

**THE ROLE OF M.R.I
IN CEREBRO VASCULAR ISCHEMIA**

Assay
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TO

My

PARENTS



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***INTRODUCTION
AND
AIM OF THE WORK***

INTRODUCTION AND AIM OF THE WORK

The term "ischemia" is used to describe the consequences of temporarily or permanently decreased blood flow whatever its mechanism. Usually, there is occlusion of a cerebral artery (regional ischemia), less commonly hypotensive shock or cardiac arrest (total or non-occlusive ischemia) may occur (Garcia, 1976).

The diagnosis of acute stroke in its early stage by clinical and radiological method can be difficult. An early diagnosis of ischemia might allow prompt initiation of treatment aimed at reducing morbidity and mortality and also enable the ongoing assessment of treatment (Yuh et al., 1990).

MRI promises to be unique tool for the experimental and clinical investigation of cerebral ischemia due to its inherent sensitivity to changes in brain water caused by various insults (Brant-Zawadzki et al., 1984).

The aim of this work is to demonstrate the role of MRI as a useful tool in the detection of cases of brain ischemia.

***ANATOMY
OF BLOOD SUPPLY
OF THE BRAIN***

ANATOMY OF BLOOD SUPPLY OF THE BRAIN

The brain receives its blood supply via two systems of arteries:-

- A. The carotid system.
- B. Vertebro-basilar system.

A. The Carotid System

It arise on the right side from the brachiocephalic trunk at the level of the right sternoclavicular joint. The left common carotid arises from the aortic arch as a second great vessel at the root of the neck opposite the 6th dorsal vertebra. The artery ascends in the neck within the carotid sheath till it divides into its two terminal branches, the internal and external carotid arteries at the superior margin of the thyroid cartilage (Krayenbuhl and Yasargil, 1965).

1. External Carotid Artery

It is one of the two terminal branches of the common carotid artery arising from its fronto medial aspect. This artery participates with the internal carotid artery and sub clavian artery in the collateral circulation of the

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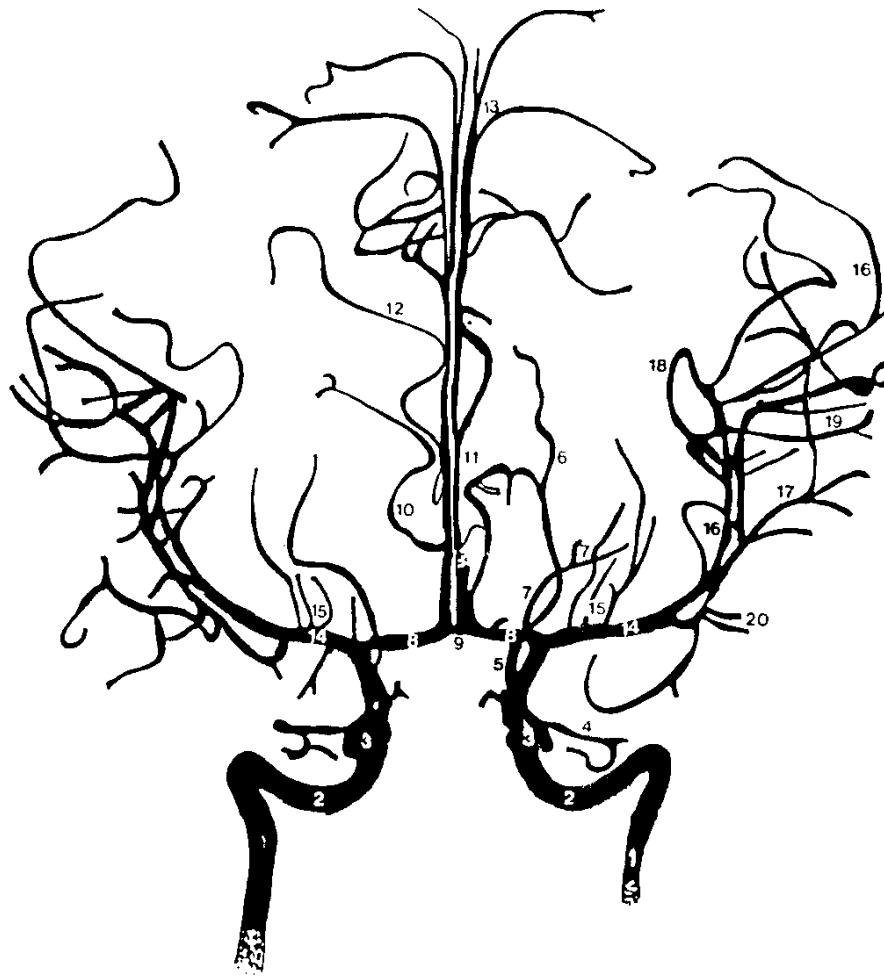
brain. Its anastomotic branches are mainly the middle meningeal from the maxillary artery and meningeal branches from the occipital artery (Maneffe et al., 1971).

2. Internal Carotid Artery

The internal carotid artery (Diag. 1) supplies the major portion of the cerebral hemispheres, the eye, the accessory organs within the orbit, and the forehead. It begins at the bifurcation of the common carotid artery at the level of the fourth cervical vertebra or the superior border of the thyroid cartilage. The internal carotid artery ascends to the base of the skull and passes through the carotid canal of the temporal bone, and then runs forward within the cavernous sinus. It terminates intra cranially at its bifurcation into the anterior and middle cerebral arteries just above the anterior clinoid process (Taveras and Ferrucci, 1987).

Anterior Cerebral Artery

The anterior cerebral artery (Diag. 1,2) complex consists of the anterior cerebral artery, the anterior communicating artery and the pericallosal artery and their branches; it supplies the medial surface of the frontal and parietal lobes including the caudate nucleus, basal ganglia, corpus callosum as well as the inferior surface of the fron-



List of Arteries

- | | | |
|---------------------------------------|--------------------------|-----------------------|
| 1 Internal carotid, cervical part | 7 Anterior choroidal | 14 Middle cerebral |
| 2 Internal carotid, intrapetrous part | 8 Anterior cerebral | 15 Lenticulostriate |
| 3 Internal carotid, cavernous part | 9 Anterior communicating | 16 Posterior parietal |
| 4 Ophthalmic | 10 Frontopolar | 17 Posterior temporal |
| 5 Position of posterior communicating | 11 Pericallosal | 18 Angular gyrus |
| 6 Posterior cerebral | 12 Callosomarginal | 19 Parietal |
| | 13 Posterior frontal | 20 Frontoparietal |

Diag. (1) The carotid arterial system (antero-posterior) view (Weir and Abrams, 1978).



List of Arteries

1 Internal carotid, cervical part	7 Anterior choroidal	14 Middle cerebral
2 Internal carotid, intra-petrous part	8 Anterior cerebral	15 Precentral
3 Internal carotid, cavernous part	9 Orbitofrontal	16 Posterior parietal
4 Ophthalmic	10 Frontopolar	17 Posterior temporal
5 Posterior communicating	11 Pericallosal	18 Angular gyrus
6 Posterior cerebral	12 Callosomarginal	19 Central
	13 Posterior frontal	20 Parietal opercular

*Diag. (2) The carotid arterial system (lateral view)
(Weir and Abrams, 1978).*

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tal lobe and medial cerebral convexity of the frontal and parietal lobe (Taveras and Ferrucci, 1982).

The anterior cerebral artery passes medially from the bifurcation of the internal carotid artery to reach the midline. This small segment of the artery lies above the optic chasma or optic nerve and is usually convex upwards. Near the midline, it is joined by the anterior communicating artery to its fellow on the opposite side. Beyond the anterior communicating artery the anterior cerebral artery turns forwards and upwards in the inter hemispheric fissure. It passes around the anterior aspect of corpus callosum and turns backwards along its upper surface. It continues as the pericallosal artery to the back end of the corpus callosum (Taveras and Ferrucci, 1982).

Branches

Lenticulostriate Arteries

Normally, they stem from the middle cerebral artery trunk but some of them may arise from the internal carotid artery or the origin of anterior cerebral artery. They pass directly up through the anterior perforated substance into the basal ganglia and internal capsule.

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Frontopolar Artery

It is generally the first major branch of the anterior cerebral and arises proximal to the knee or bend of the vessel around the corpus callosum. This vessel passes forward and upward toward the anterior pole of the frontal lobe. It divides into two or three branches which pass to the superomedial margin of the hemisphere and over on the convexity.

Callosomarginal Artery

This artery usually arises near the genu and passes backwards and upwards giving off anterior, middle and posterior internal frontal branches. It terminates in the paracentral branch around the paracentral lobule supplying it.

Pericallosal Artery

Represents the continuation of the anterior cerebral after it has given off the major branches just described. Normally it is fairly closely applied to the upper surface of the corpus callosum. It provides numerous cortical branches to the medial surface and medial convexity of the frontal and parietal lobes (Sutton, 1980).

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Middle Cerebral Artery

The middle cerebral artery is about 20 per cent larger in diameter than the anterior cerebral artery, it can be divided into three segments: horizontal, sylvian and cortical. The horizontal segment helps supply the basal ganglia, the orbital surface of the frontal lobe, and the temporal pole; the sylvian segment supplies the insula, the cortical branches supply the lateral convexities of the cerebrum (Abrams, 1983).

The middle cerebral artery passes laterally and slightly forward from the bifurcation of the internal carotid artery. This segment gives rise to lenticulostriate arteries which have just been described. About 2 cms from its origin it reaches the insula where it usually bifurcates. The main branches pass backward over the surface of the insula and are hidden by the opercula. These branches loop downward on the under surface of the inferior parietal operculum and then pass out through sylvian fissure to reach the surface of the hemisphere. As the branches of the middle cerebral artery emerge from the sylvian fissure they turn, in the case of the anterior branches, upward and in