



## VARIATIONS IN ANTERIOR SEGMENT OF CIRCLE OF WILLIS IN HUMAN CADAVERS.

### Anatomy

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### ABSTRACT

**Aims and Objective :** A major part of brain is supplied by the branches of two internal carotid arteries and two vertebral arteries. A significant anastomosis, the Circle of Willis exist between the carotid and vertebral arterial systems. An understanding of the distribution of the arteries is very important. As the neurological signs depends on the site of lesion.

**Material and methods:** The study was conducted on 45 adult brain specimens of both sexes in human cadavers. The collected specimens were preserved in 10% formalin. The Circle of Willis of each brain was dissected with care.

**Results:** Variations in anterior segment of Circle of Willis in brain specimens includes – duplicity, fenestration, trifurcation and absence of arteries.

**Conclusion:** Various diseases of arteries of brain like cerebro – vascular attack, aneurysm, haemorrhage etc. are related to the anatomic patterns of the Circle of Willis. The knowledge of which is of considerable help to neurosurgeons.

### KEYWORDS

ACA, ACoA, PCA, PCoA

### INTRODUCTION

The blood supply of brain is of great importance because of the metabolic demands of the nervous tissue. The greater part of brain is supplied by the branches of two internal carotid arteries and two vertebral arteries. A circular arterial anastomosis, the Circle of Willis exist between the carotid and vertebral arterial systems at the base of the brain in the interpeduncular fossa.

The arterial circle is formed by the internal carotid artery which is interconnected by the anterior cerebral arteries (ACA) on both the sides and an anterior communicating artery (ACoA) which connect the right and the left anterior cerebral arteries. The carotid system is connected to the posterior cerebral arteries (PCA) of the vertebral system by two posterior communicating arteries (PCoA).

The Circle of Willis provides an alternate route, when one of the major arteries leading in to it is occluded. Arterial occlusion by an embolus or thrombus leads to infarction of the region supplied. Aneurysms often develop at the sites of branching of arteries in and around the circle which can rupture leading to subarachnoid haemorrhage.

### Material and methods

The present study was conducted on 45 adult brain specimens of both sexes in human cadavers. The specimens were collected from cadavers given for dissection in dissection hall of Department of Anatomy and autopsies done in the department of forensic medicine. The collected specimens were preserved in 10% formalin. The Circle of Willis of each brain was dissected out with care. The detailed study of segments of the arterial circle was done in each specimen and the findings were noted. Variations observed in relation to the presence or absence of the differences in each segment of the circle.

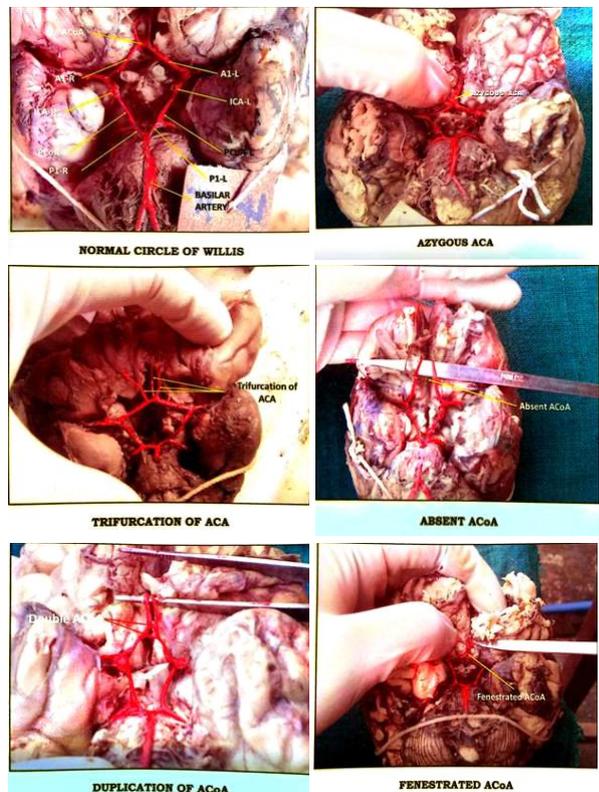
The arterial circle was coloured with premium gloss enamel red colour paint by using a '0' number brush. Photographs were taken

### OBSERVATION

In the present study the anterior part of the circle was having variations in 7 specimens (15.56%). Anterior cerebral artery (ACA) was found absent in two of the brain specimens. ACA was found hypoplastic in one brain on the right side. Azygous ACA or the median trunk formation was seen in 4 brain specimens.

In the present study, the anterior communicating artery (ACoA) was found absent in 6 of the 45 brain specimens (13.33%). Out of the 6 cases a complete absence was seen in only 2 cases, a median trunk (azygous ACA) was found in 4 of the above 6 cases. The ACoA was found double in one and fenestrated in 2 brain specimens.

Anterior communicating artery – Anterior cerebral artery (ACoA – ACA) complex was most commonly found 'H' shaped in 32 specimens (71.11%) while 'V' shaped in 4.



### DISCUSSION

The arterial circle and its branches are subjected to various morphological variations. The findings of present study are compared with the previous works done on this subject as follows:

Windle (1887) in a study of 200 brain specimens found the complete absence of the anterior cerebral artery in 2 cases and in both, the missing vessel was on the right side. The most common variation he found was that of duplicity of ACoA which was present in 14 cases.

Fawcett and Blackford (1905), in a study of 700 specimens found the doubling of the anterior cerebral artery in 2 specimens only, in both cases it was the right artery. He found the absence of ACoA in only one specimen. The ACoA artery was found to be single or double, treble or 'I' shaped.

Vare and Bansal (1970) performed a study on 175 specimens and

observed a median anterior cerebral artery in 3 cases and in 4 cases the left artery was arising as a branch of the right ACA. They found variations in ACoA such as its duplication in 18 cases, triple in 4 cases and the artery was absent in 2 cases.

Luzsa (1974) found the bilateral anterior cerebral arteries forming a common trunk known as Anterior Cerebral Azygous Artery.

Lipert H and Padst R (1985), in an anatomic study, observed the absence or hypoplasia of the proximal Anterior Cerebral Artery in 10% of specimens.

Stephen P Lownei and Jhon (1991) noted in a study of 50 specimens, that in 2% cases one of the Anterior Cerebral Arteries was hypoplastic. A single ACoA was found in 60%, double in 30% and triple in 10% of total specimens.

Kanchan K (2002) in a study on 1000 human brains noted that ACA was hypoplastic in 17 specimens. Presence of triple ACA was observed in 23 brains and ACAs of both the sides joined to form a single median artery in 9 cases.

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