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THE MAIN BRANCHES OF THE MIDDLE CEREBRAL ARTERY IN ELK (*Alces alces*)

Ryszard Jablonski, Benedykt Skoczylas, Cezariusz Wiland

*Department of Animal Anatomy, University of Technology and Agriculture, Bydgoszcz,
Poland*

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ABSTRACT

The main branches of the middle cerebral artery were defined in 16 cerebral hemispheres. It was observed that in 14 (87.5%) hemispheres, the main trunk of the middle cerebral artery bifurcated into two common branches which, in turn, branched further into cortical branches. The rostral branch gave rise to frontal and parietal branches. In one hemisphere (6.25%), the rostral cerebral artery bifurcated into two independent middle cerebral branches.

Key words: middle cerebral artery, elk

INTRODUCTION

Cortical branches of the middle cerebral artery have been investigated in different ruminant species, e.g. red deer, roe-deer, cow, Jablonski et al., (1996,1997,1999), as well as in European bison Wegrzyn et al., (1983).

The researches show that the terminal branches of the middle cerebral artery in those species reach the same cerebral cortex areas. Differences appear in the way the respective branches depart from, both from the cerebral arterial circle and the way the main arterial trunk of the middle cerebral artery divides on the convex surface of the encephalon. Bearing the above in mind, the elk was investigated and the results obtained were compared with those presented in literature.

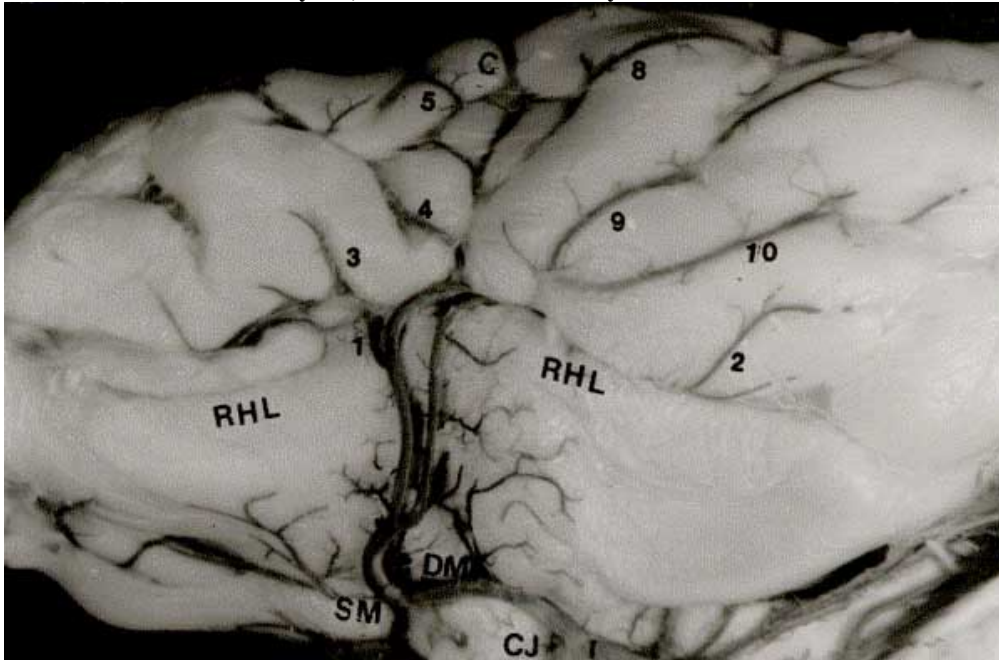
MATERIALS AND METHODS

To observe the middle cerebral artery the heads of eight elks obtained from the specimens of the Pomerania region were used. Both hemispheres were being observed, namely a total of 16 middle cerebral arteries which were filled with liquid latex. The heads were fixed in 5% hydrochloric acid and encephalon was being removed in each case. Finally the branches of the middle cerebral artery were being sign-posted and photographed.

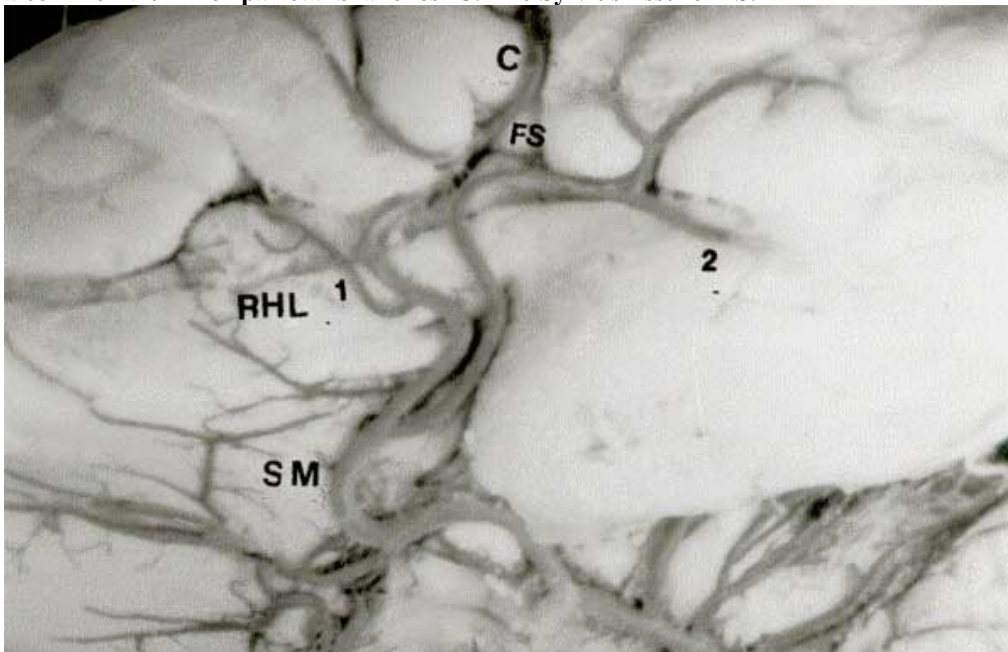
RESULTS

In elk, the supradural mirabile rete, covering hypophysis, gave rise to cerebral cervical arteries (a. cerebri cervicales [Phot. 1.-CJ](#)) running towards the encephalon base. The cerebral cervical artery, having gone through dura mater, branched rostrally into rostral cerebral artery (a. cerebri rostralis - [Phot. 1.-DM](#)). The middle cerebral artery (a. cerebri media - [Phot. 1. SM](#)) remained the most powerful branch of the rostral cerebral artery supplying a considerable part of the telencephalon. The initial part of the main trunk of the middle cerebral artery positioned itself on the surface of the optical tract and then bent before the rostral margin of the piriform lobus and ran towards the lateral rhinal sulcus (sulcus rhinalis lateralis - [Phot. 1,2-RHL](#)). Before it reached the lateral rhinal sulcus, in 14 (87.5%) of the specimens researched it bifurcated into two branches ([Phot. 1,2](#)). One constituted the common trunk for temporal and posterior olfactoral branches ([Phot. 2](#)). The posterior olfactoral artery (a. rhinalis posterior -2), having separated at the level of the lateral rhinal sulcus, ran under its surface. Its terminal branches got onto the cortex surface again and bifurcated beyond the sulcus. ([Phot. 1](#)). On the surface of the cortex one could identify further temporal branches, namely inferior temporal branch (r. temporalis inferior -10), middle temporal branch (r. temporalis medium -9) and superior temporal branch (r. temporalis superior -8). The one branching off rostrally gave rise to anterior olfactoral artery (a. rhinalis anterior-1), orbital branch (r. orbitalis -3), inferior frontal branch (r. frontalis inferior-4) superior frontal branch (r. frontalis superior -5) as well as the common trunk of the parietal branches -C, which lay inside the Sylvius fissure (fissura sylvia - [Phot. 2-FS](#)). The trunk bifurcated further into anterior and posterior parietal branches (r. parientalis anterior, posterior).

Phot. 1. Bifurcation of the middle cerebral artery SM in elk into two main branches. The one constitutes a common trunk of posterior olfactoral artery -2, inferior temporal branch -10, middle temporal branch -9 and superior temporal branch -8. The rostral branch constitutes a common trunk of the anterior olfactoral artery -1, orbital branch -3, inferior frontal branch -4 and superior frontal branch -5 as well as parietal branches -C. Cervical cerebral artery CJ, rostral cerebral artery DM. Lateral rhinal sulcus -RHL.



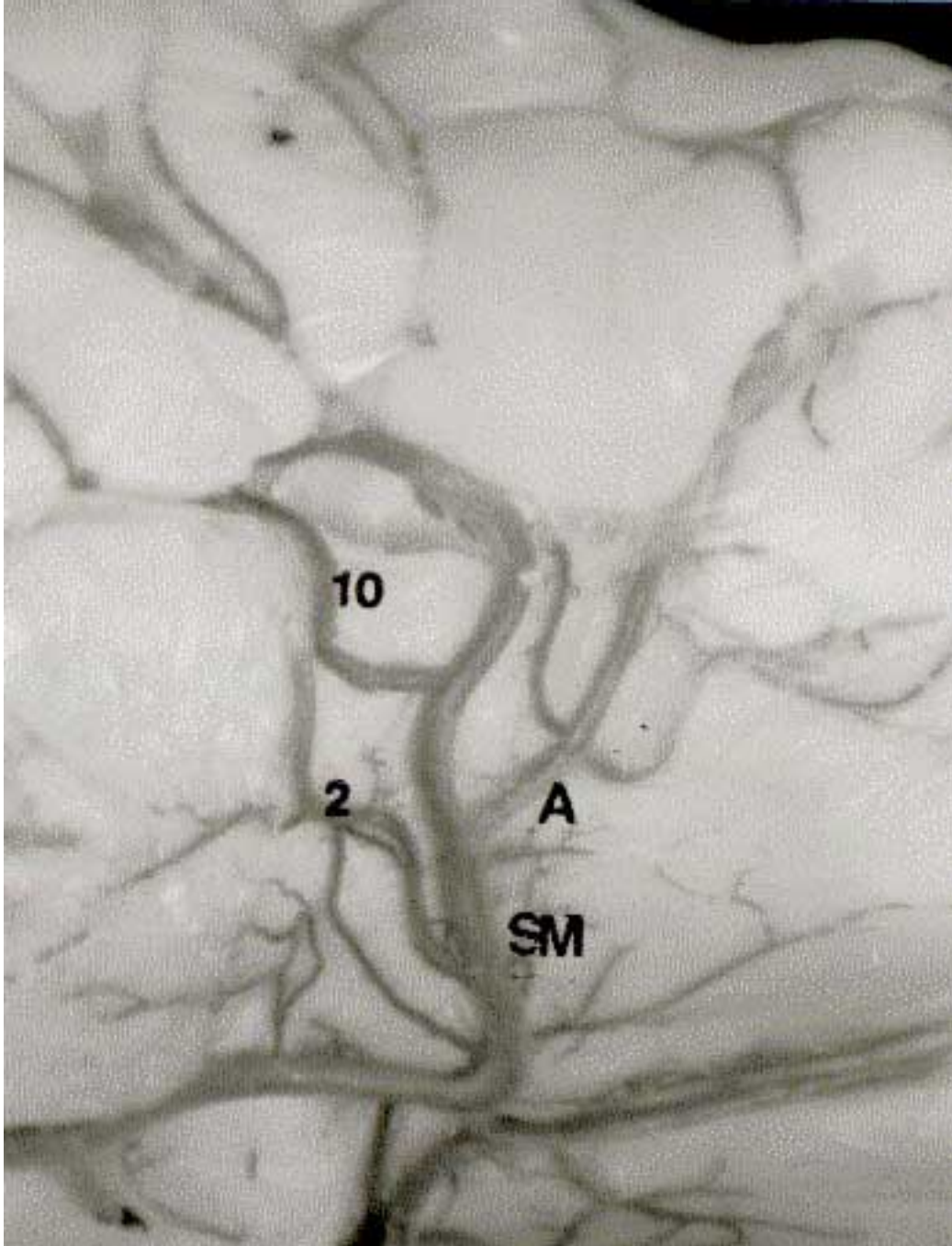
Phot. 2. Bifurcation of the middle cerebral artery SM in elk into two branches. The one constitutes a common trunk for posterior olfactoral artery -2 and all the temporal branches. Rostral branch gives rise to anterior olfactoral artery -1, frontal branches and a common trunk for parietal branches -C. The Sylvius fissure -FS.



As compared with the description of the middle cerebral branches provided, their division on two cerebral hemispheres was different. On the one cerebral hemisphere (6.25%) ([Phot.3](#)), the main trunk of the middle cerebral artery branched off into, first, posterior olfactoral artery -2,

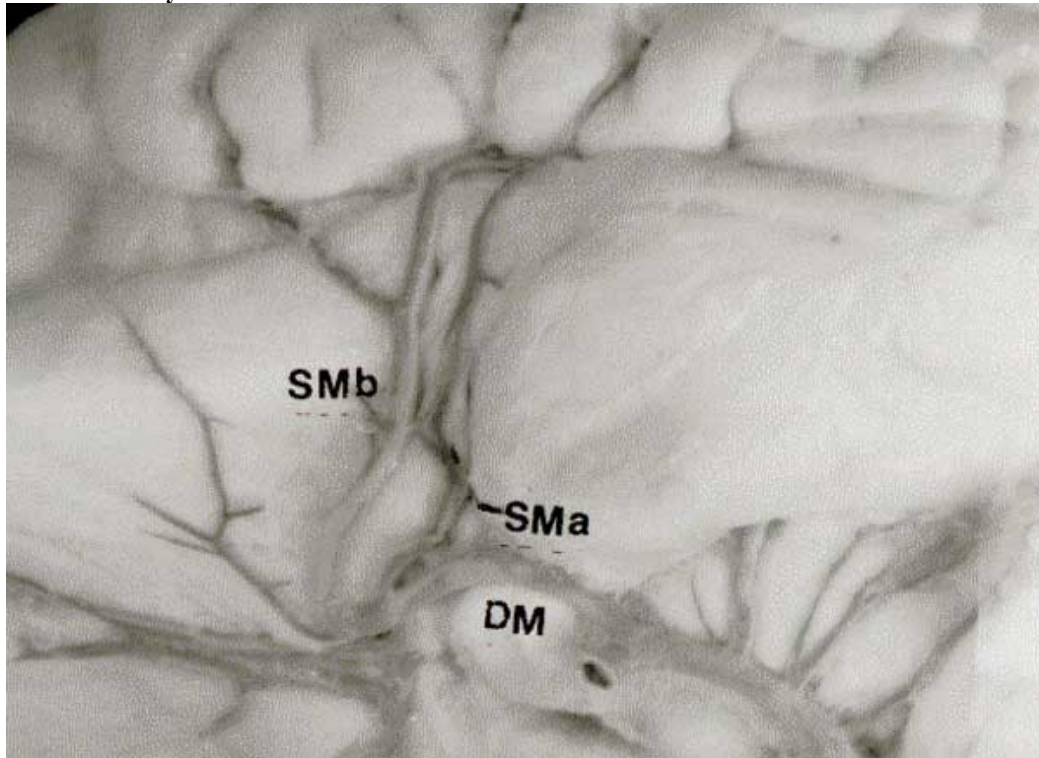
and then the common trunk for anterior olfactoral artery and all the frontal branches. -A. Having separated from the main trunk of the inferior temporal branch –10, it went further and, having passed the lateral rhinal sulcus, it went deep under the surface of the Sylvius fissure.

Phot. 3. The main trunk of the middle cerebral artery -SM branches off into posterior olfactoral artery -2, a common trunk of anterior olfactoral artery and frontal branches -A, then inferior temporal branch -10 and then the main trunk descends into the Sylvius fissure.



On the other hemisphere ([Phot.4](#)), the rostral cerebral artery DM, gave two independent branches of the middle cerebral artery SM-a and SM-b.

Phot. 4. Two independent middle cerebral arteries SM-a, SM-b. departing from the rostral cerebral artery DM.



DISCUSSION

The middle cerebral artery in elk supplies the same areas of the encephalon as in the other ruminant species and bifurcates into the same branches. The differences are found in the way it divides on the surface of the cortex. In elk in 87.5% specimens the bifurcation of the main trunk into two branches giving rise to further cortical branches was observed. The splitting of the middle cerebral artery into two branches in red deer was identified in 57.1 %, Jablonski et al., (1996) in roe-deer in 30.8% (Jablonski et al.,1997) in cow in 18.8 % , Jablonski et al., (1999)of the specimens researched. Comparing the branches of successive branches, it was observed that all the frontal and parietal branches departed from those branching off more rostrally; parietal branches appeared first as single branches. Such a departure of respective arterial complexes, Wiland (1991), Jablonski et al., (1996) define as anterior middle cerebral artery (a. cerebri media anterior). Similarly the other main branching giving rise to temporal branches, is defined as the posterior middle cerebral artery (a. cerebri media posterior).

A double middle cerebral artery in elk was observed on one cerebral hemisphere, which amounts to 6.25% cases. Whereas Wegrzyn et al., (1983) identified double middle cerebral arteries on two hemispheres in European bison (12.5% of the cases examined).

According to Wiland and Brudnicki (1984), multiple middle cerebral arteries were observed in all the pigs and wild boars researched, and in other species they were defined as vascular variations.

Comparing the results of the observations conducted and the data provided in literature, it seems that the way of bifurcation of the main branches of the middle cerebral artery in elk is closer to the bifurcation in European bison than in red deer or roe-deer.

CONCLUSIONS

1. Middle cerebral artery in elk branches out along its course into anterior and posterior olfactoral arteries as well as three frontal branches, two parietal branches and three temporal branches.
2. Its respective branches derive from the main trunk of the middle cerebral artery or form trunks which join two or a few branches.
3. In elk the trunk of the middle cerebral artery was most commonly observed to bifurcate into two main branches.

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Submitted:

Ryszard Jablonski, Benedykt Skoczylas, Cezariusz Wiland
Department of Animal Anatomy
University of Technology and Agriculture
Bernardynska 6/8, 85-029 Bydgoszcz, Poland

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