Solitary liver metastasis from follicular variant papillary thyroid carcinoma: A case report and literature review

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A R T I C L E   I N F O

Article history:
Received 6 June 2014
Received in revised form 22 November 2014
Accepted 23 November 2014
Available online 12 December 2014

Keywords:
Thyroid cancer
Liver metastases
Liver surgery
Rare thyroid metastases

A B S T R A C T

INTRODUCTION: Papillary (PTC) and follicular (FTC) thyroid carcinomas, together known as differentiated thyroid carcinomas (DTC), are among the most curable of cancers. Sites of metastases from FTC are usually osseous and those from PTC are in regional nodal basins and the lungs. Visceral metastases are rare and when they do occur, they tend to do so in multiple sites. We present the case of a patient with a follicular variant of PTC and a solitary metastasis to the liver then review the relevant literature.

PRESENTATION OF CASE: An otherwise healthy 68-year-old woman was diagnosed with follicular variant papillary thyroid cancer in 2003 and subsequently underwent thyroidectomy. The patient’s endocrinologist conducted surveillance of her thyroid cancer. In 2012, due to rise in thyroglobulin, a whole body radioiodine scan was obtained which revealed an iodine-avid left liver lobe mass. Three cycles of radioiodine ablation therapy were unsuccessful and eventually the patient was referred for surgical resection. Metastatic evaluation including a PET scan was negative with the exception of an isolated enhancing 4 cm mass in segment 4B of the liver. Anatomic segmental resection of liver was performed without complications. Intraoperative ultrasonography was used to guide resection of the liver mass. Pathology reports confirmed metastatic follicular variant of PTC. Surgical margins were free of tumor. Patient was discharged home and is doing well one year after surgery. The latest thyroglobulin level was undetectable.

CONCLUSION: Rare distant sites of metastases from DTC include eyes, pharynx, skin, muscle, ovaries, adrenal glands, kidneys, esophagus, pancreas and liver. Isolated, resectable liver metastases from PTC are exceedingly rare. Literature review revealed only 10 reported cases of liver metastases from DTC. As in our patient, solitary liver metastasis from PTC should be considered for surgical resection. Due to sparse data available in literature, collecting more data to establish algorithms for treatment of such rare metastatic cancers may be able to aid physicians to achieve better outcomes.

1. Introduction

Papillary and follicular thyroid cancers, together, are referred to as differentiated thyroid cancer (DTC) [1]. Differentiated thyroid carcinomas are relatively rare despite common incidence of thyroid nodules [2]. Furthermore, thyroid carcinomas constitute less than 1% of all human cancers. The annual incidence world-wide ranges from 0.5 to 10 cases per 100,000 population [1]. The median age at diagnosis is 45–50 years with two to four times more frequent in women than men [1]. Fortunately, both papillary and follicular (differentiated) thyroid carcinomas are among the most curable cancers. However, some patients are at higher risk for recurrent disease or even death depending on the age at diagnosis, stage, capsular involvement, nodal involvement, size and histological type. Several factors influence pathogenesis of these cancers. Previous studies report a high frequency (70%) of activating somatic alterations of genes encoding effectors in the mitogen-activated protein kinase (MAPK) signaling pathway, including point mutations of BRAF and the RAS genes [14–18]. Rearrangements of the tyrosine kinase domains of the RET and TRK genes with the amino-terminal sequence of an unlinked gene are found in some papillary carcino-
isolated metastasis to the liver from thyroid cancer is a rare event with a reported frequency of less than 0.5% [3]. Metastatic liver involvement from differentiated thyroid cancer, both follicular and papillary, is nearly always multiple or diffuse and usually found along with other distant metastases including the lungs, bones, and the brain [4–12]. Locations with very rare incidence of metastases include eyes, pharynx, skin, muscle, ovaries, adrenal glands, kidneys, esophagus, pancreas, and liver metastasis. A review of the literature revealed that only ten cases of all liver metastases from DTC have been documented, with a rate of 0.5% or less. Three patients were men and seven were women. Their average age was 63 years (range from 32 to 85 years). Histologically, the primary tumor was identified as papillary in four patients, follicular in five and Hurthle cell thyroid cancer in one patient [3]. In two cases, the metastatic histological type was inconsistent with the primary tumor. The primary tumors were FTC and PTC, while both their metastatic lesions were a FV-PTC [3]. What makes the case presented here in an interesting one is the fact that thyroid cancer metastases to liver are rare, and even more so is an isolated and resectable solitary liver metastases from thyroid cancer.

2. Methods

This is a retrospective case report and a review of the literature. Our patient’s evaluation and surgical intervention were performed at Scottsdale Healthcare, in Scottsdale, Arizona, USA.

3. Results

The patient is an otherwise healthy 68-year-old woman with a history of follicular variant papillary thyroid cancer diagnosed in
2003 and breast cancer diagnosed in 2005. Patient had no cardiac, pulmonary or renal diseases. Patient had no history of diabetes or hypertension. In 2003, the patient had a total thyroidectomy for thyroid cancer. In 2005, she had a modified radical mastectomy for stage I breast cancer and did not receive radiation therapy or chemotherapy. The patient was under the care of an endocrinologist for surveillance of her thyroid cancer. In 2012, a whole body radioiodine scan done to monitor the patient for thyroid cancer recurrence or metastases revealed a radioiodine-avid mass in the medial left lobe of the liver, presumably a solitary hematogenous metastasis. Patient then underwent three separate bouts of radioiodine ablation therapy for a total of 425 mCi. The patient received ablation post RAI ablation after her original thyroid surgery and a subsequent RAI treatment due to persistent low level thyroglobulin elevation. Her thyroglobulin level remained undetectable until the current illness, during which it rose dramatically. Accordingly, a third RAI therapy was administered and the post-RAI scan revealed only the very radioiodine avid lesion in the liver. Because this was so intense, isolated and could possibly have obscured imaging of other foci of metastatic tumor, a PET CT scan was performed, that revealed only the single liver metastasis. A fourth \(^{131}\text{I}\) dose was administered and while it resulted in a reduced the thyroglobulin level, the solitary lesion in the liver remained. Consultations with medical oncology, radiation oncology, interventional radiology and surgery obtained with the resultant consensus that the best option was surgical resection Fig. 1. The patient underwent an anatomic segment 4B liver resection for a 4 cm isolated tumor mass without complications. Intraoperative ultrasonography was used to assess the liver mass (Fig. 2). Fig. 3(a–d) describes the pathological findings of the metastasis. The gross hepatic metastasis seen intraoperatively is shown in Fig 3a. The hepatic resection specimen (Fig. 3b) showed a bulging ovoid subserosal nodule measuring 4.3 cm in greatest dimension. The mass was well-demarcated from the surrounding hepatic tissue and showed a variegated tan to red–brown cut surface with punctate areas of yellow discoloration. Microscopic evaluation of routine hematoxylin and eosin-stained sections showed a neoplasm with a follicular architecture consistent with metastatic thyroid carcinoma (Fig 3c). Tumor nuclei were enlarged and frequently showed irregular contours. Chromatin was fine and, in some cells, inconspicuous. Many cells showed nuclear grooves. Nuclear inclusions were not identified. The microscopic features were consistent with metastatic well-differentiated thy-

![Fig. 2. Intraoperative ultrasonography was used to assess the liver mass.](image1)

![Fig. 3. (a–d) Describes the pathological findings of the metastasis.](image2)
Funding

Conflicts of interest

To provide more definitive care for those who suffer from rare cancers, physicians need to better utilize diagnostic tests, surveillance and ultimately, for treatment of such rare cancers may be able to aid physicians to better utilize diagnostic tests, surveillance and ultimately, to provide more definitive care for those who suffer from rare cancers.

4. Discussion

Liver metastasis from differentiated thyroid cancer are quite rare, with a reported frequency of 0.5% [3,13]. Even more unusual are isolated resectable liver metastases from papillary thyroid cancer. The patient presented herein, fits well the typical epidemiological descriptors of previously reported cases: our patient was female, 68 years old, and had a follicular variant of papillary thyroid carcinoma. As noted in a recent study in 2011 by Hong-Jun Song et al., “…only ten cases have been documented in the literature; three were males and seven were females, with an average age of about 63 years (range from 32 to 85 years).” Histologically, the primary tumor was identified as papillary in four patients, follicular in five patients, and Hürthle cell thyroid cancer in one patient. “Post-operative surveillance by PCP, endocrinologist or surgeon for patients with thyroid carcinoma should be complete and include appropriate imaging modalities when metastasis is suspected. PET, CT and ultrasonography remain the standard imaging options. Once identified, a solitary liver metastasis from primary thyroid carcinoma should be considered for surgical resection in the appropriate clinical scenario. In addition, a compilation of the reported cases of solitary visceral metastasis from thyroid carcinoma should be studied and evaluated for success of surgical resection, prognosis, rate of survival, and size of metastatic lesions in each histological type of thyroid carcinoma. Collecting more data to establish algorithms for treatment of such rare cancers may be able to aid physicians to better utilize diagnostic tests, surveillance and ultimately, to provide more definitive care for those who suffer from rare diseases.

Conflicts of interest

No conflicts.

Funding

No relevant funding.

Author contribution

Dr Bran Djenic was the primary author and did data collection. Dr Jim Newell did the analysis of pathology and figures. He also reviewed and approved the manuscript.

Dr Dan Duick treated patient and provided historical clinical information and followup. He reviewed and did critical editorial review.

Dr Demeure was the primary surgeon, wrote much of the manuscript and provided critical review of data and manuscript.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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