PRIMARY NEUROENDOCRINE TUMOR OF THE BRAIN: IS IT BECOMING MORE COMMON?

Karen Greenberg[*,1], **Jonathan Thomas**[*] **and Alexandra Lopez**[**]
[*]Drexel Neurosciences Institute, Drexel University College of Medicine, 219 North Broad St 7th Floor, Philadelphia, PA 19102., [**]One Medical Center Boulevard, Upland, PA 19013.

ABSTRACT Neuroendocrine tumours (NETs) are neoplasms derived from neuroendocrine cells, which carry traits of both hormone-producing cells and nerve cells. The most common sites of origin for NETs are the lungs, liver, gastrointestinal tract, and pancreas. Central nervous system (CNS) involvement of NETs can occur with metastasis, but it is very rare to have NETs arise primarily from the CNS. A 71-year-old male arrived at the Emergency Department for evaluation of change in mental status. The patient complained of confusion, unsteady gait, dizziness, and vision changes. The patient's neurologic examination demonstrated right upper outer quadrant field cut to both eyes and decreased sensation to right upper and lower extremities. Computed Tomography of the head revealed a mass lesion in the left occipitoparietal lobe, and Magnetic Resonance Imaging of the brain showed a complex, enhancing, and hemorrhagic mass within the left parietal lobe. CT of the chest, abdomen, and pelvis demonstrated no other source of tumour. The patient went on to have a positron emission tomography (PET) scan one month after surgery that again did not show any evidence of extracranial primary tumour. The ultimate diagnosis was primary central nervous system NET. To date, less than 10 cases of primary CNS NETs have been reported.

KEYWORDS Neuroendocrine Tumor, Central Nervous System, Brain, Primary Brain Neuroendocrine Tumor, Carcinoid

Introduction

Neuroendocrine tumours (NETs) are neoplasms derived from neuroendocrine cells, which carry traits of both hormone-producing cells and nerve cells. The most common sites of origin for NETs are the lungs, liver, gastrointestinal tract, and pancreas. Central nervous system (CNS) involvement of NETs can occur with metastasis, especially the high-grade variant, but it is very rare to have NETs arise primarily from the CNS. Here we present a case of a primary brain NET located in the left occipitoparietal lobe. To date, less than 10 cases of primary CNS NETs have been reported.

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[1]Dr. Greenberg, Drexel Neurosciences Institute, Drexel University College of Medicine, 219 North Broad St 7th Floor, Philadelphia, PA 19102, USA. Kjgreenb@gmail.com

Case presentation

A 71-year-old male with a history of hypertension, coronary artery disease, and congestive heart failure arrived with Emergency Medical Services for evaluation of change in mental status for three days. The patient's wife stated that the patient had not been acting himself. For example, he made himself a cup of coffee, but instead of drinking the coffee, he put his hand in it. The patient himself complained of unsteady gait, dizziness, and tremors to bilateral lower extremities. He also complained of vision changes accurately described as missing objects when trying to reach for them. Initial vital signs obtained were the temperature of 99.2 orally, blood pressure 122/68, heart rate 77, respiratory rate 14, and pulse oximetry 98% on room air. Neurological examination showed cranial nerves three through twelve intact, normal gaze, right upper outer quadrant field cut in both eyes, normal strength to all limbs, normal speech, no ataxia, and decreased sensation to right upper and lower extremities.

Lab values were all within normal limits. Computed Tomography (CT) of the head revealed a mass lesion in the left occipitoparietal lobe measuring up to 4.1 cm with associated hemorrhagic components. There was associated vasogenic oedema

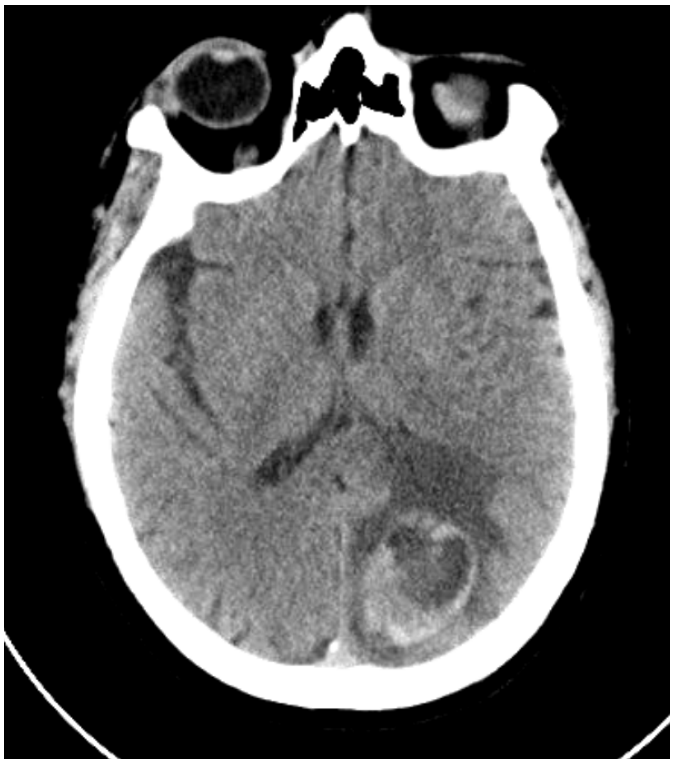

Figure 1: Noncontrast CT of the head demonstrating a mass lesion in the left occipitoparietal lobe measuring 4.1 cm with associated hemorrhagic components. There is associated vasogenic edema with local mass effect but no midline shift, herniation, or hydrocephalus.

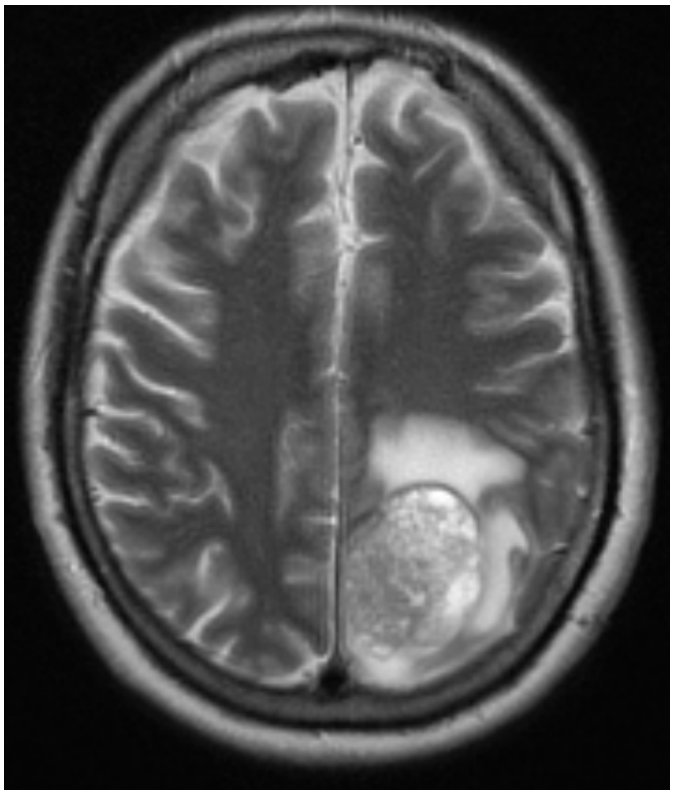

Figure 2: MRI of the brain without contrast showing a complex, enhancing, and hemorrhagic mass within the left parietal lobe.

with the local mass effect but no midline shift, herniation, or hydrocephalus (Figure 1). Magnetic Resonance Imaging (MRI) of the brain without contrast showed a complex, enhancing, and hemorrhagic mass within the left parietal lobe concerning for a primary glioma. A metastatic lesion was considered less likely (Figure 2). CT of the chest, abdomen, and pelvis demonstrated no other source of tumour. The patient was taken to the operating room three days later for a left craniotomy for resection of parietal lobe mass. Pathology ultimately revealed mostly granular chromatin and intermediate-sized cells, with occasional larger bizarre cells. In some areas, nuclear moulding was apparent. Mitotic activity was brisk. Selected IHC stains were done and showed tumour cells to be cytokeratin positive (AE1/3 and more notably Cam 5.2) and GFAP negative. Based on these results, additional stains showed tumour cells to be strongly diffusely Synaptophysin positive and positive for TTF1 in a partly patchy but significant number of tumour cells. PSA was negative. These findings supported the diagnosis of a poorly differentiated high-grade small cell neuroendocrine carcinoma. The patient went on to have a positron emission tomography (PET) scan one month after surgery that again did not show any evidence of extracranial primary tumour. Four weeks after surgery, the patient underwent stereotactic radiosurgery to the postoperative cavity delivered in 5 fractions, with surveillance MRIs every three months to detect any local or distant CNS disease. He is also undergoing surveillance whole-body PET scanning. He is living at home with his wife with improvement to his vision and no focal neurologic deficit.

Discussion

NETs were called carcinoid 100 years ago and were considered benign neoplasms. Currently, they are considered to be malignant, and the World Health Organization histopathological classification eliminated the carcinoid label in 2000. NETs are increasing and are, therefore attracting more interest and attention [1].

The neuroendocrine system comprises a complex architecture of cells that are capable of producing NETs throughout the body. While NETs are known to develop throughout the gastrointestinal and respiratory tracts, there are only a few reports to suggest NETs originating primarily from the brain. NETs can be well-differentiated or poorly differentiated, and in the high grade poorly differentiated types, they can be a large cell or small cell variants. The incidence of NETs has been prominently increasing over the past two decades. This is believed to be secondary to increased detection rates [2]. Generally, the majority of NET metastases occur in the liver, lungs, and bone. Involvement of other sites is much rarer. NETs are considered to be the origin of brain metastases in 1.5-5% of all patients that have brain metastases. In 70% of these patients, the primary tumour was located in the bronchi or the lungs. If brain metastases are present, lymph node metastases are found in 75%, and liver metastases are found in 50% of these patients. Primary unknown NET represents just 13% of these tumours [1].

Because the leading cause of death in patients with brain NETs is secondary to systemic disease progression, the prognosis may be substantially different from metastatic brain NETs. Primary brain NETs appear to be more similar to non-metastatic NETs in which the ten-year overall survival rate is 47% [2].

Conclusion

A literature search found only 8 cases of primary NET reported [1,2,3]. Three cases were reported in 2004, one case in 2005, three cases in 2014, and a recent case were reported in 2019. Now that we were reporting yet another case in 2019, practitioners need to be aware of the increasing incidence and treatment options.

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Conflict of interest

There are no conflicts of interest to declare by any of the authors of this study.

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