Radiology Case Reports 15 (2020) 2018–2021

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/radcr

Case Report

Carcinoid tumor of the anterior mediastinum in a 38-year-old woman ☆,☆☆

Khoren Abelian, ME[a,*], *Omobolaji Ismail Akano*[b], *Diana Penha, MD*[a,d], *Erique Guedes-Pinto, MD*[c,d], *Marousa Ntouskou*[a]

[a] *Liverpool Heart and Chest Hospital NHS FT, UK*
[b] *St Helens and Knowsley NHS FT, UK*
[c] *Aintree University Hospital NHS FT, UK*
[d] *Universidade da Beira Interior, Portugal*

ARTICLE INFO

Article history:
Received 21 July 2020
Revised 27 July 2020
Accepted 28 July 2020

Keywords:
Carcinoid
Contrast enhanced CT
Immunohistochemistry
Mediastinum
Neuroendocrine tumor

ABSTRACT

Mediastinal neuroendocrine tumors (NETs) are very rare. They have been estimated to account for approximately 2%-4% of all anterior mediastinal neoplasms. Carcinoid tumors are a type of NET that can occur in a number of locations. They arise from endocrine amine precursor uptake and decarboxylation cells that can be found in organs such as the lungs. In general, they are slow growing tumors but are nevertheless capable of metastasizing. We present the case of a carcinoid tumor of the anterior mediastinum in a 38-year-old woman presented to our hospital with a 4-month history of worsening breathless and cough. Definitive diagnosis was based on histopathological examination and immunophenotypic markers.

Case Presentation

Thirty-eight-year-old woman was referred to our tertiary hospital for evaluation of shortness of breath. Twelve months before this presentation she was diagnosed with breast cancer, a 9-mm grade 1 ductal carcinoma, estrogen-receptor positive and human epidermal growth factor receptor 2 negative. There was no evidence of dissemination to the regional lymph nodes and the patient underwent mastectomy and started treatment with hormonal replacement therapy.

The patient presented at the clinic with a 4-months long history of several chest infections with recent worsening of breathless, with limitation on physical exertion (having to reduce her pace while walking on the flat and noting breathlessness while climbing 2 flights of stairs). The patient reported a productive cough of white sputum in the morning time only. She denied exertional chest pain, night sweats, and change

☆ Conflicts of interest: The authors declare no conflicts of Interest.
☆☆ Funding: This research did not receive any grant from any public, commercial or not for profit sectors.
* Corresponding author.
E-mail address: abelian@doctors.org.uk (K. Abelian).
https://doi.org/10.1016/j.radcr.2020.07.081

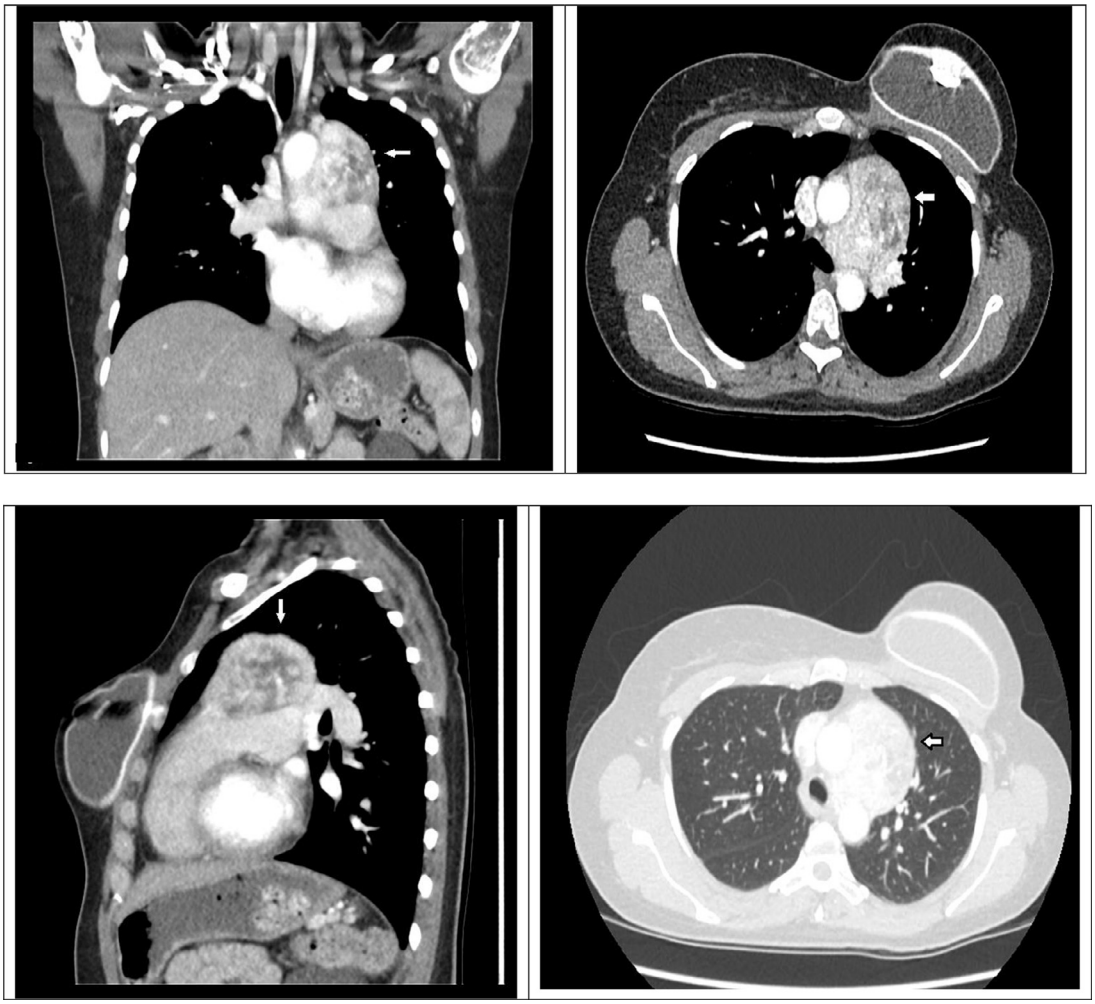

Fig. 1 – Hypervascular mass involving the anterior and mid mediastinum compartments. The lesion measures 68 x 65 x 68 mm and shows internal focal regions with lack of uptake in keeping with necrosis (white arrows).

in weight or appetite. She had a history of Ollier's disease for which she had had several operations on her hands. Her medication included Sertraline and Tamoxifen. There were no known drug allergies. She is an ex-smoker but smoked only 4 cigarettes a day for 1 year, 19 years ago. She did not consume alcohol or use illicit drugs. She worked as a pharmacy dispenser and lived with her husband and 2 children aged 13 and 14 years-old. She had no known sick contacts.

On examination, she had a temperature of 36.6°C, her blood pressure was 131/82 mm Hg, pulse was 86 beats per minute, respiratory rate 16 breaths per minute and oxygen saturation 100% while the patient was breathing ambient air. There was no evidence of finger clubbing, cervical lymphadenopathy, or jaundice. Abdominal examination was unremarkable. Blood tests including serum markers LDH, β-HCG, and α-fetoprotein were within normal limits.

Contrast-enhanced computed tomography of the chest revealed a large anterior mediastinal mass. Positron Emission Tomography (PET) scan revealed a mediastinal mass with standardized uptake values of 3.2. Another area of avidity posterior to left main bronchus within the large mass was also noted. A CT-guided fine-needle aspiration of the mass revealed cell cores infiltrated by a proliferation of monomorphic cells with a vaguely nodular arrangement in a delicate, vascular stroma. Subsequent immunochemistry analysis showed strong expression of neural cell adhesion molecule and synaptophysin with focal expression of chromogranin. These features confirm a diagnosis of a carcinoid tumor with a high possibility of thymic origin (Figs. 1–3).

The patient subsequently underwent left thoracotomy with excision of a large central mediastinal mass which was intrapericardial and was dissected off adjacent mediastinal structures including the arch of aorta, proximal descending aorta, subclavian, and carotid arteries, the ascending aorta and the right ventricular outflow tract. The tumor was extremely vascular and was also involving the left recurrent laryngeal nerve and left phrenic nerve. Both of these nerves had to be sacrificed as part of the operation. The patient's postoperative recovery was uneventful, and she was discharged 6 days after surgery, back to the care of oncology specialist at a different institution, on octreotide therapy.

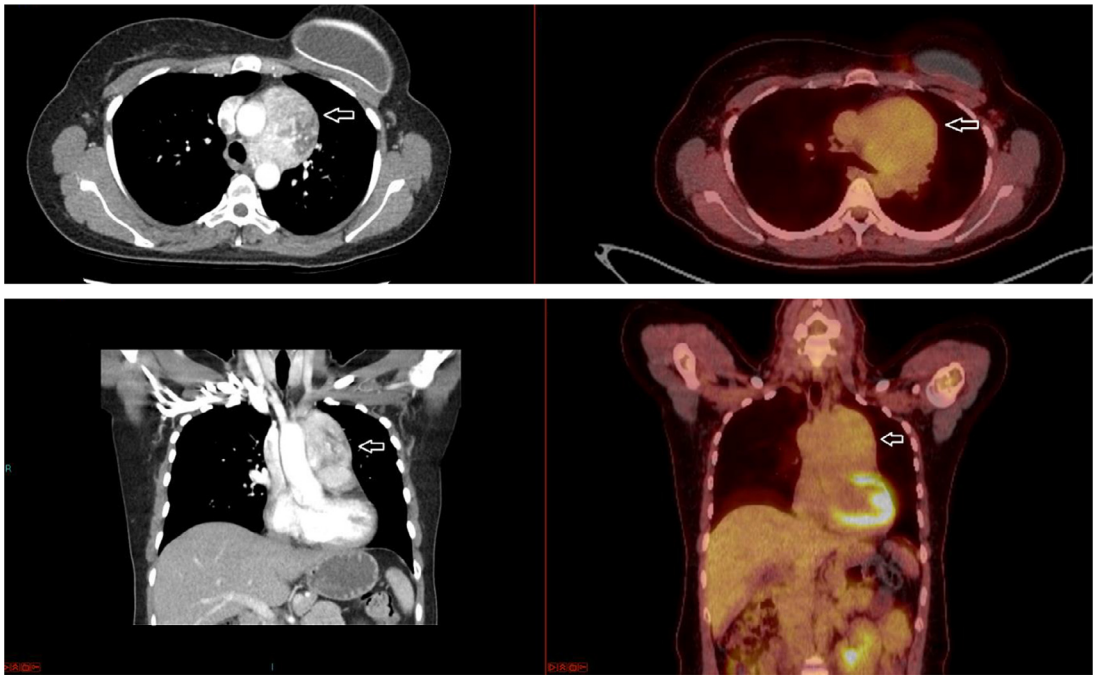

Fig. 2 – PET-CT in axial and coronal views, in correlation with axial and coronal CT reconstructions. There is low level of SUV uptake by the mediastinal mass. This likely relates to the central areas of necrosis noted on CT.

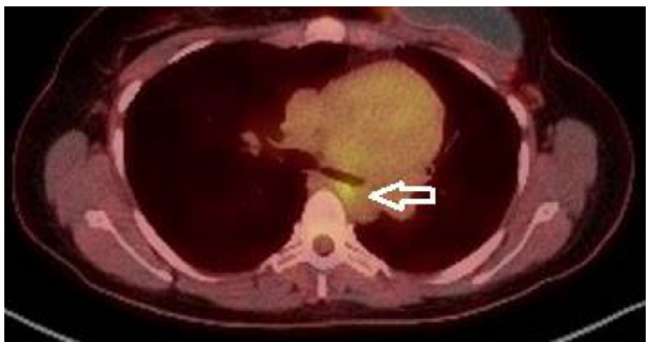

Fig. 3 – Small focus of localized FDG uptake corresponding to soft tissue in contact with the posterior aspect of the distal left main bronchus, suggesting encasement of the bronchus by the large mediastinal mass.

Discussion

NETs of the mediastinum are very rare tumors. Carcinoid tumors are the most common NETs. They can be divided into well-differentiated neuroendocrine carcinomas (atypical carcinoid tumor and typical carcinoid tumor) and poorly differentiated neuroendocrine carcinomas (small cell carcinoma [SCC] and large cell neuroendocrine carcinoma) [1]. Among these, thymic NETs are the most frequent; are exclusively located in the antero-superior mediastinum and account for 2%-4% of all mediastinal tumors [2].

NETs represent a wide spectrum of diseases, mostly occurring sporadically, with some associated with multiple endocrine neoplasia syndromes like type 1 MEN syndrome, and family history of breast, brain, or liver malignancies. In the case presented, there was a previous history of breast malignancy.

Clinically, patients may be asymptomatic, may develop local symptoms due to the compression or invasion of mediastinal structures, or develop systemic symptoms secondary to the tumor capacity to produce hormones or cytokines [3]. In asymptomatic cases or nonspecific symptoms such as above, diagnosis of mediastinal tumors may be delayed and challenging.

Only about 10% of the people with a carcinoid tumor will develop carcinoid syndrome. Major symptoms of this syndrome include hot, red facial flushing, diarrhea and wheezing. Carcinoid syndrome occurs when the tumor produces excessive amounts of serotonin in an individual with liver metastases.

A chest CT-scan is important to define the characteristics of the tumor and its anatomical relationships with surrounding structures. Definitive diagnosis is based on histopathological examination and immunophenotypic markers. Scintigraphic imaging with labeled somatostatin can provide accurate information on the site and dissemination of the tumor [4]. Somatostatin single-photon emission computerized tomography may also be used. PET/CT findings provide useful information for the differential diagnosis of anterior mediastinal masses [5].

Hodgkin disease, mediastinal large cell, non-Hodgkin lymphoma are the most common differential diagnoses in this age group and gender, closely followed by thymoma and carcinoid tumor group [6].

Other differential diagnoses could include an adenocarcinoma, SCC and neuroendocrine SCC of the thymus,

paraganglioma, neuroblastoma, peripheral primitive neuroectodermal tumor, rhabdomyosarcoma, malignant lymphoma, and mediastinal primordial germ cell tumor [7].

Typical or atypical carcinoids and large cell neuroendocrine tumors have different prognosis and available treatment options, thus making an accurate diagnosis vital for their clinical management. The 5-year survival rate ranges from around 87% (average) for patients with carcinoids to 2% for patients with SCLC [8].

Spectrums of treatment options vary from surgical debulking to surgical resection or chemo-radiation. In typical carcinoid, regional lymph node metastases can be found in 10%-15% and distant metastasis in 3%-5% of the cases, whereas in cases of atypical carcinoid, nodal metastases can be found in 50% and distant metastases in 25% of patients [9].

Interferons IFN-α, IFN-γ, and human leukocyte IFN have been used in the pharmacological management of NETs. The biochemical and tumor response rates are modest, while the adverse effects are significant, thus limiting their indication [10].

Chromogranin is the most reliable neuroendocrine marker for these tumors [11]. In a recent study on a large series of cases, positivity for chromogranin in 75% of cases and for synaptophysin in 72% was noted, with only 60% cases showed both chromogranin and synaptophysin positivity. Thus, both markers should be used in the panel of immunohistochemical stains when looking for the possibility of a neuroendocrine carcinoma.

The overall survival rate was 28% at 5 years and 10% at 10 years in 1 recent study. The biologic behavior was directly related to grade and degree of differentiation [11]. It also depends on the mitotic activity, associated endocrinopathy, capsular invasion, incomplete resection, lymph node status, and presence of metastasis at the time of diagnosis.

Conclusion

NETS are rare and often present as a large, lobulated, heterogeneous mass with an infiltrative nature. Imaging and histological characterization are key investigative modalities. Whilst surgery remains the mainstay of treatment, chemotherapy and radiotherapy have a role to play. Metastases and evidence of recurrence are typically identified with serial imaging studies, they commonly involve thoracic lymph nodes, pericardium, pleura, lungs, and less commonly extra-thoracic metastases to bones and abdominal lymph nodes are also noted.

Ethical approval

No ethical approval required.

Consent

Obtained from patient.

REFERENCES

[1] Kan X, Wang P, Gong Z, Gao F, Zhang Y, Ge Y. Investigation on computed tomography features of primary thymic atypical carcinoid tumors, doi:10.1097/rct.0000000000000615.

[2] Suster S, Moran CA. Neuroendocrine neoplasms of the mediastinum. Am J Clin Pathol 2001;115(Suppl):S17–27 [PubMed].

[3] Duwe BV, Sterman DH, Musani AI. Tumors of the mediastinum. Chest 2005;128:2893–909 [Crossref] [PubMed.

[4] Kaltsas G, Rockall A, Papadogias D, et al. Recent advances in radiological and radionuclide imaging and therapy of neuroendocrine tumours. Eur J Endocrinol 2004;1(1):15–27.

[5] Watanabe T, Shimomura H, Mutoh T, Saito R, Goto R, Yamada R, et al. Positron emission tomography/computed tomography as a clinical diagnostic tool for anterior mediastinal tumors. Surg Today 2019;49(2):143–9. doi:10.1007/s00595-018-1712-1.

[6] Carter BW, Marom EM, Detterbeck FC. Approaching the patient with an anterior mediastinal mass: a guide for clinicians. J Thorac Oncol 2014;9:S102–9.

[7] Ventura L, Gnetti L, Silini EM, Rindi G, Carbognani P, Rusca M, et al. J Thorac Dis 2017;9(4):E367–72 6p. (Article - case study, diagnostic images, pictorial) ISSN: 2072-1439.

[8] Dincer HE, Podgaetz E, Andrade RS. Pulmonary neuroendocrine tumors: part II. Treatment. J Bronchol Interv Pulmonol 2015;22(4):351–6. doi:10.1097/LBR.0000000000000206.

[9] Dincer HE, Podgaetz E, Andrade RS. Pulmonary neuroendocrine tumors: part II. Treatment. J Bronchol Interv Pulmonol 2015;22(4):351–6. doi:10.1097/LBR.0000000000000206.

[10] Gustafsson BI, Kidd M, Chan A, Malfertheiner MV, Modlin IM. Bronchopulmonary neuroendocrine tumors. Cancer 2008;113(1):5–21. doi:10.1002/cncr.23542.

[11] Moran CA, Suster S. Neuroendocrine carcinoma (carcinoid tumor) of the thymus: a clinicopathologic analysis of 80 cases. Am J Clin Pathol 2000;114:104–8.