***Delayed solitary metastasis from primary follicular thyroid carcinoma to the scapular bone, a case report, and review of the literature***

**Keywords**

Thyroid malignancy, follicular carcinoma, bone metastasis, scapula

**Introduction**

Ten to 15% of Follicular Thyroid Carcinoma (FTC) may manifest with bone metastases which may occur vary in time (1). Following lung, bone is the second prevalent site of metastasis which has a worse prognosis than lung metastases and leads to a decline the survival to nearly half (2); meanwhile, their management is also controversial. Here we present a case with a rare site of metastases – scapular bone - originating from FTC which had been gone under total thyroidectomy nine years ago.

Keywords: thyroid neoplasm, follicular, scapular metastases, solitary metastases.

Introduction

In iodine-sufficient and deficient areas, the follicular carcinoma represents about 10% and 25%-40% of all thyroidal malignancy respectively. Among them, 10% - 15% may develop metastasis most commonly to the lung and bone followed by less common areas such as the brain, liver, and skin which almost always develop through angioinvasion or hematogenous. The most common sites of bone metastasis include the spine followed by the pelvis, femur, skull, and rib bones (3). Metastasis may occur relatively early or delayed through the course of the disease. In a study on 20 patients with metastatic follicular carcinoma delayed metastasis developed in about 40% of patients within 4.5 years (2 – 8 years) after initial treatment mainly in the lung (50%), bones (25%), regional lymph nodes (13%), and brain (12%) (4). More interestingly, a retrospective study reported from MSKCC on 245 patients with thyroid carcinoma and bone metastases showed that 44% of patients had bone metastases at the time of diagnosis and 56% developed it later in addition the spine was the most common site of metastases.

Additionally, 44% of these 245 patients, have had the follicular type of cancer including 34% follicular carcinoma and 10% follicular variant of papillary carcinoma as the primary subtype.

It is worth mentioning that bone metastasis correlates with worse survival as well as reducing the quality of life by causing pain, pathological fracture, spinal cord compression, and immobility (5).

Undoubtedly, imaging plays a critical role in the evaluation of metastatic disease particularly when it uses based on clinical findings. The crucial role of skeletal and whole-body Magnetic Resonance Imaging (MRI) and currently, fusion 2-deoxy-2-[18F] and fluoroD-glucose whole-body positron emission tomography/computed tomography (PET/CT) in the assessment of disseminated FTCs have been well established for many years (6).

By now, no pervasive management guideline has been provided for the treatment of bone metastases of FTCs; as a result, all the cases should be discussed in a multidisciplinary consensus to reach a treatment plan. Indeed, A comprehensive treatment including medical (analgesia and bisphosphonates) and surgical interventions, as well as irradiation and radioisotope therapy, should be considered for these patients (6).

Herein we describe a 69-year-old man with an isolated and solitary scapular metastasis from follicular thyroid carcinoma who was in clinical remission for about 10 years after surgery and radioiodine treatment of the original disease.

Scapular metastasis is an extremely rare site for metastasis of FTC; meanwhile, isolated scapular metastatic lesion without evidence of any other sites of spread is more interesting and deserves an exceptional manifestation.

**Case presentation**

The patient is a 69-year-old man with a previous history of FTC for over nine years with initial treatment of oncological surgery followed by maintenance medical replacement therapy and assessment of TG level as his routine follow up. However, three months ago, an unexpected rise in TG level was detected; therefore, a whole-body Iodine 131 scan was done which showed a solitary and isolated increased uptake in the mid-portion of the left scapular bone along with normal uptake for the rest of the body. Although there were neither physical signs nor symptoms, the findings of MRI and PET/CT were in complete correlation with the Iodine scan. (figure 1)

As a result, the patient underwent ablation treatment with thyrogen stimulated radioactive iodine (RAI); nevertheless, a favorable response was not detected on lab results or imaging. Therefore, as the next step, he referred for surgical intervention consequently, partial scapulectomy was performed as a reasonable method to reach a safe margin from tumor along with maintaining the function of the bone. The pathological evaluation established the diagnosis of solitary metastasis originating/originated from FTC) and confirmed the resected margins were free from tumor. (figure 2)

Now, it has lasted one and a half years from metastasectomy and the patient is on the suppression therapy by thyroxine and checking the TG level regularly without evidence of recurrence or metastasis along with an appropriate quality of life and no disability after scapulectomy.

**Discussion**

The ten-year survival rate of patients with differentiated thyroid carcinoma (DTC) is 80–95%. Although it declines to 40% in patients with distant metastases. Bone metastases from DTC occur in 2–13% of patients (6).

Although ten-year overall survival with differentiated thyroid carcinoma is 80-95%, it would decrease to around 40% after becoming a metastatic disease. In presence of bone metastases, the ten-year overall survival was reported to range from 13 to 21% (7).

The possibility of the occurrence of delayed distant metastasis following sufficient initial treatment including surgical and non-surgical treatment is between seven to 23% (8) and the probability of bone metastasis from primary FTC is about 2-13% (6). Whereas the incidence rate of having metastasis within the initial presentation or even manifest with a metastatic lesion as the first presentation is about 1-9% and 10-15% respectively (4), The incidence of delayed distant metastasis after total thyroidectomy for thyroid cancer is between 7% and 23% while for patients presenting initially with distant metastasis it is approximately 1–9% (2,4).

As mentioned above nearly 10 to 15% of patients with follicular carcinoma will manifest with metastatic disease, most commonly involving the lung followed by bone (2).

Axial skeleton bone red marrow metastases account for More than 80% of bone metastases from DTC due to high blood flow in these locations (vertebrae, ribs, and hips), along with the indirect connection of inferior thyroidal veins to vertebral veins via Batson's vertebral-venous plexus (9).

Adhesive molecules presenting on the surface of matrix and marrow stromal cells facilitate the adhesion of floating cancerous cells to the target cells (marrow and matrix cells) leading to producing and releasing both angiogenesis and bone-resorbing factors (2).

Isolated bone metastases from thyroid carcinoma may develop solitary (61%) or multiple (25.4%); however, they still may occur in non-isolated features most commonly as synchronous lung and bone metastasis (10).

In Pittas' study on 146 patients with bone metastases from thyroid carcinoma at MSKCC nearly half of the patients had multiple sites of bone metastases and they reported only five cases of scapular metastases. The most common site of metastases was the vertebra (54%) followed by the pelvis, ribs, femur, and skull (11).

The lonely involvement of scapula is extremely rare and has been reported as the initial presentation of thyroid carcinoma in 2 studies (12). The first case was a papillary carcinoma and the second case was a follicular thyroid microcarcinoma, both were revealed by scapular metastases.

Whereas, in our patient, the scapular metastasis has been developed ten years after initial total thyroidectomy.

More interestingly, it has been reported in a case of follicular variant of papillary carcinoma 22 years after total thyroidectomy but it was not solitary as the patient had mandibular metastasectomy within less than one year earlier (13).

Ultrasonography, transillumination, CT, and/or MRI-scanning are examples of Noninvasive diagnostic techniques that are essential for discovering, localizing, and evaluating the extension of the lesions.

Since 18F-FDG relies on the increased cellular metabolism, it may detect metastatic foci earlier than bone scintigraphy which relies on detecting an osteoblastic response (14).

Metastasis from follicular carcinoma will concentrate radioiodine in up to 75% of patients (15), but bone metastases are less likely to condense radioiodine and are associated with a worse prognosis than pulmonary metastases. Iodine treatment had been shown to be highly effective in young patients with small metastasis, bone metastasis is associated with a low response rate especially when they were extensive or large (16) as our patient did not reveal any evidence of response.

High-dose radioiodine may cause a partial tumor response or stabilization of the disease with symptomatic improvement. (1,17), but iodine absorption by bone metastatic lesion must be proved before treatment.

Data on the effectiveness of external beam radiation in the management of thyroid carcinoma bone metastasis are lacking but it may become a treatment of choice in palliation of pain and control of disease progression when the iodine is ineffective (1,18,19).

Taking bisphosphonates leads to reducing the rate of the progression of bone metastases and pathologic fractures as well as they are useful in the management of pain due to bone metastatic lesions. (2)

In asymptomatic bone metastasis, as far as there is not activated thyroidal tissue which should be confirmed by not having radioiodine uptake, taking levothyroxine has been advised but the patient should be monitored closely. (2)

Surgical intervention is usually recommended in symptomatic bone metastases with the risk of fracture. In addition, it may be advisable for isolated, solitary, and accessible metastases. In a study by Satcher et al. that evaluated surgical management of appendicular skeletal metastases in thyroid carcinoma, a case of scapular metastases was reported that was not isolated and underwent surgical resection. Although only 41 cases required surgery in a period of 23 years in their center, they showed a survival advantage for patients who had undergone surgical resection of bone metastases (20) which is in correlation with the result of other articles that believe that complete resection of the metastatic bone lesion can be a curative treatment in these patients. For instance, Bernier et al. showed a better survival (6.2 years) for patients undergoing complete resection of metastatic bone lesions than patients undergoing partial excision (4.2years) and patients not undergoing any surgical resection (2.5 years) (7). Wang et al. showed that surgical resection of bone metastases combined with iodine therapy was beneficial for prognosis and surgery was an independent prognostic factor in multivariate analysis (1).

Similar to most of the other malignancies, the earlier detection of the bone metastases leads to improve prognosis and survival rate (21,22), and like almost other malignancies the effectiveness of metastasectomy in the patients with multiple site involvement is doubtable. Also, Lio et al. have emphasized the adverse complications of surgical treatment of bone metastasis and they recommended surgical intervention only on patients with spinal cord compression and cervical instability, and intractable pain (23).

**conclusion**

Although solitary isolated metastasis to the scapula originating from a follicular thyroid carcinoma is an extremely rare condition, it can be manageable with metastasectomy and adjuvant chemoradiation, with a good prognosis. Furthermore, due to the rarity of the mentioned scenario, we suggest discussing all rare cases in a multidisciplinary consensus and provide a multidisciplinary treatment approach for these patients.

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