https://doi.org/10.22491/2357-9730.115488

Case Report

Central nervous system high-grade neuroepithelial tumor with BCOR alteration: a short report

Marcelo Ughini Crusius[1], Pablo Santiago[2], Marco Antônio Delazeri[3], Maria Eduarda Kegler[3], Rodrigo Alberton da Silva[3], Matheus Henrique Benin Lima[3], Orly Matheus Gampert Spannenberg[3], Julia Belato Teixeira[4]

ABSTRACT

Central nervous system high-grade neuroepithelial tumors with BCOR alteration are rare. Currently, there are only 24 cases reported in the literature. These tumors are characterized by a change involving the BCOR gene and have a poor prognosis. Studies are needed to improve the current therapy and outcomes of these neoplasms. This case report describes the clinical history of a patient with this disease and aims to contribute to the current knowledge about this new entity.

Keywords: *Neurosurgery; Neuro-oncology; Neuropathology*

Clin Biomed Res. 2022;42(1):93-95

1 Departamento de Neurocirurgia, Hospital São Vicente de Paulo. Passo Fundo, RS, Brasil.

2 Departamento de Oncologia Pediátrica, Hospital São Vicente de Paulo. Passo Fundo, RS, Brasil.

3 Faculdade de Medicina, Universidade de Passo fundo. Passo Fundo, RS, Brasil.

4 Faculdade de Medicina, Pontifícia Universidade Católica. Porto Alegre, RS, Brasil.

Autor correspondente:

Marco Antônio Delazeri
antoniodelazeri@gmail.com
Faculdade de Medicina,
Universidade de Passo Fundo
Rua Teixeira Soares, 817
99010080, Passo Fundo, RS, Brasil.

INTRODUCTION

A central nervous system high-grade neuroepithelial tumor (CNS HGNET) is a neoplasm that belongs to a group previously classified as primitive neuroectodermal tumors (PNETs). This terminology has been extinguished, and these tumors currently participate in the group of embryonal tumor with multilayered rosettes, C19MC-altered (ETMR-C19MC)[1].

The incidence rate of CNS embryonal tumors in children under 5 years of age is 11 cases per 1 million[2]. There are less than 200 cases of ETMR described in the literature[3].

Our case had a tumor named central nervous system high-grade neuroepithelial tumor with BCOR alteration (CNS HGNET-BCOR). BCOR is a gene that interacts with embryological development and epigenetically silences regions of the genome by interacting with histone deacetylases and the polycomb complex 1. Mutations of this gene are associated with disorders of organogenesis during embryonal development[4]. BCOR is characterized by a somatic tandem duplication, which consists of a multiplication of certain genes and genetic segments[5]. It participates in the production of the BCL6 protein, which is related to the function and survival of immune cells and embryonal development[6].

CNS HGNET-BCOR is a subtype of embryonal tumor of the CNS and has a poor prognosis. Survival is 70% over an average of 34 months, decreasing to 50% in cases of recurrence. In a recent study, of 323 non medulloblastoma embryonal tumors, only 3% were CNS HGNET-BCOR[7]. This entity was first described in 2016, and 24 cases have been reported to date[8].

In view of the rarity of this disease and the low number of reported cases, studies are needed to better understand this neoplasm and to develop therapeutic strategies that improve its prognosis. This paper aims to report the case of a patient with CNS HGNET-BCOR.

CASE REPORT

A girl aged 3 years and 5 months sought medical attention with headaches and vomiting for 30 days. A computed tomography scan showed the presence of a space-occupying lesion in the posterior fossa associated with hydrocephalus. She was referred to our emergency department, where she underwent another examination (Figure 1). On the following day, external ventricular derivation was performed, and, on the third day, complete resection of the tumor was obtained with microsurgery. A pathologic evaluation demonstrated a CNS HGNET-BCOR (Figure 2A and 2B). During the second week of hospitalization, the derivation was removed, and the patient was discharged with follow-up.

After 10 weeks, the patient was asymptomatic and was admitted for imaging examinations that showed tumor recurrence. An analysis of possible neoplastic cells in the cerebrospinal fluid was negative. She was operated again after 2 weeks with partial resection. After 2 weeks, she started induction chemotherapy followed by consolidative myeloablative chemotherapy and autologous hematopoietic cell rescue. Then she was discharged with follow-up. Currently, 7 months after autologous hematopoietic cell rescue, the patient is in remission.

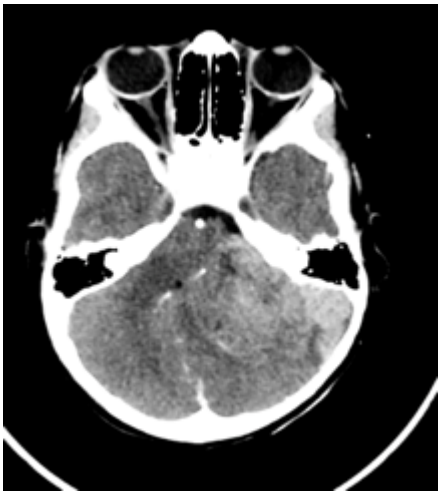

Figure 1: Computed tomography scan showing an expansive lesion in the posterior fossa to the left of the midline with heterogeneous contrast enhancement, measuring about 4.0 x 3.5 cm in the major axial axes. It causes a mass effect on the surrounding structures, determining collapse of the IV ventricle and consequent supratentorial hydrocephalus.

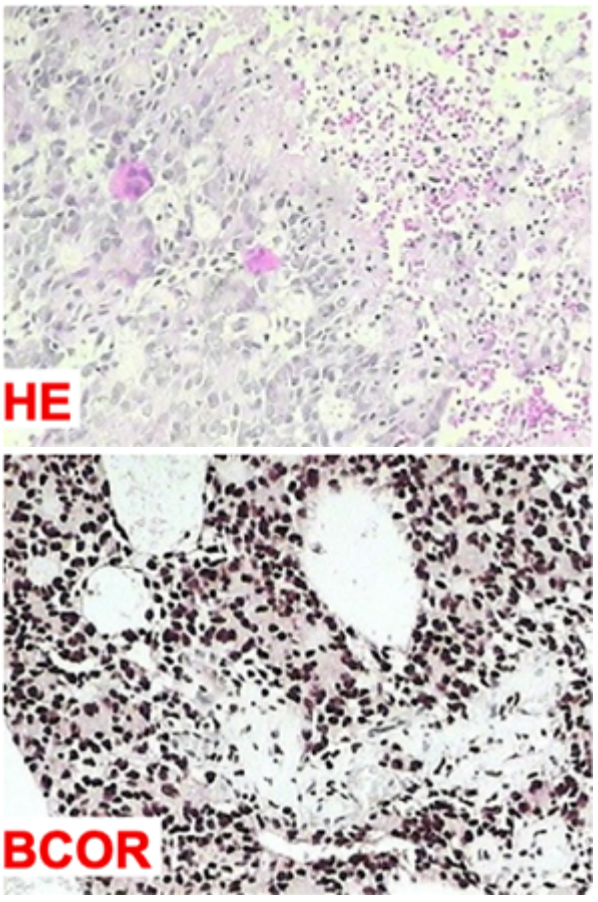

Figure 2: A: Histological section with hematoxylin-eosin staining, B: Histological section showing strong and diffuse expression of the BCOR marker.

DISCUSSION

Twenty-five of CNS HGNET-BCOR were identified in the literature. Most of those occurred in children aged between 7 months and 13 years. Only one patient was an adult (22 years old), and mean age at diagnosis was 5.5 years[8]. The most common tumor site was the infratentorial compartment[8], especially the cerebellar hemisphere[5,8-12]. The tumor site of this case also involved the cerebellum.

Symptoms depend on tumor location. Children with infratentorial tumors frequently present with headaches[9-12], vomiting[8,10,12], and intracranial hypertension[8-10]. The patient in this report had headaches, vomiting, and hydrocephalus proved by imaging examinations.

The CNS HGNET-BCOR is a well-circumscribed tumor[8,10] characterized by a combination of fusiform to oval cells[8,10] with fine chromatin[5,8,10,13]. This tumor may have microcystic features[5,8,10,12], perivascular pseudorosettes[5,8,9-11], necrotic foci[5,10,11,13], and mitotic figures[9,10,13]. Microvascular proliferation is identified

as well[10,11]. Also, fibrillary cytoplasmic processes may exist, suggesting glial differentiation[8].

The changes in this case are similar to those found in other reports. They included a neoplasm with ovoid cells, perivascular pseudorosettes, necrotic foci, and mitotic figures (Figure 2A). Well-distributed chromatin and stromal hyalinization were also identified.

An immunohistochemistry analysis revealed a strong and diffuse expression of BCOR (Figure 2B). This finding was also highlighted in other studies[7,8,10-13].

From the pathologic and clinical viewpoints, the CNS HGNET-BCOR can be mistaken for other CNS tumors, such as anaplastic ependymomas, glioblastomas, medulloblastomas, or other embryonic tumors. Thus, immunohistochemistry has a major role in making the diagnosis with specificity[5].

The first step in the present case was performing external ventricular derivation and complete tumor resection, but recurrence was detected in a short period (2 months). Therefore, another surgical intervention, chemotherapy, and stem-cell transplant were performed according to the Head Start protocol[14]. Radiotherapy and spinal cord irradiation were not used because of the patient's age, adverse effects, and good outcomes with other treatment choices[8,14].

Unfortunately, the prognosis of this disease is poor. Previous data show that the overall survival rate is 70% over a mean follow-up of 34 months, decreasing to 50% in patients with recurrence (mean follow-up of 58 months) and to 33% in patients with metastasis. However, it is still early to determine an association between patient profile and tumor profile for prognosis[8].

Fortunately, after the second surgical intervention and chemotherapy, the tumor regressed, and after autologous hematopoietic cell rescue, the patient has been in remission for 7 months as shown by follow-up imaging examinations.

REFERENCES

1. Louis DN, Perry A, Reifenberger G, von Deimling A, Figarella-Branger D, Cavenee WK, et al. The 2016 World Health Organization Classification of Tumors of the Central Nervous System: a summary. *Acta Neuropathol*. 2016;131(6):803-20.
2. PDQ® Pediatric Treatment Editorial Board. Childhood medulloblastoma and other central nervous system embryonal tumors treatment (PDQ®): Health Professional. In: *PDQ Cancer Information Summaries* [Internet]. Bethesda: National Cancer Institute; 2002 [updated 2022 Feb 25; cited 2019 Oct 20]. Available from: https://www.cancer.gov/types/brain/hp/child-cns-embryonal-treatment-pdq
3. Shah AH, Khatib Z, Niazi T. Extracranial extra-CNS spread of embryonal tumor with multilayered rosettes (ETMR): case series and systematic review. *Childs Nerv Syst*. 2018;34(4):649-54.
4. Astolfi A, Fiore M, Melchionda F, Indio V, Bertuccio SN, Pession A. BCOR involvement in cancer. *Epigenomics*. 2019;11(7):835-55.
5. Yoshida Y, Nobusawa S, Nakata S, Nakada M, Arakawa Y, Mineharu Y, et al. CNS high-grade neuroepithelial tumor with BCOR internal tandem duplication: a comparison with its counterparts in the kidney and soft tissue. *Brain Pathol*. 2018;28(5):710-20.
6. Medline Plus. *BCOR gene*: BCL6 corepressor [Internet]. Bethesda: National Library of Medicine; [updated 2020 Aug 18; cited 2019 Oct 20] Available from: https://ghr.nlm.nih.gov/gene/BCOR
7. Sturm D, Orr BA, Toprak UH, Hovestadt V, Jones DTW, Capper D, et al. New brain tumor entities emerge from molecular classification of CNS-PNETs. *Cell*. 2016;164(5):1060-72.
8. De Lima L, Sürme MB, Gessi M, Mastronuzzi A, Miele E, Tamburrini G, et al. Central nervous system high-grade neuroepithelial tumor with BCOR alteration (CNS HGNET-BCOR) – case-based reviews. *Childs Nerv Syst*. 2020;36(8):1589-99.
9. Al-Battashi A, Al Hajri Z, Perry A, Al-Kindi H, Al-Ghaithi I. A cerebellar high-grade neuroepithelial tumour with BCOR alteration in a five-year-old child a case report. *Sultan Qaboos Univ Med J*. 2019;19(2):153-6.
10. Appay R, Macagno N, Padovani L, Korshunov A, Kool M, André N, et al. HGNET-BCOR tumors of the cerebellum: clinicopathologic and molecular characterization of 3 cases. *Am J Surg Pathol*. 2017;41(9):1254-60.
11. Ferris SP, Velazquez Vega J, Aboian M, Lee JC, Van Ziffle J, Onodera C, et al. High-grade neuroepithelial tumor with BCOR exon 15 internal tandem duplication-a comprehensive clinical, radiographic, pathologic, and genomic analysis. *Brain Pathol*. 2020;30(1):46-62.
12. Kirkman MA, Pickles JC, Fairchild AR, Avery A, Pietsch T, Jacques TS, et al. Early wound site seeding in a patient with central nervous system high-grade neuroepithelial tumor with BCOR alteration. *World Neurosurg*. 2018;116:279-84.
13. Haberler C, Reiniger L, Rajnai H, Kalev O, Gelpi E, Tamesberger M, et al. Case of the month 1-2019: CNS high-grade neuroepithelial tumor with BCOR alteration. *Clin Neuropathol*. 2019;38(1):4-7.

Received: June 21, 2021
Accepted: July 19, 2021