

Connections of the skull

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 Semmelweis University Medical School - Department of Anatomy, Histology and Embryology, Budapest, 2002-2005



The connections of the bony skull are listed by regions. One can find each connection usually twice: at the region where it begins and where it ends. 1st year students are expected to know only the first and second columns; the third column (contents) is necessary in the 2nd year.

Nasal cavity

1) Common nasal meatus

	From where (to where)	Contents
Cribriform plate and foramina	Anterior cranial fossa	Olfactory nerves (I. n.) Anterior ethmoidal a. and n.
Piriform aperture	face	
Incisive canal "Y"-shaped canal	Oral cavity	Nasopalatine a. Nasopalatine n. (of <i>Scarpa</i>) (from V/2 n.)
Sphenopalatine foramen or pterygopalatine foramen	Pterygopalatine fossa	Superior posterior nasal nerves (from V/2 n.) Sphenopalatine a.
Choana	- nasopharynx -	
Aperture of sphenoid sinus in the <i>sphenoethmoidal recess</i>	Sphenoid sinus	-- ventilation (paranasal sinus!)

2) Superior nasal meatus

	Posterior ethmoidal air cells (sinuses)	-- ventilation (paranasal sinuses!)
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3) Middle nasal meatus

	Anterior and middle ethmoidal air cells (sinuses)	-- ventilation (paranasal sinuses!)
Semilunar hiatus (Between ethmoid bulla and uncinat process)		
• Anteriorly: Ethmoidal infundibulum	Frontal sinus	-- ventilation (paranasal sinus!)
• Behind: Aperture of maxillary sinus	Maxillary sinus (of <i>Higmore</i>)	-- ventilation (paranasal sinus!)

4) Inferior nasal meatus

Nasolacrimal canal	Orbit	Nasolacrimal duct
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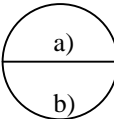
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Oral cavity

	From where (to where)	Contents
Incisive canal "Y"-shaped canal	Nasal cavity (common nasal meatus)	Nasopalatine a. Nasopalatine n. (of <i>Scarpa</i>) (from V/2 n.)
Greater palatine canal or greater pterygopalatine/ sphenopalatine canal (ends with <i>greater palatine foramen</i>)	Pterygopalatine fossa	Greater palatine n. (from V/2 n.) Descending palatine a.
Lesser palatine canals (end with <i>lesser palatine foramina</i>)		Lesser palatine nerves (from V/2 n.)
(Mandibular canal) starts with <i>mandibular foramen</i>	Mental foramen; the <i>incisive canal of the mandible</i> goes further in the mandible until the incisive teeth	Inferior alveolar a., v., n.

Tympanic cavity (or middle ear)

	From where (to where)	Contents
Musculotubarian canal  a) (Semi)canal of tensor tympani muscle b) (Semi)canal of the auditory tube	External base of the skull	a) Tensor tympani muscle b) Auditory (<i>Eustachian</i>) tube
Caroticotympanic canaliculi	Carotid canal	Caroticotympanic arteries Caroticotympanic plexus (sympathetic nerves)
Canaliculus of chorda tympani In the tympanic cavity it opens with the <i>tympanic aperture of the canaliculus of chorda tympani</i>	Facial canal (from its 3 rd , descending part)	Chorda tympani (from VII. n.) Post. tympanic a.
Stapedius canaliculus	Facial canal (from its 3 rd , descending part)	Stapedius n. (from VII. n.)
Tympanic canaliculus	Fossula petrosa (external base of the skull)	Tympanic n. (from IX. n.) Inf. tympanic a.
Canal of the lesser petrosal nerve	Middle cranial fossa (opens on the anterior aspect of the pyramid)	Lesser petrosal n. (from IX. n.) Sup. tympanic a.
Mastoid antrum Opens with <i>aditus to antrum</i>	Mastoid air cells	-- ventilation
(Fenestra vestibuli)	Inner ear	
(Fenestra cochleae)	Inner ear	

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Orbit

	From where (to where)	Contents
Aditus orbitae	face	
Optic canal	Middle cranial fossa (scala media)	Optic n. (II. n.) Ophthalmic a.
Superior orbital fissure	Middle cranial fossa	Oculomotor n. (III. n.) Trochlear n. (IV. n.), Ophthalmic n. (V/1 n.) Abducens n. (VI. n.) Superior ophthalmic vein
Inferior orbital fissure I. (postero-medial part)	Pterygopalatine fossa	I.: Infraorbital n., zygomatic n. (from. n. V/2) Inferior ophthalmic vein
II. (antero-lateral part)	Infratemporal fossa	II.: Infraorbital a., v.
Nasolacrimal canal	Inferior nasal meatus	Nasolacrimal duct
Anterior ethmoidal canal or orbito-cranial canal (starts with <i>anterior ethmoidal foramen</i>)	Anterior cranial fossa (scala anterior), above cribriform plate	Anterior ethmoidal a., v., n.
Posterior ethmoidal canal or orbito-ethmoidal canal (starts with <i>posterior ethmoidal foramen</i>)	Posterior ethmoidal air cells, sphenoid sinus	Posterior ethmoidal a., v., n.
Infraorbital canal	Face, fossa canina	Infraorbital a., v., n.
Frontal notch	Supraorbital region (forehead)	Frontal n. (= medial branch of supraorbital n.)
Supraorbital foramen	Supraorbital region (forehead)	Supraorbital n. (= lateral branch of supraorbital n.)
Zygomatic canal "Y"-shaped canal, starts in the orbit with <i>zygomatico-orbital foramen</i> ; zygomatic n. (from V/2 n.) branches in it	- Zygomaticofacial foramen (face) - Zygomaticotemporal foramen (temporal fossa)	- Zygomaticofacial branch (from zygomatic n.) - Zygomaticotemporal branch (from zygomatic n.)

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Internal base of the skull

1) Anterior cranial fossa (scala anterior)

	From where (to where)	Contents
Cribriform plate and foramina	Nasal cavity (common nasal meatus)	Olfactory nerves (I. n.) Anterior ethmoidal a. and n.
Foramen cecum	(connection to the nasal cavity in the embryonic period)	(emissary vein of foramen cecum)

2) Middle cranial fossa (scala media)

Optic canal	Orbit	Optic n. (II. n.) Ophtalmic a.
Superior orbital fissure	Orbit	Oculomotor n. (III. n.) Trochlear n. (IV. n.) Ophtalmic n. (V/1 n.) Abducens n. (VI. n.) Superior ophtalmic vein
Foramen rotundum	Pterygopalatine fossa	Maxillary n. (V/2 n.)
Foramen ovale	External base of the skull	Mandibular n. (V/3 n.)
Foramen spinosum	External base of the skull	Middle meningeal a. (main artery of the dura mater) Meningeal branch of mandibular nerve
Foramen lacerum - filled with cartilage (sphenopetrous synchondrosis)	External base of the skull	Greater petrosal n. (from VII. n.) Lesser petrosal n. (from IX. n.)
Carotid canal	External base of the skull	Internal carotid a. Internal carotid plexus (sympathetic nerves)
Hiatus for the canal of the greater petrosal nerve (opens on the anterior aspect of the pyramid)	Facial canal (geniculum)	Greater petrosal n. (from VII. n.)
Hiatus for the canal of the lesser petrosal nerve (opens on the anterior aspect of the pyramid)	Tympanic cavity	Lesser petrosal n. (from IX. n.) Sup. tympanic a.
Petrosquamous fissure	External base of the skull (infratemporal fossa)	-
Sphenopetrous fissure	External base of the skull	(Sphenopetrous synchondrosis)

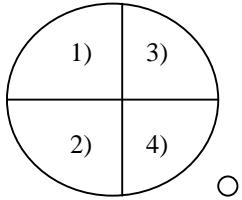
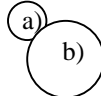
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3) Posterior cranial fossa (scala posterior)

	From where (to where)	Contents
Foramen magnum	Vertebral canal	Spinal cord / medulla border Vertebral arteries Ant. spinal artery (1), posterior spinal arteries (2) Spinal root of accessory n. (XI. n.) Internal vertebral venous plexus
Internal acoustic meatus Starts with internal acoustic pore (porus)	Ends with <i>base</i> or <i>fundus</i> of <i>internal acoustic meatus</i> :  4 quadrant: 1) facial area (beginning of facial canal!) 2) cochlear area (spiral foraminous tract) 3) superior vestibular area 4) inferior vestibular area + foramen singulare	Facial n. (VII. n.) Vestibulocochlear n. (VIII. n.) Vestibular ganglion (of <i>Scarpa</i>) Labyrinthine a., v. 1) Facial n. (VII. n.) 2) Cochlear n. (from VIII. n.) 3) Utriculoampullary n. (from VIII. n.) 4) Saccular n. (from VIII. n.) + Post. ampullary n. (from VIII. n.)
Jugular foramen ("8"-shaped opening) a) pars nervosa b) pars venosa	External base of the skull 	a) Glossopharyngeal n. (IX. n.) Vagus n. (X. n.) Accessory n. (XI. n.) Post. meningeal a. b) Internal jugular vein
Hypoglossal canal	External base of the skull	Hypoglossal n. (n. XII.)
Condylar canal	External base of the skull	Condylar (occipital) emissary vein
Aquaeductus of vestibule Opens with the <i>aperture of aquaeductus of vestibule</i> on the posterior surface of the pyramid	Inner ear, vestibule	Peri- and endolymphatic communication (endolymphatic duct)
Mastoid foramen	Outer aspect of the skull	Mastoid emissary vein
Petrooccipital fissure	External base of the skull	(Petrooccipital synchondrosis)

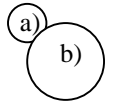
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External base of the skull

	From where (to where)	Contents
Jugular foramen ("8"-shaped opening) a) pars nervosa b) pars venosa	Posterior cranial fossa 	a) Glossopharyngeal n. (IX. n.) Vagus n. (X. n.) Accessory n. (XI. n.) Post. meningeal a. b) Internal jugular vein
Hypoglossal canal	Posterior cranial fossa	Hypoglossal n. (XII. n.)
Condylar canal	Posterior cranial fossa	Condylar (occipital) emissary vein
Foramen ovale	Middle cranial fossa	Mandibular n. (V/3 n.)
Foramen spinosum	Middle cranial fossa	Middle meningeal a. (main artery of the dura mater) Meningeal branch of mandibular nerve
Foramen lacerum - filled with cartilage	Middle cranial fossa	Greater petrosal n. (from VII. n.) Lesser petrosal n. (from IX. n.)
Carotid canal	Middle cranial fossa	Internal carotid a. Internal carotid plexus (sympathetic nerves)
Stylomastoid foramen	the end of facial canal	Facial n. (VII. n.) Stylomastoid a.
Pterygoid canal (of <i>Vidius</i>)	Pterygopalatine fossa	Nerve of the pterygoid canal: - greater petrosal n. (from VII. n.) - deep petrosal n. (sympathetic) Artery of the pterygoid canal
Cochlear canaliculus opens on the inferior aspect of pyramid with the <i>external aperture</i>	Inner ear	Perilymphatic connection
Tympanic canaliculus starts from <i>fossula petrosa</i>	Tympanic cavity	Tympanic n. (from IX. n.) Inf. tympanic a.
Musculotubarian canal a) (Semi)canal for the tensor tympani muscle b) (Semi)canal for the auditory tube	Tympanic cavity	a) Tensor tympani muscle b) Auditory (<i>Eustachian</i>) tube
Mastoid canaliculus starts from <i>jugular fossa</i>	Tympanomastoid fissure	Auricular branch of vagus n. (from X. n.)
Sphenopetrous fissure	Middle cranial fossa	(Sphenopetrous synchondrosis)
Petrooccipital fissure	Posterior cranial fossa	(Petrooccipital synchondrosis)

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Pterygopalatine fossa (or sphenopalatine fossa)

	From where (to where)	Contents
Pterygoid canal (of <i>Vidius</i>)	External base of the skull	Nerve of the pterygoid canal: - greater petrosal n. (from VII. n.) - deep petrosal n. (sympathetic) Artery of the pterygoid canal
Greater palatine canal (opens with <i>greater palatine foramen</i>)	Oral cavity	Greater palatine n. (from V/2 n.) Descending palatine a.
Lesser palatine canals (open with <i>lesser palatine foramina</i>)		Lesser palatine nerves (from V/2 n.)
Inferior orbital fissure I. (postero-medial part)	Orbit	Infraorbital n., zygomatic n. (from V/2 n.) Inferior ophtalmic vein.
Pterygomaxillary fissure	Infratemporal fossa	Posterior superior alveolar nerves (from V/2 n.) Maxillary a.
Foramen rotundum	Middle cranial fossa	Maxillary n. (V/2 n.)
Sphenopalatine foramen or pterygopalatine foramen	Nasal cavity (common nasal meatus)	Superior posterior nasal nerves (from V/2 n.) Sphenopalatine a.

Infratemporal fossa

	From where (to where)	Contents
Pterygomaxillary fissure	Pterygopalatine fossa	Posterior superior alveolar nerves (from V/2 n.) Maxillary a.
Inferior orbital fissure II. (anterior, lateral part)	Orbit	Infraorbital a., v.
Foramen ovale	Middle cranial fossa	Mandibular n. (V/3 n.)
Foramen spinosum	Middle cranial fossa	Middle meningeal a. (main artery of the dura mater) Meningeal branch of mandibular n.
Petrotympenic fissure (of <i>Glaser</i>)	Tympanic cavity	Chorda tympani (from VII. n.) Ant. tympanic a. Ant. malleolar ligament
Alveolar foramina	Leads to the upper teeth through the <i>alveolar canals</i> of maxilla	Posterior superior alveolar arteries and nerves (from V/2 n.)
Petrosquamous fissure	Middle cranial fossa	-

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Facial canal (*Fallopian canal*):

Beginning: in antero-superior quadrant of the base of the *internal acoustic meatus*.

End: *stylomastoid foramen*.

Facial canal has 3 different parts.

There are 3 canals arising from the facial canal:

Canal for the greater petrosal nerve Starts from the <i>geniculum</i> of the facial canal	Opens on the anterior aspect of the pyramid with its own <i>hiatus</i>	Greater petrosal n. (from VII. n.)
Stapedius canaliculus Starts from the 3 rd , descending part of the facial canal	Tympanic cavity	Stapedius n. (from VII. n.)
Canaliculus of chorda tympani Starts also from the 3 rd , descending part of the facial canal	Tympanic cavity	Chorda tympani (from VII. n.) Post. tympanic a.

Other openings (emissaries, diploe)

Mastoid foramen	(found on the temporal bone, above mastoid process)	Mastoid emissary vein
Parietal foramen	(found on parietal bone)	Parietal emissary vein
Condylar canal	(found on occipital bone)	Condylar (occipital) emissary vein
Diploic canals	-diploe-	Diploic veins (frontal, temporal, occipital)

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