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CT features of mature teratoma in the mediastinum of two young adults—a report of two cases

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Abstract

Background: Germ cell tumors prefer gonadal regions, but they can be expected in extragonadal sites such as the anterior mediastinum, which is the commonly involved region after gonads. Amongst germ cell tumors, teratomas are the rarer subtypes which develop in the anterior mediastinum.

Case presentation: The authors present two adult patients, a male and a female, both complaining of chronic chest pain and cough. Chest CT scans were performed revealing characteristic CT features of mature teratomas in the anterior mediastinum which were extending to the superior mediastinum in both patients.

Conclusion: Germ cell tumors are involving the mediastinum; however, amongst all germ cell tumors, teratoma is the least common type arising in the mediastinum, and a chest CT scan considered the imaging investigation of choice. Surgery is the best option and patients may have a very good prognosis.

Keywords: Mediastinal teratoma, Young adults, Report of two cases

Background

Virchow introduced the word teratoma [1] as terato which means monster and oncoma which means swelling [2]. The attention-grabbing perspective of teratomas comes from their unclear origin, strange appearing in a microscope, and their random behavior [2]. Teratomas were defined as true tumors consisting of tissues nonnative to the part of the body in which they are developed (1953 by Willis) [1]. Germ cell tumors are commonly discovered in gonads; however, rarely, they are seen in extragonadal locations, and they can be located near or in the midline [3]. Out of all germ cell tumors, only 1–3% of them arise from the mediastinum, and amongst them, teratomas contribute as the rarer subtypes [2, 3]. Teratomas of the anterior mediastinum are indolent and slowly developing of which 1/3 of the patients present no symptoms and are incidentally discovered in chest X-rays [1]. In contrast, our patients presented complaining of chronic cough and chest pain. A chest CT scan is considered the imaging investigation of choice for mediastinal teratomas [2–5]. The typical CT features of teratomas include fat-containing areas, cystic fluid contents, and dense calcifications [2, 4, 5].

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Case 1

A 22-year-old male complaining of chronic chest pain and cough for 1 month was referred to the Radiology Department to undergo a contrast-enhanced chest CT scan. There was no pertinent prior medical, family, and psycho-social history including any genetic predisposition. No pertinent prior interventions were noted. No abnormal findings on physical examination. A chest CT scan was performed revealing an enlarged heterogeneous cystic mass in the anterior mediastinum extending to the superior mediastinum. The mass was showing areas of fat contents, cystic and soft tissue compartments, and dense foci of calcifications. Antero-superiorly, the mass was abutting the sternum. Posteriorly, the mass was abutting the superior vena cava (SVC), trachea, and

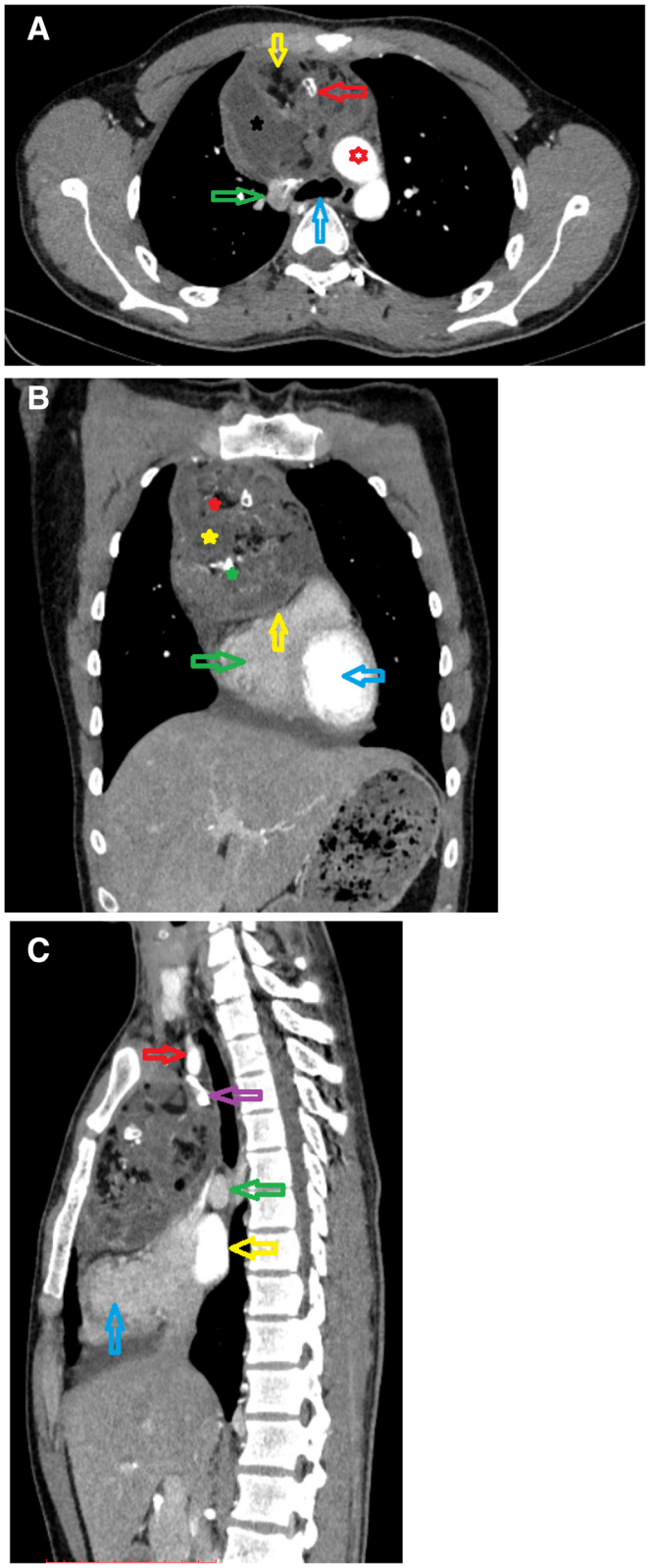

Fig. 1 (See legend on next page.)

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Fig. 1 a Axial contrast-enhanced image shows anterior mediastinal mass consisting of soft tissue and cystic fluid components (black asterisk), fat (yellow arrow), dense calcifications (red arrow), located anterior to superior vena cava (green arrow), trachea at the level of bifurcation (blue arrow), and aortic arch (red asterisk). **b** Coronal contrast-enhanced image shows complex mass superior to the heart depicting fat (red asterisk), soft tissue and fluid components (yellow asterisk), and dense calcifications (green asterisk). Intact pericardium (yellow arrow) is noted. The right ventricle (green arrow) and left ventricle (blue arrow) are also seen. **c** Sagittal contrast-enhanced image shows a large teratoma in the anterior and superior mediastinum. Superoposteriorly is the brachiocephalic trunk (red arrow), left brachiocephalic vein (pink arrow), right pulmonary artery (green arrow), left atrium (yellow arrow), and right ventricle (blue arrow)

ascending aorta (Fig. 1a, c) Inferiorly, the mass was abutting the right ventricle; however, there was no invasion of the pericardium (Fig. 1b). There was no evidence of superior vena cava obstruction. There was no extension beyond the thoracic inlet. No communication with the tracheobronchial tree, pleural effusion, or pericardial effusion. No pulmonary consolidation was seen. No suspicious lesion was detected in the imaged lungs or bony skeleton.

Case 2

A 35-year-old female complaining of chest pain and cough for a long time was referred to the Radiology Department to undergo a contrast-enhanced chest CT scan. There was no pertinent prior medical, family, and psycho-social history including any genetic predisposition. No pertinent prior interventions were noted. No abnormal findings on physical examination. A chest CT scan was performed revealing an enlarged heterogeneous complex mass in the left aspect of anterior mediastinum extending to superior mediastinum. The components of the mass were fat, soft tissue, and cystic fluid compartments as well as dense foci of calcifications. Anteriorly, the mass was abutting the left anterior chest wall. Posteriorly, the mass was abutting the aortic arch, pulmonary trunk, and left pulmonary artery (Fig. 2a–c).

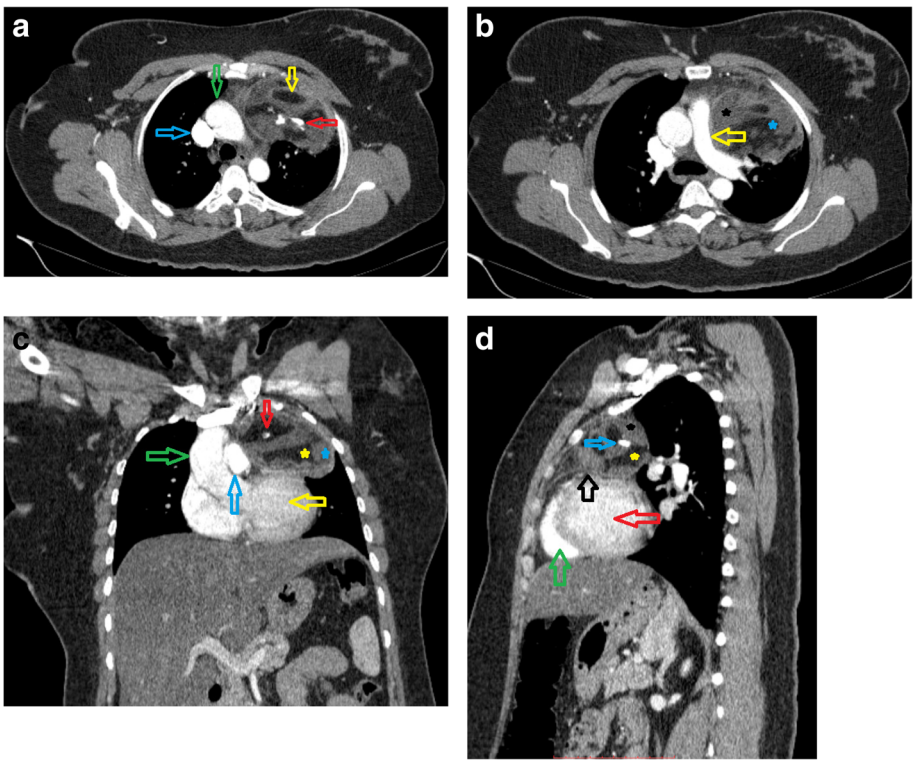

Fig. 2 a, **b** Axial contrast-enhanced CT scan images show teratoma in the left aspect of the anterior mediastinum. **a** Fat component (yellow arrow), dense calcification (red arrow), aortic arch (green arrow), and superior vena cava (blue arrow). **b** Soft tissue and cystic fluid components (black asterisk), fat component (blue arrow), and pulmonary trunk and left pulmonary artery (yellow arrow). **c** Coronal contrast-enhanced CT scan image shows teratoma. Dense calcification (red arrow), fat component (yellow asterisk), soft tissue component (blue asterisk), left ventricle (yellow arrow), ascending aorta (green arrow), and left pulmonary artery (blue arrow). **d** Sagittal contrast-enhanced CT scan image shows teratoma in the anterior aspect of the left mediastinum. Fat component (yellow asterisk), dense calcification (blue arrow), soft tissue component (black asterisk), intact pericardium (black arrow), left ventricle (red arrow), and right ventricle (green arrow)

Inferiorly, the mass was abutting the upper aspect of the left ventricle. There was no pericardial invasion (Fig. 2d). There was no extension beyond the thoracic inlet. No communication with the tracheobronchial tree, pleural effusion, or pericardial effusion. There was no pulmonary consolidation. No suspicious lesion in the imaged lungs or bony skeleton. Both patients were carried to another facility for further management and were lost to follow-up.

Discussion

Teratomas are tumors that have embryologic origin arising from immature primordial cells of two or all three germ layers [2, 4]. The location can be gonadal or extragonadal. The hypothesis that has been accepted is that during early embryogenesis, a defect is occurring in the migration of multipotent germ cells along the urogenital ridge [4] (a theory suggested by Fine) [5]. In contrast, epidermoid and epidermoid cysts both arise from ectoderm and ectodermal inclusion cysts with the first lined by squamous epithelium and the latter composed of complex tissues [6].

The global incidence of teratoma is one in every 4000 births [2, 4]. There is no gender predilection in benign germ cell tumors. On the contrary, malignant types are more found in males compared to females [3]. Anterior mediastinal teratomas are reported to be the most common extragonadal teratoma by location [3–5]. About 1 to 3% of all germ cell tumors arise in the mediastinum [5]. It is estimated that germ cell tumors account for 15% and 24% of anterior mediastinal masses in adults and pediatric populations, respectively [3, 5].

The frequency of occurrence of teratomas is as follows: 40% in the sacrococcygeal region, 25% in the ovary, 18% in the neck and mediastinum, 12% in the testis, and 5% in the brain tissues [2].

The histologic classifications include mature and immature teratomas, teratoma with malignant features, seminoma, and non-seminomas [4, 5] as well as teratocarcinoma [5]. Mediastinal germ cell tumor is considered the most common histologic type ensued by seminoma [3]. Mature teratoma of the mediastinum is a slowly developing benign tumor [3, 4] that either arises from thymic parenchyma or developing near the thymus [3]. Due to the slow development of mature teratomas in the mediastinum [1], they are often discovered in routine chest radiographs [1, 3, 5]. In 60% of diagnosed cases, patients did not have any clinical complaints [2]. Commonly, young patients between 20 and 40 years present with symptoms [2, 4]. The clinical presentation of anterior mediastinal teratomas is produced because of the mass effects on adjacent organs [1–4] transformation to malignancy or spontaneous rupture [1]. Rupture of a mediastinal teratoma (36–41% of cases) is also observed which can cause severe symptoms such as chest pain, hemoptysis, dyspnea, coughing up hair, and sebaceous material [1]. Acute respiratory distress can result if a rupture has occurred into a tracheobronchial tree [1] leading to coughing up hair, and such presentation is considered pathognomonic for teratoma [4, 5]. Rupture of anterior mediastinal teratoma can also occur in pericardial and pleural spaces [3, 4] leading to pleural and pericardial effusions [3]. Conditions such as pneumothorax and acute cardiac tamponade are also reported [3]. One of the most common presentations of anterior mediastinal teratomas is superior vena cava obstruction [1].

The radiologic examination of choice is a chest CT scan in mediastinal teratomas [2–5] which can better evaluate the location, extension, and vascularity of such lesions [3, 4] compared to conventional radiography [2]. The typical CT features in mediastinal teratomas include well-demarcation with lobulated structure [4] regions of fat, cystic fluid contents, and areas of calcification [2, 4, 5]. The presence of the fat-fluid level is pathognomonic for teratomas [3, 4]. The characteristic findings of teratoma are the presence of well-differentiated tissues such as the teeth and hair [4]. Pancreatic enzymes are reported to have a role in the rupture of tumors [3]. If teratoma is ruptured, the findings can be fat globules at the site of rupture, air space opacities such as consolidation or atelectasis in the adjacent lung parenchyma, and pleura effusion [4]. If teratomas demonstrate thick-walled heterogeneous cystic mass with mural calcifications and internal fat components invading the pericardium and great vessels, then the possibility of malignancy is highly suspicious and needs to be ruled out [3]. Magnetic resonance imaging (MRI) is also a valuable tool to characterize the infiltration of mass. It will demonstrate signal intensities of fat, fluid, and calcification [3, 4]. Usually, CT-guided biopsy is performed for the determination of the benign or malignant nature of teratomas. Pericardial involvement is critical to a patient's life and urgent intervention can be considered [4].

Usually, mature teratomas are benign with no malignant characteristics, but in few cases (1–3%), malignant transformation into sarcoma, adenocarcinoma, squamous cell carcinoma, and carcinoid tumor has been reported [2].

The treatment of choice is surgery by completely excising the tumor in non-malignant teratomas [2–5]. There is an excellent prognosis with a survival rate of almost 100% in mature teratomas. In immature teratomas, the lesions might depict aggressive behavior in adults and with poor prognosis [3]. Surgery is also helpful in establishing the diagnosis as well as maintaining long-term cure diminishing recurrence. The preferred method is the median sternotomy because it provides ease of access. Lateral thoracotomy can be useful in cases where

an extension to hemithorax is noted [4]. Although mediastinal teratomas are not life-threatening by themselves; however, complications of extensive surgery that are carried out can be fatal, for instance, pneumonectomy which can lead to death [2]. The combination of surgery with chemotherapy can increase the survival rate in malignant teratomas [4].

Conclusion

Although germ cell tumors can primarily be seen in gonads, the involvement of extragonadal regions can also be expected, such as anterior mediastinum which is believed to be the most commonly involved extragonadal site. But amongst all germ cell tumors, teratomas make up the rarer subtype developing in the anterior mediastinum. A CT scan is the investigation of choice for unruptured and complicated mediastinal teratomas. Fortunately, surgery is a successful treatment with an extremely good prognosis in patients with unruptured mediastinal teratoma. However, ruptured teratomas can cause inflammation and secondary adhesions in the lung or pleural cavity, making the surgery challenging.

Abbreviations

CT: Computed tomography; MRI: Magnetic resonance imaging; SVC: Superior vena cava

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Authors' contributions

All of the authors have participated sufficiently in the submission and take public responsibility for its content. NF: writing the manuscript and editing, selecting the images, and corresponding with the journal. FF, NR, and MMSH: revising the manuscript and selecting the case. The authors have read and approved the final manuscript.

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Availability of data and materials

The data used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

The manuscript has got an ethical review exemption from the Ethical Review Committee (ERC) of the authors' institution (French Medical Institute for Mothers and Children {FMIC}) as case reports are exempted from review according to the institutional ethical review committee's policy. Written consent is obtained from the participants for publishing the case.

Consent for publication

Written informed consent was obtained from the parent of the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor of this journal.

Competing interests

The authors declare that they have no competing interests.

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