THE ROLE OF MAGNETIC RESONANCE ANGIOGRAPHY IN EXTRACRANIAL CAROTID ARTERY DISEASES

Thesis
Submitted in partial fullfilment for
M.D. Degree in Radiodiagnosis

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بسم الله الرحمن الرحيم

قالوا سبحانك لا علم لنا إلا ما علمتنا إنك أنت العليم الحكيم

صدق الله العظيم

سورة البقرة آية ٣٢

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Haytham Ahmed Abo El Soud

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Introduction and Aim of the Work

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Duplex sonography is a non invasive technique for helping detect and grade the extent of atherosclerotic disease involving the carotid arteries ***(Robinson et al., 1988)*** however, it is limited by the presence of large calcified plaques, its inability to demonstrate the intracranial portion of the carotid artery and its heavy dependence on the skill of the sonographer ***(Erikson et al., 1989)***.

Cerebral angiography is used for the evaluation of aneurysms, stenotic and occlusive diseases ***(Princone et al., 1992)***.

However, information yield must be weighed against the small but significant complication rate. Therefore, morbidity and possible mortality make a non-invasive method of evaluation attractive ***(Princone et al., 1990)***.

MRA does not have these limitations and can also be presented in a format acceptable to clinicians ***(Polak et al., 1992)***. It allows the study of stenotic and occlusive diseases, as well as vasculitis and neoplastic diseases ***(O, Donnet M. 1985)***.

The aim of this study is to demonstrate the role of MRA in the extracranial portion of the carotid artery diseases.

Anatomy

Anatomy of the Carotid Arteries

The Carotid System

The principle arteries of the head and neck are the two common carotids, they ascend in the neck as far as the level of the thyroid cartilage, where each divides into two branches:

1- The External carotid supplying the exterior of the head , the face & the greater part of the neck.
2- The internal carotid, supplying the parts within the cranial & orbital cavities.

The common and internal carotid arteries ,together with the veins and nerves which accompany them , are situated in a cleft on each side of the neck. This cleft may be said to posses three walls, a posterior, formed mainly by transverse processes of the cervical vertebrae with their attached muscles, a medial consisting of the trachea, oesophagus, thyroid gland, larynx, the constrictor muscles of the pharynx, and an anterolateral made up of the sternocleidomastoid with, at different levels, the omohyoid, sternohyoid, thyroid and the digasteric and stylohyoid ***(Williams, 1980)***.

The common Carotid Artery

The common carotid arteries although occupying a nearly similar position in the neck, differ in position and consequently in their relations at their origin.

The right Common Carotid artery arises from the innominate artery behind the right sterno-clavicular articulation and is confined to the neck ***(Grey,1977).***

The left Common Carotid arises from the highest part of the arch of the aorta, immediately behind and to the left of the brachiocephalic trunk and therefore consisting of a thoracic and cervical portions :

a- **The Thoracic part** of the left common Carotid artery, ascends from the arch of the aorta to the level of the sterno-clavicular joint, where it is continuous with the cervical portion. It lies first in front of the trachea, but later inclines to its side.

b- **The cervical portion** of the common carotid arteries have similar courses. Each passes obliquely upwards and passes laterally, from behind the sterno-clavicular joint, to the level of the upper border of the thyroid cartilage, where it divides into the External and Internal Carotid arteries. At its point of division, the vessel show a dilatation termed the "Carotid sinus", which usually involves & may be restricted to the proximal part of the internal carotid artery.

In this situation, the tunica media is thinner than elsewhere, and the tunica adventitia, which is usually thick, contains a large number of sensory nerves, these nerves function as a baroreceptor, controlling the intracranial blood pressure. The carotid body, which lies behind the point of division of the common carotid artery, is a small structure acting as a chemoreceptor.

At the lower part of the neck , the two arteries are separated from each other by a narrow interval which contains the trachea but at the upper part, the thyroid gland, the larynx, and the pharynx project forwards between the two vessels. The common carotid artery is contained in the carotid sheath, which is continuous with the deep cervical fascia and is composed of loose cellular tissue, but the parts surrounding the artery is thicker and denser than the rest .

This sheath encloses also the internal jugular vein and the Vagus nerve, the vein lying lateral to the artery, and the nerve in between the artery and the vein on a plane posterior to both.

The superior root of the ansa cervicalis is embedded in its anterior wall *(Williams' 1980).*

The External carotid Artery

The external carotid artery begins opposite the upper border of the thyroid cartilage, at the level of the disc between the third and fourth cervical vertebrae, and taking slightly curved course, passes upwards and forwards, and the inclines backwards to a point behind the mandible, midway between the tip of the mastoid process and the angle of the jaw, where in the substance of the parotid, it divides into the superficial temporal and maxillary arteries. In the child, it is a little smaller than the internal carotid artery, but in the adult, the two vessels are of nearly equal size. At its origin, it is contained within the carotid triangle, and lies anterior to and nearer to the median plane than the internal carotid artery, higher up, it is situated lateral to the artery.

Branches:

1- The superior Thyroid Artery.
2- The Ascending pharyngeal Artery.
3-The lingual Artery.
Branches:
-The suprahyoid branch
-The sublingual artery.
-The dorsal lingual branches.

4- The facial Artery.
5- The occipital Artery.
6- The Posterior Auricular Artery.
7- The Superficial temporal Artery.

The Internal Carotid Artery

The internal carotid Artery supplies the greater part of the cerebral hemisphere, the eye and its accessory organs ,and sends branches to the fore head and the nose. It begins at the bifurcation of the common carotid artery where it usually presents a localized dilatation, termed the carotid sinus .It ascends to the base of the skull, & enters the carotid cavity through the carotid canal of the temporal bone. It then runs forwards through the cavernous sinus ,lying in the carotid groove on the side of the body of the sphenoid bone and ends below the anterior substance of the brain by dividing into anterior and middle cerebral arteries.

Divisions:

In considering the course and relation of the vessel, it may be conveniently divided into four portions: cervical, petrous, cavernous and cerebral (Fig. 1).

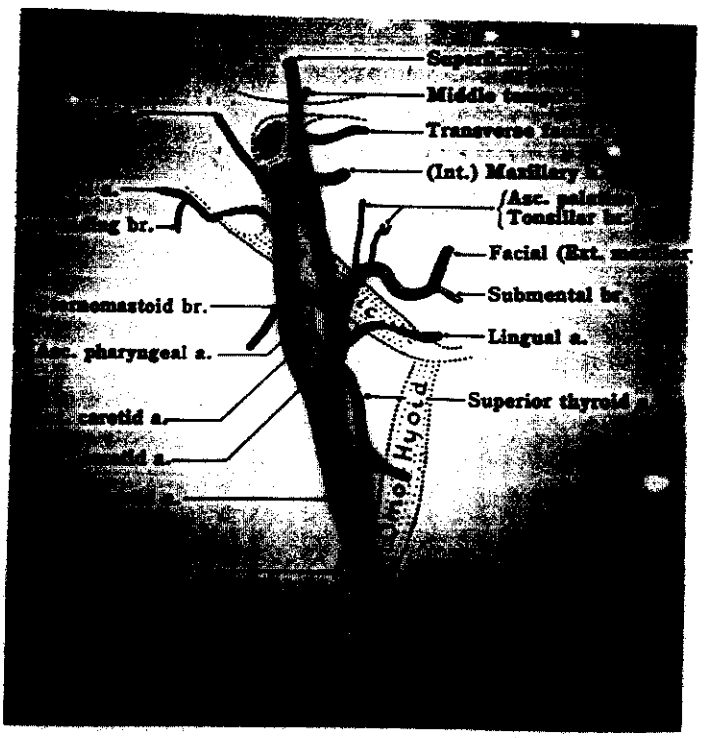

Fig. 1 (Quoted from Grant's, 1984)