D 2. Arteries and veins of the Brain and the Spinal Cord, the Venous Sinus System

Arterial blood supply of the brain

The arteries that supply the brain enter the skull from two directions. Arteries protected and fixed by the arachnoid travel on the surface of the brain. This topic involves the veins of the dog and the horse, it does not cover the rete mirabile systems of other species. Terms in italics refer to the *labels in the figures*.

A. The **a. basilaris** as the continuation of the **a. spinalis ventralis** passes through the basal surface from the for. magnum to the fossa interpeduncularis. Here it joins the basal arterial circle of the brain called **circulus arteriosus** (of Willis) system. Branches caudal to the fossa interpeduncularis (terms in the figure in parentheses):

- **a. cerebelli caudalis** (*Caudal cerebellar*): turns tot he caudal surface of the cerebellum behind the vagus group, supports both
- **a. labyrinthi** (*Labyrinthine*): enters the meatus acusticus internus, supports the inner ear, nn. VII., VIII.
- **rr. ad pontem**: supports the pons, n. V.

The caudal part of the circulus arteriosus is provided by the **a. communicans caudalis** from the a. basilaris to the junction of the left and right a. carotis communis. The branches of the a. communicans caudalis:

- **a. cerebellaris rostralis** (*Rostral cerebellar*): runs between the pons the peduncules tot he rostral part of the cerebellum
- **a. cerebralis caudalis** (*Caudal cerebral*): runs between the thalamus and the mesencephalon to the occipital lobe, supports each

B. The **a. carotis communis** couple serves as the other input support tot eh brain.

Lateral to the junction to the circle ramifies as:

• **a. cerebri media** (*Middle cerebral*): crosses the lobus piriformis, and dorsolaterally follows the hippocampus and the lateral ventricle, supports each

Rostral to the junction to the circle ramifies as:

• **a. cerebri rostralis** (*Rostral cerebral*): runs dorsal between the hemispheres to the corpus callosum and turns caudally here. Supports the cortex facing the fissura longitudinalis cerebri, mostly.

The short **a. communicans rostralis** connecting the left and right a. cerebri rostralis runs between the pedunculus olfactorius. The **a. ophthalmica interna** passes here too, and anastomoses with the a. ophthalmica externa, both run tot he caudal pole of the eye ball. The **a. ethmoidalis interna** also ramifies from here and passes through the lamina cribrosa tot he nasal cacvity. The three cerebral arteries also anastomose in the terminal vascular network.



Venous blood supply of the brain

The low pressure venous blood supply of the brain located in a rigid brain case is assisted by muscular **pump mechanisms** (m. temporalis, m. masseter). The majority of the venous sinuses are situated in dura duplicatures have an extensive drainage system (**vv. emissariae**) that delivers blood through the holes in the skull into the veins outside the skull. There are veins (**vv. diploicae**) invaginating into the spongiosa of the bones of the skull.

The veins in the brain form a dorsal and ventral system. The axis of the **dorsal system** is the **sinus sagittalis dorsalis** running in the falx cerebri. It receives the sinus rectus supported by the v. cerebri interna and the v. corporis callosi. Caudally it divides as **sinus transversus** and forms the confluens sinuum that communicates with the **sinus temporalis**. Behind this the sinus sygmoideus communacates with the sinus basilaris which belongs to the ventral system.

The ventral system runs on the base of the skull, its axis is given by the sinus basilaris - sinus - petrosus ventralis – sinus cavernosus. In horses the sinus petrosus ventralis is outbulging from the brain case through the for. lacerum. The bilateral sinus cavernosus are connected by the rostral and caudal sinus intercavernosus. Thus, they form a basal venous ring envelooped by a dura duplicature (diaphragma sellae). Through foramina of the fossa cranii rostralis an extensive

v. emissaria network is added tot he ventral system (v. emissaria foraminis ovalis, v. emissaria foraminis rotundi, v. emissaria fissurae orbitalis etc.).



Arterial supply of the spinal cord

The spinal cord is supported by the **r. spinalis** from the for. intervertebrale. The r. dorsalis enter the bilateral a. spinalis dorsalis running in the the sulcus dorsalis lateralis and the r. ventralis joins the a. spinal ventralis as a single vessel situated in the fissura mediana.

The segmental r. spinalis system is provided by the a. vertebralis in the cervical, dorsal branches of the aa. intercostales dorsales in the thoracic, dorsal branches of the aa. lumbales in the abdominal and the a. sacralis mediana in the sacral region.



Venous blood supply of the spinal cord

Venous supply to the spinal cord is provided by venous plexuses. The left and right **plexus vertebralis internus ventralis** in the vertebral canal are circularly connected to each other segmentally. Outside the vertebral arch, the **plexus vertebralis externus dorsalis** passes, where rr. interarcuales connect with each other and with the internal plexuses. Below the vertebral bodies, the **plexus vertebralis externus ventralis** travels, which ultimately drains blood from the above-mentioned vessels into the vv. intercostales/vv. lumbales. In the cervical section the v. vertebralis, in the thoracis section the v. azygos, in the abdominal section the v. azygos and the v. cava caudalis, under the sacrum the v. sacralis mediana and the v. iliaca interna drain the blood of the spinal cord.

