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# Radical resection and improvised manubriosternal reconstruction technique for solitary manubriosternal metastasis from papillary thyroid cancer

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## ABSTRACT

**INTRODUCTION:** Thyroid papillary carcinoma rarely present as manubriosternal metastasis. The standard treatment for patients with metastatic disease is iodine ablation therapy. A surgical resection is a good option for patients with resectable limited bony metastasis.

**CASE PRESENTATION:** We report a case of a 50-year-old female with thyroid gland enlargement. Positron emission tomography scan (PET) showed a solitary manubriosternal metastasis. The patient underwent total thyroidectomy and claviculo-manubriosternal en-bloc resection and improvised reconstruction using Methyl methacrylate marlex mesh plate (MMS). Post-operative recovery was uneventful, and the patient received adjuvant radioactive iodine (RAI) treatment. At five year follow up patient remained disease-free.

**CONCLUSION:** In conclusion, we report a case of papillary carcinoma of thyroid with solitary manubriosternal metastasis treated with total thyroidectomy and radical en-bloc resection of clavicular heads, manubriosternal and reconstruction by our modified reconstruction technique, which provides the best MMS plate stability, cosmesis, and good disease-free survival. In solitary bony metastasis for thyroid cancer, radical resection followed by a RAI ablation, is the best treatment modality.

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## 1. Introduction

Thyroid gland malignant neoplasms are classified mainly into well differentiated (follicular and papillary) or poorly differentiated anaplastic carcinoma. Pulmonary and bony metastasis can occur by lymphatic and hematogenous spread [1]. Manubriosternal metastasis from thoracic and extrathoracic malignant neoplasm is exceedingly rare. Thyroid cancer, metastasis to sternum has been reported in medical literature scarcely [2,3]. Patients with metastasis usually present with painful sternal mass, ulceration, shortness of breath, or symptoms of vascular compression by the mass effect [4]. This case has been reported in line with SCARE criteria [5].

## 2. Presentation of case

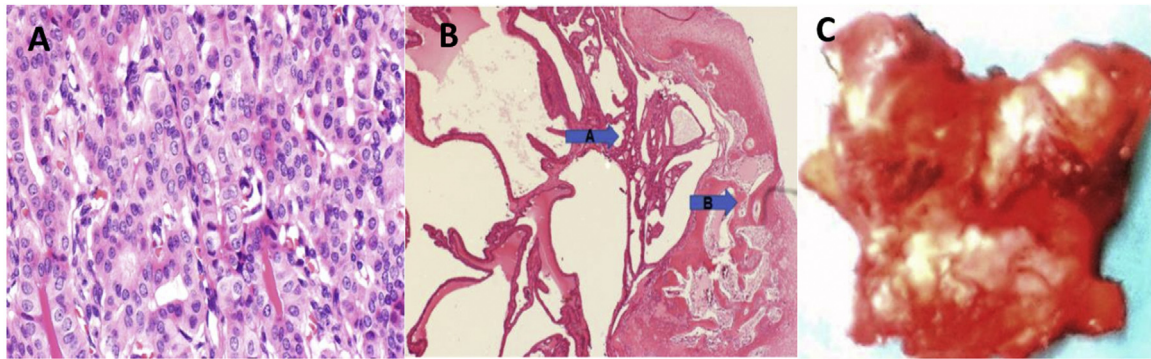
The chest wall defect was measured, and the MMS marlex mesh plate was prepared and molded according to A 50 years old female presented with a history of neck swelling and manubriosternal pain. On clinical examination, there was swelling of the manubrium and no palpable cervical lymphadenopathy.

Ultrasound-guided biopsy revealed papillary thyroid cancer. True cut biopsy of manubrial mass showed metastatic papillary thyroid cancer Fig. 1A&B. CT scan of the neck and thorax revealed a neck mass and bony lesion in the manubrium Fig. 2. A PET scan confirmed a solitary metastasis in manubrium Fig. 2B. Initial serum laboratory investigation showed normal thyroid hormone levels.

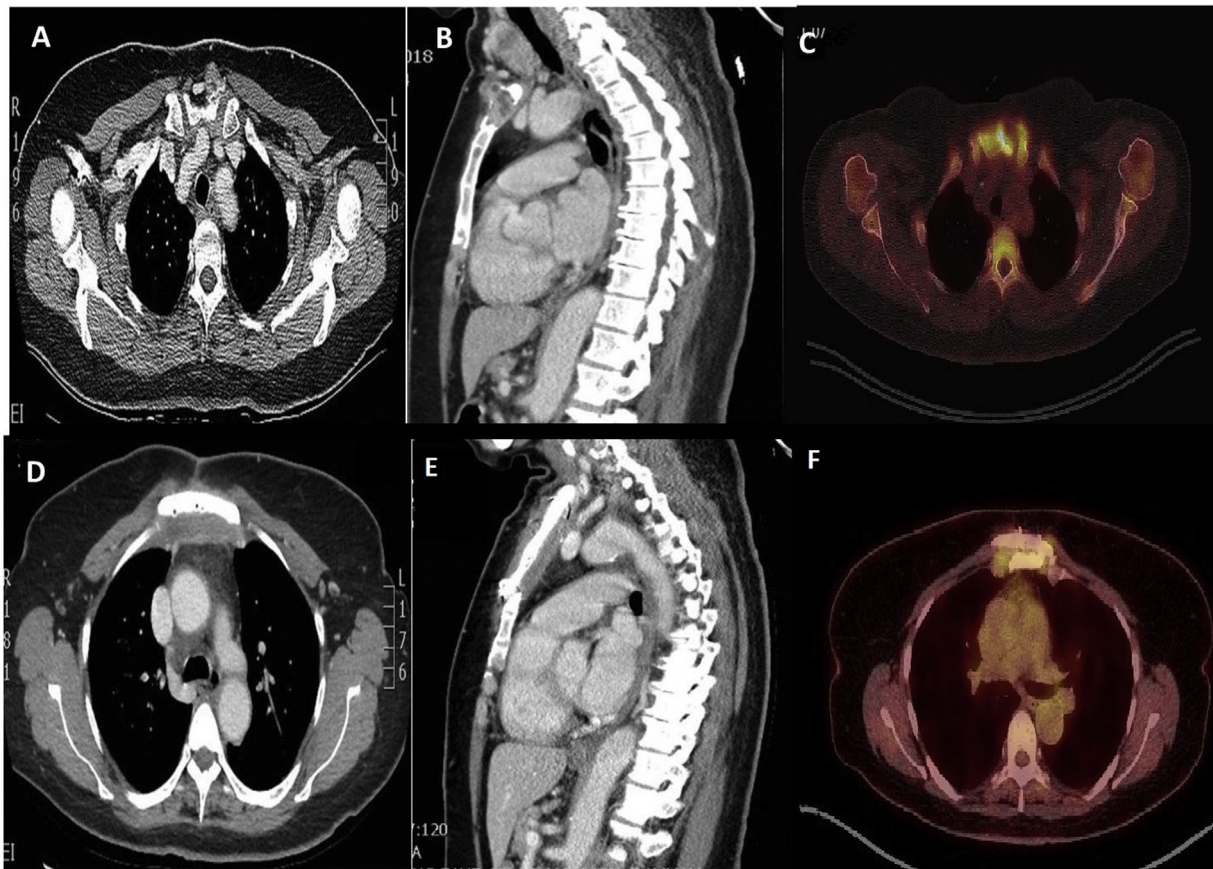
A total thyroidectomy was performed through the cervical approach. Manubriosternal and clavicular heads were exposed through a midline incision. Radical en-bloc resection of clavicular heads, manubrium, and part of sternum along with costal cartilages was performed. An improvised reconstruction was performed using methyl methacrylate cement plate in marlex mesh—the shape of the defect. Holes were drilled in clavicles, ribs, sternum, and corresponding holes were also drilled in the MMS plate. MMS plate was anchored by 5 mm wires to clavicles and sternum, and ribs, and the mesh was sutured with 2/0 prolene to the surrounding tissues. The chest wound was closed over by approximating the soft tissues and pectoralis major muscle. Post-operative recovery was uneventful, and the patient was discharged from the hospital. Five years follow up CT scan of the thorax showed no recurrence of disease Fig. 2C&D. Improvised operative technical steps are shown in illustrative drawings. Fig. 3A, B&C

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**Fig. 1.** (A) Thyroid papillary carcinoma High grade H/E 40×. (B) [Arrow A] Papillary Thyroid carcinoma H/E 4×, [Arrow B] Fragments of Bone. (C) Resected Claviculo-manubriosternal specimen.

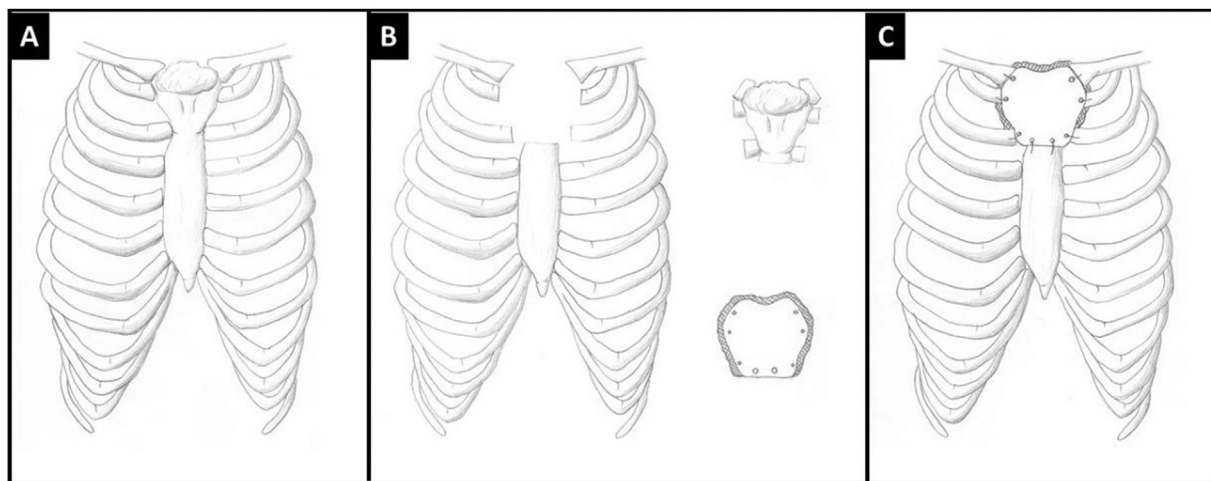


**Fig. 2.** (A & B) CT scan Thorax Axial and Sagittal views showing Manubrial metastasis. (C) Preoperative PET scan Thorax showing metastasis (D&E) post operative CT scan showing reconstruction of the manubrium sternii with MMS plate. (F) PET scan of thorax after two years showing MMS plate in good position and no recurrence.

**3. Discussion**

Papillary and follicular thyroid cancer patients can present with extracervical metastasis. Manubriosternal metastasis is more common from breast cancer, rarely do they arise from Papillary thyroid carcinoma (PTC) [6,7]. A few cases have been reported in the medical literature. Dissemination occurs by the lymphatic or hematogenous route to the lungs, pelvis, ribs, vertebrae, skull, and sternum. Rarely manubriosternal spread can be due to direct contact. The incidence of bone metastases is 0.4% in patients with PTC. Only 5–10% of cases present with metastatic disease at the time of primary diagnosis [8]. Although lung and bone are the most frequent sites for metas-

tasis, Clinical presentation varies according to the site and size of metastatic disease. Patients with manubriosternal disease may present with painful bony swelling, ulceration, compression of the airway, and superior vena cava [9,10]. Best diagnostic modalities for metastatic disease is PET scan or bone scan [11]. For metastatic thyroid carcinoma, the ideal treatment is radioiodine ablation (RAI). American Thyroid Association (ATA) guidelines recommend RAI for patients with thyroid tumor size > 4 cm, extra thyroid extension, and patients with distant metastasis. But unfortunately, bone metastasis response poorly to this treatment [12]. Surgical resection of solitary bony metastatic disease is although a matter of debate. In this case, the primary tumor is entirely respectable, and



**Fig. 3.** Illustrative drawing (A) showing the metastatic deposit in the Manubrium Sterni, (B) Bony defect along with resected specimen & MMS plate (C) Final reconstruction.

there is solitary bone metastasis, then the best treatment option is surgical resection. There are few cases of surgical resection for the isolated sternal metastatic disease reported in the medical literature. Ozaki et al. reported in 1990 a case of resection of sternum and reconstruction for solitary sternal metastatic thyroid cancer [13]. Yanagawa et al. reported a series of ten patients with sternal surgical resection with a good outcome. Zettining et al. also reported the improved survival with surgical resection of solitary bone resection for metastatic thyroid cancer [14,15]. Surgical resection in a patient with solitary bony metastasis not only provides better survival but also plays a significant role in the quality of life. Retrospective studies showed that combined treatment with surgery and radioiodine ablation could give a better result. What is the best prosthetic material for the reconstruction of sternal defect is a matter of debate? Surgeons have used polypropylene mesh, Gortex, artificial sternum, Titanium bars methyl-methacrylate marlex mesh sandwich for the reconstruction. Several types of rib prosthesis systems are available in the market. The oldest one is the Borrelly steel staple-splint system, prevalent in the 1990s. The new evolution is the STRATOS system and a Matrix Rib MDF medica device. Homograft and Allografts have been used for sternal reconstruction, but it has limitations due to its cost availability, ethical and religious issues [16,17].

Sometimes pedicle pectoralis major muscle flap is used to cover the defect. Whatsoever material is used; the main object of reconstruction should be to provide the protection of underlying vital structures, the stability of the chest wall, and good cosmeses without compromising the respiratory physiology. MMS is a cost-effective and excellent material to reconstruct chest wall defects. The main drawback of this material is the dislodgment and excursion of the plate.

We developed an excellent method of chest wall reconstruction with an MMS plate that provides maximum chest wall stability, and the incidence of dislodgment and excursion of the MMS plate is almost nil.

#### 4. Conclusion

In conclusion, we report a case of papillary carcinoma of thyroid with solitary manubriosternal metastasis treated with total thyroidectomy and radical en-bloc resection of clavicular heads, manubriosternal and reconstruction by our modified reconstruction technique, which provides the best MMS plate stability, cosmeses, and good disease-free survival. In solitary bony metasta-

sis for thyroid cancer, radical resection followed by a RAI ablation, is the best treatment modality.

#### Declaration of Competing Interest

No conflict of interest. Nothing to disclose.

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#### Ethical approval

IRB.

#### 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.

#### Author contribution

Ikram Ulhaq Chaudhry  
Operating surgeon drafting the article, Critical revision and final approval of the article. (Corresponding author).  
Ahsan Cheema, wrote structured abstract.  
Chaudhry Aqeel wrote abstract.  
Zahra Al Haji made illustration drawings.  
Yousif A AlqahtaniMD Searched references.  
Ahmad Abbas Oncology surgeon wrote oncological part of discussion.

#### Registration of research studies

1. Name of the registry: RESEARCH REGISTRY
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#### Guarantor

Ikram Chaudhry corresponding author.

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**References**

- [1] Arsalan Adil, Zidane Abdelfetah, Tourabi Khalid, Kitabi Abdurehman, Rharrassi Islam Mssougar Yacine. Isolated sternal metastasis arising from well-differentiated thyroid carcinoma, *Int. J. Cardio. Vas. Thora. Surg.* 3 (6) (2017) 67–69.
- [2] J. Yanagawa, F. Abin, C.K. Lai, M.D. Yeh, D. Carolyn, C.D. Britten, Martinez, C.A. Crisera, E.C. Holmes, J.M. Lee, Resection of thyroid cancer to sternum, *J. Thorac. Oncol.* 4 (2009) 1022–1025.
- [3] Q. Sabih, M.F. Spafford, C.A. Dietal, Poorly differentiated thyroid carcinoma with sternal invasion. A case report and review of the literature, *Int. J. Surg. Case Rep.* 5 (2014) 816–820.
- [4] J.C. Jancer, J.C. Grob, J. Rodier, F.G. Methlin, Les metastasis des cancers differencies de la thyroid: revue de la litterature et experience personnelle, *Lyon Chir.* 88 (1992) 97–103.
- [5] R.A. Agha, M.R. Borelli, R. Farwana, K. Koshy, A. Fowler, D.P. Orgill, For the SCARE Group, The SCARE 2018 statement: updating consensus surgical case report (SCARE) guidelines, *Int. J. Surg.* 60 (2018) 132–136.
- [6] Y.T. Lee, Breast carcinoma: pattern of metastases at autopsy, *J. Surg. Oncol.* 23 (1983) 175–180.
- [7] S. Noguchi, K. Miyauchi, Y. Nishizawa, S. Imaoka, H. Koyama, T. Iwanaga, Results of surgical treatment for sternal metastasis of breast cancer, *Cancer* 62 (1988) 1397–1401.
- [8] J.K. Harness, M.K. Mcleod, N.W. Thompson, W.C. Noble, R.E. Burney, Deaths due to differentiated thyroid cancer: a 46 years perspective, *World J. Surg.* 12 (1998) 623–629.
- [9] Y. Kitamura, K. Shimizu, M. Nagahama, K. Sugino, O. Ozaki, T. Minura, et al., Immediate causes of death in thyroid carcinoma clinicopathological analysis of 161 fatal cases, *Clin. Endocrinol. Metab.* 84 (1999) 4043–4049.
- [10] Charles Marcus, Pal W. Whitworth, Devaki S. Surasi, Sara I. Pai, PET/CT in management of thyroid cancer, *AJR* 202 (6) (2014) 1316–1329.
- [11] E.G. Grubbs, T.A. Ric, G. Li, E.M. Stugis, M.N. Younes, J.N. Myers, Recent advances in thyroid cancer, *Curr. Probl. Surg.* 45 (2008) 156–250.
- [12] M.O. Bernier, L. Leenhardt, C. Hoang, et al., Survival and therapeutic modalities in patients with bone metastasis of differentiated thyroid carcinoma, *J. Clin. Endocrinol. Metab.* 86 (2001) 1568–1573.
- [13] O. Ozaki, W. Kitagawa, H. Koshishi, K. Sugino, T. Mimura, K. Ito, Thyroid carcinoma metastasized to sternum resection of sternum and reconstruction with acrylic resin, *J. Surg. Oncol.* 60 (1995) 282–285.
- [14] G. Zetting, B.J. Fueger, C. Passler, et al., Long term follow-up of patients with bone metastasis from differentiated thyroid carcinoma-surgery or conventional therapy? *Clin. Endocrinol.* 56 (3) (1995) 205–208.
- [15] S. Haraguchi, Y. Yamashita, K. Yamashita, M. Hioki, K. Metasumoto, K. Shimizu, Sternal resection for metastasis from thyroid carcinoma and reconstruction with the sandwiched marlex and stainless steel mesh, *Jpn. J. Thorac. Cardiovasc. Surg.* 52 (4) (2004) 209–212.
- [16] Stefano Sanna, Jury Brandolini, Alessandro Pardolesi, Desideria Argnani, Marta Mengozzi, Andrea Dell'Amore, Piergiorgio Solli, Materials and techniques in chest wall reconstruction: a review, *J. Vis. Surg.* 3 (95) (2017) 3–15.
- [17] Giuseppe Marulli, Francesca Calabrese, Marco Schiavon, Niccolò Daddi, Giampiero Dolci, Franco Stella, Federico, Safety and effectiveness of cadaveric allograft sternochondral replacement after sternectomy: a new tool for the reconstruction of anterior chest wall, *Ann. Thorac. Surg.* 103 (3) (2017) 898–905.

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