ISSN: 2515-8260 Volume 08, Issue 04, 2021

# Outcome of Endoscopic Resection in Brain Tumors

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**Received: 12-10-2020, Revised: 15-11-2020, Accepted: 17-12-2020, e-Published: 10-1-2021**

## ABSTRACT

***A random selection of 20 patients with pathological diagnosis including tumors ranging in size from 2 to 5 cm received endoscopic management. For some deep-seated brain tumors, like thalamic gliomas and malignant lymphomas, it is a potential approach for excision or biopsy. A procedure called neuroendoscopic biopsy is utilised to confirm the pathology of brain tumors by histology. The use of this technology has various benefits, including the ability to precisely view the tumor surface and avoid veins during tumour resections under direct vision. Another option is to gather enough samples for a pathology diagnosis. Since it made hemorrhages easy to stop, the two-handed endoscopic technique that made use of a mounted rigid endoscope was exceedingly effective and safe. The purpose of this study was to illustrate the function of endoscopy in the removal of deep-seated or intraventricular malignancies. A different medial approach is offered by the rigid endoscopic technique with a thick sheath, which offers better visualisation and a bigger working area.***

***Keywords: Minimally Invasive Techniques, Deep Seated Brain Tumors, Endoscopic Resection.***

## INTRODUCTION:

The lateral and third ventricles have a deep location and association with important neuronal and circulatory structures, which makes tumors a special challenge for the neurosurgeon. Approximately 41% of lateral and third ventricular cancers in children are supratentorial and infratentorial intraventricular tumors. However, the adult population only experiences these tumors in 7% of cases **(1)**.

Numerous benign and malignant tumors are among the many types of intraventricular mass lesions **(2)**. The lateral ventricle is site to almost half of all intraventricular mass lesions in adults, compared to a much lower rate in children **(3)**. The most common lateral ventricle cancers in adults include astrocytomas, meningiomas, glioblastomas, ependymomas, and choroid plexus papillomas **(4)**.

Approaching deeply seated intracranial malignancies requires brain retraction. The first self-retaining retractor for neurosurgery was developed by Greenberg. Strong retraction may seriously damage the brain and the blood vessels **(5,6)**.

Tubular retractors have been shown in several studies to reduce retraction injury in both adult and paediatric patients **(7-9)**. While long retractors are necessary for deep brain injuries, they greatly decrease visualization **(10,11)**.

The rigid endoscopic technique, which enhances working space and offers an

ISSN: 2515-8260 Volume 08, Issue 04, 2021

alternative medial approach, uses a thick tubular sheath to improve vision. Additionally, stopping haemorrhages is a specialty of the two-handed approach **(12)**. Although the techniques for this operation have been reported in earlier studies **(13-15)**. Ours study aim to clarify the role of endoscopy in the excision of intraventricular or deep-seated tumors.

**Patients and Methods:**

This intervention clinical study included 20 patients who had deep seated and interventericular brain tumors according to the WHO classification and being given a full explanation of the possible side effects and benefits of neuroendoscopy. This study performed between 2018 and 2020 in Neurosurgery Department at Zagazig University Hospitals.

**Inclusion criteria:**

Patients with tumor size 2-5 cm in diameter, metastatic tumors, recurrent tumors and subcortical brain tumors more than 2 cm or deep structures tumors (basal ganglia, thalamus and interventricular tumors).

**Ethical approval:**

The work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans. Written informed consent was obtained from all participants and the study was accepted by the research ethical committee of Faculty of Medicine, Zagazig University.

**Surgical procedures**

Following a minor craniotomy with a single burr hole, straight incisions were made. Using bipolar electrocautery forceps, the dura mater was opened broadly and abruptly after the dural and pial entry points were coagulated. The non-eloquent cortex underwent a corticotomy. A guidance guide was used to help the surgeon implant a sheath at the preoperatively chosen target.

The ventricular wall was pierced using a ventricular penetration needle because the thick sheath makes it challenging to do so. The sheath was then carefully placed while being guided by the endoscope, making it simple to separate the tumor from the healthy brain tissue. There wasn't much brain contusion throughout the course. The diameter was 15 mm or less right away after the sheath was removed. The trajectory kept falling after the procedure.

On gadolinium-enhanced T1-weighted magnetic resonance (MR) images taken before and after surgery, the volume of the resected tumor was calculated based on the preoperative and postoperative volumes. The ventricular wall may have been pushed, the ventricular shape may have changed, or the sheath may have reached a region that we did not aim to reach if postoperative MR images were not obtained three days after surgery. To generate the surgical space, suction was applied to the ventricular wall surrounding the needle hole. The use of an endoscopic holder during the procedure allowed for double-handed manipulation.

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**Statistical analysis:**

Data entered and analyzed using Microsoft Excel software then imported into Statistical Package for the Social Sciences (SPSS version 20.0) software. Quantitative data were described using range (minimum and maximum), mean, standard deviation and median. Differences between quantitative independent multiple by ANOVA or Kruskal Wallis. P value was set at <0.05 for significant results & <0.001 for high significant result.

## RESULTS

The current study of twenty patients with brain tumors were received hyperthermia in form of radiofrequency. Patients with different histopathological tumors underwent endoscopic resection and biopsy. All 20 patients were involved in the final analysis. The demographic data of patient involved in endoscopic management. The patient's age ranged between 13-75 with mean of 52.5 years old. Almost 60 % of them were in 34-54 age class groups. 70% of patients were males while the remaining 30% were females **(Table 1)**.

More than half of detected lesions were of non-glial type (65 %), among them, colloid was the commonest lesion represented by (35 %). Glial pathological lesions were detected in 35 % of patients, among them; Astrocytoma II was represented by 20 % **(Table 2)**.

There was significant difference between pre and postoperative size of the tumor with the tumor's size was significantly lower in postoperative than in preoperative assessment (2.97 vs 8.24 respectively) **(Table 3)**.

A case of 55 year-old patient who underwent endoscopic resection of brain tumors radiollogically and histopathology finding showing picture of colloid cyst. MRI showing hydrocephalic changes with mass at foramen of monro operated for endoscopic resection and 3rd ventriculestomy. Post-operative finding showing resolving of hydrocephalic changes and complete removal of the lesion with intraventricular hemorrhage and subgaleal collection patient neurologically intact, resolving haemattoma with no signs of infection. Some adverse reactions including early induced hemorrhage and neurological deficit may aggravate cerebral edema a short time after treatment **(Figure 1-4)**.

**Table (1): Demographic data of the studied group underwent endoscopic surgery:**

| Variable | Studied group (n=20) | |
|---|---|---|
| **Age:**<br>*Mean ± SD*<br>*Range* | 52.5 ± 14.6<br>13 - 75 | |
| | **No** | **%** |
| **Age: (years)**<br>*13-33*<br>*34-54*<br>*55-75* | <br>5<br>12<br>3 | <br>25<br>60<br>15 |
| | **No** | **%** |
| **Sex:**<br>*Female*<br>*Male* | <br>6<br>14 | <br>30<br>70 |

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**Table (2): Frequency distribution of pathological lesions found among the studied group underwent endoscopic surgery:**

| Variable | Studied group (n=20) | |
|---|---|---|
| | No | % |
| **Glial:** | **7** | **35** |
| *Astrocytoma II* | 4 | 20 |
| *Astrocytoma III* | 2 | 10 |
| *Astrocytoma IV* | 1 | 5 |
| **Non glial:** | **13** | **65** |
| *Choroid plexus* | 3 | 15 |
| *Colloid* | 7 | 35 |
| *Epidermoid* | 1 | 5 |
| *Germinoma* | 2 | 10 |

**Table (3): Pre and Post-operative tumor size among the studied group underwent endoscopic resection:**

| Variable | Pre-operative (n=20) | Post-operative (n=20) | P |
|---|---|---|---|
| **Tumor size:** | | | |
| *Mean ± SD* | 8.24 ± 2.64 | 2.97 ± 2.35 | **0.001** |
| *Median* | 8 | 2.9 | **(S)** |
| *Range* | 2 - 14 | 0.5 – 8.5 | |

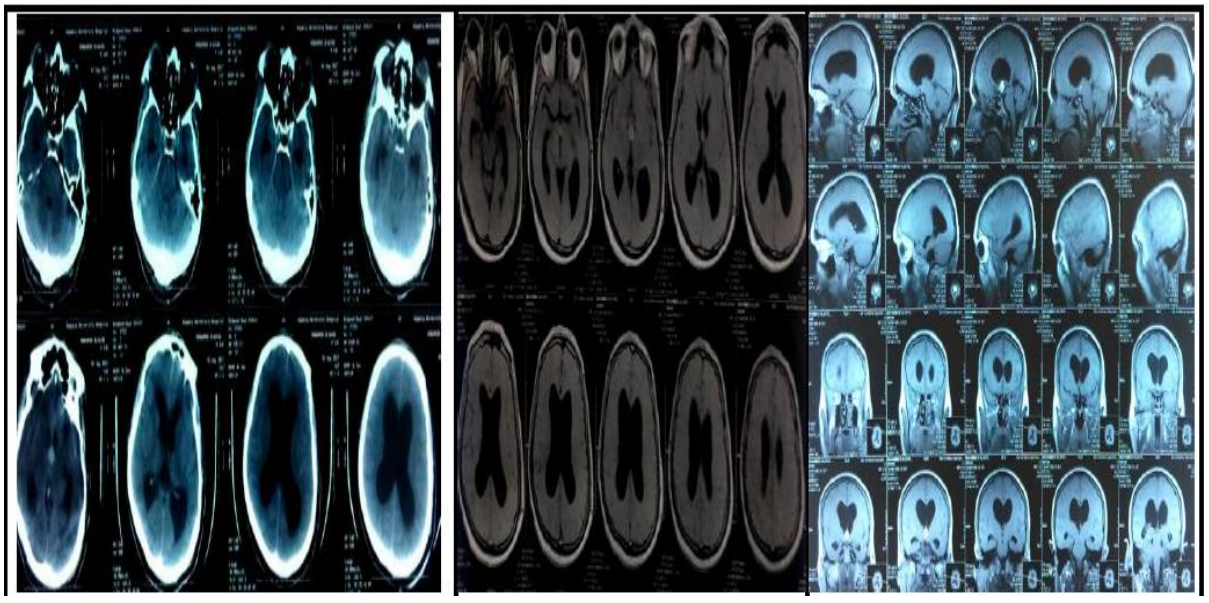

**Fig. (1): Male patient 55 years old presented with headache and blurring of vision and syncopal attacks, radiologically CT brain and MRI showing hydrocephalic changes with mass at foramen of monro operated for endoscopic resection and 3rd ventriculestomy.**

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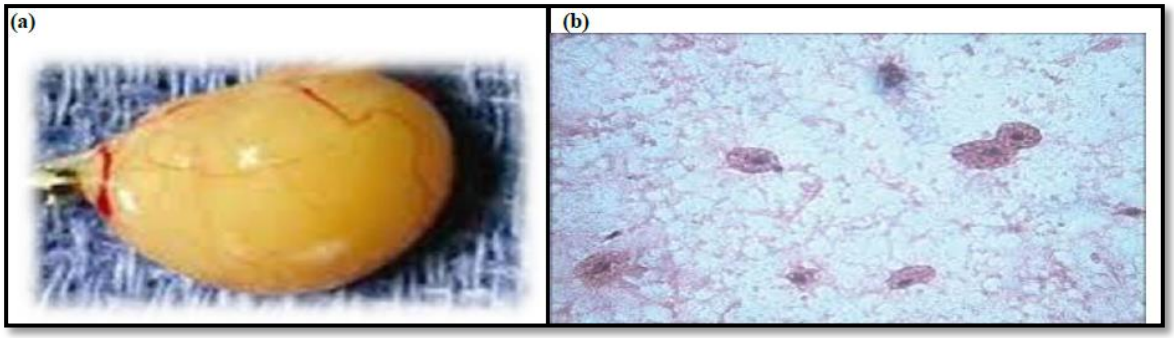


**Figure (2): (a) Image of the lesion soft cystic and greenish yellow most probably colloid cyst, (b) histopathological image of colloid cyst.**

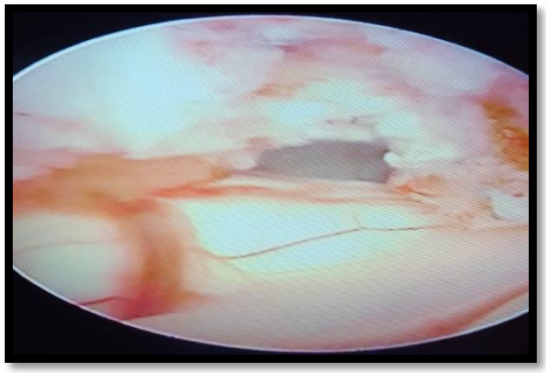

**Figure (3): Endoscopic view of foramen of monorow showing tumor resection partially with hole communicating lateral ventricle with third ventricle presrevation of anatomy regarding thalamostriate vein and choroid pleuxus at the lower medial part of the tumor.**

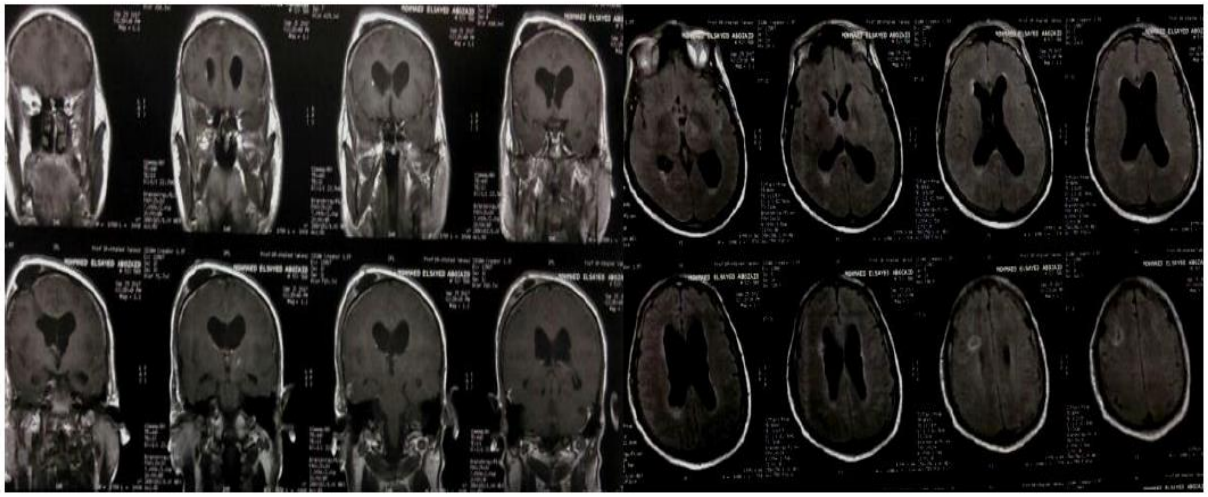

**Fig (4): Post-operative MRI showing resolving of hydrocephalic changes and complete removal of the lesion with intraventricular hemorrhage and subgaleal collection patient neurologically intact, resolving haemattoma with no signs of infection .**

## DISCUSSION

The majority of intraventricular tumors are benign in origin, and because it develops slowly, clinical symptoms may not appear until they reach a specific size **(4)**. Intraventricular tumors

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typically obstruct CSF circulation, which causes hydrocephalus and symptoms of elevated intracranial pressure **(9)**. Also, it increase in volume until signs of hydrocephalus appear, at which point emergency intervention is typically necessary. The symptoms of elevated intracranial pressure syndrome, such as headache, nausea, and vomiting, are frequently associated with intraventricular tumors **(16,17)**.

In our study the patient's age ranged between 13-75 with mean of 52.5 years old. Nearly 70% of patients were males while the remaining 30% were females. We found males tend to have these tumors more frequently than females. In a study of **Jelinek et al. (18)** revealed males and females were approximately equal in all tumors. However, **Chong et al. (19)** revealed females are more frequently affected than males with a 2:1 ratio

The commonest presenting symptom among the studied group was headache followed by headache and vomiting. Less frequently symptoms were diplopia, vomiting and blurring of vision which all were presented by the same frequency.

Our finding agrees with **Nelson & Taylor (20)** who found headaches occur commonly in all patients, including those who have brain tumors. The majority of intraventricular tumours are benign in origin, and because they develop slowly, clinical symptoms may not appear until they reach a specific size. They typically block CSF circulation, which causes, a classic "brain tumour headache type" is one that is localised, progressive, worse in the morning, aggravated by coughing or bending forward, develops in relation to the neoplasm both temporally and often spatially, and goes away within 7 days of corticosteroid treatment or surgical removal.

In our study, more than half of detected lesions were of non-glial type (65 %), among them; colloid was the commonest lesion represented by (35 %). Glial pathological lesions were detected in 35% of patients, among them; Astrocytoma II was the commonest finding. Third ventricle was the commonest anatomical site of the lesion followed by right lateral ventricular site and Pineal, while the remaining sites showed nearly frequency.

This finding agreed with several previous studies with **Majos et al.,(21); Burger and Scheithauer (22)**; **Osborn & Preece (23)** and **Majid et al., (24).**

Therefore,the tumor's location, radiological appearance, symptoms, and patient's age all provide information that can help determine the tumor's pathological type. The third ventricle is more likely to have a colloid cyst than a hypothalamic astrocytoma. The best treatment method of intra-ventricular tumor is surgical resection **(4,5)**. Transcortical, interhemispheric trans-callosal approaches are used for 3rd and lateral ventricles. The transcortical approach. For lateral ventricle, transcortical approach is more suitable than the trans-callosal approach. It is more commonly preferred due to the wider visual field and easy access to the temporal horn and atrium **(25)**. Moreover, it enables total extraction of the tumor with less morbidity. Transcallosal approach includes more advantages such as lower rate of postoperative neurological sequel and epilepsy **(26)**.

Our finding showed resolving of hydrocephalic changes and complete removal of the lesion with intraventricular hemorrhage and subgaleal collection patient neurologically intact, resolving haemattoma with no signs of infection postoperatively.

Recently, the use of neuroendoscopic techniques to treat ventricular tumors has become more common. It is hypothesized that reduced brain retraction and injury results in better eyesight. Although it can be utilized for all cancers, the procedure is difficult for large

ISSN: 2515-8260 Volume 08, Issue 04, 2021

tumours. Particularly for tumors under 2 cm, it is preferable. It is important to consider the tumor's vascularity, density, and consistency. It is claimed that the technique can be utilized as a support technique for the microsurgical technique in order to more clearly visualize the tumour **(27,28)**.

**Conclusion:**

Deep-seated brain tumors are increasingly treated endoscopically since it is a reliable procedure with several advantages (reduced surgery time, shorter hospital stay and also reduction in morbidity and mortality compared to microsurgery). In our profession, it is a relatively new technology, and preliminary results are encouraging, making it a potential method for the treatment of deeply embedded brain tumors.

**Declaration of Competing Interest**

The authors did not report any conflict of interest in competing for financial or personal relationships.

**Funding Information:** None.

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**ISSN: 2515-8260 Volume 08, Issue 04, 2021**

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