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ORIGINAL ARTICLE

Midline Posterior Fossa Tumors in Young Adults: Evolution of Skill and Practice

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ABSTRACT

Objective: *The aim of our study was to evaluate the surgical outcome of posterior fossa lesions and to find out the relation between surgical skill and post-operative outcome and to determine how evolution in surgical skill dictates post-operative outcome.*

Material & Methods: *This was a retrospective analysis of 207 patients with midline posterior fossa lesions over a period of 10 years from Jan 2009 till December 2018. The degree of surgical outcome was assessed by degree of surgical resection, Post-operative neurological deficits and complications, Stay in ICU and duration in hospital.*

Results: *207 Midline posterior fossa tumors were operated. Headache was leading symptom in patients followed by vomiting and balance problem. Medulloblastoma was a most common pathology in 133, Ependymoma 32, Astrocytoma in 28 Choroid Plexus Papilloma in 3, dermoid cyst 3,arachnoid cyst 4 and Hemangioblastoma in 4 patients. Gross Total resection was possible in 110 patients. Post operatively gag reflex was impaired in 36 and facial palsy in 5 patients. Chest infection was the most common complication in 84 patients, followed by wound infection, CSF Leak and Meningitis. Mortality was 11.59% as 24 patients died within one month, while 28.5% patients stayed in ICU.*

Conclusion: *Post-operative mortality and morbidity is relatively high among post fossa tumors. Improvement in surgical skills better instruments revealed better outcome over a period of 10 years due to better understanding of microsurgical anatomy and utilization of modern therapeutic strategies for resection.*

Keywords: *Posterior fossa tumors, Medulloblastoma, Ependymoma, Posterior fossa lesions.*

INTRODUCTION

Posterior fossa is the posterior and inferior most among all cranial fossae. It is the house of indispensable brain structures. It is compact, dense and tightly packed with brainstem and cerebellum, having less compliance as compared to supratentorial compartment[1].Posterior fossa tumors are hallmark of pediatric lesions.[1,2] Younger populations have their own issues like vague symptomatology, late diagnosis with enormous size of lesion.[3] In younger children increased surface area, less circulating blood and thermoregulation problems, all increase risk of hypotension and hypoxia. More, the primary Gliomas of brainstem, midline malignant embryonal tumors and the existence of many metastatic lesions make the outcome gloomy and dismal.[3, 4,7] A wide spectrum of benign to malignant lesions can exist in posterior fossa.[2] As a general rule the midline posterior fossa lesions due to its close proximity to neurovascular structures, spread of tumor seedlings via CSF pathway prior to surgery, difficulty to explore them safely make their treatment and excision challenging as compared to cerebellar lesions.[5]

We are presenting a series of midline posterior fossa lesions in young adults for evaluation of surgical outcome of these horrible devastating lesions.

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MATERIAL AND METHODS

Study Design

This is a retrospective study conducted at Department of Neurosurgery, Punjab Institute of Neurosciences (PINS), LGH, Lahore. Approval was taken from office of research affairs. Medical record was reviewed retrospectively of 207 midline posterior fossa lesions over a period of 10 years from Jan 2009 till December 2018.

Sampling

Midline posterior fossa tumors operated by 2 authors and three over a period of 10 years were retrospectively analyzed.

Inclusion Criteria

All patients with midline posterior fossa lesions were included in our study who were younger than 30 years irrespective of their gender.

Exclusion Criteria

Laterally placed posterior fossa lesions were excluded. Patients older than 30 years were excluded.

Data Collection

The clinical information including their age, gender, presenting symptoms, degree of surgical resection, postoperative complications, histopathological diagnosis, morbidity, mortality, hospital stay in ICU were analyzed.

Data Analysis

Data was statistically analyzed using SPSS 26. Variables were identified. Simple descriptive statistics were used for analysis of demographic variables. Mean and standard deviations were calculated for age, frequencies and percentages were determined for qualitative variables that are gender, presenting symptoms, degree of surgical resection, histopathological diagnosis, post-operative complications, mortality, morbidity and hospital ICU stay.

RESULTS

Collective data of 207 patients who were operated for posterior fossa midline lesions was included.

Table 1: *Age of the Patients.*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 10 years	93	44.9	44.9	44.9
	11 – 20 years	101	48.8	48.8	93.7
	21 – 30 years	13	6.3	6.3	100.0
	Total	207	100.0	100.0	

Table 2: *Gender.*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	121	58.5	58.5	58.5
	Female	86	41.5	41.5	100.0
	Total	207	100.0	100.0	

Table 3: *Presenting Symptoms.*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Headache	131	63.3	63.3	63.3
	Vomiting	43	20.8	20.8	84.1
	Balance disturbances	33	15.9	15.9	100.0
	Total	207	100.0	100.0	

Incidence of Age

We included all patients who were younger than 30 years and divided them into three groups. Group 1 younger than 10 years that includes 93 (44.92%) patients, group 2 ages between 11 to 20 years includes 101 (48.79%) patients. Group 3 patients' age between 21 to 30 years includes 13 (6.2%) patients (Table 1).

Gender Incidence

There were 121 (58.99%) males and 86 (41.54%) females (See table 2 below).

Clinical Features

Headache was the main presenting symptom in 131 (63.28%) patients. Vomiting accompanied headache in 43 (20.77%) patients. Our 33 (15.94%) patients had balance problems in the form of truncal ataxia and difficulty walking (See

Table 3). Apparently patients have been able to eat normally, but on neurological examination, we found impaired gag in 13 (6.28%) patients, 6th nerve palsy was found in 8 (3.86%) patients.

Surgical Approaches

All patients were reviewed clinically as well as radiologically and their surgery was planned by midline sub occipital craniectomy in prone position. All patients having lesion exposed just on lifting up of tonsils were operated by midline approach with minimum vermian dissection if required. Purely intraventricular lesions were approached by telovelar approach and anterio-superior higher midline lesions were approached by trans-vermian dissection just below the tent. We were successful in gross total excision of 110 (53.14%) patients. Residual lesion was left in 95 (45.89%) patients and just biopsy was taken 2 (0.966%) patients (see table 5). Almost in our half patients, CSF diversion procedure in the form of VP shunt was performed in 115 (55.55%) patients.

Post-operative Complications

Post operatively we noticed impaired gag in 36 (17.3%) patients.

Facial palsy in 5 (2.14%) patients. Chest infection was the main culprit in 84 (40.5%) patients. 12 (5.79%) patients had wound infection post operatively. Unfortunately CSF leakage was observed in 11 (5.31%) and 9 (4.3%) patients developed meningitis. We observed cerebellar mutism in 18 (8.69%) and truncal ataxia in 15 (7.24%) patients (see table 6).

Histopathological Findings

Histopathology revealed Medulloblastoma in 133 (64.25%) patients, Ependymoma in 32 (15.45%) patients, Astrocytoma in 28 (13.52%), Choroid Plexus Papilloma in 3 (1.44%) patients. Hemangioblastoma in 4 (1.93%) patients, dermoid in 3 (1.44%) patients, Arachnoid Cyst 4 (1.93%) patients (see table 4).

Table 4: *Histopathology.*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Medulloblastoma	133	64.3	64.3	64.3
	Astrocytoma	28	13.5	13.5	77.8
	Hemangioblastoma	4	1.9	1.9	79.7
	Choriod plexus papilloma	3	1.4	1.4	81.2
	Ependymoma	32	15.5	15.5	96.6
	Arachnoid Cyst	4	1.9	1.9	98.6
	Dermoid Cyst	3	1.4	1.4	100.0
	Total	207	100.0	100.0	

Table 5: *Tumor Resection.*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Gross total resection	110	53.1	53.1	53.1
	Residual lesion	95	45.9	45.9	99.0
	Biopsy	2	1.0	1.0	100.0
	Total	207	100.0	100.0	

Table 6: *Morbidity.*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Chest Infection	84	40.6	40.6	40.6
	Impaired gag reflex	36	17.4	17.4	58.0
	Facial nerve palsy	5	2.4	2.4	60.4
	Wound infection	12	5.8	5.8	66.2
	CSF leakage	11	5.3	5.3	71.5
	No complications	50	24.2	24.2	95.7
	Meningitis	9	4.3	4.3	100.0
	Total	207	100.0	100.0	

Morbidity and Mortality

Post operatively our 58 patients (28%) stayed in ICU for 1 month. Out of them 24 (11.59%) patients died. Out of remaining 34, 12 patients (5.79%) gradually improved and discharged and remaining 22 (10.62%) patients further remained in ward for 1 to 2 weeks and then discharged with some morbidity in the form of truncal ataxia or deteriorated cognitive level.

Analysis

For critique detailed analysis of our results we divided ten year period into three eras. First era of four years while second and third era of three years each. In first era from January 2009, till December 2012 we operated 52 patients (25.12%). We were successful in gross total resection in 8 patients. In 42 patients residual tumor was left and just biopsy was taken in 2 patients. In

Table 7: *Comparison of Surgical Resection in Three Eras.*

	2009 – 2012	2013 – 2015	2016 – 2018	Total
Operated cases	52	73	82	207
Gross total excision	8	38	64	110
Residual	42	35	18	95
Biopsy	2	0	0	2

Table 8: *Comparison of Debilitating Complications Era Wise.*

Complications	2009-2012	2013-2015	2016-2018
Facial Palsy	5	0	0
Truncal ataxia	9	6	0
Cerebellar mutism	12	6	0

second era (2013-2015), total 73 (35.26%) patients were operated, gross total resection was possible in 38 patients and residual lesion left in 35 patients. In third era (2016-2018), gross total resection was achieved in 64 patients with residual lesion left in 18 patients (see table 7). When complications were analyzed era wise, same pattern was seen. The debilitating complications of facial palsy, truncal ataxia and cerebellar mutism were more in first era and then declined gradually (see table 8). Mortality appraisal showed similar decline from 15 to 7 and then in last era only 2 patients died.

DISCUSSION

Excision of posterior fossa tumor is an arduous and laborious job. A spectrum of lesions resides in posterior fossa especially in pediatric population[2, 5,6]. Midline posterior fossa lesions are comparatively more exigent and demanding[8]. In our study, we operated 207 patients, mostly were in their first and second decade of life. Literature documents prevalence of same age group.[1,7] Our patients presented mostly with headache and vomiting. Muzumdar et al. documented in his comparative analysis of Medulloblastoma case series that 75.3% patients presented with headache and vomiting.[9] Our histopathology spectrum is also comparable with most of the studies that Medulloblastoma is the leading culprit in posterior fossa.[1,7] We were able to achieve gross total resection in just 110 (53.14%) patients while residual lesion left in 95 (45.89%) patients. This is relatively dismal as Cochrane reported to achieve gross total resection in almost all patients.[10] Our post-operative complications like transient cerebellar mutism, CSF leakage, wound infection, and meningitis are comparable to international studies, but the incidence of facial and other cranial nerve palsies have higher incidence[11,12,13]. Although, Ayman and James mentioned facial palsies after posterior fossa surgery.[14] Probably the reason of relatively higher mortality and morbidity is that in modern neurosurgical centers the surgeon's surgical skills for excision of tumor is augmented with finest, stout and premier surgical instruments or equipment. Facilitation of neurophysiological monitoring in the form of Brainstem evoked potentials and cranial nerves monitoring further add to safe resection.[15,16] In third world countries the surgeon's surgical skill is the sole weapon to deal all kinds of lesions. Corruption and departmental policies are more detrimental than financial constraints. In our study, the tumors are included mainly operated by author on and author three. Our purpose was to document outcome assessment. It was general assumption that the patient's postoperative outcome improved over a period of time, posterior fossa surgery seems safer and fruitful.

On critical, scrutiny, it was noted that there is significant outcome improvement. The better familiarity of fourth ventricle anatomy, the identification of stria medullaris, and PICA along its ramifications, protection of basal nerves in front of peeping choroid plexus from foramen of luschka, superb meticulous dissection of cerebello-medullary fissure, gentle mobilization of uvula and tonsil with lesser traction and dissection of midline vermis all improved outcome not only in terms of extent of resection and lesser mortality but also with fewer post-operative complications and hospital ICU stay.

It is that evolution of surgical skill with reflection of previous mistakes and chasing the tumor with enthusiastic, positive thought to excise completely, but not at the expense of damage to nerve tissue that is always high yielding.

CONCLUSION

Post-operative mortality and morbidity is relatively high among post fossa tumors.

Improvement in surgical skills better instruments revealed better outcome over a period of 10 years due to a better understanding of microsurgical anatomy and utilization of modern therapeutic strategies for resection.

Limitations

This study has limitations as cases from only two surgeons (authors) were included and evolution of skill and practice was noted.

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Additional Information

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Human Subjects: Consent was obtained by all patients/participants in this study.

Conflicts of Interest:

In compliance with the ICMJE uniform disclosure form, all authors declare the following:

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2.	Sundus Ali	2. Literature review, Analysis of data, data collection.
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