

**ARTERIAL VASCULARIZATION OF THE BRAIN OF THE SMALL GREEN MONKEY
(*CERCOPITHECUS AETHIOPS SABEUS*)**

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Cell cultures from the small green monkey are used for the cultivation of poliovirus in the manufacture of vaccines against poliomyelitis. In addition, kidney cultures from the same monkey serve for detection of the virus in biological material. This was the main reason that prompted us to undertake a study of one part of the monkey's cardiovascular system and thus contribute to a better understanding of the structure of its body.

Key words: Cercopithecus aethiops sabeus, brain, arteries.

INTRODUCTION

The small green monkey (*Cercopithecus aethiops sabeus*) belongs to the family of old-world monkeys (Radovanovic, 1965) widely distributed in African savannahs. The monkeys that we studied had been brought from Eastern Africa, i.e. Kenya, Uganda and Tanzania. They are considered to be the most beautiful and attractive monkeys. They can often be seen in zoos and are most frequently grey-green in colour except that the lower parts of the neck, chest, abdomen and inner side of the arms are white. According to data, mostly from zoos, they live for about 15-17 years, exceptionally 20. They are fertile between 4 and 7 years of age.

The available literature offers very little information on the arteries in the small green monkey. Nikolic *et al.* (2003) described the distribution of left coronary artery branches in the African green monkey. Blagojevic *et al.* (1999) reported the vascularization of the lungs in the small green monkey (*Cercopithecus aethiops sabeus*), while Blagojevic *et al.* (1998) described the internal artery and Blagojevic (1989) the heart and arteries. Teofilovski (1982) had earlier presented the insulopercular region of the brain of the small green monkey, while Stanojevic *et al.* (1982, 1983) and Mrvić (1995) investigated the morphology of the genital organs. This was the reason for these studies of the brain arteries in the small green monkey which were compared with the corresponding arteries in the dog (Bradley, 1948; Jankovic *et al.*, 1988; Nickel *et al.*, 1981; Baum and Ellenberger 1974), horse (Jankovic *et al.*, 1988; Nickel *et al.*, 1981; Baum and Ellenberger, 1974) and man (Boskovic, 1971; Šljivić, 1965).

MATERIALS AND METHODS

The investigation involved 45 small green monkeys of both sexes, aged 3 to 4 years and body weight 2000-3000 g. The monkeys originated from the Institute of immunology and virusology in Belgrade. After the bleeding out, various contrast agents were introduced into the blood vessels. The most often used contrast media were gelatin stained with painting tempera, micropack-barium or minium. Photographs of the blood vessels were taken after preparation.

Biocryl (a mixture of liquid biocryl-methyl-methacrylate monomer and powdered biocryl-methyl-methacrylate polymer), dyed with minium, was injected into the blood vessels of the head in order to obtain corrosive preparations of the arteries. After initiation, the preparations were kept in 5% NaOH for 96 h or in 10% NaOH for 48 h. Then the preparations were rinsed out with hot water.

RESULTS AND DISCUSSION

The common carotid aa, *A. carotis communis sinistra et dextra*, supply blood to the head and neck. *A. carotis communis sinistra* is a branch of *Truncus brachiocephalicus*; whereas *A. carotis communis dextra* is one of the branches that ramifies from the common trunk, together with *A. subclavia dextra*. At the larynx, each carotid artery gives off *A. carotis interna* of the corresponding side; the remaining part being *A. carotis externa*.

A. carotis interna supplies blood to the brain. *A. carotis interna sinistra* (Figure 1₅, 2₁) et *A. carotis interna dextra* (Figure 1₆, 2₂) course through the pharyngeal space towards the cranial cavity, which they enter after passing through the carotid canals (Canales carotici) in the petrosa of the temporal bone into the cavernous sinus, where both *Aa. carotides* are joined via *A. intercarotica caudalis*. Inside the cavernous sinus *Aa. carotides internae* course rostrally, lateral to the hypophysis.

A. carotis interna gives off the following branches:

1. *A. ophthalmica*
2. *A. cerebri media*
3. *A. communicans caudalis*.

A. cerebri rostralis represents the continuation of the carotid artery.

1. *A. ophthalmica*

The artery of the eye socket, the ophthalmic artery, (*A. ophthalmica*) is the first branch of *A. carotis interna* in the cranial cavity. It runs alongside the medioventral side of the internal carotid artery towards the optic canal (*Canalis opticus*). Together with the optic nerve, it passes through the optic canal and enters the eye socket. It supplies blood to the optic and supplementary parts of the eye.

2. *A. cerebri media*

A. cerebri media (Figure 1_{7, 2_{3,4}}) is the strongest branch of *A. carotis interna*. It gives off branches that enter the brain mass via *Substantia perforata rostralis* running further via *Fossa lateralis cerebri* and supplies blood to the lateral surface of the cerebral hemisphere.

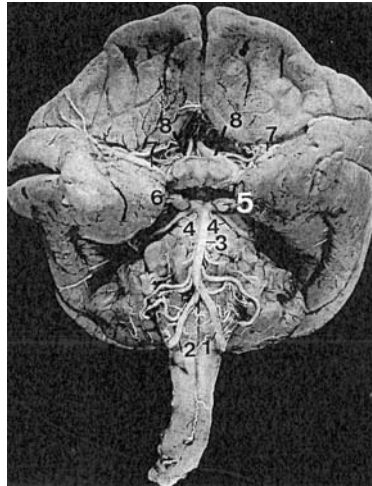


Figure 1. Arteries of the brain of the small green monkey (*Cercopithecus aethiops sabeus*)
1-A. vertebralis sinistra, 2-A. vertebralis dextra, 3- A. basilaris cerebri, 4-A. cerebri
caudalis, 5-A. carotis interna sinistra, 6- A. carotis interna dextra, 7-A. cerebri
media, 8-A. cerebri rostralis.

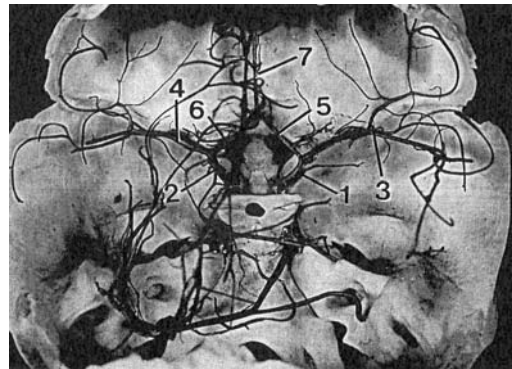


Figure 2. Arteries of the brain of the small green monkey (*Cercopithecus aethiops sabeus*). The corrosive preparation.
1- A. carotis interna sinistra, 2-A. carotis interna dextra, 3- A. cerebri media
sinistra, 4-A. cerebri media dextra, 5-A. cerebri rostralis sinistra, 6-A. cerebri
rostralis dextra, 7-A. cerebri rostralis communis.

3. *A. communicans caudalis*

A. communicans caudalis is the weakest branch of *A. carotis internae*. It runs aborally and connects the caudal cerebral artery (*A. cerebri caudalis*-Figure 14) with the internal carotid artery. *A. communicans caudalis* gives off branches to the hypothalamus and cerebral peduncles.

A. cerebri rostralis

A. cerebri rostralis (Fig. 1₈, 2_{5,6}) is the continuation of the trunk of the internal carotid artery. The rostral cerebral artery (*A. cerebri rostralis*) unites with its fellow on the other side, in front of the optic chiasm (*Chiasma opticum*). The result of this union is *A. cerebri rostralis communis* (Figure 2₇), which enters the deep longitudinal fissure (*Fissura longitudinalis cerebri*) and turns around *Genu corporis callosi*, running up to the caudal part of the corpus callosum. *A. cerebri rostralis* gives off surface or cortical branches that ramify in the brain cortex and deep or central branches that enter the brain substance.

A. cerebri caudalis, *A. communicans caudalis* and *A. cerebri rostralis* form an arterial circle (*Circulus arteriosus-Willisi*), around the hypophysis and optic chiasm. In addition to *A. carotis internae* and *A. vertebralis* supplies blood to the brain.

A. vertebralis separates from *A. subclavia* in the thoracic cavity. It leaves the thorax at *Apertura thoracis cranialis*, and courses craniodorsally along the medial face of *M. scalenus*. At the sixth cranial vertebra it enters *Canalis transversarius* and courses through the canal up to the 2nd cranial vertebra where it ramifies, supplying branches for deep cranial muscles (*Rami muscularis*), as well as for the spinal cord (*Rami spinales*), by entering the spinal canal through intervertebral orifices. *A. vertebralis* leaves the transversal canal, enters *Canalis transversarius atlas* at the second cranial vertebra, and via *Foramen vertebrale laterale* enters the vertebral canal. Within the vertebral canal it perforates the dura and reaches the lateral side of the spinal cord. *A. vertebralis* enters the cranial cavity through *Foramen magnum*.

A. vertebralis sinistra (Figure 1₁) and *A. vertebralis dextra* (Figure 1₂) unite behind the pons at Fossa postpontina and form the basilar artery (*A. basilaris cerebri*-Figure 1₃). *A. basilaris cerebri* divides into two terminal branches *Aa. cerebrales caudales* (Figure 1₄) that, together with the branches of the internal carotid arteries, form the arterial circle.

A. carotis communis in the small green monkey, as well as in man, (Bosković, 1971; Šljivić, 1965; Ilić *et al.* 1973), the horse and dog (Nickel *et al.* 1981; Baum and Ellenberger, 1974; Janković *et al.* 1988) divides into the external (*A. carotis externa*) and internal carotid arteries (*A. carotis interna*).

According to our investigations, as well as the results of other authors (Stanojević *et al.* 1981; Teofilovski, 1982; Teofilovski *et al.* 1984) the main suppliers of blood to the brain in the small green monkey are *A. carotis interna* and *A. vertebralis*. *A. basilaris cerebri* is formed by the union of the left and right cerebral arteries (*A. vertebralis sinistra et extra*).

According to the abovementioned authors the branches of *A. carotis interna*, are: *A. cerebri media*, *A. communicans caudalis*, and the continuation of

the internal carotid artery is *A. cerebri rostralis* (*A. cerebri anterior*). *A. cerebri rostralis* unites with its fellow from the other side in front of the optic chiasma (*Chiasma opticum*). The result of this union is *A. cerebri rostralis communis*.

We have obtained the same results, the only difference being that we established that *A. ophthalmica* separates from *A. carotis interna*, as its first branch.

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ARTERIJSKA VASKULARIZACIJA MOZGA MALOG ZELENOG MAJMUNA (*CERCOPITHECUS AETHIOPS SABEUS*)

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SADRŽAJ

Glavni krvni sudovi koji dovode arterijsku krv u mozak su *A. carotis interna* i *A. vertebralis*. Spajanjem leve i desne kičmene arterije (*A. vertebralis sinistra et dextra*) nastaje *A. basilaris cerebri*.

A. carotis interna sinistra et dextra pružaju se kroz parafaringealni prostor prema lobanjskoj duplji, u koju ulaze pošto prođu kroz karotidne kanale (*canales carotici*) piramide slepoočne kosti u kavernozi sinus u kome se povezuju obe *Aa. carotides* preko *A. intercarotica caudalis*. Grane *A. carotis interna* su: *A. ophthalmica*, *A. cerebri media*, *A. communicans caudalis*. *A. ophthalmica* dovodi krv u optičke i pomoćne delove oka. *A. cerebri media* daje grane koje ulaze u moždanu masu i dovodi krv u lateralnu površinu moždane hemisfere. *A. communicans caudalis* povezuje zadnju moždanu arteriju (*A. cerebri caudalis*) sa unutrašnjom karotidnom arterijom i daje grane za vaskularizaciju hipotalamusa.

A. cerebri rostralis je produžetak stabla unutrašnje karotidne arterije. Ona se spaja sa odgovarajućom granom druge strane ispred *Chiasma opticum*. Iz ovog spoja nastaje *A. cerebri rostralis communis*. Od *A. cerebri rostralis* odvajaju se površne i duboke grane koje ulaze u moždanu masu.

A. cerebri caudalis, *A. communicans caudalis* i *A. cerebri rostralis* obrazuju oko hipofize i raskršća vidnih nerava arterijski krug (*Circulus arteriosus Willisii*).