

# Partial resection and reconstruction of the sternum for treatment of metachronous sternal metastasis of thyroid carcinoma

## A case report

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### Abstract

**Rationale:** Metachronous sternal metastasis of thyroid carcinoma was a rare disease. There was no consensus in the treatment for bone metastasis after the initial thyroid carcinoma surgery.

**Patient concerns:** A 53-year-old female patient was hospitalized due to recurrent dull chest pains, with a history of radical right side thyroid carcinoma 4 years ago. On examination, there was an irregular mass on the lower left half of the sternum. Computerized tomography scan showed sternal bone destruction with a soft tissue mass.

**Diagnoses:** Metachronous sternal metastasis of thyroid carcinoma.

**Interventions:** Partial resection of the sternum and reconstruction with a titanium alloy mesh were performed.

**Outcomes:** After a 3-year follow-up, the patient had no recurrence.

**Lessons:** Surgical resection may be a sufficient treatment for metachronous sternal metastasis of thyroid carcinoma. Biosynthesis material mesh is preferred to be used.

**Abbreviations:** CT = computed tomography, BMI = body mass index.

**Keywords:** sternal metastasis, surgical resection, thyroid carcinoma

## 1. Introduction

Differentiated thyroid carcinoma is one of the most commonly diagnosed thyroid gland malignancies, and its incidence has been rising in recent years.<sup>[1]</sup> The incidence of bone metastasis in thyroid carcinoma is about 25%, which results in a significant reduction in survival rate.<sup>[2]</sup> Currently, there is no consensus in the treatment for bone metastasis after the initial thyroid carcinoma surgery. However, additional surgery is 1 intervention option to manage metastases.<sup>[3]</sup> A case of resection and reconstruction of a sternal recurrence after the initial thyroid carcinoma surgery with a review of relevant literatures is reported here.

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We declare that we have no conflict of interest to this work.

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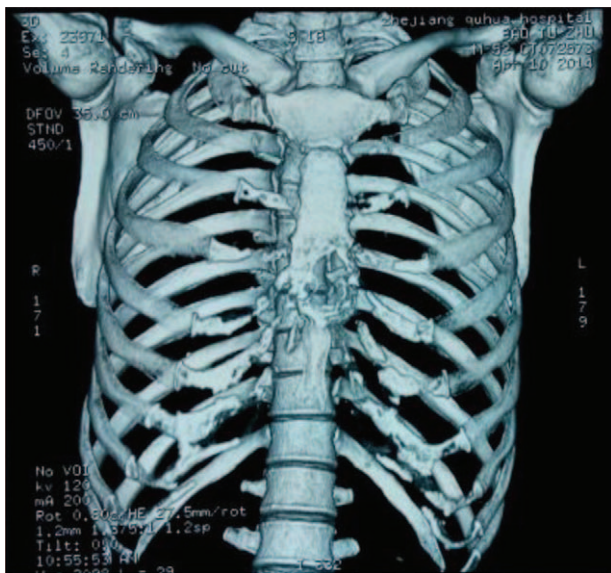
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## 2. Materials and methods

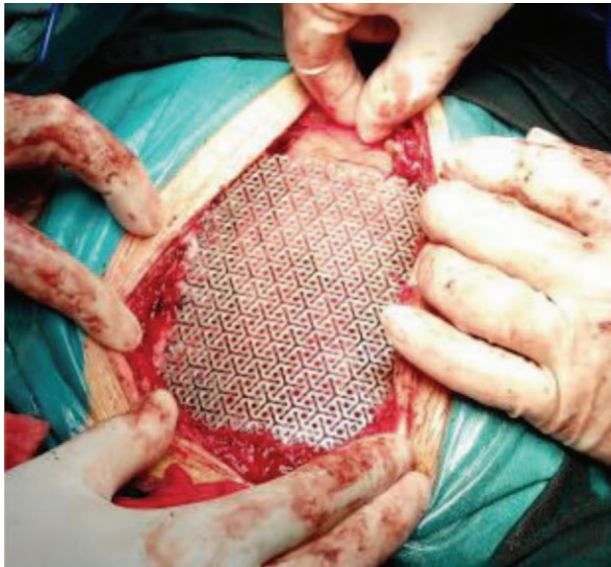
This report was approved by the ethics committee of The Second People's Hospital of Quzhou. The subject, a female aged 53 years, was hospitalized due to recurrent dull chest pains for 1 year that had worsened in the last month. The subject experienced dull, persistent, but tolerable chest pain 1 year ago without an obvious trigger. There was no relief of the chest pain after rest, but there was also no difficulty in breathing and her symptoms improved upon treatment at a local hospital. The subject underwent a consultation at our hospital due to worsening of the chest pain 1 month ago. A chest computed tomography (CT) 3-dimension reconstruction showed sternal bone destruction with a soft tissue mass that was potentially a tumor (Fig. 1). The subject was hospitalized with a suspected "sternal tumor." The subject received a radical surgery for right side thyroid carcinoma 4 years ago. Postsurgical replacement therapy using L-thyroxine sodium and other anti-tumor therapies such as I-131 were declined by the subject.

Upon admission, the subject was conscious, presented a 6-cm transverse surgical scar on the neck, and showed the following vitals: body mass index (BMI) of 20.8, temperature of 36.8°, pulse of 61 beats per minute, respiratory rate of 19 breathes per minute, and blood pressure of 109/74 mm Hg. An irregular mass was found on the lower left half of the sternum. The mass was hard with a rugged surface, no clear border, hardly movable, and slight tenderness. Tumor marker and thyroid function showed no obvious abnormality. No abnormalities were observed with other tests.

After a thorough assessment upon admission to exclude potential risk, a resection of the sternal tumor and implantation of a titanium alloy mesh internal fixation were performed on May



**Figure 1.** Three-dimensional CT for chest showed that a soft tissue mass on sternal bone, and partial sternal bone was destructed.



**Figure 2.** Partial sternum was resected and reconstructed by a titanium alloy mesh.

7, 2014, under general anesthesia (Fig. 2). The surgical procedures went smoothly. Postsurgical pathology suggested that the tumor was a metastatic thyroid follicular carcinoma. The following immunochemical markers were assayed: CK18 (+), CK19 (+), CK7 (+), Ki-67 (<5%), TTF-1 (+), High CK (-), Vimentin (-), CD34 (-), S-100 (-), and CK20 (-). The subject refused any postsurgical anti-tumor therapy. No recurrence was seen in the 3-year follow-up and thyroid function was normal.

### 3. Discussion

The growth of follicular thyroid carcinoma is slow, yet the incidence of bone metastasis is significantly higher than nipple cancer.<sup>[4]</sup> Metastasis occurs predominantly in the first 5 years postsurgery and is commonly observed in the ribs or skull.<sup>[4]</sup> The 10-year survival rate for patients with metastatic follicular thyroid carcinoma is around 13% to 21%,<sup>[5]</sup> with radioactive iodine (I-131) as the first-line therapeutic strategy.<sup>[6]</sup> However, complications such as salivary gland injury or secondary malignancies are often caused. Surgical interventions are usually seen as a second-line treatment option. The subject in this case refused any anti-tumor therapy after both surgeries, yet neither recurrence nor distal metastasis has been seen to date in the 3-year follow-up period, suggesting that surgical removal may provide a beneficial outcome for some patients with metachronous bone metastasis of thyroid carcinoma. Indeed, for patients in developing countries who cannot afford the financial cost of therapies such as I-131, surgical removal could be an affordable treatment alternative.

Currently, there is no standard method for sternal reconstruction after partial sternal resection. Although a small resected area can be reconstructed using an autologous bone graft, a larger resection would have to be repaired using artificial material. There is no consensus on the material for reconstruction and a number of materials have been discussed in the literature (Table 1).<sup>[7,8]</sup> Ishinaga et al<sup>[6]</sup> reported that the use of a polypropylene/expanded polytetrafluoroethylene (ePTFE) compound material achieved a better clinical outcome. In this case study, a titanium alloy mesh was used for an internal fixation, which provided a sufficient mechanical support.

### 4. Conclusion

To summarize, surgical treatment could be a sufficient therapeutic approach for metachronous sternal metastasis of thyroid carcinoma. However, the material for sternal reconstruction lacks a common consensus, while polypropylene/ePTFE and titanium alloy mesh are possible materials to be used.

**Table 1**  
Literatures review of metachronous sternal metastasis of thyroid carcinoma.

Author	Country	Year	Case	Time to recurrence after thyroid surgery, mo	Material of reconstruction	Follow-up time after sternum surgery, mo
Ishinaga et al <sup>[6]</sup>	Japan	2013	1	9	Polypropylene/ePTFE composite	14
Meyer and Behrend <sup>[7]</sup>	Germany	2005	1	144	Polypropylene mesh	54
Haraguchi et al <sup>[8]</sup>	Japan	2004	1	9	Sandwiched marlex and stainless steel mesh	108
Ozaki et al <sup>[3]</sup>	Japan	1995	2	6, 36	Acrylic resin	42, 36
Our case	China	2017	1	48	Titanium alloy mesh	36

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## References

- [1] Kovatch KJ, Hoban CW, Shuman AG. Thyroid cancer surgery guidelines in an era of de-escalation. *Eur J Surg Oncol* 2017;16:30371–2.
- [2] Osorio M, Moubayed SP, Su H, et al. Systematic review of site distribution of bone metastases in differentiated thyroid cancer. *Head Neck* 2017;39:812–8.
- [3] Ozaki O, Kitagawa W, Koshiishi H, et al. Thyroid carcinoma metastasized to the sternum: resection of the sternum and reconstruction with acrylic resin. *J Surg Oncol* 1995;60:282–5.
- [4] Matsuno A, Murakami M, Hoya K, et al. Clinicopathological and molecular histochemical review of skull base metastasis from differentiated thyroid carcinoma. *Acta Histochem Cytochem* 2013;46:129–36.
- [5] Zanotti-Fregonara P, Rubello D, Hindie E. Bone metastases of differentiated thyroid cancer: the importance of early diagnosis and <sup>131</sup>I therapy on prognosis. *J Nucl Med* 2008;49:1902–3.
- [6] Ishinaga H, Miyamura T, Tenpaku H, et al. Metastasis of thyroid cancer to the sternum after total thyroidectomy and laryngectomy. *Case Rep Surg* 2013;2013:346246.
- [7] Meyer A, Behrend M. Partial resection of the sternum for osseous metastasis of differentiated thyroid cancer: case report. *Anticancer Res* 2005;25:4389–92.
- [8] Haraguchi S, Yamashita Y, Yamashita K, et al. Sternal resection for metastasis from thyroid carcinoma and reconstruction with the sandwiched Marlex and stainless steel mesh. *Jpn J Thorac Cardiovasc Surg* 2004;52:209–12.