

Posterior fossa tumors in children, Histopathology & extent of excision as prognostic factors

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ABSTRACT

The Posterior fossa is the commonest site of primary intracranial tumors in children, for the last two decades the over-all survival and 5-years progression-free survival of children with posterior fossa tumors (PFT) like Medulloblastoma & Ependymomas has been doubled due to the improvement in the diagnostic tools and the advances in the surgical techniques approaching total or near total resection. The aim of the study is to find the relation of histopathology and the extent of excision with mortality and survival. A total of twenty eight cases with Histologically (26 cases) and two cases radiologically (CT-scan and MRI) confirmed pediatric posterior fossa tumors treated in Erbil Teaching Hospital between ,Jan.2013 and Dec.2015 were included in the study

As a result the twenty-eight pediatric patients were included in the study, mean age was (8 years),16 boys and 12 girls, mean follow-up period was 14 months,11 cases had Medulloblastoma (39%), 5 cases had Ependymoma (18%), 9 cases had Astrocytoma(32%) , 2 cases had Brainstem mass (7%) and one case had Choroid plexus papilloma (4%).Tumor resection was performed in 26 patients, Twenty cases had total resection (77%), and six Pts .had subtotal resection (23%), two cases without surgery

During the follow-up period out of the 20 cases that had total resection nineteen are still alive(95%) and only one died (5%),six cases that had Subtotal resection; four of them are dead (67%) and only two cases are still alive(33%). Two cases that had no surgery both of them are dead (100%).Eleven cases of Medulloblastoma 8 of them had gross total resection and three of them had subtotal resection, 9 of them still alive (82%) and two are dead (18%). Nine Pts of Astrocytoma, 8 of them had total resection and one subtotal; eight of them are still .(alive (89%) and only one died (11%

Five pts with Ependymoma, three had total resection and two had subtotal resection, three are still alive (60%) and two dead (40%). Two cases of Brainstem mass not operated

and both are dead, One case of Choroid papilloma totally resected & still alive. In conclusion treatment of posterior fossa tumors in children with surgery yields long survival rates, children with gross total resection or a near total resection had better outcome. Histopathology subtypes of the tumors were associated with a favorable outcome for Astrocytoma which has less mortality and better survival rate than others

.Keywords Posterior, fossa, pediatric, tumors, Medulloblastoma, Astrocytoma, Ependymoma, papilloma.

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أورام الحفرة الخلفية عند الاطفال

كمية الاستئصال الجراحي والنمط النسيجي المرضي وعلاقتها كعوامل تنبئية

لسنوات الحياة المتوقعة

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المخلص

ان اورام الحفرة الخلفية هي الاكثر شيوعا في عمر الاطفال حيث تشكل 54% الى 70% من مجموع الاورام في عمر الطفولة. وان الهدف من هذه الدراسة هو لبحث النمط النسيجي المرضي وكمية الاستئصال الجراحي وعلاقتها مع سنوات الحياة المتوقعة ونسبة الوفيات. وقد تم التعامل مع 28 حالة من اورام الحفرة الخلفية عند الاطفال في مستشفى اربيل التعليمي في مدينة اربيل للفترة بين كانون الثاني 2013 ولغاية كانون الثاني 2015 من اجل دراسة العلاقة بين النمط النسيجي المرضي وكمية الاستئصال وبين سنوات الحياة المتوقعة ونسبة الوفيات. وكانت النتائج ان متوسط عمر المرضى هو 8 سنة. 11 حالة ورم النخاعي الارومي, 9 حالات ورم الخلايا النجمية, 5 حالات ورم الخلايا البطانية ,حالتا ورم جذع الدماغ وحالة واحدة لورم الظفائر المشيمية.

تم اجراء عملية الاستئصال التام للورم في 20 حالة و قريب التام في 6 حالات وحالتين لم يتم اجراء التداخل الجراحي فيهما. متوسط مدة المتابعة لمدة 14 شهرا, حالات ورم الخلايا النجمية كلهم لازالوا على قيد الحياة و 9 حالات من اصل

11 حالة ورم النخاعي الارومي على قيد الحياة وحالتان من ورم الخلايا البطانية لازالوا على قيد الحياة وحالتا ورم جذع الدماغ توفيتا وحالة ورم الظفائر المشيمية لازالت على قيد الحياة.

من اصل 19 حالة عملية استئصال تام 18 حالة لازالت على قيد الحياة(95%) وحالة واحدة فقط توفيت(5%) بينما في الحالات السبعة التي تم فيها اجراء عملية استئصال شبه تام حالتين فقط لازالت على قيد الحياة(29%) والخمسة الاخرين توفوا بالاضافة لحالتا ورم جذع الدماغ الذين توفيا بدون اجراء التداخل الجراحي.

نستنتج من البحث بان استئصال التام يحسن معدل الحياة وسنوات الحياة المتوقعة في حالات اورام الحجرة الخلفية عند الاطفال. ونوع النمط النسيجي المرضي لبعض الاورام ذات نسب اعلى بالنسبة لمعدل الحياة المتوقعة اكثر من غيرها مثلا ورم الخلايا النجمية اعلى نسبة من باقي اورام الحجرة الخلفية عند الاطفال.

الكلمات الدالة: الحفرة الخلفية، طب الأطفال، الأورام، ورم الأرومة النخاعية، ورم الأرومة النجمية، ورم الأرومة الدبقية.

1. Introduction

Anatomy:

The interior of the base of the skull is divided into three cranial fossae, Anterior, Middle and Posterior cranial fossa [1]. The posterior cranial fossa is the Largest and the deepest of the three cranial fossae, contains the most complex intracranial organs.[2]. the cerebellum, cranial nerves, brainstem, cerebellar arteries, veins, pedicles and the complex fissures between the cerebellum and brainstem [3].

Etiology:

The etiology of the PFT in children remains largely unknown, Less than 5% can be attributed to a genetic predisposition (P53), and less than this can be linked to Ionizing radiation or other environmental factors, For most of the cases no predisposing factor are not yet apparent [4].

Incidence and Pathology:

Central nervous system tumors accounts for nearly 20% of all neoplasm in children under the age of 15 years [5,6]. it is the 2nd most common solid tumors form of pediatric cancer, exceeded only by Leukemia [7]. Brain tumors remain the leading cause of cancer death in pediatric oncology patients [6]. The incidence of pediatric brain tumors is roughly 3.3 per

100.000 in modern countries [8]. 54% to 70% of all childhood brain tumors are infratentorial and arise in the PF [9].

Medulloblastoma:

Medulloblastoma accounting for 20-25% of pediatric CNS neoplasm, Incidence is estimated at 2 to 6 cases per million children per year, the median age 6-9 years [10]. It is highly malignant and may disseminate [11].

Cerebellar Astrocytoma (CA):

Astrocytomas are one of the most common PFT in children (33%) [12]. Average age is 7 yrs, CAs are of low-grade and carry good prognosis for long-term survival [17].

Ependymoma:

Ependymoma is the 3rd most common PFT in the children age at diagnosis is 4-6 years [13]. WHO classified Ependymomas to (Myxopapillary, Subependymomas and Ependymomas & anaplastic Ependymoma) [14]. In general Anaplastic Ependymomas exhibit a high growth rate & have been associated with less favorable prognosis.

Brainstem Glioma (BSGs):

By definition BSGs are tumors that arise within the anatomic structures that make up the brain. Mean age at diagnosis is 6.5 to 9 yrs.

Choroid plexus papillomas:

Choroid plexus tumor is a rare brain tumor with variable clinical features according to the histological grade. [15] Choroid plexus papillomas are benign arise from ventricular choroid plexus & account about 3% of pediatric brain tumors

Clinical presentation:

Presentation is dictated by both location in the posterior fossa and aggressiveness of the lesion involved. The more malignant the lesion is, the shorter the time from symptom onset to diagnosis. The most common presenting sign of a posterior fossa lesion is hydrocephalus, and symptoms related to intracranial hypertension include headache, macrocephaly (in small children), vomiting, blurred vision (papilledema), strabismus (sixth nerve palsies), lethargy, and failure to thrive. Compression of the midline cerebellum can cause truncal Ataxia and unsteady gait.

2. Patients and Methods

A prospective study of 28 selected cases of pediatric posterior fossa tumors treated in Erbil Teaching Hospital in Erbil city between January 2013 to December 2015.

3. Results and Calculations

Twenty-eight pediatric patients were included in the study, mean age was (8 years), and mean follow-up period was 14 months. Eleven cases had Medulloblastoma (39%), nine cases had Astrocytoma (32%), five cases had Ependymoma (18%), two cases had Brainstem mass (7%) and one case had Choroid plexus papillomas (4%). Tumor resection was performed in 26 patients & two cases no surgery done. Out of the 26 cases that tumor resection performed twenty cases had total resection (77%) and six had subtotal resection (23%), two cases without surgery. During follow-up period, out of the 20 cases that had total resection 19 are still alive (95%), and one died (5%). Six cases that had Subtotal resection two of them are still alive (33%) and four of them are dead (67%). Two cases that had no surgery both of them are dead (100%).fig.4& tab.1

At time of follow-up,(fig.3&tab.2), eleven cases of Medulloblastoma eight of them had GTR and three of them had subtotal resection, nine of them are still alive (82%), and two are dead (18%). Nine cases of Astrocytoma, 8 of them had total resection and one subtotal; at time of follow-up eight of them are still alive (89%) and only one died (11%). Five pts with Ependymoma, three had total resection and two had subtotal resection, three are still alive (60%), and two are dead (40%). Two cases of Brainstem mass not operated and both are dead (100%). One case of Choroid papilloma and at time of follow-up he is still alive (100%).

Fifteen patients receiving radiotherapy (53%),one patient receiving both radio and chemotherapy because of spinal metastasis, other demographic variables, clinical variables, radiological findings, age, sex, signs and symptoms, ventricular shunting and post-op radiotherapy &/or chemotherapy were recorded but it was of no significance as a prognostic factors in the outcome of the patients included in the study.

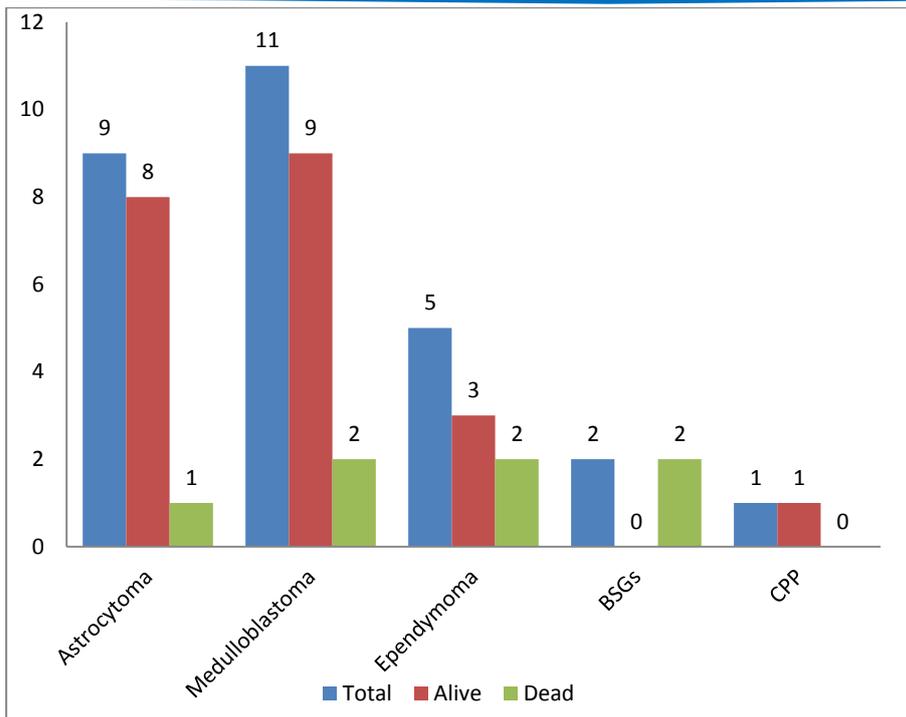


Fig.(3) PFT Histopathology subtypes cross survival.

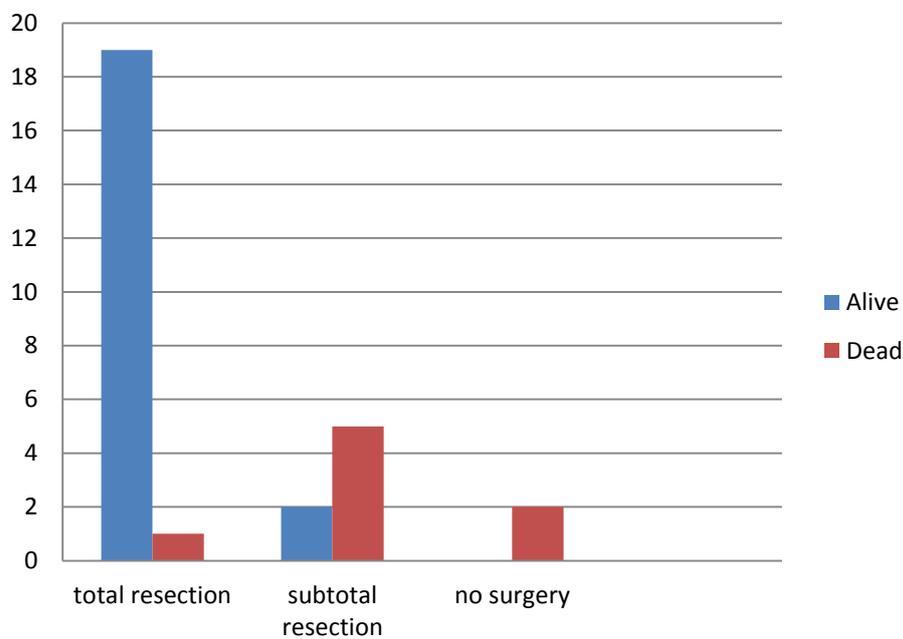


Fig.(4) Extent of excision cross survival.

Table (1) extent of resection / patients survival cross tabulation.

			Patients condition		Total
			Alive	Dead	
Extent of tumor resection	TOTAL	Count	19	1	20
		%	95%	5%	100%
	SUBTOTAL	Count	2	4	6
		%	28%	72%	100%
	NO surgery	Count	0	2	2
		%	0%	100%	100%
Total		Count	21	7	28
		%	71%	29%	100%

Table (2) Histopathology subtypes/survival rates cross tabulation.

			Patients condition		Total
			Alive	Dead	
Histopathology subtypes	Astrocytoma	count	8	1	9
		%	89%	11%	100%
	Medulloblastoma	Count	9	2	11
		%	73%	27%	100%
	Ependymomas	Count	3	2	5
		%	60%	40%	100%
	Brainstem glioma	count	0	2	2
		%	0%	100%	100%
	Choroid Plexus Papillomas	count	1	0	1
		%	100%	0%	100%
Total		Count	21	7	28
		%	71%	29%	100%

4. Conclusion

1. Extent of excision is a major determinant of survival rate, Compared with subtotal resection and no surgery.
2. Histopathologically, Cerebellar Astrocytoma has favorable prognosis with respect to mortality, survival rate and functional outcome more than the other histopathologically subtypes like Medulloblastoma, Ependymoma and Brainstem glioma.

5. Aim of the study

To find the relation of histopathology and the extent of excision with mortality and survival.

6. Surgery

26 patients out of 28 cases included in this study underwent surgery; all of them had full clinical examination, laboratory, radiological investigations and Ventricul operitoneal shunt done before tumor excision surgery.

Operative procedure:

Both prone and sitting position used in the surgical positioning, head fixed with Mayfield or Suggita, usually midline incision used which extends from external occipital protuberance to the midcervical (according to the tumor extension or surgeon preference), cervical paravertebral muscles gently separated from the spinous processes by electrocautery, periosteum striped from skull, one burr-hole done in the sub-occipital region below transverse sinus and then extended by Craniectomy to foramen magnum(fig1), first cervical spine arch maybe opened if the tumor is extending downward, dura opened in Y-shape, cerebellar cortical incision used to approach the cerebellar tumors, vermal approach used with mid-line tumors(fig2), microscope or Loupe with head lamp used, tumor excision done by bipolar cautery and gentle suction, all attempts were to reach gross total resection without injuring brainstem which was monitored by any change in heart rate &/or blood pressure, subtotal resection done in the cases were tumor was invading the floor of the fourth ventricle, homeostasis secured by electrocautery and surgiseal, dura closed and if defect present Dural patch used.

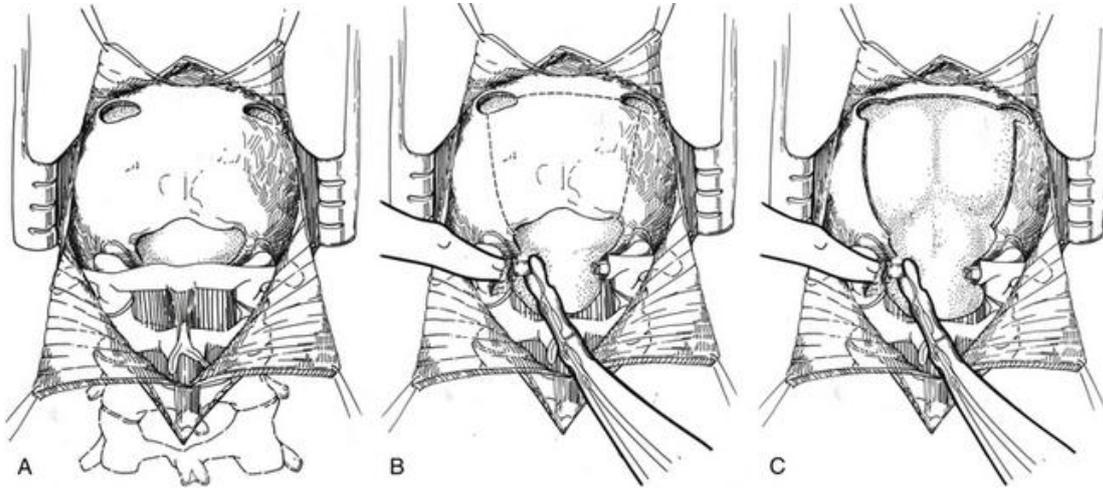


Fig.(1) Posterior fossa craniotomy.

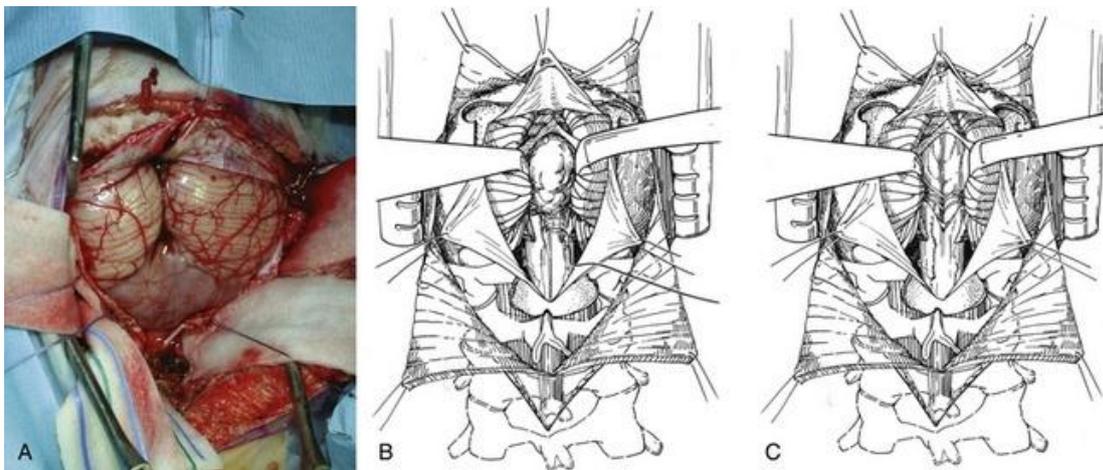


Fig.(2) Tumor exposure and removal. خطأ! الإشارة المرجعية غير معرفة.

7. Discussion

A brain tumor is the most devastating forms of human illness, especially when occurring in a small child in the posterior fossa, were Brainstem compression, herniation, and death are all risks in tumors which occur in this critical location, Posterior fossa tumors are more common in children than adults, CNS tumors are the most common solid tumors in children; between 54% and 70% [6]. Gross total resection is a major determinant of patient's

outcome and long term survival. The high survival rate in our study could be explained by the short follow-up period.

A study done by Bernt J. Due-Tonnessen et al [16], shows Astrocytoma with favorable benign behavior and better prognosis than other PFT Histopathologically subtypes with 100% survival rate, our study also showed a favorable survival rate, during follow-up period out of nine cases of Cerebellar Astrocytomas (8) of them are still alive (89%) and only one case died (11%), delayed death may be due to shunt malfunction.

For Medulloblastoma according to Smoll, Nicolas R.[17] 5-years survival rate is (72%), in our study during follow-up period out of (11) cases, nine of them are still alive (82%), and two cases are dead (18%). According to Fulya Ayman Aga-oglu et al [18], it is (65%) survival rate for pediatric posterior fossa Ependymoma, in our study during follow-up period out of 5 cases three of them are still a live (60%) and two cases are dead (40%).

M. Kaplan, Albright and Zimmer R.A et al,[19] study shows less than (10%) survival rate for Brainstem glioma, in our study it was (0%), both cases are dead (not operated). For Choroid Plexus Papilloma, Gozali AE, Britt B, Sane L et al. [20] & Ellenbogen R.G. et al,[21] study showed 90% survival rate, Dudely R.W, Torok MR et al,[22] study showed 98% survival rate, in our study it was 100%, which could be explained because it was only one case of CPPs.

The study shows that type of the tumor (Histopathology) have significant effect on mortality. In the study beside Extent of surgical excision and Histopathology subtypes, age, sex, clinical presentation & duration of symptoms had been recorded but it did not had any significance in the results, maybe because of the small sample number and short follow-up period, also post-operative Radiotherapy and Chemotherapy had been recorded but because of the difficulty to follow-up the doses and sessions and unavailability of nearby centers make it of no significance effect on the patients in the study.

8.Recommendations

1.Worldwide literatures depends on longer period of follow for more accurate results, some discrepancy might happen because of shorter follow up period, beside other

difficulties in follow up of the patients like traveling abroad for radio &/or chemo therapy and some parents were uncooperative for different reasons.

2. Complete surgical resection of the tumor is demanded whenever possible, because residual tumor leads to many problems, like recurrence, metastasis and need for higher doses of radiation.

3. Team work is always better, different specialties can contribute in the success of managing the troubles that face the patient in his journey to recovery.

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