Study of Hilar Masses by Angiocardiography*

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Reports of four patients demonstrate the value of angiocardiography in the diagnosis of hilar masses. Two patients had large pulmonary arteries after initial diagnoses of carcinoma; hilar tumors were erroneously called large pulmonary arteries in the other two patients. Pulmonary angiocardiography is more valuable than routine x-ray films and laminography in the definition of hilar masses.

The hilum of the lung is a region occupied by many structures, including bronchi, pulmonary arteries, pulmonary veins, and lymph nodes. Abnormally, several other structures may be radiographically superimposed on the hilum region1-2 and may require angiocardiography for anatomic definition.3-7 It has been our experience that neither standard x-ray films nor laminography uniformly permits differentiation of hilar shadows. It is the purpose of this brief report to present four cases which demonstrate the value of angiocardiography in the definition of hilar shadows.

CASE REPORTS

CASE 1

A 64-year-old white man was well until December, 1963, when he developed an upper respiratory infection followed by severe pleuritic chest pain. He was hospitalized and was found to be in atrial fibrillation. He received digitalis and quinidine and his condition improved. However, a productive cough continued. He was discharged but had to be readmitted two months later because of productive cough, anorexia, weakness and a 20-lb. weight loss.

Physical examination revealed a well-developed, well-nourished, white man. Neck veins were normal. The blood pressure was 150/90 and the pulse rate around 100/min, and irregular. The respiratory rate was 14/min. The lungs showed decreased breath sounds and percussable dullness at the left base. The heart showed normal sounds except for slight accentuation of the pulmonary closure sound. No murmur was heard. A pleuropericardial friction rub was heard along the left sternal border.

His past history revealed many episodes of palpitations since 1922. He had several documented episodes of atrial fibrillation prior to the present admission.

Thoracentesis yielded 830 ml of clear fluid obtained from the left side of the chest; the result of cytologic examination was negative for malignant cells.

The electrocardiogram showed normal sinus rhythm with frequent ventricular premature beats with right axis deviation at 100° and large, notched P waves.

The chest x-ray film (Fig 1) showed a slightly enlarged heart and a large left hilar mass. The left pleural effusion had disappeared several days later.

The initial diagnosis of bronchogenic carcinoma led to bronchoscopy and laminography. Bronchoscopy showed extrinsic compression of the middle and left upper bronchi; laminography suggested an extravascular hilar mass. The patient was tentatively scheduled for thoracotomy, but uncertainty about the diagnosis led to the performance of an angiocardiogram.

This revealed markedly dilated right and left pulmonary arteries* (Fig 2) with no evidence of any nonvascular hilar mass. Subsequently, cardiac catheterization demonstrated the presence of a large atrial septal defect (secundum type) with a left-to-right shunt of 4.8 liter/min and a mean pulmonary arterial pressure of 31 mm Hg.
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CASE 2

A 15-year-old white boy was admitted for study of possible endocrine defect associated with a congenital clubfoot. Results of physical examination were normal. Subsequent studies showed no evidence of endocrinopathy.

The admission chest x-ray picture (Fig 3) showed an abnormal left hilar density. The initial impression was possible idiopathic dilatation of the pulmonary artery. An angiocardiogram was performed. The right-sided cardiac chambers and the pulmonary arteries were normal. The major hilar densities were clearly nonvascular.

Bronchoscopy was performed and the result was negative. A thoracotomy disclosed large lymph nodes in the fissure between the left upper and lower lobes. The final pathologic diagnosis was sarcoidosis.

CASE 3

A 54-year-old white man was admitted to Presbyterian-St. Luke's Hospital because of a two-year history of chest pain of variable duration, unrelated to exertion, meals or emotional states. There was no shortness of breath, cough or weight loss.

His past history was unrevealing with exception of a long history of asthma. The physical examination showed no distress, cyanosis or clubbing. Blood pressure was 110/65 bilaterally. The pulse was regular at 78/min, and the respiratory rate was 18/min. Neck veins were normal.

The chest had an increased anteroposterior diameter and scattered rhonchi and wheezes were heard bilaterally. The heart was of normal size. The second heart sound was widely split, with physiologic respiratory variation. The pulmonic closure sound was slightly increased in intensity. No murmurs were heard.

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hypertension producing enlargement of the left hilar pulmonary arteries. An angiocardiogram, performed to delineate the anatomy of the pulmonary vessels, showed an anterior mediastinal mass which compressed and displaced the main pulmonary artery (Fig 5). A small pressure gradient between the right ventricle and the main pulmonary artery was present. At thoracotomy, a large, hard and irregular anterior mediastinal mass was found extending down the pericardium toward the diaphragm. Anteriorly, the tumor was firmly attached to the right ventricle and to the pulmonary artery. The final pathologic diagnosis was a malignant thymoma, predominantly epidermoid.

**Case 4**

A 36-year-old asymptomatic white man had a routine health examination. The chest x-ray film (Fig 6) showed a left hilar mass. He was hospitalized for study and therapy of probable carcinoma of the lung. He had known of a "benign" heart murmur for 31 years.

Physical examination showed the lungs to be unremarkable. The heart size was normal. A loud systolic ejection click followed by a grade III/VI systolic ejection murmur was heard along the left sternal border. The blood pressure was 125/80.

A right heart catheterization showed a gradient of 23 mm Hg across the pulmonary valve. An angiocardiogram (Fig 7) showed that the left hilar mass was a large left pulmonary artery.

The final diagnosis was mild congenital pulmonic stenosis with poststenotic dilatation of the pulmonary artery.³

**Comment**

The four cases presented in this report illustrate the difficulties encountered in the differentiation...
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FIGURE 5. Selective right ventricular angiogram shows the outflow tract (lower arrow) and the main pulmonary artery (upper arrow) to be normal in size, but both were markedly displaced posteriorly by an anterior mediastinal mass (malignant thymoma).

of radiographic densities in the hilar region of the lungs. In two, a large pulmonary artery was initially believed to be carcinoma; a hilar tumor was erroneously thought to be a large pulmonary artery in the other two. Routine radiographic views of the chest, laminography and bronchoscopy failed to yield the correct distinction between vascular and nonvascular structures.

Particular attention should be directed to tumors of the anterior mediastinum which, in the process of growing, press upon the heart or pulmonary artery, mimicking organic abnormalities of the cardiopulmonary structure, or even producing intracardiac pressure gradients by extrinsic compression. Also, partial congenital defects of the pericardium may present as a hilar mass because of prolapse of the left atrial appendage through the defect; this has been diagnosed by angiocardiography.

Several papers published in the past, have dealt with the difficulties in the anatomic and radiographic differentiation of abnormal hilar masses.

One of the most important considerations in similar problems is to determine, using relatively benign techniques, the need for surgery and thus avoid unnecessary and potentially dangerous procedures.

Despite previous publications, many patients do not receive the benefit of correct interpretation of the information obtained by routine radiologic techniques. Only angiocardiography precisely distinguishes between vascular and nonvascular structure. Angiocardiography was first applied clinically by Castellanos and co-workers in 1937 and has been widely used since.

FIGURE 6. Case 4: A 36-year-old white man with a prominent left hilar shadow.

FIGURE 7. Selective main pulmonary artery angiogram demonstrated an enlarged main and left pulmonary artery. Mild valvular pulmonic stenosis was present.

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Angiocardiography provides a means of defining the pulmonary vascular anatomy and, thereby, of delineating the extent of nonvascular masses. This procedure, with injection of the contrast medium into the right-sided chambers, provides important diagnostic information with minimal risk to the patient and should, in our opinion, be considered to be routine in the study of patients with abnormal hilar masses.

References

It's for the Birds

Pigeons, ubiquitous symbols of holiness, purity, peace and tender marital affection, are conspicuous in public parks and squares. Their favorite roosting places are ornamental buildings, statues and monuments. Their petit steps, swaying gait and sensuous cooing have gained them popularity. On the other side of the ledger, it is known that *Aspergillus fumigatus* may exist as a saprophyte in pigeons' respiratory tracts. Aspergillus from this source may bring about human infection and disease in pigeon fanciers. Lung involvement caused by Aspergillus has been recorded since 1842 in the form of bronchitis, bronchopneumonia, abscess, granulomas and fungus balls. Pigeon breeders' disease was first described in 1897. *Cryptococcus neoformans* (*Torula histolytica*), the cause of subclinical or grave disease, cryptococciosis (*Busse-Bischke's disease, European blastomycosis*), including meningioencephalitis, was found in pigeon droppings in 50 percent of specimens examined in New York City in 1967. Dust from these sources, spread by the wind, is important means of human infection. In New York City there are some 5,000,000 pigeons, with an estimated annual incidence of 5,000–10,000 instances of subclinical and clinical cryptococciosis. Feces of birds, especially domesticated fowl, including pigeons, is a fertilizer and aids the growth of *Histoplasma capsulatum*. Birds similarly implicated include starlings, oil birds and grackles. Infection may be brought about by inhalation of contaminated dust from working in caves, storm cellars, silos, chicken houses, bell towers, water towers, remodeling, clearing or digging at construction sites. Millions of people are infected with *Histoplasma capsulatum*. Positive skin tests may run as high as 90 percent in some regions. Recently a new kind of pigeon breeder's disease has been reported. It is considered a hypersensitivity reaction in its acute phase and is associated with cough, dyspnea, chills, fever and malaise. Chest roentgenograms reveal interstitial pneumonitis. Precipitin tests are positive to pigeon serum proteins, feathers and droppings. Another possible menace from pigeons is toxoplasmosis which may affect them, and the occurrence of Salmonella in their excreta. Parrots are attractive birds with their vivid, multicolored plumage and proclivity to imitate human sound. They may recite words and phrases which, however, sometimes are malapropos and not permissible in ecclesiastic circles. Parrots and parrakeets may transmit the psittacosis virus, *Bedsonia*, to humans and thus cause serious illness. The same may originate from diseased finches, sparrows, buntings, linnets, thrushes, Italian cardinal bird, canaries, love birds, arctic fulmar, other petrels and sea gulls. In poultry plants, ducks, turkeys and chickens may be the source of ornithosis. Feathers used in pillows, comforters and upholstered furniture are responsible for bronchial asthma in some individuals. For the same reason, bronchial asthma may be an occupational hazard in poultry farmers, veterinarians and pet shop employees. Also, canaries, love birds and mynah birds are possible sources of bronchial asthma. Avian tubercle bacilli may be found in chickens and other birds, including parrots and may cause human infection. Such occurrence, however, is uncommon. Guinea pigs and puffer are sea birds of the northern shores. They are eaten as delicacies by Icelanders, after being singed over slow burning fuel. During singeing carcinogens from the fuel may saturate the birds' flesh. Habitual consumption of the latter is allegedly a contributory factor to the high incidence of gastric carcinoma in Iceland.

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