Case Report

Medullomyoblastoma: A Case Report and Literature Review of a Rare Tumor Entity

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ABSTRACT

Objective: Medulloblastomas are the most common malignant Central nervous system neoplasms of childhood. However cerebellar midline primitive neuroectodermal tumors containing muscle elements are exceedingly rare hence awareness and knowledge of this entity is necessary to make correct diagnosis.

Case Report: We report a case of Medullomyoblastoma that presented as a cerebellar mass of brief duration. Four and half year old child presented with vomiting and headache with convulsions. She underwent total resection of the tumor. The resected specimen showed a tumor composed predominantly of elongated cells with eosinophilic cytoplasm, some showing discernible cross striations (indicating myoblastic differentiation) and focally of round cells with scant cytoplasm (indicating neuroectodermal differentiation). Based on these findings, the differential diagnosis thought of were Medullomyoblastoma, Atypical teratoid rhabdoid tumor, and Metastatic rhabdomyosarcoma. Immunohistochemistry staining revealed positive expression of desmin and myogenin in the elongated eosinophilic cells while the round cells were negative for the same. The round cells were weakly positive for synaptophysin and retained INI-1 protein expression.

Conclusion: The travail faced during the diagnosis cued us to report this case. A thorough history physical examination, imaging findings, histopathology and immunohistochemical markers are crucial to arrive at accurate diagnosis in such difficult cases.

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Introduction

Primary tumors of the CNS containing muscle elements are exceptional. Medullomyoblastoma is an uncommon embryonal tumor of the CNS which is almost exclusively seen in children and is classified as Medulloblastomas with myogenic differentiation according to the 4th edition of WHO classification [1]. These tumors generally tend to occur in the cerebellum but may also be found in other sites in the CNS. Marinesco and Goldstein in 1933 first described the biphasic nature of Medullomyoblastoma with both a primitive neuroectodermal and striated muscle components. [2] English literature provides only some case reports of this rare tumor and an occasional series of small number of cases. We are presenting this case because of the challenges it posed at the diagnosis.

Case Report

Four and Half year old female child presented with complaints of vomiting and headache of four days duration. She also had four episodes of convulsions GTC type. Examination of other systems revealed no abnormality. Routine hematological investigations, Serum chemistry and chest x-ray were normal. CT and MRI brain revealed a high density, large contrast-enhancing lesion in posterior fossa arising from the cerebellar vermis measuring 4.1 X 3.5 X 3 cms causing moderate dilatation of lateral ventricle. (Fig 1) Suboccipital craniotomy with total resection of the tumor was performed. Grossly multiple chips of tan colored tumor tissue were received.

Microscopically haematoxylin and eosin stained sections from tumour showed that it was composed of two populations of cells, predominantly of spindle shaped elongated strap-like cells with elongated nuclei and eosinophilic cytoplasm showing discernible cross striations (indicating the rhabdomyoblastic component) which were further highlighted on Masson's Trichome stain. In addition, foci of small round cells with hyperchromatic nuclei with scant cytoplasm in a conspicuous myxoid stromal background also seen. (Fig 2A & 2B)

Immunohistochemistry revealed positive staining for desmin and myogenin in the elongated eosinophilic cells while the round cells were negative for the same. The round cells were weakly positive for synaptophysin. The tumor showed retained INI-1 protein expression, while it was negative for GFAP, SMA, Mic- 2, and LCA. (Fig 3)

Discussion

The clinical and cranial CT findings in this patient indicated the presence of a cerebellar midline tumour believed to be either a medulloblastoma or other tumors.

Based on histological grounds, our case was biphasic composed predominantly of spindle shaped cells with foci of small round cells, posing much of a diagnostic challenge.

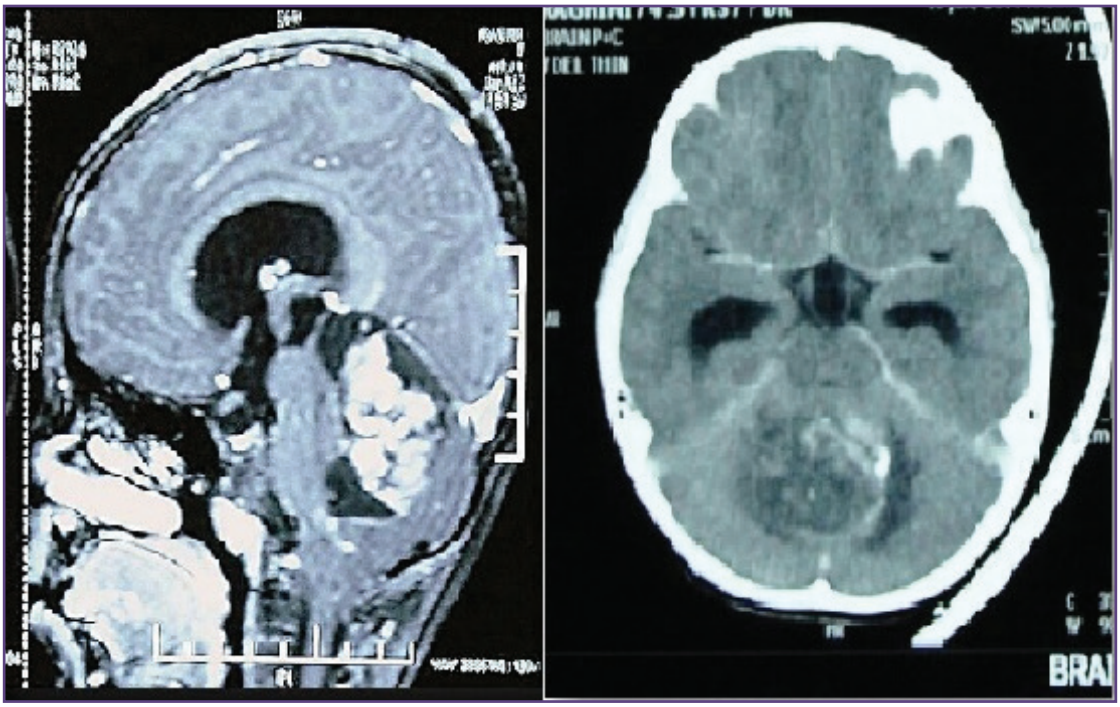

Fig. 1: MRI brain showing a large a high density, contrast-enhancing lesion in posterior fossa arising from the cerebellar vermis measuring 4.1 X 3.5 X 3 cms

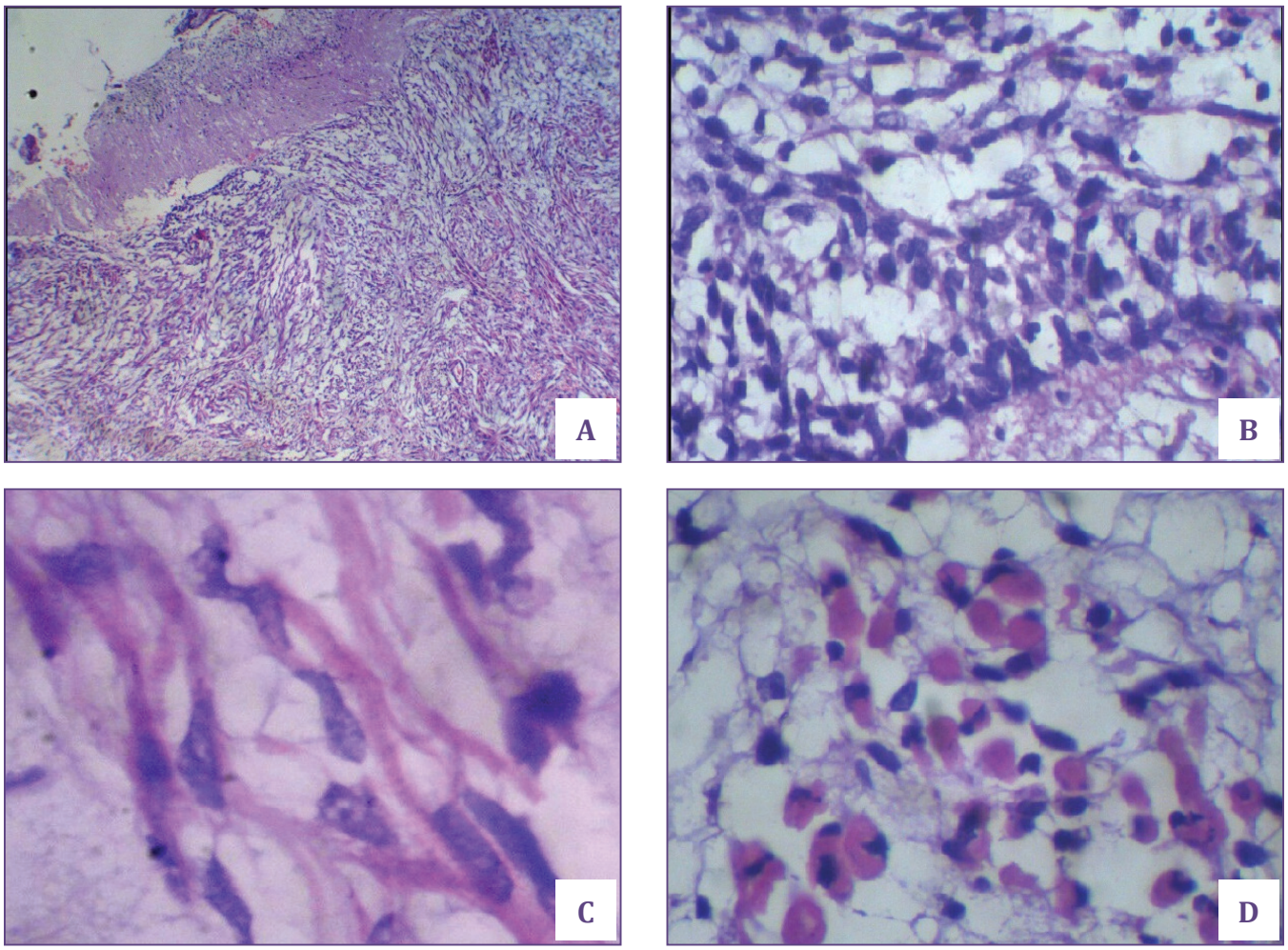

Fig. 2A: H & E sections from tumour showing two populations of cells (a) - H & E 100 X , predominantly of spindle shaped elongated strap-like cells with elongated nuclei and eosinophilic cytoplasm showing discernible cross striations (c & d) - H & E 400 X and foci of small round cells with hyperchromatic nuclei with scant cytoplasm.(b) - H & E 400 X

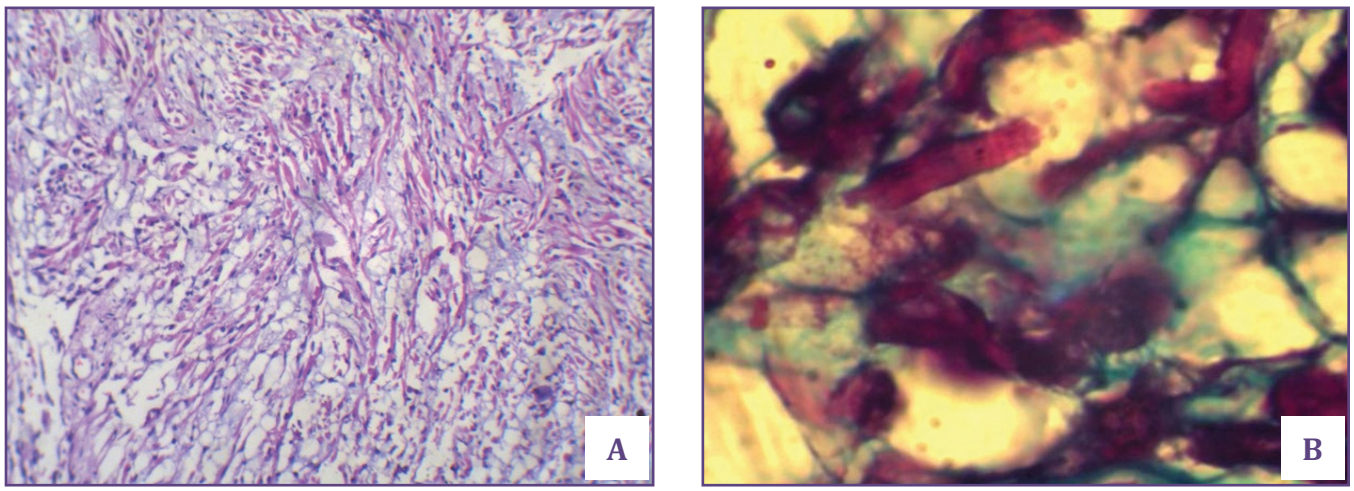

Fig. 2B: Rhabdomyoblastic spindle shaped elongated strap-like cells (a) - H & E 100 X which highlighted on (b) Masson's Trichome stain- 1000 X

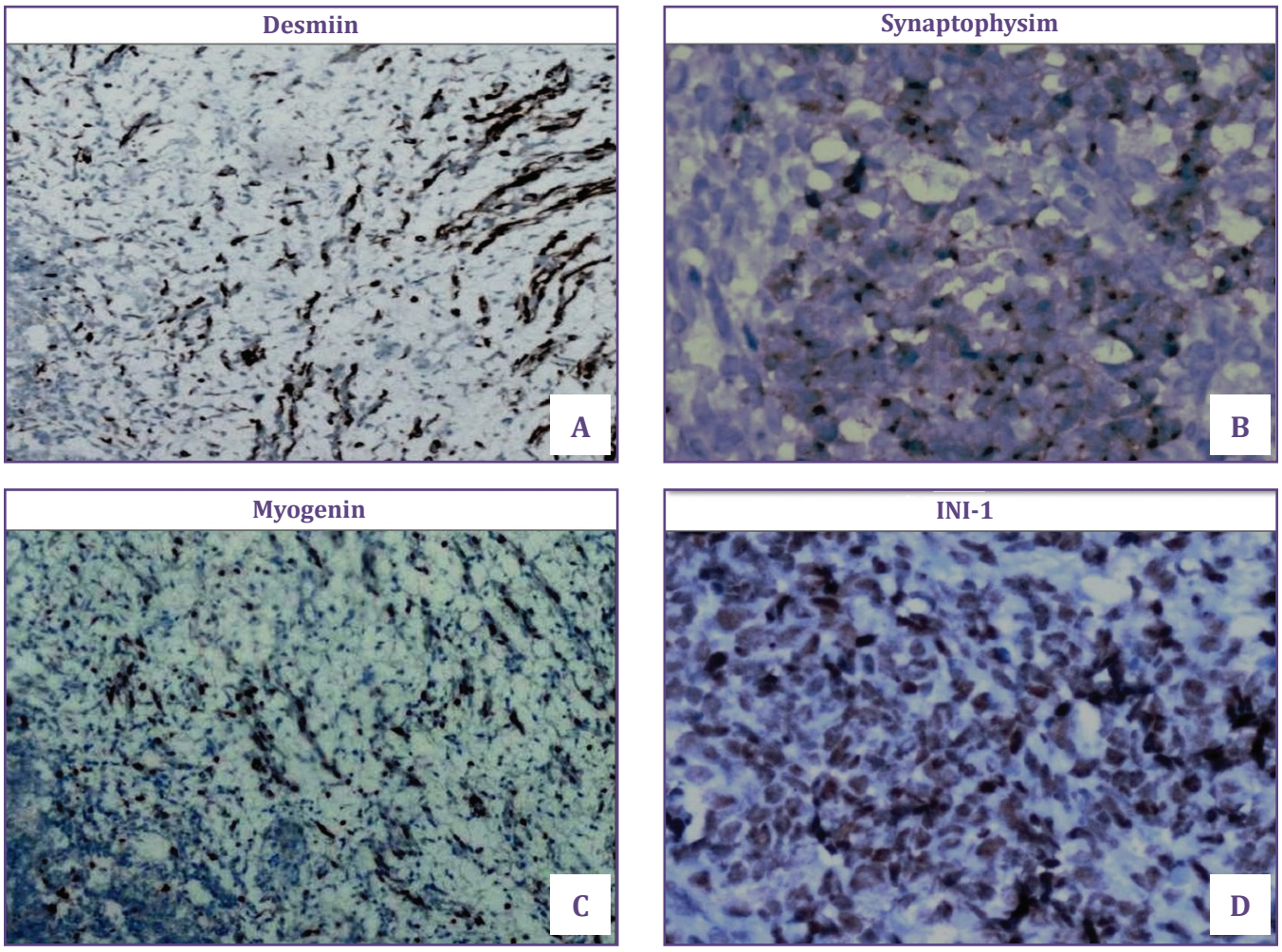

Fig. 3A: Immunohistochemistry revealed positive staining for desmin and myogenin in the elongated eosinophilic cells while the round cells were negative for the same (a & c) 100 X. The round cells were weakly positive for synaptophysin (b) 100 X. The tumor showed retained INI-1 protein expression.(d) 100 X

On the basis of these features the differential diagnosis thought of were Medullomyoblastoma, Metastatic rhabdomyosarcoma, Atypical teratoid rhabdoid tumor. However with the use of a panel of Immunohistochemical markers [2], this problem was greatly reduced. The spindle cell component showed positive expression of desmin, myogenin suggesting myogenic differentiation while the round cells were expressing co existence of neuronal differentiation with weakly positivity for synaptophysin, thereby excluding metastatic rhabdomyosarcoma [3].

Although Atypical teratoid rhabdoid tumor are also embryonal CNS neoplasms that show overlapping morphological features with Medulloblastoma and variable polyphenotypic differentiation, this is mostly seen in early infancy and preferentially located in cerebellar hemispheres, rather than arising from vermis. The characteristic loss of INI-1 immunohistochemical expression in the nucleus plays a major role in the differential diagnosis from other embryonal neoplasms, which retain INI1 nuclear expression, as in our case [3,4]. Furthermore, the absence of glial, especially astrocytic differentiation, on morphological grounds and by the detection of neuronal markers (synaptophysin) and absence of GFAP expression excluded a high grade astrocytic tumor. Anaplastic ependymoma was also excluded by the absence of perivascular pseudorosettes, the definite neuronal and rhabdomyoblastic differentiation.

Medullomyoblastoma is a rare embryonal tumor of CNS. Since Marinesco and Goldstein's first report, too little cases have been reported in the literature.Medullomyoblastoma arises exclusively within the infratentorial compartment and its typical location being cerebellar vermis, as in

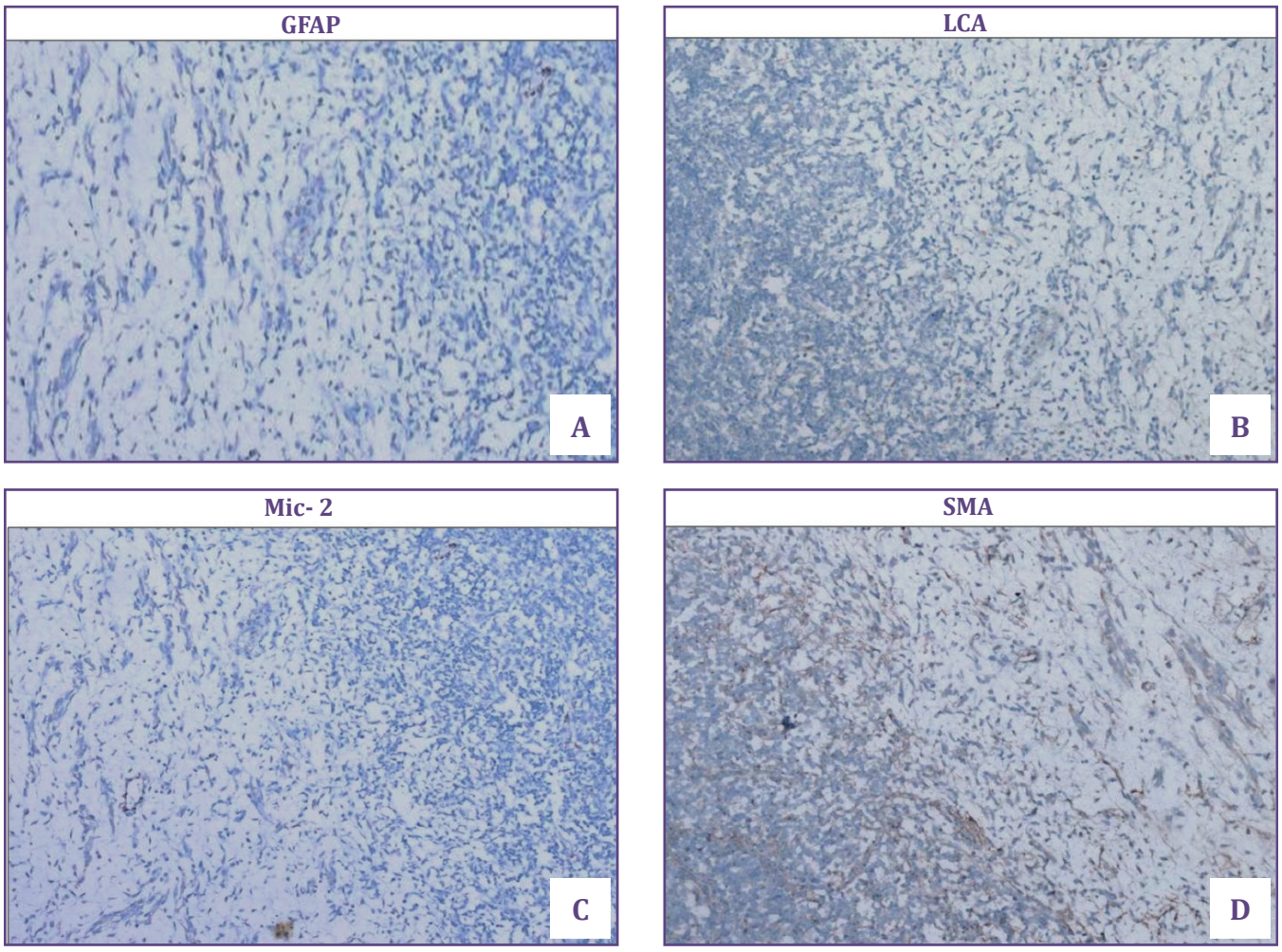

Fig. 3B: Immunostaining negative for GFAP (a) 100 X, LCA (b) 100 X, Mic- 2 (c) 100 X, and SMA (d) 100 X

our case. Of the cases reported in the literature, nearly 90% were aged less than 10 years and only 3 were adults [5]. The male to female ratio was 3.9:1. Biological behavior, clinical characteristics and metastatic pattern of Medullomyoblastoma are nearly similar to those of classical Medulloblastoma [5,6,7]. The clinical symptoms usually last for a short period from a few weeks to months before diagnosis. Medullomyoblastoma is an aggressive tumor with surgical debulking as the essential path of the treatment. Post-operative radiotherapy and chemotherapy may be beneficial for lengthening the survival time. However, despite aggressive therapy the survival period for Medullomyoblastoma is dismal; ranging from 4 days to 1 year. [8] The histogenesis of the myogenic component of medullomyoblastoma is controversial. The concept that this tumour might represent a variant of a malignant teratoma or a teratoid tumour, was first proposed by Ingraham and Bailey and has been supported by others. [9] This interpretation was criticised by Stahlberger and Friede because the nonectodermal component in these tumours is restricted to cross-striated muscle fibers. Other mesodermal or endodermal components are not seen. Some authors have suggested that the muscle fibers in medullomyoblastoma may be derived from embryonal pluripotential mesenchymal cells present within or near the tumour. [10] Walter and Bmeher propose that the myoblastic component is derived from the multipotential endothelial cells. A final hypothesis concerning the histogenesis of the muscle fibers in medullomyoblastoma is that they originate directly from the primitive neuroepithelial (medulloblastoma) cells.

To conclude, Medullomyoblastoma is a unique variant of medulloblastoma with more aggressive nature. Primary tumors of the CNS containing muscle elements are exceptional hence awareness and knowledge of this entity is necessary to make correct diagnosis. A thorough history, physical examination, imaging findings, histopathology

and immunohistochemical markers are crucial to arrive at accurate diagnosis in such difficult cases.

Conclusion

A rare tumour occurring in the cerebellar midline comprising of a mixture of medulloblastoma with mature and immature striated muscle is referred to as "medullomyoblastoma" which is more aggressive in nature. Primary tumors of the CNS containing muscle elements are exceptional hence awareness and knowledge of this entity is necessary to make correct diagnosis.

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Competing Interests

None Declared

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