



MIDDLE CEREBRAL ARTERY

Anatomy

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ABSTRACT

Middle Cerebral artery is one of the Terminal branch of cerebral part of Internal carotid artery and is the largest branch. Normally lies in the lateral cistern with superficial middle cerebral vein comes I the lateral sulcus and divides into two division as superior and inferior division in the research study middle cerebral artery divides into three divisions as superior, middle and inferior divisions.

For the description of middle cerebral artery there are two approaches are used as functional and segmental approach. Segmental approach is the M1 segment, M2, M3 and M4 segment. M1 segment is the origin of middle lateral artery from the cerebral part of internal carotid artery. Normally M1 segment is 14-16mm. 30 mm is noted in the three division of middle cerebral artery. Lumen size normal as 3-6 mm. 6 mm is noted in three division of middle cerebral artery and M1 length is 30 mm stem of M1 gives only lenticulo striate branches normally. In this research orbito frontal branch arteries from the stem and connected with fronto polar branch of middle cerebral artery.

KEYWORDS:

Artery of circle of willis, Artery of cerebral Haemorrhage, Artery of Insula, Artery of lateral cistern, Largest terminal branch of internal carotid artery.

INTRODUCTION:

Middle cerebral artery is the largest of the terminal branches of the internal carotid artery. It lies in the cistern of stem of lateral sulcus/sylvian fissure accompanied by superficial middle cerebral vein in the inferior surface of cerebrum. Then it comes to the lateral sulcus and divides into superior and inferior division which come to the posterior ramus of the lateral sulcus of the cerebrum.

The proximal middle cerebral artery (M1 segment) give rise to the perforating Branches (Termed Lenticulo striate arteries) that supplies the putamen, outer Globus pallidum, posterior limb of internal capsule above the plane of upper border of Globus Pallidum, the adjacent corpora Radiata and the body of upper and lateral head of caudate nucleus in the sylvian fissure. The middle cerebral artery is mostly divides in to superior and inferior division. One of the branch is larger and causes stroke. So It is called as artery of cerebral hemorrhage is the artery of charcot.

Branches are end arteries six groups of central arteries are anterior median –single, postero lateral paired. Middle cerebral artery mostly divides into superior and inferior division.

Cortical branches supplies except the region supplied by anterior and posterior cerebral artery.

- Except the area of finger breadth area close to the supero medial margin on the superolateral surface of the cerebral hemisphere except the occipital lobe.
- Entire medial surface of cuneus.
- Medial 1/3 of orbital surface
- Except the occipital lobe and a finger breadth area close to the inferolateral margin on the supero lateral surface.

Cortical branches are

- Lateral orbito frontal artery arises from the anterior surface of the horizontal segment of the middle cerebral artery runs forwards & laterally supplying lateral orbital and inferior frontal gyri.
- Anterior temporal branch supplies the anterior part of the temporal lobe on the convex surface.
- Ascending frontal artery – ascends on the anterior part of frontal lobe.
- Pre central (PreRolandic artery).
- Central –Roalandic branch.
- Anterior parietal artery – post Rolandic branch
- Posterior parietal
- Angular artery
- Posterior temporal artery – all the cortical branch.

Lateral orbito frontal which supplies the Pre frontal cortex. The pre Rolandic branch which supplies the middle and posterior parts of superior, middle and inferior Frontal Gyrus. Frontal eye field area and Brocas area. A Rolandic branch which supplies the pre central and post central Gyrus except the leg area and Brocas area. Anterior parietal which distributes to the parietal association cortex and above the supra marginal Gyrus.

Inferior division supplies the two third of individuals. Superior division that supplies region above the angular Gyrus.

Two approaches are used to describe middle cerebral artery. The functional branching approach follows the MCA trunk from the source to the end branches.

The other approach known as segmental approach, analyses branches of the middle cerebral artery in relationship to brain landmark dividing the artery into 4 segments. In segmental approach, M1 is the portion most proximal to the origin of the vessel and M4 includes the terminal MCA branches at the brain surface.

M1 describes the artery from its origin to the fliminsulae. Most of which the portion from which the lenticulo striate arteries arises. The second portion of M1 describes the 3 branches that result from the bifurcation of middle cerebral artery and enter the sylvian sulcus M2 is the segment that runs along the Insula. M3 follows the operculum superior to the Insula.

Finally M4 describes the branches of the middle cerebral artery that passes nearly all the convex surface of the cerebral hemisphere aside from the frontal pole and posterior rim. Using the functional branching approach to Anatomy, the middle cerebral artery generally arises as a single trunk of 14 & 16 mm length and a diameter of approximately 3mm – 6 mm.

First branch consists of 5-7 small lenticulo striate arteries that supply the putamen, pallidum, lentiform nucleus, Internal capsule and caudate nucleus of basal ganglia.

Occasionally a few of the smaller lenticulo striate arteries arise from the internal carotid arteries. After giving lenticulo striate branch middle cerebral artery bifurcates into superior and inferior divisions. The superior branch supplies the prefrontal and orbitofrontal cortex inferior branch supplies the anterior middle and posterior temporal regions.

METHOD OF STUDY:**M1 SEGMENT AND LUMEN:**

- a. Length of M1 segment is noted from the origin of the middle cerebral artery from the internal carotid artery. The length of M1 was measured. Variation in the mode of course and termination of M1 were also looked.
- b. Size of Lumen also measured.
- c. Branches, Numer, Gyrus to which enter any other artery to the same Gyrus . If so size of the lumen of both are noted.
- d. Angle of origin of each division are noted.
- e. Termination of M1 segment and number of divisions are noted.
- f. Sources of origin of middle cerebral artery and source of other arteries if any noted.
- g. Site and level of origin of internal carotid artery is noted & its terminal branch.
- h. Size of lumen of middle cerebral artery and compared with other terminal branches for all function of the area.

LUMEN

1. Lumen size of M1 between origin and termination are noted. Lumen is same at origin and termination. Normal is 3 mm variation into 6mm.
2. Lenticulo striate branch appears from M1 segment is usually six in number. Four and two branches also seen.
3. Termination of M1 segment into superior middle and inferior division in 4% of cases. In most of cases it divides into superior & inferior division.

OBSERVATION:

- I.
 1. Angle of origin on fronto polar is 110°
 2. Angle of origin of pre frontal is 120°
 3. Angle of origin of orbito frontal is 130°
 4. It occurs in 94% of cases. Middle cerebral artery divides into superior and inferior division.
 - II.
 1. Only in 6% the angle of fronto polar is 110°
 2. Angle of pre frontal is 130°
 3. Angle of origin of orbito frontal is 150°.
 4. It occurs in 6% of cases. Middle cerebral artery divide into superior, Middle and inferior division.
 5. M1 length is 30 mm.
 6. Lumen size is 6 mm.
 - III.
 1. Angle of origin of pre Rolandic 110°
 2. Angle of origin of Rolandic 120°
 3. Angle of origin of post Rolandic is 130° (Anterior parietal)
 4. Each branch varies 10° variation in middle cerebral artery length is 15 mm Lumen is 6 mm. Middle cerebral artery divides into superior and inferior division.
 - IV.
 1. Angle of origin of pre Rolandic 110°
 2. Angle of origin of Rolandic 130°
 3. Angle of origin of post Rolandic is 150° (Anterior parietal)
 4. Each branch varies 10° variation in middle cerebral artery length is 15 mm Lumen is 6 mm. Middle cerebral artery divides into superior and inferior division.
 - V.
 1. Angle of origin of angular artery 130°
 2. Angle of origin of anterior temporal is 140°
 3. Angle of origin of posterior temporal is 150°
 4. It occurs in 94% of cases.
 - VI.
 1. Angle of origin of angular artery 130°
 2. Angle of origin of anterior temporal is 150°
 3. Angle of origin of posterior temporal is 170°
 4. It occurs in 6% of cases.
- Each branch varies 10° variation in middle cerebral artery length is 15 mm Lumen is 6 mm.
 - 20° variation in middle cerebral artery is 30 mm Lumen size is 6 mm.
 - Branches are superior, middle and inferior.
 - Orbito frontal arises from stem & enters pre rolandic area.
 - Mostly M1 segment terminated as 2 divisions.
 - In 4% it divides into three divisions as superior, middle and inferior.
 - Motor speech area is supplied by three branches. Orbito frontal, Fronto polar and pre Rolandic arises from stem before the division of middle cerebral artery.
 - Orbito frontal branch shows dichotomous pattern which has not been observed in any specimen and this division has not been

reported previously.

CONCLUSION

It has been observed that the middle cerebral artery was the largest of the terminal branch of internal carotid artery arising that lateral to the anterior perforated substance.

An accessory middle cerebral artery has been reported by Jain 1964. Such artery has not been found in the present study.

Size of lumen of anterior cerebral artery is between is 3-6 mm . The largest diameter of 6 mm has been observed in four specimens of which two specimens the lumen of anterior cerebral artery was only 2 mm. So it may be concluded that these two cases are more prone for anterior cerebral artery ischaemia.

Length of artery which is between 14-16 mm is majority is agree with the previous works.

The length of middle cerebral artery in 2 specimens were only 10 mm. In these cases the force of flow will be more and so prone for damage to the tunics of the arteries. In one lumen is 21 mm and another is 30 mm. So possibility for sluggish flow which is a predisposing factor for the formation of Thrombus.

Three divisions denotes liberal blood supply to all the functional lobes of cerebral cortex.

It has been observed that there is a uniform reduction in the caliber of the middle cerebral artery from the origin to the termination. But in 2 specimens lumen at termination is same.

Occlusion of Rolandic gives rise to motor loss & Occlusion of Anterior Parietal branch giving rise to Hemiparesis shows serve and example of various clinical manifestation of occlusion of either the division of branch.

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