THE ROLE OF COMPUTED TOMOGRAPHY IN CEREBROVASCULAR ACCIDENTS

THESIS

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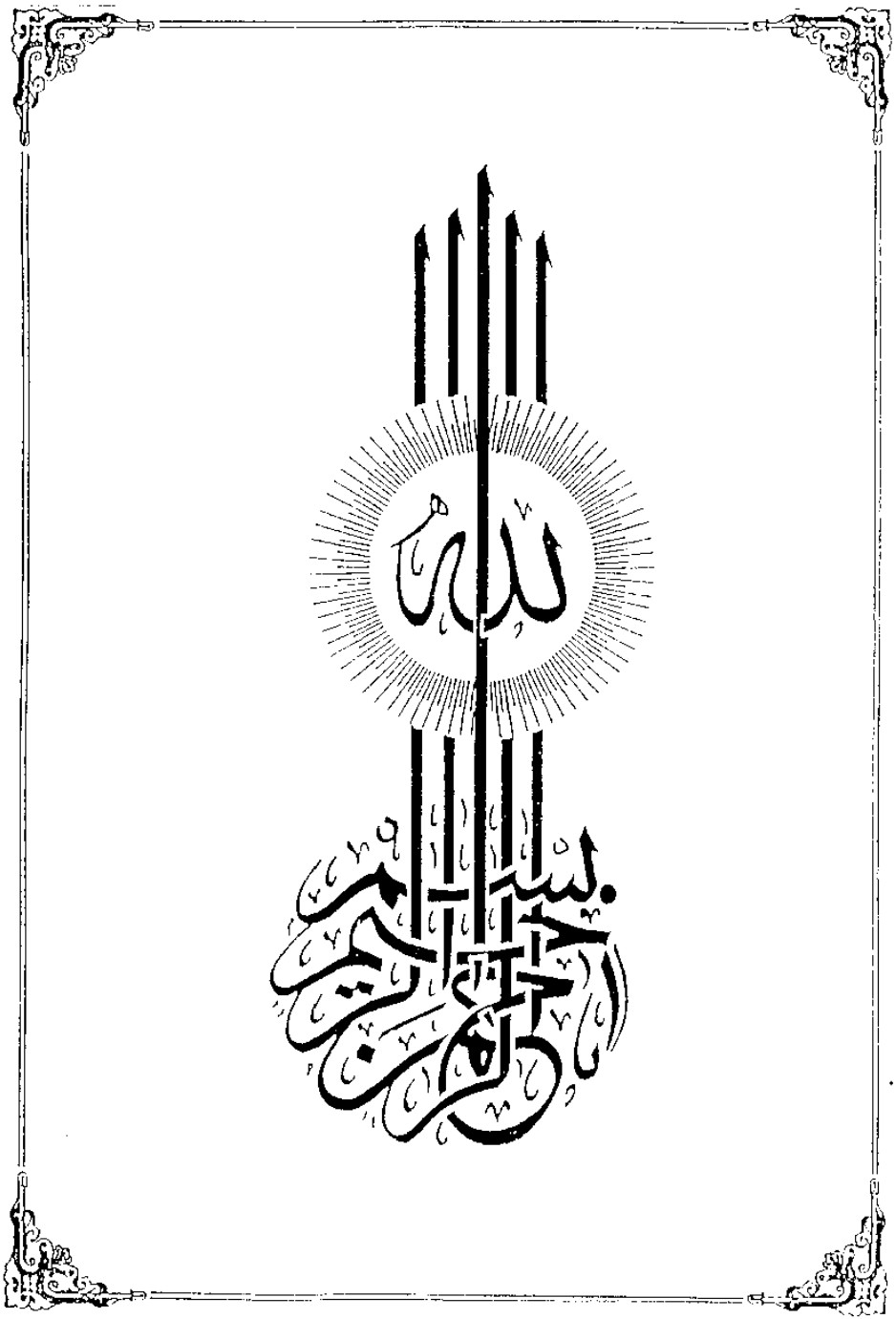
TABLE OF CONTENTS



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KEY TO ABBREVIATIONS

CCA	Common Carotid Artery
ICA	Internal Carotid Artery
ACA	Anterior Cerebral Artery
MCA	Middle Cerebral Artery
C 6	6th Cervical Vertebra
C 2	Second Cervical Vertebra
AICA	Anterior Inferior Cerebellar Artery
PCA	Posterior Cerebral Artery
PCV	Packed Cell Volume
CT	Computed Tomography
IV	Intravenous
CSF	Cerebro Spinal Fluid
HU	Hounsfield Units
SAH	Subarachnoid Hemorrhage
IVH	Intraventricular Hemorrhage
ICH	Intracerebral Hemorrhage
PET	Positron Emission Tomography
MRI	Magnetic Resonance Imaging

INTRODUCTION

AND

AIM OF WORK

INTRODUCTION AND AIM OF WORK

Since the development of computed tomography in the early 1970's, major technical advances have resulted in substantial improvements in image quality concomitent with a marked reduction in scanning time. In the late seventies computed tomography has become gradually accepted as an accurate and practical diagnostic technique, with its clinical applications broadened to include virtually every part of the body.

In many cases, the information obtained by computed tomography is unique. On occasion, data derived from computed tomography has enabled re-evaluation of traditional concepts of various disease process. In the field of neurology and neurosurgery the advent of computed tomography had revolutionized the traditional management of various pathological problems, one of such is the stroke or the problem of cerebrovascular accidents. Modern clinical management of a cerebrovascular problem is by no means achievable without a computed tomography examination, which enables the attending physician to start a prompt treatment on a solid diagnostic base, also follow up of such treatment could be very easy attended to.

Within this thesis a trial of gathering and consolidating the different informations about the computed tomography appearances of the different cerebrovascular accidents will be made. prior to the display of such informations a concised review of the anatomy of cerebral blood vessels together with the pathological aspects of cerebrovascular accidents will be made.

The aim of this work is to clarify the role of computed tomography in the management of cerebrovascular accidents either in their primary diagnosis or their follow-up studies by displaying their different computed tomography images in their various locations and chronological sequence, evaluating the capabilities of computed tomography as a major, corner stone, diagnostic modality in such a major neurological disorder.

EVIEW OF LITERATURE

SECTION ONE

LOOD SUPPLY OF THE BRAIN

BLOOD SUPPLY OF THE BRAIN

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

A- The Carotid System

B- The Vertebro-Basilar System

A- THE CAROTID SYSTEM

The Common Carotid Artery

It arises 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).

External Carotid Artery

It is one of the two terminal branches of the C.C.A. arising from its frontomedial aspect. This artery participates with the I.C.A. and subclavian artery in the arterial supply of the brain. Its anastomotic branches are mainly the middle meningeal from the maxillary artery and meningeal branches from

List of Arteries

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

Fig. 1 : The carotid arterial system (antero-posterior) view (Weir and Abrahams, 1978).

the occipital artery (Maneffe et al., 1971).

Internal Carotid Artery (Fig.1)

The internal carotid artery supplies the major portion of the cerebral hemispheres, the eyes, 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 ICA 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 intracranially at its bifurcation into the anterior and middle cerebral arteries just above the anterior clinoid process (Taveras and Ferrucci, 1987).

The ICA may be divided into four parts : cervical, petrous, cavernous and cerebral portions:

1- Cervical Portion

The cervical portion begins at the bifurcation of the C.C.A and extends vertically to the orifice of the carotid canal of the temporal bone. The artery ascends anterior to the transverse processes of the cervical vertebrae. The internal jugular vein and the vagus nerve course on the lateral side except near the base of the skull, where the jugular vein runs posterior to the internal carotid artery. There are usually no arterial branches arising from the cervical portion, but the inferior pharyngeal artery may rarely arise from it.

2- Petrous Portion

The first 1cm of the petrous portion ascends vertically within the carotid canal of the petrous portion of the temporal bone. The artery then takes an anterior and medial course horizontally to reach the cranial cavity just above the foramen lacerum (Taveras and Ferrucci, 1987). The petrous segment gives off a posterior branch to the tympanic cavity (carotico tympanic artery) and an anterior branch to the vidian canal (Abrams, 1983).

3- Cavernous Portion

When the ICA comes out of the carotid canal, the artery first ascends towards the posterior clinoid process and then runs forward on the lateral aspect of the sphenoid bone within the carotid groove, followed by a sharp curve backwards at the medial aspect of the anterior clinoid process. The artery transverses the dura and enters into the subarachnoid space. This portion of the ICA artery is divided into precavernous and intracavernous segment.

The precavernous segment is a short segment that runs from the exit of the artery from the carotid canal to a point where the artery enters the cavernous sinus lateral and posterior to the sella turcica. This segment passes superiorly, anteriorly and medially towards the posterior clinoid process. This portion may be called the presellar segment. The intracavernous segment or juxtasellar segment courses within the cavernous sinus and runs

forward and slightly medially on the lateral aspect of the sella turcica. Following a sharp turn posteriorly, medially and superiorly the ICA pierces the dura of the medial aspect of the anterior clinoid process.

Cavernous Branches : there are numerous small arterial branches arising from the intracavernous segment of ICA. These cavernous branches supply the wall of cavernous sinus, the hypophysis, the gasserian ganglion, and the inferior petrosal sinus. There are rich anastomoses between the right and left arteries as well as with the branches of the middle meningeal artery (Taveras and Ferrucci, 1987).

4- Cerebral Portion

The cerebral portion may be called the supraclinoid segment of ICA. After piercing the dura at the medial aspect of the anterior clinoid process, the ICA passes posterolaterally for a short distance towards the anterior perforated substance, where it bifurcates into the anterior and middle cerebral arteries.

Branches of the ICA

Carotico - Tympanic Branch

This artery arises from the vertical segment of ICA within the petrous bone and enters the tympanic cavity through small foramen in the wall of the carotid canal. The carotico tympanic artery

cannot be seen unless enlarged by a pathologic process.

Pterygoid Branch

The pterygoid or vidian artery originates from the horizontal segment of the petrous portion of the internal carotid artery. The artery enters the pterygoid canal and anastomoses with a branch of the maxillary artery.

Meningo Hypophyseal Artery

It arises from the precavernous or intracavernous segment of ICA and has three major branches : tentorial, inferior hypophyseal and dorsal meningeal branches. Rich anastomoses are noted among the distal branches of right and left meningohypophyseal arteries.

Cavernous Branches

These are numerous small arterial branches arising from the intracavernous segment of the carotid artery. These cavernous branches supply the wall of the cavernous sinus, the hypophysis, the gasserian ganglion, and the inferior petrosal sinus. There are rich anastomoses between the right and left arteries as well as with the branches of middle meningeal artery.

Anterior Meningeal Branch

It is a small branch that supplies the dura and bone of the anterior cranial fossa by passing over the lesser wing of the sphenoid.