INTRODUCTION AND AIM OF THE WORK

Nuclear Magnetic Resonance (MR) techniques have been used for chemical analysis since the mid 1950's. Only in the last decade has MR became an imaging modality.

MR scanners now have a capability rivalling that of the best CT scanners for displaying anatomic detail, as well as, the additional capability for displaying organ function.
For instance, MR scanners can provide three dimensional images of any part of the human body. Images of the posterior fossa are free from bone artifacts. The extent of brain stem tumors are easily determined without the need for intravenous contrast administration. The practice of MR scanning is considerably more complex than that of CT scanning. One has to choose among a variety of imaging techniques, the interpretation of MR images require more expertise than a mere familiarity with anatomy.

The clinician must have the same understanding of the physical principles of MR scanning if he has to contribute to the development of this exciting and rapidly changing field.

To understand principles of MR angiography (MRA) and how it developed, we have to consider first different vascular appearances in basic MR sequences routinely used i.e. spin-echo, and through which we could develop our sense to follow the process of development till it reached the new vascular imaging methods.

MRA has become one of the most exciting applications of MR.

The ability to visualize blood flow without contrast agents, down to 1.5 minutes time, is now a requirement for any state-of-the-art MR system. Due to the noninvasive nature of this method, it is ideally suited for screening as well as serial follow-up of vascular lesions.
(MRVI), magnetic resonance vascular imaging have opened powerful windows into viewing blood flow in the vascular system.

However, despite impressive clinical results, MRVI is still much in its infancy. The ability to delineate complex and turbulent flow is still beyond its capability. Hemodynamics orientation and quantification requires a lot of improvements of hardware and postprocessing methods.

AIM OF WORK

The aim of this work is to review the literature as regard: the physical principles of MR, method of utilization of its capability for vascular imaging, magnetic resonance angiography "MRA"as a new method of imaging, its basic principles, appearance of blood whether intravascular -flow- or extravascular, appearance of normal intracranial circulation by MRA and its use in different intracranial vascular pathologies.
It is also aimed to evaluate the different techniques of MR in assessment of dynamics of cerebral blood flow in intracranial vascular lesions.

40 representative cases of different intracranial vascular lesions will be included in the study. Assessed primarily by MR, and MRA compared and verified by other diagnostic modalities whenever possible.
It is also aimed to practice the technical procedures followed in examination of such cases.

FORWARD TO THE WORK

This short introduction aims to describe this work shortly and what is intended to reach in every chapter.

Going through MR and its different new techniques has 2 dimensions. The first which is easier to see, is the final examination its self, how fascinating rapid and aimingful it could be to show a specific lesion. While the other side shows how this technique is developed through multiple complicated steps which yielded at end a useful meaningful examination.

MRA is an optimal example to show this fact.

In the first chapter, physical principles of MR are introduced. Then its common pulse sequences aiming to clarify the basic criteria in Gradient-echo and how did they introduced us to MRA.

Then a brief discussion on blood and its different MR appearance to cover its extravascular appearances.

Flow with its complex nature is reviewed, stepping up from its simplest form till its full intravascular complex nature.

Then, how we have gathered these data to get flow signal through inherent blood flow nature.

Thrombus is one of the complex items in MR and MRA, that's why it is covered alone with regards to flow.

Confronting with different MRA techniques is essential. Not aiming to cover the topic completely, but aiming to develop our knowledge how to think of this topic. This is due to the daily wide improvement in the techniques associated with the different practice school methods.

Appearance of normal intracranial circulation will be impressed by the used technique. Its drawbacks on the normal anatomy which may suffer from misinterpretation.

Our practiced method is inflow MRA. Other MRA methods are included in the review. Every school of medicine has its rules that it follows and develops in the same time. And every team of work intensifies their knowledge in certain direction. Ours was in inflow MRA.