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CORTICAL BRANCHES OF THE MIDDLE CEREBRAL ARTERY IN THE WILD BOAR (SUS SCROFA L.)

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ABSTRACT

Anatomical arrangement of the middle cerebral artery in the wild boar was described based on 92 brain hemispheres. The artery was found to form 10 branches. Two rhinal arteries supply the part of cerebrum situated between the old and new cortex. Of the remaining 8 branches three are directed to the frontal region, two to the parietal region, while three temporal branches supply blood only to the new cortex. In the wild boar in 62% cases the rostral cerebral artery gave two, and in 38% cases three independent branches.

Key words: Mammalian brain vascularization. Middle cerebral artery.

INTRODUCTION

In papers dealing with the structure and variation of the basilar arteries in the wild boar and domestic pig (Wiland and Malinski 1968, Wiland and Brudnicki 1984, Jablonski et a1.1989), the authors state that multiple middle cerebral arteries depart from the cerebral arterial circle. The papers provide no description of further cortical branches.

There exist papers discussing the structure and division of the middle cerebral artery in the region of telencephalon of various animal species (Walinczus 1973, Chadzypanagiotis 1975, Wiland 1991, Wegrzyn and Roskosz 1983, Jablonski et al. 1996, Jablonski and Roskosz 1997) and in humans (Jain 1964, Lang and Dehling 1980, Jachnowicz-Wisniewska et al. 1984). Their authors describe cases of multiple middle cerebral arteries as arterial varieties. Considering the results of studies of other authors, we have decided to describe the structure and variation of the branches of the middle cerebral artery in the wild boar.

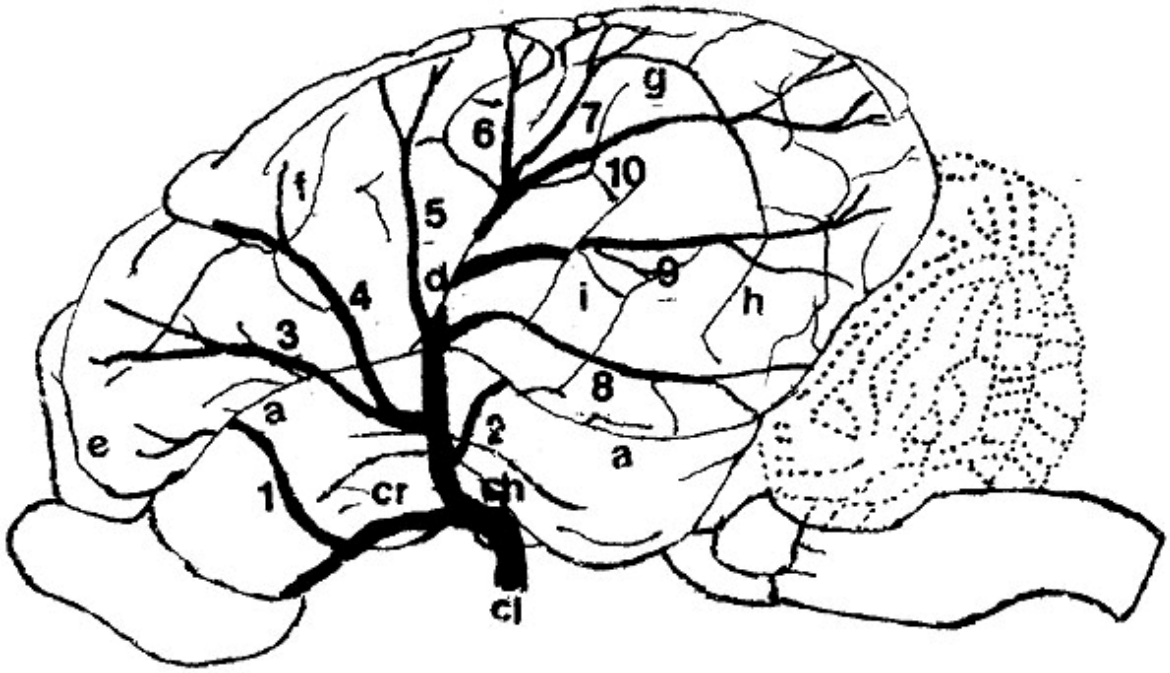
MATERIALS AND METHODS

The studies were carried out on 46 wild boar (Sus scrofa L.) brains. Both hemispheres were examined. Ninety two middle cerebral arteries were described. The arteries were filled with synthetic latex through the common carotid artery. The preparations were fixed in 5% formalin. Following decalcification of the bone in 5% hydrochloric acid, the brains were removed and the arteries filled with injection mass were uncovered.

RESULTS

In the wild boar, in the rete mirabile epidurale encompassing pituitary gland, internal carotid arteries run towards the brain base (a. carotis interna, fig.1-ci). The internal carotid artery, after perforating dura mater, divides into rostral cerebral artery (a. cerebri rostralis - cr) and caudal communicating artery (a. communicans caudalis) which form a part of the cerebral arterial circle (circulus arteriosus cerebri).

Fig. 1. Diagram of division of the middle cerebral artery on the surface of pallium in the wild boar. Rostral ethmoidal artery (a. rhinalis anterior) - 1, caudal ethmoidal artery (a. rhinalis posterior) - 2, orbital branch (r. orbitalis) - 3, inferior frontal branch (r. frontalis inferior) - 4, superior frontal branch (r. frontalis superior) - 5, rostral parietal branch (r. parietalis anterior) - 6, caudal parietal branch (r. parietalis posterior) - 7, inferior temporal branch (r. temporalis inferior) - 8, media temporal branch (r. temporalis medium) - 9, superior temporal branch (r. temporalis superior) - 10, internal carotid artery (a. carotis interna) - ci, rostral cerebral artery (a. cerebri rostralis) - cr, rostral choroidal artery (a. choroidea rostralis) - ch, rhinal lateral groove (sulcus rhinalis lateralis) - a, ascending branch of Sylvius fissure (r. ascendens fissura sylvia) -d, pre-Sylvius groove (sulcus praesylvius) - e, rostral supra-Sylvius groove (sulcus suprasylvius rostralis) - f, media supra-Sylvius groove (sulcus suprasylvius medius) - g, caudal supra-Sylvius groove (sulcus suprasylvius caudalis) - h, caudal ecto-Sylvius groove (sulcus ectosylvius caudalis) - i.

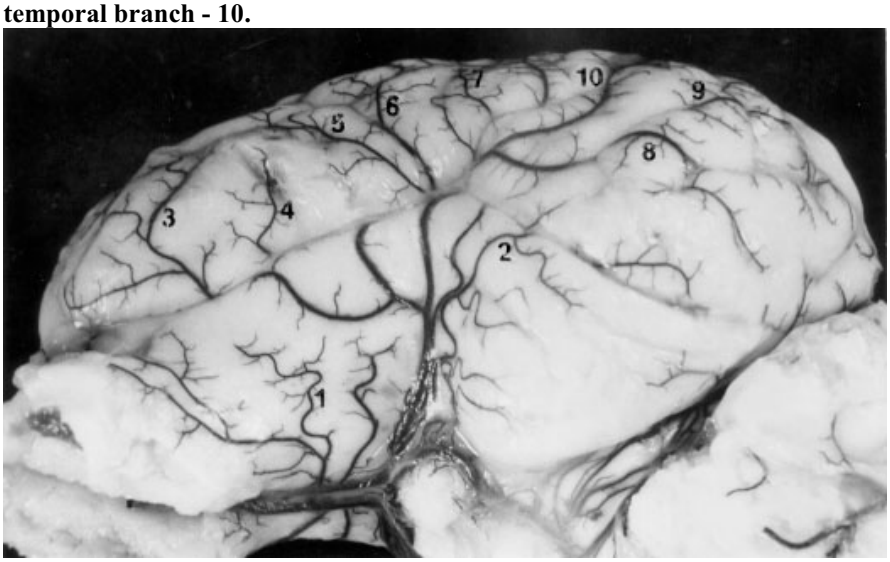


Rostral cerebral artery runs first along the ventral surface of the optic nerve and, after passing it, makes an arc towards the median fissure of the brain. On the surface of the optic nerve it gives off rostral choroidal artery (a. choroidea rostralis - ch) and then middle cerebral artery (a. cerebri media). In 12 hemispheres the middle cerebral artery separated from the rostral cerebral artery as a single trunk, in 45 cases as two trunks, and in 35 cases as three branches.
Irrespective from the way of departure from the main trunk, particular areas of the cortex were always reached by the same branches. The branches are directed to the proper hemisphere of the brain. The following branches are constant:
Rostral ethmoidal artery (a. rhinalis anterior - fig.1-1) which, after having separated, enters the nasal part of the lateral rhinal sulcus. Its terminal branches supply also the area of the pallium located above this sulcus.
Caudal ethmoidal artery (a. rhinalis posterior - fig.1-2) enters the caudal part of the lateral rhinal sulcus, and its terminal branches re-enter the area of the pallium located above this sulcus.
Orbital branch (r. orbitalis - fig.1-3) after passing the lateral rhinal sulcus runs towards the presylvius sulcus and branches on both its sides.
Inferior frontal branch (r. frontalis inferior - fig.1-4) runs towards the mid part of the suprasylvius rostral sulcus, and its terminal branches run towards the coronary sulcus.
Superior frontal branch (r. frontalis superior - fig.1-5) runs towards the brain roof and is located above the ascending part of the sylvius fissure.
Rostral and caudal parietal branches (r. parietalis anterior et r. parietalis posterior - fig.1 - 6, 7) are thin vessels which originate from a branch located inside the sylvius fissure. After emerging on the surface they croos the middle suprasylvius groove and run towards the ansate sulcus and initial section of the marginal sulcus.
Inferior temporal branch (r. temporalis inferior - fig.1 - 8) branches in the area of cortex located below the system of external caudal ectosylvius sulcus and runs towards the caudal suprasylvius sulcus. Its terminal branches exceed the posterior margin of the hemisphere.
Media temporal branch (r. temporalis medius - fig.1 - 9) crossed the middle of the caudal ectosylvius sulcus towards the upper section of the caudal suprasylvius sulcus and then to the end of the marginal sulcus.

Superior temporal branch (r. temporalis superior - fig.1 - 10) is a terminal branch of the middle cerebral artery which most often emerges from the end of the sylvius fissure and runs towards the marginal sulcus. Its terminal branches do not exceed the internal marginal sulcus.

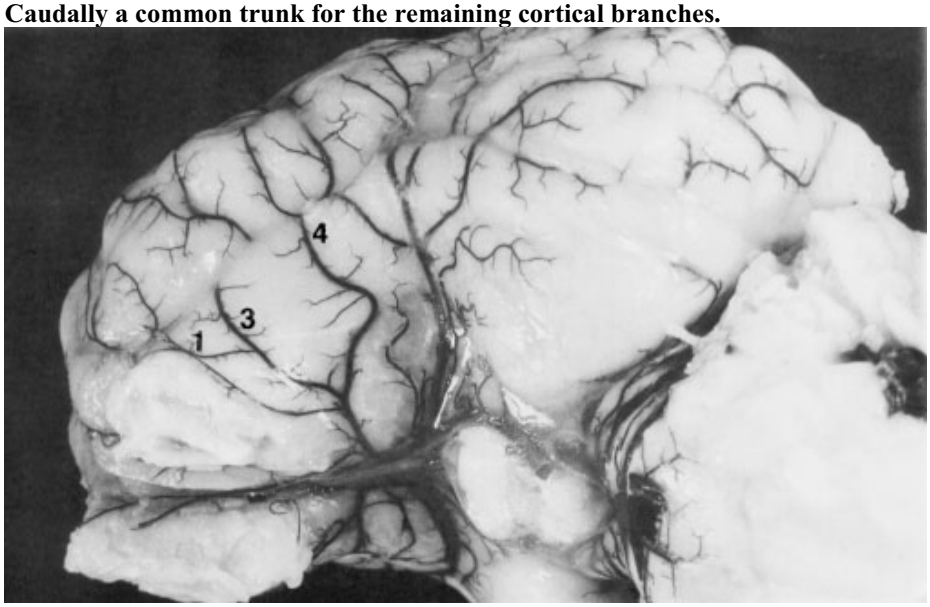
The above branches departed from the rostral cerebral artery in various ways. In 12 cases the middle cerebral artery departed as a single trunk. In these cases the rostral ethmoidal artery was an independent branch of the rostral cerebral artery (phot.1).

Phot. 1. Middle cerebral artery departing as a single trunk. Rostrally relative to the trunk the rostral artery gives off the anterior rhinal artery - 1, posterior rhinal artery - 2, orbital branch - 3, inferior frontal branch - 4, superior frontal branch - 5, anterior parietal branch - 6, posterior parietal branch - 7, inferior temporal branch - 8, media temporal branch - 9, superior temporal branch - 10.



When the rostral cerebral artery gave off two branches of the middle cerebral artery, the second branch running rostrally formed a common trunk for the rostral ethmoidal artery , orbital branch and inferior frontal branch (phot.2).

Phot. 2. Two trunks of middle cerebral artery . Rostral trunk divided into anterior rhinal artery - 1, orbital branch - 3, inferior frontal branch - 4. Caudally a common trunk for the remaining cortical branches.



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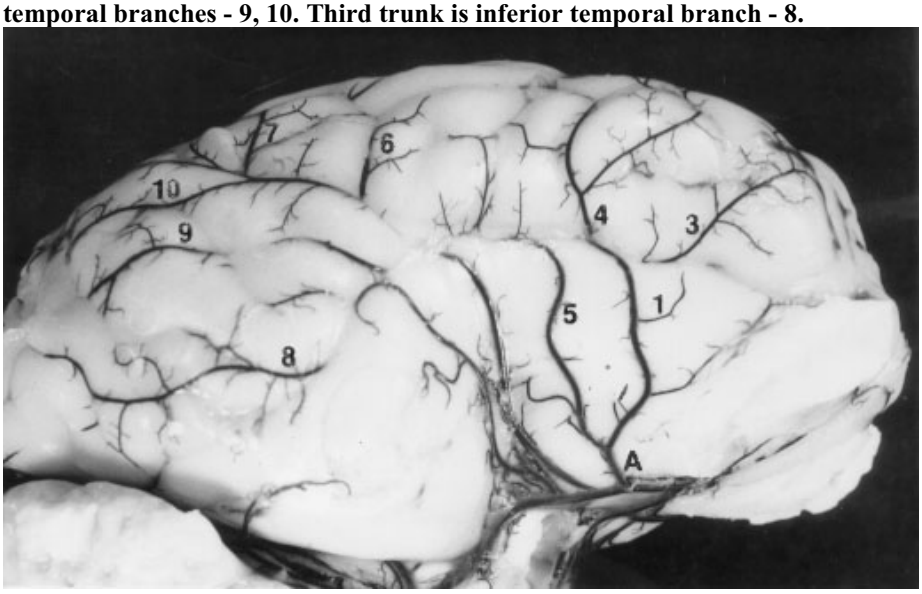
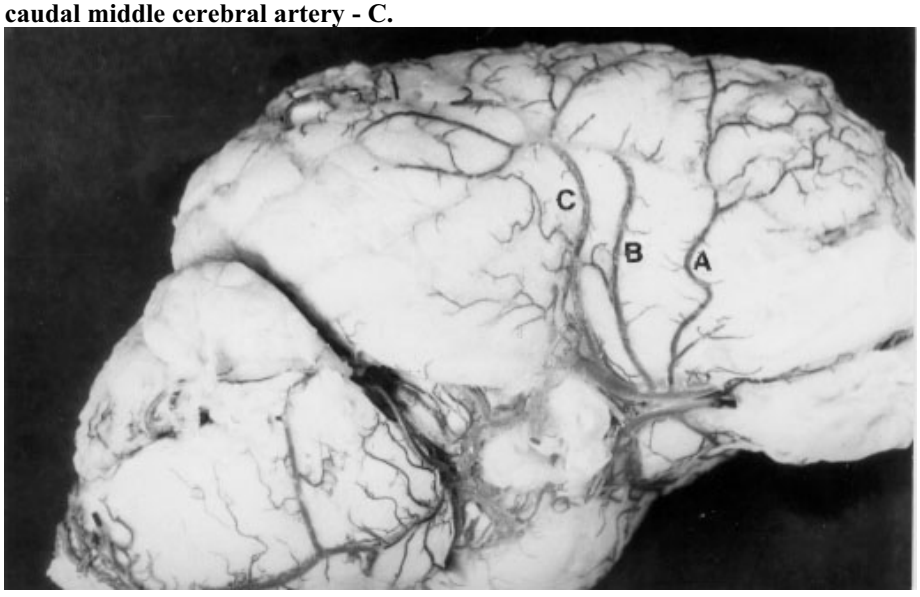
Division of the middle cerebral artery into three independent branches displayed two variants. On cerebral 19 hemispheres the first branch was a common trunk for the inferior temporal branch and the caudal ethmoidal artery, the second - a common trunk for both parietal branches and the media and superior temporal branches. The last, third branch, gave off the rostral ethmoidal artery and all the frontal branches; for this reason the branch was termed the rostral middle cerebral artery (a. cerebri media anterior - phot.3 - A).

Phot. 3. Three trunks of middle cerebral artery. Anterior middle cerebral artery - A, which gives off anterior rhinal artery - 1, orbital branch - 3 and frontal branches - 4, 5. Second trunk is a common trunk for parietal branches - 6, 7 and temporal branches - 9, 10. Third trunk is inferior temporal branch - 8.



In the remaining 16 preparations there were three equal branches. There was a common trunk for the temporal branches, termed caudal middle cerebral artery (a. cerebri media posterior), a common trunk for parietal branches, termed the upper middle cerebral artery (a. cerebri media superior) and a common trunk for the frontal branches, termed the rostral middle cerebral artery (a. cerebri media anterior - phot.4 - A, B, C).

Phot. 4. Three equal trunks of the middle cerebral artery departing from the rostral middle cerebral artery - A, upper middle cerebral artery - B , and caudal middle cerebral artery - C.



DISCUSSION

In the wild boar the middle cerebral artery supplies with blood the same regions of the brain as in the other mammal species studied hitherto. It divides into the same basic branches, which is in agreement with the descriptions presented by other authors (Jablonski et al. 1996, Wegrzyn and Roskosz 1983, Wiland 1991).
Significant differences involve mainly the way of departure of particular groups of branches from the rostral cerebral artery. In 12 (13%) hemispheres, where the main departure was formed by a single common trunk, only the rostral ethmoidal artery departed as an independent branch.
In the light of these observations, in the wild boar the middle cerebral artery divided into two branches in 57 (62%) cases and in three branches in 35 (38%) cases.
It is also interesting to note that in the wild boar in 35 (38%) cases frontal branches departed as the middle anterior cerebral artery . Similarly Wiland (1991) found it in dogs in 48.20% cases. In other studied species it was found in a much lower percentage of cases division of the middle cerebral artery into three independent branches was found only in the wild boar.

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