

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: <http://Elsevier.com/locate/radcr>

Neuroradiology

Lethal disseminated dysembryoplastic neuroepithelial tumor following West Nile virus: Report of a very unusual combination

Amy Farkas MD*, David Joyner MD, Ali G. Saad MD, Mark Anderson MD, Majid Khan MD

The University of Mississippi Medical Center, 2500 N. State Street, Jackson, MS 39216, USA

ARTICLE INFO

Article history:

Received 31 October 2017

Accepted 7 February 2018

Available online

Keywords:

Dysembryoplastic neuroepithelial tumor

Leptomeningeal carcinomatosis

West Nile virus

ABSTRACT

Dysembryoplastic neuroepithelial tumors (DNETs) are typically benign World Health Organization (WHO) grade I tumors of the cortical or deep gray matter with a favorable prognosis. We encountered a patient with DNET who has been evaluated and treated for West Nile encephalitis 7 months before presentation. Over the course of 2 years, the patient developed diffuse leptomeningeal carcinomatosis. As the disease burden increased, the patient eventually became quadriparetic. The patient elected for hospice care and expired shortly thereafter. Autopsy revealed DNET (WHO grade I) with extensive involvement of the cervical, thoracic, and lumbar spinal cord, bilateral cerebellar hemispheres, brainstem, the cortex of the right frontal and temporal lobes, and meningeal carcinomatosis of the brain and spinal cord. Mortality from DNET is rare, and as per our extensive literature search, there has been only 1 case reported of death attributed to seizures from this diagnosis. To the best of our knowledge, this is the only case of disseminated DNET with meningeal infiltration or carcinomatosis resulting in mortality.

© 2018 the Authors. Published by Elsevier Inc. under copyright license from the University of Washington. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Case report

A 36-year-old man was transferred to our care for hydrocephalus and a T2-T3 spinal cord lesion. He had a known history of West Nile encephalitis, diagnosed 7 months before presentation by viral polymerase chain reaction on a cerebrospinal fluid

(CSF) specimen. On presentation, he endorsed a 2-week history of migraine and blurred vision. His additional symptoms included weakness, numbness, urinary incontinence, and vomiting. On physical examination, he was noted to have decreased strength in his left lower extremity, clonus in his right foot, and a positive left Babinski sign. Imaging demonstrated enhancement of the filum terminale and of nerve roots in the

Competing Interests: The authors have declared that no competing interests exist.

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

* Corresponding author.

E-mail address: afarkas@umc.edu (A. Farkas).

<https://doi.org/10.1016/j.radcr.2018.02.014>

1930-0433/© 2018 the Authors. Published by Elsevier Inc. under copyright license from the University of Washington. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

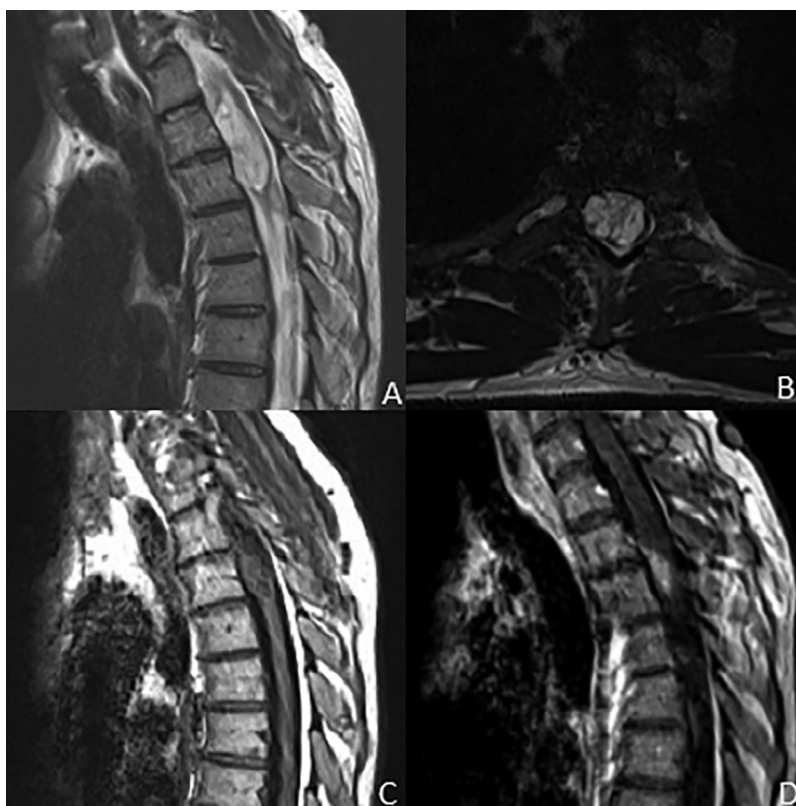


Fig. 1 – Sagittal (A) and axial (B) T2-weighted magnetic resonance imaging (MRI) of the thoracic spine on the patient’s initial presentation demonstrates an expansile intramedullary mass from T1 to T3-4. Sagittal T1-weighted pre- and postcontrast MRI (C and D) demonstrate enhancement of the mass.

lumbar and sacral regions (Fig. 1). This is thought to represent leptomeningeal spread from the patient’s known thoracic spinal cord mass.

An endoscopic third ventriculostomy was performed. CSF specimen was sent for cytology at the time of the procedure and was negative for malignancy. The patient’s symptoms initially improved postoperatively; however, he then proceeded to present to the hospital multiple times in the following months with complaints of increasing headaches, enuresis, and decreased visual acuity.

Three months after the ventriculostomy, he was readmitted for intractable headache, pain in the neck, lower back, and left thigh, as well as worsening lower extremity weakness. Lumbar imaging showed nodular leptomeningeal disease with a prominent dural-based mass in the distal lumbar spinal canal. He underwent lumbar laminectomy and a biopsy of a lumbar subdural lesion. Pathology came back as dense fibrous connective tissue with chronic inflammation and myxoid-like foci, and was negative for malignancy. Imaging repeated 1 month after the procedure showed worsening of leptomeningeal enhancement.

The patient re-presented with continually worsening neurologic symptoms and underwent multiple shunt revisions. Throughout his clinical course, serial imaging demonstrated severe progression of a cervical-thoracic intramedullary spinal cord mass, a sacral tumor, tonsillar herniation, and diffuse carcinomatosis. He had repeat biopsy of an enhancing cerebellar mass, but again the sample showed no evidence of his ma-

lignancy. Additionally, he continued to show West Nile virus (WNV) activity, with persistent immunoglobulin M antibodies in the CSF.

Ultimately, the patient’s symptoms worsened as he became quadriparetic. Two years after his initial presentation to our institution, magnetic resonance imaging (MRI) yet again showed worsening diffuse leptomeningeal carcinomatosis (Fig. 2). One month after the MRI confirming further advancement of his disease, the patient and his family elected for hospice care and he unfortunately expired shortly thereafter.

On autopsy, he was found to have dysembryoplastic neuroepithelial tumor (DNET) (World Health Organization grade I), with involvement of the cervical, thoracic, and lumbar spinal cord, bilateral cerebelli, brainstem, the cortex of the right frontal and temporal lobes, and meningeal carcinomatosis of the brain and spinal cord (Fig. 3).

Discussion

DNET is a typically benign superficial cortical neoplasm. For a long time, it was considered a hamartomatous lesion but molecular studies and clonal analysis confirmed its neoplastic nature. More than 60% of DNET are located in the temporal lobe. DNET is a slowly growing tumor, and the morbidity associated with this neoplasm consists virtually of only intractable, difficult to manage, seizures. Most patients

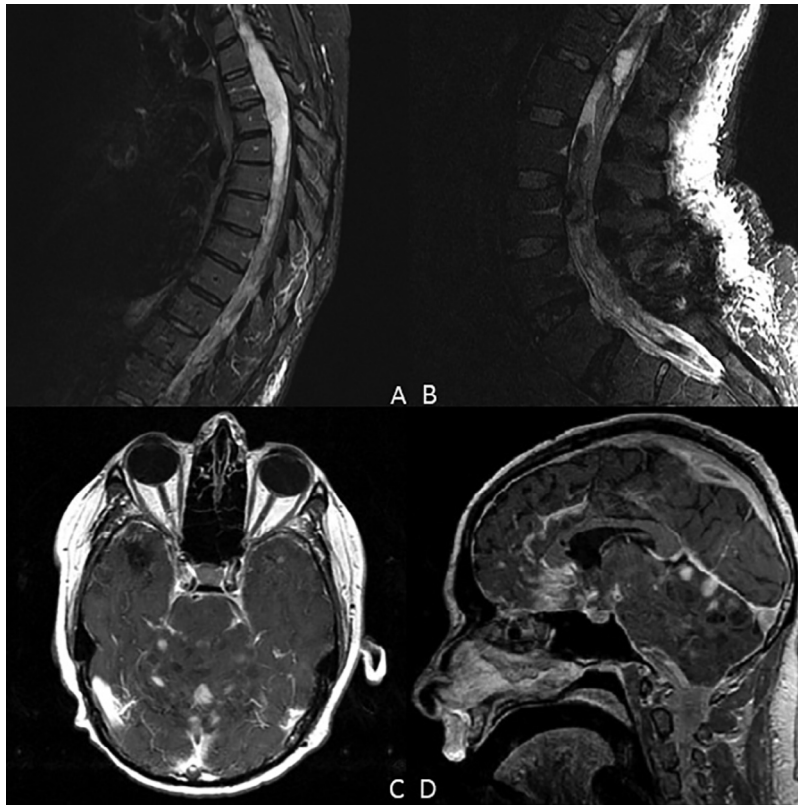


Fig. 2 – Sagittal short tau inversion recovery (STIR)-weighted magnetic resonance imaging (MRI) of the thoracic spine (A) demonstrates marked interval increase in the expansile intramedullary cord lesion. Sagittal STIR-weighted MRI of the lumbar spine (B) demonstrates diffuse leptomeningeal and cerebrospinal fluid signal continuous with the thoracic mass and inseparable from the expanded distal spinal cord. Axial (C) and sagittal (D) T1-weighted postcontrast MRI of the brain demonstrate diffuse leptomeningeal enhancement.

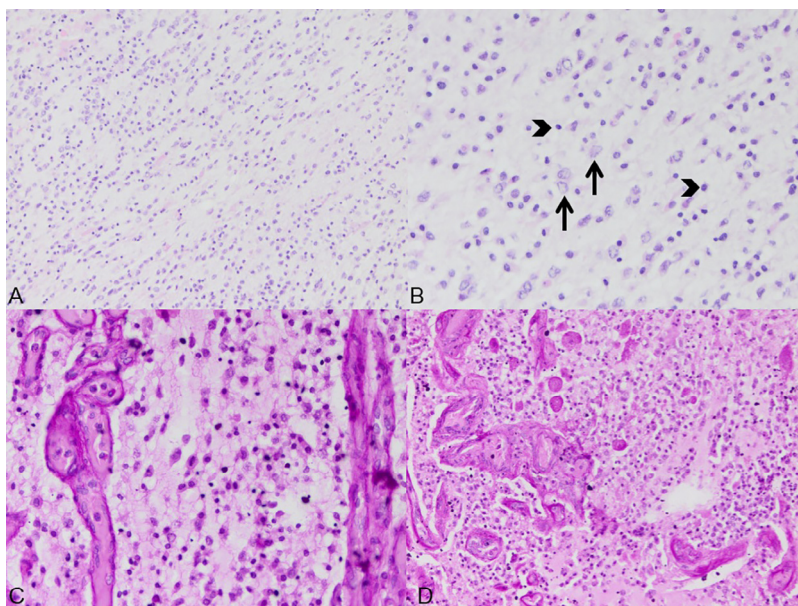


Fig. 3 – (A) Histologic section of the tumor shows a cellular neoplasm with mostly round tumor cells. No necrosis or vascular proliferation is noted (hematoxylin and eosin stain; 40 \times). (B) Higher magnification shows occasional neurons “floating” within a myxoid space (arrows). These neurons are scattered among smaller and hyperchromatic cells representing astrocytes (arrowheads) (hematoxylin and eosin stain; 200 \times). (C) The tumor shows heavy infiltration of the cerebral leptomeninges (hematoxylin and eosin stain; 200 \times). (D) Heavy infiltration of spinal leptomeninges is noted as well (hematoxylin and eosin stain; 40 \times).

demonstrate symptomatic improvement even with subtotal resection of the tumor [1].

Review of the English language literature discloses a single case of mortality due to DNET. In that case, the patient's demise was attributed to complications related to seizure. Although the severity of the complication was unexpected, the clinical course of the patient in the previously published case report was otherwise characteristic of the tumor [2].

Widespread central nervous system (CNS) dissemination of DNET is exceedingly rare. Only 1 case of DNET with spinal drop metastasis has been reported. In that case, the primary tumor was intraventricular which inherently increased the likelihood of CSF dissemination and drop metastasis [3]. Leptomeningeal carcinomatosis is most commonly associated with hematogenous spread of a breast or lung primaries. Primary CNS tumors that may result in leptomeningeal dissemination include anaplastic astrocytoma, glioblastoma, medulloblastoma, and ependymoma [4].

Here, we report the second case of fatality due to disseminated CNS DNET. Given that disseminated DNET lesions are rarely reported, it is very tempting to postulate that the confounding feature of the patient's prior exposure to WNV and resultant encephalitis have contributed to this fulminant form of DNET dissemination. WNV has been thought to influence glioma genesis or glioma development through the induction of S100B. Activation of the S100B pathway is known to

promote glioma growth. From these data, we believe that WNV may influence glioma through the pathways activated by S100B, specifically activated in dysembryoplastic neuroepithelial tumors [5]. We propose that this additive effect may have led to an unusually aggressive behavior in a low-grade tumor. Additional studies are needed, as it is possible that there are other factors through which this interaction may occur.

REFERENCES

- [1] Grossman RI, Yousem DM. *Neuroradiology, the requisites*. Mosby Inc.; 2003. ISBN:032300508X.
- [2] Sîrbu C-A. Dysembryoplastic neuroepithelial tumor and probable sudden unexplained death in epilepsy: a case report. *J Med Case Rep* 2011;5:441. doi:10.1186/1752-1947-5-441.
- [3] Kim SK, Jeong MY, Jung TY, Kang HK, Yoon W. Diffuse ependymal dysembryoplastic neuroepithelial tumor causing spinal drop metastases: a case report. *Korean J Radiol* 2012;13(4):492-5. doi:10.3348/kjr.2012.13.4.492.
- [4] Balm M, Hammack J. Leptomeningeal carcinomatosis. Presenting features and prognostic factors. *Arch Neurol* 1996;53(7):626-32.
- [5] Kuwar RB, Stokic DS, Leis AA, Bai F, Paul AM, Fratkin JD, et al. Does astroglial protein S100B contribute to West Nile neuroinvasive syndrome? *J Neurol Sci* 2015;358(1-2):243-52.