

## Sternal Metastasis in Follicular Thyroid Carcinoma: An Atypical Presentation

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### Abstract

Follicular Thyroid Carcinoma (FTC), the second most common type of thyroid cancer, accounts for 10-20% of thyroid cancers, primarily affecting individuals over 40, and it tends to spread hematogenously to various organs. It often metastasizes to the lungs (49%) and bones (7-28%), including the spine, pelvis, skull, long bones, and rarely, the sternum. Metastatic FTC carries a poor prognosis, with a 3-21% ten-year survival rate when bone metastases are present. Sternal metastasis from thyroid carcinoma is exceptionally rare and significantly impacts prognosis.

In this article, we present an unusual case of a 65-year-old patient who presented with a year-long compressive goiter. Examination revealed a firm, painless nodular goiter and a sternal mass. Tests showed a low TSH, normal T4, and thyroid nodules. Following thyroidectomy, a 7cm vesicular thyroid carcinoma was diagnosed. Sternal metastasis was confirmed through biopsy. The patient underwent sternal mass excision, responded well, and was referred for radioactive iodine therapy.

Treatment options for metastases in FTC include surgery, radioactive iodine therapy and radiation. Surgical removal of metastases is crucial in such cases, as it can enhance the effectiveness of subsequent treatments and improve patient outcomes. This comprehensive management approach can offer a better quality of life and extended survival for patients facing this uncommon but challenging situation.

**Keywords:** Follicular Thyroid Carcinoma; Sternal Metastasis; Total Thyroidectomy; Radioactive Iodine Therapy; Distant Metastases; Surgical Intervention

### 1. Introduction

Follicular Thyroid Carcinoma (FTC) is the second most common thyroid cancer after papillary carcinoma, representing 10-20% of all thyroid malignancies, typically diagnosed in individuals over 40 years old. FTC exhibits a unique hematological spread pattern, with common metastatic sites including the lungs (49%) and bones (7-28%), kidney and breast. Among bone metastases, the spine is the most affected (33.9%), followed by the pelvis (30.5%), skull (27.1%), long bones (16.9%), and sternum (11.9%). Unfortunately, the prognosis for metastatic FTC is generally unfavorable, with a ten-year survival rate plummeting to 3-21% when bone metastasis is present [1,7,13].

The rarity of sternum metastasis in thyroid carcinoma is notable. Nevertheless, managing metastatic thyroid cancer is crucial for palliative care or potential cures. Treatment options encompass surgical excision, external-beam radiation, radioactive iodine therapy with I-131, or participation in clinical trials. Surgical removal of metastases, particularly for large tumors and bone metastases, is highly recommended due to the limited efficacy of radioactive iodine therapy. This report describes a patient with sternal metastases from follicular thyroid carcinoma [14].

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## 2. Case report

Patient A.F, 65 years old, with no specific medical history, presented with a compressive goiter that had been evolving for one year. Clinical examination revealed a normotensive, normocardic patient with a firm, painless, nodular goiter, no cervical lymphadenopathy, and a hard mass over the sternum (figure 1).

Laboratory tests showed a suppressed TSH  $<0.005$  mIU/L, normal T4 level of 12 pmol/L, and T3 level was not measured. Cervical ultrasound revealed an enlarged thyroid with multiple nodular formations, the largest of which measured 5.5x2.6 cm in the right upper lobe classified as Eutiards 5, and nodules in the right lower lobe and left upper lobe measuring 3.5x2.7 cm and 3.2x3 cm, respectively, classified as Eutiards 3.

Following thyroid fine-needle aspiration, the patient underwent total thyroidectomy with lymph node dissection. The histopathological examination revealed a 7 cm vesicular thyroid carcinoma without vascular emboli or extrathyroidal extension, classified as PT3a according to PTNM 2017.

The patient was placed on L-thyroxine for replacement and suppressive therapy. Due to the sternal mass, a thoraco-abdomino-pelvic CT scan was performed, revealing an anterior cervical mass measuring 56 mm x 52 mm x 66 mm, extending both intra- and extra-thoracically, with osteolysis of the sternal manubrium, compressing the muscular structures.

A biopsy of the sternal mass was performed, and the histopathological and immunohistochemical analysis confirmed it to be a metastasis from a vesicular thyroid carcinoma.

The patient underwent excision of the sternal mass, removal of the first two costal cartilages on either side of the sternum, and resection of the upper two-thirds of the sternal manubrium, followed by sternal reconstruction. Subsequently, she underwent post-operative follow-up, responded well to treatment, and was referred for radioactive iodine (RAI) therapy.



**Figure 1** Pictures of our patient with the sternal mass

## 3. Discussion

Thyroid carcinoma, the most common endocrine system tumor, affects 3.7 to 4 people per 100,000, comprising 1% of malignancies. It primarily affects young to middle-aged adults, especially females [1,8]. Follicular carcinoma, the second most prevalent thyroid cancer, constitutes 10-20% of thyroid malignancies, spreading hematogenously to various organs. Papillary carcinoma has  $<1\%$  distant metastasis, while follicular carcinoma has 3-4% at presentation [2,4,6]. Distant metastases of FTC are usually found in the lungs and bones, occasionally in the brain, liver, kidney, breast, and skin.

Lesions of the sternum are primarily secondary to chondromas, osteochondromas, bone cysts, primary bone tumors, soft tissue tumors, and metastases. Secondary lesions of the sternum are more common in patients with lung or breast

cancer [2,8]. Metastasis of thyroid carcinoma to the sternum is rarely reported. In one study, the spine was the most common site of follicular thyroid cancer metastasis, accounting for 33.9% of cases, followed by the pelvis at 30.5%, the skull at 27.1%, and long bones at 16.9%. As for the sternum and ribs, they were involved in 11.9% of the cases each. In our case, sternal metastasis was detected at the time of diagnosis, representing an exceptionally rare presentation. [1,5].

The presence of bone metastasis, whether solitary or in combination with other metastases, worsens the prognosis significantly because bone metastases do not respond effectively to radioactive iodine (RAI) therapy [3,4], which is potentially associated with the presence of poorly differentiated tumor cells within them.

For the optimization of thyroid carcinoma management featuring sternal metastases, careful consideration of various factors is imperative when formulating the most appropriate treatment plan. These considerations encompass assessing the risk of fractures, the potential for neurologic compromise, the presence of pain, the extent of RAI uptake, and the potential for significant marrow exposure arising from radiation associated with RAI-avid pelvic metastases. These criteria serve as valuable guidelines for informing therapeutic decisions and striving to achieve the most favorable patient outcomes [1,7,10].

In the management of metastatic sternal tumors, surgical intervention plays a crucial role. Surgical resection is particularly advisable for cases with solitary sternal metastases that can be surgically addressed. This approach aims to enhance the response and effectiveness of subsequent radioiodine treatment and the uptake of RAI in other metastatic sites. This combined therapy approach may still offer an improved quality of life and extended survival, as evidenced by our patient's favorable outcome following total thyroidectomy, sternal metastasis resection, and RAI therapy [1,7,9,11,12].

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#### 4. Conclusion

Thyroid carcinoma, while often treatable, becomes a challenge when distant bone metastases such as sternal lesions occur, which is very rare. Surgical intervention is crucial to improving the efficacy of subsequent treatment and overall quality of life. This combined, multidisciplinary therapeutic approach, as illustrated in our case, can improve outcomes in this rare but critical scenario.

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#### Compliance with ethical standards

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##### *Disclosure of conflict of interest*

The authors declare no conflict of interests.

##### *Statement of informed consent*

Informed consent was obtained from all individual participants included in the study.

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