THE RELATIVE PLACE OF MODERN INVESTIGATIVE TECHNIQUES IN THE MANAGEMENT OF POSTERIOR FOSSA TUMOURS

THESIS
Submitted for Partial Fulfilment of
M.D. Degree in Neurosurgery

BY

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M.Sc. Degree in General Surgery

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(1994)

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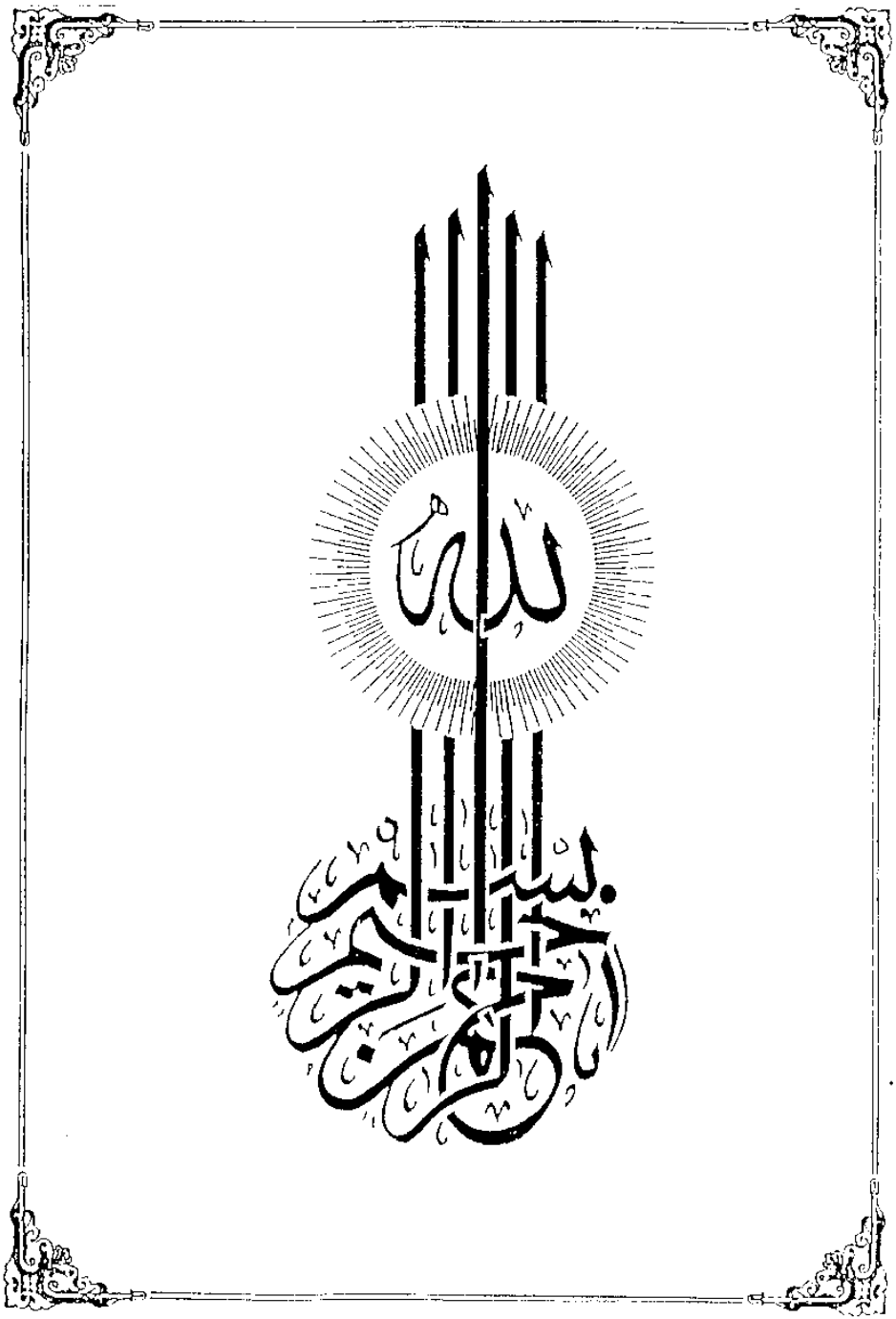

[وما أوتيتم من العلم إلا قليلا]

صدق الله العظيم
الاسراء ٨٥

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CONTENTS

ABBREVIATIONS

BAEP	:	Brain Stem Auditory Evoked Potentials.
CECT	:	Contrast Enhanced Computed Tomography.
CEMR	:	Contrast Enhanced Magnetic Resonance.
CPA	:	CerebelloPontine Angle.
CSF	:	Cerebrospinal Fluid.
CT	:	Computed Tomography Scanning.
FOV	:	Field Of View.
FVS	:	Flow Void Signal.
GCCT	:	Gas Cisternography Computed Tomography.
Gd-DTPA	:	Gadolinium - Diethylene Triamine Pentaacetic Acid.
MRI/MR	:	Magnetic Resonance Imaging.
NCCT	:	Non Contrast Computed Tomography.
NCMR	:	Non Contrast Magnetic Resonance.
PICA	:	Posterior Inferior Cerebellar artery.
SCA	:	Superior Cerebellar artery.
TE	:	Echo Time.
TI	:	Inversion Time.
TR	:	Repetition Time.
T1WI	:	T1 Weighted Images.
T2WI	:	T2 Weighted Images.
VHL	:	Von Hipple-Lindau complex.
WSCTC	:	Water Soluble Computed Tomography Cisternography.

Introduction

and

Aim of the Work

INTRODUCTION

The posterior cranial fossa is a unique and important part of the cranial cavity. It contains approximately one quarter of the intra cranial contents, and despite the water bag appearance of the cisterna magna, space in the posterior fossa is at a premium, and expansion of a mass lesion is at the expense of its contents. The resection and decompression of the posterior fossa tumours have demanded the best of neurosurgical skills and neuroradiological localization.

Magnetic resonance imaging, brain stem audiotory evoked potential, intraoperative monitoring of brain stem audiotory evoked potential , and digital angiography and are modern investigative techniques that play an important role in the management of posterior fossa tumours.

In the early 1970s, several investigators suggested the possibility that the principles of MRI could be used for medical purposes, and the first magnetic resonance images of the human body were produced. Initial progress was slow, but over the past few years imaging with magnetic resonance has come of age.

Brain stem auditory evoked potential were first reported in 1967. It was not until the advent of portable, affordable digital averaging computers in the 1970s, however, that the application of these techniques in diagnostic clinical neurology became widespread. Only in recent years has this technology been transported to the operating room and intensive care unit for the express purpose of monitoring, as opposed to diagnosis.

AIM OF THE WORK

The aim of this work is to study and evaluate magnetic resonance imaging, brain stem auditory evoked potential, intraoperative brain stem evoked potential and digital angiography as modern investigative techniques in the management of posterior fossa tumours.

Review of Literature

ANATOMY

THE POSTERIOR CRANIAL FOSSA

The posterior fossa is the largest and deepest of the three cranial fossae. It is bounded in front by the dorsum sellae, the posterior part of the body of the sphenoid and the basilar part of the occipital bone; behind, by the lower portion of the squamous part of the occipital bone; on each side, by the petrous and mastoid parts of the temporal bone, the lateral part of the occipital and, above and behind, by a small part of the mastoid angle of the parietal bone [Fig.1]. It contains the midbrain, pons and medulla oblongata in front and the cerebellum behind.

The foramen magnum is in the floor of the fossa and surrounded by the parts of the occipital bone, by the basilar part in front, the lateral part on each side, and a small portion of the squama behind. Just in front of its transverse diameter it is encroached on by the medial aspects of the occipital condyles, so that it is somewhat ovoid in shape and wider behind. Its narrower, anterior part lies above the dens of the axis vertebra; its wider, posterior part communicates below with the vertebral canal, and through it the medulla oblongata becomes continuous with the spinal cord.

In the front of the foramen magnum, the basilar part of the occipital bone, the posterior part of the body of the sphenoid bone and dorsum sellae form a sloping surface, gently concave from side to side, antero-inferior to the pons and medulla oblongata. On each side this area is separated from the petrous part of the temporal bone by the petro-occipital fissure, occupied in life by a thin plate of cartilage. The fissure is limited behind by the jugular foramen, and its margins are grooved by the inferior petrosal sinus.

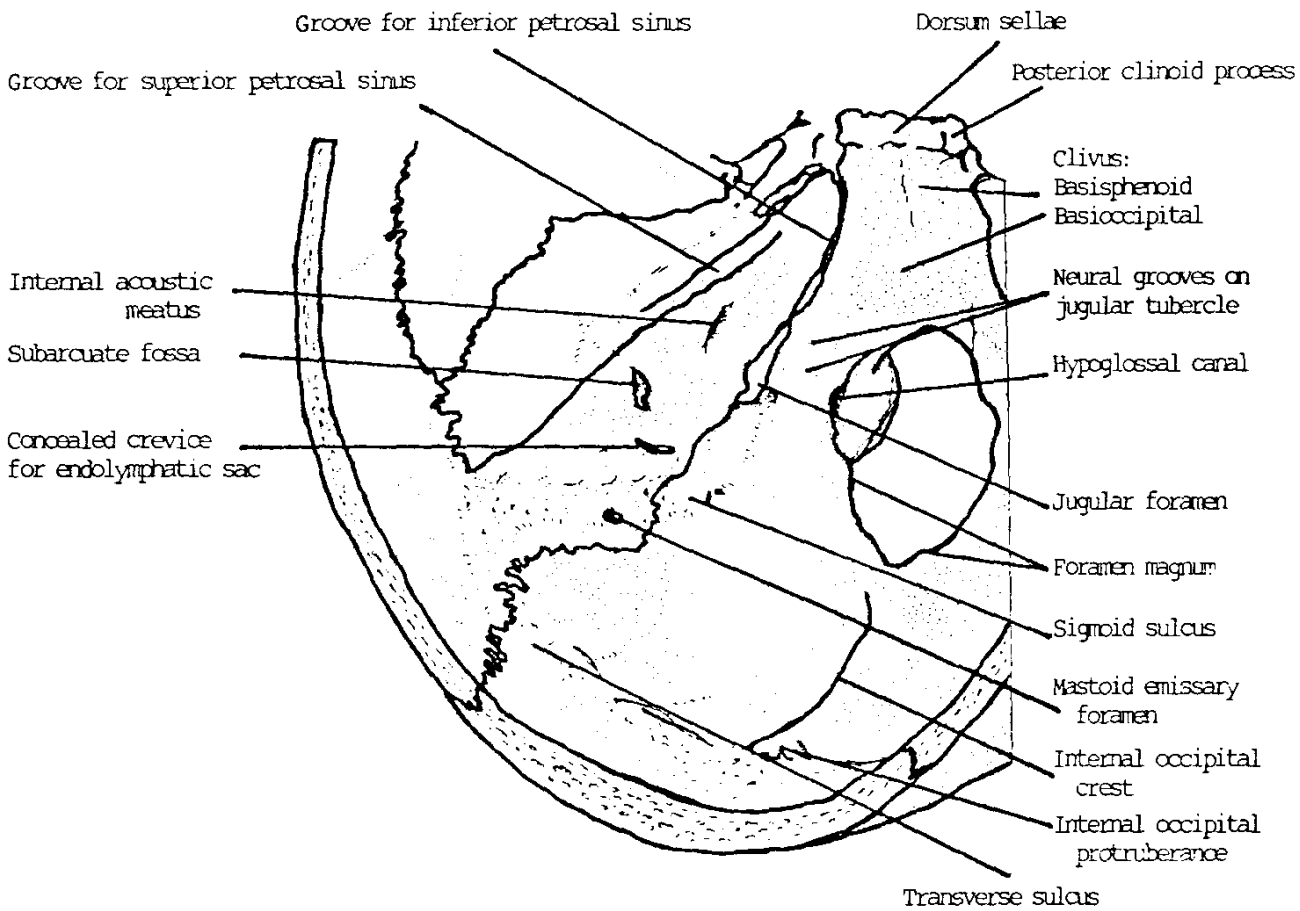

Fig.1 Left posterior cranial fossa.
(after Williams et al. 1989).

The jugular foramen lies at the posterior end of the petro-occipital fissure, and leads forwards, downwards and laterally to the exterior. Its upper border is sharp and irregular and presents a notch for the glossopharyngeal nerve. Its lower border is smooth and regular. The posterior part of the foramen contains the sigmoid sinus, continuous below with the internal jugular vein. In front of the sinus the accessory, vagus and glossopharyngeal nerves, in that order from behind forwards, traverse the foramen [275].

Medial to the lower border of the jugular foramen a rounded elevation, termed the jugular tubercle, marks the lateral part of the occipital bone. It lies above and somewhat in front of the inner opening of **the hypoglossal canal**, which pierces the bone at the junction of the basilar with the lateral part and contains hypoglossal nerve.

The posterior surface of the petrous part of the temporal bone forms a large portion of the lateral (or antero-lateral) wall of the posterior fossa. Above the anterior part of the jugular foramen **the internal acoustic canal** runs transversely in the lateral direction. It is a short passage, about 1 cm long, closed laterally by a perforated plate of bone which separates it from the internal ear. Through it pass the facial and vestibulocochlear nerves, the nervus intermedius and labyrinthine vessels [275].

Behind the petrous part, the lateral wall of the posterior cranial fossa is formed by the mastoid part of the temporal bone. Anteriorly, it bears a wide groove, which runs forwards and downwards, then downwards and medially, and finally forwards to the posterior limit of the jugular foramen. This groove is made by the sigmoid sinus and is termed **the sigmoid sulcus**. At its upper end, where it touches the mastoid angle of the parietal bone, the groove is continuous with that for the transverse sinus and crosses the parietomastoid suture (Asterion). As it descends, it lies behind the mastoid antrum, the most important relation of the

cavity. In this part of its course the mastoid foramen opens near its posterior margin and transmits an emissary vein from the sinus. In its lowest part the sigmoid sulcus crosses the occipitomastoid suture and grooves the jugular process of the occipital bone. It is usually deeper on the right then on the left side [275].

Behind the foramen magnum the squamous part of the occipital bone bears the median **internal occipital crest,** which ends above and behind in an irregular elevation named **the internal occipital protuberance** (Inion). On each side of the protuberance a wide shallow groove curves laterally with a slight upward convexity to the mastoid angle of the parietal bone [Fig.2]. It is produced by the transverse sinus, which is usually deeper on the right, and at its lateral extremity is continuous with the sigmoid sulcus. Below the transverse sulcus the internal occipital crest divides the bone into two gently hollowed fossae, adapted to the cerebellar hemispheres. When **the condylar canal** is present, its inner orifice lies behind and lateral to the orifice of the hypoglossal canal. It transmits an emissary vein from the lower end of the sigmoid sinus [514].

The anterior wall of the posterior fossa (the clivus) is related to the plexus of basilar sinuses, which connects the two inferior petrosal sinuses and communicates below with the internal vertebral venous plexus. A little in front of the foramen magnum the membrana tectoria is attached to the basilar part of the occipital bone, covering the attachment of the apical ligament of the dens [275].

The jugular tubercle is often grooved by the glossopharyngeal, vagus and accessory nerves, as they pass to the jugular foramen. In addition to the hypoglossal nerve, the hypoglossal canal, which is often subdivided, transmits a meningeal branch of the ascending pharyngeal artery. To the rough medial aspects of the occipital condyles the alar ligaments are attached. The lower and posterior borders of the