Microscopic versus endoscopic resection of lateral ventricle tumors

Systematic review
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in Neurosurgery
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List of abbreviations

CT	Computerized tomography
CN	Central neurocytoma
CNS	Central nervous system
CPP	Choroid plexus papilloma
CPC	Choroid plexus carcinoma
CSF	Cerebrospinal fluid
E	Endoscopic study
EDH	Extradural hematoma
ETV	Endoscopic third ventriculostomy
EVD	External ventricular drain
Fig.	Figure
GBM	Glioblastoma multiforme
GFAP	Glial fibrillary acidic protein
HC	Hydrocephalus
H&E	Hematoxylin and eosin
JPA	Juvenile pilocytic astrocytoma
ICH	Intracerebral hematoma
ICP	Intracranial pressure
IM	Intraventricular meningioma
INF.	Infection
IVH	Intraventricular hemorrhage
LPChAs	Lateral posterior choroidal arteries
LV	Lateral Ventricle
M	Microscopic study
MPChAs	Medial posterior choroidal arteries
MRI	Magnetic resonance imaging
MRV	Magnetic resonance venography
NR	Not reported
PCA	Posterior cerebral artery
SDH	Subdural hematoma
SGCT	Subependymal Giant Cell Astrocytoma
T	Type of study
TSV	Thalamostriate vein
T1W	T1-weighted image
T2W	T2-weighted images
WHO	World health organization
VP	Ventriculoperitoneal

Introduction

Intraventricular tumors present a difficult surgical challenge for the neurosurgeon, requiring a careful entire preoperative assessment to determine the optimal surgical approach with the best outcome and minimal morbidity. Lesions confined to the lateral ventricles are relatively rare and constitute about 1% of all intracranial tumors. **(Baehring et al., 2007)**

Each lateral ventricle is a C-shaped cavity that wraps around the thalamus and is situated deep within the cerebrum. Each lateral ventricle has five parts: the frontal, temporal, and occipital 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)**

A variety of tumors arise in the region; however, a majority of them are benign, including low-grade gliomas (50%), choroid plexus papillomas (20 to 25%) and meningiomas (15%), teratomas, epidermoid, neurocytomas, and metastatic tumors are less commonly seen in the lateral ventricles. **(Baehring et al., 2007)**

Because of the deep location of the ventricular system within the brain and its proximity to important neural and vascular structures, ventricular tumors may cause a great variety of clinical symptoms. Grossly, symptoms may be divided into two types: symptoms caused by CSF obstruction and those caused by compression of certain neuronal structures. Because many ventricular tumors are benign and slow growing, they may reach considerable size before causing nonspecific symptoms. Common clinical symptoms include headache, vertigo, visual disturbances, difficulty concentrating, and changes in personality, cognitive deficits, motor weakness, and epileptic seizures. Acute hydrocephalus causes headache, nausea, and vomiting. Additionally, memory deficits and gait disturbances may occur**. (Bertalanffy et al., 2011)**

A CT scan is often the first radiological study patients undergo simply because of diagnostic ease in the surveillance workup. The presence of calcifications on the CT image may further narrow the differential diagnosis.

Calcification may be seen in central neurocytoma, subependymal giant cell tumor, meningioma, and ependymoma.Subsequent MRI, with and without gadolinium, reveals the precise location and extent of the lesion within the ventricle and, thus, helps guide the surgical approach. At a minimum this should include sagittal, coronal, and axial reconstructions of T1-weighted sequences (with and without gadolinium), T2-weighted images, and fluid-attenuated inversion recovery (FLAIR). These sequences are sufficient to refine the differential diagnosis and begin basic surgical planning. Preoperative visual field testing, a neuro-ophthalmological examination, and neuropsychological evaluations are performed for all patients as part of our baseline examination**. (Ellenbogen et al., 2012)**

Because of their deep location, the lateral ventricles are not readily accessible for surgery. Either the cerebral hemisphere or the corpus callosum must be traversed to reach the ventricular cavity. There are two generally accepted avenues to the lateral ventricle: the transcortical and interhemispheric pathways. The decision to approach transcortical or via an interhemispheric route depends on the location and size of the tumor and varies on a case-by-case basis. Currently, extirpation of lesions located in the lateral ventricle is in the domain of microsurgery, but an increasing number of studies have reported successful removal with endoscopic techniques. **(Bertalanffy et al., 2011)**

Endoscopic applications for intraventricular tumors include tumor biopsy, tumor resection, and management of tumor associated hydrocephalus. The ideal conditions for endoscopic resection of an intraventricular tumor are that it should be small, avascular or with relatively low vascularity, partially or totally cystic, and located in enlarged ventricles. Hydrocephalus creates an ideal working space. However, a normal ventricle is adequate to gain access to a tumor and biopsy it and, for smaller tumors, to resect it safely. **(Ellenbogen et al, 2012)**

- **Aim of the work**

1-AIM:

To review and summarize available knowledge on the role of endoscope versus microscope in management of lateral ventricle tumors

2-Objectives:

To review and summarize available knowledge on the role of endoscope for excision of lateral ventricle tumors versus the microsurgical approaches and analysis for success of complete resection, postoperative complications, rates of intraoperative hemorrhage, rates of tumor recurrence, and length of clinical and/or radiographic follow-up.

Methodology:

Study design: Systematic review of published English literature from 1985 to 2015**.**

1-search strategy

a) Study site (setting):

i) Source:

1) Electronic database: Medline

-online internet search from the electronic database of medline via pubmed.com

2) Manual searches from other sites

ii) Study language:

Only published English articles and some articles translated into English will be included in the study.

iii) Time frame:

All studies from 1985 till 2015 will be included.

b) Study population :

Criteria for inclusion and exclusion of studies in the review according to the study design:

Included studies:

- Eligible studies designs included mainly analytic studies.

-Well conducted descriptive studies of good quality were included.

Excluded studies:

-Articles with language other than English language.

-Case reports or case series with less than ***10*** patients.

-Technical notes, letters, non human and comments were excluded.

Criteria for inclusion and exclusion of studies in the review according to the study outcomes:

-primary outcomes:

1. Estimated completeness of resection through assessments of postoperative imaging studies, surgeon or observer recollection and self-report.
2. Radiographic recurrence rates
3. Complications related to the procedure.
4. Intraoperative blood loss, ICU stay, hospital stay and operative time.

Due to the limitation of the number of the available studies, no restriction was placed on length of follow up, as this will probably vary from one study to another.

c) Search plan:

- Primary medline search for keywords (neuroendscopy, microsurgical, intraventricular tumors, lateral ventricle tumors, outcome, and resection) in various combinations will be done.
- All the primary research studies that come out from the search will be screened regarding the title to remove and duplicates.
- Then screening the title and abstract of all, and categorize them in three groups:
  1) Included primary studies.
  2) Studies that will be considered for inclusion in the review.
  3) Studies that will be omitted.

The full text of the articles from the second group will be screened to decide if they will be included or omitted according to the criteria previously mentioned. Included studies will be categorized according to level of evidence and evaluated for quality using a modified downs and black scale.

- Included studies will be categorized according to level of evidence and evaluated for quality using a modified Downs and Black scale. This scale was chosen due to its strength in evaluating non-randomized methodologies, including cohort and case-control studies. The level of evidence was determined for each study, indicating the quality of methodology used in the study.

- **d) Data collection:**
- After screening full text for the included studies the following data will be extracted from each primary study:
- 1) Study design.
- 2) Full reference of article including author, year and source.
- 3) Population description:
- - Number.
- - Age.
- - Gender.
- 4) Intervention:
- - Pure endoscopic resection.
- - Microsurgical resection.
- 5) Comparative group if relevant.
- 6) Outcomes and measurement.

Anatomy

The ventricles are four fluid-filled cavities located within the brain; these are the two lateral ventricles, the third ventricle, and the fourth ventricle. The lateral ventricle is C-shaped cavity and includes two central portions (body and atrium) and three horns: frontal, occipital, and temporal horns. **(Waxman, 2010)**

The frontal Horn

It is located anterior to the foramen of Monro. The medial wall is formed by the septum pellucidum, the anterior wall and the roof are formed by the genu of the corpus callosum, and the lateral wall is composed of the head of the caudate nucleus and the rostrum of the corpus callosum. **(Waxman, 2010)**

The Body

It extends from the intraventricular foramen to the splenium of the corpus callosum. The lateral wall is formed by the thalamus and the tail of the caudate nucleus. The medial wall is formed by the body of the fornix. The **a**tr**ium** or tr**igo**n**e** is a wide area of the body that **c**onne**c**ts with the posterior and inferior horns. **(Standring, 2005)**

The occipital Horn

It extends posteriorly into the occipital lobe. The roof and lateral wall are formed by the tapetum of the corpus callosum and the optic radiation respectively. The medial wall of the posterior horn has two elevations the forceps major and the calcar avis.

The temporal Horn

It extends anteriorly into the temporal lobe (Fig. 1). The inferior horn has a roof and a floor. The roof is formed by the tapetum of the corpus callosum and the tail of the caudate nucleus. The floor consists of the hippocampus and the collateral eminence. (**Snell, 2010)**

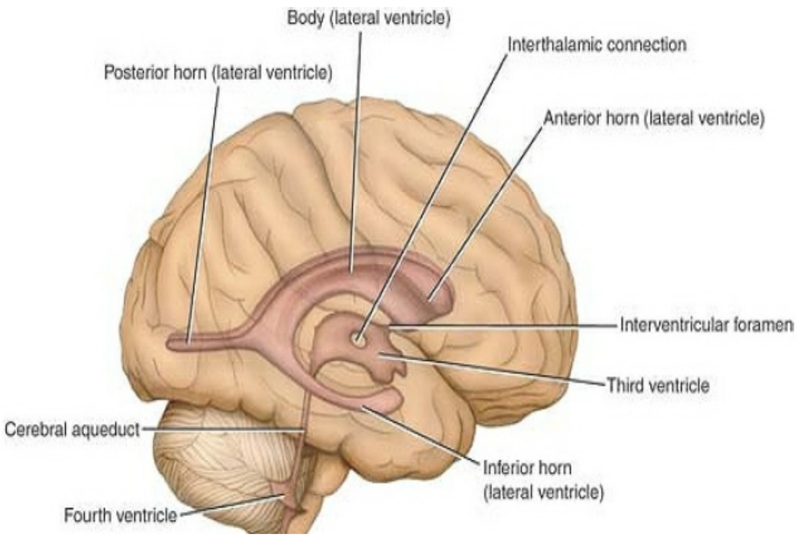

Fig.(1): The lateral ventricle parts. **(Snell, 2010)**