



# An Unusual Case of Papillary Thyroid Carcinoma with Solitary Cerebral Metastases Mimicking Cavernous Hemangioma

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## Abstract

Papillary Thyroid Carcinoma (PTC) is the most common type of thyroid cancer and usually has a favorable prognosis as it has a low rate of recurrence and metastasis. The incidence of brain metastases in thyroid carcinoma is low while solitary brain metastases are even rare. In this case, we introduced a male patient 11 years after PTC resection. He was brought to the emergency department for sudden fainting and CT showed bilateral occipital lobe lesions with hemorrhage in the right lesion. It is worth noting that the left occipital lobe lesion was found by physical examination in 2017 and no enlargement was observed during subsequent examination (the last one was in June 2020). Meanwhile, the right occipital lobe lesion was not found until he fainted. We initially diagnosed the intracranial lesions as cavernous hemangioma based on imaging findings and clinical features while postoperative pathological sections revealed PTC. This case reminds us that PTC may appear to be primary intracranial disease, especially cavernous hemangioma, and intracranial metastasis of PTC can be multisite and staged.

**Keywords:** Papillary thyroid carcinoma; Cerebral metastasis; Cavernous hemangioma

## Introduction

PTC is the most common type of thyroid cancer, constituting approximately 80% of thyroid malignancies [1]. It is usually associated with a favorable prognosis and low recurrence rate, as it rarely involves distant organs, and local lymph nodes are the main site of metastasis [2,3]. Distant metastasis of PTC occurs in merely 2% of all patients, although local lymph nodes are frequently involved. Among the patients with distant metastasis, the lungs (53.4%) and bones (28.1%) have been reported to be the main sites of distant metastasis. The incidence of solitary cerebral metastasis is less than 5% according to various studies [3-5]. Distant metastasis is associated with a worse prognosis than local metastasis, although the overall long-term survival of patients with distant metastasis is approximately 50% [6]. In this case, the *in situ* PTC was thoroughly removed 11 years ago, and there were no metastatic lesions according to a radioactive I131 examination. Moreover, there were no signs of local recurrence on follow-up MRI scans after the operation. Only a left occipital lobe lesion with a slow growth rate was found during a routine cranial MRI examination 7 years later. The lesion behaved like cavernous hemangioma. Then, 11 years after the resection of the primary tumor, the right occipital lobe also became involved, and cerebral hemorrhage occurred. We finally confirmed that the patient had metastatic PTC by pathological examination of the specimen. We report this rare case to emphasize that PTC with intracerebral hemorrhage is similar to cavernous hemangioma in clinical course, symptoms and MRI findings. The differential diagnosis between cavernous hemangioma and metastatic PTC requires careful consideration.

## Case Presentation

A 65-year-old man who underwent thyroidectomy due to papillary thyroid cancer 11 years ago fainted at home for no reason and was immediately sent to the hospital. He was hemodynamically

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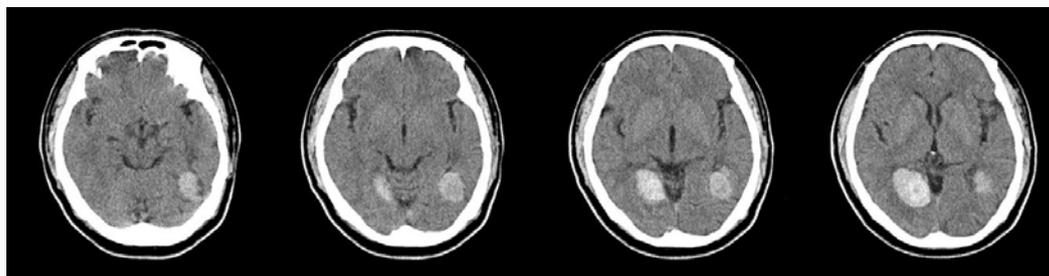
stable and not afebrile in the emergency room. He had no headache, nausea, vomiting or seizures during the whole process. Physical examination, including neurological examination, showed clear consciousness, no movement disorder of his limbs, normal muscle tension in the extremities and a narrowed bilateral visual field, of which the left visual field defect was more severe. Hematological and biochemical examinations, including blood tests, urine tests, and drug tests, were all negative.

An emergency CT scan was recommended; the CT scan showed a high-density lamellar shadow in the left temporal lobe (Figure 1), measuring 2.5 cm × 2.0 cm, with a clear border, a surrounding circular hypointense edematous zone, and no significant compression of the posterior horn of the left ventricle; and a nodular hyperdense shadow in the right occipital lobe, measuring approximately 3.8 cm × 2.5 cm, with a CT value of 62 HU, a surrounding hypointense lamellar shadow, and a clear border, and the posterior horn of the right lateral ventricle was clearly defined. Cranial magnetic resonance examination was advised considering the possibility of intracranial lesions complicated with cerebral hemorrhage. MRI examination revealed a space-occupying lesion measuring approximately 2 cm × 3 cm in the left occipital lobe (Figure 2). The lesion showed iso- or slightly hypointense signals on T1WI and isointense signals on T2WI. Moreover, a 4 cm × 5 cm lesion with signs of hemorrhage was found in the right occipital lobe. The lesion showed hyper or irregular hypointense signals on T1WI and hyperintense or mixed signals on T2WI. Diffusion-weighted imaging showed a lesion in the left

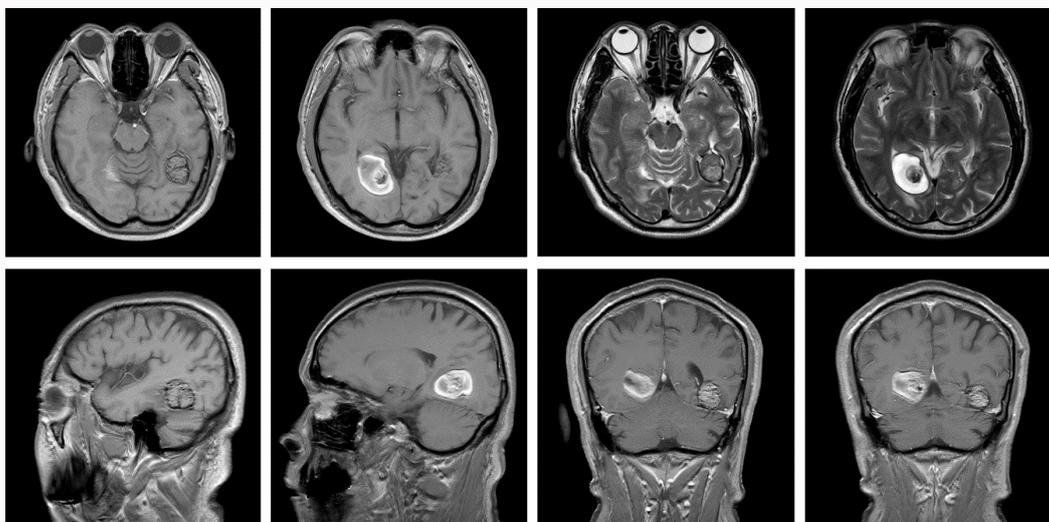
occipital lobe with an isointense signal and a right lesion with uneven high signal accompanied by a low-signal centre. MRI examination of other parts of the body, including the lungs, bones, and liver, found no abnormal sign. The MRI findings were consistent with cavernous hemangioma, while the patient's history of thyroid cancer raised concerns about possible hemorrhagic brain metastases.

Interestingly, a left occipital lobe lesion was found in this patient through MRI during a routine re-examination in October 2017 (Figure 3). The lesion was roughly kidney-shaped, with a slightly high signal on T1WI and a high signal on T2WI. There was no obvious peripheral invasion or ventricular compression. The diagnosis of cavernous hemangioma was made first. Nonsurgical treatment was administered based on the patient's wishes, and regular follow-up examinations were performed. The size of the lesion on MRI did not increase significantly in November 2018 or June 2020. The lesion even seemed to undergo a slight reduction in size in 2018.

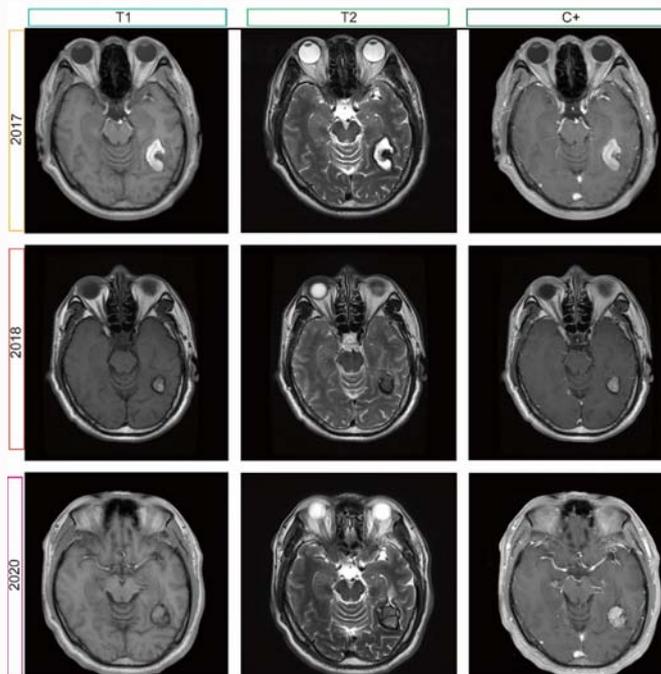
The patient reported no symptom, and the previous treatment was continued. At the time of this visit, he fainted suddenly, and a hemorrhagic lesion in the right occipital lobe was found. The patient was diagnosed with bilateral occipital cavernous hemangioma with intracranial hemorrhage in the right lesion. Considering that the patient had a history of PTC, these lesions could not be excluded from metastatic tumors. Hematoma removal and resection of the lesions in the bilateral occipital lobes were performed based on oncological surgical standards.



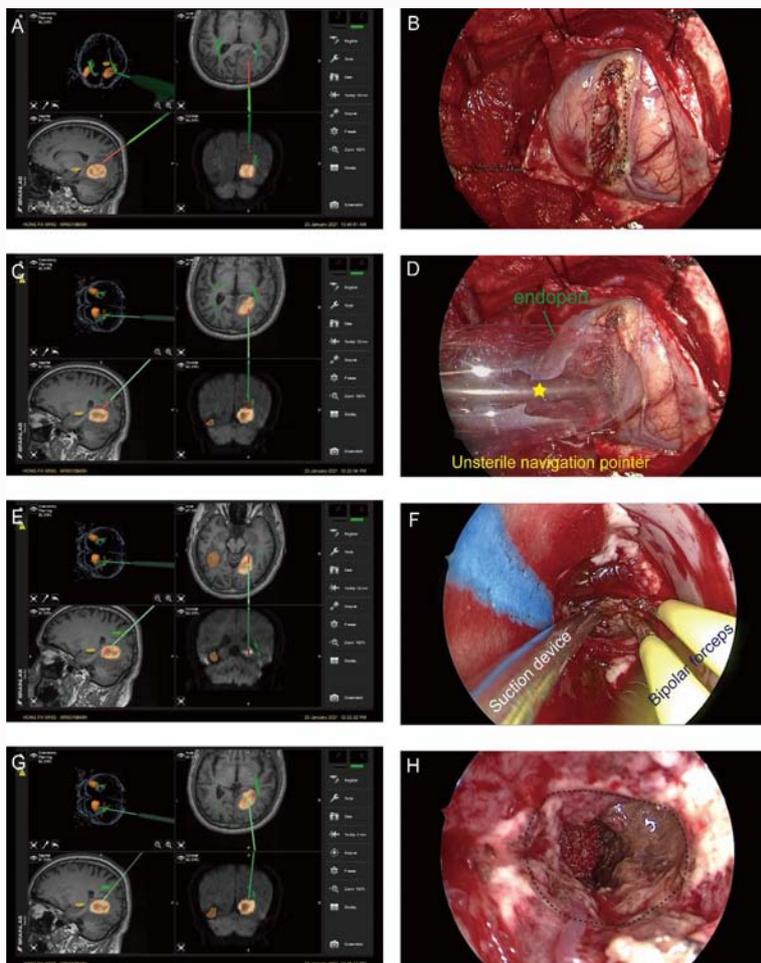
**Figure 1:** CT scan shows bilateral occipital lesions.



**Figure 2:** T1WI (upper row, left) and T2WI (upper row, right) scans of the lesions in the bilateral occipital lobes (upper row); sagittal (lower row, left) and coronal (lower row, right) images of the lesions in the bilateral occipital lobes.



**Figure 3:** Variation of the lesion in the left occipital lobe from 2017 to 2018 and 2020 (images in a row acquired in the same year and each column represents T1WI, T2WI and enhanced MRI respectively).



**Figure 4:** Surgical procedure.

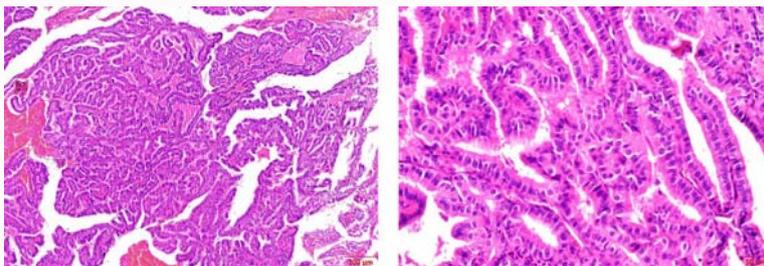


Figure 5: HE staining of the resected tissue revealed PTC (left, magnified at 100 times; right, magnified at 400 times).

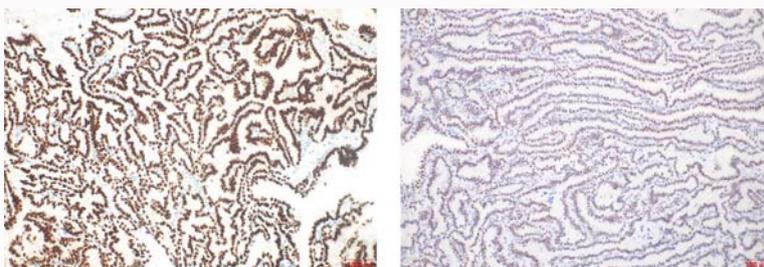


Figure 6: Immunohistochemical staining showed that the tissues were positive for TTF-1 (left) and PAX8 (right).

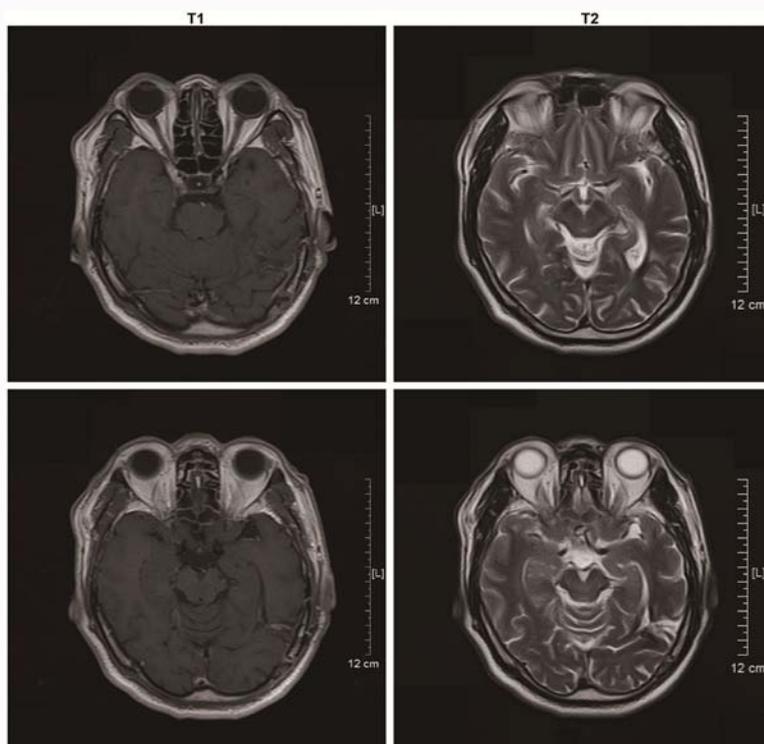


Figure 7: Postoperative MRI.

**Surgical procedure:** After general anesthesia, the patient was placed in the left lateral position and the skin was routinely disinfected. The lesion was relocalized under neuronavigation, and the neuroendoscope was placed into the lesion using endoport after removal of the bone flap. First, the tumor boundary is determined, then the tumor is removed in pieces, and finally the complete removal of the tumor is reconfirmed under neuronavigation (Figure 4). During surgery, the right hematoma was surgically removed, and the bilateral lesions were completely resected. The tissues were sent to the

pathology laboratory for HE staining after the operation (Figure 5). Immunohistochemical staining showed that the tissues were positive for TTF-1 and PAX8 (Figure 6). The pathological diagnosis was PTC. Thus, a clinical diagnosis of metastatic PTC with intracranial hemorrhage was made. The patient was given anti-thyroid cancer treatment after surgery. The bilateral lesions were completely cleared as shown by postoperative MRI (Figure 7). The neurological symptoms improved after surgery, and the patient was suggested to undergo regular follow-up examinations to rule out recurrence or

new metastasis of papillary thyroid cancer.

## Discussion

Metastatic PTC commonly leads to local metastasis. Distant metastasis of PTC is very rare and indicates a poorer prognosis. The lungs, liver, and bones are common sites of distant metastasis. Solitary brain metastases are rare. Metastatic PTC can occur within a few months to 37 years after primary tumor resection [7] and grow slowly at the metastatic site for several years [8,9]. This is consistent with the slow growth rate of the lesion in the left occipital lobe in this case. This metastatic lesion grew slowly for nearly 4 years, making it difficult to distinguish it from benign lesions such as cavernous hemangioma in routine examinations.

In this case, there was no obvious initial neurological symptom, due to the slow growth of the tumor, until the lesion in the right occipital lobe experienced intracerebral hemorrhage. In another case report, Ohta et al. [10] also reported a case of metastatic thyroid cancer with a radiographic appearance similar to that of cavernous hemangioma. Indeed, the location and imaging signs of the lesion are reminiscent of primary intracranial lesions. In particular, the lesion in the right occipital lobe was accompanied by intracerebral hemorrhage in this case. Cerebral hemorrhage is a common manifestation of cavernous hemangioma [11]. Critically, there was no report of intracerebral hemorrhage in metastatic thyroid cancer, which was the most confusing point in this case. Since there was no imaging or clinical sign of metastatic thyroid cancer in other parts of the patient's body, we suspected that the right lesion most likely resulted from local metastasis of the left lesion. We cannot rule out that the tumour was already present in the right occipital lobe at the very start since it could have been growing at an extremely slow rate for several years before causing hemorrhage or appearing on the medical images.

The case of metastatic PTC of the brain in this report is very rare. According to the existing clinical evidence of this patient, metastatic PTC only showed up in the brain and does not involve local lymph nodes or other distant organs. There were two metastatic lesions in the bilateral occipital lobes, including a lesion in the right occipital lobe with intracerebral hemorrhage which has never been reported before.

## Conclusion

This case reflects the characteristic of low malignant degree of PTC. Although multiple intracranial metastases were found in this case, the growth rate was slow as the left occipital lobe lesion initially showed up in MRI in 2017. The lesion even showed a tendency of reduction in 2018, further indicating that it was growing slowly. We

also found a right occipital lobe lesion in MRI. The characteristics of multiple lesions, slow growth rate and hemorrhage led us to make the diagnosis of cavernous hemangioma. This case suggests that metastatic PTC may behave as multiple, benign and hemorrhagic lesions which are similar to intracranial primary diseases such as cavernous hemangioma.

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