

Clinicopathological Spectrum of Intracranial Posterior Fossa Tumours and their Prognostic significance: A Retrospective Institutional Study at Tertiary Care Hospital of Nalgonda District

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ABSTRACT

Background: Intracranial Posterior fossa tumors are critical brain lesions with significant neurological morbidity and mortality due to limited space and involvement of vital brain stem nuclei and fourth ventricle. Early diagnosis of posterior fossa tumors is vital to prevent potential risks of Brain stem compression, herniation, hydrocephalus and death.

Aim of the Study: 1. To study the morphological spectrum of intracranial posterior fossa SOLs. 2. To determine the frequency of posterior fossa SOLs reported in the tertiary care center of Nalgonda district. 3. To correlate clinical presentation with histopathological diagnosis and assess prognosis, and compare it with national and international literature.

Materials and Methods: The present study was a retrospective description study conducted at the Department of pathology, Kamineni Institute of Medical Sciences, Narketpalli over a period of 3 years starting from June 2015 to June 2018. During this period, histopathological analysis of all the intracranial posterior cranial fossa tumors was done, correlated with clinical and radiological findings and prognosis assessed.

Result: In our study Posterior fossa tumors are predominantly seen in adults with peak incidence in fourth decade. In children majority of the tumors were reported below 5 years of age. Most common presenting symptom was head ache and vomiting. Most common tumor was Medulloblastoma in children and Schwannoma in adults. Most common location was Cerebello-pontine angle followed by cerebellum. Recurrence rates were higher for CP angle tumors due to difficult sub-total resection. Prognosis is good for patients with total resection of tumors.

Conclusion: Posterior fossa tumours are critical brain lesions with significant neurological morbidity and mortality. With rapid advancement in radiology and advent of modern therapeutic modalities early diagnosis and treatment is possible in many cases. Histopathology remains the gold standard in diagnosing Intracranial Posterior fossa tumours and necessary for the formulation of further management after neurosurgery.

Keywords: Intracranial Posterior Fossa Tumors, Cerebello-pontine Angle, Brainstem Compression, Hydrocephalus.

Introduction

Intracranial posterior fossa tumours are heterogenous group of neoplasms more common in children than in adults. Central nervous system tumours are the most common solid tumours in children and 54%-70% of all childhood brain tumours originate in the posterior fossa. In the adults about 15-20% of brain tumours occur in the posterior fossa. ⁽¹⁾ In view of limited space within the posterior fossa and the potential involvement of vital brain stem nuclei, the posterior fossa tumours are considered critical brain lesions. Brainstem compression, herniation, and death are all risks associated with these tumours. ^(2,3)

No specific causes for posterior fossa tumours exist. However, genetic factors, such as dysfunction of some tumour suppressor genes (*p53* gene) and activation of

some oncogenes, may play a role in their development. ⁽⁴⁾ Environmental factors such as irradiation and toxins may also play a role. Cushing was the first to report a large series of posterior fossa tumours, which comprised of 61 cases of fatal cerebellar medulloblastoma. ⁽²⁾

The clinical presentation depends on the site of the tumour, biological behaviour, aggressiveness of the tumour, and the rate of growth. Symptoms are caused by focal compression of the cerebellum or brain stem centres and the increased intracranial pressure with resultant hydrocephalus. ⁽⁵⁾ Majority of the patients present with severe headache and frequent vomiting due to associated hydrocephalus. Hydrocephalus is common in children, occurring in 71-90% of paediatric patients and approximately 10-40% demonstrate persistent hydrocephalus even after posterior fossa tumour resection. ^(6,7,8,9)

Common Posterior fossa tumours in children and the adults are illustrated in figure 1. Posterior cranial fossa tumours in children differ from adults in their clinical presentation, behaviour, management and prognosis. Pilocytic Astrocytoma and Medulloblastoma are most prevalent tumours in childhood, and schwannomas and meningiomas were most frequent in adults. Medulloblastomas have varied prognosis and long-term survival rates are generally lower for in patients 3 years or younger.⁽¹⁰⁾

Posterior fossa tumours warrant surgical management to achieve decompression of the posterior fossa, relieve pressure on the brain stem, release intracranial pressure and avert the risk of herniation. Surgery is also mandatory for histopathological diagnosis of the tumour and to determine further plan of management depending on the nature of the tumour^(11,12,13)

Significant neurological morbidity and mortality associated with posterior fossa tumours results from late presentation, local infiltration and metastasis outside the cranial cavity. Recurrence are reported in benign lesions of Cerebello-pontine angle, like meningiomas and schwannomas due to subtotal excision.⁽³⁾ Extent of surgical resection is thus the most important prognostic factor determining disease free survival in these tumours. With this background, the main purpose of this study was to analyse the frequency of histological types of posterior cranial fossa tumours in children and adults in the tertiary care centre of Nalgonda district, and to correlate with clinical findings and determine prognosis.

Materials and Methods

The present study was a retrospective description study conducted at the Department of pathology, Kamineni Institute of Medical Sciences, Narketpalli over a period of 3 years starting from June 2015 to June 2018. Prior informed consent was taken from all the patients and the study was approved by Institutional review board of kamineni Institute of medical sciences, Narketpalli.

Aims of the study

1.To study the morphological spectrum of intracranial posterior fossa SOLs. 2.To determine the frequency of posterior fossa SOLs reported in the tertiary care center of Nalgonda district. 3. To correlate clinical presentation with histopathological diagnosis and assess prognosis, and compare it with national and international literature.

Inclusion Criteria: During the study period of all the CNS tumours only cases of Intracranial posterior fossa tumours in all the age groups and both the sexes were included in the study.

Exclusion Criteria: CNS tumours from other anatomic sites and Non-neoplastic Space occupying lesions (SOLs) of the posterior cranial fossa were excluded from the study.

Specimen Size: 80 cases of Intracranial Posterior fossa tumour in children and adults of both sexes.

Methodology: Based on WHO classification of CNS tumours, all tumours in intracranial posterior fossa were morphologically classified and their incidence in children and adults was compared with national and international data to note any changing trends in patterns of presentation. Histopathological findings are correlated with clinical presentation and prognosis was assessed. Haematoxylin and eosin stained histopathology slides of cases were retrieved from departmental archives and were reviewed independently by two pathologists. Sections were recut from paraffin blocks available in the pathology department where ever needed. Data pertaining to clinical presentation, MRI findings and other lab investigations performed were obtained from the patient records available at the medical records department and were analysed.

Result

Inclusion criteria-Age incidence (Table 1): Out of total 216 cases of CNS tumours operated 80 cases of Posterior Fossa tumours were reported. These tumours constituted 69.0% of total CNS tumours in children below 5 years of age and in adults they constituted maximum percentage of 32.5% in fifth decade.

Inclusion criteria-Posterior fossa SOLs (Table 2): Among Posterior Fossa SOLs greater representation is of Neoplasms (82.5%). There were 17 cases of Non-neoplastic lesions which included cerebellar abscess, arachnoid cyst and epidermoid cyst which were excluded from the study.

Clinical presentation (Table 3): Most common clinical presentation was Headache and vomiting present in 77.5% of cases with Posterior fossa tumours. Cerebellar signs with gait abnormalities and hydrocephalus were present in 23.8% and 20% of cases respectively. Least common clinical presentation was papilledema present in 8.8% of cases.

Microscopy (Table 4): Histopathological findings on microscopy revealed that Schwannoma was the most common tumour, hemangioblastoma and Glioblastoma were the least common. Based on the location, CP angle (Cerebello-Pontine) was the most common site presenting with 46.25% of total posterior fossa tumours which included Schwannomas (27.5%) and Meningiomas (18.75%). Cerebellum presented with wide spectrum of lesions, medulloblastoma (15.0%) being the most common

and Glioblastoma multiforme (2.5%) being the least common. There is limited representation of the tumours of fourth Ventricle (12.5%) and Brainstem (6.25%)

Distribution of tumours in children and adults (Table 5): Medulloblastoma was the most common tumour in the children constituting 28% of total posterior fossa tumours reported in children, and 75% of total Medulloblastomas reported in the study were in children. 2 cases of Desmoplastic medulloblastomas were exclusively confined to children. Similarly, Glioblastoma multiforme and Metastatic carcinoma were confined to adults. Schwannoma was the most common tumour in adults

constituting 72.7% of total schwannomas reported in the study and representing 33.3% of total adult posterior fossa tumours.

Gender-wise distribution of tumours (Table 6): Majority of the tumours in posterior Fossa had male predilection with M:F ratio of 1.6:1 except meningioma which favoured females with M:F ratio of 1:1.3.

Correlation with radiological findings: Concordance between radiological and pathological diagnosis was best for Schwannoma and Glioblastoma multiforme, intermediate for meningioma and was least for low grade gliomas.

Table 1: Age-wise Prevalence of Posterior Fossa tumours (As percentage of total CNS Tumours).

| Age Group | Category | CNS Tumours | Posterior Fossa Tumours | |
|--------------|----------|-------------|-------------------------|---------------------------|
| | | Number | Number | Percentage of CNS Tumours |
| 0-5 Yrs. | Children | 23 | 16 | 69.0% |
| 5-9 Yrs. | Children | 9 | 5 | 55.6% |
| 9-12 Yrs. | Children | 17 | 11 | 64.7% |
| 12-20 Yrs. | Adults | 19 | 6 | 31.6% |
| 20-30 Yrs. | Adults | 28 | 9 | 32.1% |
| 30-40 Yrs. | Adults | 29 | 7 | 24.1% |
| 40-50 Yrs. | Adults | 43 | 14 | 32.5% |
| > 50 Yrs. | Adults | 48 | 12 | 26.1% |
| Total | | 216 | 80 | |

Table 2: Prevalence of Posterior fossa SOLs: Neoplastic/Non-Neoplastic.

| Broad Category | Number | Percentage |
|----------------|-----------|---------------|
| Neoplastic | 80 | 82.5% |
| Non-Neoplastic | 17 | 17.5% |
| Total | 97 | 100.0% |

Table 3: Distribution of the clinical features in Children and Adults.

| Symptoms | Number | Percentage |
|---------------------------------------|--------|------------|
| Head ache & Vomiting | 62 | 77.5% |
| Cranial nerve palsy | 13 | 16.3% |
| Motor Deficit | 17 | 21.3% |
| Pyramidal tract signs | 8 | 10.0% |
| Cerebellar signs (Gait abnormalities) | 19 | 23.8% |
| Papilledema | 7 | 8.8% |
| Vertigo, Tinnitus | 9 | 11.3% |
| Seizures | 11 | 13.8% |
| Hydrocephalus | 16 | 20.0% |

Table 4: Distribution of Posterior Fossa Tumours based on location.

| Site/Location | Tumour type | Number | Percentage |
|--|------------------------------|-----------|---------------|
| Cerebellum (28) | Medulloblastoma | 12 | 15.0% |
| | Desmoplastic Medulloblastoma | 2 | 2.5% |
| | Hemangioblastoma | 2 | 2.5% |
| | Astrocytoma-Low grade | 7 | 8.75% |
| | Glioblastoma Multiforme | 2 | 2.5% |
| | Metastasis | 3 | 3.75% |
| Cerebello-pontine (CP Angle) (37) | Schwannoma | 22 | 27.5% |
| | Meningioma | 15 | 18.75% |
| Fourth ventricle (10) | Ependymoma | 6 | 7.5% |
| | Choroid plexus papilloma | 4 | 5.0% |
| Brainstem (5) | Astrocytoma-Low grade | 5 | 6.25% |
| Total | | 80 | 100.0% |

Table 5: Morphological distribution of Posterior Fossa tumours in Children and Adults.

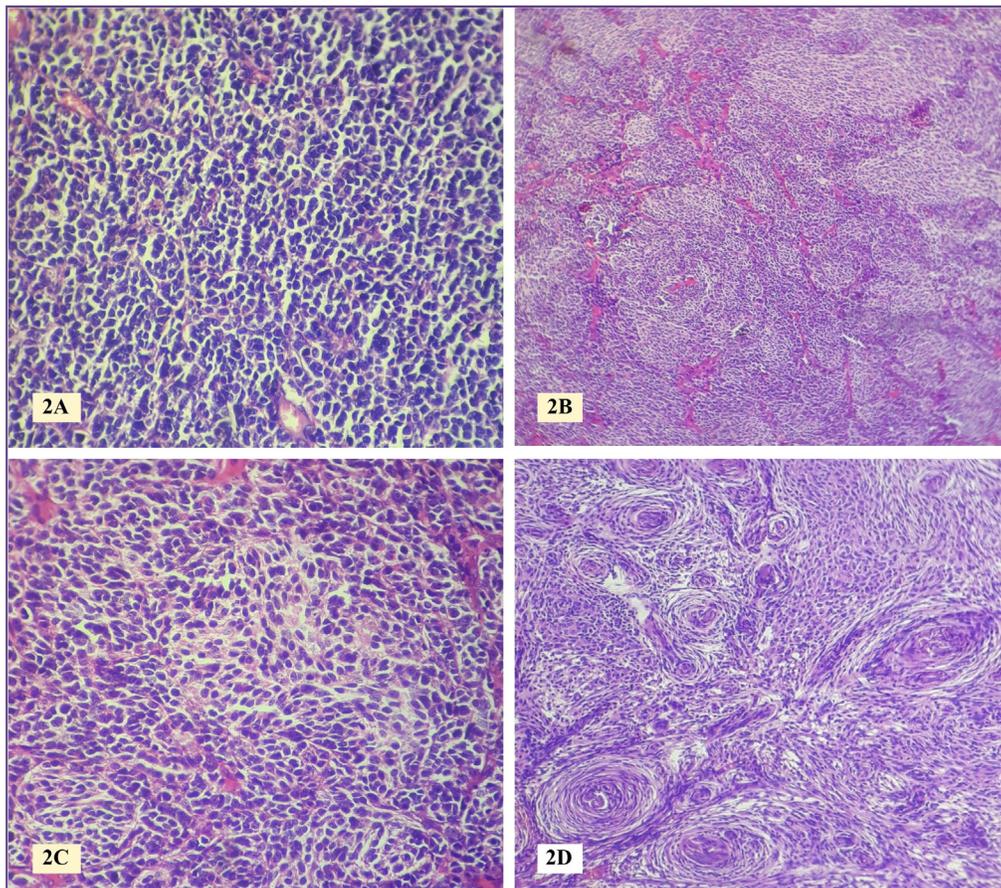
| Tumour type | Children | | Adults | |
|------------------------------|-----------|--------------|-----------|--------------|
| | Number | Percentage | Number | Percentage |
| Medulloblastoma | 9 | 75.0% | 3 | 25.0% |
| Desmoplastic Medulloblastoma | 2 | 100.0% | 0 | 0.0% |
| Hemangioblastoma | 1 | 50.0% | 1 | 50.0% |
| Astrocytoma-Low grade | 5 | 41.7% | 7 | 58.3% |
| Glioblastoma Multiforme | 0 | 0.0% | 2 | 100.0% |
| Choroid plexus papilloma | 2 | 50.0% | 2 | 50.0% |
| Ependymoma | 4 | 66.7% | 2 | 33.3% |
| Schwannoma | 6 | 27.3% | 16 | 72.7% |
| Meningioma | 3 | 20.0% | 12 | 80.0% |
| Metastatic Carcinoma | 0 | 0.0% | 3 | 100.0% |
| Total | 32 | 40.0% | 48 | 60.0% |

Table 6: Gender wise Morphological distribution of Posterior fossa tumours.

| Tumour type | Male | | Female | |
|------------------------------|-----------|---------------|-----------|--------------|
| | Number | Percentage | Number | Percentage |
| Medulloblastoma | 8 | 66.7% | 4 | 33.3% |
| Desmoplastic Medulloblastoma | 1 | 50.0% | 1 | 50.0% |
| Hemangioblastoma | 1 | 50.0% | 1 | 50.0% |
| Astrocytoma-Low grade | 8 | 66.7% | 4 | 33.3% |
| Glioblastoma Multiforme | 2 | 100.0% | 0 | 0.0% |
| Choroid plexus papilloma | 3 | 75.0% | 1 | 25.0% |
| Ependymoma | 4 | 66.7% | 2 | 33.3% |
| Schwannoma | 14 | 63.6% | 8 | 36.4% |
| Meningioma | 6 | 40.0% | 9 | 60.0% |
| Metastatic Carcinoma | 2 | 66.7% | 1 | 33.3% |
| Total | 49 | 61.25% | 31 | 38.8% |

| INTRACRANIAL POSTERIOR FOSSA TUMORS | | | |
|-------------------------------------|--------------------------------|-------------------------------|--------------------------|
| A. Children | | | |
| Brainstem | Cerebellum | Fourth ventricle | CP angle |
| Astrocytoma | Pilocytic astrocytoma | Ependymoma | Schwannoma |
| Ganglioglioma | Medulloblastoma | Medulloblastoma | Meningioma |
| Glioblastoma multiforme | Hemangioblastoma | Choroid plexus papilloma | Choroid plexus papilloma |
| | PNET | | |
| | Atypical Rhabdoid | | |
| | Pineoblastoma | | |
| B. Adults | | | |
| Intra-axial Intraventricular | Intra-axial Parenchymal | Extra-axial | |
| Sub-Ependymoma | Hemangioblastoma | Vestibular schwannoma | |
| Choroid plexus papilloma | Metastasis | Meningioma | |
| | | Metastasis | |
| | | Glomus Jugulare Paraganglioma | |

Fig. 1: Morphological Spectrum of Intracranial Posterior Fossa Tumours.



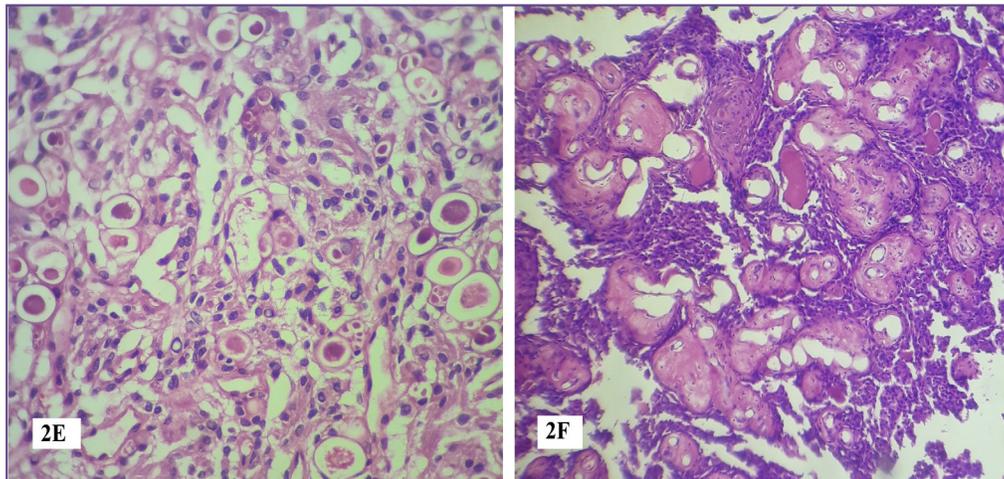
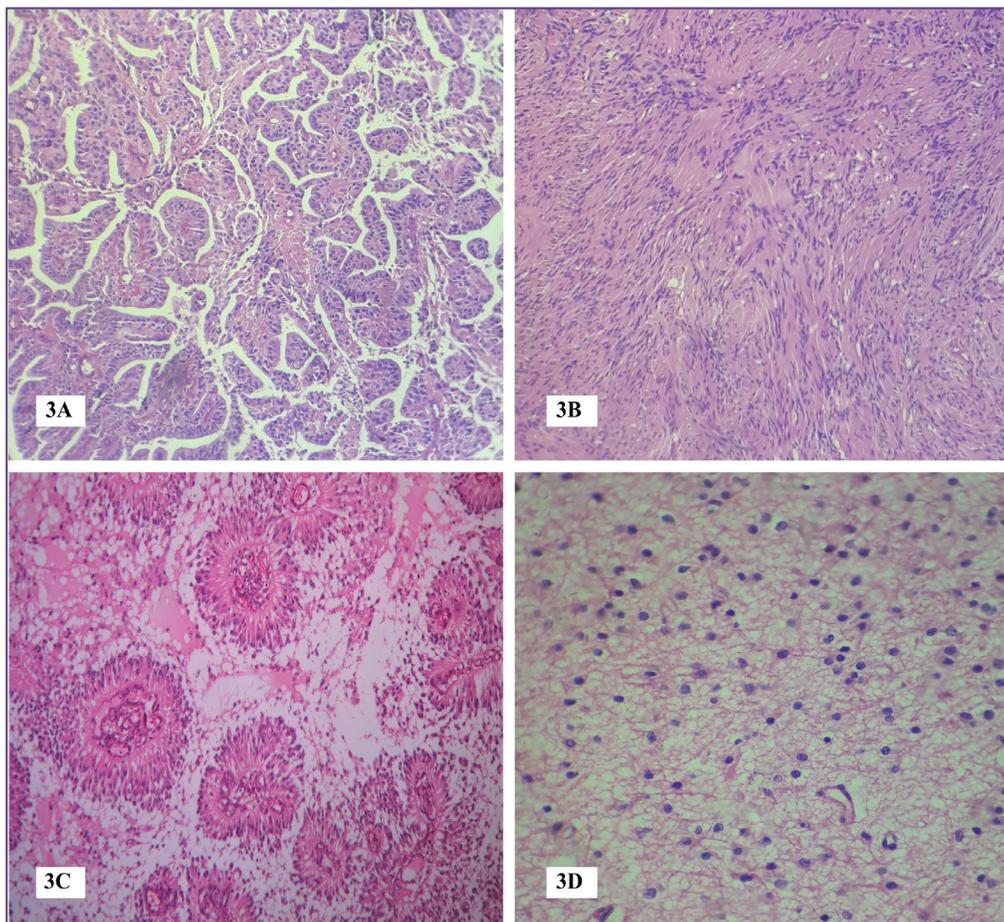


Fig 2: 2A. Medulloblastoma comprised of densely packed small round undifferentiated cells. H/E (400X) 2B. Desmoplastic medulloblastoma comprised of pale nodular areas surrounded by densely packed hyperchromatic cells. H/E (100X). 2C. Desmoplastic medulloblastoma with densely packed hyperchromatic cells H/E (400X). 2D. Meningothelial Meningioma with whorls of meningothelial cells H/E (100X). 2E. Secretory Meningioma H/E (100X). 2F. Angiomatous meningioma H/E (100X)..



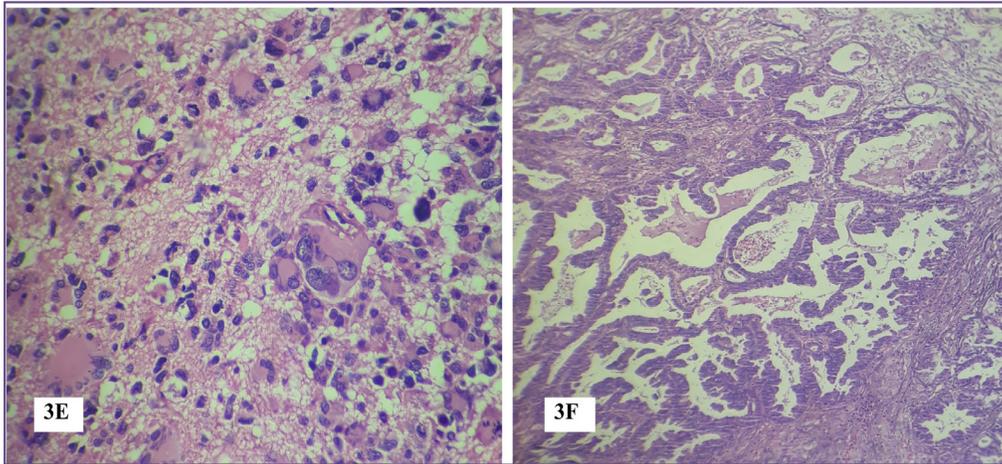


Fig. 3: 3A. Choroid plexus papilloma with well differentiated papillae lined by a single layer of monomorphic cells H/E (100X) 3B. Schwannoma with verocay bodies H/E (100X) 3C. Ependymoma with perivascular pseudo rosettes H/E (100X). 3D. Diffuse Fibrillary Astrocytoma H/E (100X) 3E. Glioblastoma multiforme with marked cellular pleomorphism H/E (400 X) 3F. Metastatic Adenocarcinoma H/E (100X).

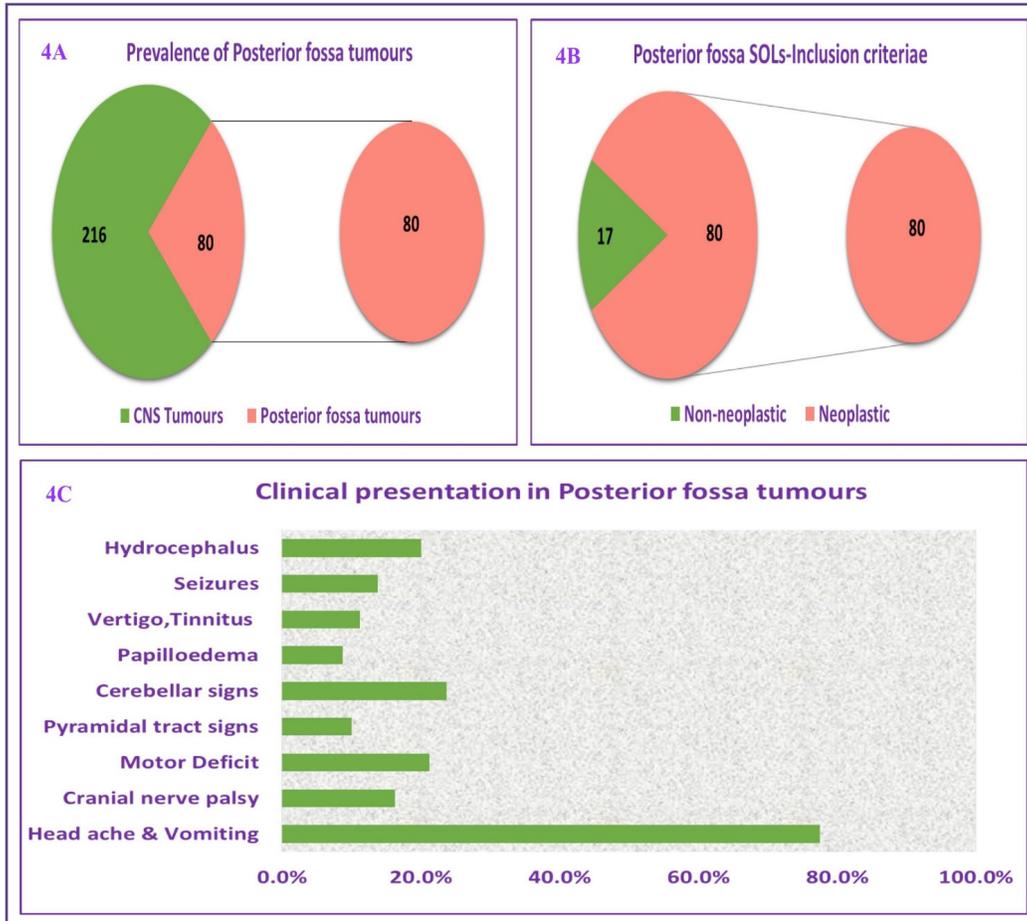


Fig. 4: A Prevalence of Posterior Fossa tumours B. Posterior fossa SOLs-Inclusion criteria C. Clinical presentation of Posterior fossa tumours.

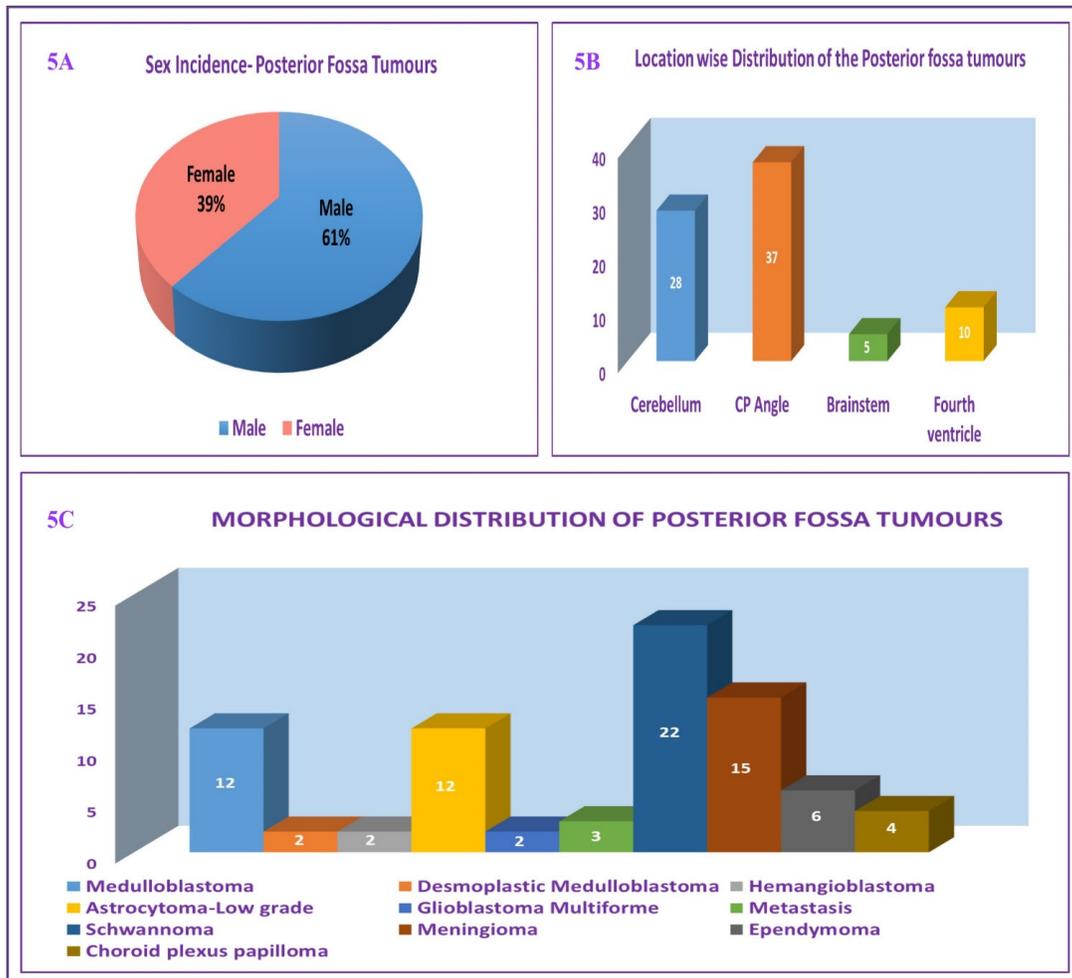
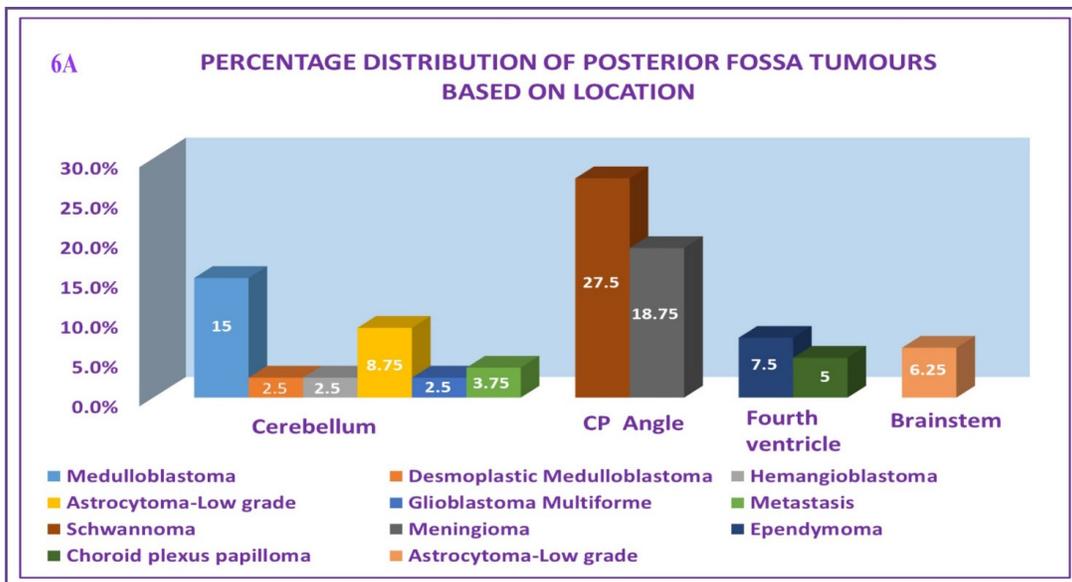


Fig. 5L Posterior Fossa Tumours 5A. Sex Incidence. 5B. Location wise distribution 5C. Morphological Distribution.



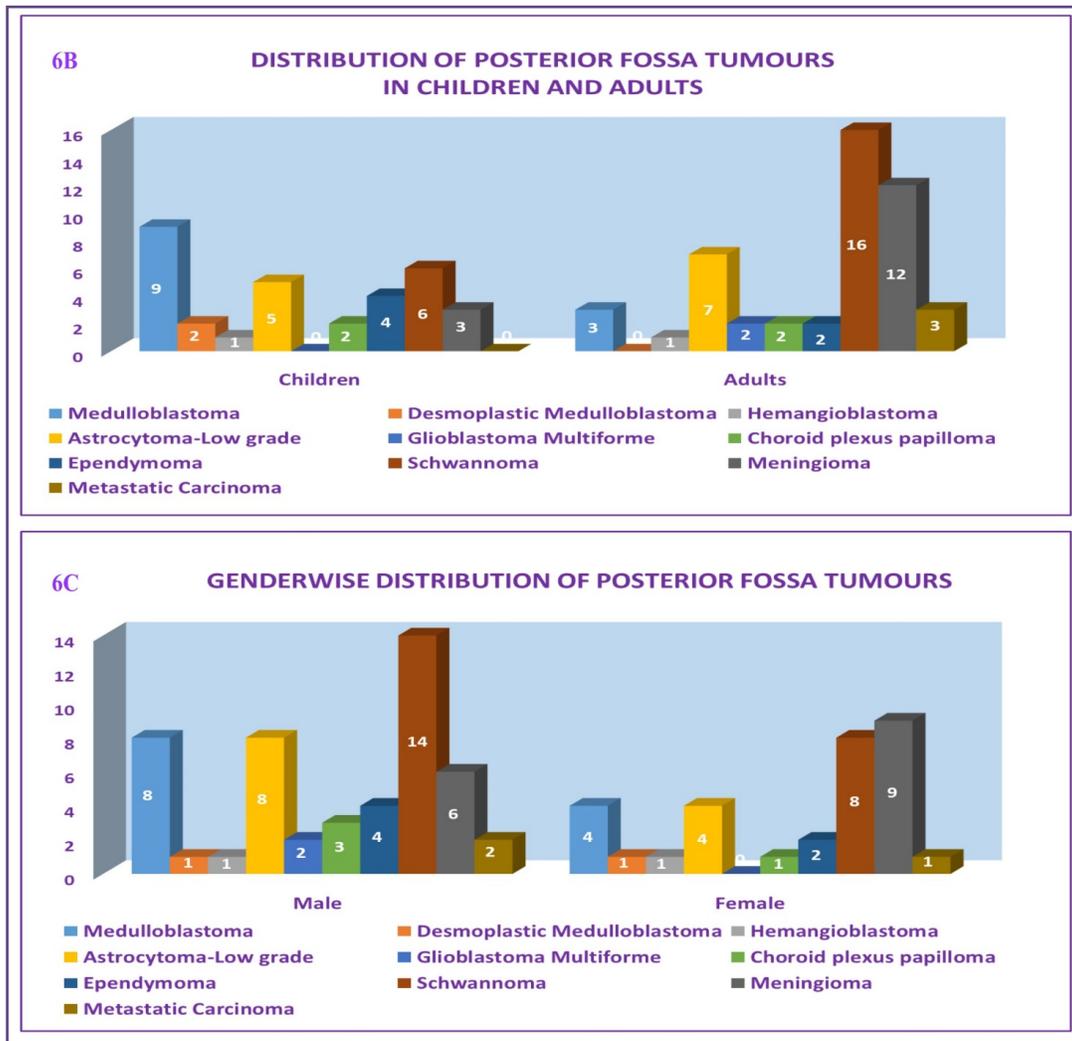


Fig. 6: Distribution of Posterior fossa tumours 6A. Location wise 6B. In Children and adults 6C. Gender wise distribution.

Discussion

Intracranial posterior fossa tumours are critical brain lesions constituting 54%-70% of all childhood brain tumours and 15-20% of brain tumours in adults.⁽¹⁾ Due to potential involvement of vital brain stem nuclei and associated morbidity and mortality, varied clinical behaviour in different age groups and among various histological types, a multidisciplinary approach comprised of neurosurgeon, radiologist and pathologist is warranted for determination of optimal patient management. Advent of new diagnostic techniques is facilitating early diagnosis of posterior fossa tumours, planning of adequate optimal therapy and post-operative monitoring for effectiveness of treatment and minimising the complications.

Posterior cranial fossa is the deepest and most capacious of the 3 cranial fossae, contains the cerebellum, pons,

and medulla oblongata. and tumours affecting the above structures lead to pressure symptoms, neurological deficits or even death. Wide morphological spectrum of tumours are reported in this site (Refer to Figure 1) which vary in clinical and biological behaviour, management and prognosis among children and adults.

Clinical presentation in Posterior fossa tumours: Due to focal compression of the cerebellum or brain stem centres and the increased intracranial pressure these patients usually present with headache, vomiting and hydrocephalus. Headache is insidious and intermittent. It is most severe in the morning or after a nap because of increased intracranial pressure from recumbency and hypoventilation during sleep. Vomiting usually occurs in the morning and may be due to generalized intracranial hypertension or irritation of the vagal nuclei in the medulla oblongata. Associated

neck pain, stiffness, or head tilt suggest tonsillar herniation into the foramen magnum. Most alarming symptoms result from focal brainstem compression with cranial nerve dysfunction and present with ocular palsies, diplopia and long tract signs (hemiparesis).^(6,7,8,9)

Our Institutional study findings.

Prevalence: In our study 80 cases of posterior fossa tumours were analysed and these constituted 69% of total CNS tumours in children below 5 years reported in our institute. In adults, posterior fossa tumours constituted from 32.5% of total CNS tumours in fifth decade to 24.1 % in fourth decade. Intracranial posterior fossa tumours constituted 37.03% of total CNS tumours in our study. These findings were concordant with study done by kalyani et al who reported 40.9% of posterior fossa tumors in their institute.⁽¹⁴⁾ Similar studies done by Srilakshmi et al (21.8%) and Meenakshi Sundaram et al (60%) showed great variation in prevalence probably related to demographic attributes.^(15,16)

Clinical features: Majority of patients presented with headache and vomiting irrespective of age and gender. Hydrocephalus was the second most common clinical presentation in the children and cerebellar signs with Gait abnormalities in the adults. Cranial nerve palsies were reported in 16.3% of cases. Our results are concordant with findings of study by Srilakshmi et al. In study done by Kalyani et al. cerebellar signs was the most common presentation and hydrocephalus in study done by Meenakshi Sundaram et al.^(14,15,16)

Gender-wise distribution: Majority of the tumours in posterior Fossa had male predilection with M:F ratio of 1.6:1. except meningioma which favoured females with M:F ratio of 1:1.3. These findings are concordant with reference studies.

Histopathological findings on microscopy revealed that Schwannoma was the most common tumour and Hemangioblastoma and Glioblastoma were the least common. Based on the location, CP angle (Cerebello-Pontine) was the most common site presenting with 46.25% of total posterior fossa tumours which included Schwannomas (27.5%) and Meningiomas (18.75%). These findings are concordant with reference studies, however, cerebellum was the most common location in series of Meenakshi Sundaram et al. and Priya V.S et al.^(16,17) Cerebellum presented with wide spectrum of lesions, medulloblastoma (15.0%) being the most common and Glioblastoma multiforme (2.5%) being the least common. There is limited representation of the tumours of fourth Ventricle (12.5%) and Brainstem (6.25%). Among the children Medulloblastoma was the most common tumour

constituting 28% of total posterior fossa tumours reported in children, and 75% of total Medulloblastomas reported in the study. These findings are concordant with reference studies. However, pilocytic astrocytoma was the most common tumour in series of Meenakshi Sundaram et al⁽¹⁶⁾ 2 cases of Desmoplastic medulloblastomas were also reported in the children. Schwannoma was the most common tumour in adults constituting 72.7% of total schwannomas reported in the study and representing 33.3% of total adult posterior fossa tumours. These findings are concordant with reference studies. Correlation with reference studies is represented in Table 7.

Medulloblastoma, Medulloblastomas develop from cerebellar stem cells, adjacent to 4th ventricle between brain stem and cerebellum. The tumour is cellular and comprised of densely packed small round undifferentiated cells with mild to moderate nuclear pleomorphism and high mitotic count with both true and pseudo-rosettes. Medulloblastomas are second in frequency only to pilocytic astrocytoma and accounts for 25% of all intracranial neoplasms.⁽¹⁸⁾ In our study 12 cases of medulloblastoma were reported and constituted 15 % of total posterior fossa tumours reported. 75 % of cases were reported in children and majority were in children below 5 years. 3 cases were reported in adults. These findings are consistent with reference studies. All cases presented clinically with headache and vomiting due to raised intracranial pressure. Post-operative radiotherapy was done for all cases. The cases were thoroughly followed up with repeat brain and spine MRI every 3-6 months for 2 years following surgery and the follow-up was uneventful.

Desmoplastic Medulloblastoma, develop from Granule cell progenitor cell. These tumours are comprised of pale nodular areas surrounded by densely packed hyperchromatic cells. They account for 20% of all medulloblastomas.⁽¹⁹⁾ In our study two cases of desmoplastic medulloblastoma are reported in children constituting 14.2% of total medulloblastomas. These cases predominantly presented with hydrocephalus. Post-operative chemotherapy was given for both cases. There was no evidence of recurrence or metastasis of follow-up for 2 years. These tumours have excellent prognosis with optimal surgery and chemotherapy.

Low grade astrocytoma, constitutes about 33% of all posterior fossa tumours in children.⁽²⁰⁾ It represents 25% of all paediatric tumours.⁽²¹⁾ In our study 12 cases of astrocytoma were reported. Five cases in children and seven cases in adults. Pilocytic astrocytoma was predominant in children and diffuse fibrillary astrocytoma in adults. Small number of cases of Astrocytoma reported in children

(20.5%) seen in our study can be due to the reason that this is a hospital-based study and may not reveal the true incidence of this neoplasm. These findings are concordant with series of Priya VS et al (21.42%)

Ependymoma, develop from cerebral neural stem/radial glial cells and composed of uniform small cells with round nuclei in a fibrillary matrix characterized by perivascular pseudo-rosettes. Ependymomas account for 5% - 9% of primary neuroepithelial neoplasms. ⁽²²⁾ In our series 6 cases were reported constituting 7.5 % of all posterior fossa tumours and all are reported in the fourth ventricle. In study done by Schiffer et al. 60% of ependymomas were reported in fourth ventricle. ⁽²³⁾ There was male sex predilection as four of the six cases were reported in males. Majority of the cases presented with head ache and vomiting, visual disturbances and cranial nerve deficits. Post-operative radiation was done in all cases. Recurrence was reported in three cases on follow-up for two years. Extent of surgical resection is consistently reported to be a reliable indicator of outcome and gross total resection is associated with significantly improved survival. ^(24,25,26) Optimal Radiotherapy also improves survival in ependymomas. ⁽²⁷⁾

Choroid plexus papilloma, is a well differentiated papillary tumor lined by a single layer of monomorphic cells. Choroid plexus tumors constitute 0.3-0.8% of all brain tumors. In our study 4 cases are reported, constituting 5% of total posterior fossa tumors and 1.5% of total CNS tumors during the study period. There is male sex predilection and equal representation among children and adults. They presented with hydrocephalus, papilledema, raised ICP. These cases were uneventful on follow-up for 2 years. National and international literature states that prognosis of these tumors is very good with 1 Year, 5 Years and 10 Years projected survival rates of 90%, 81% and 77% respectively. ⁽²⁸⁾

Schwannoma, have strong predilection for the eighth cranial nerve in the cerebello pontine angle and constitute 8% of all primary intracranial tumours ⁽²⁹⁾ and 85% of cerebellopontine angle tumours. ⁽³⁰⁾ Peak age incidence is in fourth to sixth decade. ⁽³⁰⁾ Histologically, the tumour consists of cellular Antoni A and acellular Antoni B areas and Verocay bodies. In our study Schwannoma was the most common tumour accounting for 27.5 % of posterior fossa tumours reported and majority were in adults (72.7%). These findings are consistent with reference studies. Patients presented with Vertigo, tinnitus, hearing loss and cranial nerve palsies. Recurrences were reported in three cases of Schwannoma on follow-up.

Meningioma, Posterior fossa meningiomas are slow growing, constitute 20% of all intracranial meningiomas. ⁽³¹⁾

In our study meningiomas were the second most common tumours of posterior fossa accounting for 18.75 % of cases with predominant adult (80%) and female representation (60%). These findings are consistent with study done by Helseth et al. ⁽³²⁾ There was recurrence in four cases on follow-up. Recurrences are frequent with posterior fossa meningioma and have poor prognosis. ⁽³¹⁾ Posterior cranial fossa Meningiomas are difficult to excise completely even by skilled surgeons.

GBM (Glioblastoma Multiforme), Posterior fossa GBMs are rare accounting for 1% of posterior fossa tumours. ⁽³³⁾ Two cases are reported in adults in our study representing 2.5% of total posterior fossa tumours. These aggressive tumours are rare in posterior fossa. The results are concordant with series of Priya VS et al. Both cases were given post-operative radiotherapy and both succumbed to illness during the study period.

Metastasis. Three cases of metastatic cerebellar tumour were reported accounting for 3.8% of posterior fossa tumours. All the three cases had primary lung adenocarcinoma. In contrast to the reference studies, lower number of metastatic tumours reported in our study represents only institutional statistics and population demographics, and does not reflect the true prevalence in the region. There is a need to analyse a greater number of cases to predict accurate prevalence in the population.

Hemangioblastoma are benign neoplasms that constitute roughly 2% of intracranial neoplasms. ⁽³⁴⁾ Two cases of Hemangioblastoma are reported accounting for 2.5% of posterior fossa tumours and with equal gender incidence. These findings are similar to the findings of series done by Kalyani et al. (4%). These tumours have excellent prognosis with complete surgical resection.

Follow-up: A total number of 8 deaths and recurrences in 4 cases of meningioma, 3 cases of Schwannoma of CP angle and three cases of fourth ventricle ependymoma were recorded in our series with a follow-up of 2 years. In cases of medulloblastoma long term follow-up was done with repeat brain and spine MRI every 3-6 months in the first 2 years following surgery. Recurrence rates are higher in tumours of CP angle esp. meningioma and fourth ventricle ependymomas due to incomplete resection of tumours. Thus the extent of surgical resection is the most important prognostic factor for predicting recurrence and patient's survival.

Prognosis. Early investigation and diagnosis are necessary to improve the overall prognosis of the patients with posterior cranial fossa tumours. Patients with medulloblastoma are classified into good-risk and bad-risk categories based

on the age of presentation, extent of surgical resection, leptomeningeal dissemination or metastasis. Prognosis in medulloblastoma is worse for children younger than 2 years, for patients with subtotal resection (80%), and for those with subarachnoid metastasis or positive results on CSF cytology more than 2 weeks after surgery. In patients with ependymomas, the 5-year survival rate is 20%. Choroid plexus papilloma has excellent prognosis with as high as 100% survival rate.

Conclusion:

1. In our study Posterior fossa tumors are predominantly seen in adults with peak incidence in fourth decade and in children below 5 years. Most common tumor was Medulloblastoma in children and Schwannoma in adults. Most common location was Cerebello-pontine angle followed by cerebellum. Recurrence rates were higher for CP angle tumors and fourth ventricle ependymomas due to difficult sub-total resection. Prognosis was good for tumors which were amenable for total resection.
2. Posterior fossa tumours are critical brain lesions with significant neurological morbidity and mortality. Early diagnosis of posterior fossa tumours is vital to prevent potential risks of Brain stem compression, herniation, hydrocephalus and death.
3. With rapid advancement in radiology and advent of modern therapeutic modalities, early diagnosis and treatment reduced the morbidity and mortality rate and improved prognosis among the patients. Magnetic resonance imaging is ideal for delineating posterior fossa and its lesions however histopathology still remains the gold standard for diagnosis of Intracranial Posterior fossa tumours, determination of prognosis and for formulation of further management after neurosurgery.
4. Clinicopathological correlation and grading are significant as many of the tumours require radiotherapy and chemotherapy in addition to surgical excision. In our study radiotherapy was advised for High grade gliomas, medulloblastomas, ependymomas and for residual and recurrent lesions. Histopathological analysis and grading of tumours are of paramount importance for selection of cases to avoid potential neurotoxic effects of unwarranted radiotherapy.

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