

# VASCULARIZATION OF THE BRAIN WITH SPECIAL ATTENTION TO MENINGEAL VESSELS

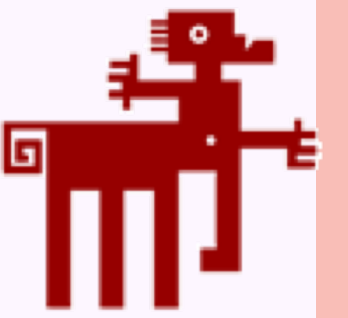
Andrea Andía Wessalowski

Faculty of Veterinary Medicine

June 2018

UAB

Universitat Autònoma  
de Barcelona



FACULTAT DE VETERINÀRIA

## OBJECTIVE

The aim of this project is to analyse and describe the meningeal blood vessels of the brain, and its clinical importance and physiological function.

## BLOOD VESSELS OF THE BRAIN

### Arteries

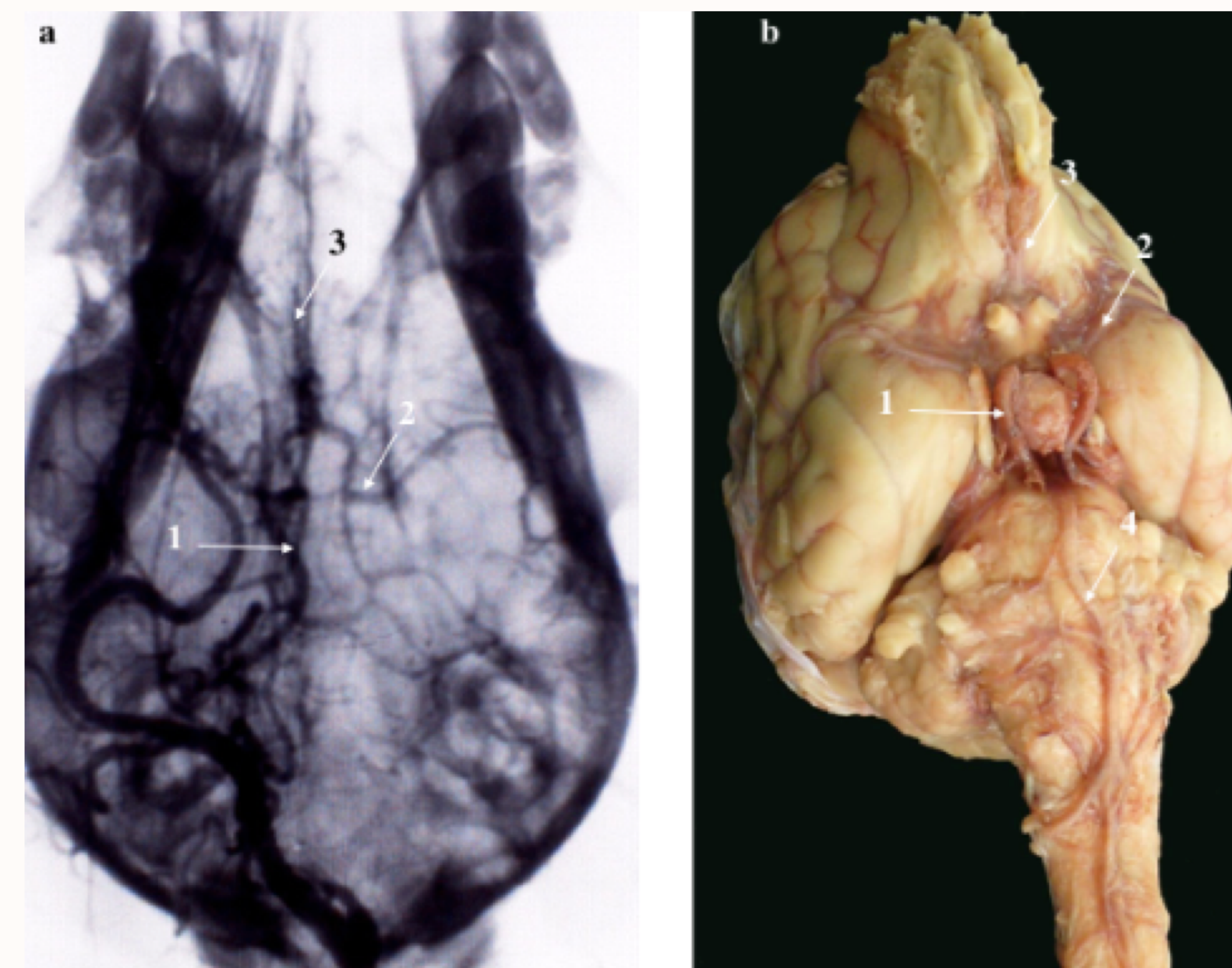
The basilar artery and internal carotid arteries supply blood to the **cerebral arterial circle**. It is formed by the rostral cerebral arteries and the caudal communicating arteries. The rostral cerebral arteries give rise to the internal ethmoidal arteries and the internal ophthalmic arteries. The middle cerebral artery leaves the internal carotid artery as a terminal branch. The caudal cerebral arteries branch off from the caudal communicating arteries.

The caudal cerebellar and labyrinthine arteries, and branches to the pons and medulla oblongata branch off from the basilar artery.

### Veins

The veins of the encephalon drain into venous passages located within the dura mater and osseous canals called **sinuses of the dura mater**. The main are the dorsal sagittal sinus, straight sinus, sigmoid sinus, dorsal petrosal sinus, temporal sinus, the transverse sinuses, and the cavernous sinuses.

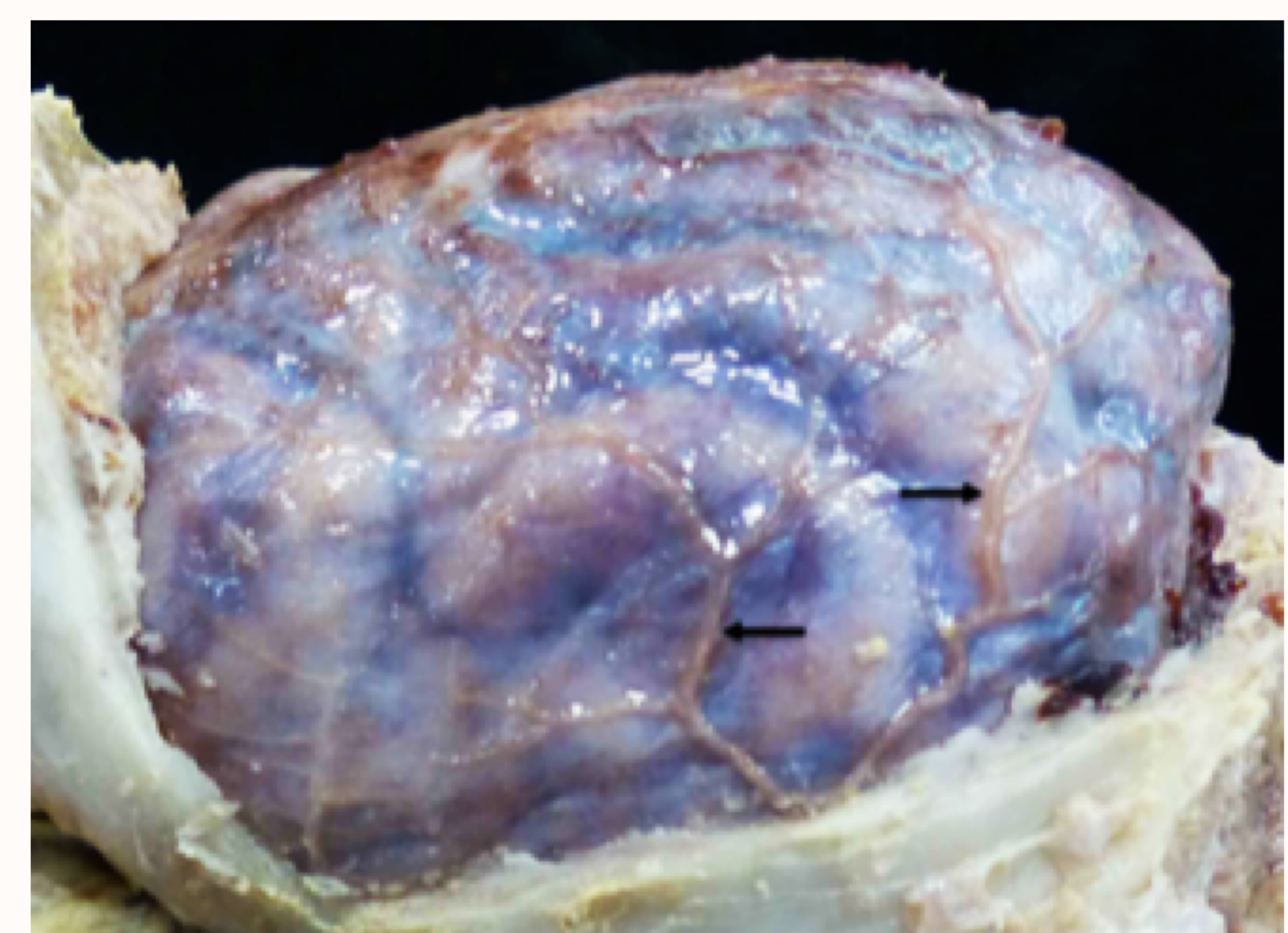
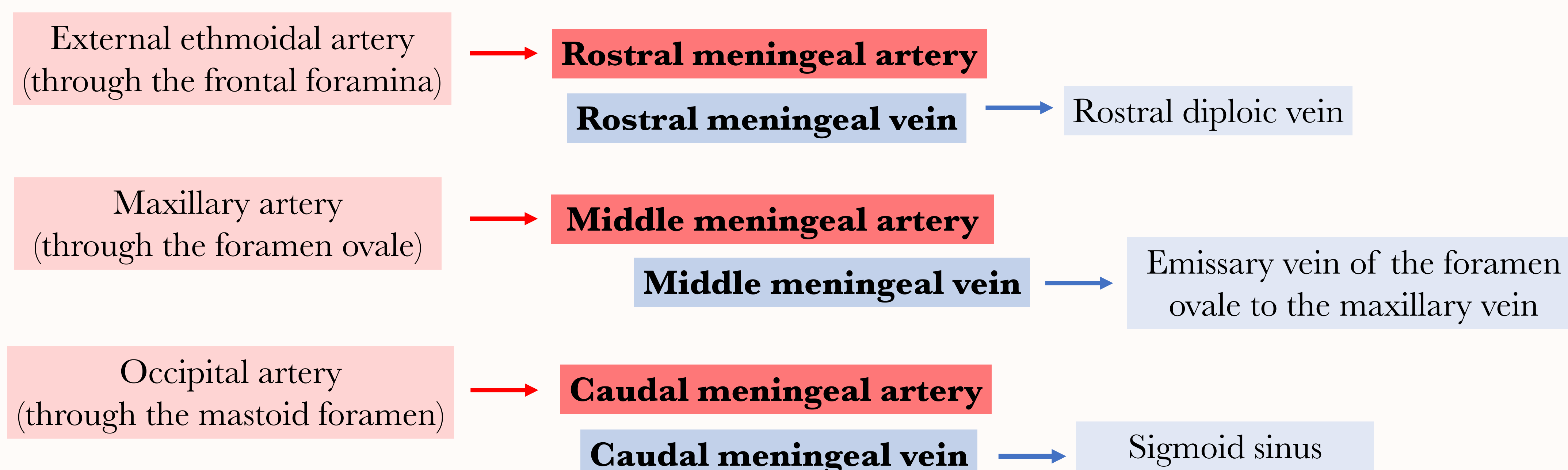
The venous sinuses drain blood to the maxillary vein and to internal jugular vertebral vein, and the internal vertebral venous plexus.



1. Internal carotid artery 2. Middle cerebral artery 3. Internal ethmoidal artery 4. Basilar artery

## THE MENINGEAL VESSELS

The encephalon and the cranial nerve roots are surrounded by membranes of connective tissue called **meninges**. An external meninge, the **dura mater** (pachymeninx), and two internal meninges (leptomeninges), the **arachnoid** and the **pia mater**.



Middle meningeal artery

## CLINICAL IMPORTANCE

### Neurosurgery

At present, no functional impairments are known to be associated with the suppression of the meningeal vascularization during neurosurgery.

However, an angiography should be performed before any neurosurgery to determine any possible vascular abnormalities that could compromise the outcome of the intervention.

### Traumatisms

The meningeal vessels represents the source of bleeding in 85% of epidural hematomas in human and needs to be surgically evacuated. After removing the blood clot, the middle meningeal artery (MMA) is ligated as close as possible to the foramen ovale.

### Lymphatic system

A system of vessels with structural characteristics of lymphatic tissue that runs along the perisinus space has recently been demonstrated. Two basic functions are hypothesized: the immune surveillance of the brain and the waste clearance from the brain parenchyma.

## CONCLUSIONS

There are two principal functions of the meningeal vessels: **oxygenation and thermoregulation**.

- The oxygenation is a questionable idea considering that the dura mater it has no clear contact with the underlying brain parenchyma.
- The middle meningeal vein is a satellite of the middle meningeal artery to allow interchange of heat.

In the MMA, the blood flow is generally low or even absent in adults. Three general hypotheses can be proposed:

- The MMA could have a relevant physiological role in early **ontogenetic stages**, in **specifically situations** or the MMA may not have a physiological role, but rather a **biomechanical** one.

The description and number of studies of the meningeal vessels in veterinary medicine is limited. We propose further studies concerning the anatomy and physiology.

Aige, V. 2017. Neuroanatomy of the dog. [www.neuroanatomyofthedog.com](http://www.neuroanatomyofthedog.com)  
Bruner, E., & Sherkat, S. 2008. The middle meningeal artery: From clinics to fossils. *Child's Nerv Syst*, 24(11). 1289–1298.  
Scremin, O. 2004. Cerebral vascular system. *The Human Nervous System*. 4th ed. 1167–1202. ELSEVIER