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Case Report

Medulloblastoma Mimicking Cerebellar Metastases: Case Study and Literature Review

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Abstract: ***Introduction:*** Medulloblastomas account for approximately 20% of pediatric brain tumors but are rare in adults. We present a case of adult medulloblastoma with radiological features suggestive of cerebellar metastases, along with a literature review focusing on immunohistochemical classification and management strategies. ***Case Report:*** A 37-year-old male patient, with a medical history of benzodiazepine use (discontinued six months prior), tobacco and cannabis consumption, was admitted following generalized seizures in a context of increased intracranial pressure and a static cerebellar syndrome. A brain CT scan revealed two cerebellar hemispheric lesions (right and left), associated with perilesional edema and mass effect on the fourth ventricle, resulting in upstream hydrocephalus. Further imaging with MRI demonstrated hypointense lesions on T1-weighted sequences, hyperintense on T2, with no contrast enhancement after gadolinium injection. The patient underwent urgent ventriculoperitoneal shunt (VPS) placement. After stabilization, a stereotactic biopsy was performed and histopathological analysis confirmed the diagnosis of a WHO grade IV medulloblastoma. ***Discussion:*** Recent advances in the molecular characterization of medulloblastomas have highlighted significant heterogeneity among subtypes, supporting their classification as distinct pathological entities with unique biological and clinical profiles. Immunohistochemistry plays a pivotal role in both therapeutic decision-making and prognosis, allowing assessment of metastatic and recurrence potential. Furthermore, the extent of residual tumor following surgical resection remains a critical determinant of recurrence and guides the indication for adjuvant radiotherapy. ***Conclusion:*** Medulloblastomas can present diagnostic challenges on neuroimaging, particularly on non-contrast-enhanced CT. Our literature review underscores the critical importance of immunohistochemical classification in the therapeutic management of medulloblastomas.

Keywords: Medulloblastoma, Immunohistochemistry, Classification, Radiology.

INTRODUCTION

Medulloblastomas represent 20 % of all cerebral tumors in children and 63% of all embryonal intracranial tumors. Incidence of medulloblastomas peaks between 1 and 4 years old and between 5 and 9 years old, but it is rare in adults with 0,05 case for 100 000 [1]. We describe this case of medulloblastoma in an adult, which radiological aspect evokes cerebellar metastases, and we also propose a literature review concerning the immunohistochemical classification and treatment.

CASE REPORT

A 37 years-old man with history of chronic benzodiazepine use, stopped 6 months prior, smoking and cannabis consumption. He was admitted for seizures, in a context of intracranial hypertension syndrome and static cerebellar syndrome progressively evolving for 2 months.

A CT scan was done upon admission showing 2 right and left hemispheric cerebellar processes, appearing spontaneously hyperdense with peripheral

edema and causing a mass effect on the 4th ventricle, at the origin of an acute hydrocephalus (Fig. 1).

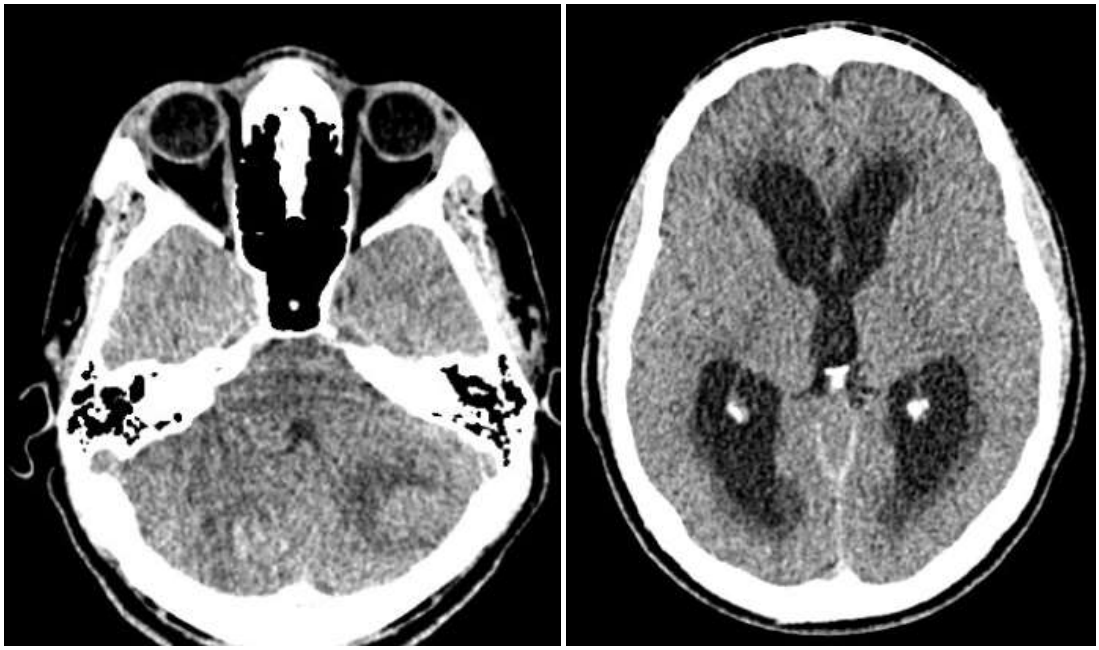

Figure 1: Initial Cerebral CT scan (at admission)

The radiological evaluation was completed by a cerebral MRI, showing 2 cerebellar lesions located in the right and left cerebellar hemispheres that were hypointense in T1, hyperintense in T2 without enhancement after Gadolinium injection. The peripheral oedema is shown hyperintense in Flair sequences (Fig. 2). The acute hydrocephalus was initially treated in emergency by a ventriculo-peritoneal shunt. The outcome was good, achieving complete relief of the intracranial hypertension syndrome.

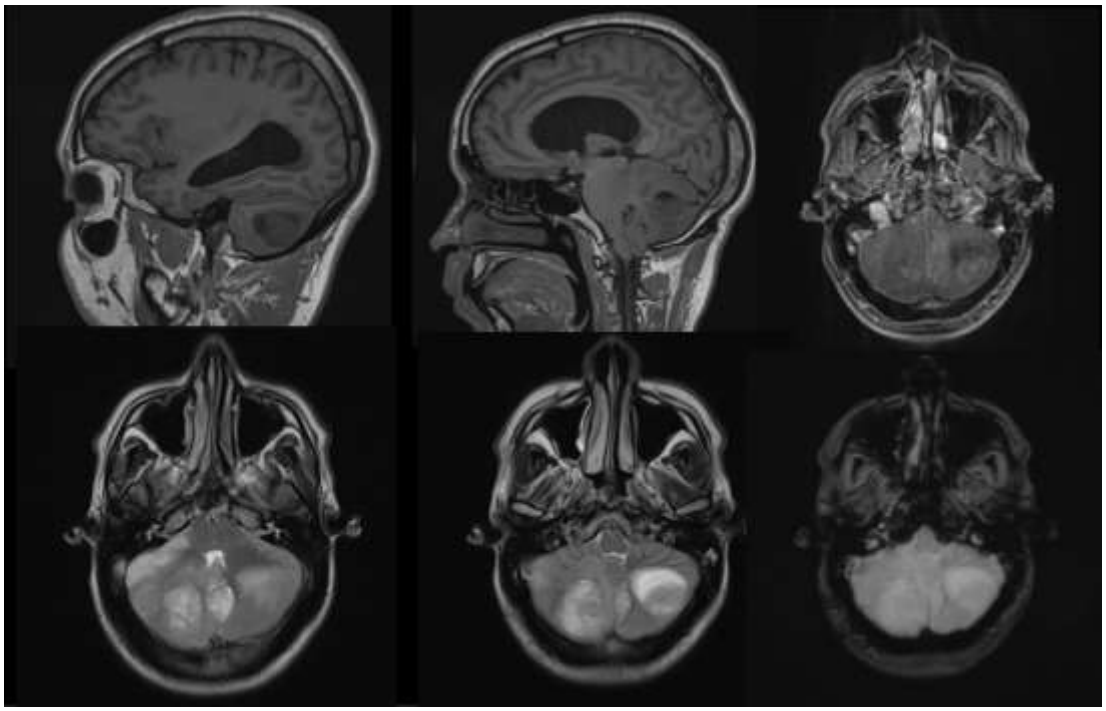

Figure 2: Cerebral MRI at admission

After clinical stabilization, the patient was admitted in the operating room for a stereotactic biopsy (Fig 3 and 4). The anatomopathological exam of the collected samples are in favor of a WHO 2016 grade IV medulloblastoma. The clinical outcome was good. The patient is currently awaiting resection surgery.

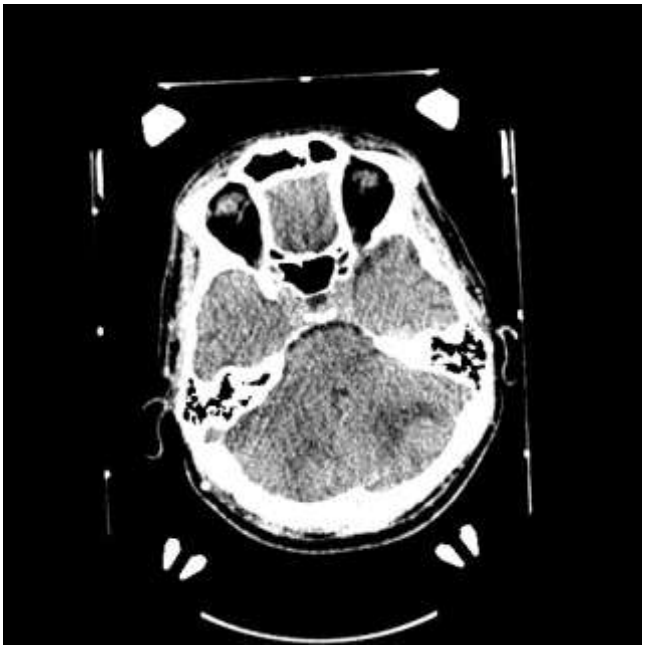

Figure 3: CT scan done with the stereotactic frame in place

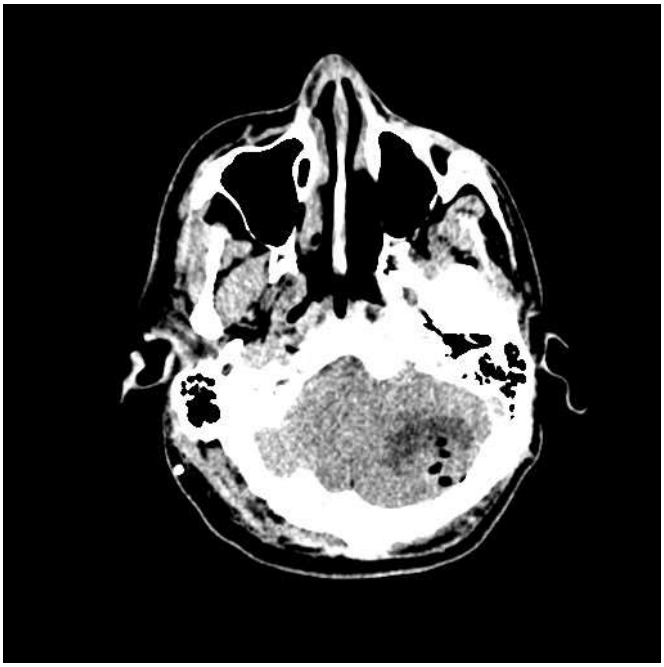

Figure 4: CT scan done after the stereotactic biopsy

DISCUSSION

Although medulloblastomas are the most common central nervous system tumor, accounting for 12 to 25% of all childhood central nervous system tumors, they are very rare in adults, representing only 0,4 to 1% of all adult tumors [2]. Our patient was diagnosed at 37 years old, which is a quite rare presentation, even if there are 13 cases of patients diagnosed with medulloblastoma at an age superior to 60 years old reported in the literature [3].

Medulloblastoma commonly presents with symptoms of increased intracranial pressure and cerebellar dysfunction evolving over a period of weeks to a few months [3]. Our patients had a similar clinical presentation also appearing progressively over 2 months.

Concerning radiological aspect, usually it shows on a CT scan as hyperdense, well-defined vermian mass with surrounding vasogenic edema, frequently with signs of hydrocephalus, and homogeneous enhancement on contrast material enhanced sequences [4].

On MRI imaging, the typical aspect of medulloblastoma is iso- to- hypointense relative to white matter with a great degree of heterogeneity. As with CT, nearly all enhance following the intravenous administration of contrast material, but the enhancement

is usually heterogeneous [5]. The case we report showed what seemed to be multiple hypodense lesions on the CT scan located in the left and right cerebellar hemispheres. Then on MRI imaging, there was no enhancement after Gadolinium administration. This radiological aspect in this clinical context didn't orient us to the diagnosis of medulloblastoma, as it was indeed more suggestive of multiple cerebellar metastasis.

Advances in molecular studies of medulloblastomas find consequent differences between different subtypes, each one having its own biological and clinical characteristics.

There are 4 subtypes: Wingless (WNT), Sonic Hedgehog (SHH), Group 3 and Group 4. WNT subtype has the best outcome, especially non- metastatic. SHH are the only medulloblastomas that develop in cerebellar hemispheres, their outcome can go from low risk to high risk depending on clinical and molecular findings. Group 3 has the worst outcome and is very metastatic. Group 4 has intermediate outcome although metastatic, recurrence is more late [1].

Concerning surgery, a study done on 787 patients shows that there seems to be no statistically survival benefit of extent of resection for patients with WNT, SHH, or Group 3 patients, as long a residual tumor size is inferior to 1,5 cm3. There was a progression free survival benefit for gross total removal over subtotal removal in patients with Group 4 medulloblastoma [6]. If a gross total removal can't be done during first surgery, a second look operation should be done, if a gross total removal is anatomically feasible [7]. A MRI should be done during the first 48 hours post-resection (level IIIA) [8]. This will show if there is any residual tumor and quantify it. It will also be a baseline imaging for further follow-up studies.

There seems to be no consensus on post-surgery chemotherapy for medulloblastomas, depending on molecular subtypes. Different protocols use vincristine, cisplatin, cyclophosphamides and lomustine.

CONCLUSIONS

Medulloblastomas are lesions that can lay a diagnostic trap on radiological findings, especially on CT scan images. Their treatment strategy should be guided by the immunohistochemical subtype, although no consensus was reached concerning chemotherapy. Post-operative outcome and recurrence risk are also dependent of the molecular subtype.

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