Endoscopic versus open procedures in the third ventricle tumors surgery

A Systematic Review
and Meta-Analysis dissertation submitted in partial fulfillment of
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بسم الله الرحمن الرحيم
قالوا
سبحانك لا علم لنا
إلا ما علمتنا إنك أنت
العليم الحكيم
صدق الله العظيم
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Introduction

Primary third ventricular tumors are tumors that located in the wall of third ventricle or inside it; it depends on patient's age in its varieties. The most common type of these tumors involves astrocytomas that may compress the ventricle by direct spread. Third ventricle tumors are reliably not common tumors of the brain at all but it considered a major problem due to its effect on CSF dynamics, and also due to it mostly happened in children ***(Mapstone, et al., 2001).***

The third ventricular region is one of the most challenging areas of the brain for surgery because of the complex anatomy and physiology of the surrounding hypothalamus, infundibulum, optic nerves, limbic system, and nearby vasculature. It is just this challenge that has excited the imagination of both neurologists and neuroscientists to understand the myriad of lesions that arise in this region and their diverse set of clinical presentations. ***(Piepmeier, et al., 2003)***

Because of the unusual nature of these types of tumors and their interesting outcomes after operations, there is a gap of information and so this problem has a high importance.

There was a role to excision the posterior half of the corpus callosum to complete excision of the tumor; the postoperative complications may develop the callosal syndrome, and that add another importance to the problem. ***(Ford, et al., 2001)***

The most common type of third ventricle tumors is benign or low grade lesion and that makes the symptoms delay to be found and appear after the tumor grows and reaches several centimeters in size and the most common symptoms include headache, memory loss, cognitive changes and gait disorders. The approaches that are available to be done in these tumors surgeries are multiple; all are used to minimize the disturbance of normal anatomy whether the surgery will be done endoscopically or by open procedure. Of course before the surgeon embarks on an approach, he should be aware of important two things; ventricular anatomy and how to catch the lesion easily. Some of these approaches are transcallosal, transcortical and in some cases, supracerebellar, subfrontal, pterional and transtentorial approaches. Endoscopic techniques are important to be considered in surgeon's mind. ***(Sweet, et al., 2012)***

The endoscopic procedure was used for the first time by Lespinasse in 1910 in performation of interventricular choroid plexus fulguration in cases of infantile hydrocephalus in treatment of them. ***(Ja, et al., 2007)***

Endoscopic surgery is generally withheld in patients with small ventricles due to difficulties in ventricular cannulation and intraventricular manipulation. The effectiveness of flexible endoscopy for management of intraventricular brain tumors in patients with small ventricles was evaluated. ***(Morota, et al., 2014)***

Neuroendoscopy has greatly impacted pediatric neurosurgery over the past few decades. Improved optics and microsurgical tools have allowed neuroendoscopes to be used for a multitude of neurosurgical procedures. ***(Guzman, et al., 2014)***

Aim of the work

This work aims to review endoscopic versus open surgery in excision of third ventricular tumors regarding the extent of excision and the procedure complications.

Embryology

The ventricular system is embryologically derived from the neural canal, forming early in the development of the neural tube. The 3 brain vesicles (prosencephalon or forebrain, mesencephalon or midbrain, and rhombencephalon or hindbrain) form around the end of the first gestational month. The neural canal dilates within the prosencephalon, leading to the formation of the lateral ventricles and third ventricle. The cavity of the mesencephalon forms the cerebral aqueduct. The dilation of the neural canal within the rhombencephalon forms the fourth ventricle. ***(Fitz Gerald MJT, et al., 2002).***

The lateral ventricles communicate with the third ventricle through interventricular foramens, and the third ventricle communicates with the fourth ventricle through the cerebral aqueduct. During early development, the septum pellucidum is formed by the thinned walls of the 2 cerebral hemispheres and contains a fluid-filled cavity, named the cavum, which may persist. ***(Fitz Gerald MJT, et al., 2002).***

Tufts of capillaries invaginate the roofs of pros encephalon and rhomb encephalon, forming the choroid plexuses of the ventricles. Cerebrospinal fluid (CSF) is

secreted by the choroid plexuses, filling the ventricular system. CSF flows out of the fourth ventricle through the 3 apertures formed at the roof of the fourth ventricle by week 12 of gestation. ***(Fitz Gerald MJT, et al., 2002).***

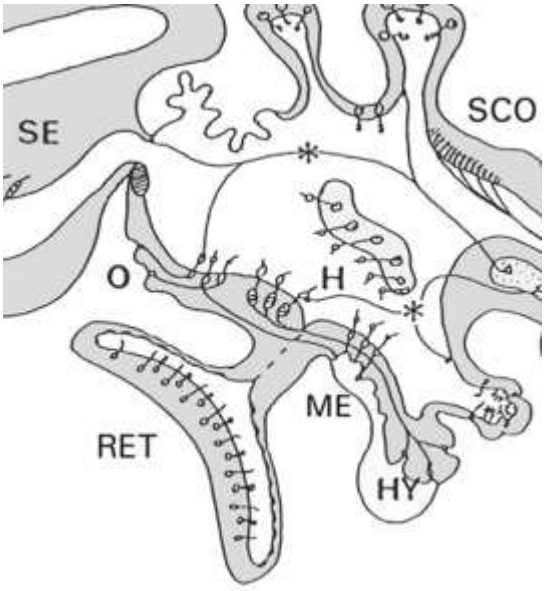

Figure (1): Emberyology of third ventricle

SE - septal region

O - vascular organ of the terminal lamina

RET – retina

H - hypothalamic CSF-contacting neurons

ME - median eminence

HY – Hypophysis

SCO - subcommissural organ

(Jan G Veening,et al., 2010)

Anatomy

Anatomy in brief:

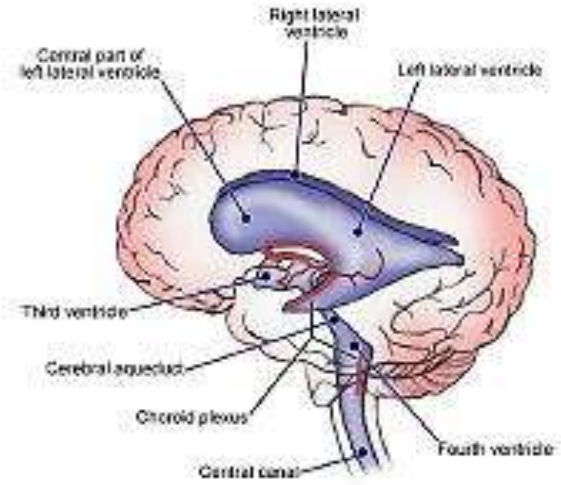

Figure (2): The ventricular system of the human brain. ***(Fitz Gerald MJT, et al., 2002).***

The third ventricle is the narrow vertical cavity of the diencephalon. A thin tela choroidea supplied by the medial posterior choroidal arteries (branch of posterior cerebral artery) is formed in the roof of the third ventricle. The fornix and the corpus callosum are located superiorly. The lateral walls are formed by the medial thalamus and hypothalamus. The anterior commissure, the lamina terminalis, and the optic chiasm delineate the anterior wall. The floor of the third ventricle is formed by the infundibulum, which attaches the hypophysis, the tuber cinereum, the mammillary bodies, and

the upper end of the midbrain. The posterior wall is formed by the pineal gland and habenular commissure. The interthalamic adhesions are bands of gray matter with unknown functional significance, which cross the cavity of the ventricle and attach to the external walls. ***(Gilman S, et al., 2003).***

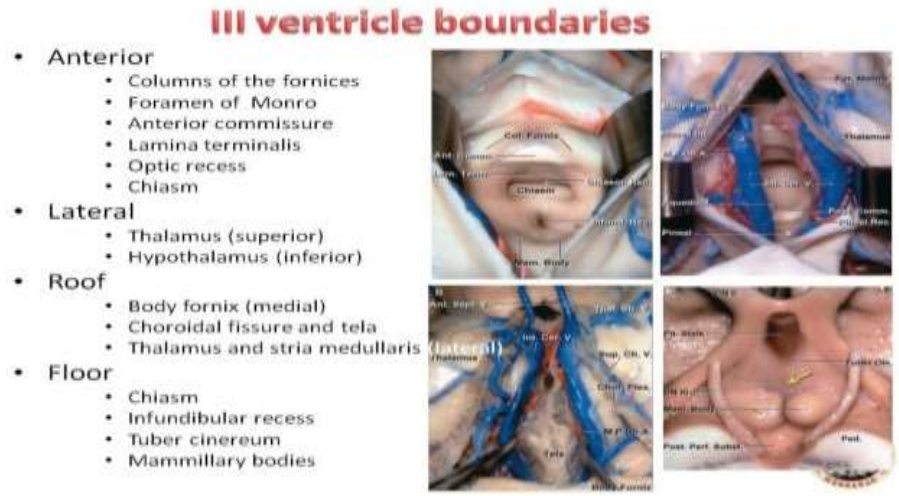

Figure (3): 3rd ventricle boundaries ***(Vikas Naik, et al., 2009).***