

# Morphometric Study of Callosomarginal Artery

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## ABSTRACT

**Aim:** The present study presents the morphometric anatomic features of the CMA. Its relations with the pericallosal artery & clinical implications are presented.

**Methods:** Fifty cerebral hemispheres were obtained from cadavers & put in 10% formalin for one week so as to fix them. A mixture of gelatin & Indian ink of blue colour was injected in the anterior cerebral artery. Measurements of length & diameter of vessels was made by digital vernier calipers.

**Results:** The CMA was present in 94.3% of hemispheres arising from the distal part of ACA. The mean diameter of the CMA at its origin was  $1.47 \pm 0.36$  mm. The CMA ran  $1.28 \pm 0.8$  cm until first branch describing an anterior convex curve backwards & upwards was given. An average of three lesser branches originated from CMA. The mean diameter of the CMA branches was  $0.92 \pm 0.33$  mm.

**Conclusions:** The morphometric measurements can help neurosurgeons access lesions located in distal intracranial vessels. Its largest course was near the cingulate gyrus.

**Keywords:** CVA (cardiovascular accidents), CMA, ACA

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## INTRODUCTION

Attempts to understand the varied structures, functions, relationships within the human brain have a long history. In the 1980's the positron emission tomography (PET) which measures functions related changes in the regional arteries blood flow was invented closely followed in early 1990's by a Functional Magnetic Resonance Imaging (MRI) which measures blood oxygen level<sup>1</sup>.

The intracranial aneurysms were described for the first time at autopsy in 1705. The development of angiography in 1927 facilitated the diagnosis & treatment of cerebral aneurysms. It was found that mortality from the first blood in an aneurysm from the CMA may be as high as 50%. The knowledge of supply to CMA & variations enable the surgeon to choose the right approach<sup>2</sup>.

The variations on the frontal lobe artery from the CMA resulted in tonic & clonic seizures due to focus in the left frontal lobe region where blood was supplied by the contralateral CMA<sup>3</sup>.

The origin, course branching pattern of callosomarginal artery was studied in cadavers Cerebral hemispheres. It was concluded that these morphometric measurements can help the neurosurgeons access to lesions located in distal intracranial vessels<sup>4</sup>.

It was concluded that the CMA supplied the cortical areas in the region of the orbitofrontal & paracentral lobule including upper part of premotor & supplementary motor areas which extend over the superlateral margin to medial surface of cerebral hemisphere.

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## MATERIAL & METHODS

It was cross sectional study at King Edward Medical University. Fifty embalmed & un-embalmed cerebral hemispheres were collected from recently deceased adult males between 20- 60 years of age from various teaching institutes, Forensic department KEMU Lahore & anatomy departments of SIMS, FJMC & AIMC with permission.

Skull caps were cut by electric saw passing through middle of frontal bone, squama of temporal bone & the occipital bone. Skull cap was removed. After incising the falx cerebri & tentorium cerebelli hand was passed over the surface of brain & it was removed through the epidural space. Each brain was examined for any bleeding, softening or any other pathological lesion like infarcts. Brain with these lesions were then excluded. Then each selected brain was put in 10% formaline for one week so that it got fixed. After one week the dura was removed gently by forceps & intravenous branula No. 24 was passed into anterior cerebral artery. An injection medium consisting of mixture of gelatin & blue Indian ink was injected by syringe into Anterior Cerebral artery after ligating anterior communicating artery. After injection the branula was removed & ligature applied to the artery so that the dye may not escape. The contrast colour clearly defined the branches of the anterior cerebral artery. As the vessels of the brain are tortuous it was difficult to measure the length by digital caliper, so a flexible copper wire was molded along the course of the CMA. The wire was cut according to the length of vessels & straightened out and actual length was computed on digital caliper. The diameter of the blood vessels was computed by digital electronic vernier caliper. The external diameter was noted at proximal middle &

distal end & mean diameter was noted for statistical analysis

**Statistical analysis:** Data was entered into SPSS version 13.0 & analysed descriptively & analytically. In our descriptive analysis means & standard deviations were computed for all quantitative variables like length & diameter of blood vessels

**RESULTS**

Out of 50 cerebral hemispheres the callosomarginal artery was found in 47 cases (94%). It originated from the Pericallosal artery in 44 cases (93.6% cases) & in 3 cases it originated from the Anterior

Communicating artery. Its surface appeared smooth in 34 cases (72.34%) & in the other 13 cases (27.65%) it appeared nodular. It originated near the cingulate gyrus & travelled over the orbito-frontal & paracentral lobule & ended by dividing into three branches. It followed an arch upward course in 39 cases (82.97%) & backward straight course in 8 cases (17.22%). Its maximum & minimum diameter was 1.53mm & 1.42mm respectively. Its mean diameter at proximal segment was 1.47±0.36 mm. its mean length was 18.72±0.23mm. The mean diameter of its cortical branches was 0.92±0.33.

Table 1: Morphometric variations of callosomarginal Artery

Origin		Appearance		Course		Mean diameter(mm)	Mean length (mm)
Pericallosal artery	Anterior communicating artery	Smooth	Nodular	Curved	Straight		
44 cases	3 cases	34 cases	13 cases	39 cases	8 cases	1.47±0.36 mm	18.72±0.23 mm
93.61%	6.38%	72.34%	27.65%	82.97%	17.02%		

**DISCUSSION**

It is reported that an anatomic & morphological variations of the cerebral vessels are of immense importance in surgery, angiography & all non-invasive procedures. The abnormal origin of the CMA may favour cerebral disorders including aneurysms<sup>5</sup>. In our study CMA showed variable origin, course & appearance & may be responsible for infarcts in distal cortical areas. This shows involvement of the primary motor area 6. In our study CMA appeared to be the major branch of ACA & supply primary motor area so occlusion can lead to distal body hemiplegia<sup>6</sup>.

Fibromuscular dysplasia involving the intracranial vessels revealed the beaded appearance of the vessels<sup>7</sup>. Our study showed significant difference of smooth & beaded appearance. The anatomy of the callosomarginal artery was studied in 60 cases & was found to originate from A3 (Pericallosal artery) of the ACA & its mean diameter at origin was 1.53±0.36mm. Its cortical branches supplied the frontal lobe mainly<sup>7</sup>. These findings are comparable to our study. In another study on variations of anterior & middle cerebral artery it was found in 65% cases the path is arch shaped but in 44% it is straight & wavy<sup>8</sup>. In 9% the results are comparable to our study. Two right handed patients with clinical evidence of major infarct in the territory of the left anterior cerebral artery developed a profound transient aphasia due to premotor & supplementary motor region comparable to our study<sup>9</sup>.

Gama radiations delivered to brain can change the appearance of vessels supplying functional areas of brain, nodular appearance in our study support the case<sup>10</sup>.

**CONCLUSION**

The morphometric study of CMA can be of immense importance for the neurosurgeons operating in these areas. The variations in its origin, course & appearance may have implication in clinical practice nodularity & tortuous course could explain the high incidence of cerebrovascular accidents in mankind.

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