Original article

Systematization, distribution and territory of the rostral cerebral artery on the brain surface in chinchilla (*Chinchilla lanigera*)

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Abstract

The present study has analyzed thirty chinchilla (*Chinchilla lanigera*) brains, injected with latex, aiming to systematize and describe the distribution and the vascularization territories of the rostral cerebral artery. The rostral cerebral artery was the terminal branch of the terminal branch, right and left, of the basilar artery, projected from the emittion of the middle cerebral artery, rostromedially, crossing dorsally the optic nerve until it reaches the cerebral longitudinal fissure, ventrally. Its branches were distributed mostly on the paleopallium, supplying the olfactory trigone, the medial olfactory tract, the olfactory peduncle and the olfactory bulb. The branches to the neopallium vascularized the entire medial surface, except for the tenctorial part of it, the frontal pole and a zone that was extended from the frontal to the occipital poles, medially to the vallecula, on the convex surface of the cerebral hemisphere. The first collateral branch of the rostral cerebral artery was the medial branch, which entered into the longitudinal fissure of the brain and continued as rostral inter-hemispheric artery. The rostral cerebral artery continued rostrally emitting central branches and the medial and lateral arteries of the olfactory bulb, to the paleopallial region of the chinchilla brain. After the emittion of the medial artery of the olfactory bulb, the rostral cerebral artery continued to follow the cerebral longitudinal fissure, as internal ethmoidal artery, its terminal branch.

Keywords: anatomy, brain, arteries, rodent, chinchilla.

1 Introduction

Research on the functioning of the central nervous system has been intensifying in recent years. Therefore, it is necessary to improve the knowledge about the cerebral vascularization, and for that much work has been developed to supply the necessities of this basic knowledge. According to Beccari (1943) rodents are macrosmatic (they present a very developed paleopallial area), lissencephalic animals, in other words, they do not present gyri or sulci on the neopallial surface and present a non developed corpus callosum. The telencephalon is well developed caudally covering the entire region of the mesencephalon. Tandler's (1898) classic paper regarding the comparative anatomy and the head arteries developmental history, as well as the phylogenetic and ontogenetic study of De Vriese (1905), which classified several animal groups according to their encephalic irrigation, showed a variety of vascular models associated with the phylogenetic development of the brain. The present study will discuss the rostral cerebral artery of the chinchilla, *Chinchilla lanigera* (Molina, 1782). Due to the lack of information about this species both in classic literature and in specialized articles, our results will be compared to the results of authors who dedicated themselves to other rodents, like Scremin (1995) with *Mus rattus*, Michalska (1995) and Librizzi, Biella, Cimino et al. (1999) with *Guinea pig* (*Cavia porcellus*), Panesar, Hamrahi, Harel et al. (2001) with *Chinchilla lanigera*, Reckziegel, Liendemann and Campos (2001) with capybara (*Hydrochoerus hydrochaeris*), Araújo and Campos (2005) with *Chinchilla lanigera* and Azambuja (2006) with nutria (*Myocastor coypus*). The present work has the aim to describe the systematization, distribution and vascularization territory of the rostral cerebral artery on the surface of the brain in chinchilla.

2 Material and methods

Thirty brains of adult *Chinchilla lanigera*, 13 males and 17 females, derived from the cities of Santa Maria and Viamão, State of Rio Grande do Sul, Brazil, were used. The animals were heparinized (Heparin, Cristália Produtos Químicos Farmacêuticos Ltda, Itapira, SP, Brazil) with 5000 IU/animal and, after 30 minutes they were sacrificed with 8 mL of 2.5% thiopental (Thiopental, Cristália Produtos Químicos Farmacêuticos Ltda, Itapira, SP, Brazil), both intraperitoneally. Subsequently, the thorax was opened, the cardiac apex and the two cranial cava veins were sectioned, the thoracic aorta artery was clamped and the aortic arch was cannulated through the left ventricle. The arterial system was washed with refrigerated 0.9% saline solution and filled with a latex injection (Cola 603, Bertoncini Ltda, São Paulo, SP, Brazil) colored with red pigment (Suvinil Corante, Basf S.A., São Bernardo do Campo, SP, Brazil). The animals were submerged in running water for one hour until the latex was polymerized. The skin was removed and a bone window was opened in the skullcap. The specimens remained immersed in a 20% formaldehyde solution for at least seven days for tissue fixation. After this period, the brains were removed with the spinal cord segment from the skullcap and the vertebral column, the dura mater was removed and the arteries were dissected. The material analysis was performed under magnifying glasses (LTS – 5X increase and Stemi SV8 – Zeiss – Goettingen, Germany), and to illustrated the results, schematic drawings of the arteries were made in dorsal, ventral, left and right lateral and medial views of the cerebral hemisphere. Furthermore, photographic records of all preparations were made for the documentation of the results. Nomina Anatomica Veterinaria (ICVGAN, 2005) was used for naming the cerebral arteries and their ramifications, adding some terms according to the authors interpretations based on previous reports. For the statistic analysis of the results, percentage calculations were applied.

3 Results

The rostral cerebral artery was the terminal branch of the terminal branch, right and left, of the basilar artery, projected from the emittion of the middle cerebral artery, rostromedially, crossing dorsally the optic nerve until it reaches the cerebral longitudinal fissure, ventrally. Its branches were distributed mostly on the paleopallium, supplying the olfactory trigone, the medial olfactory tract, the olfactory peduncle and the olfactory bulb. The branches to the neopallium vascularized the entire medial surface, except for the tenctorial part of it, the frontal pole and a zone that was extended from the frontal to the occipital poles, medially to the vallecula, on the convex surface of the cerebral hemisphere. The first collateral branch of the rostral cerebral artery was the medial branch, which entered into the cerebral longitudinal fissure and continued as rostral inter-hemispheric artery. The rostral cerebral artery continued rostrally emitting central branches and the medial and lateral arteries of the olfactory bulb, to the paleopallial region of the chinchilla brain. After the emittion of the medial artery of the olfactory bulb, the rostral cerebral artery continued to follow the cerebral longitudinal fissure, as internal ethmoidal artery, its terminal branch. The rostral cerebral artery to the right, in 100% of the samples, and, to the left in 96.7%, was present as a single vessel. But, in 3.3% to the left the rostral cerebral artery was absent, being found, in its place of origin, a thin vestigial vessel (Figure 1).

The medial branch of the rostral cerebral artery, usually emitted from a single antimere, entered deeply into the cerebral longitudinal fissure, forming the rostral inter-hemispheric artery, a single median vessel, which was dorsally projected until reaching the corpus callosum's knee, and then being divided into its two terminal branches, right and left. During its pathway, the rostral inter-hemispheric artery emitted a sequence of rostral hemispheric collateral and rostral medial hemispheric branches and, its terminal branch reached the convex surface of the cerebral hemisphere, next to the caudal pole and emitted a thin anastomotic branch to the terminal branch of the caudal inter-hemispheric artery (branch of the caudal cerebral artery), next to the corpus callosum's splenium. The rostral inter-hemispheric artery was originated from the medial branch of the left rostral cerebral artery in 40%, and from the right rostral cerebral artery in 36.7%, of the samples. Yet in 13.3% of the preparations, it was formed from the union of the medial branches of the rostral cerebral arteries, right and left, and in 10% of the cases, the rostral inter-hemispheric artery was formed by the medial branch of the left rostral cerebral artery, which received a thin anastomosis from the medial artery of the olfactory bulb, from the opposite antimere. Still regarding the rostral inter-hemispheric artery, it was divided into right and left branches, next to the corpus callosum's knee in 66.6%, and in 26.7% this division occurred in the initial third of the corpus callosum's trunk, while in 6.7% of the cases it occurred at the level of the corpus callosum's rostrum (Figure 2).

The first collateral branches of the rostral inter-hemispheric artery were the rostral hemispherical branches (Figure 2). These vessels were of thin caliber, emitted from the rostral inter-hemispheric artery, between its origin, and before it reached the corpus callosum's knee, vascularizing the medial surface of the cerebral hemisphere, in a small area rostral to the corpus callosum's rostrum and knee (Table 1).

The right and left branches of the rostral inter-hemispheric artery, when surrounding the corpus callosum's knee and trunk, emitted as collateral branches, the rostral medial hemispheric branches. These vessels were distributed on the medial surface of the cerebral hemisphere, reaching the convex surface, since the frontal pole until the occipital pole. Its terminal ramifications ended their path on the convex surface of the cerebral hemisphere, anastomosing with the terminal branches of the collateral vessels of the rostral, medial and caudal cerebral arteries (Table 2). Some rostral medial hemispheric branches were emitted from the rostral inter-hemispheric artery, before its division into right and left branches. In some samples, vessels originated from the

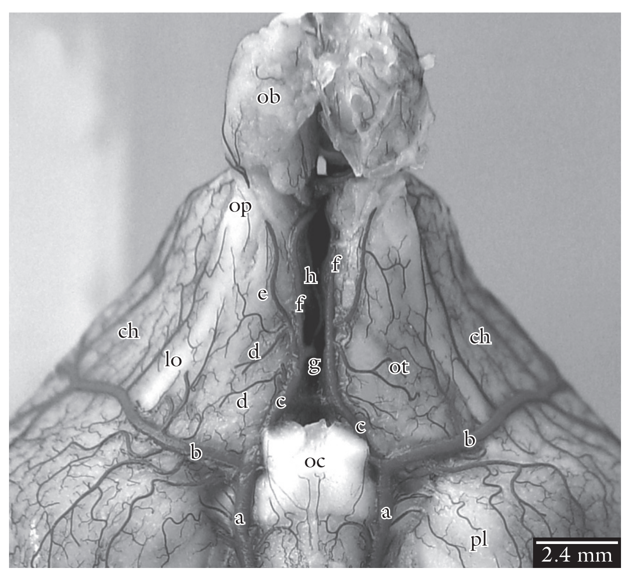

Figure 1. Ventral view (detail) of the base of the cerebral hemispheres in chinchilla showing the origin and ramification of the rostral cerebral artery: a – terminal branch of the basilar artery; b – middle cerebral artery; c – rostral cerebral artery; d – central branches of the "c"; e – lateral artery of the olfactory bulb; f – internal ethmoidal artery; g – medial branch of the "c"; h – medial artery of the olfactory bulb; ob – olfactory bulb; op – olfactory peduncle; lo – lateral olfactory tract; pl – piriform lobe; ot – olfactory trigone; oc – optic chiasma; ch – cerebral hemisphere. Barr: 2.4 mm.

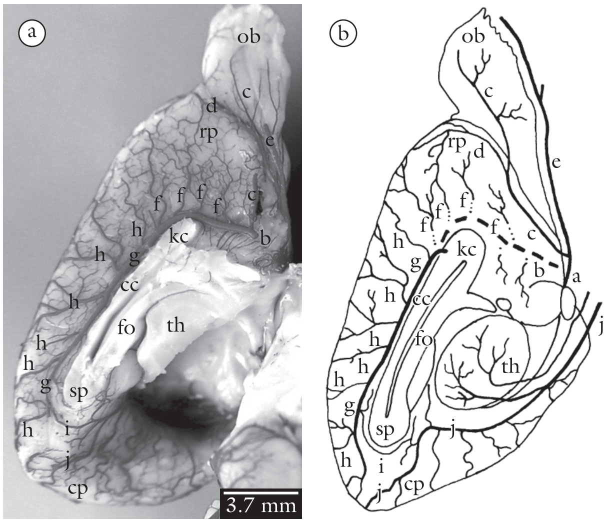

Figure 2. Medial view of the left cerebral hemisphere in the chinchilla, showing pattern distribution of the rostral cerebral artery: a) picture and b) schematic draw. a – rostral cerebral artery; b – rostral inter-hemispheric artery; c – medial artery of the olfactory bulb; d – frontal hemispheric artery; e - internal ethmoidal artery; f – rostral hemispheric branches; g – left branch of the "a"; h - rostral medial hemispheric branches; i – anastomose of the terminal branch of the rostral (left branch) and caudal inter-hemispheric arteries; j – caudal cerebral artery; ob – olfactory bulb; rp – rostral pole; cp – caudal pole; cc – corpus callosum; fo – fornix; sp – splenium of the corpus callosum; kc – knee of the corpus callosum; th – thalamo. Barr: 3.7 mm.

Table 1. Frequency of the rostral hemispherical branches emitted from the inter-hemispherical artery.

Branches number	Rostral hemispherical branches	
	Right	Left
1	50%	50%
2	26.7%	36.6%
3	16.6%	6.7%
zero	6.7%	6.7%

Table 2. Frequency of the rostral medial hemispherical branches emitted from the rostral inter-hemispherical artery (RIHA) on the medial surface of the brain.

Branches number	Rostral medial hemispherical branches	
	Emitted from the right branch of the RIHA to the right medial surface of the cerebral hemisphere	Emitted from the left branch of the RIHA to the left medial surface of the cerebral hemisphere
2	10%	3.3%
3	10%	10%
4	16.7%	13.4%
5	36.7%	40%
6	16.7%	13.4%
7	3.3%	3.3%
8	6.7%	6.7%
9		3.3%
11		3.3%
zero		3.3%

right or from the left branch reached, and were distributed on the medial surface of the opposite antimere.

The rostral cerebral artery and its ramifications, when running over the ventral surface of the cerebral hemisphere, emitted the central branches which supplied a large part of the paleopallial region, comprising the rostral two-thirds of the olfactory trigone, the medial olfactory tract, the olfactory peduncle and the olfactory bulb (Figure 1). These branches were originated from the main axis of the rostral cerebral artery, the lateral artery of the olfactory bulb, or from a common trunk between the medial and lateral arteries of the olfactory bulb. The central branches emitted innumerous striated (perforating) branches, which penetrated in the rostral perforated substance, vascularizing the striated body (Figure 1). The main axis of the rostral cerebral artery, during its path on the base of the brain, emitted from zero to four central branches, that were distributed on the olfactory trigone, and may reach even the medial olfactory tract. The lateral artery of the olfactory bulb emitted from one to two central branches, well-developed, to the olfactory trigone. When a common trunk between the medial and lateral arteries of the olfactory bulb was formed, it emitted from one to three central branches, also well-developed, to the rostral part of the olfactory cortex of chinchilla. The lateral artery of the olfactory bulb, during its path on the base of the brain, emitted from one to four central branches poorly developed, which were distributed on the olfactory trigone, and may reach even the medial olfactory tract.

The lateral artery of the olfactory bulb was, usually, a thin caliber vessel emitted from the rostral cerebral artery, next to the origin of its medial branch (Figure 1). It was projected laterorostrally, irrigating the ventral and lateral surface of the olfactory bulb and was individually originated from the rostral cerebral artery or in a common trunk with the medial cerebral artery, of the olfactory bulb (Table 3).

The medial artery of the olfactory bulb was, usually, a single vessel, individually, emitted by the rostral cerebral artery of the same antimere (Figures 1-2). It was projected rostrally in the interior of the cerebral longitudinal fissure, reaching the olfactory bulb on its medial and dorsal faces. It emitted as its collateral branch, generally, the frontal hemispheric artery, next or inside the medial rhinal sulcus (Table 4). The frontal hemispheric artery turned medially, running the rostral pole of the cerebral hemisphere, emitting branches which were distributed on the frontal lobe, on the medial and convex surfaces of the cerebral hemisphere. In 70% to the right and 73.3% of the pieces to the left, the frontal hemispheric artery was emitted by the medial artery of the olfactory bulb. In 23.3% to the right and 20% to the left, the frontal hemispheric artery was a branch of the rostral inter-hemispheric artery (Figure 2). In the remaining cases, in both antimeres, there was some origin variation.

The internal ethmoidal artery was a vessel of great caliber, being the natural continuation of the rostral cerebral artery, as its terminal branch. Its origin was considered after the emittion, individual or in trunk, from the medial artery of the olfactory bulb. The internal ethmoidal artery, after anastomosing with the external ethmoidal artery, crossed the lamina cribosa of the ethmoid, to distribute in its lateral masses, in the nasal cavity. In 86.7% to the right and 90% to the left, the internal ethmoidal artery was terminal branch from the rostral cerebral artery, and in 13.3% of the samples

Table 3. Forms of origin of the lateral olfactory bulb artery. RCA: rostral cerebral artery; MOBA: medial olfactory bulb artery; MCA: middle cerebral artery; RRCA: right rostral cerebral artery.

	Origin of the lateral olfactory bulb artery			
	Individually from the RCA	**Common trunk with the MOBA**	**Branch of the MCA**	**Branch of the medial branch of the RRCA**
Right	73.3%	26.7%		
Left	66.7%	26.7%	3.3%	3.3%

Table 4. Forms of origin of the medial olfactory bulb artery. RCA: rostral cerebral artery; LOBA: lateral olfactory bulb artery; RRCA: right rostral cerebral artery.

	Origin of the medial olfactory bilb artery			
	Individually from the RCA	**Common trunk with the LOBA**	**Branch of the medial branch of the RCA**	**Branch of the medial branch of the RRCA**
Right	53.3%	26.7%	20%	
Left	50%	26.7%	16.6%	6.7%

to the right and 10% to the left, was branch from the internal ethmoidal artery from the opposite antimere, only being emitted at the cerebral longitudinal fissure, between the olfactory bulbs (Figures 1-2).

The terminal ramifications of the rostral cerebral artery (rostral medial and frontal hemispheric branches) anastomosed "in osculum" with the terminal segments of the middle cerebral artery, through its rostral convex hemispheric branches, on the convex surface of the cerebral hemisphere of chinchilla, since the rostral pole, parallelly following the cerebral longitudinal fissure towards caudal direction, limited by the vallecula, until the caudal pole of the cerebral hemisphere. The terminal ramifications of the caudal cerebral artery, made anastomosis with the terminal ramifications of the rostral cerebral artery, on the medial surface at the level of the corpus callosum's splenium and/or next to the caudal pole and on the convex surface of the cerebral hemisphere, bordering the cerebral transverse fissure (Figure 3).

The territory of the rostral cerebral artery in chinchilla (*Chinchilla lanigera*) comprehended the rostral two-thirds of the olfactory trigone, the medial olfactory tract, the olfactory peduncle, the olfactory bulb, the entire medial surface of the cerebral hemisphere, except for the tenctorial part of it and, on the convex surface of the cerebral hemisphere, since the rostral pole until next to the caudal pole, medially to the vallecula and a small area on the convex surface, bordering the cerebral transverse fissure (Figure 4).

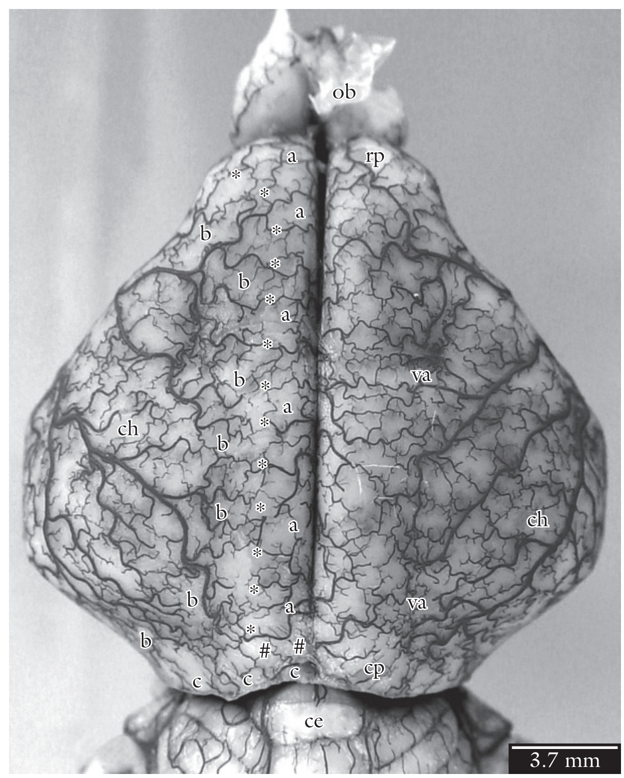

Figure 3. Dorsal view of the cerebral hemispheres in the chinchilla, showing the limits of the territorial area and anastomoses of the rostral cerebral artery with middle (*) and caudal (#) cerebral arteries: a – terminal branches of the rostral cerebral artery; b - terminal branches of the middle cerebral artery; c - terminal branches of the caudal cerebral artery; ob – olfactory bulb; rp – rostral pole; va – vallecula; ch – cerebral hemisphere; cp – caudal pole; ce – cerebellum. Barr: 3.7 mm.

4 Discussion

Araújo and Campos (2005) concluded in their systematic work of the arteries from the base of the brain in chinchillas, that the cerebral blood supply of this species depends on a single source constituted by the terminal branches of the vertebral arteries, composing the vertebral-basilar system. They cited that the vertebral arteries, when penetrating the foramen magnum, formed the basilar artery by anastomosis (SCREMIN, 1995; LIBRIZZI, BIELLA, CIMINO et al., 1999; PANESAR, HAMRAHI, HAREL et al., 2001). The basilar artery emitted some collateral branches such as the caudal cerebellar artery (RECKZIEGEL, LINDEMANN and CAMPOS, 2001 in capybara; AZAMBUJA, 2006 in nutria), directed up rostrally to the rostral sulcus of the pons, where it was divided in its two terminal branches (RECKZIEGEL, LINDEMANN and CAMPOS, 2001; AZAMBUJA, 2006). The rostral cerebellar, rostral tectal and caudal cerebral arteries were systematized as collateral

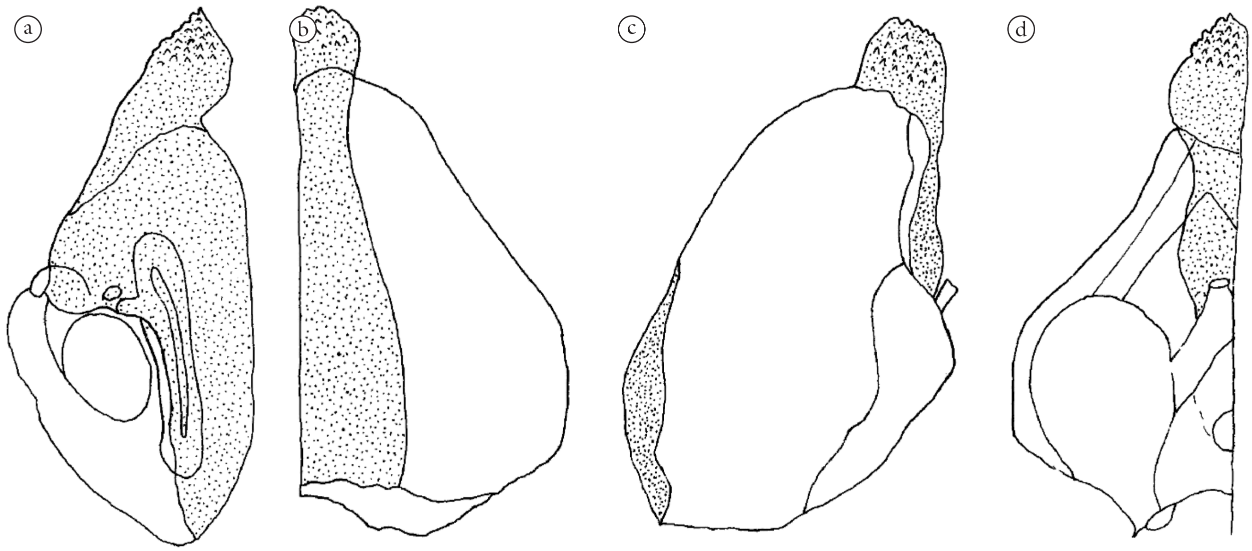

Figure 4. Schematic draw, showing the territory area of the rostral cerebral artery on the surface of the brain in chinchilla. The stippled area corresponds to the distribution of the branches of the rostral cerebral artery: a) medial view; b) dorsal view; c) lateral view; d) ventral view of the right cerebral hemisphere.

branches of the terminal branches of the basilar artery, and the middle cerebral artery as the last collateral branch (RECKZIEGEL, LINDEMANN and CAMPOS, 2001; AZAMBUJA, 2006). Also according to Araújo and Campos (2005), the rostral cerebral artery was the terminal branch of the terminal branches of the basilar artery, which is a developed vessel, in the majority of the pieces, in both antimeres (RECKZIEGEL, LINDEMANN and CAMPOS, 2001; AZAMBUJA, 2006). The rostral inter-hemispherical, lateral olfactory bulb, medial olfactory bulb arteries were collateral branches of the rostral cerebral artery, and the internal ethmoidal artery, was its terminal branch (ARAÚJO and CAMPOS, 2005; AZAMBUJA, 2006).

According to Araújo and Campos (2005), the rostral cerebral artery was the terminal branch of the terminal branch, right and left, of the basilar artery, projected from the emittion of the middle cerebral artery, rostromedially (RECKZIEGEL, LINDEMANN and CAMPOS, 2001; AZAMBUJA, 2006). For the same authors, the rostral cerebral artery was present in the majority of the samples, also having cases where it was absent, one to the right and another to the left. Whereas for Azambuja (2006), the rostral cerebral artery was also a single vessel and well-developed in the majority of the encephala, but the author observed cases of duplicity and absence of this artery always to the right, not in agreement to what found in chinchilla. According to Scremin (1995), in his work about the vascular system in rats (*Mus rattus*) was described that the second terminal branch of the internal carotid was the rostral cerebral artery, which was projected towards cranial and medial direction, immediately ventral to the lateral border of the optic chiasm.

For Araújo and Campos (2005), the rostral cerebral artery presented as collateral branches the median inter-hemispheric rostral, lateral and medial arteries of the olfactory bulb and internal ethmoidal, its terminal branch. But for Azambuja (2006), the first collateral branch of the rostral cerebral artery was the medial branch, which entered into the cerebral longitudinal fissure and continued as rostral inter-hemispheric artery, the same being observed in chinchilla. Still for the same author, the rostral cerebral artery proceeded rostrally emitting central branches and the medial and lateral arteries of the olfactory bulb to the paleopallial region of the base of the brain of nutria, where after the emittion of the medial artery of the olfactory bulb, the rostral cerebral artery continued to follow the cerebral longitudinal fissure, rostrally, as the internal ethmoidal artery, its terminal branch, corresponding to what was found in chinchilla.

According to Azambuja (2006), the rostral inter-hemispheric artery was a single vessel, until the level of the corpus callosum's knee, generally originated from a single medial branch of a rostral cerebral artery, or from an anastomosis of the medial branch from the rostral, right and left, cerebral arteries (ARAÚJO and CAMPOS, 2005). Still for Azambuja (2006) the rostral inter-hemispheric artery, after penetrating in the cerebral longitudinal fissure, ventrally, it was dorsally projected, and just before it countered the corpus callosum's knee, it bifurcated originating the rostral, right and left, inter-hemispheric arteries. According to Reckziegel, Liendemann and Campos (2001), the rostral cerebral artery was projected medialdorsally towards the cerebral longitudinal fissure, and rostrodorsally to the optic chiasm, where it anastomosed with its contralateral homologue forming the rostral communicating artery. This artery, for its part, ramified to supply the corpus callosum, more rostral olfactory areas and the rostral pole of the cerebral hemisphere. Panesar, Hamrahi, Harel et al. (2001), studying the arterial blood supply to the auditive cortex of adult chinchillas, observed that the rostral cerebral arteries turned medially-toward to reach the longitudinal fissure between the cerebral hemispheres over the optic chiasm. And, in several mammal species the same were united by the rostral communicating artery, but in the majority of the cases this artery was not present, leaving the cerebral arterial circle rostrally opened. For Scremin (1995), the rostral cerebral artery turned medial and dorsally, anastomosing with its contralateral homologue, to form the azygos rostral cerebral artery (corresponding to the rostral inter-hemispheric artery in chinchilla), which went dorsally to reach the corpus callosum, where it originated the azygos pericallosal artery.

For Azambuja (2006) the rostral inter-hemispheric artery, emitted a sequence of hemispheric branches to the medial surface of the cerebral hemisphere, reaching the rostral two-thirds of this face. Their terminal branches anastomosed with caudal inter-hemispheric artery, branch of the caudal cerebral artery, at the level of the corpus callosum's splenium (ARAÚJO and CAMPOS, 2005). For Scremin (1995), during the origin transition of the azygos pericallosal, the azygos rostral cerebral artery emitted a sequence of cortical branches (corresponding to the rostral medial hemispheric branches of chinchilla) which turned dorsally to finally anastomose, "in osculum", with the termination of the medial branches of the middle cerebral artery. Still for the same author, on the medial surface of the cerebral hemisphere, anastomosis were observed among the branches of the azygos rostral cerebral, azygos pericallosal and middle cerebral arteries and, on the caudal region among the azygos pericallosal, middle cerebral and caudal cerebral arteries. But for Michalska (1995), in his study about the encephalic vascularization of the guinea pig, the rostral cerebral artery originated branches for the convex surface of the frontal and parietal lobes.

For Azambuja (2006), the lateral artery of the olfactory bulb was emitted from the main trunk of the rostral cerebral artery at the level, or next to, the olfactory peduncle's bipartition in the medial and lateral olfactory tracts. It was projected laterodorsally, irrigating the ventral and lateral surfaces of the olfactory bulb (ARAÚJO and CAMPOS, 2005). Still for Azambuja (2006), the medial artery of the olfactory bulb was a single vessel, emitted at the level of the olfactory peduncle, distributing on the medial and dorsal surfaces of the olfactory bulb (ARAÚJO and CAMPOS, 2005) and in the rostral extremity of the frontal pole of the cerebral hemisphere. But for Scremin (1995), at the level of the optic sulcus, the rostral cerebral artery originated the olfactory artery (corresponding to the internal ethmoidal artery in chinchilla), and after it emitted the lateral orbitofrontal artery (lateral artery of the olfactory bulb). Still for the same author, the azygos rostral cerebral artery (rostral inter-hemispheric artery) originated the medial orbitofrontal artery (medial artery of the olfactory bulb) for each hemisphere.

According to Azambuja (2006), the internal ethmoidal artery was a natural continuation of the main axis of the rostral cerebral artery, after the emittion of the medial and lateral arteries of the olfactory bulb (ARAÚJO and CAMPOS, 2005). For the author, the internal ethmoidal artery went deeply toward dorsal direction, between the olfactory bulbs, anastomosing, in each antimere, with the external ethmoidal artery (ARAÚJO and CAMPOS, 2005). After this anastomosis, they proceeded towards the interior of the nasal cavity through the lamina cribosa of the ethmoid, where they distributed on the structures of this cavity (SCREMIN, 1995; ARAÚJO and CAMPOS, 2005), corresponding to what was observed in chinchilla. But for Araújo and Campos (2005), either to the right or to the left, the internal ethmoidal artery was not only a branch from the rostral cerebral artery, but also from the internal ethmoidal artery from the opposite antimere, when one of them was absent, being the same found in chinchilla in a few pieces.

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