بسم اللّه الرحمن الرحيم

HOSSAM MAGHRABY

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

HOSSAM MAGHRABY

بالرسالة صفحات

لم ترد بالأصل

ROLE OF MRI IN DIAGNOSIS OF POSTERIOR CRANIAL FOSSA MASSES

Thesis

Submitted for partial fulfillment of the requirements of the MD degree in

Radiodiagnosis

By

HANAA MOHAMED ALY KAMEL

(M.B.,B.Ch., M.Sc. (Radiodiagnosis)

SUPERVISORS

Prof. Dr.

MAHMOUD ABD-EL-AZIZ DAWOUD

Professor and Head of Radiology Department
Faculty of Medicine
Tanta University

Dr.

KHALED ESMAIL EL-SHAFEY

Assistant Professor of Radiodiagnosis
Faculty of Medicine
Tanta University

FACULTY OF MEDICINE
TANTA UNIVERSITY
2003

بسم الله الرحمن الرحيم

(سنريهم آياتنا في الآفاق وفي أنفسهم حتى يتبين لهم أنه
الحق، أو لم يكف بربك أنه
على كل شئ شهيد)

(سورة فصلت، الآية ٥٣)

Acknowledgement

First, and for most thanks to **ALLAH**, *the most merciful, gracious and compassionate, to* **ALLAH** *everything in life is resumed.*

I would like to express my sincere thanks and deepest gratitude to Prof. Dr. **MAHMOUD ABD-EL-AZIZ DAWOUD**, *Professor and Head of Radiology Department Faculty of Medicine Tanta University for his encouragement, sustained support, export guidance, valuable instructions and suggestions throughout this work. I feel greatly honored to work under his supervision.*

I am deeply indebted to Dr. **KHALED ESMAIL EL-SHAFEY**, *Assistant Professor of Radiodiagnosis Faculty of Medicine, Tanta University, for his continuous guidance, unlimited help, the precious time and effort he devoted in the supervision of the present work.*

I would like to express my profound gratitude and deep appreciation to Prof. Dr. **AHMED ABOU-ELIZ**, *Professor and Head of Radiology Department, Faculty of Medicine, Zagazig University and All his member staff for helping me in the collection of the material of this work.*

My heartful thanks to all the Staff Members of radiology department of Tanta Univesity hospitals, for their kind support and cooperation .

CONTENTS

ABBREVIATION

CPA : Cerebello-pontine angle

CSF : Cerebrospinal fluid

GD-DTPA : Gadolinium Diethylene triamine penta-acetic acid.

IAC : Internal auditory canal.

NCCT : Non contrast computerized tomography.

CECT : Contrast enhanced computerized tomography

IV ventricle : Fourth ventricle

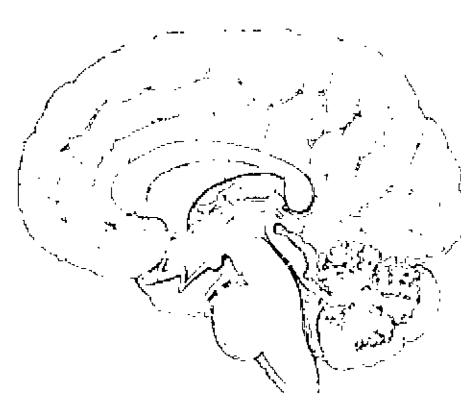
CEMR : Contrast enhanced Magnetic resonance.

T_1 : Longitudinal relaxation time

T_2 : Transversal relaxation time.

INTRODUCTION & AIM OF WORK

INTRODUCTION & AIM OF WORK



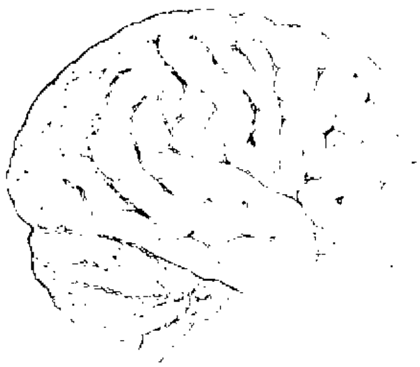
INTRODUCTION AND AIM OF THE WORK

The posterior cranial fossa is considered as a unique and an important part of the cranial cavity, as it contains the brain stem and cerebellum containing important vital centers, the entire intracranial course of the last six cranial nerves, and parts of the intracranial course of cranial nerves third through sixth **[Fitz Gerald and Curran, 2001]** [1].

MR is particularly well suited for imaging the posterior fossa. The lack of bone induced artifacts results in a clear description of the anatomy of the brain stem and cerebellum. Multiplanar imaging allows for accurate delineation of lesion margins, showing their relationship to the fourth ventricle, tentorial incisura and foramen magnum. In general, the axial and sagittal planes are preferable for midline lesions, hemispheric cerebellar masses are shown best with axial and coronal scans **[Barrett, 1994]** [2].

MRI is a major step forward, because of its sensitivity to detect small lesions that have increased dramatically. In addition, MRI is able to evaluate the posterior and middle fossa. The bony vault that surrounds these areas and causes artifacts on CT do not interfere with the MR imaging. Therefore the small intraparenchymal foci is visible **[Barrett, 1994]** [2].

The aim of this work is to study the radiological findings of mass lesions occurring in posterior fossa region to determine accuracy of MR imaging in evaluating these lesions.



REVIEW OF LITERATURE

REVIEW OF LITERATURE

BASIC MR PHYSICS

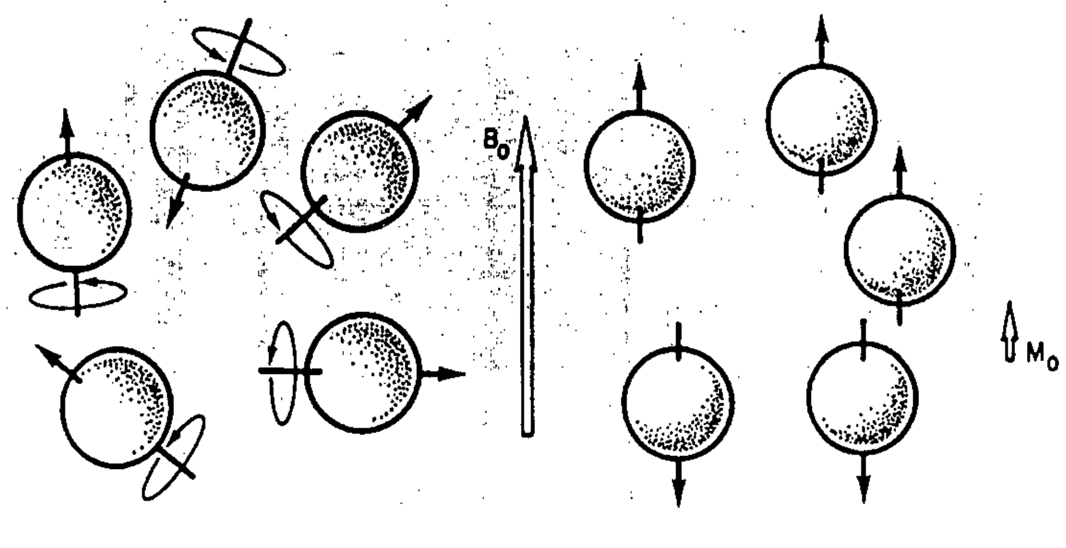
Nuclear Magnets:

Both protons and neutrons, the basic constituents of the nucleus, possess magnetic dipole moments, making their magnetic properties similar to those of tiny bar magnets. The magnetic dipoles of protons and neutrons tend to pair up (Protons with protons , neutrons with neutrons), canceling the magnetic effect of one another. In nuclei with both an even number of protons and an even number of neutrons, this pairing is complete, leaving no residual magnetic dipole moment in the nucleus. However, nuclei having either an odd number of protons or and odd number of neutrons (or both) have a net magnetic dipole moment, making possible the phenomenon of nuclear MR. Such nuclei occurring naturally in biologic tissue are hydrogen (one proton and no neutrons), carbon-13 (six protons and seven neutrons), sodium –23 (11 protons and 12 neutrons), and phosphorus-31 (15 protons and 16 neutrons) [Bushong, 1996]. The hydrogen atom, having a nucleus consisting of a single unpaired proton, has the strongest magnetic dipole moment of any nucleus. Since hydrogen occurs in both water and lipids it is copious in the human body. Each cubic millimeter of soft tissue contains approximately $(10)^{19}$ hydrogen atoms. Because of the strong magnetic dipole moment of hydrogen and its great abundance in tissue, the signal from hydrogen in the human body is more than 1.000 times stronger than that form any other atomic nucleus. It is for this reason that hydrogen is used almost exclusively as the source of signal in MR imaging [Bushong, 1996] [3].

Without an externally applied magnetic field, the magnetic dipoles of hydrogen nuclei are randomly oriented, and the net magnetization of hydrogen in a sample of tissue is Zero. However, when placed in a strong externally applied magnetic field, slightly more than half of these nuclear dipoles line up (parallel) to the direction of the main magnetic field "Bo " .Slightly fewer than half of the magnetic dipoles orient themselves in the opposite direction (anti-parallel to the magnetic field) **[Bushong, 1996]** [3].

Random thermal interactions between the magnetic dipoles and surrounding macromolecules cause the proton magnetic dipoles to flip back and forth between lower (parallel) and higher (antiparallel) energy states. Left undisturbed in a magnetic field on the order of 1 tesla (T) , a constant difference will exist between the number of nuclei in the lower and higher energy states, giving rise to "equilibrium" magnetization M_0. The net equilibrium magnetization points in the same direction as the externally applied magnetic field **[Bushong, 1996]** [3].

Fig. (1).



(a) **(b)**

Fig. (1): **(a)** In the absence of an external magnetic field, the spinning unpaired protons in hydrogen nuclei are randomly oriented; therefore, the net sample magnetization is zero **(b)** When placed in a strong external magnetic field (B_0), slightly more than half the magnetic dipoles align with the field, while slightly fewer than half assume an antiparallel orientation. This imbalance creates a net magnetization of the sample M_0.