Surgical management of secondary hydrocephalus in patients with posterior fossa tumors

Thesis

Submitted for partial fulfillment for the Master Degree in Neurosurgery

Submitted by

Mohamed Mostafa Hany Mohamed Hassan

M.B,B.Ch. Faculty of Medicine, Ain Shams University

Supervised by

Prof. Dr. Hussein Al Sayed Moharram

Professor of Neurosurgery
Faculty of Medicine, Ain Shams University

Asst. Prof. Dr. Hatem Adel Said Sabry

Assistant Professor of Neurosurgery
Faculty of Medicine, Ain Shams University

Dr. Ibrahim Abdelmohsen Abdelnaiem Ismaiel

Lecturer of Neurosurgery
Faculty of Medicine, Ain Shams University

Faculty of Medicine
Ain-Shams University
2018

سورة البقرة الآية: ٣٢

Acknowledgments

First and forever, thanks to **Allah**, *Almighty whom I relate any success in achieving any work in my life.*

I wish to express my deepest thanks, gratitude and appreciation to **Prof. Dr. Hussein AlSayed Moharram,** *Professor of Neurosurgery, Faculty of Medicine, Ain Shams University for his meticulous supervision, kind guidance, valuable instructions and generous help.*

Special thanks are due to **Assist. Prof. Dr.Hatem Adel Said Sabry,** *Assistant Professor of Neurosurgery, Faculty of Medicine, Ain Shams University for his sincere efforts, fruitful encouragement.*

I am deeply thankful to **Dr. Ibrahim Abdelmohsen Abdelnaiem Ismaiel,** *Lecturer of Neurosurgery, Faculty of Medicine, Ain Shams University for his great help, outstanding support, active participation and guidance.*

Mohamed Mostafa Hany Mohamed Hassan

To my father, my role model, my hero, wish you were here with me,

May you rest in peace

List of Contents

List of Abbreviations

Abbr.		Full-term
CCD	**:**	Charge-Coupled Device
CNS	**:**	Central nervous system
CP	**:**	Choroid plexus
CPA	**:**	Cerebellopontine angle
CPC	**:**	Choroid plexus carcinoma
CPP	**:**	Choroid plexus papilloma
CSF	**:**	Cerebrospinal fluid
CT	**:**	Computed tomography
Cu/s	**:**	Cranial ultrasound
ETV	**:**	Endoscopic 3rd Ventriculostomy
EVD	**:**	External Ventricular Drain
FH	**:**	Frontal Horn
HCP	**:**	Hydrocephalus
HPF	**:**	High Power Field
ICP	**:**	Intra cranial Pressure
ID	**:**	Internal Diameter
IQ	**:**	Intellectual Quality
MB	**:**	Medulloblastoma
MRI	**:**	Magnetic resonance imaging
NF2	**:**	Neurofibromatosis type 2
NPH	**:**	Normal Pressure Hydrocephalus
PNET	**:**	Primitive neuroectodermal tumors
Pts	**:**	Patients
SE	**:**	Subependymoma
TH	**:**	Temporal Horn
V-P shunts	**:**	Ventriculoperitoneal shunt

List of Tables

List of Figures

Introduction

Posterior fossa is a common site for various tumors to occur. It is estimated that they comprise 54-60% of childhood brain tumors ***(Gupta et al., 2004)***.

The proximity to the fourth ventricle and therefore CSF pathways predisposes patients with posterior fossa tumors to the development of obstructive hydrocephalus (HCP). Therefore, some patients with posterior fossa tumors will require a CSF diversion procedure at some time during the course of their illness ***(Cullcy et al., 1994).***

The perioperative management of this associated obstructive hydrocephalus remains controversial. Some authors proposed a preoperative indwelling cerebrospinal fluid shunt as most advantageous for the subsequent surgical approach to the tumor resection ***(Whitehead and Kestle, 2001).***

Advocates of preoperative placement of a permanent shunt prior to the definitive tumor removal suggested that this decreases the morbidity and mortality of the tumor resection However, a number of complications have been associated with CSF shunts, including shunt malfunction, upward herniation, infection, tumor hemorrhage and multiple abdominal complications ***(Whitehead and Kestle, 2001)***.

In an attempt to minimize the placement of permanent shunts and avoid the associated complications, some investigators have advocated the use of preoperative external ventricular drainage (EVD) devices and corticosteroids to control symptomatic hydrocephalus. They noted that with this approach the majority of patients remain shunt free after tumor resection ***(Schmid and Scilcr, 1986).***

Recently, Endoscopic third ventriculostomy (ETV) is one of the options considered by some authors as an initial surgical procedure for the management of obstructive hydrocephalus related to posterior fossa tumors ***(Ruggiero C et al., 2004).***

ETV has a curative effect on intracranial hypertension. Even though ETV does not prevent postoperative hydrocephalus in all cases, it does protect against acute postoperative hydrocephalus due to cerebellar swelling ***(Sainte-Rose et al., 2001).***

Aim of the work

The aim of this study is to analyze the different modalities used in the perioperative management of hydrocephalus associated with posterior fossa tumors. This study therefore compares outcome in relation to different treatment modalities for the hydrocephalus namely:

- Ventriculo-peritoneal shunts (VP shunts)
- Endoscopic third ventrculostomy (ETV)
- Direct tumor excision with External ventricular drain (EVD)
- Direct attack on the tumor with no CSF diversion

Anatomy

The ventricular system of the brain consists of four freely communicating, cerebrospinal fluid (CSF) filled cavities: the two lateral ventricles, the third ventricle, and the fourth ventricle. Each of the four ventricular chambers is bordered by a roof and a floor as well as by anteroposterior and lateral walls. Each of the individual ventricular chambers is associated with unique neural, arterial, and venous relationships ***(Gray, 2008)***

1- Lateral Ventricles:

The lateral ventricles are C-shaped cavities that lie deep in each cerebral hemisphere ***(Gray, 2008).***

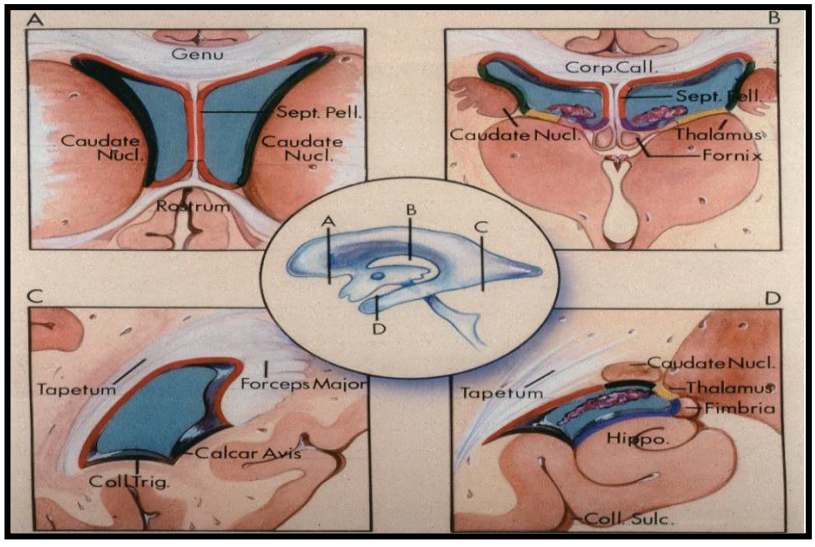

Figure (1): Structures in the walls of the lateral ventricles. The central diagram shows the level of the cross sections through the frontal horn (A), body (B), atrium (C), and temporal horn (D)

Each of the paired lateral ventricles can be subdivided into five regions: The frontal horn, the body, the atrium, the temporal horn, and the occipital horn ***(Rhoton, 2007).***

The frontal horn

- It extends anteriorly from the interventricular foramen into the frontal lobe.
- The medial wall: septum pellucidum, separating the frontal horns on both sides.
- The anterior wall and roof: the genu of the corpus callosum.
- The lateral: the head of the caudate nucleus.
- The floor: the rostrum of the corpus callosum.

(Rhoton, 2007).

The body

- It occupies the parietal lobe and extends from the posterior edge of the foramen of Monro to the point where the septum pellucidum disappears and the corpus callosum and fornix meet.
- The lateral wall: the caudate nucleus superiorly and the thalamus inferiorly, separated by the striothalamic sulcus, the groove in which the stria terminalis, and the thalamostriate vein course.
- The medial wall: the septum pellucidum superiorly and the body of the fornix inferiorly.
- The floor: the supero-medial surface of the thalamus.
- The roof: the body of the corpus callosum.

(Rhoton, 2007).

The atrium

- The roof: the body, splenium, and tapetum of the corpus callosum.
- The floor: the collateral trigone, a triangular area overlying the posterior end of the collateral sulcus.
- The medial wall: the bulb of the corpus calllosum superiorly and calcar avis inferiorly.
- The lateral wall: anteriorly by the caudate nucleus and posteriorly by fibers of the tapetum of the corpus callosum.
- The anterior wall: pulvinar of the thalamus.

(Rhoton, 2007).

The occipital horn

- It curves postero-medially from the atrium towards the occipital lobe to form a triangular or diamond-shaped cavity.
- The medial wall: the bulb of the corpus callosum superiorly and the calcar avis inferiorly.
- The roof and lateral wall: the tapetum of the corpus callosum, overlaid laterally by the optic radiation, and then the inferior longitudinal fasciculus.
- The floor: the collateral trigone (***Rhoton, 2007).***

The temporal horn

- It is the largest part of the lateral ventricles.
- The anterior wall: the amygdaloid nucleus.