Computed tomography (CT) is frequently used in the screening process to determine the need for angiography in patients with possible blunt thoracic aortic injury. Misinterpretation of normal mediastinal structures (particularly the thymus in patients under age 40 years) as mediastinal hematoma may result in a significant number of false-positive scans.

During a 20-month period, we reviewed the chest CT examinations of 1247 patients to select two groups of patients: group I, in whom the mediastinum was normal by CT, and group II, in whom the CT identification of a mediastinal hematoma had been proven surgically.

Two major mediastinal CT differences were noted between the groups. The first was a normal cleavage plane between the lateral aspect of the aortic arch and the soft tissue density of the thymus seen in 100% of patients with normal mediastinum (group I) and 0% of patients with known mediastinal hematoma (group II). The second difference relates to the anatomic fact that the thymus is normally present only in the anterior mediastinum. Thus, the presence of a soft tissue density throughout the right paratracheal region of the middle mediastinum, which was seen in 100% of group II (mediastinal hematoma) patients and in 0% of group I (normal) patients, represented blood and not thymus tissue.

These results demonstrate fundamental differences in appearance between thymic tissue, regardless of its state of involution, and a mediastinal hematoma on unenhanced mediastinal CT (UMCT). It is important that these differences be recognized so that thymic tissue is not confused with a mediastinal hematoma resulting in unnecessary thoracic aortography.

The rapid diagnosis of acute traumatic aortic injury (ATAI) is crucial in blunt thoracic trauma victims because the injury is almost always fatal if undetected and untreated (1). Currently, chest and mediastinal radiography is the principal screening method used to detect mediastinal hemorrhage in the selection of patients who require thoracic aortography for evaluation of aortic integrity. Recent reports have advocated the addition of chest (mediastinal) computed tomography (CT) to the screening process if the chest radiograph is indeterminate for mediastinal hematoma (2–4). The addition of chest CT has been shown to reduce the angiography rate (5, 6). Although the use of mediastinal CT has led to a significant decrease in the false-positive rate for mediastinal hematoma when compared to plain chest and mediastinal radiography, a considerable number of false-positive CT scans still occur, as determined by negative thoracic aortography.

A common cause of false-positive mediastinal CT scans in patients under age 40 years is misinterpretation of the thymus as mediastinal blood. The thymus is normally present in the anterior mediastinum. Fatty involution of the thymus begins during adolescence and is completed in approximately 50% of people by the age of 40 years (7). Thus, in patients under age 40 years, the soft tissue density of the noninvoluted or partially involuted thymus is present within the mediastinal fat and can easily be mistaken for a hematoma if the characteristic unenhanced mediastinal CT (UMCT) appearance of the thymus is not recognized. The purpose of this work is to define the appearance of the normal thymus on UMCT and to describe those characteristics that distinguish it from mediastinal hematoma, with the aim of reducing the number of unnecessary thoracic aortograms performed as the result of false-positive mediastinal CT.
MATERIALS AND METHODS

All of the chest CT scans (N = 1247) performed from May 1992 to January 1994 in our institution were reviewed to identify patients in whom the mediastinum was negative (group I) or who had mediastinal hematomas subsequently confirmed surgically (group II). The medical record of each patient was examined to identify the reason for obtaining the CT scan, results of other relevant radiologic investigations, and the operative findings of patients in group II.

Group I

Group I (N = 51) consisted of patients without clinical or radiographic abnormality related to the mediastinum. Indications for mediastinal CT in this group included minor thoracic trauma, evaluation for thymoma in patients with myasthenia gravis, and staging for malignant tumors. For the purposes of this study, our primary interest was the normal thymus.

Group II

Group II (N = 7) consisted of patients with major blunt thoracic trauma who had abnormal chest and/or mediastinal CT, positive thoracic aortograms, and surgically proven mediastinal hematoma and ATAI.

All CT scans were obtained on GE 9800 scanners utilizing contiguous 0.5-cm or 1.0-cm sections. Patients examined in the trauma center (N = 36) were scanned with contiguous 0.5-cm slices from the lung apices to the level of the carina without the use of iodinated contrast medium. Patients in the main radiology department (N = 22) had contiguous 1.0-cm slices performed from the lung apexes to the diaphragm following the administration of intravenous contrast medium. The scans were reviewed by both authors with particular attention to the mediastinum. The soft tissue densities of thymic tissue (group I) and of mediastinal hematoma (group II) were evaluated with respect to location, configuration, and relationship to surrounding structures.

RESULTS

The age of all patients included in this study ranged from 8 to 75 years.

Group I (normal thymus)

Normal thymic tissue was defined as having the following UMCT appearances:

- Childhood: a homogeneous soft tissue density which is often inseparable from those surfaces of the normal vascular structures in the prevascular space with which it comes in contact (Fig. 1).
- Adolescence through early adulthood: an encapsulated homogeneous soft tissue density with convex margins (Fig. 2).
- 20–30 years (approximately): a poorly marginated inhomogeneous mass of diminished density in the prevascular space (Fig. 3).
- 30–40 years (approximately): irregularly marginated, inhomogeneous soft tissue densities irregularly dispersed throughout mediastinal fat, representing moderate to marked involution (Fig. 4).
- >40 years with complete involution: no radiographically visible thymic tissue within mediastinal fat (Fig. 5).

In all cases, the thymus was located in the prevascular space of the anterior mediastinum between the left bra-