



Posterior Cranial Fossa Space Occupying Lesion: A Tertiary Center Experience

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Abstract

Background: Tumors in the Posterior fossa are well known for their critical location and complications as they result in brain stem compression and hydrocephalus. This study was conducted to analyze the histological types, frequency and prognosis of the posterior cranial fossa tumors in children and adults at department of Neurosurgery, Rangaraya Medical College, KAKINADA, ANDHRA PRADESH .

Methods: It was a descriptive study in which 26 consecutive cases of posterior cranial fossa tumors in children and adults were studied from January 2019 to October 2021. During this period, patients with posterior cranial fossa tumors were thoroughly studied and analysed regarding further management options.

Results: Out of 26 cases in our study, 15 (58%) cases were female and 11 (42%) were male patients. The morphological distribution of the posterior cranial fossa tumors was as follows: schwannoma 10 (38.7%) cases, metastasis 04(15.7%) cases, meningioma 03 (11.5%) cases, medulloblastoma 03 (11.5%) cases, hemangioblastoma 03(11.5%)cases, pilocytic astrocytoma 01(3.8%) cases, PNET 01 (3.8%) case and neurofibroma 01 (3.8%) case.

Conclusions: Brainstem compression, herniation, and death are all risks in tumors which occur in this critical location. Tumors in the posterior fossa are considered critical brain lesions, primarily because of the limited space within the posterior fossa and the potential involvement of vital brain stem nuclei.

Keywords: Early diagnosis, Histopathology, Prognosis, Posterior cranial fossa tumors

Introduction

Posterior fossa lesions are one of the most serious forms of human illnesses which are common in children. Its critical location leads to brainstem compression and herniation, then death. Prevalence of posterior fossa lesions in children are more common than in adults. 54% to 70% of all brain tumours in children are present in the posterior fossa but 15–20% in adults. These tumours occur more in males than females.(1)

Medulloblastoma, ependymomas and pilocytic astrocytomas occur more frequent in childhood. Tumours such as metastatic lesions, lymphomas and hemangioblastoma are more common in adulthood .

Intracranial dermoid tumours have a rare percentage of all intracranial tumours, about 0.1–0.7% .(2)

The clinical presentation varies according to the tumour site, its biological behaviour and aggressiveness, and its growth rate. Symptoms may be due to focal compression on the cerebellum or brain stem, or from increased intracranial tension. The modern neuroimaging modalities lead to their diagnosis at earlier stages of the disease. CT delineates the presence of posterior fossa tumours in more than 95% of cases, but MRI becomes the procedure of choice in their diagnosis(3)(4) .The purpose of this study was to analyze the demographic frequency, clinical presentation, histological types, complications and surgical outcome of posterior cranial fossa tumors at our institute.

Methodology

1. This study comprises of 26 cases of posterior fossa tumors in all age groups. Children above 12 years of age are included under adults. CSF diversion procedures like VP shunt was carried out in patients with hydrocephalus prior to lesional resection.
2. Duration of study: All patients who were admitted to the Neurosurgery department at GGH, KAKINADA from January 2019 to October 2021 (covid epidemic). Patients with complaints of headache especially in the sub occipital region, vomiting, altered sensorium, features suggestive of lower cranial nerve involvement and increased ICP underwent serial imaging techniques
3. Study design: retrospective observational study
4. Imagiology : CT and MRI sequences include T1, T2, FLAIR, diffusion weighted imaging DWI, susceptibility weighted imaging SWI, T1 gadolinium contrast enhancement and MR SPECTRO.
5. Final outcome was assessed and typed as excellent, good and poor 3 months after discharge.

- 5.1. excellent- total tumor excision with no neurological deficit
- 5.2. good- subtotal excision with no or reversible neurological deficit OR total excision with reversible neurological deficit
- 5.3. poor- subtotal or total excision with irreversible neurological deficit

Observation

This study comprises of 26 cases of posterior fossa tumors in all age groups. It was a retrospective observational study.

The overall cases of 26 had 58% of female prevalence against 42% male. When the detailed tumour with gender distribution was observed, schwannoma had 60% male predominance against 40% female. Metastasis and neurofibroma had complete female dominance in their gender distribution.

Figure 1: Gender wise incidence of tumors

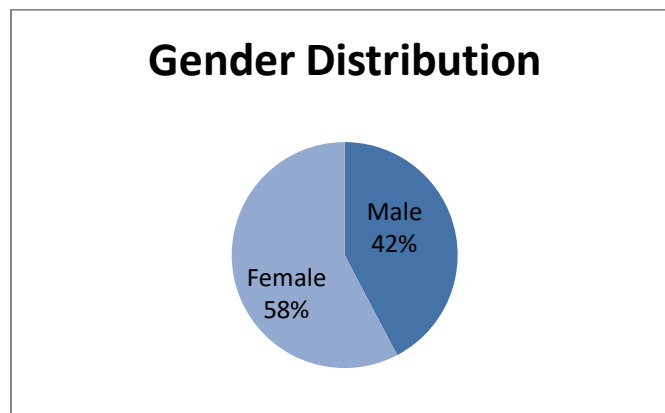
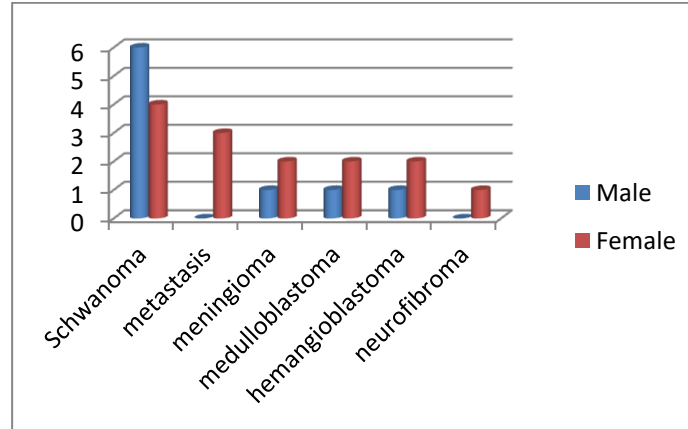


Figure 2: Distribution of tumors according to the gender



Histology

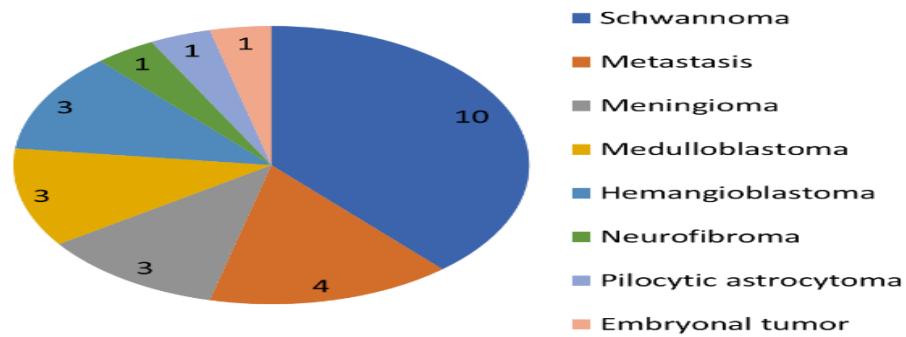


Table 1- Distribution of tumors according to histopathology

Types:	No. of cases	Percentage
Schwannoma	10	38.7%
Metastasis	04	15.7%
Meningioma	03	11.5%
Medulloblastoma	03	11.5%
Hemangioblastoma	03	11.5%
Neurofibroma	01	3.8%
Pilocytic astrocytoma	01	3.8%
Embryonal tumor	01	3.8%
Total	26	100%

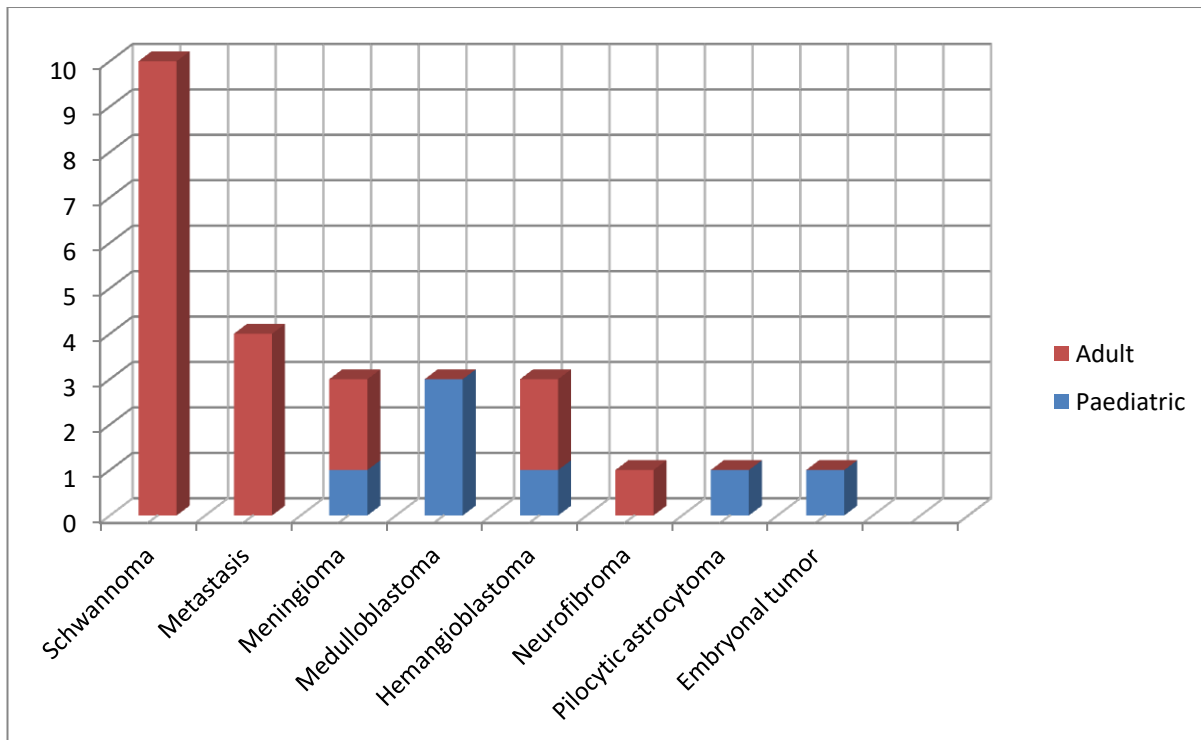
Frequency of tumors: Schwannoma leads out of 26 cases (38.7%), followed by metastasis 15.7%, meningioma, medulloblastoma and hemangioblastoma(11.5%), Rarest findings among the posterior fossa tumors were incidences of neurofibroma, pilocytic astrocytoma, embryonal tumor of 3.8%

Among these patients, 5 (19.3%) of them below 12 yrs and 21 (80.7%) were more than 12 yrs (Figure 4). The prevalence of schwannoma, metastasis and neurofibroma was exclusively found in adults(100%), where as paediatric prevalence was seen in medulloblastoma, pilocytic astrocytoma and embryonal tumor.

Table 2: Distribution of tumors by age group

Types	Paediatric (%)	Adult (%)
Schwannoma	0	10
Metastasis	0	4
Meningioma	1	2
Medulloblastoma	3	0
Hemangioblastoma	1	2
Neurofibroma	0	1
Pilocytic astrocytoma	1	0
Embryonal tumor	1	0

Figure 4: Morphological distribution of posterior cranial fossa tumors by age group



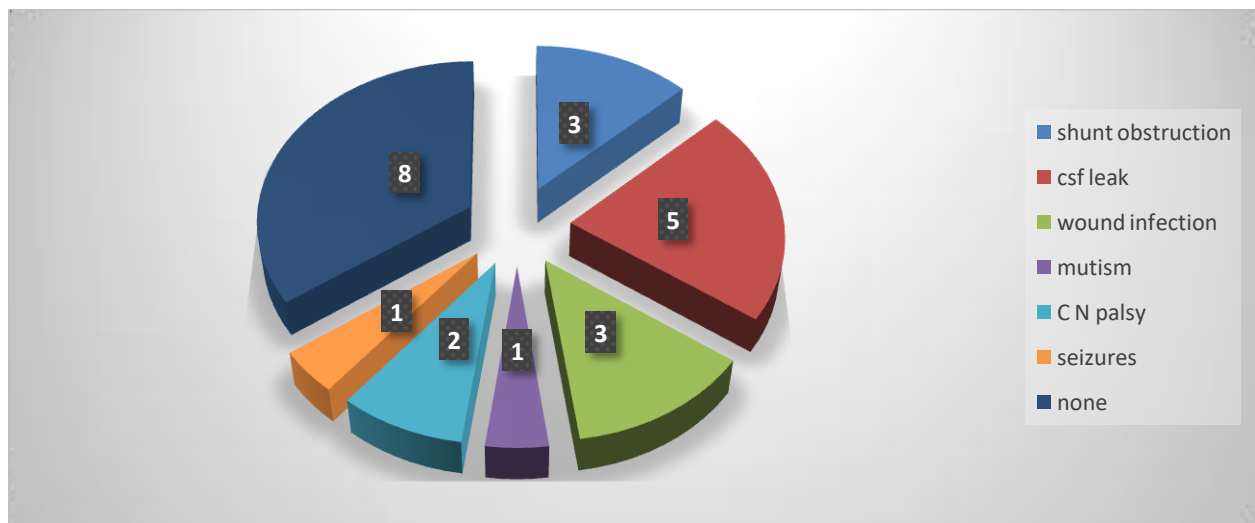
Clinical Presentation

Most of the patients suffering from posterior cranial fossa tumor were suffering from headache and vomiting (69.2%), cerebellar signs(57.7%), cranial nerve palsy(46.2%), hydrocephalus (46.2%), motor symptoms and convulsion(27%) and blurred vision in 19.2%.

Clinical presentation	Numbers	%age
Headache and vomiting	18	69.2%
Cranial nerve palsy	12	46.2%
Motor symptom	07	27 %
Cerebellar signs	15	57.7%
Blurred vision	05	19.2%
convulsions	07	27 %
Hydrocephalus	12	46.2%

Complications

While majority of the cases did not end up in any severe complication, there were few cases who ended with mild to fatal complications post operatively. Most common complication was found to be CSF leak (22%), shunt obstruction and wound infection (13%), cranial nerve palsy were found in 9% of the cases, seizures and mutism was found in 4%.



Outcome

Excellent	0	0 %
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Good	17	65.7%
Poor	03	11.5%
Death	06	23 %

While the degree of outcome was based on parameters such as recurrence, type of tumor and extent of removal complications post operatively, recovery time etc, an improved outcome was found in 65.7%, 11.5% deteriorate over time, and death occurred in 23% of the cases.

Discussion

Brain tumors are the most common solid tumors of the children and occur at a rate of 2.4/1,00,000 children at risk per year. Approximately half of the brain tumors of childhood arrive from the posterior fossa. (2)(5)

In our study, we found that headache along with nausea and vomiting was the primary presenting symptoms in majority of patients with posterior fossa tumour. Prasad et al found in his study of 37 cases presented similar findings of headache/ vomiting being most common followed by hydrocephalus and cerebellar signs. Our findings for cerebellar compression, raised ICT were concurrent with findings of Prasad et al and Kakar et al in 2020.(2)(6) Posterior fossa syndrome (PFS) is a known consequence of medulloblastoma resection, which ranged from complete mutism (PFS1) , diminished speech (PFS2). Children with PFS had severe ataxia and movement disorders.(7)

Schwannoma was the most commonest tumor and is most commonly seen in adults (38.7%). Medulloblastoma was the most common tumor seen in children (11.5%) in our study which is similar to many others. All reports were confirmed by imaging and histopathology. Alves et al in recent studies have validated the clinical usefulness of a radiologic decision flow chart based on previously published neuroradiologic knowledge for the diagnosis of posterior fossa tumors in children. Duc et al in 2019 stated how MRI plays a crucial role in demonstrating the features of posterior fossa brain tumours for appropriate diagnosis of medulloblastomas, ependymomas, and pilocytic astrocytomas.(8)(9)

Mean Age: Certain tumors are common in adults which were observed in our study. Meningiomas are commonly seen in adults which is consistent with other studies. In our study, 80.7 % of cases were seen in adults. Prasad et al found Posterior fossa tumors predominantly between between 1 and 9 years of age, where 81% of the cases were below 10 years.(2) In astrocytoma, the frequency varies in many studies. In our study, 01 case of high grade pilocytic astrocytoma was seen in children.(10) Brain metastasis is more common in the older age group (concordant with our study) as the authors got 8 cases, all are seen in elderly adults.(11)

Gender distribution: It was mostly seen how in all tumor of our study had female predominance(58%) except schwannoma(42%). This finding has contradicted with Duc et al(2019) and Prasad et al(2017). Ahmad et al in 2019 did a ten year retrospective study on profile of posterior fossa tumors, where out 546 patients, 306 patients were male (2.4:1) (9)(2) (12) Gender does not appear to impact short- or long-term outcomes following posterior fossa tumor resection.(13)

Near total resection was done in 09 cases as complete resection was very difficult in these cases because of their location. Basing on the histopathology, patients were subjected for post op radiotherapy. Kakar et al in 2020 observed that out of 29 patients <7 years 22 (75.86%) and out of 42 of age 7 years and >35 (83.33%) had satisfactory surgical outcome. Sunderland et al in 2016 presented study where 74 patients (80 %) underwent gross total resection (GTR), 13 (14 %) subtotal resection (STR) and 5 (6 %) underwent biopsy only. (6)(14)

Most common complication post operatively was found to be CSF leak (22%) which is consistent with other studies. where as many other studies such as Ahmed et al, found hydrocephalus which was mostly managed by VP shunt and CSF leak managed conservatively. (12)Dubey et al in 2009, worked on 500 cases found that the overall complication rate in their study was 31.8%, affecting 159 patients. Cerebrospinal fluid leaks were the most frequently encountered, presenting in 65 (13%) patients followed by meningitis in 46 (9.2%) patients, wound infection in 35 (7%) patients, and CN palsies in 24 (4.8%) patients. There exists no class I evidence in the literature to guide the management of hydrocephalus in children with posterior fossa tumors as mentioned by Lam et al in 2015. (4)(15)

Outcome was based on scale where it was found most of the patient had satisfactory outcome. Eastern Cooperative Oncology Group Performance Status or ECOG PS or WHO scale and Karnofsky Performance Status (KPS) give a qualitative assessment based on patient's function and performance abilities. (16) 23% of our study had poor outcomes in form of mortality, because of various co factors. An approach with neuronavigation with transtentorial microsurgeries actually give par excellent outcome as studied by Maselli et al in 2012. (17)The modified Frailty Index (mFI) is a previously validated scoring system to determine the extent of preoperative patient comorbidities. (18)

Conclusion

As the posterior fossa is a limited space, the tumors presenting in this region cause symptoms early on and require prompt treatment to avoid potential morbidity and mortality. Early detection and diagnosis of these tumors and prompt neurosurgical consultation is crucial in the optimum management of pediatric infratentorial brain tumors. Surgery is the mainstay of treatment, as it provides biopsy and decompression of the tumor. Adjuvant therapy is required in the majority of cases. Recent advances in the field of radiation biology and pharmacology have improved dose and delivery techniques of chemoradiation therapy. In the current era, advances in translational research and molecular genetics have assumed a major role in the pursuit of achieving a 'cure' for these potentially malignant tumors.

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