SURGICAL APPROACHES TO LATERAL VENTRICLE TUMORS AND ITS OUTCOMES

Essay

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TABLE OF CONTENTS

TABLE OF FIGURES

FIGURE 5.9.2	A tumor that straddles the foramen of Monro and extends into both the frontal horn and third ventricle has been exposed.
FIGURE 5.10	Transcortical approach to a tumor in the atrium of the right lateral ventricle.
FIGURE 5.11	Images obtained in a 52-year-old-man with a meningioma originating from atrium of the right lateral ventricle.
FIGURE 5.12	Posterior transcallosal approach to the atrium of the right lateral ventricle.
FIGURE 5.13	Occipital-transcingulate approach to an arteriovenous malformation of the right atrium.
FIGURE 5.14	Right frontotemporal craniotomy and approach to temporal horn through a temporal lobectomy.
FIGURE 5.15	Subtemporal approach to the temporal horn and basal cisterns.

TABLE OF TABLES

ABBREVIATIONS

A.Ch.A	Anterior choroidal artery
L.P.Ch.A	Lateral posterior choroidal artery
M.P.Ch.A	Medial posteror choroidal artery
Ch.Pl	Choroid plexus
PCA	Posterior cerebral artery
ACA	Anterior cerebral artery
Calc. A	Calcrine artery
Car. A	Carotid artery
Bas. A	Basilar artery
Thal.Str.V	Thalamostriate vein
Int.Cer.V	Internal cerebral vein
H-MRS	Proton MR Spectroscopy
Cho	Choline
NAA	N-Acetyle aspartate
Cre	Creatinine
SEGA	Subependymal giant cell astrocytoma
ADC	Apparent Diffusion Coefficient
AFP	Alpha fetoprotein
HCG	Human chorionic gonadotropin

Introduction

Tumors of the lateral ventricle are rare lesions in general neurosurgical practice, with a reported incidence between 0.81% and 1.6%. Lesions that affect the lateral ventricle include a large variety of benign tumors, malignant tumors, and cyst formations. Tumors that originate in the ventricular wall and expand mainly within the ventricular cavity, or arise and expand within the lateral ventricle are considered real lateral ventricle tumors. Tumors in this location are generally slowly growing, and can become large before causing symptoms. **(Secer *et al*., 2008)**

Typically, these lesions cause symptoms and signs of obstruction of the normal cerebrospinal fluid (CSF) pathways, compression of the adjacent neural structures, or hydrocephalus induced by overproduction of CSF. **(Pendl *et al*., 1992)**

Tumors that are most likely to occur in the lateral ventricles are astrocytoma, ependymoma, oligodendroglyoma, choroid plexus papilloma, and meningioma. Subependymal giant cell astrocytoma (SGCA), subependymoma, pilocytic astrocytoma, neurocytoma, choroid plexus carcinoma, teratoma, choroid plexus cyst, hemangioblastoma, epidermoid tumor, cavernous angioma, and metastatic carcinoma are rare intraventricular tumors. Lateral ventricular tumors are easily detected with computed tomography (CT) and magnetic resonance imaging (MRI) at a time when they are still small and produce insignificant clinical manifestations. Microsurgical resection has been the treatment of choice for the majority of these lesions. Complete resection of

many, but not all, of these lesions is possible via the transcortical or transcallosal route. Multimodal strategies, including stereotactic biopsy, radiosurgery, adjuvant radiotherapy, and chemotherapy further improve clinical outcomes. The location of the lateral ventricles makes passing through cortical structures mandatory in all approaches to these lesions. The surgeons must choose the way that will cause least morbidity, provide adequate working space, and achieve a complete resection by surgery for these deep lesions. The transcallosal route is performed by some neurosurgeons for a variety of reasons. The transcallosal approach may decrease the risk of postoperative seizures and functional deficits. It is recognized that the transcallosal route to the ventricles can be safely used to excise lesions in the ventricular body, anterior horn, and atrium. The transcortical approach to the lateral ventricles is a simple and attractive alternative to the transcallosal approach for many deep tumors. It has the advantage of simplicity. Especially, tumors located in the temporal horn and atrium are safely and easily operated on with transcortical approach. **(Secer *et al*., 2008)**

Planning and performing surgery via the transcallosal or transcortical approach is dependent on the tumor localization and origin, tumor size, tumor nature, and tumor expanding side. Amidst this wide multiplicity of routes and techniques for lateral ventricle tumors we think an up-to-date **reviewing** and **pooling** of available data will summarize the current state of knowledge on the surgical management of lateral ventricle tumors so as to provide strong evidence of each surgical approach and its outcomes.

Section one

Anatomy of the lateral ventricles

ANATOMY OF THE LATERAL VENTRICLES

Operative approaches to the lateral ventricles are made challenging by their deep position near the centre of intracranial space, complete encasement in neural tissue, curved shape within the cerebrum, variable shape and size in the different lobes, narrow communicating orifices making them susceptible to obstruction, expansile nature allowing them to act as mass lesions, and walls containing important motor, sensory, and visual pathways and vital autonomic and endocrine centres. The lateral ventricles provide deep cavities through which the third ventricle and basal cisterns may be approached. In this chapter, the neural and vascular relationships that provide the basis for optimizing the results obtained with intraventricular operations are reviewed before the individual operative approaches are described. Many of the structures that form part of the walls of the lateral ventricle are also seen in the third ventricle. The lateral ventricles are intimately related to the deep venous system, and numerous arteries supply the walls of ventricles. **(Rhoton, 2002)**

Each lateral ventricle is a C-shaped cavity that wraps around the thalamus and is situated deep within the cerebrum **(Fig. 1.1)**. Each lateral ventricle has five parts: the frontal (anterior), temporal, and occipital (posterior) horns, the body, and the atrium. Each of these five parts has medial and lateral walls, a roof, and a floor. In addition, the frontal and temporal horns and the atrium have anterior walls. These walls are formed predominantly by the thalamus, septum pellucidum, deep cerebral white matter,

corpus callosum, and two C-shaped structures, the caudate nucleus and the fornix, that wrap around the thalamus. **(Rhoton, 2002)**

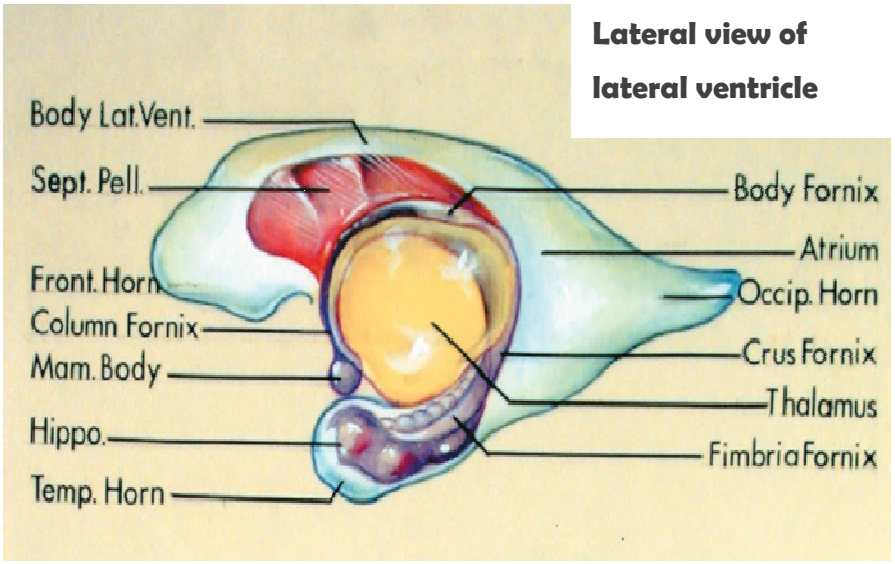

FIGURE 1.1
Lateral View of The Ventricular System And Neighboring Neural Structures. ***(Rhoton, 2002)***

Neural relations

Thalamus

The thalamus is located in the center of the lateral ventricle. Each lateral ventricle wraps around the superior, inferior, and posterior surfaces of the thalamus. The body of the lateral ventricle is above the thalamus, the atrium and occipital horn are posterior to the thalamus, and the temporal horn is inferolateral to the thalamus. The superior

surface of the thalamus forms the floor of the body, the posterior surface of the pulvinar of the thalamus forms the anterior wall of the atrium, and the inferior surface of the thalamus is situated at the medial edge of the roof of the temporal horn. **(Timurkaynak *et al.*, 1986)**

Caudate Nucleus

The caudate nucleus is an arched, C-shaped, cellular mass that wraps around the thalamus and constitutes an important part of the wall of the lateral ventricle **(Fig. 1.2)**. It has a head, body, and tail. The head bulges into the lateral wall of the frontal horn and body of the lateral ventricle. The body forms part of the lateral wall of the atrium, and the tail extends from the atrium into the roof of the temporal horn and is continuous with the amygdaloid nucleus near the anterior tip of the temporal horn. In the body of the lateral ventricle, the caudate nucleus is superolateral to the thalamus; in the atrium, it is posterolateral to the thalamus; and in the temporal horn, it is inferolateral to the thalamus. The stria terminalis, a fiber tract that runs parallel and deep to the thalamostriate vein, arises in the amygdaloid nucleus and courses along the border between the caudate nucleus and the thalamus in the wall of the ventricle from the temporal horn to the body. **(Timurkaynak *et al.*, 1986)**

Fornix

The fornix is another C-shaped structure that wraps around the thalamus in the wall of the ventricle **(Fig. 1.1)**. The fornix consists mainly of hippocampomamillary tract fibers that originate from the hippocampus, subiculum, and