Metastatic Follicular Thyroid Cancer to the Scapula with Rotator Cuff Muscles Involvement: A Case Report

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Background: Follicular carcinomas occur frequently in women beyond the 5th decade of life as a slow-growing thyroid nodule. They are known to invade locally and metastasize distantly. Common sites for distant metastases are lungs and bones. The bones often involved are axial skeleton such as vertebrae, sternum, and skull. Metastasis to scapula is an infrequent presentation and skeletal muscle metastasis is extremely rare.

Methods: Case Report

Results: We present a case of metastatic follicular thyroid carcinoma that manifested as a large scapular mass on the right shoulder of a 65-year-old female patient. MRI of the right shoulder revealed a large lobulated mass with central necrosis and non-delineation of the 4 rotator cuff muscles. Biopsy of the scapular mass revealed an invasive metastatic follicular carcinoma. A thyroid ultrasound showed a significant right thyroid nodule. The patient underwent total thyroidectomy and subsequent right total scapulectomy with biceps tendon transplantation attached to the clavicle. Histopathologic reports from both operations are consistent with invasive follicular thyroid carcinoma. The patient underwent radioiodine therapy. Follow-up showed no evidence of any functioning metastasis.

Conclusion: Soft tissue metastasis is an uncommon initial presentation of follicular thyroid carcinoma. Synchronous metastasis to the bone and soft tissue particularly on the right scapula and surrounding muscles is a rare occurrence that warrants this report.

Keywords: Thyroid carcinoma, bone metastasis, soft tissue metastasis

Introduction

Thyroid carcinoma comprises only 1 to 2 % of all cancers nonetheless is the most common form of endocrine malignancies. Thyroid follicular epithelial-derived cancers include 85% papillary thyroid carcinoma (PTC), 12% follicular thyroid carcinoma (FTC), and 3% anaplastic carcinoma.[1] FTC is divided into two categories based on degree of invasiveness, minimally invasive and widely invasive type. The direct extrathyroidal extension is seen in its rarer widely invasive form with reported distant metastasis incidence of 6–20%.[2,3] It tends to invade blood vessels and metastasize by hematogenous spread to distant sites, most commonly to the bones and lungs.[1,2]

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Osseous metastases (OM) which occur only in 4% of all thyroid cancer cases are rarely encountered as presenting manifestation and are correlated with poor prognosis. They are mostly identified in axial skeleton such as vertebrae, sternum, and skull. Appendicular skeleton involvement is infrequently reported.[4] Metastasis to scapula occurs only in 5% of OM and concomitant skeletal muscle metastasis is extremely rare.[4,5] Expected probability of identifying the skeletal muscle metastasis of PTC/FTC is 4/1,000,000,000 and is observed in gluteus, sternocleidomastoid, and thigh with no literature found regarding metastatic spread to the 4 rotator cuff muscles. Synchronous metastases to the bone and soft tissue are not commonly reported.[5]

We present a rare incident of metastatic follicular thyroid carcinoma that initially presented as a large sarcoma-like scapular mass on the right shoulder.

Case

This is a case of a 65-year-old, Filipino, female with no known comorbidities, presented with a large mass on her right shoulder. She is a non-smoker and non-alcoholic beverage drinker with no known allergies.

Figure 1. Large, firm, non-tender suprascapular mass on the right shoulder.

History started 5 years before admission when the patient sought consult for unrecalled nasal problem with incidental finding of thyroid nodule associated with no signs and symptoms. She was advised for work-up but was non-compliant and condition was tolerated.

Three years prior to admission, the patient noted the onset of right arm weakness associated with numbness and occasional gnawing pain on the right scapular area but no noted limitation in the range of motion. Condition tolerated and no consult was done.

During the interim, the patient noticed a right scapular mass which was observed to be gradually increasing in size. This was associated with persistent pain and subsequent difficulty in exerting a full range of motion in the right shoulder.

Two months before admission, the patient sought consult with a rheumatologist. Physical examination showed a large firm non-tender mass on the right scapular area measuring approximately 24cm x 14cm (*Figure1*). Limitation of movement of the right shoulder was elucidated wherein flexion noted to be 0-30 degrees, the extension was 0-10 degrees, abduction was 0-45 degrees and adduction was 0-10 degrees with no noted sensory loss. Magnetic Resonance Imaging (MRI) of the right shoulder was taken which revealed a large (22.2 cm x 13.5 cm x 13.8 cm) lobulated mass with fairly circumscribed margins arising from the scapula with a large irregular central area of fluid-like signals suggestive

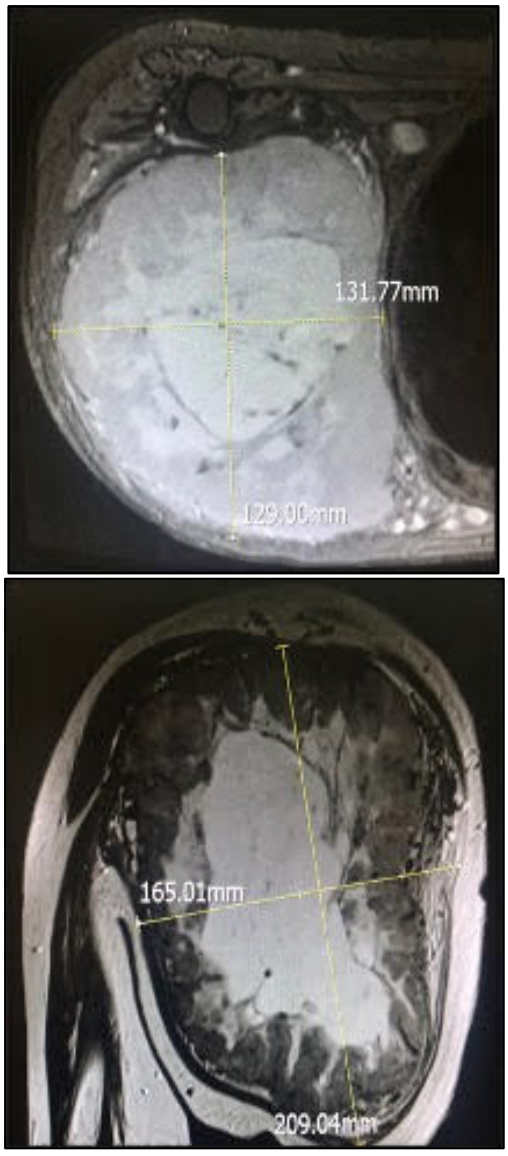

Figure 2: Magnetic Resonance Imaging of the right shoulder showing a lobulated and necrotic mass demonstrating diffuse lytic bone destruction of the right scapula. (Top: Sagittal view of the right shoulder mass. Bottom: Coronal view of the right shoulder mass).

of necrosis (*Figure 2)*. Flow voids indicative of internal vascularity are seen within the mass with diffuse lytic bone destruction of the scapula. The rotator cuff muscles, comprising the supraspinatus, infraspinatus, subscapularis, and teres minor muscles are not well delineated and likely involved by the mass with mild peritumoral edema. These MRI findings were consistent with malignancy. Initial considerations are fibrosarcoma and osteosarcoma thus the patient was referred to an orthopedic surgeon for further assessment and management. A core needle biopsy was performed which revealed metastatic follicular thyroid carcinoma of the right scapular mass.

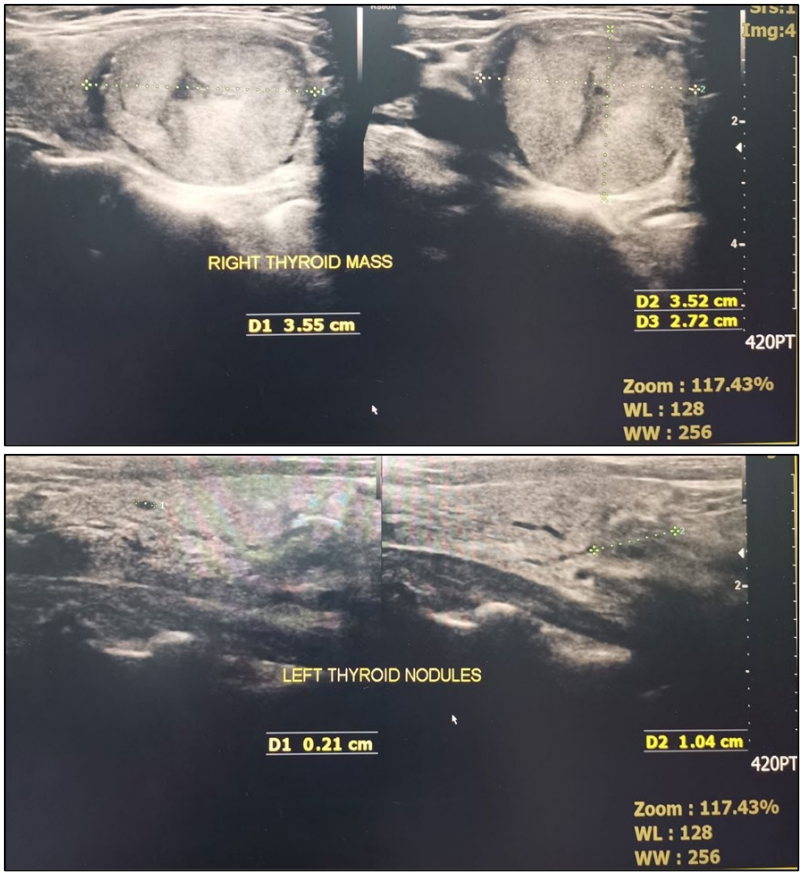

Figure 3. Ultrasound of the neck showing (Top) enlarged right thyroid lobe with a solid mass occupying the mid to inferior pole measuring 3.55 x 3.52 x 2.72 cm (TIRADS 5) causing slight left tracheal deviation, and (Bottom) left thyroid lobe is normal in size with at least 3 solid cystic nodules ranging from 0.21 to 1.04 cm exhibiting benign honeycomb appearance (TIRADS 2)**.**

The patient was referred to an endocrinologist wherein physical examination revealed a solitary mass with smooth border in the inferior lobe of the right thyroid approximately 3cm x 3cm in size by palpation. Ultrasound of the neck was done revealing an enlarged right thyroid lobe with an isoechoic solid mass occupying the inferior pole measuring 3.55 cm x 3.52 cm x 2.72 cm with smooth borders, multiple calcifications and significant vascularity causing left tracheal deviation thus suspicious for malignancy (TIRADS 5) *(Figure 3)*. The left thyroid lobe was normal in size with at least three solid to cystic nodules with sizes ranging from 0.21 cm to 1.04 cm exhibiting benign honeycomb pattern (TIRADS 2). Initial thyroid function test was unremarkable. The patient was referred to a surgeon and underwent Total Thyroidectomy wherein official biopsy result showed widely invasive follicular carcinoma of the right thyroid lobe and multinodular colloid goiter in the left thyroid lobe and isthmus *(Figure 4)*.

The patient underwent right Total Scapulectomy with biceps tendon transplantation attached to clavicle 2 months after thyroid surgery. Official histopathologic reports exhibited a similar result of widely invasive follicular carcinoma *(Figures 5 and 6)*. She was subjected to 200 mci of radioiodine therapy and maintained on thyroid hormone replacement of Levothyroxine 100 mcg daily based on a suppression dose of 1.8 mcg/ kg/ day.

Six months after radioiodine therapy, a follow-up neck ultrasound exhibited right thyroid bed solid nodules considering tumor residual or recurrence thus patient underwent Iodine-131 meta scan which showed unremarkable result without scintigraphic evidence of thyroid residuals or functioning metastasis. Thyroglobulin and anti-thyroglobulin were also normal. The disease condition and diagnostic results were explained to patient wherein she expressed understanding of the prognosis and the importance of treatment compliance and follow-up.

Discussion

Thyroid cancer accounts for only 5% to 10% of all thyroid nodules. It represents about 1% to 2% of all solid human malignancies. Thyroid follicular epithelial-derived cancers include 85% papillary thyroid carcinoma (PTC), 12% follicular thyroid carcinoma (FTC), and 3% anaplastic carcinoma.[1] There is still no accepted paradigm for the pathogenesis of FTC. Of the cytogenetic abnormalities described in FTC, the most common are deletions, partial deletions, and deletion rearrangements involving the *p* arm of chromosome 3.[2] FTC tends to occur in older people, with the mean age of 50 years old. As in most thyroid malignancies, women outnumber men by more than 2 to 1.[1,2] Cancer incidence disparities exist among specific ethnic populations. Several epidemiological studies in Asian-American populations reported that thyroid cancer rates were relatively higher among Filipinos compared to other Asian subgroups and non-Hispanic whites, although the reasons for this were unclear. Also, it was shown to be more aggressive and recurrent among this population.[6,7] The patient has a negative family history of thyroid diseases.

Most patients with FTC present with a slow-growing, painless thyroid nodule, with or without background thyroid nodularity.[1,2,8] However, hematogenous spread to distant sites can occur to the bones, lungs, brain, and liver with incidence of 6-10%.[2,9,10] Only 4% of all thyroid cancer presents initially as osseous metastases (OM) which commonly affects axial bones and less frequently involve appendicular skeleton. The susceptibility to axial bone is attributed to the blood flow distribution and skeletal microenvironment including tumor expansion by

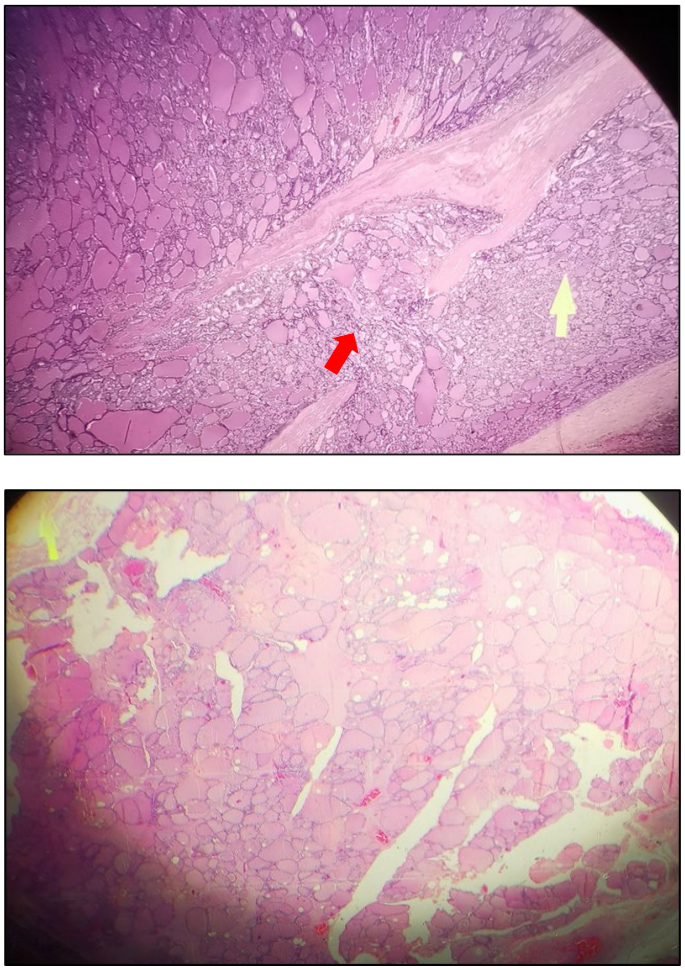

Figure 4. Histopathology of the thyroid gland mass using hematoxylin and eosin stain x100. Top shows the right thyroid mass revealing microfollicular structures (white arrow) transecting the capsule (red arrow). This is consistent with follicular carcinoma. Bottom shows the left thyroid with variably sized thyroid follicles with colloid.

growth factors.[3,4] Most frequent metastatic sites are lungs and bones, commonly noted in the spine (50%), pelvis (30–50%), ribs (10–30%), femur (20%), skull (10–13%), and humerus (10%), with infrequent scapular involvement.[11] Scapular metastasis appears only in 5% of OM. Concomitant skeletal muscle spread is an atypical entity and differentiation between a primary soft tissue sarcoma and metastatic carcinoma is challenging without a biopsy.[4,5,12] Probability of identifying the skeletal muscle metastasis of PTC/FTC is 4/1,000,000,000 and is observed in gluteus, sternocleidomastoid, and thigh with no literature found regarding metastatic spread to the four rotator cuff muscles.[5,11,12] The patient is a 65-year-old female who presented with a large sarcoma-like mass lesion in the right scapular area associated with movement limitations of the right upper extremity. Shoulder MRI showed diffuse lytic bone destruction of the scapula with involvement of the rotator cuff muscles by the mass, thus primary bone neoplasm was initially considered. However scapular mass biopsy revealed metastatic follicular thyroid carcinoma which similarly exhibited in the official thyroid biopsy.

There remains a consistent agreement between management guide from the American Thyroid Association (ATA) and the National Comprehensive Cancer Network (NCCN) that total thyroidectomy is the ideal treatment of choice for patients with differentiated thyroid cancers with primary tumors larger than 4 cm, gross extrathyroidal extension, and clinically apparent of cervical lymph nodes or known distant metastases.[13,14] The patient had a documented distant metastasis to the right scapular area thus underwent total thyroidectomy and followed by Right Total Scapulectomy with biceps tendon transplantation attached to clavicle 2 months after. This is following NCCN guidelines 2020 wherein it is recommended for patients with suspected or known distant metastasis at presentation to undergo resection of clinically significant structural disease at 6 to 12 weeks post-thyroidectomy and to go through radioiodine treatment thereafter.[14] In high-risk patients with recurrence risk above 40%, post-operative radioiodine administration is routinely done because such therapy can reduce both recurrence and death rates.[13] Postoperative management also includes treatment with TSH suppressive therapy with an initial effective dose of 1.6-2 mcg/ kg body weight.[2,13-15] The patient went through 200 mci of radioiodine therapy and currently on thyroid hormone suppressive management of Levothyroxine 100 mcg daily (1.8 mcg/ kg/ day).

The effect of metastases on survival is well-known with a 50% reduction in survival rates in metastatic disease. This is notably correct for bone metastases, in which the 10-year survival rate declines further to 13–21%.[16,17] Irrespective of ATA risk, most patients are seen at intervals of 3 to 6 months but ATA high-risk patients such as those with known distant metastasis may entail a more individualized management approach. According to ATA guidelines, first-year follow-up after initial therapy recommends thyroglobulin, anti-thyroglobulin, thyroid function tests, and thyroid ultrasound is done every 3-6 months. Depending on presenting features, a neck/ chest CT scan with contrast may be done as early as 2-3 months and considerations to do further imaging studies such as surveillance diagnostic RAI scan, FDG-PET scan, and other cross-sectional imaging if needed.[2,13,15,17] Patient follow-up 6 months post-thyroidectomy showed TSH of 0.11 mIU/L but thyroid ultrasound showed a probable right thyroid lobe bed nodule approximately 0.41 cm x 0.40 cm x 0.38 cm. Thyroglobulin and anti-thyroglobulin were taken showing normal results of < 0.040 ng/mL and 19.21 U/mL respectively. To rule out the possibility of recurrence, Iodine^{131} meta-scan was done which showed a normal result of no scintigraphic evidence of thyroid residuals or functioning metastasis.

Distant metastasis at the time of presentation confers poor prognosis for patients with thyroid malignancies,

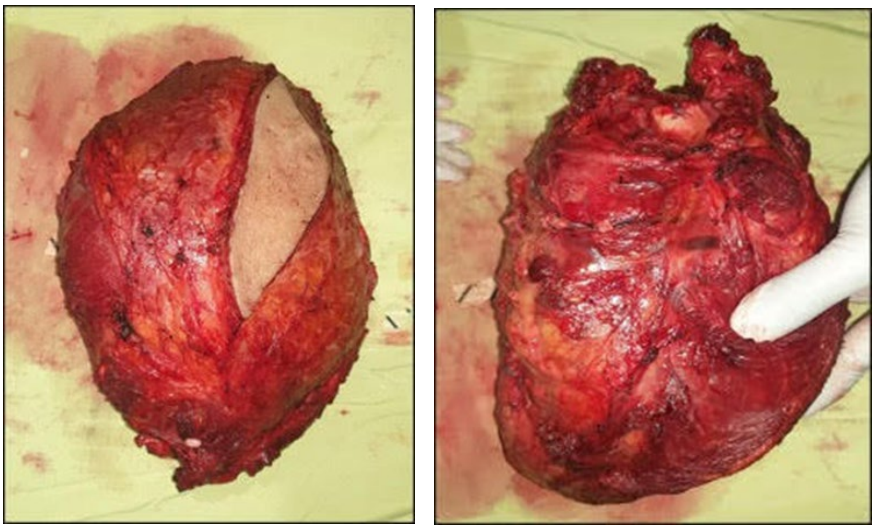

Figure 5. Gross appearance of the removed right suprascapular mass with a size of 22.2cm x 13.5cm x 13.8cm.

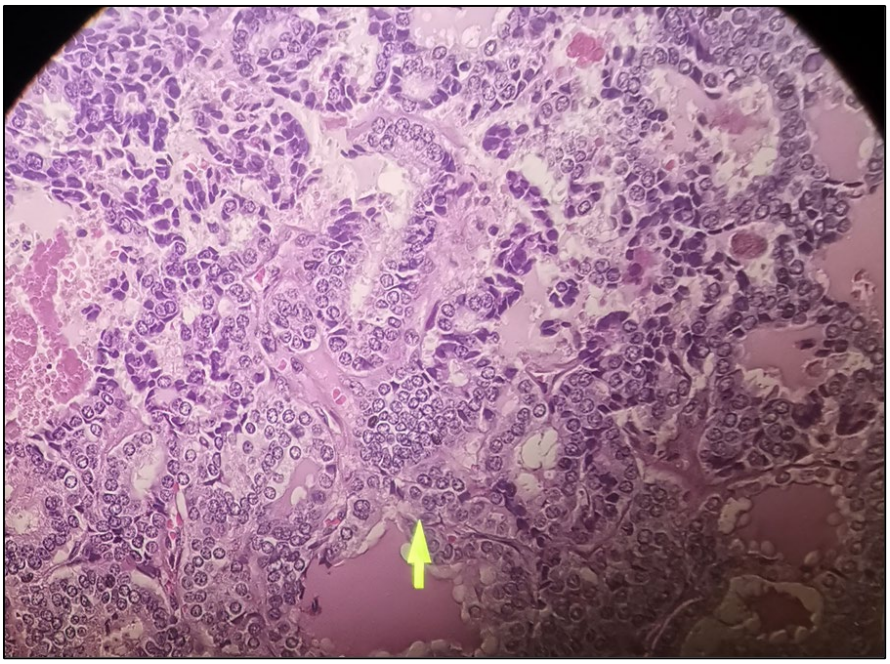

Figure 6. Histopathology of the Scapular Mass (hematoxylin & eosin stain) showing neoplastic process composed of Macrofollicular cells lined with ovoid cells filled with colloid material and microfollicular cells with fine nuclear chromatin consistent with Metastatic Follicular Carcinoma.

thus early suspicion and yielding an increased understanding of follicular carcinoma is an essential matter of investigation including its rare presentations. Soft tissue metastasis is an uncommon initial presentation of follicular thyroid carcinoma. Simultaneous metastases to the bone and skeletal muscle mainly on the right scapula and rotator cuff muscles is a rare occurrence that necessitates this report. Differential diagnosis of metastatic follicular thyroid carcinoma must be kept in mind whenever a sarcoma-like tumor is evaluated.

Conclusion

Soft tissue metastasis is an uncommon initial presentation of follicular thyroid carcinoma. Synchronous metastasis to the bone and soft tissue particularly on the right scapula and surrounding muscles is a rare occurrence that warrants this report.

Conflict of Interest

No conflict of interest relevant to this article was reported.

Acknowledgements

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