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Morphological evaluation of the choroidal arteries. A direct anatomic study

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SUMMARY

The Anterior Choroidal Artery (AChA), the Lateral Posterior Choroidal (LPChA) and the Medial Posterior Choroidal Arteries (MPChA) provide blood supply to the choroid plexus of the lateral ventricle and third ventricle. The objective of this study was to evaluate the morphology of the choroidal arteries in 74 unclaimed male cadavers, who underwent necropsy at the Institute of Legal Medicine and Forensic Sciences of Bucaramanga, Colombia. The AChA originated from the Internal Carotid Artery (ICA) in 96.6% of the cases, with a length of 10.1 ± 1.5 mm and 15.2 ± 1.7 mm for its pre-optic and post-optic segments respectively and had a diameter of 0.6 ± 0.16mm. The AChA originated branches to the optic tract (5.2), the anterior and posterior segment of the uncus of the hippocampus (3.4 and 2.4) and cerebral peduncles (2.6), before penetrating through the choroidal fissure. The MPChA originated from the pre-communicating segment of the posterior cerebral artery (ACP) in 97 cases (70.3%), its length was 38.1 ± 5.85 mm and its diameter 0.4 ± 0.14 mm; in three cases (2.2%) it was doubled. 46.3% of the MPChA presented proximal bifurcation at 8.7 ± 5.47 mm of their ACP origin, but in 17 cases (26.6%) an early bifurcation was found (less than 5 mm). The LPChA originated in the post-communicating segment (94.2%), without significant differences in presentation side (p= 0.189). Its length was 37.6 ± 7 mm and its diameter 0.5 ± 0.16 mm. The findings related to the site of origin, global dimensions and branches of the choroidal arteries observed in the present study are consistent with those reported in other population groups. This study, carried out in cadaveric material, provides relevant qualitative and morphometric information of the choroidal arteries, useful for diagnosis and clinical management, as well as for surgical approaches that may compromise this structure.

Key words: Anterior choroidal artery – Posterior choroidal artery – Posterior cerebral artery – Posterior communicating artery – Cerebral arteries – Choroid plexus – Optic tract

INTRODUCTION

The choroid plexus of the lateral and third ventricles are supplied by the anterior choroidal artery (AChA) and by the lateral and medial choroidal arteries (LPChA and MPChA recpectively) (Yu et al., 2018). The AChA enters in the temporal horn of the lateral ventricle, while the LPChA and the MPChA enter in the roof of the third ventricle at the level of the splenium of the corpus callosum. In this way, each artery has a cisternal segment and a plexal segment. (Uz et al., 2005).

The AChA originates in 70-85% from the Internal Carotid Artery (ICA), specifically from the posterior

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aspect of the supraclinoid portion of the ICA, proximal to the terminal bifurcation of the ICA and distal to the origin of de PComA (Koyama et al., 2000; Takahashi et al., 1990), while in 8-10% it emerges from the middle cerebral artery (MCA). Biometric data report a length of 12-24 mm and a diameter of 0.4-2.0 mm. The AChA follows a posterolateral trajectory to the posterior communicating branch, dorsolateral to the optic chiasm in the cisternal segment and around the anterior region of the midbrain, which receives blood supply from its ramifications. (Baskaya et al., 2004; Fujii et al., 1980; Mandiola et al., 2009; Nishio et al., 2009; Tanriover et al., 2014). In addition, in most cases the cisternal segment of the AChA takes an S-shaped course (Takahashi et al., 1990).

In its course is related to and gives off branches to important motor, sensory, and visual pathways and structures, such as the optic tract, cerebral peduncle, lateral geniculate body, uncus, temporal lobe, temporal horn and the choroid plexus (Haegelen et al., 2012). These perforating branches may arise along the cisternal segment, from its proximal or distal portion and supply the optic radiations, globus pallidus, midbrain and posterior limb of the internal capsule (Koyama et al., 2000).

The major part of them arise close to the AChA origin and varied from 2 to 9 in number. (Marinković et al., 1999). Variations can be found in the perforators branches of the AChA, in some cases the uncal branch may be hypertrophic and supply irrigation to the distribution area of the PCA with the anterior temporal artery; also, when there are not enough branches of the AChA, the ipsilateral ICA may give several perforators to compensate. (Marinković et al., 1999; Takahashi et al., 1990).

Finally, the AChA penetrates the lateral ventricle through the choroidal fissure and contributes to irrigate the choroid plexus (plexal segment) along with the LPChA and the MPChA from the posterior cerebral circulation (Akar et al., 2009; Tanriover et al., 2014).

The AChA has been studied mainly for its topographic relationship, which has allowed within the areas of microsurgical anatomy to delimit the cisternal segment of the AchA in the pre- optic and post-optic subdivisions. This entails the particular interest of the present study to perform more detailed description of the AchA in terms of origin, trajectory and ramifications to the supply areas and thus contribute to having an anatomic basis for safe operations in patients with AChA aneurysms, which are usually located superior or superolateral to the origin of the AChA (Marinković, et al, 1999; Tanriover et al., 2014; Koyama et al., 2000).

Different authors have documented its morphological variability, related mainly to its site of origin, length, diameter of its pre-optic and post-optic segments and branches.

Additionally, due to the variety of irrigated territories by this vascular structure, its injury or obstruction has been related to the presence of various clinical signs, such as hemianopsia, cognitive disorders, contralateral hemiplegia and hemiparesis, hemianesthesia, ataxia, hypesthesia, anosmia and Parkinson's disease (Komiyama et al., 2002; Andrés et al., 2012; Tanriover et al., 2014; Yu et al., 2018; Marinković et al., 1999).

The LPChA and the MPChA originate from the Posterior Cerebral Artery (PCA) and are distributed in branches that supply brain structures such as: the cerebral peduncles, tegmentum, geniculate bodies, and colliculus (Kawashima et al., 2009). They continue their course through the pulvinar nucleus of the thalamus and turn laterally towards the pineal gland to enter into the roof of the third ventricle, between the thalamus and the splenium of the corpus callosum. Finally, they supply the choroid plexus of the third ventricle (Pai et al., 2007).

The predominant origin of the MPChA and the LPChA has been reported in 60-70% in the post-communicating segment (P2) of the ACP (Yamurri et al., 2006). For the MPChA, 10-15% originates from the pre-communicating segment (P1) of the PCA, as well as from branches of the PCA (parietooccipital, posterior temporal, calcarine, and anterior temporal).

The MPChA has a length of 42-77.4 mm and a diameter of 0.2-1.4 mm, without significant differences in relation to the presentation side, and a number of branches of 25 ± 9; in addition, the posteromedian choroidal system has two portions, suprathalamic and infrathalamic, which give off lateral mesencephalosubthalamic, inferocentral, brachiopulvinarian and posterocentral arteries, medial pulvinarian and superomedian thalamic arteries (Percheron, 1977). These arteries irrigate the major part of nucleus medialis and the anterior nucleus of the Thalamus. Whereas for the LPChA length has been reported as 49.5 mm on the right side and 58.0 mm on the left side (a range of 5 to 70 mm), and a diameter of 0.2-1.5 mm (Vinas et al., 1995) . The posterolateral choroidal system gives lateral genicular arteries for the lateral geniculate body, inferolateral pulvinary arteries, and superolateral thalamic arteries, these arteries supply the dorsal part of the inner region of the thalamus (Percheron, 1977). Lesions of the posterior choroidal arteries (PChA) have been linked to various types of hemianopsia, hemiparesis, sensory disorders and hyperkinetic syndromes (Neau and Bogousslavsky, 1996).

Considering the variability of the AChoA and the PChA, the difficult clinical and surgical management and the limited information on these vascular structures in the different population groups, this study proposes to evaluate the morphology of the choroidal arteries in a sample of Colombian individuals contributing relevant biometric and anatomical information.

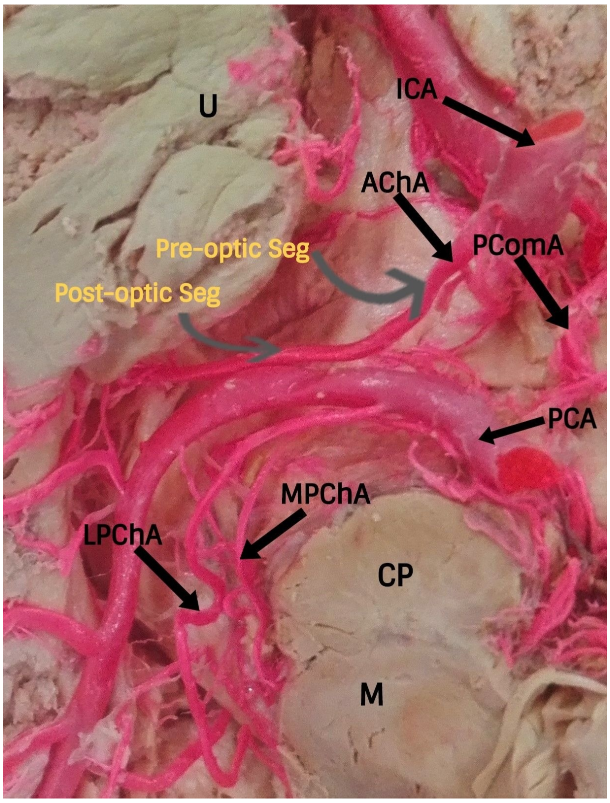

Fig 1. A. Upper segment of the midbrain. Identification of the origin of the anterior choroidal artery from the internal carotid artery. Pre-optic and post-optic segments of the anterior choroidal artery. Origin of the lateral posterior choroidal artery from the P2 segment of the posterior cerebral artery. ICA = internal carotid artery; AChA = anterior choroidal artery; PComA = posterior communicating artery; PCA = posterior cerebral artery; MPChA= medial posterior choroidal artery; LPChA = lateral posterior choroidal artery; CP = cerebral peduncle; M = midbrain; Pre-optic Seg = pre-optic segment; Post-optic Seg = Post-optic segment; U =uncus

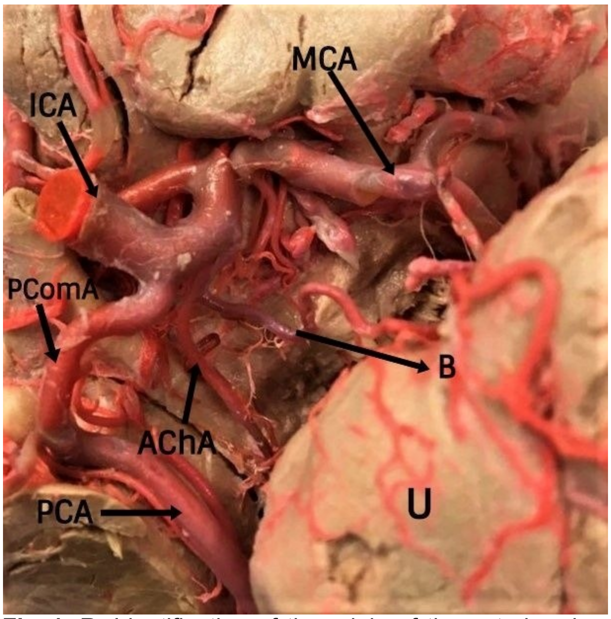

Fig 1. B. Identification of the origin of the anterior choroidal artery from the middle cerebral artery. ICA = internal carotid artery; MCA = middle cerebral artery; AChA = anterior choroidal artery; PComA = posterior communicating artery; PCA = posterior cerebral artery; B = branch to the anterior uncus segment; U =uncus. **C.** Identification of the anterior choroidal artery originated from the ICA bifurcation. Late origin of the lateral posterior lateral choroidal artery of the P2 segment of posterior cerebral artery. ICA = internal carotid artery; AChA = anterior choroidal artery; PComA = posterior communicating artery; PCA = posterior cerebral artery; LPChA = lateral posterior choroidal artery; B = branch to the anterior segment of the uncus; M = midbrain; U =uncus.

MATERIALS AND METHODS

We studied the cerebral arteries of 74 unclaimed male cadavers, with ages between 18 and 75 years, who underwent necropsy at the Institute of Legal Medicine and Forensic Sciences of Bucaramanga-Colombia. Selecting males is due to the high statistic of corpses received in legal medicine given the accident rate compared to female mortality. Besides, female cadavers are mostly related to death by violence, and therefore do not have the same accessibility. The inclusion criteria of the sample evaluated were racially mixed subjects (mixture of white Hispanics with natives). This is due to the fact that the predominant race in Colombia is the mixed people: as we want to know our own data, we decided to include those that are more frequent in legal medicine, rather than those who present in low proportions. In addition, foreign bodies are handled differently by other entities. Also, we include subjects without evidence of having died from direct trauma or pathologies that compromised the brain. The Ethics Committee of the Industrial University of Santander approved this research.

Each specimen was subjected to bilateral channeling of the proximal segments of the ICA, and through these washing and pre-fixation of the brain with 3% formaldehyde was performed. Additionally, the carotid vessels were perfused with 100 ml of semi-synthetic resin (E210® Basf 80 cc palatal mixture; 20 cc styrene) impregnated with mineral red color. Once the polymerization of the resin was obtained (30 minutes), the brain exeresis was performed. Then, the sample was subjected to 10% formaldehyde fixation for 15 days.

Subsequently, resection of brain stem and cerebellum was performed and the leptomeninges were released with microdissection material, a maneuver that allowed identifying the structures that configure the arterial circle of the brain and each of its branches. The different morphological expressions of the AChA and the PChA were recorded, in relation to their presence, level of origin, duplication, calibers, length and branches to the optic tract, midbrain and anterior segment of the base of the temporal lobe. To evaluate the morphometric characteristics of these vessels, a digital calibrator (Mitotuyo ®) was used.

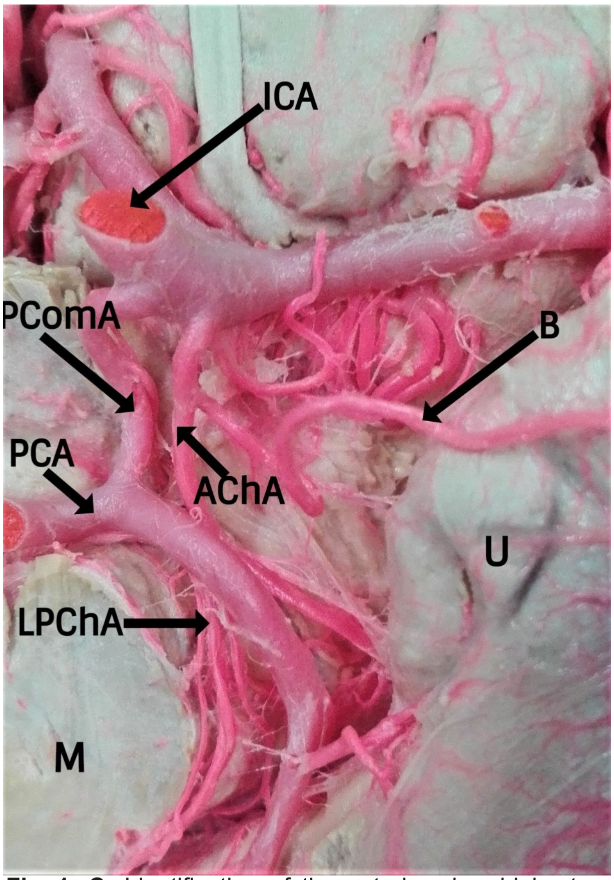

Fig 1. C. Identification of the anterior choroidal artery originated from the ICA bifurcation. Late origin of the lateral posterior lateral choroidal artery of the P2 segment of posterior cerebral artery. ICA = internal carotid artery; AChA = anterior choroidal artery; PComA = posterior communicating artery; PCA = posterior cerebral artery; LPChA = lateral posterior choroidal artery; B = branch to the anterior segment of the uncus; M = midbrain; U =uncus.

From each specimen studied, digital photographs (supporting the recorded observations) were taken. The data obtained were indexed in Excel and the statistical analyses were performed in SIGMASTAT 4.0. Continuous variables were described with their averages and dispersions. Nominal variables with their proportions. Statistical tests of chi-square ($\chi 2$) and Student's test (t) were performed, accepting an alpha error of up to 5%.

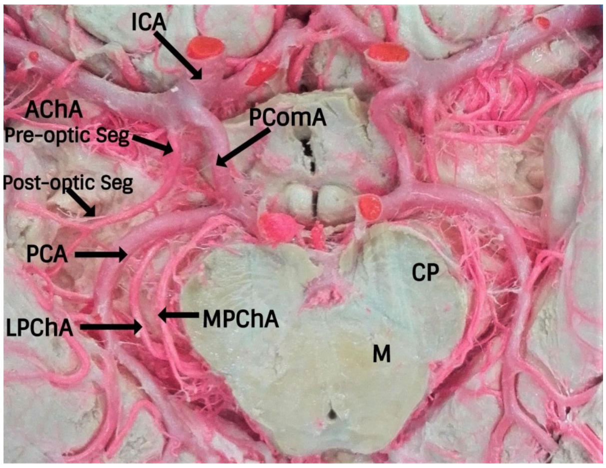

Fig 2. Identification of the pre-optic and post-optic segments of the anterior choroidal artery. Origin of the medial posterior choroidal artery from the PComA and PCA junction. Origin of the lateral posterior choroidal artery from the P2 segment of the posterior cerebral artery. ICA = internal carotid artery; AChA = anterior choroidal artery; PComA = posterior communicating Artery; PCA = posterior cerebral artery; MPChA = medial posterior choroidal artery; LPChA = lateral posterior choroidal artery; CP = cerebral peduncle; M = midbrain; Pre-optic seg = pre-optic segment; Post-optic seg = post-optic segment.

RESULTS

The AChA was observed in 100% of cases and in one specimen it was doubled (0.8%). In 143 samples the AChA originated from the ICA (96.6%) (Fig. 1A), four from the MCA (2.7%) (Fig. 1B) and in one case from the PComA (0.7%) (Fig. 1C), without significant differences in presentation side (p=0.722), (Fig. 1C).

The length of the AChA was 25.3 ± 1.6mm, being slightly longer on the right side (p=0.064); its post-optic segment measured 15.2 ± 1.7 mm. The length of the origin of the AChA to the ICA bifurcation site was 3 ± 0.77 mm, being greater on the left side (p= 0.22). Other dimensions of the AChA are shown in Table 1. The AChA presented branches in the cisternal segment aimed at irrigating various structures of the central nervous system (Fig. 2). Branches to the optic tract, anterior segment of the uncus and the apex of the uncus originated in the

Table 1. Dimensions with standard deviation of the AChA according to side. Values expressed in millimeters

	Right	Left	Total	*P Value*
Pre-optic segment diameter	0.6 ± 0.16	0.6 ±0.16	0.6 ± 0.16	0.870
Post-optic segment diameter	0.5 ± 0.14	0.5 ± 0.14	0.5 ± 0.14	0.505
Pre-optic segment length	9.9 ± 1.56	10.3 ± 1.41	10.1± 1.5	0.066
Post-optic segment length	15.5 ±1.77	15 ± 1.58	15.2± 1.7	0.064
Origin to the PComA distance	2.8 ± 0.81	2.6 ± 0.66	2.7± 0.75	0.170
Origin to the ICA bifurcation distance	2.6 ± 0.88	3.0 ± 0.77	2.8± 0.84	0.022*

*P ≤ 0.05, significant difference compared to side.

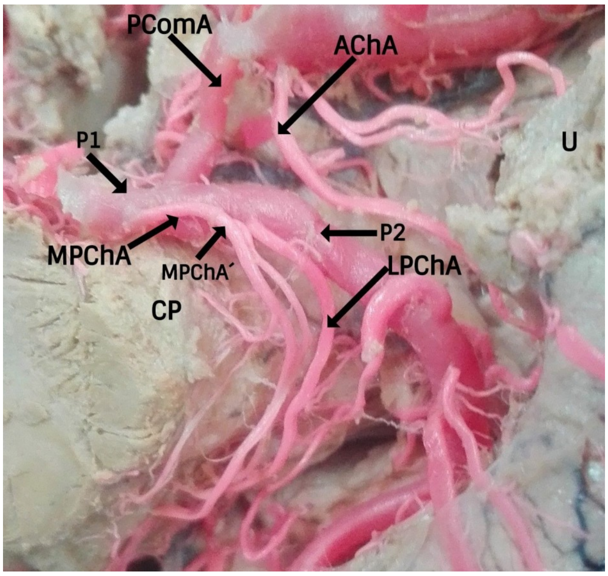

Fig 3. Identification of branches from the anterior choroidal artery. Early medial choroidal artery bifurcation. Identification of the lateral posterior choroidal artery originated from P2 segment. AChA= anterior choroidal artery; PComA = posterior communicating artery; P1 = pre -communicating segment of the posterior cerebral artery; P2 = post-communicating segment of the posterior cerebral artery; MPChA = medial posterior choroidal artery; LPChA = lateral posterior choroidal artery; MPChA' = bifurcation of the medial posterior choroidal artery; CP = cerebral peduncle; U = uncus.

pre-optic segment of the AchA (Fig. 3), while posterior uncal branches and to the cerebral peduncle originated from the post-optic segment (Table 2). Specimens in which the branches did not perfuse properly were not registered. (Fig. 1A and Fig. 2).

Due to deficiency in vascular filling, 10 brains were excluded for the morphological record of the PChA. The MPChA originated in 97 cases in the pre-communicating segment of the PCA (Fig. 3) (70.3%), 34 cases (24.6%) in the junction of the PComA with the PCA (Fig. 2) and seven cases (5.1%) in the post-communicating segment of ACP. Three duplicate MPChA were found (2.2%). The length of the cisternal segment of the vascular structure was 38.1 ± 5.85 mm, and the diameter was 0.4 ± 0.14 mm (range of 0.18 and 0.8 mm). 46.3% of the MPChA presented proximal and distal bifurcation in relation to the pulvinar nucleus of the thalamus. The MPChA bifurcation occurred at 8.7 ± 5.47 mm of its PCA origin, but in 17 cases (26.6%), an early bifurcation (Fig. 3) was found (less than 5 mm). In these samples it was observed that the two small branches derived from the MPChA were running in parallel and with antero-posterior trajectory on the surface of the midbrain until reaching the colliculus and the lower edge of the splenium of the corpus callosum. In 9 samples (14.1%), the MPChA bifurcation was observed more than 15 mm from its origin (Table 3).

LPChA agenesis was found in one case (0.7%) (Fig. 4). Additionally, a case of duplicated LPChA (0.7%) was observed. It originated from the pre-communicating segment of the PCA in three cases (2.17%), from the junction of P1 with the PComA in five cases (3.62%) and in 130 cases (94.2%) from the post-communicating segment of the PCA (Fig. 1A and Fig. 2). The length of the LPChA was 37.6 ± 7 mm and the diameter was 0.5 ± 0.16 mm, without significant side differences (p= 0.913). In

Table 2. Number and average of the branches of the pre-optic and post-optic segments of the the AChoA cisternal segment

Segment of the AChA	Termination areas	No. of Hemispheres (N=148)	No of Branches	Mean (Ranges)
Pre-optic	Optic tract	137	713	5.2 (0-13)
	Anterior segment of the uncus	112	383	3.4 (0-9)
	Apex of the uncus	88	227	2.6 (0-6)
Pots-optic	Optic tract	111	395	3.6 (0-8)
	Posterior segment of the uncus	101	240	2.4 (0-7)
	Cerebral peduncle	88	227	2.6 (0-8)

Table 3. Average values and standard deviation of length, diameter and origin distances of the the PChA according to side. Values expressed in millimeters

Artery		Right	Left	Total	P value
MPChA	Diameter	0.4 ± 0.14	0.4 ± 0.13	0.4 ± 0.14	0.535
	Length	38.7 ± 5.83	37.4 ± 5.85	38.1 ± 5.85	0.238
	Origin to the junction of PComA distance	1.9 ± 1.27	1.9 ± 1.34	1.9 ± 1.30	0.874
	Origin to its bifurcation distance	8.8 ± 4.79	8.7 ± 6.40	8.7 ± 5.47	0.973
LPChA	Diameter	0.5 ± 0.16	0.5 ± 0.16	0.5 ± 0.16	0.913
	Length	36.9 ± 7.25	38.6 ± 6.62	37.6 ± 7	0.215
	Origin to the junction of PComA distance	7.5 ± 5.43	5.4 ± 3.81	6.6 ± 4.88	0.049*

*P ≤ 0.05, significant difference compared to side.

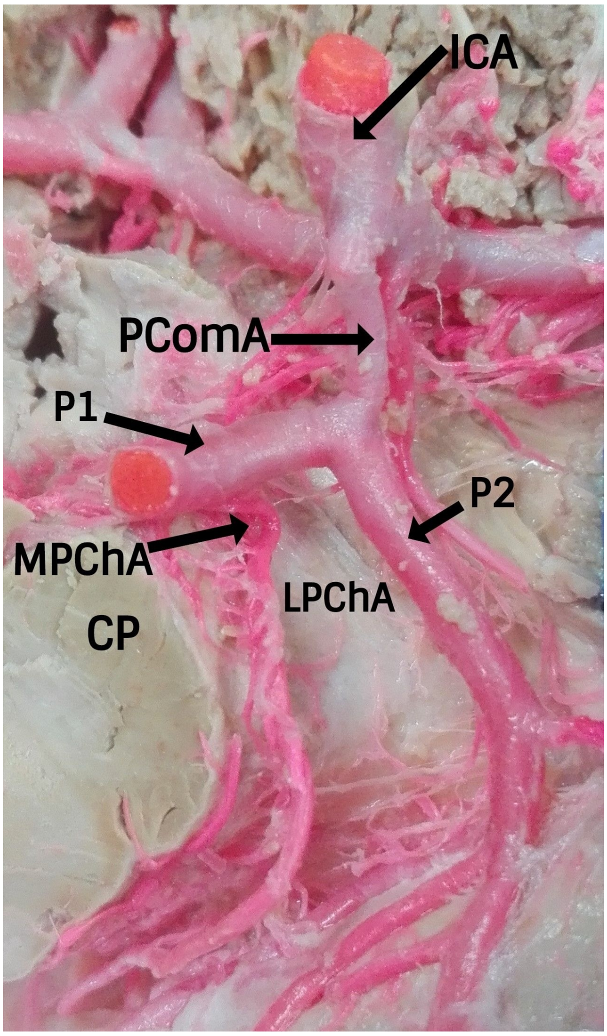

Fig 4. Absence of the lateral posterior choroidal artery. Identification of medial posterior choroidal artery. ICA = internal carotid artery; PComA = posterior communicating artery; P1 = pre-communicating segment of the posterior cerebral artery; P2 = post-communicating segment of the posterior cerebral artery; MPChA = medial posterior choroidal Artery; LPChA =. lateral choroidal artery agenesis; CP = cerebral peduncle.

12 cases (8.4%), this vessel was less than 28 mm long and its origin in P2 was located at a distance greater than 15 mm from the junction of P1 with the PComA. The distance from the origin of the LPChA to the junction of P1 with the PComA was significantly greater on the right side (p= 0.049).

The PChA also presented branches in the cisternal segment aimed at irrigating various structures such as thalamus, cerebral peduncles, tegmentum, superior colliculi, medial and lateral geniculate body; however, these branches were very small and only the number from their origin was taken into account, because the branches were cut at the end (Table 4).

In addition, the ramifications of the plexal segment were not counted, and specimens in which the branches did not perfuse properly were not registered. (Fig. 1A, Fig. 2 and Fig. 3). Other measurements in relation to the PChA are shown in Table 3 and Table 4.

DISCUSSION

The origin of the AChA on the ICA has been reported between 70-80% (Akar et al., 2009; Fujii et al., 1980; Mandiola et al., 2012; Morandi et al., 1996; Tanriover et al., 2014). In this study, a high incidence was found in the origin of the AChA on the ICA, which is consistent with Fujii et al. (1980) and Morandi et al. (1996), and in a lower incidence it was found emerging from MCA (2%), a characteristic that is not consistent with that reported in studies carried out by Mandiola et al. (2012) (12.5%). In this study we found a case of AChA emerging from the PComA (0.7%) and one case emerging from the bifurcation of the ICA (0.7%). Our findings have lower incidence and do not match what was highlighted by Mandiola and Akar (6.25% and 20% origin in PComA) (Akar et al., 2009; Mandiola et al., 2012). Additionally, in our series no agenesis of this vascular structure was observed, in accordance with previous studies that report this anatomical feature in a range of -0 - 1.7%- (Carpenter et al., 1954; Fujii et al., 1980; Komiyama et al., 2002; Mandiola et al., 2012; Morandi et al., 1996).

The caliber of the AChA in our study was similar to that reported by Fujii et al. (1980), and slightly smaller than indicated by Mandiola et al. (2012) (0.7mm). It is noted that Uz and Mine (2004) reported a diameter of 0.94 mm for this structure. The length of the pre-optic segment (10.1 mm) and the

Table 4. Number and average of the branches of the MPChA and LPChA

Artery	Hemispheres	No. of Hemispheres (N=138)	No of Branches*	Mean (Ranges)
MPChA	Right	61	492	8 (0-15)
	Left	46	362	7.9 (0-17)
	Total	107	854	8 (0-17)
LPChA	Right	61	321	7.5 (0-15)
	Left	42	455	7.6 (0-14)
	Total	103	776	7.5(0-15)

*Branches of the PChA were included according to the side of brain hemispheres. These branches in the cisternal segment of the MPChA and LPChA aimed at irrigating various structures such as thalamus, cerebral peduncles, tegmentum, pineal gland, medial and lateral geniculate body.

postoptic segment (15.2 mm) are similar to that observed by Tanriover et al. (2014) (8 and 17.2 mm, respectively). The distance from the origin of the AChA to the ICA bifurcation reported by Fujii et al. (1980) (2.5 mm) is similar to our findings, where a significantly greater distance was found on the left side.

In our study, it was observed that from the cisternal segment of the AChA emerge branches of the pre-optic and post-optic segments in a similar number (3-5 branches) to that reported in previous studies towards the optic tract, uncus and cerebral peduncle (Morandi et al., 1996; Tanriover et al., 2014).

Alterations of the cisternal segment of the AChA due to aneurysmal lesions, cerebral infarctions, arteriovenous malformations, traumatic and surgical lesions cause difficulty in the irrigation of their cerebral territories, producing clinical symptoms and neurological disorders that can be explained by the ischemia of these structures, which generate clinical signs according to the irrigation site, such as hemiparesis, aphasia, spatial neglect and visual field alterations. However, if these lesions occur near to the plexal segment, the damage could be less, thanks to the blood supply received at this level by the PChA (Andrés et al., 2012; Yu et al., 2018).

The P1 segment of the PCA is the most frequent site of origin of the MPChA (97%) found in the present study. This result is not consistent with the findings of Pai et al, of origin in the P2 segment (61.4 %) and in a lower incidence in the P1 segment (38.6%) (Pai et al., 2007). In our series, it was observed that in 24.6% of the cases the MPChA originated from the junction site of PComA and the PCA, a feature that has not been previously reported (Fujii et al., 1980; Pai et al., 2007; Párraga et al., 2011). Fujii et al. (1980) and Párraga et al., 2011), in agreement with Pai et al. (2007) have reported the post-communicating segment of the PCA as the most frequent origin of the MPChA.

The LPChA originated mainly from the post-communicating segment of the PCA (94.2%), a result slightly higher than that reported by Párraga et al. (2011) (87.1%).

Additionally, Yamurri et al. (2006) also reports variability in their origin, although more than 70% originates from the P2 segment.

The length of the MPChA and the LPChA found in our study (38.1 and 37.6 respectively) is considerably shorter than that reported by Vinas, Fujii and others. This may be due to the fact that, in previous studies, the lengths of the PChA of the cisternal and plexal segments were possibly measured, while in the present study only the cisternal segment was measured.

Similarly, it is noted that, in the evaluated sample, a good number of the LPChA (8.4%), originated from the distal part of P2, consequently presenting a short length of its cisternal segment. The diameter of the PChA was similar to that reported by Fujii et al. (0.8 and 0.6 mm) (Fujii et al., 1980; Vinas et al., 1995). The PChA has been reported to arise from different sites, as well as anatomical studies have reported variability in their diameter, length and number of their branches (Table 5).

Of the choroidal arteries, the PChA have greater variability. The low agenesis of LPChA (0.7%) is similar to that reported in other studies (Yamurri et al., 2006). The presence of duplication of 2.2% and 0.7% for the MPChA and the LPChA respectively is reported by Pai et al. (2007) in a slightly higher number, while Fujii et al. (1980) did not report duplication of these vascular structures.

In this series, proximal or distal bifurcation of the MPChA was observed in a significant percentage, a characteristic that has not been previously reported and that may increase the risk of injury and of causing neurological damage during surgical interventions, or in contrast, it may be a contributing factor in the blood supply of the unilateral or bilateral posterior circulation.

The variation in the number of collateral branches of the AChA can be related to the caliber of

Table 5. Anatomical studies of the PChA including diameter, length and site of origin (expressed in millimeters and %)

Authors	MPChA Diameter	LPChA Diameter	MPChA Length	LPChA Length	MPChA Branches	LPChA Branches	MPChA Origin (%)			LPChA Origin (%)		
							P1	Junction PComA and PCA	P2	P1	Junction PComA and PCA	P2
Vinas et al. (1995)	0.8	0.7	77.5	54	25	14	11.5	-	76.9	-	-	-
Fujii et al. (1980)	0.8	0.6	42	23	1.14	0.8	-	20	57	14	54	18
Párraga et al. (2011)	-	-	-	-	-	-	14.3	70	5.7	-	11.4	87.1
Yamurri et al (2006)	-	-	-	-	1-3	1-6	26	40	20	-	26	47
Present Study	0.4	0.5	38.1	37.6	8 (0-17)	7.5 (0-15)	70.3	24.6	5.1	2.17	3.62	94.2

these thus creating scenarios with few branches with good caliber or numerous branches with little caliber; Additionally, these will be influenced by the irrigation received by the anterior segment of the temporal lobe, the optic tract and the cerebral peduncles from branches emerging from the middle cerebral and posterior cerebral arteries.

Various factors such as sample size, different measurement methodologies and phenotypic expressions of each population group evaluated can explain the qualitative and morphometric variability observed in the various studies of the choroidal arteries.

Clinical manifestations such as sensory loss related to residual sensory dysfunction and abnormal movements are caused by infarcts in the LPChA and the MPChA, as well as visual field defects, hemisensory disorders, neuropsychological dysfunctions and abnormal movements. The location and extent of the infarcts caused by occlusion of the PChA are mainly determined by the nature of their etiology, hemodynamic factors and anatomical variations of the vessels, which mainly comprise the origin, branching pattern, areas irrigated and parental vessel sizes (Bozkurt et al., 2018; Neau and Bogousslavsky, 1996; Teitelbaum et al., 2002).

The compression of the various expressions of the AChA, the MPChA and the LPChA especially in relation to the biometric data of their origins and irrigated territories, related marginally in previous studies, will allow the optimization of surgical interventions in order to prevent and/or reduce deficits and postoperative neurological damage, caused by lesions of these arteries or their branches. Similarly, this study, carried out in cadaveric material, provides relevant qualitative and morphometric information of the choroidal arteries, which enriches the morphological concept and is useful for the diagnosis and management of clinical events that compromise these vascular structures.

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