



Intrathymic cyst: Clinical and radiological features in surgically resected cases



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AIM: To investigate radiological and clinical characteristics of pathologically proven cases of intrathymic cysts.

MATERIALS AND METHODS: The study population consisted of 18 patients (five males, 13 females; median age 56 years) with pathologically confirmed intrathymic cysts who underwent thymectomy and had preoperative chest computed tomography (CT) available for review. The patient demographics, clinical presentation, and preoperative radiological diagnoses were reviewed. CT images were evaluated for shape, contour, location of the cysts and the presence of adjacent thymic tissue, mass effect, calcifications, and septa. The size and CT attenuations of the cysts were measured.

RESULTS: The most common CT features of intrathymic cysts included oval shape (9/18; 50%), smooth contour (12/18; 67%), midline location (11/18; 61%), the absence of visible adjacent thymic tissue (12/18; 67%), and the absence of calcification (16/18; 89%). The mean longest diameter and the longest perpendicular diameter were 25 mm (range 17–49 mm) and 19 mm (range 10–44 mm), respectively. The mean CT attenuation was 38 HU (range 6–62 HU) on contrast-enhanced CT, and was 45 HU (range 26–64 HU) on unenhanced CT ($p = 0.41$). The CT attenuation was >20 HU in 15 of 18 patients (83%). Preoperative radiological diagnosis included thymoma in 11 patients.

CONCLUSION: In surgically removed, pathologically proven cases of intrathymic cyst, the CT attenuation was >20 HU in most cases, leading to the preoperative diagnosis of thymoma. Awareness of the spectrum of imaging findings of the entity is essential to improve the diagnostic accuracy and patient management.

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Introduction

With the increasing use of computed tomography (CT) for thoracic imaging, detection of incidental mediastinal masses is becoming very common. Due to its unique embryonic derivation, the thymus gives rise to a variety of

benign and malignant pathological conditions, which can be noted as incidental mediastinal masses.¹ For example, in a study of the 9263 individuals who underwent CT screening for lung cancer as part of the Early Lung Cancer Action Project (ELCAP), 71 had a mediastinal mass at baseline screening, of which 41 (58%) were of thymic origin.² Given that the multiple published guidelines recommend CT screening for lung cancer for high-risk individuals within the appropriate age range,³ incidental mediastinal masses may present more frequent challenges to radiologists in clinical practice.

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Although multiple studies have evaluated the radiological manifestations of thymic neoplasms, such as thymomas and thymic carcinoma,^{4,5} there are few studies focused on the radiological manifestations of benign entities of the thymus, such as cysts or hyperplasia.^{6–8} In particular, the imaging characteristics of intrathymic cysts have rarely been studied, except for being mentioned in comparison to thymic neoplasm, under the non-specific category of “benign thymic pathology”.⁵

Thymic cysts represent 1–3% of all mediastinal masses,^{9,10} and can be either congenital or acquired. Congenital thymic cysts are typically unilocular and contain clear fluid within a thin wall. Most are asymptomatic and found incidentally during the first two decades of life.¹¹ In contrast, acquired thymic cysts (also known as multilocular thymic cysts) are usually multilocular and contain turbid fluid or gelatinous material as a result of haemorrhage or infection.¹² Acquired thymic cysts are reported to be associated with radiation therapy for Hodgkin’s disease,^{13,14} thymic tumour,¹⁵ thymic hyperplasia,¹⁶ thoracostomy or chest trauma,¹⁷ and human immunodeficiency virus (HIV) infection.¹⁸ Although less common than thymic neoplasms, thymic cysts are one of the most common benign thymic lesions.⁵ One of the challenges to the systematic radiological investigation of the entity is the lack of surgical and pathological confirmation for asymptomatic patients with imaging features strongly suggestive of simple cysts without suspicion for solid neoplasm. On the other hand, it is well known that some cases of intrathymic cysts have higher attenuation than simple fluid due to protein-rich contents, and are surgically removed due to the suspicion of neoplasm or malignancy based on imaging. A systematic investigation of the imaging features of pathologically proven cases of intrathymic cysts will contribute to the description of the imaging spectrum of this entity.

The purpose of the present study was to investigate the imaging characteristics of pathologically proven intrathymic cysts at CT, combined positron-emission tomography (PET)/CT, and magnetic resonance imaging (MRI).

Materials and methods

Patients

The original cohort was obtained from the retrospective review of the pathology patient database between 2001 and 2012, which resulted in 29 patients with pathological diagnosis of intrathymic cysts. Of these 29 patients, 11 patients had no preoperative chest CT available for review and were excluded from this study. Therefore, the patient population for the present study comprised 18 patients (five men, 13 women; age range 37–79 years; median 56 years; mean 55 years) with histopathologically confirmed intrathymic cysts who had undergone preoperative chest CT, which was available for review. CT was performed using the standard clinical chest CT protocol at the time of each scan over the 11 year period of this retrospective study. In general, patients were scanned in the supine position from the

cranial to caudal direction from the clavicles to the adrenal gland, using multidetector row CT scanners with 4–64 detectors, with 120 kVp and 116–160 mAs or by utilizing dose modulation. For contrast-enhanced studies, 75–100 ml non-ionic iodinated contrast agent was injected intravenously. Axial images of 5 mm thickness were reconstructed and transferred to the picture archiving communication system (PACS) workstation (Centricity, GE Healthcare, Barrington, IL, USA). Of these 18 patients, MRI images of the chest were also available in three patients, and 2-[¹⁸F]-fluoro-2-deoxy-D-glucose (FDG) PET/CT images were also available in three patients. Institutional review board approval was obtained for this retrospective study.

Clinical characteristics and radiologic and pathological diagnoses

Medical records were reviewed for the patient demographics, clinical presentation, indication for surgery, and radiological and pathological diagnoses. Medical conditions associated with thymic diseases, including myasthenia gravis, thyroid disease, autoimmune diseases, history of cancer, and history of thoracotomy or chest trauma were also reviewed. Preoperative radiological diagnosis was obtained by reviewing the radiology reports. Pathology reports were reviewed by a board-certified anatomic pathologist (L.S.) to determine the pathological sub-categories of intrathymic cysts, such as thymic cysts and bronchogenic cysts.^{5,19} Thymic cysts were also sub-categorized into multilocular or unilocular according to the histopathology reports.

Assessments of imaging characteristics

Two board-certified radiologists with expertise in thoracic imaging (M.N. and T.A.) reviewed the CT images of the intrathymic cysts in consensus for qualitative imaging characteristics including (1) shape (round, oval, or irregular); (2) contour (smooth or lobulated); (3) location (right, left, or midline); (4) the presence or absence of thymic tissue adjacent to the cyst; (5) mass effect to the adjacent structure; (6) calcifications; and (7) septa. All images were reviewed on the PACS using a mediastinal window setting (level, 50 HU; width, 350 HU). Quantitative measurements of the size and CT attenuation of the intrathymic cysts were performed by a board-certified radiologist (T.A.) using a calliper-type measurement tool on the PACS. The longest diameter of the lesion and the longest perpendicular diameter were obtained. CT attenuation values were measured by placing an oval region of interest (ROI) covering the maximum area of thymic lesions. In three patients with chest MRI, the signal intensity on T1- and T2-weighted images of the intrathymic cyst was evaluated in reference to the skeletal muscle (hyperintense, isointense, or hypointense) in consensus. The presence or absence of septa within the cyst was evaluated in the same manner. In three patients with PET/CT images, the patterns and intensity of uptake in terms of maximum standard uptake

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