Posterior Cerebral Fossa Tumors in Children: About 323 Cases and Literature Review

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Abstract:

Tumors of the posterior cerebral fossa are common in children, often located intra-axially. Common types include medulloblastoma, astrocytoma, and cerebellar ependymoma. Diagnosis is based on clinical neuroimaging, particularly magnetic resonance imaging and histology. Between 2005 and 2020, 323 cases of posterior cerebral fossa tumors in children were treated in the neurosurgery departments of the Ali Ait Idir Health Hospital Establishment and Mustapha BACHA University Hospital Center. The average age of patients is 7 years old. 144 children were treated for medulloblastoma, 129 for astrocytoma, and 50 for ependymoma over a 15-year period. Indeed, advancements in anesthesia, surgical techniques, adjuvant treatments, and molecular biology have significantly improved the prognosis of tumors.

Keywords: *Tumors of the posterior cerebral fossa, surgical techniques, adjuvant treatments*

Introduction

Tumors of the posterior cerebral fossa, also known as infra or subtentorial tumors, are extensive lesional processes involving various elements at the base of the skull**[1-2] (Figure 1)**. Common in children, they are primarily intra-axial and include medulloblastoma, astrocytoma, and cerebellar ependymoma **[2–5].** Diagnosis is based on clinical, neuroimaging, and histology **[3]**. Treatment is often multidisciplinary, involving surgery, radiotherapy, or chemotherapy,

depending on the tumor's histological nature [7]. The prognosis depends on excision quality and tumor type[12–13].

Figure 1: Limits of the posterior cerebral fossa

1:Back of the saddle of the sphenoid bone

2: Upper borders of the petrous part of the temporal bone

3: Transverse sinus groove on the occipital bone

Material and method

Between January 2005 and January 2017, 323 cases of tumors of the posterior cerebral fossa in children were gathered in our neurosurgery departments at Ali Ait Idir Health Hospital Establishment and Mustapha BACHA University Hospital Center.

We treated :

- (144 cases) children with medulloblastoma of the posterior cerebral fossa
- (129 cases) gave birth with an astrocytoma of the posterior cerebral fossa
- (50 cases) children with ependymoma of the posterior cerebral fossa

With the exception of two patients who underwent emergency surgery, all patients were investigated using a cranial CT scan and brain and spinal cord MRI. All children had a ventriculoperitoneal bypass preceding.

With the exception of two patients without valves and four children who underwent surgery and received a shunt, the surgical excision was decided upon following a review of the operating report, postoperative CT scan, and brain MRI prior to chemotherapy and radiotherapy.

Results

The study analyzed treatment for medulloblastoma, astrocytoma, ependymoma, and literature. It found that medulloblastoma treatment involved 144 cases, with 83 total excisions (57%)
, 50 partial excisions (50%), and 38% biopsy cases **(Fig 2)**. Astrocytoma treatment involved 129 cases, with 109 total excisions (84%), 24 partial excisions (24%), and 33.33% literature cases **(Fig 4).** The study involved 50 cases of ependymoma, with a total excision rate of 35% and partial excision rate of 65%, and a literature review rate of 22.2% **(Fig 3)**.The literature treatment involved 50 cases with a total excision rate of 94.44% **[9]** **(Table 1).**

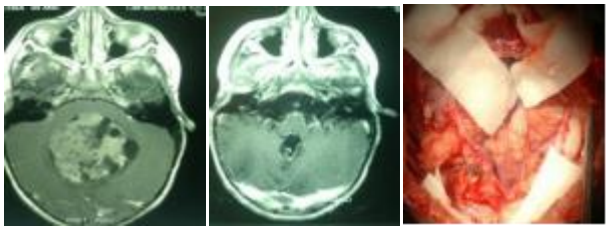
	Medulloblastoma 144 cases	**Astrocytoma 129cases**	**Ependymoma 50cases**	**Literature 50cases**
Total excision	83 CASES 57%	109 CASES 84%	35% 7%	94.44%
Excision partial	50 CASES	24 CASES	65%	-
Biopsy	03 CASES	-	-	-
Literature 50 cases [9]	38.88%	33.33%	22.22%	

Table 1: Surgical modalities used in the treatment of Posterior Cerebral Fossa Tumors

The symptoms include Intracranial Hypertension Syndrome (304 cases), Cerebellar Kinetic And Static Syndrome (320 cases), and Consciousness Disorder (10 cases) **(Table 2).**

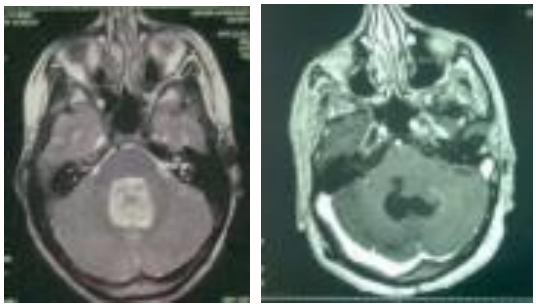
Symptomatology	Number
Intracranial Hypertension Syndrome	304 cases
Cerebellar Kinetic And Static Syndrome	320 cases
Consciousness Disorder	10 cases

Table 2: Symptomatology of Posterior Cerebral Fossa Tumors



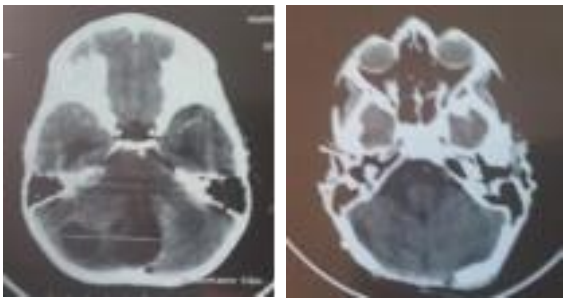
(a) (b) (c)

Fig 2: Medulloblastomas FCP MRI Pre (a) and post(b) operative, Image per Operatories (c)



(a) (b)

Fig 3: Ependymoma FCP MRI Pre (a) and post(b) operative



(a) (b)

Fig 4: Pilocytic astrocytoma FCP MRI Pre (a) and post(b) operative

Our series includes 12 cases of recurrence of multlobullblastoma with 6 leptomeningeal metastases, 11 cases of ependymoma, and 10 cases of astrocytoma **(Table 3, Fig 5).**

	Our Series
Medullblastoma	12 cases of recurrence + 06 leptomeningeal metastases
Ependymoma	11 cases
Astrocytoma	10 cases

Table 3: recurrence with leptomeningeal metastases of Posterior Cerebral Fossa Tumors

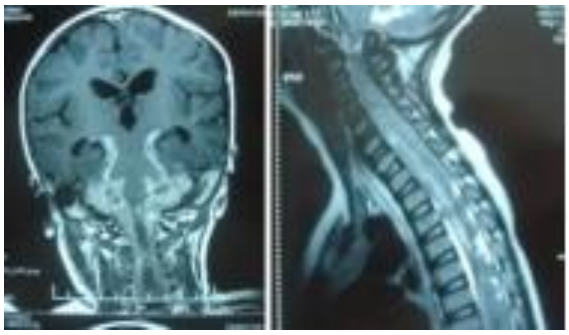


Fig 5: Medulloblastomas with metastasis and leptomeninge infiltration

Medulloblastoma treatment varies based on various modalities, with radiotherapy being the preferred method in some cases and chemotherapy used in 45 cases. In 90 cases, a combination of radiotherapy and chemotherapy (Rt + Chemio) is used, enhancing treatment effectiveness. The choice of treatment depends on factors like patient age, overall health, tumor characteristics, and tumor spread. Treatment decisions are made by a multidisciplinary team after a thorough evaluation. Astrocytoma cases include radiotherapy (RT) cases with 18 cases, chemotherapy cases with 1 case, and radiotherapy + chemotherapy cases with 13 cases. Ependymoma treatment depends on tumor location, grade, and patient characteristics, with treatment plans tailored to each patient. There are 35 total cases of radiotherapy, 3 cases of chemotherapy, and 5 cases of radiotherapy + chemotherapy **(Table 4).**

	Medulloblastoma	Astrocytoma	Ependymoma
Radiotherapy	Case	18 Cases	35 Cases
Chemotherapy	45 Cases	Case	3 Cases
Rt +Chemio	90 Cases	13 Cases	5 Cases

Table 4: Various therapeutic modalities used in the treatment of Posterior Cerebral Fossa Tumors

The survival rates for medulloblastoma are 74% at 0-5 years and 45% at 0-10 years, with the percentage of patients who survive for 0-5 years and 0-10 years respectively **(Table 5).**

Survival	0-5 years	0-10 years
Medulloblastoma	**74%**	**45%**
Pilocytic astrocytoma	**04%**	**01%**
Ependymoma	**29%**	**10%**

Table 5 : Morbidity-Mortality of Posterior Cerebral Fossa Tumors

The hydrocephalus series showed a high prevalence of cases, with 60.00% of cases requiring resection. Histological examination revealed 38.88% of medulloblastoma, 33.33% of astrocytoma, 22.22% of ependymoma, and 55.7% of tuberculoma, with a 16.66% mortality rate.

The histological examination confirms the diagnosis of medulloblastoma with the study of the CSF taken by lumbar puncture postoperatively supplemented by an assessment of extensions.

Patients can then be classified into two groups: standard risk group (total or subtotal excision) and high risk group (tumor residue or metastasis).

Standard risk Medulloblastoma group: Table 1

The standard risk Medulloblastoma group has 83 cases with total removal or residual volume below 1.5 cm2, no metastasis on the nervous system, no tumor cells in the CSF, and a negative CSF analysis(26 cases).

The high-risk medulloblastoma group: Table 3

The high-risk medulloblastoma group includes tumors remaining, the presence of tumor cells in the CSF in 4 cases, and 8 tumor of medullar metastasis. Histopathological types in the posterior fossa include medulloblastoma, ependymoma, and infratentorial pilocytic astrocytoma of the cerebellum.

Discussion :

According to previously released studies, the posterior cerebral fossa is the site of between 55% and 70% of pediatric brain tumors **[2–6].**

A cerebellum tumor can cause a number of symptoms, the most common of which are balance, coordination, and muscular tone issues. Another constant symptom is nystagmus, which is an involuntarily oscillating movement of the eyeball**[2–6].**

One symptom that has a pathophysiological explanation is intracranial hypertension, which is caused by blockage of CSF flow pathways and V4, leads to hydrocephalus, compression and destruction of nerve parenchyma, and cranial nerve focal syndrome, causing commitment and symptoms like headaches, nausea, and vomiting**[8]**.

The diagnosis of FCP tumors is established through an MRI, and surgery aims to be both diagnostic and therapeutic **[13]**. Surgical excision is crucial for managing these tumors, as it unblocks the CSF flow pathway and decompresses the brainstem **[12]**. It is essential to complete the surgery to unblock the CSF flow pathway and decompress the brainstem. Some authors recommend preoperative ventriculoperitoneal diversion. The main approaches are the suboccipital route (median or paramedian).

The significance of CSF drainage before to surgery is further demonstrated by all of these data. Due Tonnesen B.J. et coll.In the collection by D. Morelli et al. **[10].**

Our study found that surgical excision is the most common method for medulloblastomas, accounting for 57% of cases, followed by astrocytomas at 84% and ependymomas at 7%. Subtotal excisions were 15.45% for medulloblastomas, 7.4% for astrocytomas, and 20.12% for ependymomas. The Berete IM series **[10],** shows that surgical excision is used in 71.15% of cases, compared to only 0.01% in biopsy cases involving medulloblastomas(our serie).

Childhood ependymoma is primarily caused by chromosomal variations, with the receptor tyrosine kinase protein playing a role in angiogenesis **[2]**. Gain of chromosome 1q and loss of

chromosomes 6q, 17p and 22q are the most common chromosomal variations in childhood ependymoma **[6]**. The 2016, WHO classification of medulloblastoma reveals WNT activated medulloblastomas accounting for 10% of cases, SHH activated medulloblastomas accounting for 30% of cases, and non-WNT/non-SHH tumors accounting for 40% of cases and 20% of cases **[13]**.

Pilocytic astrocytoma is a common pediatric brain tumor with a 90% survival rate at 10 years, but infants have a less favorable prognosis than older children, with low-grade tumor progression rarely occurring. The most important factor in the prognosis is surgery (total and possible resection) **[4-7].**

The quality of surgical excision for cyst walls in children with pilocytic astrocytomas (PA) of the posterior cerebral fossa (PCF) was studied on a series of AP operated between 2006 and 2015. The procedure for excision of cyst walls linked to pilocytic astrocytomas (PA) in children remains a contentious issue **[9-10]**.

The prognosis of a tumor depends on factors like age, excision quality, and tumor histology. These factors are categorized into four orders: age, tumor histology, location, and excision quality **[1-11]**. Advances in imaging and therapeutic protocols combining surgery, neuroanesthesia, radiotherapy, and systemic treatments have improved the prognosis.

Conclusion

The posterior cerebral fossa is a common site for solid tumors in children, diagnosed clinically and radiologically. Treatment begins with emergency surgery, with adjuvant treatment based on histological type. Medulloblastoma is a malignant cerebellum tumor with high metastatic power, particularly leptomeningeal. Future research suggests molecular biology data will play a significant role in prognosis and therapeutic adaptation strategies. Radical surgery with vital structure preservation is the preferred treatment, followed by chemotherapy or radiotherapy if the tumor is of a higher histologic grade.

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