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CONNECTION OF THE BONES OF THE SKULL. ARTICULATIONS OF THE TRUNK

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for students of Medical and Dental Faculties

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Connection of the bones of the skull. Articulations of the trunk

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During the study of the human anatomy, the student has an opportunity to use different visual aids, namely anatomical preparations, layouts, pictures in atlases and textbooks.

We create this tutorial using tables and pictures. This technique will facilitate the study of new material and better memorization.

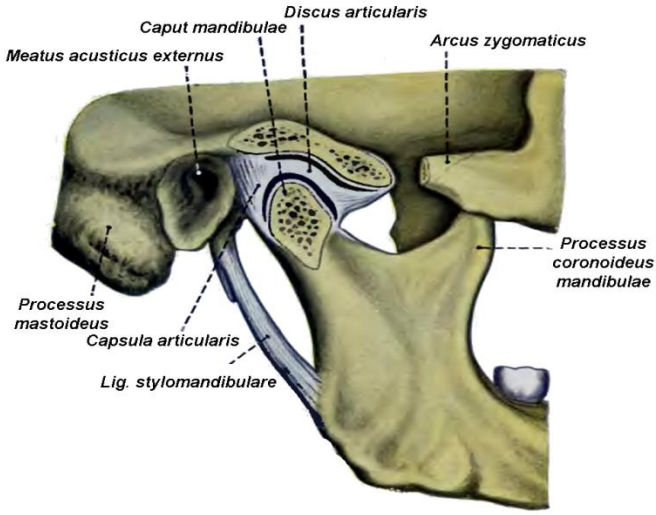
The purpose of the development is a detailed description of the functional anatomy of the joints of the skull and trunk. Deepening knowledge in the study of their components. The tutorial provide different types of joints between the bones of the skull and trunk.

According to the structure, methodical recommendations for students' independent work are compiled in accordance with the topics of the work program from the section "Arthrology" and include a more detailed analysis and relevant drawings for each topic.

1 Connection of the bones of the skull

1.1 Bones of the skull connected by syndesmosis. Syndesmosis include all those articulations in which the surfaces of the bones are in almost direct contact, fastened together by intervening connective tissue or hyaline cartilage, and in which there is no appreciable motion, as in the joints between the bones of the skull, excepting those of the mandible.

Name	Arti.surface	Articular disks, ligaments	Type of joint	Function
Articulation of the Mandible *(Articultio tomporomandibularis)*	-the mandibular fossa of the temporal bone and the articular tubercle above with the condyle of the mandible below	-contains the **articular disc *(discus articularis)*** inside -**fibrous capsula *(capsula articularis)*** which connect to the margin of the mandibular fossa , articular tubercle and petrotympanic fissurae ; on mandibular it is attached to the edge of the articular surface of the head and neck -**lateral ligament *(lg. laterale)*** from zygomatic process of the temporal bone to the neck of mandibular -**stylomandibular ligament *(lg. stylomandibulare)*** from styloid process to the posterior edge of mandibular -**sphenomandibular ligament (*lg.sphenomandibularis)*** from spine of sphenoid to the lingula of mandibula	-ellipsoid -complex -combined	-Frontal axis – elevation and depression in the lower level -protrusion of the mandibule occurs in upper level -lateral movement



Pic 1. Temporo-mandibular joint

Sutura is that form of articulation where the contiguous margins of the bones are united by a thin layer of fibrous tissue; it is met with only in the skull.

The surface of the scalp is traversed by three sutures, viz.:

1) the **coronal sutures,** nearly transverse is direction, between the frontal and parietals;

2) the **sagittal sutures,** medially placed, between the parietal bones, and deeply serrated in its anterior two-thirds;

3) the upper part of the **lambdoidal suture,** between the parietals and the occipital.

1.2 Synchondrosis of the skull. Where the connecting medium is cartilage the joint is termed a synchondrosis. This is a temporary form of joint, for the cartilage is converted into bone before adult life.

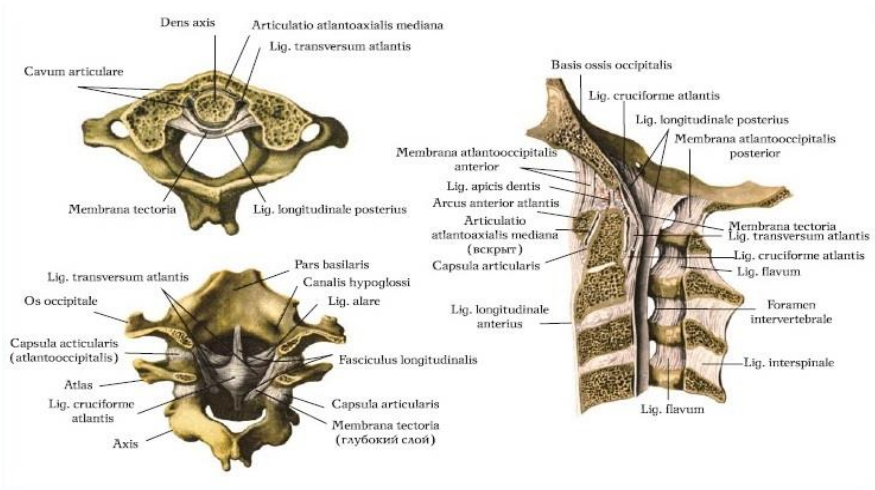
Name of synchondrosis	Connection between bones
Sphenoocipital synchondrosis ***(synchondrosis sphenooccipitalis)***	Posterior surface of the body of the sphenoid bone with the basilar part of the occipital bone
Sphenopetrosal synchondrosis ***(synchondrosis sphenopetrosa)***	Body of the sphenoid bone with the apex of the petrosal part of the temporal bone
Petroocipital synchondrosis ***(synchondrosis petroocipitalis)***	Posterior border of the petrosal part of the temporal bone with borders of basilar and lateral parts of the occipital bone

Intraoccipital synchondrosis *(synchondrosis intraoocipitalis)*	Between diferent parts of the occipital bone
Sphenoethmoidal synchondrosis *(synchondrosis sphenoethmoidalis)*	Between the sphenoid and ethmoid bones connection

2 Articulation between the vertebral column and the head

Name	Articular surfase	Articular ligaments	Type of joint	Function
Articulation of the Atlas with the Occipital Bone *(articulatio atlantooccipit-alis)*	-left and right occipital condyles with superior articular surfaces of the atlant	-the **articular capsules (capsulae articulares)** surround the condyles of the occipital bone, and connect them with the articular processes of the atlas -the **anterior atlantooccipital membrane *(membrana atlantooccipitalis anterior)*** pass between the anterior margin of the foramen magnum above, and the upper border of the anterior arch of the atlas below -the **posterior atlantooccipital membrane *(membrana atlantooccipitalis posterior)*** connected above, to the posterior margin of the foramen magnum; below, to the upper border of the posterior arch of the	-bicondy-lar -ellipsoid -paired -combi-ned -bi-axial	-Frontal axis – flexion and extension nodding of the head -Sagittal axis-slight lateral motion to one or other side

		atlas.		
Articulation of the Atlas with the Axis (*articulation atlantoaxialis)* consist of **-medial atlantoaxial joint *(articulatio atlantoaxiale mediana)***	-between articular surface of the dens and anterior arch of the atlas in front – transverse ligament and posterior surface of the dens	-the **apical ligament of dens *(ligamentum apices dentis)*** from apex of the dens to occipital bone - the **allar ligaments *(lgg. alaria)***- from dens upward and laterally to occipital bone -the **cruciate ligament of the atlas *(lg. cruciformis atlantis)*** consis of 1) the **transverse ligament *(lg transversum atlantis)*-**runs behind the dens to the lateral masses 2) **longitudinal bands *(fasciculi longitudenales)*** extends from transverse ligament upward and downward **-tectorial membrane *(membrana tectoria)*** which is represented the extension of the posterior longitudinal ligament of spine -the **cruciate ligament of the atlas** **-tectorial membrane**	cylindrical -uniaxial	-Vertical axis – rotation of the atlant around the dens
-lateral atlantoaxial joint *(articulatio atlantoaxialis lateralis)*	-inferior articular surface of atlant and superior articular surface of axis		-plane -combined -multiaxial	-slight gliding



Pic 2. Atlantooccipital and atlantoaxial artoculations

3 Articulations of the vertebral column

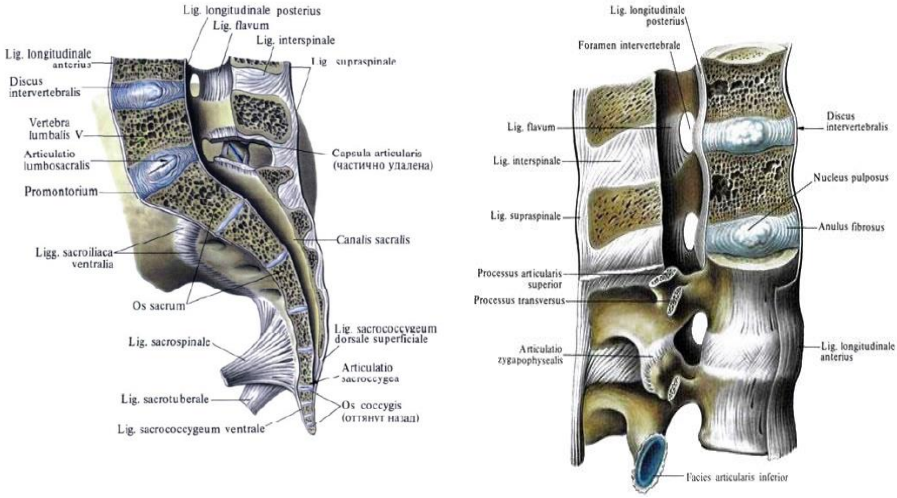
The articulations of the vertebral column consist of a series of hemiarthrodial (intermedial) joints between the vertebral bodies, a series of synovial joints between the articular processes and syndesmosis between the vertebral arches.

Name of joint	**Articu-lar surface**	**Atricular ligaments, disks**	**Type of joint**	**Function**
Articulation of Vertebral Bodies	- between the bodies of the vertebræ	-the **anterior longitudinal ligament (*ligamentum longitudinale anterius)*** extends along the anterior surfaces of the bodies of the vertebræ, from the axis to the sacrum -the **posterior longitudinal ligament (*ligamentum longitudinale posterius)*** is situated within the vertebral canal, and extends along the posterior	-synchondrosis -syndesmosis -sometimes it can belong to symphysis	-Frontal axis - flexion and extension -Sagittal axis - lateral movement -Vertical axis –

		surfaces of the bodies of the vertebræ, from the body of the axis, where it is continuous with the membrana tectoria, to the sacrum -the **intervertebral disk *(discus intervertebralis)***are interposed between the adjacent surfaces of the bodies of the vertebræ, from the axis to the sacrum, and form the chief bonds of connection between the vertebræ. Each is composed, at its circumference, of laminæ of fibrous tissue and fibrocartilage, forming the **annulus fibrosus *(annulus fibrosus);*** and, at its center, of a soft, pulpy, highly elastic substance, of a yellowish color- **pulpy substance (*nucleus pulposus*)**		rotation -circum-duction
Articulation of Vertebral Arches	-laminæ, spinous and transverse processes are conected by the following ligaments:	-the **ligamenta flava (*ligamenta flava)*** connects the laminæ of adjacent vertebræ, from the axis to the first segment of the sacrum -the **supraspinal ligament (*ligamentum supraspinale)*** connects together the apices of the spinous processes from the seventh cervical vertebra to the sacrum - the **ligamentum nuchæ** in the neck represents the supraspinal ligaments of the lower vertebræ and	-syndesmosis	-immovable

		extends from the external occipital protuberance and median nuchal line to the spinous process of the seventh cervical vertebra -the **interspinal ligaments (*ligamenta interspinalia)*** connect adjoining spinous processes and extend from the root to the apex of each process -the **intertransverse ligaments (*ligamenta intertransversaria*)** are interposed between the transverse processes		
Cone-ction between the vertebral articular proceses -zygapophysial joint *(art. zygapophysialis)*	- the superior articular surface of lower vertebrae and the inferior articular process of the upper vertebrae	-the **articular capsula** is surrounded articular processes	-plane	-slightly movable
Lumbosacral joint *(art. lumbosacralis)*	- the inferior articular process of the L5 and S1	-the **iliolumbar ligament (*ligamentum iliolumbare*)** arises from the apex of the transverse process of the L5 to the inner lip of the iliac crest -the **lateral lumbosacral ligament (*ligamentum***	-symphysis	-slightly movable – flexion, extension and lateral flexion

	verteb-rae -the bodies of the L5 and S1	***lumbosacrale laterale*)** connects the transverse process of the L5 and the ala of the sacrum		
Sacro-coccygeal joint *(art. sacro-coccy-gea)*	- the fifth sacral verteb-rae and the coccyx	-the **intervertebral disk** -the **anterior and posterior sacrococcygeal ligaments *(lgg sacrococcygeum anterius et posterius)***	-symphysis	-passive flexion and extension



Pic 3. Articulations of the vertebral column

4 Articulation between the vertebral column and bones of the thoracic cage

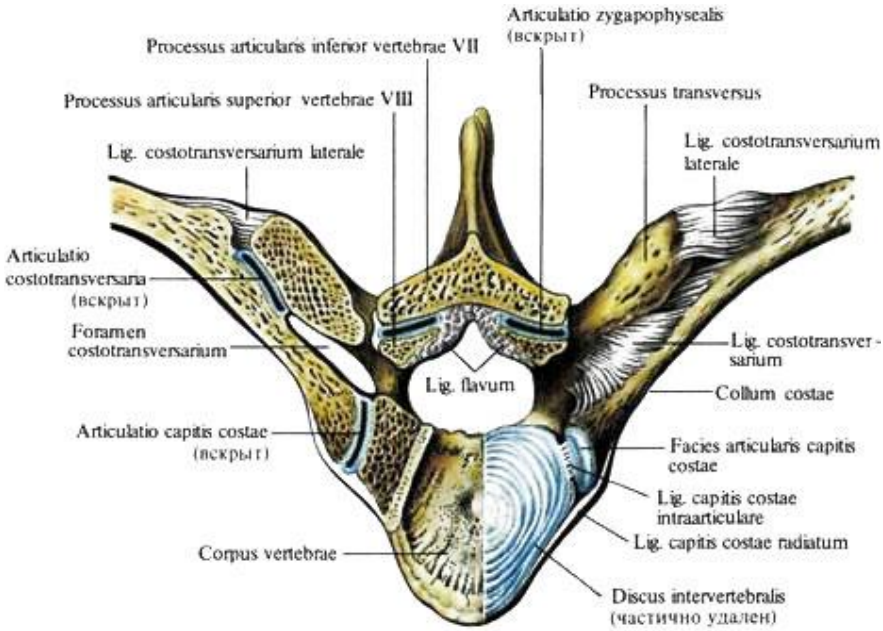
Costovertebral Articulations *(Articulationes Costovertebrales)* The articulations of the ribs with the vertebral column may be divided into two sets, one connecting the heads of the ribs with the bodies of the vertebræ, another uniting the necks and tubercles of the ribs with the transverse processes.

Name	Art. surf	Articular ligaments, disks	Type	Function
Articulations of the Heads of the Ribs (*articulationes capitis costae)*	-the heads of the typical ribs with the facets on the contiguous margins of the bodies of thoracic vertebræ and with intervertebral fibrocartilages between them; - the 1st, 10th, 11th, and 12th ribs each articulate with a single vertebra	-the **articular capsule (*capsula articularis)*** surrounds the joint -the **radiate ligament (*ligamentum capituli costæ radiatum)*** connects the anterior part of the head of each rib with the side of the bodies of two vertebræ, and the intervertebral fibrocartilage between them -the **interarticular ligament (*ligamentum capituli costæ interarticulare*)** is situated in the interior of the joint and attached by one extremity to the crest separating the two articular facets on the head of the rib, and by the other to the intervertebral fibrocartilage. In the joints of the first, tenth, eleventh, and twelfth ribs, the interarticular ligament does not exist	spherical -combine -uniaxial	-the heads of the ribs are so closely conected to bodies of the vertebræ by the radiate and interarticular ligament that only slight gliding movements of the articular surfaces on one another can take place
Costotransverse Articulations (*articulationes costotransversariæ*)	-the articular portion of the tubercle of the rib forms with the articular surface	-the **articular capsule (*capsula articularis)*** is a thin membrane attached to the circumferences of the articular surfaces -the **costotransverse ligament (*ligamentum costotransversarium)*** is attached to the posterior surface of the neck of the rib	-plane -combine	-slight gliding -upward and downward movements of the tubercles

	on the adjacent trans-verse process. In the eleventh and twelfth ribs this articula-tion is wanting	and connected with anterior part of the adjacent transverse process -the **superior costotransverse ligament (*ligamentum costotransversarium superius)*** is attached to the neck of the rib and passes upward and medially to the transverse process above -the **lateral costotransverse ligament (*ligamentum costotransversarium laterale)*** is attached to tubercle of the rib and continue to the end of the transverse process		are associa-ted with rotation of the rib neck on its long axis
Sterno-costal Articu-lations *(Articu-lationes Sterno-cotales)*	-the articul-ations of the cartilages of the true ribs with the sternum - the excep-tion of the 1st, in which cartilage is directly united with the sternum - the first rib synchon-drosis ***(synchon***	-the **articular capsules (*capsulæ articulares)*** surround the joints between the cartilages of the true ribs and the sternum -the **radiate sternocostal ligaments (*ligamenta sternocostalia radiata)*** bands that radiate from the front and back of the sternal ends of the cartilages of the true ribs to the anterior and posterior surfaces of the sternum -the radiate sternocostal ligaments on the anterior surface of the sternum is fused with the periosteum of sternum and is formed a thick fibrous membrane ***(membrana sterni)*** -the **interarticular sternocostal ligament (*ligamentum sternocostale interarticulare)*** is found	spherical -uni-axial	-slight gliding

	drosis costae primae)	constantly only between the second costal cartilages and the sternum.		
Inter-chond-ral Articu-lations (*articu-lationes inter-chond-rales)*	-the conti-guous borders of the sixth, seventh, and eighth, articulate with each other by small, smooth, oblong facets	-the **articular capsule,** lined by **synovial membrane** and strengthened laterally and medially by ligamentous fibers (**interchondral ligaments**) which pass from one cartilage to the other		

Articulation of parts of the Sternum. The manubrium is united to the body of the sternum either by a piece of fibrocartilage connecting the segments, forming **manubriosternal synchondrosis *(synchondrosis manubriosternalis)*.** The xiphoid process is connected with the body of the sternum by the **xiphosternal symphysis *(symphysis xiphosternalis)*.**The anterior part of all ribs is connected with each other by the **external intercostal membrane *(mambrana intercostalis externa)*.** Between posterior part of ribs is placed the **internal intercostal membrane *(mambrana intercostalis interna)*.**



Pic 4. Articulation between the vertebral column and ribs

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