the *bursa synovialis* , the shape and size of which vary.

They are typically located between the bone surfaces and the tendons moving near the bone. In this case, the *bursa* acts as a cushion, eliminating friction between the tendon and the bone.

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