Thyroid Follicular Carcinoma Metastasized to the Lung, Skull, and Brain 12 Years After Initial Treatment for Thyroid Gland

—Case Report—

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Abstract

A 65-year-old woman presented with multiple metastases from thyroid follicular carcinoma to the lung, skull, and brain. The skull and brain tumors had been successfully treated by surgery, thyroxine supplementation, and radiosurgery until she died of sudden intracerebral hemorrhage which had no connection with tumor treatment. The lung tumor was treated by conventional irradiation and radioactive ablation. Well-differentiated thyroid carcinoma is a slowly progressive tumor. Follicular carcinoma is thought to have the most optimistic prognosis even with metastases to the lymph nodes and lung. Radioactive ablation using iodine-131 is widely used to treat the primary and/or metastatic lesion. However, the prognosis for patients with brain metastases is poor. Intracranial metastasis of this tumor is rare, but has a mean posttreatment survival of around 12 months. Surgical excision of the metastatic intracranial lesion may be the only effective treatment.

Key words: intracranial metastasis, thyroid follicular carcinoma, thyroid transcription factor-1

Introduction

Well-differentiated thyroid carcinoma is recognized as a slowly progressive tumor and the posttreatment clinical course can be quite benign.5,8 The 5-year and 10-year survival rates are more than 90% and 18–50%, respectively.15 Adverse prognostic factors include age greater than 45 years, oncocytic tumor variant, extrathyroidal extension, diameter larger than 4 cm, and distant metastasis.14 Lung metastasis is the least serious, followed by bone metastasis and brain metastasis.2,9 Patients with brain metastasis have a mean posttreatment survival time of only 12 months,3,7,13,15 which is almost equivalent to that for other metastatic carcinoma.1

We treated a patient with metastases of thyroid follicular carcinoma to the lung, skull, and brain 12 years after the initial treatment for thyroid lesion by multimodal treatment including radical excision.

Case Report

A 65-year-old woman had been aware of a subcutaneous elastic tumor in her head since June 2004. She had a past history of thyroid disease. She became aware of a small nodule in her right neck in 1992. Aspiration biopsy revealed class 2b benign tumor and her serum thyroglobulin concentration was 36 ng/ml. She began to take levothyroxine sodium 150 mg per day. By 2001 the nodule had enlarged, and repeated aspiration biopsy showed class 3 tumor. Total thyroidectomy was performed on June 7, 2001 followed by levothyroxine supplementation of 150 µg per day. By 2001 the nodule had enlarged, and repeated aspiration biopsy showed class 3 tumor. Total thyroidectomy was performed on June 7, 2001 followed by levothyroxine supplementation of 175 µg/day. The histological diagnosis was follicular thyroid carcinoma. Postoperative thyroglobulin decreased to 17 ng/ml. However, by 2004 her serum thyroglobulin concentration gradually increased again. Several examinations disclosed a pulmonary solid nodule as well as the subcutaneous elastic tumor in her head. Biopsy for pulmonary lesion revealed follicular carcinoma. She came to our out-
patient department in July 2004. Examinations revealed a tumor in the right parieto-occipital skull bone extending to the epidural and subcutaneous spaces in addition to another tumor in the upper lobe of the left lung (Fig. 1). She was admitted for removal of the intracranial tumor and treatment with radioiodine for the lung tumor.

Neurological examination on admission showed no abnormalities. Magnetic resonance imaging revealed a massive dumbbell-shaped tumor located in the epidural and subcutaneous region, with only the margin fuzzily enhanced by contrast medium. Another small lesion with a maximum diameter of about 1 cm was detected in the right occipital subcortex (Fig. 2). Surgery was performed on August 5, 2004. The tumor was totally excised with the invaded skull despite massive bleeding because the tumor was fed by the bilateral middle meningeal and superficial temporal arteries (Fig. 3). The operative findings also identified an intradural but extra-arachnoidal small nodule of the tumor, which was also excised with the invaded dura mater. After removal of stitches from the wound, stereotactic radiosurgery was performed on September 1, 2004 for the occipital subcortical lesion with a linac system.

Histological examination found large polyangled, semioval tumor cells arranged in follicular and partially papillary patterns (Fig. 4A). Large semioval nuclei were occasionally seen, and the cytoplasm was almost clear but sometimes eosinophilic. Rare but distinctive vast necroses were also seen. Immunohistochemistry showed strong positivity to periodic acid-Schiff stain in the intrafollicular colloid-like deposits which indicated glycogen, whereas immunostaining for thyroglobulin showed only partial expression (Fig. 4B). Metastasis from neuroendocrine pulmonary carcinoma was also considered as a differential diagnosis. However, in addition to resemblance of the histological findings between the thyroidectomy specimen in 2001 and the skull and brain specimens, diffuse expression of thyroid transcription factor-1 (TTF-1) confirmed the final diagnosis as metastasis of thyroid follicular carcinoma (Fig. 4C).

She was transferred to the radiological department. Conventional irradiation (40 Gy) was performed for the pulmonary lesion followed by
radioiodine treatment to the same metastatic lesion. Treatment was performed uneventfully and she was discharged on foot on November 5, 2004. Unfortunately she suffered massive intracerebral hemorrhage, located in the basal ganglia. Because preoperative angiography showed no abnormal findings around that area, this fatal intracerebral hemorrhage had no connection with the carcinoma treatment. She died on December 12, 2004.

Discussion

The incidence of thyroid carcinoma is about 3.7 to 4 per 100,000 population, accounts for approximately 1% of malignancies, and is the most common tumor of the endocrine system. Thyroid carcinoma occurs in young or middle aged adults, and is two to four times more frequent in females. Follicular carcinoma accounts for 10–15% of clinically evident thyroid malignancies. Intracranial metastasis occurs about 1% of these cases. Thyroid carcinoma accounts for 2.1% of metastatic brain tumors. These statistics clearly indicate the rarity of intracranial metastases of thyroid carcinoma.

The incidence of follicular thyroid carcinoma is higher in iodine-deficient areas, and dietary iodine supplementation has been associated with a decrease in the relative frequency of thyroid follicular carcinoma. Immediate suspension of supplementary thyroid-stimulating hormone or thyroxine may cause rapid tumor progression, and so thyroid hormone supplementation may be effective. Today administration of radioactive iodine-131 is widely used for ablation. However, this treatment has some difficulties because of the affinity of iodine-131 to the tissues. Only 17% of metastatic lesions to the brain take up iodine-131, so the effect of radioactive ablation on brain metastasis is very restricted. Intracranial metastasis have been treated by external irradiation using the linac x-ray system or radioactive ablation using iodine-131 but the effect was very limited, suggesting that excision is the only method to improve the prognosis, as only surgical excision of metastatic brain lesion from differentiated thyroid carcinoma is correlated with longer survival. Based on these findings, the optimum treatment for metastatic brain tumor from well-differentiated follicular thyroid carcinoma may be radical and maximal excision of brain tumor followed by thyroid hormone supplementation and radioactive ablation using iodine-131 for untreated primary and/or pulmonary lesion.

The present case manifested as a skull and intracranial metastatic lesion 12 years after the primary lesion was controlled with thyroxine supplementation. Radical excision of the skull metastasis was followed by stereotactic radiosurgery for the intracranial lesion. The patient was then transferred to the radiological department for treatment using iodine-131 ablation. Immunohistochemistry showed partial positivity for thyroglobulin and strong positivity for TTF-1, which established the final diagnosis. Multimodal treatment including stereotactic radiosurgery is essentially required.
This is a rare case of follicular thyroid carcinoma metastasized to the brain. Twelve years after the initial treatment for thyroid gland, the tumor metastasized to the lung, skull, and brain. Treatment was performed by radical excision, thyroxine supplementation, and radiosurgery for the intracranial metastatic lesion. TTF-1 was more useful than thyroglobulin immunostaining for confirming the histological diagnosis.

References


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