

## ANATOMICAL VARIATIONS IN ANTERIOR CEREBRAL ARTERY IN HUMAN CADAVERS

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### ABSTRACT

**Introduction:** Anterior cerebral artery is one of the terminal branches of internal carotid artery below the anterior perforated substance. Cerebral artery occlusion may leads to infarction in brain tissue. The occlusion is caused by stenosis, embolism or rupture of arteries. Cerebrovascular accidents which are the 3<sup>rd</sup> leading cause of morbidity and death in United States have attracted the attention of many scientists.

**Materials and Methods:** Study sample 50 well formalin preserved brain from cadavers in dissection hall of MGMs Medical College in year of June 2012 to December 2013. Length is measured by thread and diameter measured by venire caliper.

**Results:** The origin and course of anterior cerebral artery in all brains were same and 42 brains the size of Anterior cerebral artery (ACA) was equal. In 8 brains they were unequal size.

**Discussion and Conclusion:** Present study was undertaken in order to determine anatomical variations in anterior cerebral artery. The need for dimensional data for variation in morphology of vessels is expressed by neurosurgeons and radiologists as well as researches but no comprehensive measurements have been published, especially the Indian data. In anterior cerebral arteries diameter on right is 2.1 mm and on left 2.4 mm which was smaller than those of previous studies.

In present study the length of right 1.3 cm and left 1.2 cm which was less compared to other studies.

**KEY WORDS:** Anterior Cerebral Artery, Human Cadavers.

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### INTRODUCTION

Anterior cerebral artery is smaller terminal branch of internal carotid artery below the anterior perforated substance. Cerebral artery occlusion leads to infarction in brain tissue. The occlusion is caused by stenosis, embolism or rupture of arteries. Cerebrovascular accidents

which are the 3<sup>rd</sup> leading cause of morbidity and death in United States have attracted the attention of many scientists. The term 'stroke' is applied to the severe manifestations of cerebrovascular disease.

The brain is supplied by two internal carotid and two vertebral arteries. The branches of these

arteries anastomosis on the inferior surface of the brain to form the circular arteriosus [1]. The anterior cerebral artery is smaller terminal branch of internal carotid artery. Its hypoplasia and absence can cause serious problems during neurosurgery or in vascular dynamics of the brain [2].

The anterior cerebral artery is major vessels responsible for the blood supply of the interhemispheric region. The anterior cerebral artery segment after anterior communicating artery (a Com A) origin is called the distal ACA and has central and cortical branches [1,3]. The distal ACA is the principal artery supplying the corpus callosum [4].

Most of anatomical variations have been reported on posterior cerebral and posterior communicating arteries. However, there are very few case reports regarding the variations encountered in anterior cerebral arteries and their communications [5-7].

This study is of particular interest to cerebrovascular surgeons because of aneurysms of anterior, middle and posterior cerebral arteries are common [8].

Hence the present study was undertaken to study the origin, length and diameter of anterior cerebral arteries in both cerebral hemispheres.

## MATERIALS AND METHODS

**Study Sample:** Fifty well formalin preserved brains (after discussion with the biostatistician) from cadavers in dissection hall of Mahatma Gandhi Missions Medical College, Aurangabad, India.

**Instruments:** The instrumentation required were scalpel, forceps, scissors, measuring scale, brush, cotton, glycerin, gloves, oil paint and vernier caliper.

**Method:** The cadavers were placed in supine position. A pencil mark was made on the skull by encircling it horizontally. By making saw cut along the line skull cap was removed.

To remove the brain in one piece, the falx cerebri from the crista galli was detached. Falx pulled posteriorly. A block of wood placed under the shoulder to allow the head to fall back. This allows the frontal lobe to move out of anterior

cranial fossa, the optic nerve, internal carotid, and infundibulum were cut. The posterior part of hemisphere was raised with fingers, pressing the Pons further posteriorly and knife was passed into the vertebral canal in front of medulla oblongata cutting firmly from side to side. The brain was withdrawn from cranial cavity [9].

Fifty brains were removed from cranial cavity using the above procedure. The anterior cerebral arteries were observed. Each artery was examined under side.

Anterior cerebral artery study according to its proximal ( $A_1$ ) segment and distal ( $A_2$ ) segment.  $A_1$  and  $A_2$  is the segment of proximal and distal to the origin of anterior communicating artery. The origin course diameter, length and number of each segment were noted.

## RESULTS

Anterior cerebral arteries were observed in 50 brains. The origin and course of anterior cerebral artery in all the brains were same. In 42 brains, the size of anterior cerebral arteries was equal. In 8 brains they were unequal in size.

$A_1$  is the segment of anterior cerebral artery from internal carotid to anterior communicating artery.  $A_2$  is the segment of anterior cerebral artery after anterior communicating artery.

In 6 brains the  $A_1$  segment was narrow or sting like associated with a large anterior cerebral artery on the opposite side. In 2 brains  $A_1$  and  $A_2$  segment were smaller on one side.

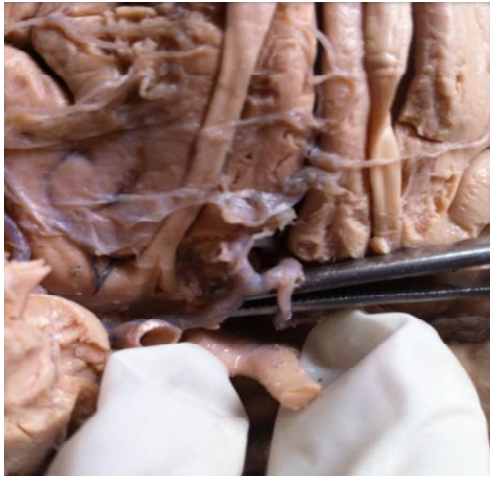
In 50 brains the course was normal. Straight or tortuous arteries were not found. United  $A_2$  segment or duplication of  $A_2$  segment was not observed. Aneurysms were not seen on the anterior cerebral arteries.

Hypoplasia was defined if component vessels of circle of Willis were less than 1 mm in diameter. (Table 1) (Figure 1)

**Table 1:** Showing number of cases in variations of anterior cerebral arteries.

Anterior cerebral artery	Right (n=50)	Left (n=50)	Total (n=50)
Hyperplasia	6	-	6
Hypoplasia	-	8	8
Absence	-	-	-
Partial duplication	-	-	-

**Fig. 1:** Showing diameter of anterior cerebral artery.

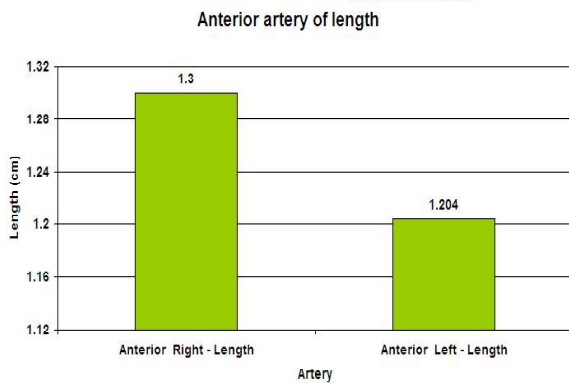


**DISCUSSION**

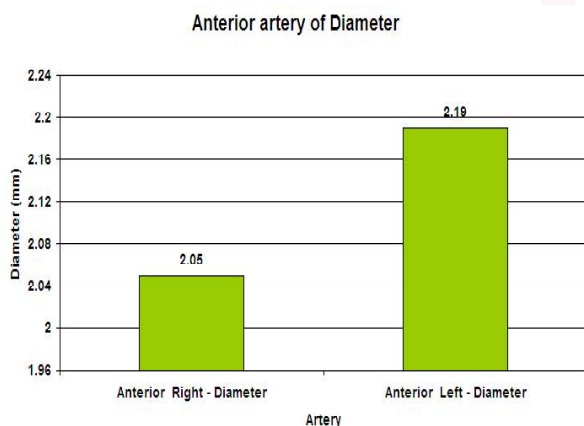
**Table 2:** Showing descriptive statistics.

Anterior	n	Minimum	Maximum	Mean	S.D.	CV%
Right length	50	1.1	1.5	1.3	8.57E-02	6.59
Left length	50	1.1	1.3	1.204	8.80E-02	7.31
Riht diameter	50	1	2.5	2.05	0.432	21.07
Left diameter	50	1	2.8	2.8	0.283	12.92

**Graph 1:** Showing the Anterior Cerebral Artery Length in Both sides.



**Graph 2:** Showing the Anterior Cerebral Artery Diameter in Both sides.



In 1962 Thomas Willis was the first scientist to describe the circulus arteriosus, as the major blood supply to the brain. He considered as one of the greatest neuroanatomists of all time. He was born on 27 January great Bedwyn in Wiltshir England, the son of a farmer who lost his life at the blege of Oxford during civil war [5].

The other methods of studying are by magnetic resonance imaging (MRI) or angiography of cerebral vessels.

In the present study diameter length taken and compared with the previous studies.

The diameter of right anterior cerebral artery mention by Kamath S. (1981) with dissection method was 2.2 mm and in present study it was 2.1 mm. The diameter of right anterior cerebral artery mention by Kamath S. (1981) with dissection method was 2.4 mm and in present study it was 2.2 mm. [10].

The diameter of both anterior cerebral arteries mentioned by Sacki et al (1977) with dissection method was 2.6.[11] the diameter of anterior cerebral artery by Portmutter et al (1976) in autopsy specimen was 2.6 mm.[12].

The length of right anterior cerebral artery mentioned by Kamath et al (1987) with dissection method was 1.47 cm whereas in present study it was 1.3 cm. The length of left anterior cerebral artery mentioned by Kamath et al (1981) with dissection method was 1.38 cm. In our study it was 1.2 cm.[10] (Table 2, Graph 1 and 2))

**CONCLUSION**

In the anterior cerebral arteries the diameter on the right was 2.1 mm and on the left it was 2.4 mm which is smaller than those of Sacki et al and Prlmutter et al who had mean of 2.6 mm. In present study length of right 1.3 cm and left 1.2 cm which was less as compared to Kamath et al who showed findings of 1.47 cm and 1.38 cm on right and left side respectively [10-12].

**Conflicts of Interests:** None

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