

## THE ORIGIN OF THE ANTERIOR CHOROIDAL ARTERIES: A CADAVERIC STUDY

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### Abstract

**Background:** The anterior choroidal artery is important artery for neurosurgeons. It arises from the postero-lateral wall of the Internal carotid artery. Anterior choroidal artery supplies the lateral ventricles and also gives branches to diencephalon, mesencephalon, cerebrum and motor, visual pathways. As surgical interventions to epileptic lesions at amygdalohippocampal region have increase in recent days, a better understanding of the origin of the anterior choroidal artery may be helpful to vascular surgeons. **Aim:** To study the origin and number of anterior choroidal artery in south Indian cadavers. **Materials and Methods:** This study done in 50 formalin fixed human brains obtained from routine dissection from donated cadavers with 10x magnification. The origin in relation with internal carotid artery, numbers of anterior choroidal artery for both sides, totally 100 anterior choroidal arteries noted and photographed for documentation. **Results:** All the anterior choroidal artery (AChA) arose from the internal carotid artery (ICA) except two specimens, where it arose from posterior communicating artery (PCoA). Out of 98 anterior choroidal arteries, 65 arose from posteroinferior aspect of ICA, in 30 from the posterolateral aspect and in 3 from its anterior part. Out of 50 specimens all showed single artery except in two case, where double anterior choroidal artery was present on left side in one case and right side in another case. **Conclusion:** The knowledge of anatomical variations in the anterior choroidal arteries is important to neurosurgeons in order to keep neurological damages to minimum, during treatment of arteriovenous malformations, aneurysms and in interventions of inferior temporal lobes.

## INTRODUCTION

The importance of anterior choroidal artery is related to its strategic and extensive area of arterial supply. Anterior choroidal artery usually arises 2-5mm distal to the posterior communicating artery from the posterolateral wall of the internal carotid artery. As a variation, anterior choroidal artery arises from another artery such as the middle cerebral artery and posterior communicating artery.<sup>[1]</sup> It usually arises as a single trunk, however, duplicate or rarely multiple.<sup>[2]</sup> It supply globus pallidus, caudate nucleus and amygdaloid body, hypothalamus, red nucleus, substantia nigra, posterior limb of the internal capsule, the optic radiation, optic tract, hippocampus, and the fimbria of the fornix.<sup>[3]</sup>

The first branch from the anterior choroidal artery in cisternal segment is the unco-hippocampal branch, which supplies head of the hippocampus. The superior branches pass to anterior and posterior perforated substances and optic tract. The lateral and inferior branches that pass to the temporal lobe and the uncus, and the medial branches that penetrate the cerebral peduncle and lateral geniculate body.<sup>[1]</sup> Occlusion of the anterior choroidal artery in the cisternal segment results in contralateral hemiparesis, homonymous hemianopia, hemihyperaesthesia, and depressed level of consciousness.

In addition, the artery may be involved in cases of intracranial aneurysms, arteriovenous malformations or intracranial tumors. The diagnostic evaluation of anterior choroidal artery is required in order to obtain

knowledge of the anatomy of this vessel, therefore we decided to examine their origin related to internal carotid artery and number of arteries in detail.

## MATERIALS AND METHODS

An observational study was conducted on 100 anterior choroidal arteries from 50 adult formalin-fixed donated human cadaver brains from routine dissection during the period of august 2011 to January 2014 in the Department of Anatomy, Thanjavur Medical College, Thanjavur, India. The number of anterior choroidal arteries was determined.

### Inclusion and Exclusion criteria

Good and well formalin-fixed cadavers age from 20 to 80 yrs were included in the study. Age below 20 yrs were excluded from the study.

### Study Procedure

Standard dissection was performed. The specimens were removed from the cadaver as described in Cunningham's manual of practical anatomy [4]. The arachnoid was carefully removed from base of the brain. The origin of anterior choroidal artery in relation with internal carotid artery and double anterior choroidal artery noted with 10x magnification. The most representative specimens were photographed with the Nikon digital camera.

### Statistical Analysis

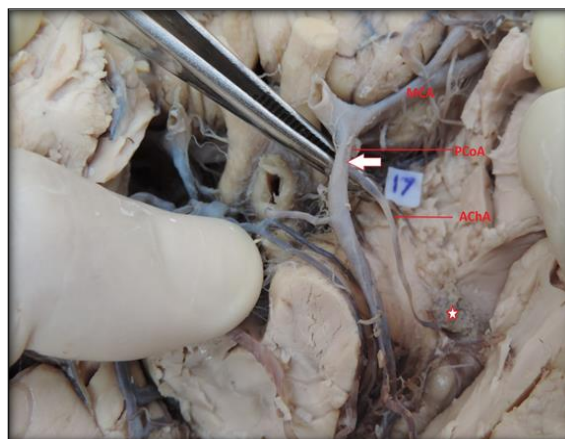
Descriptive statistics were used for this study and results were expressed in terms of frequency (N) and percentages (%).

## RESULTS

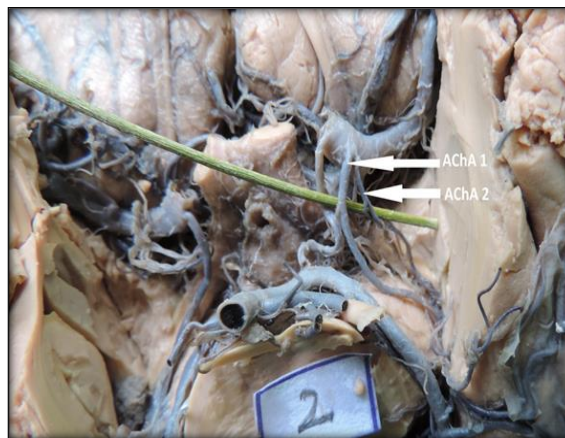
One 100 anterior choroidal arteries were studied from their origin on the carotid to the choroidal fissure. Anterior choroidal artery was present in all specimens. 98 arteries arose from ICA from both sides except in two specimens (2%), in one case it arose from the right side of the Posterior communicating artery [Fig-1], another case arose from the left side of the posterior communicating artery. The anterior choroidal artery arose from postero-inferior aspect of the internal carotid arteries in 65% of cases, from posterolateral aspect in 30%

of cases and from the anterior part of the internal carotid artery in 3% of cases [Table-1].

The anterior choroidal artery courses dorsolaterally and then runs through uncus and the amygdaloid body of the temporal lobe. Along this route it usually lies in close proximity to oculomotor nerve and posterior communicating artery. In our study all anterior choroidal artery showed single artery except in two case (2%), where double anterior choroidal artery was present on left side in one case [Fig-2] and right side in another case [Table-2].



**Figure 1: Anterior choroidal artery from posterior communicating artery. MCA-middle cerebral artery, Red star – Choroid plexus**



**Figure 2: Double anterior choroidal artery**

**Table 1: Site of origin of Anterior choroidal artery**

Side of hemisphere	Site of origin	No. of Specimens	Frequency	Relation with internal carotid artery
Right side	ICA	49	98%	Posteroinferior - 33 Posterolateral - 14 Anterior - 2
	PCoA	1	2%	-
Left side	ICA	49	98%	Posteroinferior - 32 Posterolateral - 16 Anterior - 1
	PCoA	1	2%	-

**Table 2: Number of Anterior choroidal artery**

S. No	Side of hemisphere	AChA	No. of Specimens	Frequency
1	Right	Single	49	98%
2		Double	1	2%
3	Left	Single	49	98%
4		Double	1	2%

**Table 3: Comparison of origin of the anterior choroidal artery in different studies**

Origin of the AchA	From ICA( %)	From MCA(%)	Bifurcation of (ICA %)	From PCA(%)	Absent(%)
Carpenter et al (1954)	76.6	11.7	3.3	6.7	1.7
Herman et al(1996)	85	8	9	0	0
Fujii et al(1980)	98	0	0	2	0
Lang et al(1995)	98	0	0	2	0
Aysun uz et al(2005)	100	0	0	0	0
Present study	98	0	0	2	0

## DISCUSSION

The embryogenesis of the cerebral vascular system begins at approximately 5 weeks of gestation. As the brain develops, the blood flow of the artery through the choroid plexus increases and at this time a large part of the telencephalic region that is supplied by this artery begins to take its blood flow from the posterior cerebral artery. It is known from human embryological studies that anterior choroidal artery is an early developed artery of the brain and plays an important part in the blood supply of the brain.<sup>[5]</sup> According to Ronald A. Bergman (1995),<sup>[6]</sup> Aysun Uz (2004),<sup>[7]</sup> and Akar et al (2009),<sup>[8]</sup> the anterior choroidal artery (AChA) arise from the internal carotid artery. However, variations in the origin of the artery were reported. Carpenter et al found 76.6% of anterior choroidal artery arose from the internal carotid artery, 3.3% AChA from the bifurcation of ICA, 11.7% of AChA arose from middle cerebral artery, 6.7% of AChA arose from posterior communicating artery.<sup>[9]</sup> Herman et al found anterior choroidal artery to arise from the internal carotid artery in 85% cases, from middle cerebral artery in 8%, and from the junction of ICA, MCA in 7%.<sup>[10]</sup> Other investigators, Fujii et al, Lang J have mentioned 2% of anterior choroidal artery as arose from the posterior communicating artery.<sup>[11,12]</sup> This may be explained by anterior choroidal artery arising from rostral and caudal parts of internal carotid artery phylogenetically. During the development these parts of Internal carotid artery are, in any case, the posterior communicating artery if self.

Anterior choroidal artery arising from the bifurcation of internal carotid artery may be due to deficiency in the development of distal part of the ICA or deficiency in the migration of distal part of the anterior choroidal artery. In the present study, we found in 100 arteries, 98 anterior choroidal arteries arose from the internal carotid artery, 2% arteries arose from posterior communicating artery in the right side of the specimens. In [Table-3], we compared our study of origin of anterior choroidal artery with different studies. These observations

were similar to the findings of Rhoton et al, Fujii et al.

Anterior choroidal artery may found as single, double or triple. In an intraoperative study Akar et al,<sup>[8]</sup> reported in 130 cases, AChA were found single in 110 (84.6 %), double in 17 (13%) and triple in 3 (2.4%). Onsay et al,<sup>[13]</sup> stated duplication was found in one hemisphere. Rhoton stated double anterior choroidal arteries found in 4%. Their origins were two types. One type consisted of two separate arteries arising from the carotid, and others arise from the carotid as a single artery but divided immediately into two trunks. In the present study anterior choroidal artery was present in all specimens and all were single except in two (2%) which was duplicated. In Both cases double choroidal artery are arising two separate arteries from the carotid.

### Limitation(s)

The study was done on the human cadavers. It can be extended to intra-operative and radiological studies to obtain further results and conclusions. Sample size is also a limitation for the present study

## CONCLUSION

Anterior choroidal artery aneurysms form 4% of all intracranial aneurysms. The aneurysms of AChA of this artery generally located near its origin and related to the medial part of the temporal lobe. Ischemic stroke is the most common complication after surgical clipping of the aneurysms of internal carotid artery-anterior choroidal artery complex. We concluded that the recognitions of the anatomical variations of anterior choroidal artery and its origin will allow neurosurgeons to construct a better and safer microdissection plan and can prevent postoperative neurological deficits.

## REFERENCES

1. Rhoton Jr AL, Fujii K, Fradd B. Microsurgical anatomy of the anterior choroidal artery. *Surg Neurol.* 1979; 12:171-187.
2. Yasargil MG. *Microneurosurgery.* Vol.1. New York, Thieme-Stratton, 1984:5-168.
3. Peter L Williams. *Gray's Anatomy.* 37th ed. Churchill livingstone. 1993:747-49.

4. G.J. Romanes. Cunningham's manual of practical anatomy.15th ed. Oxford University Press. 1996: p14, 15,46,50,51.
5. Hoyt WF, Newton TH, Margolis TM. The posterior cerebral artery. Section I. Embryo development Anomalies, 1974: 1540-1550.
6. Ronald A. Bergman, Adel K. Ann, Ryosuke Miyuchi. Illustrated Encyclopedia of Human Anatomic Variation: Opus II: Cardiovascular system: Arteries: Head, Neck and Thorax-Anterior Communicating Artery. 1995
7. Aysun Uz, Kadriye Mine Erbil, Ali Fİrat Esmey. The origin and relations of the anterior choroidal artery: an anatomical study. Folia Morphol. Vol.2005; 64(4): 269-272.
8. Ali Akar, Goksin Sengul, Ismail Hakki Aydin. The Variations of the Anterior Choroidal Artery. Turkish neurosurgery.2009; Vol 19(4): 349-352.
9. Carpenter, M.B., Noback, C.R., a Moss, M.L.: The anterior choroidal artery. Its origin, course, distribution and variations, Arch. Neurol. Psychiatry 71:714-722, 1962.
10. Herman LH, Fernando OV, Gurdjian ES. The anterior choroidal artery. An anatomical study of its area of distribution. Anat Rec.1966; 154:95-102.
11. Fujii K, Lenkey C, Rhoton AL Jr. Microsurgical anatomy of the choroidal arteries: lateral and third ventricles. J Neurosurg .1980; 52:165-188.
12. Lang J (1995) Skull base and related structures. Atlas of clinical anatomy. Schattaure, 27-29
13. Onsay, Dumitru, S. Toma. Thalamus vascularisation. Bulletin of the Transilvania University of Brasov Series VI: Medicine. 2011; Vol. 4 (53).