



ORIGINAL RESEARCH

ORIGINS AND DIAMETER OF THE ANTERIOR CHOROIDAL ARTERY

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ABSTRACT

Objective: The anterior choroidal artery (AChoA) may be involved in cases of intracranial aneurysms, arteriovenous malformations (AVMs) or intracranial tumors. The diagnostic evaluation of the anterior choroidal artery is required in order to obtain knowledge of the anatomy of this vessel, therefore we decided to examine their origin and diameters in detail.

Methods: Eighty cerebral hemispheres from 40 autopsy cases (11 female, 29 male) aged between 20 and 71 years were obtained as soon as possible after death. Forty μ m thickness of transverse sections were cut by cryostat. The average diameter was calculated. Sex and side differences were statistically analyzed.

Results: AChoA were present in 75 (93.75%) hemispheres, whereas in 5 cerebral hemispheres (6.25%) the AChoA was absent. In all autopsy cases, it arose from the posterior wall of the internal carotid artery (ICA) (100%). The inner diameter of the AChoA was 0.56 ± 0.15 mm in females; 0.58 ± 0.18 mm in males. The outer diameter of the AChoA was 0.67 ± 0.17 mm in females; 0.70 ± 0.16 mm in males. No statistically significant difference between genders in terms of the inner and outer diameters of AChoA were found.

Conclusion: For the endovascular treatment of AChoA aneurysms, the knowledge of the inner diameter gains importance.

Keywords: Choroidal, Diameter, Artery, Origin

ARTERIA CHOROIDEA ANTERIOR'UN ÇAP VE ORİJİNİ

ÖZET

Amaç: Arteria choroidea anterior, arteria carotis interna'nın en kalın dalıdır. Bu damarın arteria communicans posterior'dan da ayrılabilmesi belirtilmiştir. Kafaiçi anevrizmalar ya da tümörler ve arteriovenöz malformasyonlar bu damarı tutabilirler. Arteria choroidea anterior'un diagnostik açıdan değerlendirilmesinde, bu damarın anatomik yapısıyla ilgili bilgilere ihtiyaç vardır. Bu sebeple çalışmamızda hem orijin tanımlanmış hemde çap ölçülmüştür.

Yöntem: Yaşları 20 ile 71 arasında değişen (ortalama yaş 43,5), 40 otopside (11 kadın, 29 erkek) toplam 80 adet serebral hemisferi ölümü takiben mümkün olduğunca kısa bir sürede aldık. Alınan damarlardan kriostat ile 40 μ m kalınlığında transvers kesitler alındı. Her kesit üzerinde en uzun, en kısa ve diagonal çap ölçülüp bunların ortalaması alındı. Cinsiyet ve taraf farklılıkları istatistiksel olarak analiz edildi.

Bulgular: 75 serebral hemisferde (%93,5) arteria choroidea anterior tespit edilmişken 5 hemisferde (%6,25) bulunamamıştır. Vakalarımızın hepsinde bu damar arteria carotis interna'nın arka duvarından çıkmaktaydı (%100). Kadınlarda arteria choroidea'nın iç çapı 0.56 ± 0.15 mm (0.4-0.7mm) iken; erkeklerde ise 0.58 ± 0.18 mm (0.4-0.8) olarak bulunmuştur. Kadınlarda arteria choroidea'nın dış çapı 0.67 ± 0.17 mm (0.55-0.91mm) iken; erkeklerde ise 0.70 ± 0.16 mm (0.6-0.98mm) olarak bulunmuştur. İstatistiksel olarak damarın iç ve dış çapları cinsiyete göre farklılık göstermemektedir.

Sonuç: Arteria choroidea anterior anevrizmalarının endovasküler tedavilerinde iç çapın bilinmesi önem kazanır.

Anahtar Kelimeler: Choroidea, Çap, Arter, Orijin

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INTRODUCTION

The importance of the anterior choroidal artery is related to its strategic and extensive area of arterial supply¹⁻⁴.

The anterior choroidal artery is the largest branch of the ICA and it also may arise from the posterior cerebral artery (PCA)⁵. Further, it was reported that it was derived from the middle cerebral artery (MCA) as well as from the junction between the ICA and MCA⁶. However, the territory supplied by this artery has large variations, the most consistent area contains the optic tract, the posterior limb of the internal capsule, the cerebral peduncle and the choroid plexus¹⁻⁴.

Foix et al⁷ described the complete anterior choroidal artery syndrome, which includes the triad of hemiplegia, hemisensory loss, and hemianopia. In addition, the artery may be involved in cases of intracranial aneurysms, arteriovenous malformations (AVMs) or intracranial tumors. The diagnostic evaluation of the anterior choroidal artery is required in order to obtain knowledge of the anatomy of this vessel, therefore we decided to examine their origin and diameters in detail.

MATERIAL AND METHOD

Eighty cerebral hemispheres from 40 autopsy cases (11 female, 29 male) aged between 20 and 71 years (mean age 43.5) were obtained as soon as possible after death. The autopsies with head injuries were excluded from the study. The calvaria and the brains were removed via routine autopsy dissections and the brains were removed out of the skull together with the vascular structures. Routine dissection of the anterior circulation of the brain was performed. The anterior choroidal artery in autopsy cases were photographed by a Nikon Coolpix E995 digital camera.

The proximal 4 mm length of the anterior choroidal artery was taken in every case (Figure 1). Forty μm thickness of transverse sections were cut by cryostat (Microtome FRG). An eyepiece with a millimeter scale (AX0057 24mm Cross Olympus) was used to measure the outer and inner diameters of this artery with an X4 objective and X10 eyepiece. Three measurements (longest, shortest and intermediate diameters) were taken and the average diameter was calculated. Sex and side difference were statistically analyzed using the Mann-Whitney U-test.

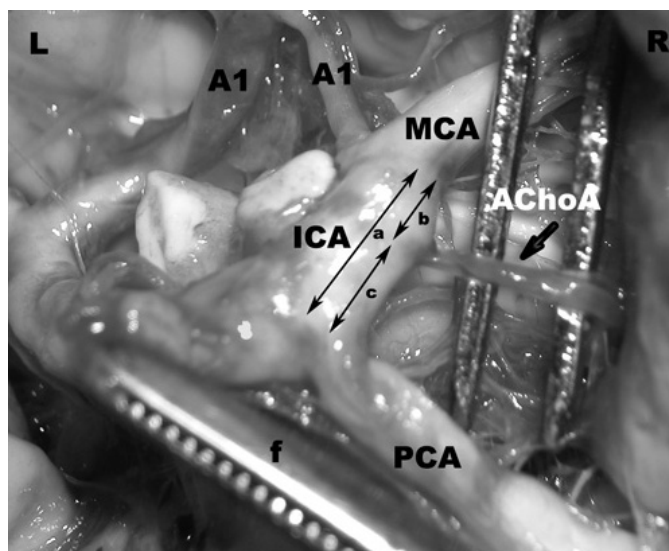


Figure 1: Inferior view of the brain, showing photographic demonstration of the anterior choroidal artery originating from the internal carotid artery. A1: Precommunicating portion of the anterior cerebral artery; A2: Postcommunicating portion of the anterior cerebral artery; AChOA: Anterior choroidal artery; ICA: Internal carotid artery; MCA: Middle cerebral artery; PCA: Posterior communicating artery; length of the internal carotid arteries between MCA and the PCA (a), MCA and the AChOA (b), AChOA and the PCA (c); f, forceps; L and R, left and right sides



RESULTS

Of the 80 cerebral hemispheres, the anterior choroidal arteries were present in 75 (93.75%) hemispheres, whereas in 5 cerebral hemispheres (6.25%) we could not identify the anterior choroidal artery. In all autopsy cases in which we were able to identify the origin of the anterior communicating artery, it arose from the posterior wall of the ICA (100%).

In one male brain only this artery was absent bilaterally (2.5%), whereas in three cases (1 female, 2 male) this artery was not seen unilaterally (7.5%). In absent cases the anterior choroidal arteries were all persistently on the right side.

The inner diameter of the anterior choroidal artery was 0.56 ± 0.15 mm (range: 0.4-0.7 mm) in females; 0.58 ± 0.18 mm (range: 0.4-0.8 mm) in males. The inner diameter in unilaterally cases were 0.7 mm and 0.8 mm in males and 0.7 mm in females.

The outer diameter of the anterior choroidal artery was 0.67 ± 0.17 mm (range: 0.55-0.91 mm) in females; 0.70 ± 0.16 mm (range: 0.6-0.98 mm) in males. No statistically significant difference between genders in terms of the inner and outer diameters of the anterior choroidal artery were found. In regardless of gender, the mean value of inner diameter was 0.57 ± 0.11 mm on the right side, 0.58 ± 0.12 mm on the left side, whereas the mean value of the outer diameter was 0.68 ± 0.13 mm on the right side, 0.70 ± 0.12 mm on the left side. There is no statistically significant difference between the sides in both inner and outer diameters of the anterior choroidal artery.

DISCUSSION

The results of the present study showed that males have higher inner and outer diameters than the women, whereas diameters of the left side of the artery was slightly higher than the right side. However, these differences were not statistically significant.

Scarce and conflicting data are present in the literature considering the origin, genders and

side differences of the anterior choroidal artery. Variations in the origins of the artery were reported. Herman et al⁶ found the anterior choroidal artery to issue from the ICA in 85% of cases, from the MCA in 8%, and from the junction of these two vessels in 7%.

In 96% of the cases, the anterior choroidal artery arose from the ICA and in 2% of the cases it arose with double origins⁵. Furthermore, we could not demonstrate the double origins of the anterior choroidal artery. The duplication may be confused with the uncal artery⁸. Fujii et al⁹ identified the origin of the anterior choroidal artery from the ICA in 98% of the cases and from the PCA in 2% of the cases. As identified in our study, the anterior choroidal artery was derived from the ICA in 100% of the cases⁸ (Table I), which may show the vascular system depends on racial factors. Although studies were previously performed on the fixed material, fresh autopsy material and angiography had different values for the diameter of the anterior choroidal artery^{6-8-10,11}. Present study shows the side and gender differences in terms of the anterior choroidal artery. Herman et al⁶ reported the diameter as 0.77 mm. Hussein et al¹⁰ found it as 0.9 mm; Uz et al⁸ gave it as 0.94 mm, whereas our inner diameter was 0.58 mm, the outer diameter was 0.69. Above mentioned studies⁶⁻⁸⁻¹⁰ did not clearly state whether the measured diameter was the outer or inner diameter. For the endovascular treatment of anterior choroidal artery aneurysms, the knowledge of the inner diameter gains importance. Anterior choroidal artery aneurysms account for 4% of all intracranial aneurysms. Ischemic stroke has been reported as the most common complication after surgical clipping of the aneurysms of the internal carotid artery-anterior choroidal artery complex. Patients with aneurysms located on the anterior choroidal artery itself have an even higher risk of getting postoperative stroke, because of the critical territory supplied by the anterior choroidal artery¹²⁻¹⁴. Therefore, endovascular treatment of anterior choroidal artery is effective to protect the patients from



rebleeding¹⁵. We assume that not only general anatomical knowledge but also knowledge of some morphological features such as inner

diameter of the anterior choroidal artery will help the diameter planning of endovascular instruments.

Table I. shows the percentage of the origins of the anterior choroidal artery in different studies.

Origin of the anterior choroidal artery	From ICA	From MCA	From junction of ICA and MCA	From PCA
Herman et al. (1966)	85%	8%	7%	
Fujii et al. (1980)	98%			2%
Lang et al. (1995)	98%			2%
Uz et al. (2005)	100%			
Present study	100%			

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