

# 2: VEINS

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**INTRACRANIAL SINUSES****& VEINS**

From: Cerebrum, cerebellum & diploe of the skull

To: Internal jugular V

The cerebrum, cerebellum and bones of the skull are drained by the external, internal and meningeal veins to the sinuses. The sinuses lie within the inner layer of the dura mater, either as an endothelial lined space in its free edge (inferior sagittal and straight sinuses), or a similarly lined space where the dura is reflected over the bone of the inner surface of the skull. They are characteristically thin walled, contain no valves and communicate freely with each other.

**Superior sagittal sinus.** Lies in the superior margin of the falx cerebri draining the arachnoid granulations as it does so and usually drains as a continuation into the right transverse sinus. It frequently connects at its termination with the left transverse sinus.

**Inferior sagittal sinus.** Runs in the inferior free margin of the falx cerebri draining medial cortical veins as it does so, and terminates by fusing with the great cerebral vein of Galen and right and left basal veins to form the straight sinus.

**Straight sinus.** Runs in the junction of the falx cerebri and tentorium cerebelli for a short distance before terminating in its continuation — the left transverse sinus.

**Transverse (lateral) sinus.** Runs in the lateral border of the tentorium cerebelli grooving the occipital and squamous temporal bones, to terminate in the sigmoid sinus as it receives the superior petrosal sinus from the cavernous sinus on each side.

**Sigmoid sinus.** Deeply grooves the temporal bone as it passes inferomedially into the posterior compartment of the jugular foramen at the inferior margin of which it

unites with the inferior petrosal sinus to form the internal jugular vein.

**Cavernous sinus.** Lies on the lateral wall of the body of the sphenoid bone and is a lateral relation of the sella turcica, the pituitary gland and the sphenoidal air sinus. It lies medial to the medial gyrus of the temporal lobe and lies on the greater wing of the sphenoid bone. Lying in it is the internal carotid artery (carotid syphon) with the abducent nerve (VI) on its lateral surface and lying on its lateral wall are nerves (from above down): oculomotor (III), trochlear (IV), ophthalmic (Va) and maxillary (Vb) divisions of the trigeminal. It has a sponge-like reticular structure and its connections, particularly those with the other major sinuses (as shown opposite), frequently provide both supply to, and drainage from, the sinus. There are two intercavernous sinuses connecting the cavernous sinuses to each other.

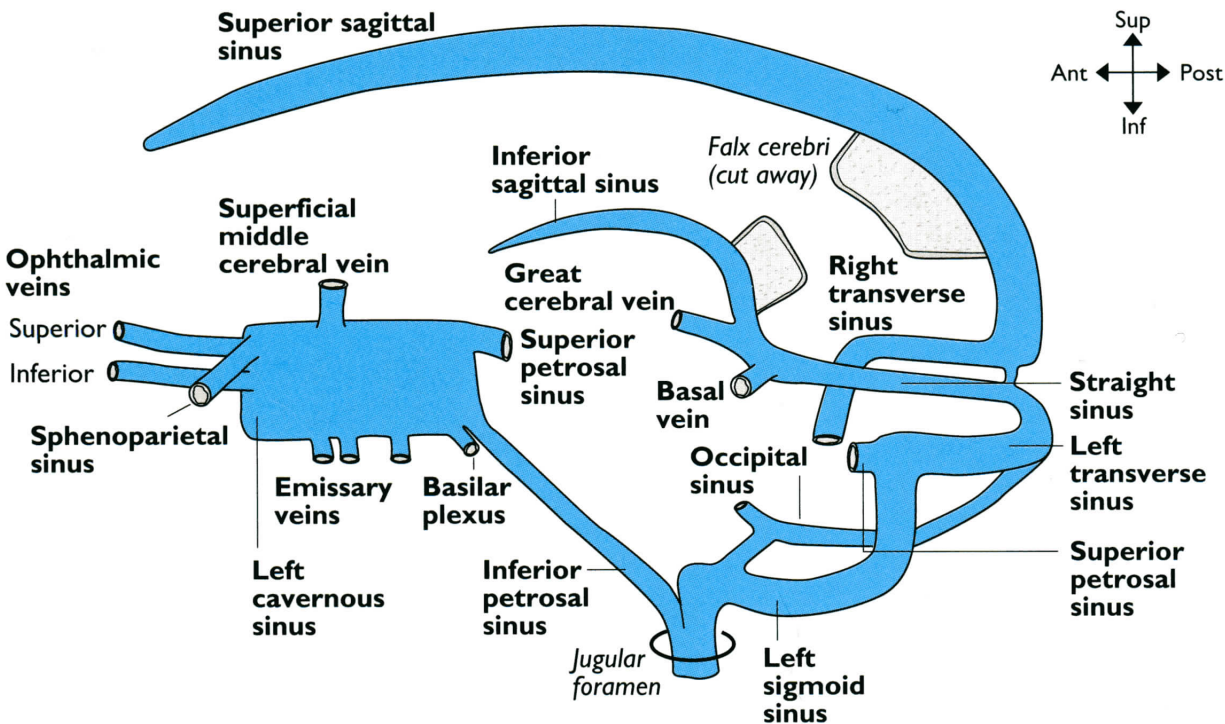
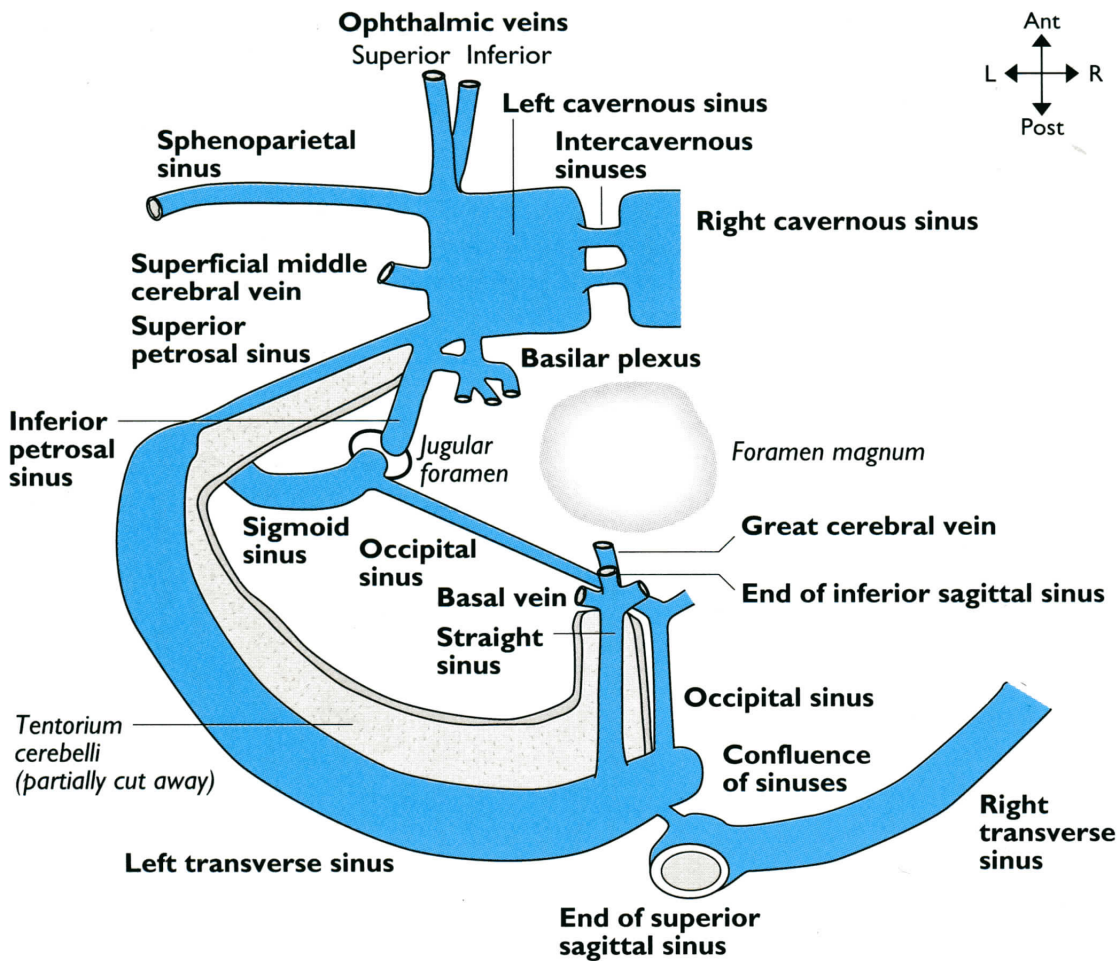
**Occipital sinus.** Begins at the foramen magnum and ascends to end in the confluence of sinuses.

**Confluence of sinuses** is at the lowest, posterior end of the superior sagittal sinus at the point that it turns, usually to the right, to become the transverse sinus. It connects with the straight, occipital and opposite transverse sinuses.

**Sphenoparietal sinus.** Runs along the lesser wing of the sphenoid bone and drains into the cavernous sinus.

**Superior petrosal sinus.** Runs along the petrous temporal bone where the edge of the tentorium cerebelli attaches and hence connects the cavernous and transverse sinuses.

**Inferior petrosal sinus.** Runs inferiorly to connect the cavernous sinus to the internal jugular vein.



**INTERNAL JUGULAR VEIN**

From: Sigmoid & inf petrosal sinuses

To: Brachiocephalic Vs

It runs almost vertically downwards within the carotid sheath although its covering is thin and readily stretched. Its relationship to the internal carotid artery is as follows:

posterior to the artery at the level of C2, posterolateral at C3 and lateral at C4, the vagus nerve (X) lies between the two throughout. Outside the sheath it is surrounded by deep cervical lymph nodes and it lies on (from above down): the lateral mass of the atlas (C1), prevertebral fascia, scalenus medius, scalenus anterior and the dome of the cervical pleura. It is crossed at its origin by the spinal accessory nerve, the lower root of the ansa cervicalis in its middle

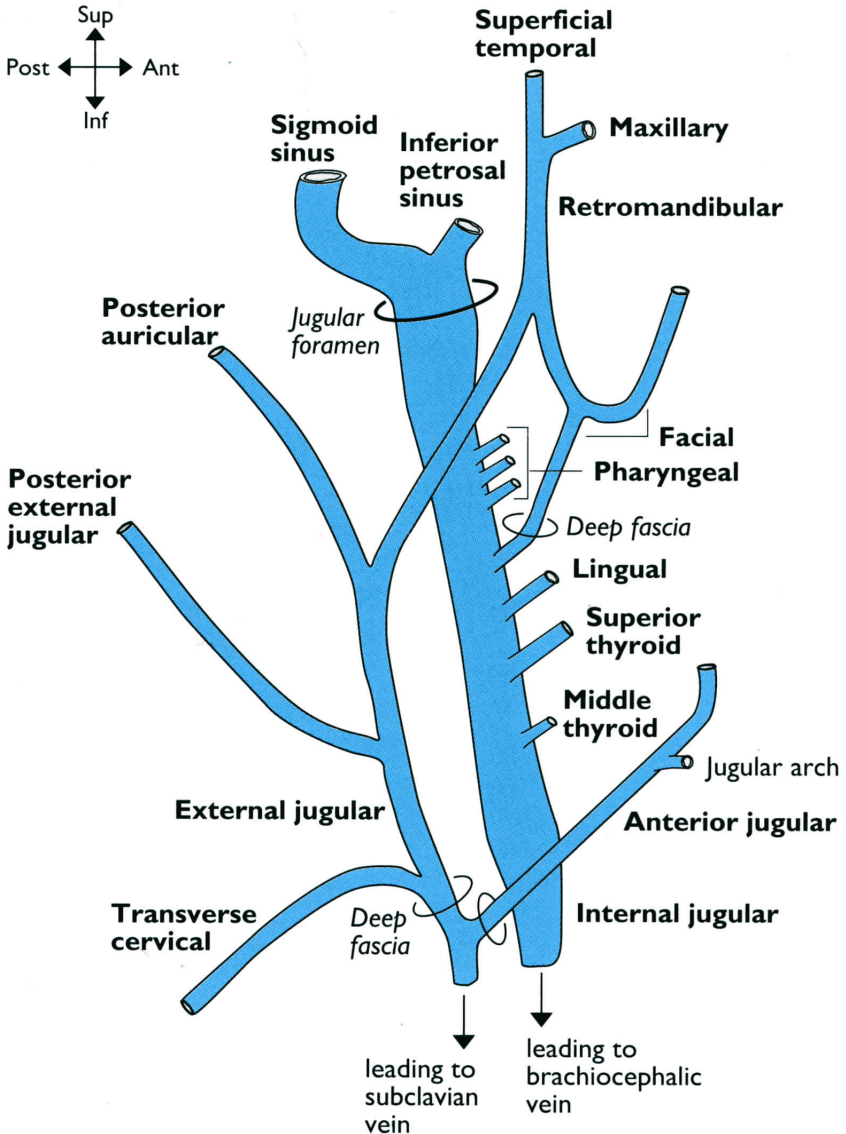
third and is overlaid by sternocleidomastoid and the tendon of omohyoid in its lower third.

**EXTERNAL JUGULAR VEIN**

From: Various brs

To: Subclavian V

It arises from tributaries as shown opposite and drains into the subclavian vein. The external jugular system lies within the superficial tissues of the neck (as does the anterior jugular system). The external and anterior jugular veins pierce the deep fascia of the neck, usually posterior to the clavicular head of sternocleidomastoid to fuse before draining into the subclavian vein.



**SUPERIOR VENA CAVA**From: **Brachiocephalic Vs**To: **Right atrium**

It is formed posterior to the right first costal cartilage and passes posterior to the right sternal border where it is a close posterior relation of the right internal thoracic vessels and sternal periosteum and is occasionally overlaid by the anterior segment of the right upper lobe of the lung. It lies anterolateral to the trachea and upper right lung hilum with the right phrenic nerve applied to its right lateral surface. It receives the azygos vein into its posterior surface at the level of T4. It enters the superior surface of the right atrium without any valvular mechanism guarding its orifice.

**Left brachiocephalic vein.** Formed posterior to the left sternoclavicular joint and anterior to the cervical pleura. It passes obliquely downwards to the right, posterior to the manubrium, separated from it only by the thymus gland or its remnant. It lies anterior to the left common carotid and brachiocephalic arteries and crosses the upper anterior aortic arch. Other tributaries are thymic and pericardial veins.

**Right brachiocephalic vein.** Formed posterior to the right sternoclavicular joint and passes directly inferiorly behind the right side of the manubrium sterni, anterolateral to the trachea and anteromedial to the pleura over the upper lobe of the lung.

**AZYGOS VEINS**From: **Inf vena cava/ascending lumbar Vs**To: **Sup vena cava**

The azygos veins drain the upper lumbar region and the thoracic wall. There is a single system on the right whilst on the left

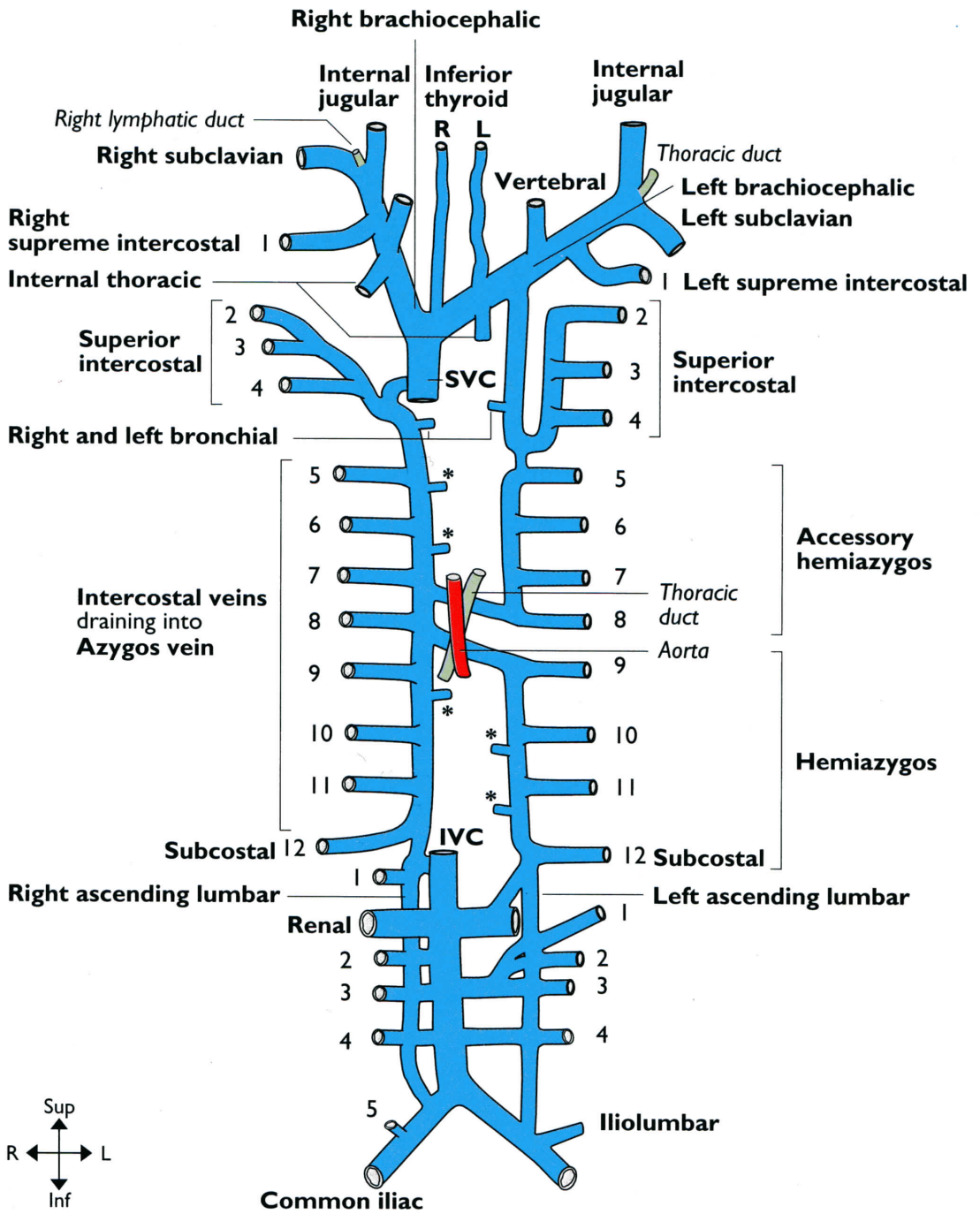
there are two — the hemiazygos and accessory hemiazygos that drain over into the azygos separately.

**Azygos vein.** Arises at the approximate level of the right renal vein either as a posterior tributary of the inferior vena cava or as a confluence of the right ascending lumbar and right subcostal vein. It passes through the aortic opening of the diaphragm under the right crus at the level of T12 vertebra and ascends on the right side of the vertebral bodies behind the oesophagus. It turns anteriorly to pass over the hilum of the right lung, lateral to the oesophagus, trachea and right vagus, to enter the superior vena cava at the level of T4. Its tributaries are the lower eight right posterior intercostal veins, the right superior intercostal vein (draining the 2nd, 3rd and 4th right intercostal veins), bronchial and oesophageal veins and, from the left side, the two hemiazygos veins.

**Hemiazygos vein.** Arises from the confluence of the left ascending lumbar vein, the left subcostal vein and often a tributary from the left renal vein. It ascends through the aortic opening of the diaphragm and onto the left side of the thoracic vertebra to the level of T9 from where it crosses posterior to the aorta, oesophagus and thoracic duct to enter the azygos vein at T8. It drains the four lower left posterior intercostal veins (9–12th).

**Accessory hemiazygos vein.** Drains the 5–8th left posterior intercostal veins and runs inferiorly on the left side of the vertebral bodies to T8 where it crosses similarly to the hemiazygos vein to enter the azygos vein at T7. It also receives tributaries from the bronchial and mid-oesophageal veins.

Note: The anterior intercostal veins drain to the musculophrenic and internal thoracic veins.



**Superior vena cava & azygos veins**

Note: (1) Accessory hemiazygos crosses to azygos at T7 and hemiazygos at T8 — each crosses behind thoracic aorta, oesophagus and thoracic duct, (2) left bronchial vein may enter accessory hemiazygos. \* = oesophageal and mediastinal veins, IVC = inferior vena cava, SVC = superior vena cava

## **INFERIOR VENA CAVA**

**From: Common iliac Vs**

**To: Right atrium**

It arises as the fusion of the common iliac veins anterolateral to the L5 vertebral body lying posterior to the right common iliac artery. It ascends, initially posterolateral to, then lateral to the aorta and lies anterolateral to the right of the bodies of L5–L1. It lies on (from below up): right lumbar arteries, right renal artery, right sympathetic chain, right suprarenal gland, right crus of the diaphragm and right phrenic artery. It is crossed by (from below up): the root of the ileal mesentery, the third part of the duodenum, the head of the pancreas, the common bile duct, the portal vein, the first part of the duodenum, the posterior abdominal peritoneum and the bare area of the liver. It is hugged closely on

its right side by the right suprarenal gland and forms the posterior wall of the epiploic foramen of Winslow below this. After passing through the caval orifice in the diaphragm (T8) with the right phrenic nerve lateral to it, it runs for a short distance within the middle mediastinum before entering the inferior aspect of the right atrium. The vein possesses a ‘valve-like’ flap guarding the medial portion of its orifice.

**Lumbar veins.** Drain somewhat inconsistently but usually the 3rd and 4th drain directly into the inferior vena cava whilst above this level they drain into the ascending lumbar veins and hence to the azygos and hemiazygos systems. There are, however, usually connections of the 3rd and 4th lumbar veins with the ascending lumbar veins.

