

Metastasis to the Choroid Plexus from Thyroid Cancer: Case Report

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Abstract

Thyroid cancer is not a common primary cancer causing intracranial metastasis. Here we report a 74-year-old woman with magnetic resonance imaging (MRI) demonstrating a 4 cm round, heterogeneously enhancing mass in the trigone of the right lateral ventricle. Systemic screening by computed tomography (CT) examination detected a 20 mm nodule with calcification in the thyroid, multiple well circumscribed nodules in bilateral lung field, and a bone metastasis to the right dorsal rib. Cerebral angiography demonstrated a hypervascular mass fed from anterior and posterior choroidal arteries. Tumor biopsy via parietal transcortical approach confirmed a thyroid carcinoma metastasis to the choroid plexus. Of the 33 reported cases of choroid plexus metastasis, 14 (42%) are from kidney and 3 (9%) from thyroid cancer, which appears to be overrepresented considering their prevalence among all brain metastasis. There may be seed-and-soil relationship between thyroid cancer and choroid plexus.

Key words: brain metastasis, intraventricular tumor, choroid plexus, seed-and-soil phenomenon

Introduction

The vast majority of intracranial cancer metastasis occurs in the brain parenchyma, and metastasis to choroid plexus is rare. Common pure intraventricular tumors are meningiomas and choroid plexus papillomas/carcinomas, and metastasis is not ranked high on the list of differential diagnosis. Here we report a metastatic tumor to the choroid plexus from a thyroid cancer, which is not a common cause of intracranial metastasis.

Case Report

A 74-year-old woman with a history of hypertension but not of any malignancy presented with vertigo, memory loss, and clumsiness in the left hand that had gradually worsened by 2 months. Neurological examination detected no focal neurological deficit. Magnetic resonance imaging (MRI) showed a well demarcated, 4 cm in diameter, heterogeneously enhancing mass in the right lateral ventricle trigone (Fig. 1). Cerebral angiography demonstrated a hypervascular mass supplied from both anterior and posterior choroidal arteries. A meningioma was suspected, but the heterogeneous enhancement prompted us to

screen for systemic malignancy by whole body computed tomography (CT) scan that revealed multiple nodules in the lung, a destructive lesion at the right dorsal rib, and a slightly enlarged thyroid gland with calcification. Preoperative differential diagnosis included meningioma, choroid plexus carcinoma, and metastasis. Considering the high vascularity of the tumor, open biopsy of the tumor via parietal transcortical approach was performed. The tumor consisted of soft tissue containing yellowish and reddish portions, and caused profuse bleeding when incised. On histological examination, the tumor demonstrated follicular structure containing colloidal substances (Fig. 2). Immunohistochemistry showed that the colloidal substance was positive for thyroglobulin and thyroid transcription factor-1, confirming the diagnosis of thyroid carcinoma metastasis. Considering the general status and the risk of resection of the highly hemorrhagic tumor, the patient underwent local radiation therapy with 60 Gy, and the MRI obtained 1 month after the radiation treatment demonstrated slight shrinkage of the mass. The patient further underwent thyroid tumor resection, followed by systemic radiation therapy using radioactive iodine (RAI). Two months after surgery, MRI of the brain showed enhancement along the biopsy tract suggesting possible dissemination, and 15 Gy of whole brain radiation therapy was performed. The intraventricular

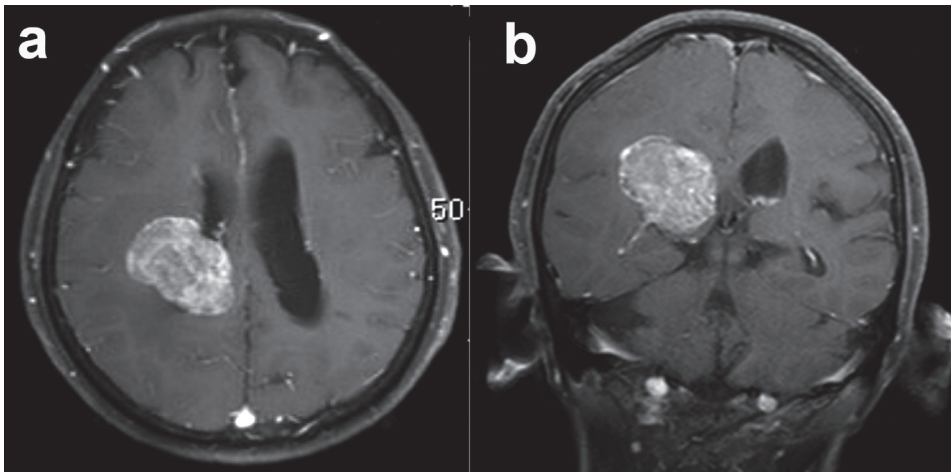


Fig. 1 (a) Axial and (b) coronal view of gadolinium-enhanced magnetic resonance imaging (MRI) demonstrating a well-demarcated tumor within the lateral ventricle.

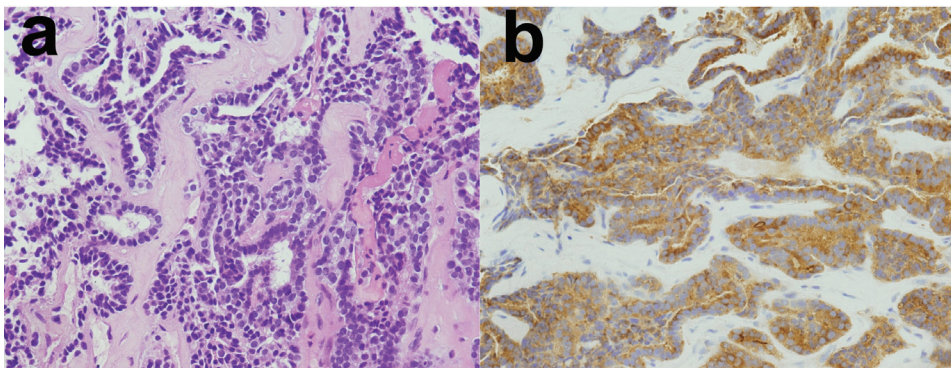


Fig. 2 Microscopic appearance of the tumor. a: Haematoxylin-eosin stain and b: immunohistochemistry for thyroglobulin demonstrate thyroid cancer metastasis.

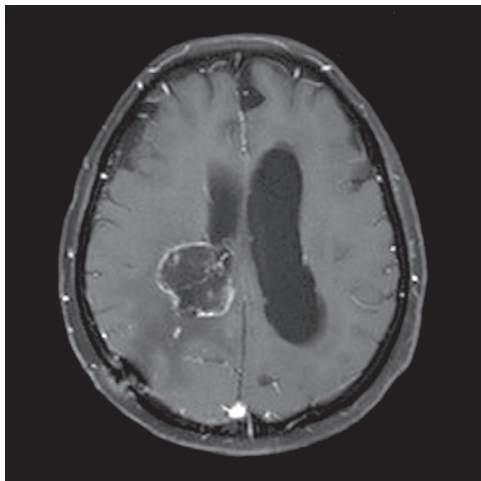


Fig. 3 Gadolinium-enhanced magnetic resonance imaging (MRI) obtained 14 months later demonstrates necrosis of the tumor without growth.

mass gradually lost enhancement, and MRI obtained 14 months after surgery showed complete central necrosis with rim enhancement, with the patient remaining in stable neurologically (Fig. 3).

Discussion

Thyroid cancer accounts for about 1% of newly diagnosed malignant neoplasms, of which 94% are differentiated thyroid cancer of either papillary or follicular type. Both types show relatively benign clinical course with 10-year survival exceeding 80% and 50%, respectively. When metastasize, the papillary cancer usually develops lymphogenous metastasis to lymph nodes, while the follicular type mostly causes hematogenous metastasis to lung and bones. Thyroid cancer metastasis to the central nervous system is rare, with only 0.9–1.5% of brain metastasis being reported to be from the thyroid cancer.^{3,26,33)}

In the present case, the tumor was a purely intraventricular mass without obvious attachment to the ventricular wall, and rich blood supply from the anterior and posterior choroidal arteries were observed. Therefore, the choroid plexus was the probable site of the metastasis. Choroid plexus is not a frequent site of the metastasis, and we could find only 33 such cases in the literature (Table 1).^{1,2,4–14,16–18,20–24,27–33)} Of those 33 cases, 14 cases (42%) were from kidney, 4 were from colon, and

6 (18%) were from lung cancer. Considering that more than 16.3% of brain metastases are from lung cancer while kidney accounts for only 9.8%,²⁵⁾ there seems to be clear tendency for kidney cancer to preferentially metastasize to choroid plexus. Similarly, 9% (3 of 33 including the present case) prevalence of thyroid cancer as the origin of choroid plexus metastasis also suggest that thyroid cancer cells might have some biological affinity to choroid plexus, demonstrating an example of the seed and soil relationship.¹⁵⁾ Neurological symptom for those cases are mostly non-localizing, with headache or consciousness disturbance caused by increased intracranial pressure being the common presentation. Probably

reflecting the notorious tendency of thyroid cancer for bleeding, intratumoral hemorrhage can be the onset of the symptoms (Table 1).³²⁾

Although patients with papillary thyroid cancer can expect 10-year survival of more than 90%, the rate drops to 30% to 50% in patients with lung metastasis. For those with brain metastasis, median survival is reported to be only 12.4 months.^{19,26)} McWilliams et al. studied the cases of 16 patients with brain metastasis from thyroid cancer, and reported that surgical resection of the brain lesion was associated with longer survival (20.8 months vs 2.7 months).¹⁹⁾ Addition of stereotactic radiosurgery to the residual tumor after partial surgical

Table 1 Summary of 33 cases of metastasis to the choroid plexus

Author (year)	Age/Sex	Primary	Location	Presenting symptoms
Killebrew et al. (1983) ¹²⁾	55/F	Kidney	L. trigone	headache
Kendal et al. (1983) ¹¹⁾	?/F	Breast	R. trigone	
Kendal et al. (1983)	?/F	Skin	4th ventricle	
Kart et al. (1986) ¹⁰⁾	61/M	Lung	L. trigone	
Shigemori et al. (1987) ²⁷⁾	58/M	Kidney	Body of R.LV	headache
Fukui et al. (1990) ⁶⁾	53/F	Lymphoma	R. trigone	headache
Tanimoto et al. (1991) ³¹⁾	64/M	Lung	R. trigone	headache
Mizuno et al. (1992) ²⁰⁾	59/M	Kidney	Body of L.LV	headache
Nakabayashi et al. (1994) ²²⁾	64/M	Stomach	Body of L.LV	consciousness dist.
Suetake et al. (1994) ²⁹⁾	78/M	Kidney	Body of L.LV	consciousness dist.
Spetzger et al. (1995) ²⁸⁾	60/F	Kidney	4th ventricle	headache
Kohno et al. (1996) ¹⁴⁾	66/M	Kidney	R. trigone	hemiparesis. disorientation
Kohno et al. (1996)	66/M	Lung	R. inferior horn	seizures
Kohno et al. (1996)	45/M	Colon	L. trigone	hemiparesis
Matsumura et al. (1997) ¹⁸⁾	68/M	Kidney	Body of R.LV	headache
Raila et al. (1998) ²⁴⁾	47/F	Kidney	R. trigone	headache
Arbelaez et al. (1999) ²⁾	48/F	Skin	L. trigone	headache
Iwatsuki et al. (1999) ⁸⁾	75/F	Kidney	L. trigone	headache, consciousness dist.
Qasho et al. (1999) ²³⁾	40/M	Bladder	R. trigone	seizures
Ai-Anazi et al. (2000) ¹⁾	81/M	Colon	Bil ventriclars	headache
Motoyama et al. (2000) ²¹⁾	70/F	Kidney	L. trigone	headache
Escott et al. (2001) ⁵⁾	32/M	Skin	L. trigone	headache
Hillard et al. (2003) ⁷⁾	54/F	Kidney	L. trigone	headache
Kitajima et al. (2003) ¹³⁾	48/F	Colon	R. inner horn	headache
Kadrian et al. (2004) ⁹⁾	54/F	Kidney	L. trigone	headache
Leach et al. (2004) ¹⁷⁾	50/F	Colon	3rd ventricle	headache
Leach et al. (2004)	43/F	Kidney	3rd ventricle	personality & behavioral changes
Lauretti et al. (2005) ¹⁶⁾	65/F	Kidney	Body of R.LV	headache
Sung et al. (2006) ³⁰⁾	42/M	Esophagus	3rd ventricle	unsteady gait
Zang et al. (2009) ³³⁾	62/M	Thyroid	R. trigone	memory loss
Della Puppa et al. (2010) ⁴⁾	66/F	Breast	L. trigone	aphasia
Wasita et al. (2010) ³²⁾	75/M	Thyroid	Body of R.LV	headache
Present case (2012)	74/F	Thyroid	R. trigone	memory loss

LV: lateral ventricle.

resection improved the prognosis (31.3 months vs 12.8 months). Administration of RAI was also effective while the benefit was rather marginal (18.4 months with RAI and 13.6 months without RAI).³³⁾ When the lesion was resected, there was no clear benefit of whole brain radiation therapy. Therefore, when feasible, total resection of the lesion is the treatment of choice for thyroid cancer metastasis to the brain. In our case, however, the large size, location, and the hypervascularity of the lesion led to the decision to perform biopsy and radiation therapy to follow.

In summary, we reported a large ventricular tumor caused by thyroid cancer metastasis to the choroid plexus. Choroid plexus metastasis is a rare event and the number of reported cases is still small, but kidney and thyroid cancer seems to have higher tendency to metastasize to choroid plexus and hence should be included in the list of differential diagnosis when such lesions are encountered.

Conflicts of Interest Disclosure

The authors have no personal, financial, or institutional interest in any of the drugs, materials, or devices described in this article.

References

- 1) Al-Anazi A, Shannon P, Guha A: Solitary metastasis to the choroid plexus. Case illustration. *J Neurosurg* 92: 506, 2000
- 2) Arbelaez A, Castillo M, Armao DM: Imaging features of intraventricular melanoma. *AJNR Am J Neuroradiol* 20: 691–693, 1999
- 3) Chiu AC, Delpassand ES, Sherman SI: Prognosis and treatment of brain metastases in thyroid carcinoma. *J Clin Endocrinol Metab* 82: 3637–3642, 1997
- 4) Della Puppa A, Dal Pos S, Zovato S, Orvieto E, Ciccarino P, Manara R, Zustovich F, Berti F, Gardiman MP, Scienza R: Solitary intra-ventricular brain metastasis from a breast carcinoma. *J Neurooncol* 97: 123–126, 2010
- 5) Escott EJ: A variety of appearances of malignant melanoma in the head: a review. *Radiographics* 21: 625–639, 2001
- 6) Fukui K, Okamura K, Watanabe M, Nakamura S, Yamamoto M, Nagatani T, Oyama H, Itou M: [Choroid plexus involvement in malignant lymphoma. Case report]. *Neurol Med Chir (Tokyo)* 30: 869–873, 1990 (Japanese)
- 7) Hillard VH, Musunuru K, Hasan I, Zia S, Hirschfeld A: Long-term management of bilateral metastases of renal cell carcinoma to the choroid plexus. *Acta Neurochir (Wien)* 145: 793–797, 2003
- 8) Iwatsuki K, Sato M, Taguchi J, Fukui T, Kiyohara H, Yoshimine T, Hayakawa T: [Choroid plexus metastasis of renal cell carcinoma causing intraventricular hemorrhage: a case report]. *No Shinkei Geka* 27: 359–363, 1999 (Japanese)
- 9) Kadrian D, Tan L: Single choroid plexus metastasis 16 years after nephrectomy for renal cell carcinoma: case report and review of the literature. *J Clin Neurosci* 11: 88–91, 2004
- 10) Kart BH, Reddy SC, Rao GR, Poveda H: Choroid plexus metastasis: CT appearance. *J Comput Assist Tomogr* 10: 537–540, 1986
- 11) Kendall B, Reider-Grosswasser I, Valentine A: Diagnosis of masses presenting within the ventricles on computed tomography. *Neuroradiology* 25: 11–22, 1983
- 12) Killebrew K, Krigman M, Mahaley MS, Scatliff JH: Metastatic renal cell carcinoma mimicking a meningioma. *Neurosurgery* 13: 430–434, 1983
- 13) Kitajima K, Morita M, Morikawa M, Sugimura K: Choroid plexus metastasis of colon cancer. *Magn Reson Med Sci* 2: 155–158, 2003
- 14) Kohno M, Matsutani M, Sasaki T, Takakura K: Solitary metastasis to the choroid plexus of the lateral ventricle. Report of three cases and a review of the literature. *J Neurooncol* 27: 47–52, 1996
- 15) Langley RR, Fidler IJ: The seed and soil hypothesis revisited—the role of tumor-stroma interactions in metastasis to different organs. *Int J Cancer* 128: 2527–2535, 2011
- 16) Lauretti L, Fernandez E, Pallini R, Massimi L, Albanese A, Denaro L, Maira G: Long survival in an untreated solitary choroid plexus metastasis from renal cell carcinoma: case report and review of the literature. *J Neurooncol* 71: 157–160, 2005
- 17) Leach JC, Garrett H, King JA, Kaye AH: Solitary metastasis to the choroid plexus of the third ventricle mimicking a colloid cyst: a report of two cases. *J Clin Neurosci* 11: 521–523, 2004
- 18) Matsumura H, Yoshimine T, Yamamoto S, Maruno M, Hayakawa T, Ono Y, Kondoh N, Namiki M: Single solitary metastasis of the slowly progressive type of renal cell carcinoma to the choroid plexus—case report. *Neurol Med Chir (Tokyo)* 37: 916–919, 1997
- 19) McWilliams RR, Giannini C, Hay ID, Atkinson JL, Stafford SL, Buckner JC: Management of brain metastases from thyroid carcinoma: a study of 16 pathologically confirmed cases over 25 years. *Cancer* 98: 356–362, 2003
- 20) Mizuno M, Asakura K, Nakajima S, Sampei T, Sayama I, Kawamura S, Yasui N, Fukazawa H: [Renal cell carcinoma metastasizing to choroid plexus of lateral ventricle; a case report]. *No Shinkei Geka* 20: 469–474, 1992 (Japanese)
- 21) Motoyama Y, Nabeshima S, Yamazoe N, Isaka F, Higuchi K, Satow T: [A case of choroid plexus metastasis with intracerebral hemorrhage from renal cell carcinoma]. *Jpn J Neurosurg* 9: 753–757, 2000 (Japanese)
- 22) Nakabayashi H, Murata K, Sakaguchi M, Nakajima K, Katsuyama J: Choroid plexus metastasis from gastric cancer—case report. *Neurol Med Chir (Tokyo)* 34: 183–186, 1994
- 23) Qasho R, Tommaso V, Rocchi G, Simi U, Delfini R: Choroid plexus metastasis from carcinoma of the bladder: case report and review of the literature. *J Neurooncol* 45: 237–240, 1999
- 24) Raila FA, Bottoms WT, Fratkin JD: Solitary choroid plexus metastasis from a renal cell carcinoma. *South Med J* 91: 1159–1162, 1998
- 25) Schouten LJ, Rutten J, Huveneers HA, Twijnstra A: Incidence of brain metastases in a cohort of patients with carcinoma

- of the breast, colon, kidney, and lung and melanoma. *Cancer* 94: 2698–2705, 2002
- 26) Sherman SI: Thyroid carcinoma. *Lancet* 361: 501–511, 2003
 - 27) Shigemori M, Shimamoto H, Noguchi S, Yoshitake Y, Sugita Y, Kuramoto S: [Choroid metastasis of renal cell carcinoma]. *Progress in computerized tomography* 9: 603–606, 1987 (Japanese)
 - 28) Spetzger U, Mull M, Sure U, Gilsbach J: Subarachnoid and intraventricular hemorrhage caused by hypernephroma metastasis, accompanied by innocent bilateral posterior communicating artery aneurysms. *Surg Neurol* 44: 275–278, 1995
 - 29) Suetake K, Shinya T, Takeda M: [A choroid plexus metastasis of a renal cell carcinoma: a case report]. *Jpn J Neurosurg* 3: 436–441, 1994 (Japanese)
 - 30) Sung WS, Dubey A, Erasmus A, Hunn A: Solitary choroid plexus metastasis from carcinoma of the oesophagus. *J Clin Neurosci* 15: 594–597, 2008
 - 31) Tanimoto M, Tatsumi S, Tominaga S, Kamikawa S, Nagao T, Tamaki N, Matsumoto S: Choroid plexus metastasis of lung carcinoma—case report. *Neurol Med Chir (Tokyo)* 31: 152–155, 1991
 - 32) Wasita B, Sakamoto M, Mizushima M, Kurosaki M, Watanabe T: Choroid plexus metastasis from papillary thyroid carcinoma presenting with intraventricular hemorrhage: case report. *Neurosurgery* 66: E1213–1214, 2010
 - 33) Zhang YA, Kavar B, Drummond KJ: Thyroid carcinoma metastasis to the choroid plexus of the lateral ventricle. *J Clin Neurosci* 16: 118–121, 2009

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