A Rare Case of Differentiated Thyroid Carcinoma with Liver Metastases

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Abstract

Papillary thyroid carcinoma (PTC) is the most frequent type of differentiated thyroid cancers (DTCs) and commonly metastasizes to regional lymph nodes. Distant metastases of DTC typically occur in the lungs and bones. Liver metastases of DTC are very rare and difficult to diagnose. We present a case of a 52-year-old woman who had a previous history of PTC treated by total thyroidectomy and lymph node dissection. The patient received two radioactive iodine-131 (I-131) treatments. The second postradioiodine therapy whole-body scan (WBS) revealed intense iodine uptake in the neck region and in the lungs. After 2 months, during the follow-up period, increase in serum thyroglobulin (Tg) level was detected. Positron-emission tomography–computed tomography (PET-CT) with 18F-fluorodeoxyglucose (FDG) revealed increased FDG uptake in the mass lesion that invaded the muscles in the neck area, lung, bone, and liver. The uptake in liver was interpreted as suspicion of malignancy. The trucut biopsy of the liver masses demonstrated metastases of the thyroid carcinoma with the immunohistochemical thyroid transcription factor-1 and PAX8 positivity observed in these tumor cells. In DTC patients with progressive rapid rise of Tg level, the diagnostic value of I-131 WBS will decrease as the differentiation of the tumor decreases. The combined use of I-131 WBS and FDG PET-CT as diagnostic modalities in these patients will be important in treatment planning in detecting locoregional or distant metastases, especially in patients with negative diagnostic I-131 WBS.

Keywords: *Liver, metastases, papillary thyroid carcinoma, thyroglobulin*

Introduction

Thyroid cancer is the most common endocrine tumor and differentiated thyroid cancers (DTCs) account for 90% of thyroid gland carcinomas. Papillary thyroid carcinoma (PTC), which is the most frequent type of DTC, is typically characterized by good prognosis, long-term survival, and commonly metastasizes to regional lymph nodes. Distant metastases may rarely occur. Distant metastases of DTC typically occur in the lungs and bones. Involvement of the brain, breast, liver, kidney, muscle, and skin is very rare. Liver metastases of DTC are usually iodine-131 (I-131) negative; therefore, routinely performed I-131 whole-body scan (WBS) during follow-up is not sensitive in detecting such lesions.

Here, we report a rare case of liver metastases from PTC, accompanied by involvement of neck lymph nodes, bone, and bilateral lung metastases.

Case Report

A 52-year-old woman underwent thyroidectomy and Level 3 lymph node dissection in February 2018. Histopathological diagnosis was PTC (1% tall-cell variant) to striated muscle invasion and lymph node metastasis with thyroglobulin (Tg) (+), thyroid transcription factor-1 (TTF-1) (+), and PAX8 target gene (PAX8) (+). Tumor observed in thyroid tissue consisted of follicular and papillary structures and solid islands [Figure 1a]. In the infiltrative tumor, a lower proportion of tall-cell variants were also observed. The tumor cells had a diffuse ground-glass nucleus with intranuclear inclusions in between, and large clear and some columnar-shaped eosinophilic cytoplasm. Carcinoma metastasis was observed in three dissected lymph nodes [Figure 1b]. In the immunohistochemical study, tumor cells were positive with TTF-1, Tg, and PAX8.

After total thyroidectomy, 150 mCi radioiodine ablation therapy was administered to the patient.

During the follow-up period under suppressive treatment with

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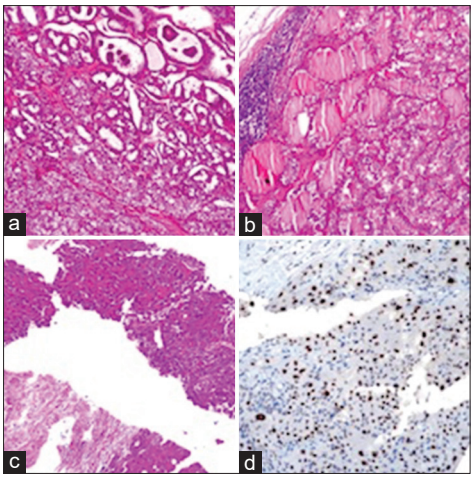

Figure 1: Histological and immunohistochemical features of the present case. (a) Tumor tissue consisting of follicular, papillary, and solid islands in the thyroid, H and E, ×100. (b) Lymph node metastasis, HE ×100. (c) Metastatic tumor consisting of oncocytic cells in liver tissue, HE ×100. (d) Nuclear PAX8 positivity in metastatic tumor cells, ×100

L-thyroxine (L-T4), the patient was referred to our clinic in 2019 for the second dose of radioiodine therapy due to high serum Tg levels (Tg: 2756ug/L (normal range: 0.73–84 ug/L), TSH: 0.27 mU/L (normal range: 0.34–5.6), and anti-Tg: <0.9 (normal range: 0–4)). Two hundred millicurie of radioiodine therapy was planned. In August 2019, the patient was treated with a dose of radioiodine 7400 MBq (200 mCi) in hypothyroidism condition obtained after a 6-week period of L-T4 withdrawal. The postradioiodine therapy WBS on day 7 with I-131 revealed intense iodine uptake in the neck region and massive uptake in bilateral lungs parenchymal nodules [Figure 2a]. After 2 months, during periodic follow-up progressive rapid rise of Tg level on L-T4 was detected (Tg: 10943 ug/L (normal range: 0.73–84 ug/L), TSH: 0.01 mU/L (normal range: 0.34–5,6), and anti-Tg <0.6 (normal range: 0–4)). There was a rapid deterioration in the clinical condition and tracheostomy was performed due to difficulty in breathing and shortness of breath in the patient.

The patient was referred for positron-emission tomography–computed tomography (PET-CT) for further investigation. PET-CT with 18F-fluorodeoxyglucose (FDG) of the whole body revealed increased FDG uptake in the mass lesion that invaded the muscles in the neck area, measuring approximately 6 cm in diameter (maximum standardized uptake value (SUVmax: 12). In the lung parenchyma, there were a large number of millimeter nodules with slightly increased FDG uptake (SUVmax: 1.2). Skeletal lesions observed in sternum, lumbar first vertebrae, and posterior of the left sacroiliac joint (SUVmax: 6.9) were evaluated as metastases [Figure 2c]. Lesions observed in both lobes of the liver, with the largest measured in axial sections with a diameter of 98 mm, revealed increased FDG uptake (SUVmax: 9.6) suggestive of malignancy [Figure 2d].

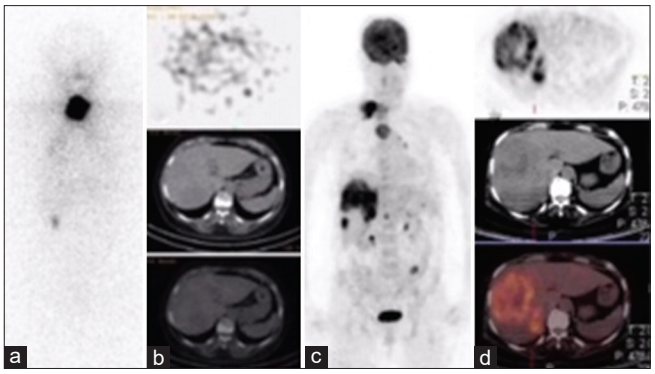

Figure 2: Diagnostic imaging. (a) Planar postradioiodine I-131 whole-body imaging in anterior view showed foci of radioiodine uptake in the lower neck and in the upper thorax. (b) Abdomen axial single-photon emission computed tomography/computed tomography/fusion single-photon emission computed tomography/liver window images performed to identify the exact anatomical locations and there was no any abnormal radioiodine uptake in liver suggestive of malignancy. (c) The maximum intensity projection (maximum intensity projection image) by positron-emission tomography revealed an increased fluorodeoxyglucose uptake in liver lesions. Heterogeneous fluorodeoxyglucose uptake in neck region, lung, sternum, lumbar vertebrae, and pelvis was also seen. (d) Figures demonstrated a liver mass measured approximately 97 mm ×83 mm in the axial sections and numerous foci of intense fluorodeoxyglucose activity in both lobes of liver (SUVmax: 9.6)

The patient was referred to the interventional radiology department for liver biopsy in suspicion of the second primary malignancy. Pathology results following trucut biopsy of the liver masses demonstrated the metastatic lesion in the liver tissue, consisted of oncocytic cells [Figure 1c], some of which were atypical in appearance, forming large solid islands in which necrosis took place in a fragment. In the immunohistochemical study, the lesion was interpreted as thyroid carcinoma metastasis with the positivity of TTF-1 and PAX8 observed in these tumor cells [Figure 1d]. A second look at the initial specimens of papillary cancer and liver metastases was performed by another specialized pathologist, confirming these results. Lack of iodine uptake excluded the possibility of radioactive iodine treatment [Figure 2b], and the patient was referred to the medical oncology department.

Discussion

Differentiated thyroid cancers (DTC) usually has an excellent prognosis, with 10-year disease-specific survival rates over 90%.[1]

Commonly, PTC metastasizes predominantly to local lymph nodes. Distant metastases from PTC are rare and associated with a poor prognosis.[2] The histological subtypes of PTC associated with worse prognosis are tall-cell, insular, hobnail variants. In our case, the patient had an aggressive histological type of tall-cell variant that might be the cause of such widespread metastases.

Distant metastases are found in <10% of DTC patients.[3] The most common sites for distant metastases from thyroid

carcinomas include the lung, followed by bones, brain, and liver.[4]

Isolated hepatic metastases are very rare with a reported frequency of <0.5%.[5] Due to the systemic mode of tumor spread, DTC metastases frequently involve multiple organs and are usually diffused in metastasized organs.[6] In our case, WBS showed hyperactivity in neck region and bilateral lung parenchymal nodules after RAI treatment, whereas no uptake in skeletal lesions and hepatic metastases was seen. This difference in imaging pattern can be explained by the different morphology of liver metastases from neck lesions.

Song *et al*.[7] suggested in their review that liver metastases from DTC are usually I-131-negative and I-131-positive liver metastases which are extremely rare. Shah *et al*., who described one of the largest patient cohorts with liver metastases of DTC (n = 11), found that three patients had noniodide concentrating hepatic metastasis which was treated with chemotherapy. To our knowledge, this is the only report on rates of patients with radioiodine uptake in liver metastases.[8,9]

In DTC patients with progressive rapid rise of Tg level and with negative diagnostic I-131 WBS, the combined use of I-131 WBS and FDG PET as diagnostic modalities will be important in detecting locoregional or distant metastases and in treatment planning.[10]

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient (s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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