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Case Report

Possible association between minor head injury and intratumoral hemorrhage: A metastatic brain tumor from thyroid carcinoma ☆☆☆

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ABSTRACT

A 78-year-old woman presented after a fall and injury in the left forehead. She had undergone surgery for papillary thyroid carcinoma 14 years prior and breast carcinoma 7 years prior. The patient had exhibited uneventful postoperative courses without relapse or metastasis. Anticoagulants or antiplatelet agents were not prescribed her. At presentation, the patient exhibited no focal neurological deficits. Computed tomography revealed a 19 × 20 mm hemorrhagic lesion in the right temporal lobe. On cerebral magnetic resonance imaging, the center of the lesion exhibited inhomogeneous intensity on both T1- and T2-weighted sequences with heterogeneous enhancement. In contrast, the perilesional hemorrhagic regions, appearing hyperintense on both T1- and T2-weighted sequences, showed temporary regression followed by marked enlargement over the subsequent 123 days. The patient underwent total tumor resection. The microscopic findings of the resected specimens were consistent with papillary thyroid carcinoma. Minor head injuries may trigger intratumoral hemorrhage in metastatic brain tumors. Metastasis should be assumed when patients with a history of thyroid carcinoma present with a solitary parenchymal lesion with the appearance of cerebral cavernous malformation, even if they have been disease free for a long period.

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Introduction

Distant metastasis of thyroid carcinoma is considered a rare manifestation [1]. Thyroid carcinomas rarely metastasize to the central nervous system, with an estimated incidence of only 0.1%-5% [2–4]. The interval from the histological diagnosis of thyroid carcinoma to central nervous system metastases can range from 6 months to 41 years [3]. These metastatic foci reportedly cause intratumoral hemorrhages more frequently than other systemic carcinomas [5,6]. Intratumoral hemorrhages caused by minor head injuries are infrequently reported [7,8].

Cerebral cavernous malformations (CCMs) are hamartomatous vascular malformations characterized by intralobar hemorrhages [9,10]. The mean annual hemorrhage rate of CCMs is approximately 2.4% [11]. On magnetic resonance imaging (MRI), CCMs typically exhibit mixed signal intensities with internal loculations [12]. Papillary glioneuronal tumors, malignant melanomas, and astroblastomas are reportedly similar in radiological appearance to CCMs [13–16].

Herein, we present a unique case of metastatic papillary thyroid carcinoma that was diagnosed 14 years after the initial successful surgery, and mimicked a cavernous malformation on MRI.

Case report

A 78-year-old woman fell at home and sustained bruising in the left forehead. The patient had previously undergone surgical resection for papillary thyroid carcinoma 14 years prior and invasive ductal carcinoma of the left breast 7 years prior. After each surgery, the patient had an uneventful course without relapse or distant metastasis. Anticoagulants or antiplatelet agents had not been prescribed for her. At presentation, the patient exhibited no focal neurological deficits. Computed tomography revealed a 19 × 20 mm hemorrhagic mass in the posterolateral area of the right temporal lobe. A relatively hypodense region was observed in the lesion (Fig. 1). On cerebral MRI performed 3 days after the initial presentation, the center of the lesion exhibited inhomogeneous intensity on both T1- and T2-weighted sequences and enhanced heterogeneously. Furthermore, it was accompanied by perilesional hemorrhage with hyperintensity on both T1- and T2-weighted sequences. The patient was conservatively managed with a presumptive diagnosis of CCM. On serial MRIs performed 42 and 126 days after the initial presentation, the perilesional hemorrhagic regions showed a temporary regression followed by marked enlargement with the emergence of extensive surrounding brain edema (Fig. 2). No other abnormalities were observed in the cranial cavity. The patient underwent tumor resection through a temporal craniotomy. Intraoperatively, reflection of the dura mater revealed a superficially exposed dark-red tumor in the inferior temporal gyrus (Fig. 3A). The tumor was well-demarcated, containing multiple perilesional cysts filled with fluid hematoma, and showed hemosiderin deposits in the surrounding cerebral parenchyma. With circumscribed dissection, gross total resection was achieved in-



Fig. 1 – Axial computed tomography scan shows a 19 × 20 mm hemorrhagic mass in the posterolateral area of the right temporal lobe (arrow). The lesion has a relative hypodense area (asterisk).

volving the central solid part and adjacent cysts (Figs. 3B and C). Microscopic findings of the resected specimens revealed atypical tumor cells proliferating in papillary patterns, with mucin production (Fig. 4A). Immunohistochemical examination revealed positive staining for cytokeratin 7, thyroid transcription factor-1, and paired box 8 (Figs. 4B–D). Conversely, the tissue was negative for cytokeratin 20, GATA-binding protein 3, human epidermal growth factor receptor 2, and cluster of differentiation 34. These findings, consistent with metastatic papillary thyroid carcinoma, were identified in both the central, solid tumor and adjacent cysts. The patient's postoperative course was uneventful. Currently, adjuvant chemotherapy is scheduled.

Discussion

In the present case, peritumoral hemorrhage was identified on initial neuroimaging. It appeared hyperintense on both T1- and T2-weighted sequences, suggesting a hematoma in post-subacute phase. Therefore, we considered that the hemorrhage was not associated with the minor head injury occurring 3 days prior. The peritumoral hemorrhage showed a temporary regression on the second MRI that was performed 42 days after the head injury. However, MRI performed after 126 days revealed marked enlargement of peritumoral hemorrhages, exhibiting mixed signal intensity on both T1- and T2-weighted sequences. The hematomas were histologically verified to contain tumor cells of papillary thyroid carcinoma. Brain metastases from thyroid carcinomas are documented to show a bleeding tendency [5,6]. Therefore, we assumed that in the present case, preceding minor head injury might have triggered the peritumoral, in fact intratumoral hemorrhages identified on the third MRI. The mechanism underlying traumatic intratumoral hemorrhage is unclear. Traumatic rupture and obliteration of ectatic tumor vessels followed by recanal-

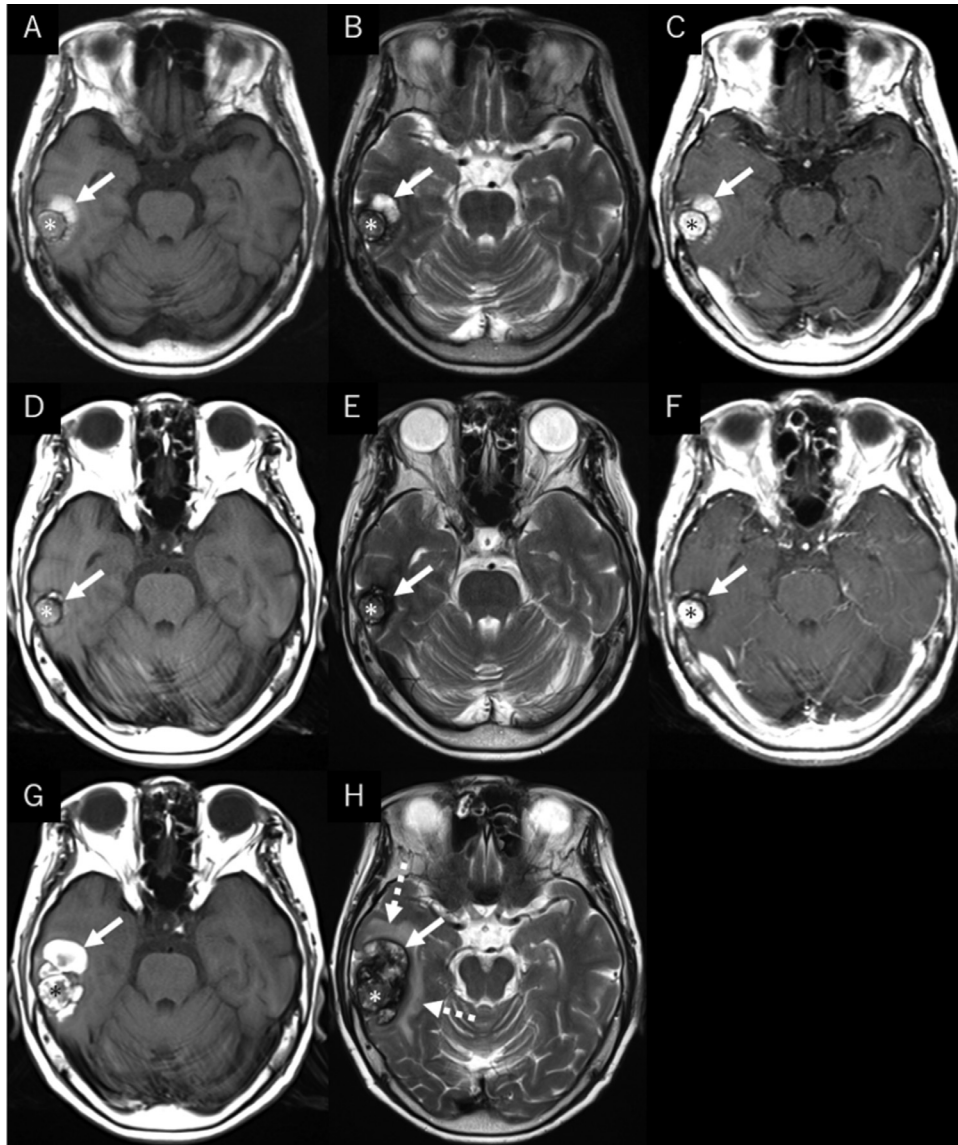


Fig. 2 – Non-contrast axial T1- (A, D, G), T2- (B, E, H), and contrast enhanced (C, F) T1-weighted magnetic resonance images performed 3 (A-C), 42 (D-F), and 126 days (G, H) after the initial presentation showing the central part of the right temporal lesion appearing inhomogeneous intensity on both T1- and T2-weighted sequences with heterogeneous enhancement. The perilesional hemorrhagic regions appear hyperintense on both T1- and T2-weighted sequences, showing temporary regression (D-F) followed by marked enlargement with an emergence of extensive perifocal brain edema during the next 123 days (G, H). Arrow: perilesional hemorrhagic regions; Asterisk: central part of the lesion; Dashed arrow: perifocal brain edema.

ization are considered possible mechanisms of minor head injury-associated intratumoral hemorrhage, which also might have occurred in the present case [7,8]. In addition, a larger tumor reportedly contributes to the intratumoral hemorrhage in metastatic thyroid carcinoma to the brain [5].

The interval from the diagnosis of thyroid carcinoma to central nervous system metastases can range from 6 months to 41 years [3]. Therefore, a metastatic focus should be assumed when patients with a history of thyroid carcinoma present with a CCM-like solitary brain tumor. The present tumor was diagnosed as a metastasis from thyroid carcinoma.

The patient had previously undergone thyroid and breast carcinoma surgeries, the former preceding the latter. Aggressive histological verification may be recommended before plan treatment strategies when patients with multiple primary cancers present with brain tumors.

In conclusion, minor head injuries may trigger intratumoral hemorrhage in metastatic brain tumors. Metastasis should be assumed when patients with a history of thyroid carcinoma present with a CCM-like solitary parenchymal lesion, even when the patient has been disease free for a long period.

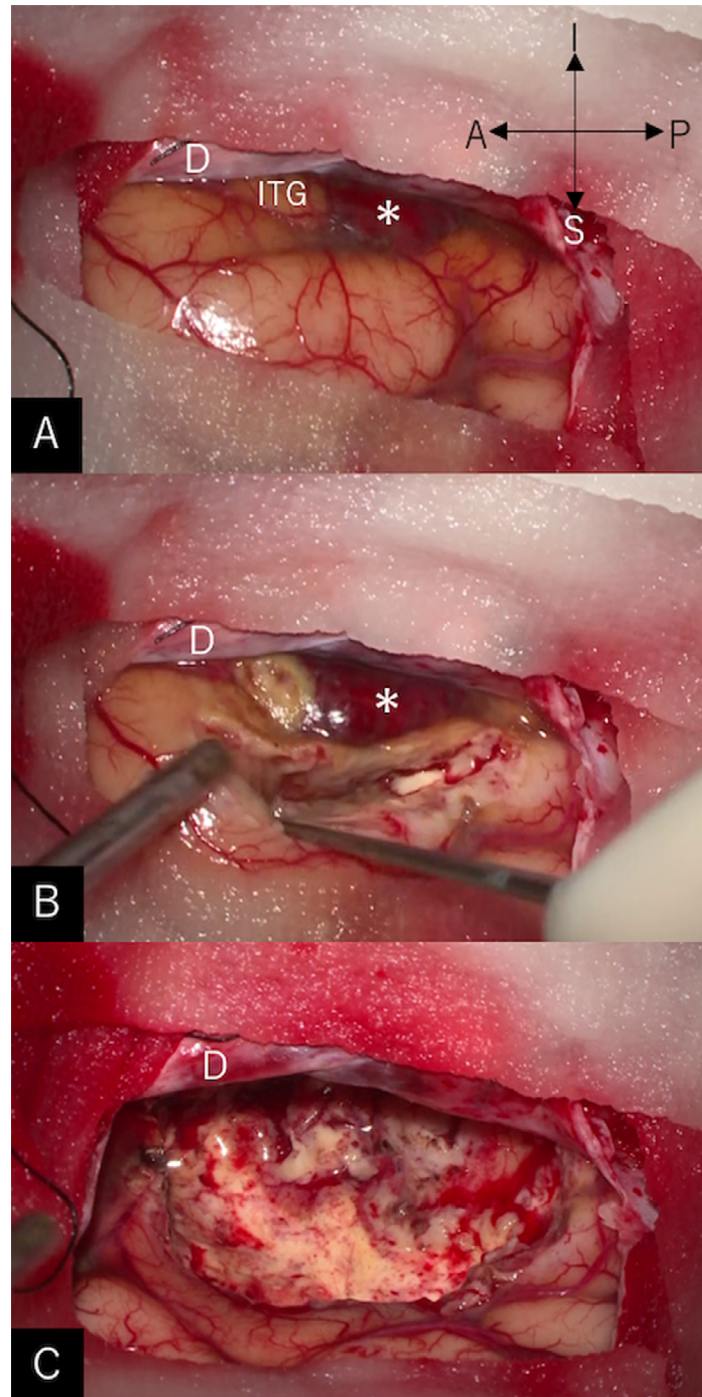


Fig. 3 - Intraoperative photos showing superficially exposed tumor (asterisk) in the inferior temporal gyrus (A), circumferential dissection of the tumor (B), and its total resection (C). A, anterior; D, dura mater; I, inferior; ITG, inferior temporal gyrus; P, posterior; S, superior.

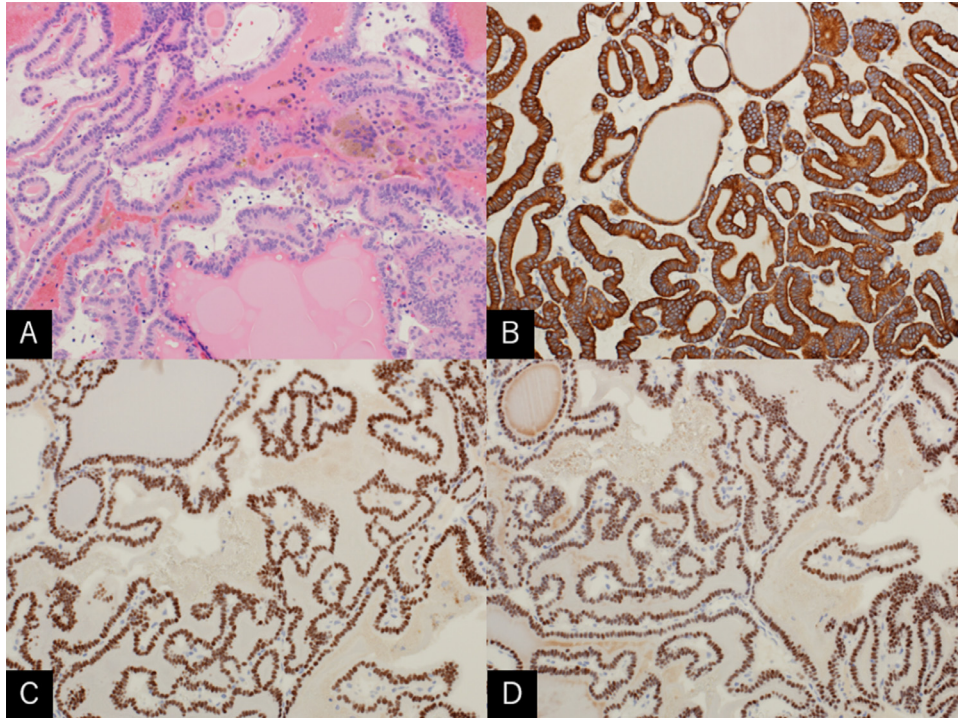


Fig. 4 – Photomicrographs of the resected specimen show atypical tumor cells proliferating in papillary patterns, with mucin production (A). Immunohistochemical examination shows positive staining for cytokeratin 7 (B), thyroid transcription factor-1 (C), and paired box 8 (D). A: hematoxylin and eosin staining, $\times 200$; B-D, $\times 200$.

Author contributions

All the authors contributed equally to this study.

Ethical standards

We declare that the present study has been approved by the institution's guidelines for human research and was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments.

Patient consent

The patients documented in the manuscript fully understood and agreed that the authors use the information materials of the patients in anonymized manner for possible publication in Radiology Case Reports.

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