ORIGINAL ARTICLE

Supratentorial Ventricular Tumors Surgical Management Experience at Shaikh Zayed Hospital, Lahore

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ABSTRACT

Background: There are variety of tumors arising within and proximity of ventricles. Their deep location and surrounding by eloquent brain parenchyma makes their surgical excision difficult. Image guided navigation system is a useful help in volumetric excision which can minimize morbidity and mortality.
Methods: In this study a series of eleven patients who underwent surgical excision with the help of image guidance, through transcortical transventricular approach, in a period of three years is presented. The complications and outcome of this surgical series are evaluated.
Conclusion: The surgical excision of the ventricular tumors is challenging, but potential for maximal tumor resection and good outcome are also high when careful microneurosurgical and intraoperative image guidance techniques are used.
Keywords: Supraventricual tumor, brain parenchyma**,**

INTRODUCTION

One tenth of all intracranial neoplasmas present within or in proximity of the ventricular system. These neoplasms comprise of a heterogenous group with regard to tumor type and clinical prognosis in both children and adults[1,2]. Although some of these tumors are high grade lesions, many are histologically benign and potentially curable by complete excision. Most of these tumors grow slowly, they may remain clinically silent and reach significant size before becoming symptomatic, thus making their excision challenging[3]. Typically these lesions cause symptoms and signs of raised intracranial pressure due to hydrocephalus because of blockage of cerebrospinal fluid pathways or compression of adjacent neural structures[2,3]. Sometimes hydrocephalus is also due to over production of cerebrospinal fluid[4]. Patient usually complains of persistent headache that may be associated with vomiting characteristically occurring in the morning. Specific focal neurological deficit occur depending upon tumor location and involvement of adjacent structures of surrounding cerebral parenchyma. Microsurgical resection has been the treatment of choice for majority of these lesions. Stereotactic navigation system is used to assist in volumetric resection of intraventricular tumors as completely as possible without compromising intact neurological function. Specific tumor type appear to occur more frequently in certain anatomical location and in certain age group[2].

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MATERIAL AND METHODS

There were 11 patients with intraventricular tumors presented to Department of Neurosurgery from January 2010 to December 2013. The age ranged from 10-27 years of age and average being 21 years. Seven patients were females and four males. Patients developed symptoms late in the growth of the lesions and the symptoms were often nonspecific in nature. These symptoms were headache, visual field defects, imbalance, weakness, cognitive impairment and drop attacks. The symptoms and signs prior to diagnosis in this series were typically of patients with large size tumors located in the ventricles. However in majority of patients who presented with signs of increased ICP, the nonspecific symptoms included headache, vomiting and malaise (9 patients). Six patients had varying degree of visual deterioration. Four patients had hemiparesis and 2 patients gave history of drop attacks (Table 2).

The patients were investigated with computed tomography and magnetic resonance imaging with and without contrast and MRI with image guided surgery protocol (2mm non contignous slice stealth station treon plus – Medtronic). After general anaesthesia and postioning, all patients underwent image guided craniotomies. In all patients transcortical transventricular approach was used to access the ventricles and the tumor. The tumors were excised piecemeal using microsurgical techniques. CUSA (cavitronic ultrasonic aspiration, valley corp) and bipolar cautery.

RESULTS

There was one death in this series. This patient deteriorated after 12 hours and was found to have a hematoma on CT scan. Re-exploration and evacuation of the hematoma was done immediately but he never recovered. Four patients underwent subtotal resection of their tumor. Six patients had gross total resection of their oligodendrogliomas which arose from deep structures and grew into the ventricles (Table 3).

Table 1: Tumors in various anatomical locations in ventricular system

Location	Tumor
Lateral Ventricle	Astrocytoma, PNET, teratoma, subependymal giant cell astrocytoma
Body	neurocytoma
	Choroid plexus papilloma
Trigone	ependymoma, meningioma
Third Ventricle	Pituitary adenoma,
Anterior	craniopharyngioma, choroid plexus papilloma, colloid cyst
	Pineal tumors, germ cell tumors, high
Posterior	grade cliomas, ependymomas

Table 2: Frequency of symptoms in our patients

Symptoms	n	%age
Headache	9	82
Visual field defects	6	54
Imbalance	4	36
Memory deficits	3	27
Cognitive impairment	2	18
Motor weakness	4	36
Drop attacks	2	18

Table 3: Frequency of histological tumor type in the patients

Tumors type	n	%age
Astrocytoma grade-II	2	18
Olgiodendroglioma	1	9
Glioblastoma Multiformae	1	9
Neurocytoma	1	9
Mixes astro/ oligodendroglioma	2	18
Epyndymoma grade-II	2	18
Colloid cyst	2	18

Table 4: Outcome analysis

Outcome	n	Glasgow outcome scale
Good	6 (55%)	7/8
Fair	4 (36%)	3/5
Poor	1 (9%)	1

Good: Patient improved and can look after himself independently
Fair: Preoperative status remained same
Poor: Patient worsened after surgery, death

The patient outcome analysis was performed in three categories i.e. good, fair and poor. Patients with good outcome 6(55%) experienced no deficit or minor deficit which permitted them to resume their activities of daily life. Four (36%) patients were included in fair outcome as their disabilities persisted. In 1(9%) patient it was worse. One patient needed shunt placement after 3 weeks.

DISCUSSION

The deep location and eloquent surrounding of ventricular system within the brain have historically posed significant and often formidable challenges for the optimal resection of tumors in these locations[1,2,3]. The evolution and advances in microneurosurgical techniques and neuroanatomical knowledge has led to the general paradigm shift from transcerebral to transcistemal corridor strategies. The essence of microsurgeries of the ventricular systems has evolved around the concept of circumnavigating eloquent cortical and white matter structures to achieve minimally invasive access and resection while optimizing functional and cognitive outcome[9].

As seen from table 3, a large variety of tumors arise in and around the ventricles but differential diagnosis of these tumors depends on the age of the patients, location of the lesion and specific radiological characteristics as determined by CT scan, MRI and angiography e.g. tumor found in the lateral ventricle of children younger than 5 years of age were often choroid plexus tumors, whereas in older children they are glioma. The most common hypo or isodense, non-enhancing tumor in the body or around foramen Monro is subependymoma, in children with tuberous sclerosis they are often giant cell astrocytoma[2-6].

Astrocytomas can be found in all parts of the ventricles and frequently arise from thalamic area. Ependymomas can be intraventricular as well as intraparenchymal. Intraventricular meningiomas can also occur in atrium and trigone region in adults. Tumors in older patients are often either a primary or a metastatic malignant tumors. Central neurocytomas occur in adults in 2^{nd} – 4^{th} decade primarily as a solid lesion with cystic region and contain calcification. These tumors may have achieved large size at presentation. Colloid cyst and other mal-formative cyst can also arise from anterior part of third ventricle. Other neoplastic growths, xanthogranuloma, sarcoidosis, AVM, cavernous hemangiomas etc can be found in lateral ventricles in varying frequencies[1,5-7].

The complex anatomy of the ventricular system permits a wide variety of surgical approaches. The location and size of the lesion, hemispheric dominance, preoperative deficits, associated hydrocephalus, vascularity of the lesion and

experience of the surgeon will contribute to selection of surgical approach. Stereotaxy is used to guide precisely localized craniotomy site and corticotomy. It can provide guidance during the approach, reduce need for retraction, improve trajectory towards the lesion and assist in complete resection of the lesion[3,9]. Establishment of ventricular communication after tumor resection is an important goal. Cyst wall residual tumor or any blood clot need to be removed so that intraventricular communication has been achieved[3,5,6,9].

Postoperative deficit includes contralateral hemiparesis when a large trigone or ventricular body tumor is excised by transcortical approach. Frequently weakness is the result of retraction pressure and will resolve with time. Language impairment is a possibility when the tumor is based in the dominant hemisphere. In such cases approximately 10 to 30% of the patient will suffer a new speech deficit or worsening of their preoperative deficit[3,5].

Subdural hygroma is a well-recognized problem especially in patients in whom large tumor are associated with hydrocephalus. The cortical surface may fall, or pull away from the dura and create a hematoma or hygroma, which may eventually need treatment (shunt or evacuation)[1]. Filling the ventricle with saline or ringer lactate before completion of surgery and placement of intraventricular catheter in subdural space may reduce the incidence of subdural hygroma and hydrocephalus. There are reports of placement of fibrin glue over the cortical surface for reducing this incidence of subdural space collection[8]. Postoperative ventriculomeglay is common but not every patient will require placement of a shunt, however 5-10% of the patients will ultimately require CSF diversion[8,9]. In our series only one patient needed placement of the shunt. The strategy to avoid postoperative hydrocephalus was first to clear out a complete resection as possible to open CSF pathways and to leave a ventricular drain postoperatively allowing it to clear any blood products and debris. This drain was removed after 48-72 hours once effluent was clear.

The true incidence of cortical incision related postoperative epilepsy is hard to determine because there are many factors that can contribute to a seizure disorder including preoperative seizures, tumor histology, presence of residual tumor, subdural hygroma and electrolyte imbalance etc[3]. None of our patients have preoperatively seizures though 18% of patients postoperatively develop seizures. Although any patient who undergoes corticotomy is at a risk for postoperative seizure, in our series 2 of the patients had seizures. Morbidity and mortality was as high as 75% mostly because of intraoperative hemorrhage in premicrosurgical era[1,2] however in more modern series, the mortality rates are far lower than 10%[9]. The death in microsurgical era are usually secondary to catastrophic postoperative hemorrhage, pulmonary embolism or infarction.

CONCLUSION

Although potential for complication in operative treatment of ventricular tumors is relatively high regardless of the surgical approach, nevertheless the potential for maximal tumor resection and good outcome is equally high with careful and meticulous observation of surgical technique. Image guided stereotactic techniques are of great help in localizing the craniotomysites, corticotomy planning, improve the trajectory towards the lesion and assist in complete resection of all lesion without compromising normal tissue.

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