Case report

Mucoepidermoid carcinoma of the thymus incidentally diagnosed following two-years of non-productive cough

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ABSTRACT

Mucoepidermoid carcinoma of the thymus is a rare primary thymic carcinoma. Radiologic imaging of this malignancy is rarely reported in literature. We present a patient who complained of a chronic cough for two years who was later found to have mucoepidermoid carcinoma of the thymus. Chest radiograph revealed a large anterior mediastinal mass. Follow-up computed tomography of the thorax demonstrated a large, heterogeneous anterior mediastinal mass with traversing vessels. F-18 fluorodeoxyglucose positron emission tomography-computed tomography demonstrated high avidity in the lesion with areas of diminished activity thought to represent necrosis. Following surgical resection, pathology revealed high-grade mucoepidermoid carcinoma of the thymus extending into the skeletal muscle and pericardium with evidence of lymphovascular invasion. The patient received external beam radiation therapy and has remained disease-free for three years.

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Introduction

Mucoepidermoid carcinoma (MEC) of the thymus is a rare primary thymic carcinoma which comprises only 2% of thymic carcinoma in the literature [1,2]. While most published cases discuss the gross and histopathologic findings, there is little discussion of the radiologic findings. Studies discussing the radiologic findings are variable with some studies describing a cystic (unilocular or multilocular) mass with a focal heterogeneously enhanced solid component or well-circumscribed, homogeneous tumor [3,4]. In this case report, we discuss the radiologic findings of MEC of the thymus in our patient.
Case presentation

A 58-year-old male with a past medical history of hyperlipidemia, hypertension, and gastroesophageal reflux presented to his primary care physician with an intermittent, non-productive cough for the past two years. The cough began to worsen following an upper respiratory infection and he also began to experience chest tightness. His primary care physician ordered a chest radiograph (Fig. 1) that demonstrated an anterior mediastinal mass with loss of the retrosternal clear space. There was expansion of the paratracheal soft tissues bilaterally, which was suspected to be from enlarged lymph nodes. No pulmonary or pleural abnormalities were seen. A computed tomography (CT) of the thorax was recommended.

CT of the thorax with contrast on the same day demonstrated a large, heterogeneous anterior mediastinal mass, measuring approximately 9.3 × 7.0 × 9.6 cm, with rightward and posterior tracheal displacement (Fig. 2). Some areas of hypoattenuation within the mass were thought to be related to necrosis. Vessels were seen traversing the mass (Fig. 2). There was a small pericardial effusion. Given these findings, a cervical mediastinotomy and biopsy was performed.

Gross pathology of the mass indicated several areas of fibrous tissue with red-tan soft tissue fragments. Microscopically, the tissue fragments showed irregular nests and sheets of carcinoma composed of combined epidermoid and mucinous cells in the background of fibrosis (Fig. 3). The tumor revealed intermediate nuclear grade with mitosis (3-4 per 10 high power field). The mucinous cells were positive for mucicarmine and periodic acid-Schiff staining. These findings were consistent with low- to intermediate-grade MEC, which may have arisen from primary or metastatic disease, or arose from a multicellular thymic cyst/teratoma. The tissue specimen was sent to an outside institution for cytogenetic analysis.

Given the unknown etiology of the tumor, F-18 fluorodeoxyglucose positron emission tomography-computed tomography (FDG PET/CT) and magnetic resonance imaging (MRI) of the brain was ordered. There was increased FDG activity in the large anterior mediastinal mass (volume 298 mL) with a maximum standardized uptake value (SUV) of 8.4 (Fig. 4). There was diminished activity in the hypodense regions corresponded to areas of hypoattenuation on CT (Fig. 4). A small pericardial effusion was present, but no abnormal uptake was seen in the lung parenchyma or hilar lymph nodes. MRI with contrast of the brain did not reveal any evidence of intracranial metastatic disease.

The patient underwent median sternotomy and resection of the anterior mediastinal mass and thymectomy with mesh reconstruction. The mass measured approximately 20 cm in its greatest dimension. The mass extended beyond the thymus and encompassed the left phrenic nerve, and the entirety of the left innominate vein. The mass involved the pleura bilaterally and was inseparable from the pericardium and manubrium but free from the body of the sternum. The patient also underwent neck dissection to preserve the right phrenic nerve, both vagus nerves, and both recurrent laryngeal nerves. Final surgical pathology revealed high-grade MEC of the thymus extending into the skeletal muscle and pericardium without perineural invasion. There was also evidence of lymphovascular invasion and focal necrosis. There was no evidence of tumor invasion into the resected portions of the xiphoid and manubrium.

The patient received external beam radiation therapy of 60 Gy in 30 fractions to the mediastinum. The treatment course was complicated by radiation dermatitis and transient dysphagia. Follow-up CT of the thorax approximately 3 months post-radiation revealed bilateral paramediastinal fibrosis and postsurgical changes without evidence of tumor recurrence.
Fig. 2 – Contrast-enhanced CT of the thorax demonstrates a large, heterogeneous anterior mediastinal mass with some internal areas of low density (yellow arrows). Vessels are seen traversing through the mass (red arrow). There is evidence of rightward and posterior tracheal deviation (blue arrows) secondary to the mass. (color version of figure is available online.)

To date, the patient has remained free of recurrent disease for approximately 3 years.

Discussion

MEC was first described as a distinct pathologic entity of salivary gland tumors in 1945 [5]. Since then, MEC has been discovered in multiple sites including the upper respiratory system, esophagus, breast, and thymus [6,7]. It accounts for approximately 10%-15% of all salivary gland neoplasms and 30% of all salivary malignancies [8,9]. Approximately 50%-60% of these tumors arise in the major salivary glands with more than 80% occurring in the parotid gland, 8-13% arising in the submandibular gland, 2%-4% arising in the sublingual gland, and the remaining tumors originating in the minor salivary glands (most commonly in the palate) [6]. Low-grade MEC most commonly arises in minor salivary glands while the majority of high-grade MEC arises in the major salivary glands and is more frequently associated with higher T and N-staging status [10,11]. With the exception of submandibular gland MEC due to its propensity to recur or metastasize, low-grade tumors have a high 5-year survival rate (90%-100%) [11–13].
MEC of the thymus was first described in 1982 by Snover et al and Tanaka et al [14,15]. Mucinous epithelium differentiation may occasionally be noted in normal thymus and thymomas [16]. MECs have been reported to be associated with a multilocular cyst or observed to form sheets of tumor cells originating from the wall of an epithelial-lined cyst [3,14]. Histologic analysis of MEC shares similarities with its salivary gland counterparts. Examination typically reveals a triphasic tumor composed of epidermoid (squamous) cells intermingled with mucus-secreting cells (mucocytes), and intermediate cells that may also have a clear cell component [3,13,17]. In general, MEC of the thymus differs from other thymic neoplasms in that they are rarely associated with paraneoplastic symptoms, such as myasthenia gravis or other autoimmune diseases [18]. While there have been reported cases of patients with MEC of the thymus presenting with symptoms of myasthenia gravis, it is uncertain whether the patients had a concurrent thymoma as the cause of their myasthenia gravis [19]. Most patients with MEC of the thymus remain asymptomatic, but some patients may present with respiratory symptoms secondary to extrinsic compression of the respiratory tract [18].

Imaging plays an important role in the diagnosis and workup of thymus MEC, though they are frequently found incidentally on imaging. Imaging is also helpful in determining differential diagnoses, assessing the possibility of metastasis, and determining the extent of local invasion into adjacent structures. Patients are usually found to have an incidental anterior mediastinal mass on radiography of the chest. As with our patient, MEC appears as an intermediate density mass in the anterior mediastinum. Given the wide differential of benign and malignant causes of a superoanterior mass, further evaluation using CT is commonly pursued. Axial imaging of the thorax commonly shows thymic carcinomas as a large, poorly-defined, homogeneous mass in the superoanterior mediastinum, often with areas of necrosis, hemorrhage, calcification, or cyst formation [20-22]. The appearance may vary depending on the grade of the tumor and the presence and extent of local invasion into adjacent structures [4,23].

To date, the radiologic findings of MEC of the thymus have not been well described in literature. However, radiologic findings of MEC of other sites (namely the salivary glands and lung) are better described. Current studies describe a solid mass (83.3%), but may occasionally demonstrate a cystic mass with a mural nodule (16.8%) on CT [24]. Enhancement patterns of MEC are approximately equal with a slightly increased incidence of heterogeneously enhanced tumors compared to homogeneously enhanced tumors (55.7% vs 44.3%) [24]. Tumors tend to be more commonly ill-defined (55.7%) compared to well-defined margins (44.4%) [24]. MEC is bland on unenhanced CT imaging, but demonstrates avid arterial enhancement without washout on venous and delayed phase scanning [24].

Given that MEC may metastasize, FDG PET/CT may be ordered to stage the disease and plan treatment options. On FDG PET/CT, pulmonary mucoepidermoid carcinoma (PMEC) has been reported to have a variable SUV depending on the grade of the tumor. Several cases of low-grade PMEC have been reported to have a SUV of 3.63 and 6.2, while a high-grade PMEC with nodal metastasis was reported to have a SUV of 7.4 [25-27]. A study from Park et al used FDG PET/CT as a preoperative predictor of pathologic grade and found that their optimal cut-off for assessing grade for PMEC was a SUVmax of 6.5 [28]. Patients who had a SUVmax of <6.5 were more commonly found to have low-grade tumors while those with a SUVmax of ≥6.5 more commonly had high-grade tumors [28]. These data align with previous studies predicting the pathologic grade of MEC and surgical outcomes [29,30]. Our patient was initially thought to have intermediate-grade MEC but final surgical pathology revealed high-grade MEC. Thus, our patient’s SUVmax of 8.4 aligned with the predicted high-grade nature of his disease.

MRI of high-grade MEC of the parotid gland is reported to have inhomogenous low to intermediate signal intensity on T1-weighted and T2-weighted images with ill-defined margins which may reflect the high cellularity and invasive nature of these tumors. Intermediate-grade carcinoma demonstrated intermediate signal intensity on T2-weighted images with only some tumors presenting as a well-defined mass. Low-grade MECs demonstrated hyperintensity on T2-weighted images due to abundant mucin-secreting cells. Low-grade MECs were also found to have ill-defined margins, but this is due to peritumoral inflammatory changes rather than infiltrative disease [31]. These MRI findings are shared with other primary
sites, including the larynx, minor and major salivary glands, and brain [32–36].

Conclusion

Mucoepidermoid carcinoma of the thymus may present with nonspecific symptoms. It is frequently found incidentally on imaging. Radiologic imaging of mucoepidermoid carcinoma of the thymus demonstrates heterogeneous mass with possible areas of necrosis and associated cystic structures on CT imaging. Recent data reveals that the SUVmax from PET-CT may predict the pathologic grade in mucoepidermoid carcinoma.

Patient consent

No consent obtained for this case report as this is a retrospective study with no patient identifiers.

“Formal consents are not required for the use of entirely anonymized images from which the individual cannot be identified - for example, x-rays, ultrasound images, pathology slides or laparoscopic images, provided that these do not contain any identifying marks and are not accompanied by text that might identify the individual concerned.”

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