Posterior Mediastinal Mass with Intraspinous Extension*

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The differential diagnosis of masses in the posterior mediastinum includes neurogenic neoplasms, cysts, esophageal tumors, infectious processes including abscesses, and disorders of the thoracic spine. Nonoperative procedures, including transcutaneous and transbronchial biopsies and thoracoscopy, may not lead to a definitive diagnosis. We present two cases in which a neurogenic tumor, with and without significant spinal canal involvement, was diagnosed at thoracotomy after several nondiagnostic procedures. The appearance of the mass on chest roentgenogram can be used to narrow the preoperative differential diagnosis between ganglion-series and nerve-sheath tumors. The utility of computerized tomography of the chest, in addition to the chest roentgenogram, in assessing the bony involvement of the thoracic spine is illustrated. The role of magnetic resonance imaging is yet to be fully defined in this entity. These lesions may be approached by separate thoracic and neurosurgical approaches, or by a combined, single-staged procedure. These cases and a review of the literature support the use of the single-staged approach.

Neurogenic tumors are the most common neoplasms found in the mediastinum and occur almost solely in the posterior mediastinum. They are usually intrathoracic and benign, although approximately 30 percent are found to be, or later become, malignant. The benign tumors are frequently asymptomatic but may produce respiratory compromise by their bulk, or neurologic consequences by their intravertebral involvement. The therapeutic approach and clinical outcome differ depending on the neurogenic tumor, histologic findings and roentgenographic manifestations.

CASE REPORTS

CASE 1
A 60-year-old white woman was referred for evaluation of a right-posterior mediastinal mass found on routine chest roentgenogram. She was asymptomatic, a nonsmoker, and had no prior history of chest disease, neoplasm, or trauma. Physical examination revealed normal vital signs. Chest and cardiac auscultation were normal. There were no skin lesions, clubbing, edema, or neurologic findings. Laboratory data were unremarkable. Pulmonary function tests revealed an FVC of 1.8 L (69 percent of predicted) and an FEV₁ of 1.5 L (67 percent of predicted). A 5-TU PPD was negative with positive skin test controls.

Chest roentgenogram revealed a 10 × 10 cm, smooth-bordered, well-circumscribed mass in the right-posterior mediastinum. The mass appeared to abut the vertebral column, but no bony erosion nor destruction was evident. A small right pleural effusion was noted. A computerized tomographic (CT) scan of the chest (Fig 1) defined the mass with an eccentrically necrotic center and erosion into the T-10 vertebral body and pedicle. There was no suggestion of spinal cord compression. Fiberoptic bronchoscopy showed only extrinsic narrowing of all right lower lobe bronchi. A fluoroscopically-guided needle aspiration biopsy of the mass was performed; cytologic specimens from both procedures were negative for malignancy. A lumbar puncture showed no evidence of malignancy or infection, and spinal fluid pressure was normal. Repeat percutaneous needle aspiration biopsy was performed, showing only dense fibrous tissue on histologic evaluation. A myelogram was performed showing a nearby-circumferential extradural defect at T10-12. At thoracotomy, a 10-cm mass representing the intrathoracic portion of the mass was removed from its stalk at the spinal foramen, and the intraspinous portion of the mass was also easily removed after enlarging the foramen.

Histologic examination revealed features consistent with a neural sheath tumor: there was a well-defined capsule, sclerotic blood vessels, and hyperchromic, atypical nuclei. Areas of cellular pallisading (Antoni type-A tissue) and of loose myxoid appearance (Antoni-B tissue) were evident (Fig 2). There was no evidence of malignancy. The lesion was found to be a schwannoma with a "dumbbell" configuration extending through the vertebral foramen.

CASE 2
A 45-year-old white woman was found on routine chest x-ray to have a 3-cm right posterior mediastinal mass. She was a nonsmoker, asymptomatic, and had an unremarkable past medical history and

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FIGURE 1. CT scan of chest at T-10 vertebral body showing lesion with necrotic center, erosion of the pedicle, and encroachment upon the spinal canal.

FIGURE 2. Schwannoma with loosely cellular Antoni-A and myxoid Antoni-B areas, and thick-walled vessel (original magnification × 100).
review of systems. Physical examination and laboratory analyses were normal, as were the vital capacity (3.11 L) and the forced expiratory volume in one second (2.63 L).

A CT scan of the chest, including images obtained at 0.3-cm increments through the lesions, revealed a 2.5 × 4 cm posterior mediastinal mass at the level of the sixth thoracic vertebra with no apparent vertebral foramen involvement. Subsequent magnetic resonance imaging (MRI) confirmed the absence of central nervous system involvement (Fig 3). Fiberoptic bronchoscopy revealed normal bronchial anatomy.

The patient underwent a right posterolateral thoracotomy during which the mass and its surrounding fat and pleura were removed from the area of the sympathetic chain. No intraforaminal involvement was noted. Histopathologic examination revealed a benign schwannoma.

**DISCUSSION**

Neurogenic tumors make up one-third of all mediastinal tumors. In adults, the nerve sheath tumors (schwannomas and neurofibromas) account for 75 percent of the neurogenic tumors and are nearly always benign. Their location is equally distributed along the vertebral column, but because of the length of the vertebral segments, the cervical canal contains 20 percent, the thoracic 50 percent, the lumbar 25 percent, and 5 percent exist in the caud equina. Depending on whether the mass is intradural or extradural, cord compression or bony involvement around the cord may occur, respectively. Extrathoracic tumors are usually asymptomatic but may present with radicular pain, spastic weakness, decreased deep tendon reflexes, urinary (and later fecal) incontinence, back pain on percussion, or the Brown-Séquard syndrome. Compression of intercostal nerves or of airways can result in pain or dyspnea in a small number of patients.

In a series from the Armed Forces Institute of Pathology, the roentgenographic appearance of the mass and demographic data were used to narrow the preoperative diagnostic possibilities. Thirty percent of the patients with intrathoracic neurofibromas had neurofibromatosis, in contrast to 75 to 85 percent noted elsewhere. Associated symptoms of Horner syndrome or brachial plexus palsy were seen both in schwannoma and neuroblastoma and are therefore nonspecific for distinguishing benign vs malignant tumor. Roentgenographically, a rounded shape favored the nerve-sheath tumors, whereas an elongated form with the vertical axis in the direction of the sympathetic chain favored the ganglion-series tumors (ie, ganglioneuroma, neuroblastoma, and ganglioneuroblastoma). Small size, defined as equal to one posterior rib interspace or smaller, as was seen in case 2, favored the nerve-sheath tumors. Only 6 percent of the schwannomas were “extra large,” defined as six to ten interspaces in largest diameter. Most of the ganglion-series tumors were, however, in the “large” (three to five interspaces) or “extra large” category. The most common bony abnormality was rib erosion, which occurred most frequently in neuroblastomas, cut also in other histologic types.

In the AFIP series, rib destruction was seen only in neuroblastomas. Enlargement of the vertebral foramen was seen in a small number of both neuroblastomas and schwannomas. The most common location of the neural tumors was in the posterior mediastinum; those in the anterior and middle mediastinum tended to be neural-sheath tumors involving the phrenic or vagus nerves. In contrast to prior reports, pleural involvement (pleural-based nodules or effusion) was considered to be evidence of malignancy. Several papers have associated nerve sheath tumors with fibrosing alveolitis, but the tumors are limited to neurofibromas with Von Recklinghausen disease and seldom seen in schwannomas. Other phakomatoses, such as tuberous sclerosis and Sturge-Weber disease, may be similarly associated. As mentioned, some patients with intrathoracic neurofibromas do not have cutaneous signs of Von Recklinghausen disease; conversely, 15 percent of patients with neurofibromatosis are estimated to have thoracic abnormalities, including the “dumbbell” neurofibromas, intercostal neurofibromas, and intrathoracic meningoceles.

In a comprehensive review of 706 cases of mediastinal neurogenic tumors, 69 patients (9.8 percent) had extension through the intervertebral foramen, resulting in the so-called dumbbell lesion. Only 10 percent of these tumors were malignant. The majority of these patients presented with neurologic symptoms of cord compression. In 40 percent of their cases, the intraspinal component was not apparent clinically. It is emphasized, therefore, that preoperative evaluation of such involvement be undertaken, to include myelography if vertebral involvement is suspected by chest roentgenogram or CT. Our cases show the utility of CT in detecting unsuspected vertebral and intraspinal involvement. However, conventional CT scanning without metrizamide may be unreliable. Siegel et al10 report an increased sensitivity using MRI with respect to spinal cord invasion. Of note are the advantages of not requiring metrizamide, of being noninvasive, and of providing anatomic detail comparable to contrast-CT and superior to noncontrast-CT.10,11

Earlier literature described a two-staged procedure, involving thoracotomy with extirpation of the mass and as much of its intrathoracic component as possible, followed by laminctomy and removal of any residual tumor as needed. This approach can lead to bleeding into the canal as the
CONCLUSIONS

Although the differential diagnosis of this lesion was initially quite large and included developmental abnormalities, infectious and neoplastic etiologies, and diaphragmatic herniae, the roentgenographic and clinical signs permitted a considerable narrowing of the possibilities. Plain-film roentgenographic techniques may manifest certain characteristics favoring nerve-sheath tumors over ganglion-series tumors. The CT scanning or MRI is invaluable in assessing vertebral and intraspinous involvement in posterior mediastinal lesions and should be a part of the evaluation in any such lesion. This allows assessment of the vertebral component and serves to guide the decision for possible surgery by orthopedic, orthopedic, or neurosurgeons. In so doing, many of the complications of the multistaged procedure can be avoided.

Early detection is important in preventing neurologic complications of intraspinous disease; long-term survival is the rule, with morbidity related to direct compressive or irritative effects of the mass. Despite extensive preoperative evaluation, diagnosis often eludes determination until tissue is obtained at thoracotomy.

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REFERENCES


Cardiac Arrest during Dipyridamole Imaging*

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A case of cardiac arrest and subsequent acute myocardial infarction occurring during thallium-201 imaging with oral dipyridamole augmentation is presented. Previous reports emphasizing the safety of this procedure are briefly reviewed and a recommendation for close hemodynamic and arrhythmia monitoring during the study is made. Large doses of oral dipyridamole may be contraindicated in patients with unstable angina.

Thallium-201 myocardial perfusion imaging is widely used to evaluate patients with suspected coronary heart disease. Immediately after injection of thallium-201, regional myocardial uptake of the isotope reflects regional coronary blood flow. The presence and size of a reversible underperfused zone and of an infarcted zone have important diagnostic implications. In an effort to increase the sensitivity of this method for the detection of functionally significant coronary artery disease, thallium studies are usually performed after near-maximal exercise, so that flow differences are increased between zones of ischemia and areas of normal perfusion. However, many patients have physical limitations which preclude adequate exercise in conjunction with thallium imaging. In these patients, pharmacologic coronary vasodilatation using dipyridamole has been shown to offer a satisfactory alternative to exercise for the detection of ischemia and infarction. Although initial studies were done using intravenous dipyridamole, the intravenous preparation is still an investigational drug and is not available for use in most community hospitals. More recently, oral dipyridamole has been shown to be a satisfactory alternative, yielding almost equal diagnostic reliability when used in conjunction with thallium-201 imaging.

Studies using both intravenous and oral forms of dipyridamole have shown a high degree of safety. Although ventricular premature beats may occur with some frequency, in well over 600 cases combined from the recent literature only one case of ventricular fibrillation was reported and no case of acute myocardial infarction has been reported in conjunction with this study. The frequency of angina pectoris has ranged from 16 to 41 percent, and in all cases, angina has been relieved promptly after intravenous administration of aminophylline. Recently, we evaluated a patient who sustained a cardiac arrest and acute myocardial infarction in the course of an oral dipyridamole-thallium study. To our knowledge, no previous occurrence of acute myocardial infarction has been reported in this context.

CASE REPORT

The patient is a 71-year-old woman who presented with a three-week history of atypical chest and abdominal pain. The pain was described as "boring" in quality, was located in the lower lateral left chest and left upper quadrant of the abdomen, occurred two or three times daily, and was associated with nausea and vomiting. Chest x-ray, electrocardiogram, and standard laboratory studies were normal. Cardiac catheterization performed elsewhere showed a long right coronary artery occlusion with collateral vessels to the left coronary artery. An acute or subacute coronary occlusion could not be demonstrated. The ventriculogram demonstrated normal ventricular function.

Dipyridamole imaging was performed with a dose of 1 mg/kg. Immediately after injection of thallium-201, a brief period of hypotension (80/50 mm Hg) and bradycardia (40 beats/min) occurred. The patient became hypoxic and went into ventricular fibrillation. Emergency cardioversion with direct current of 200 J was performed. Oxygen was administered, and the patient was subsequently treated with a dopamine infusion. The patient was discharged home with no further complications.

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