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Adult medulloblastoma: A rare case report and literature review

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Abstract

Background: Medulloblastoma is a highly malignant embryonal tumor which commonly arises in the cerebellum. It is relatively rare and accounts for less than 2% of all primary brain tumors. The tumor primarily occurs in childhood; however, rarely, it may be found in adult population. In addition, medulloblastoma in adult population shows features which are quite distinct from the pediatric group.

Case Description: We report the case of a 33-year-old man who presented to our institution with a history of blurred vision of both eyes for 5 months preceded by intermittent headache since the previous year. Preoperative investigation suggested a posterior fossa mass and we suspected an ependymoma. The patient underwent ventriculoperitoneal shunt and craniotomy tumor removal, followed by radiotherapy. Histopathological and immunohistochemical examination were performed, and the results showed a diagnosis of medulloblastoma.

Conclusion: This case is exceptional because adult medulloblastoma occurrence in our center is extremely rare, and the diagnosis can only be established through histopathological and immunohistochemical studies.

Key Words: A rare case of adult medulloblastoma, fossa posterior brain tumor, immunohistochemical studies

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INTRODUCTION

Medulloblastoma is a malignant embryonal tumor that commonly arises in the cerebellum.[17] The tumor primarily affects children and the occurrence in adults is rare.[9] Most patients with the malignancy show manifestation of increased intracranial pressure, which is best explained as the result of hydrocephalus.[3,6] Medulloblastoma gives widely variable and nonspecific findings in imaging modalities;[2] hence, histopathological examination should be performed in order to confirm the diagnosis. The etiology of medulloblastoma has not been so well-described in most patients, both children and adults;[15] however, it seems that various mechanisms leading to medulloblastoma are different among the two groups.[16] In addition, it has been reported that medulloblastoma in adults has certain clinical and pathological features which are distinct with the presentations in children.[4,8] Low incidence of medulloblastomas in adults gives us a narrow perspective about the disease nature. Moreover, this also makes standard procedures to treat the tumor in adults that are very hard to establish. We report the case of a 33-year-old man with a cerebellar mass, which was diagnosed as medulloblastoma according to the histopathological and immunohistochemical findings.

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CASE REPORT

A 33-year-old man came to our center with blurred vision in both eyes for 5 months as the chief complaint. This was also accompanied with intermittent headaches since the previous year. Neurological findings showed that visual acuity in both eyes was 3/60 without papilledema. Other cranial nerves were within normal limit, and there was no motor or sensory deficit. Magnetic resonance imaging (MRI) of the head was conducted that showed a midline posterior fossa mass, which had an iso-hypointense appearance on T1-weighted images, an inhomogenously enhanced appearance in T1-weighted contrast images, and iso-hyperintensity in T2-weighted images. The MRI also revealed that the temporal horns were more than 2 mm with frontal horns–internal diameter ratio (FH/ID) of 50% and the Evan ratio of 0.3. [Figure 1a and b] Preoperative investigation suggested that the patient had an infratentorial mass at the fourth ventricle, suspected ependymoma, which caused a noncommunicating hydrocephalus. We performed ventriculoperitoneal shunt procedure to overcome the hydrocephalus and transvermian craniotomy tumor removal to eradicate the tumor [Figure 2a-d]. We found a grayish solid mass, with undefined border, during the operation, and the tumor was near-total excised. A histopathology sample from the mass was obtained and the examination revealed a "carrot-shaped cell" with polymorphic hyperchromatic nuclei and "Homer Wright Rosettes" appearance, which suggested that the mass was medulloblastoma [Figure 3a and b]. In addition, immunohistochemical analysis was also conducted and the result showed that the tumor was positive for glial fibrillary acidic protein (GFAP), synaptophysin, and smooth muscle actin [Figure 4a-c], whereas it was negative for cytokeratin, desmin, and epithelial membrane antigen (EMA) [Figure 4d]. The patient was discharged with slight balance disturbance, and no major postoperative complication was observed.

DISCUSSION

Medulloblastoma is a highly malignant tumor of the central nervous system which commonly arises from the cerebellar vermis in the roof of fourth ventricle.[3] The cell of origin from which medulloblastoma derives has been controversial. According to few previous studies, it was speculated that the origin of medulloblastoma is the restricted cerebellar granule neuron precursors.[18,26] They form a germinal center that develops in the rhombic lip located in the anterior part of the fourth ventricle, which later proliferate and migrate to become the external and internal granular cell layer in the cerebellum.[20] However, other studies suggested that medulloblastoma arises from multipotent stem cells of cerebellum.[13,21] In adults, the tumor more frequently involves the cerebellar hemisphere; thus, is more lateral than the midline vermis which commonly ensues in the pediatric population.[3] The notable tumor primarily affects children, with the highest incidence rate among 1–9 year old children, and it declines as the age advances.[19] Medulloblastoma is relatively rare, accounting for less than 2% of all primary brain tumors and 18% of all pediatric brain tumors.[1] The incidence rate in children is nearly 6.0 per million population, where in adults it is less than 0.6 per million population; therefore, the tumor is 10 times more likely to occur in children than in adults.[19] According to sex group, males have a higher incidence rate of medulloblastoma than females.[9]

Patients with medulloblastoma classically present to medical facilities with clinical signs and symptoms of increased intracranial pressure due to cerebrospinal fluid flow obstruction or cerebellar dysfunction. Headache, nausea, vomiting, and blurred vision are the most common presenting manifestations. Funduscopic examination shows papilledema. As the disease progresses and the tumor infiltrates the brainstem, cranial nerves

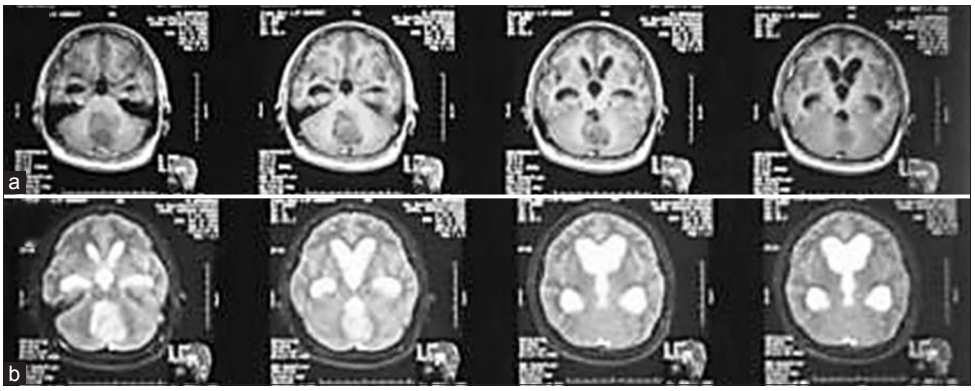

Figure 1: Magnetic resonance imaging of the head without contrast (a) and with contrast was performed (b), which showed a posterior fossa mass that enhanced inhomogenously, as well as noncommunicating hydrocephalus

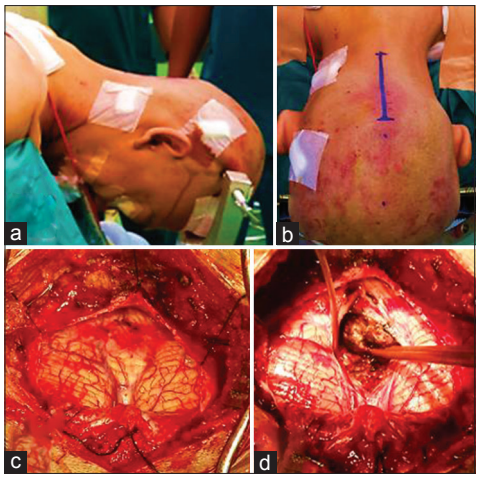

Figure 2: The tumor had been treated with prone position (a), skin incision line (b), surgical view (c) and gross-total surgical excision (d) Craniotomy Tumor Removal Transvermian

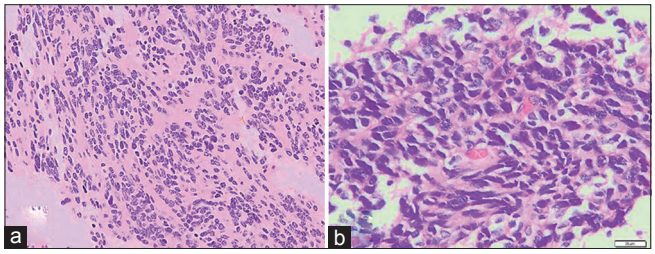

Figure 3: Histological examination, magnification 100× (a) and 200× (b) shows carrot-shaped cell with polimorfic hyperchromatic nuclei and Homer Wright Rossetes appearance as patognomonic sign for medulloblastoma

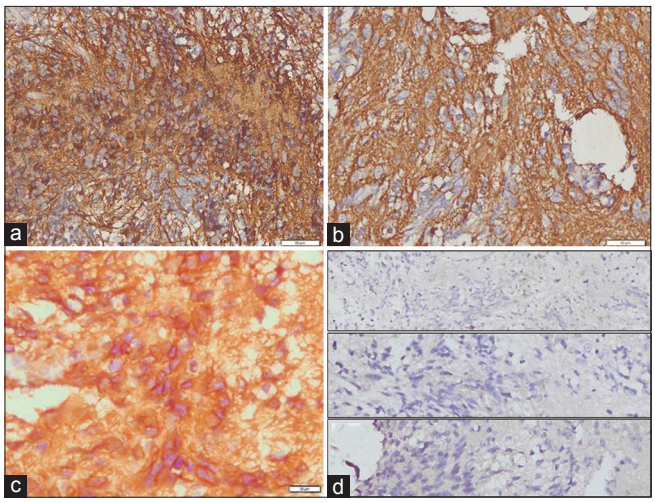

Figure 4: Immunohistochemistry analysis was conducted and the result showed that the tumor is positive for glial fibrillary acidic protein, synaptophysin, and smooth muscle actin (a-c), whereas negative for cytokeratin, desmin, and epithelial membrane antigen (d, from upper, middle, and lower figures, respectively)

dysfunction becomes more common. Nystagmus and diplopia manifests as the results of cranial nerve IV or VI palsy. Ataxia is also commonly seen.[3,15,17]

Computed tomography (CT) and MRI of medulloblastoma is quite distinct between adults and children. In children, the typical medulloblastoma has been well-described in CT imaging. The tumor in pediatric groups appears as a well-defined, homogeneous, hyperdense, median mass in CT contrast imaging. Medulloblastoma in adults rarely gives this appearance but shows more variable findings, that is, poorly defined, less enhanced with contrast, inhomogeneous due to cystic, necrotic degeneration, and more laterally placed.[2,14] In children, cerebellar mass with low intensity on T1-weighted MRI image in addition to hyperdensity in CT scan suggests the diagnosis of medulloblastoma.[25] MRI appearance in adults medulloblastoma gives a wide range of findings; on T1 weighted, tumors are hypo or isointense relative on cortex, whereas on T2-weighted image, tumors have hypo, iso, or hyperintense appearance.[2] In addition, T1-weighted contrast images show a variable level of enhancement and heterogeneousity in the adult population.[12] It is believed that the atypical imaging findings in adult medulloblastoma could be linked with the tumor pathology which tends to show different pattern with pediatric population.[2] Hydrocephalus is also a common feature in medulloblastoma.[2,14]

Histopathologically, classic medulloblastoma is extremely cellular with sheets of anaplastic cells and abundant mitosis, whereas the individual cells are small, with scant cytoplasm and hyperchromatic nuclei which are frequently elongated or crescent shaped. The tumor may express neurosecretory granules or Homer Wright rosettes.[7] The immunostaining of medulloblastoma shows a wide variety of neural markers reactivity. Immunohistochemical features of medulloblastoma typically revealed positivity for synaptophysin with variable reactivity for GFAP, EMA, and cytokeratin.[23] In our case, the results show tumor's reactivity for synaptophysin, GFAP, and SMA, but not for EMA and cytokeratin. Synaptophysin is an integral membrane glycoprotein of presynaptic vesicles of neuronal and neuroendocrinal cells that has been identified as a reliable marker for neuronal differentiation, which is commonly seen in medulloblastoma.[22] GFAP is an astroglial intermediate cytoskeletal protein that is commonly expressed in neural stem cells,[27] from which medulloblastoma is thought to be originated.[13,21] SMA is a marker for muscle-derived cell, generally seen in atypical teratoid/rhaboid tumor.[23] Nevertheless, atypical teratoid/rhabdoid tumor (AT/RT) is defined based on its anaplastic and divergent histopathological features: Rhabdoid cell, primitive neuroectodermal tumor cells, mesenchymal and epithelial components, along with positivity for GFAP, cytokeratin, and EMA, with variable reactivity for synaptophysin and desmin in immunohistochemical study.[10,23] Four molecular subgroups of medulloblastoma have been identified (SHH, WNT; Group 3 and

Group 4),[11,24] however, Remke *et al.* revealed that only 3 variants which predominantly exist in the adult population: SHH, WNT, and Group 4.[16] These molecular subgroups correlate with the clinicopathology, treatment options, and prognosis of medulloblastoma.[5] However, we did not conduct molecular investigation in this patient because of the limitation of time and cost.

CONCLUSION

Medulloblastoma is particularly rare in adults and the diagnosis is difficult to be established. The imaging modalities alone cannot determine the diagnosis of medulloblastoma in adults, given that the tumor shows a wide range of features which can be confused with other posterior fossa masses. In our case, the diagnosis of medulloblastoma can only be confirmed by means of histopathological and immunohistochemical examination.

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Consent
Informed consent was obtained from the patient for publication of this case report and any accompaning images. His family was present at the time.

Competing interests
The authors declare that they have no competing interests.

Authors' contributions
AF, MAP, SS, and MZ had examined, treated, observed, and followed-up the participant of this research. AP and AF performed the operation on the patient. BSH carried out the histopathological studies and intepreted the results of the patient's tissue. All authors participated in writing the manuscript. All authors have read and approved the final manuscript.

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Conflicts of interest
There are no conflicts of interest.

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