

# **A STUDY OF VARIATIONS OF ANTERIOR CEREBRAL ARTERY AND ANTERIOR COMMUNICATING ARTERY**

## **ABSTRACT**

### **INTRODUCTION:**

Anterior Cerebral Artery (ACA) contributes to the major part of anterior circulation of human Brain by completing the anterior component of Circle of Willis along with the Anterior Communicating Artery (ACoA). Variations in anterior circulation of the brain is important in Neuro surgical Interventions particularly related to aneurysms and craniotomies.

### **AIM OF THE STUDY:**

This study aims to highlight the variations of ACA and ACoA under the following parameters.

- I. Origin of Anterior Cerebral Artery
- II. Relation of ACA to Optic nerve or Optic chiasma.
- III. A1 segment
  - a) Number of A1 segment
  - b) Diameter of A1 segment
  - c) Length of A1 segment
- IV. Anterior Communicating Artery
  - a) Number of ACoA
  - b) Course of ACoA
  - c) Length of ACoA
  - d) Diameter of ACoA
- V. Origin of Recurrent Artery of Heubner
- VI. Orbito Frontal Artery
  - a) Origin of Orbito Frontal Artery

- b) Distance of origin of Orbito Frontal Artery from ACoA and ACA junction.
- VII. Distance of origin of Fronto Polar Artery from ACoA and ACA junction.
- VIII. Callosomarginal Artery
  - a) Origin
  - b) Distance of Calloso Marginal Artery from ACoA and ACA junction.

## **MATERIALS AND METHODS**

### **STUDY MATERIALS**

1. 60 adult cerebral hemispheres from 21 male and 9 female cadavers.
2. Ruler and thread.
3. Digital Vernier Calipers.
4. Dissection set.

### **METHOD OF STUDY**

1. Conventional dissection method.
2. Injection method.

### **SPECIMEN COLLECTION**

Adult human brain hemispheres were collected from embalmed cadavers allotted for routine academic dissections to the first MBBS and first BDS students at the Institute of Anatomy, Madras Medical College, Chennai.

### **RESULTS:**

The Anterior Cerebral Artery and Anterior Communicating Artery, were studied in detail by conventional dissection method.

The observations of the present study were compared with the findings of previous studies. The following conclusions were derived from this study.

- In all the 60 cerebral hemispheres, the origin of Anterior Cerebral Artery was from the Internal Carotid Artery of the same side.

- The ACA coursed the above optic nerve and optic chiasma in 59 hemispheres (98.3%). In 1 hemisphere, however the artery coursed below the optic chiasma close to the optic nerve (1.67%).
- In all the 60 cerebral hemispheres, the A1 segment of the ACA was single. Agenesis, duplication or triplication of the A1 segment of the ACA was not observed in the present study.
- The length of A1 segment of right ACA in the present study ranged from 16mm to 12mm with an average of 13.70mm. The length of A1 segment of left ACA ranged from 16mm to 12mm with an average of 14.43mm
- The average diameter of A1 segment of right ACA observed in the present study was 1.72mm ranged between 2.58 mm and 0.72 mm. The average diameter of A1 segment of left ACA observed in the present study was 1.76mm ranged between 2.60 mm and 0.68 mm.
- In all the 30 specimens, Anterior Communicating Artery was single, duplication or triplication of the Anterior Communicating artery was not observed in the present study.
- The course of ACoA was oblique in 20% of specimens and transverse in 80% of specimens.
- The average length of ACoA was 2.81mm with a range from 4 mm to 2 mm.
- The average diameter of ACoA was 2.52 mm with the range from 3.07 mm to 2.01 mm.
- On the right side, the Recurrent Artery of Heubner originated from A1 segment in 33.3% of the specimens, from the A2 segment in 66.7% of the specimens. On the left side, the artery originated from the A2 segment in 63.7% and from the A1 segment in 36.7% of the specimens.
- The average distance of origin of orbitofrontal artery from ACoA & ACA junction was 14.20 mm on the right side and average distance on the left side was 16.37mm

- The average distance of origin of FPA from ACA & ACoA junction was 30.37 mm on the right side and 34.30 on the left side.
- The average distance of origin of CMA from ACA & ACoA junction was 49.87 mm on the right side and 53.87 mm on left side.
- The distance of origin of these branches from ACA & ACoA junction will be helpful to the neurosurgeons to locate the vessels exactly in microsurgery.

The relation of the artery to the Optic nerve gives us an idea about the location of compression in the visual defects. In aneurysm of ACA with unequal diameter of both sides, the base of the aneurysm arises on the side of larger A1 and the dome points towards the side of the hypoplastic A1. Recurrent artery of Heubner, an important central artery of ACA should be preserved while clamping an aneurysm of ACA – ACoA complex.

The comprehensive study of the origin, course, length, diameter, branches and the distance of origin of branches of anterior cerebral artery and anterior communicating artery under a common roof will be useful to the neurosurgeons who plan for endovascular surgeries, anastomosing surgeries and also for radiologists interpreting various imaging of Anterior Cerebral Artery and Anterior Communicating Artery.

**Keywords :** Anterior Cerebral Artery, Anterior Communicating Artery, Orbito Frontal Artery, Fronto Polar Artery, Calloso Marginal Artery.