Primary Pericardial Malignant Epithelioid Mesothelioma Causing Acute Myocardial Infarction*

Maj Patrick K.C. Chun, M.D.; Capt William T. Leeburg, M.D.; Col Julian T. Coggin, M.D.; and Lt Col Russ Zaitzchuk, M.D.

A case of primary pericardial malignant epithelioid mesothelioma had an unusual presentation and emphasizes the urgency and possibility of antemortem diagnosis. Postmortem findings with electron microscopic studies document its histologic origin.

About 120 cases of primary pericardial mesothelioma have been reported. Of these, 25 percent were diagnosed antemortem. We recently had a patient with a primary malignant pericardial mesothelioma in whom the diagnosis was made postmortem. Its unusual presentation and gross findings at autopsy, as well as electron microscopic findings, prompt this case report.

CASE REPORT

The patient was a 41-year-old white man who had been well until Feb 8, 1976, when he developed a nonproductive cough. A chest x-ray film showed a left lower lobe infiltrate. Penicillin therapy was started. On Feb 23, 1976, the patient had recurrence of his cough and occipital neck, bilateral shoulder, and anterior chest pains, as well as hoarseness. The ECG was normal. Chest x-ray film demonstrated a left lower lobe infiltrate as well as a prominent anterior mediastinal mass (Fig 1). On fluoroscopy, the mass was not pulsatile. On angiography, there was posterolateral displacement without obstruction of the superior vena cava. The aortic arch was normal, and the mass was situated anterior and inferior to it. On March 11, 1976, the patient was transferred to Fitzsimons Army Medical Center.

On admission, the patient appeared to be in mild distress. Respirations were 12; pulse rate, 84; blood pressure, 118/84 mm Hg; and a temperature of 37°C. There were diffuse bilateral basilar expiratory wheezes. The neck veins were not distended. The cardiac and neurologic examinations were normal. Laboratory data included the following: hematocrit, 39.3 percent; hemoglobin, 13 gm/100 ml; white blood cell count, 8,100/cu mm; prothrombin time and PTT, normal; urinalysis, normal; and SMA-20 normal except for an elevated lactic dehydrogenase (LDH), 708 IU/L. The ECG was within normal limits. Pertinent negative history included no known occupational exposure to known environmental toxins, eg, asbestos, or exposure to tuberculosis or fungal diseases, no fever, anorexia, orthopnea, paroxysmal nocturnal dyspnea, edema, or palpitations. On the fourth hospital day, he suffered a cardiac arrest. Cardiopulmonary resuscitation was unsuccessful.

*From the Departments of Medicine and Pathology, Fitzsimons Army Medical Center, Denver.
The opinions and assertions contained herein are the private views of the authors and are not to be construed as official or as reflecting views of the Department of the Army or the Department of Defense.

Reprint requests: Dr. Chun, Walter Reed Hospital, Washington, D.C. 20054

Figure 1. Chest x-ray film with left lower lobe infiltrate and now prominent large anterior mediastinal mass (2-23-76).

Pathologic Findings

The organs within the thoracic cavity maintained their normal relationships. The pericardium was irregular in shape, thickened, and tightly adherent to an obvious mass within it. The 13 × 10 × 8 cm mass (Fig 2) was localized and totally within the pericardial sac. It overlaid the anterolateral aspect of the right atrium and inferiorly, partially crossed the atrioventricular groove. Superiorly, it followed the ascending aorta, surrounded the superior vena cava, extended onto the pulmonary artery, severely compressed the left anterior descending and right coronary arteries, and laterally extended onto the anterior surface of the right main stem bronchus. The epicardial surface of the ventricles was thickened. The

Figure 2. A 13 × 10 × 8 cm tumor association with the heart, after removal of pericardial sac.
mass was yellow-tan, friable, and soft with areas of obvious infarction and hemorrhage. The heart and mass weighed 820 gm (the mass would then be about 400 gm). The cardiac valves were normal, and right and left ventricular thicknesses were 0.4 and 1.4 cm, respectively. There was a red discolored area in the posterior left ventricular wall near the posterior papillary muscle. There were no atheromatous lesions in the aorta or its branches.

No posterior mediastinal or retroperitoneal masses were noted. The testes, kidneys, prostate, lungs, thyroid, adrenals, liver, and spleen were sectioned at 1 to 2-mm intervals, and no masses or scars were noted. There were no intestinal lesions. The brain was normal.

The tumor (Fig 3) had highly cellular areas without a distinctive growth pattern, interspersed with areas of necrosis. The viable areas had a perivascular distribution with acute and chronic inflammatory cell infiltrates. Mitoses were numerous and atypical with pleomorphism of the nuclei. The parachromatin was increased with clearing of the nuclei. There was peripheral clumping of the chromatin with one or two centrally placed small nucleoli. The cytoplasms was ill-defined and amphophilic to eosinophilic. Cell membranes appeared attached suggesting an epithelioid origin. There were strands of reticulum between tumor cells and scant amounts of collagen. Cells had PAS-positive cytoplasm before and after diastase digestion. Special stains for mucin, including one for acid mucins, were negative.

The epicardium had chronic inflammatory cellular infiltrates. The coronary arteries were minimally atherosclerotic, but the left anterior descending artery was compressed externally by the tumor. There was acute muscle necrosis with a polymorphonuclear leukocytic infiltrate in the left ventricular wall and the adjacent posterior papillary muscle.

The liver and spleen were acutely congested. The right upper lobe of the lung had focal emphysematous changes. The bronchi, eg. right main stem bronchus, were normal and without evidence of tumor involvement. All other tissues were normal, eg. there was no invasion of underlying tissue.

Thin sections of the tumor were fixed in 10 percent buffered formalin, postfixed in glutaraldehyde, washed in buffer (cacodylate), and postfixed in osmium tetroxide. The thin sections were viewed on an electron microscope and thick sections on a light microscope. The nuclei were large, irregular and pleomorphic. There were irregular collections of tonofilaments in the cytoplasm and numerous mitochondria. Desmosomes were noted where the plasma membranes were intact. Elongated cytoplasmic extensions (microvilli) containing small slender filaments, were in the extracellular spaces (Fig 4). Irregular bundles of extracellular collagen and small irregular clusters of electron dense material which stained with ruthenium red, and probably represented acid mucopolysaccharides, were found in the extracellular space.

The terminal event was an acute myocardial infarction secondary to external compression of the left coronary artery by a primary malignant epithelioid mesothelioma of the pericardium. The infarction was recent (greater than six hours but less than 48 hours) and correlated with an abnormal LDH of 708 IU/L.

**DISCUSSION**

Clinically, the desirability of diagnosing a primary pericardial tumor antemortem for surgical or radiotherapeutic treatment has led to the search for diagnostic clues. Findings suggesting its presence are as follows: (1) pericardial effusion, especially hemorrhagic without signs of an inflammatory disease; (2) modifications of a cardiac silhouette with bizarre irregular bulges (as in our case); (3) heart failure without obvious etiology, especially with venous hypertension, hepatomegaly, ascites, and edema, (4) chest pain; (5) narrowed pulse pressure and paradoxical pulse characteristic of cardiac compression; and (6) superior vena cava obstruction.

On chest film, a pericardial effusion was often suspected when a mass was evident as in our case. The rapid change in our patient's cardiac contour on serial examination suggested a malignant pericardial tumor. Fluoroscopy demonstrated that the mass was not pulsatile and extracardiac with displacement of the superior vena cava.

There are two distinct histologic patterns of mesotheliomas—fibrous and epithelial, and three distinct

![Figure 4. Microvilli with extensions into extracellular spaces containing small slender filaments (Uranyl acetate-lead citrate, X 350,150).](http://journal.publications.chestnet.org/pdaccess.ashx?url=/data/journals/chest/21134/ on 06/21/2017)
TALC-INDUCED
throughout

The diagnosis of mesothelioma is often very difficult. Small surgical specimens from the pericardium, without adequate examination of the pleural surfaces, make it impossible to distinguish it from a primary pleural lesion or some other lesion. To standardize criteria for a primary pericardial mesothelioma. Andersen and Hansen set up the following: (1) localization to the pericardium, (2) only metastases to lymph nodes, (3) no other primary tumor, and (4) complete autopsy in case of death.

Electron microscopic studies have added much to the understanding of the very adaptable nature of the mesothelial cell. In studies on both fibrous and epithelial lesions from the pleura and peritoneum, the similarity and spectrum between different types of mesotheliomas have been worked out. In our case, many of these features were identified and included—microvilli from the surface of the cells, occasional cells containing tonofilaments, desmosomal attachments, extracellular collagen, and acid mucopolysaccharides.

To our knowledge this is the first case reported of a primary pericardial malignant mesothelioma documented by electron microscopy. The clinical, diagnostic, histologic, and electron microscopic aspects were presented to emphasize that with currently available methods, the diagnosis can be made.

REFERENCES
4 Pader E, Kirshner PA: Primary sarcoma of the pericardium. Am J Cardiol 14:399-406, 1964
5 Forest JL: Kozonis MC: Primary mesothelioma of the pericardium. Am J Cardiol 5:126-128, 1960
6 Miscia VF: Primary pericardial tumor. JAMA 231:1340, 1975

67Gallium Scanning in Talc-Induced Pulmonary Granulomatosis*

David G. Brown, M.D.; Augusto Aguirre, M.D.; and Albert Weaver, M.D.

We describe a case of pulmonary granulomatosis in a user who habitually injected methylphenidate (Ritalin) intravenously; symptomatic and objective improvement occurred with corticosteroid therapy. A scan of the lungs using radioactive 67gallium showed an increased concentration of 67gallium throughout both lungs. There was a reduction in abnormal accumulation of 67gallium, improvement in the arterial oxygen pressure and the diffusing capacity for carbon monoxide, and a reduction in the infiltrate on the chest x-ray film two months after the institution of therapy. Before treatment the patient's symptoms and arterial deoxygenation increased despite the cessation of her drug abuse, thus raising the question of a self-perpetuating inflammatory process in a case of pulmonary deposition of talc.

Foreign body embolization of talc-containing material, with resulting pulmonary granulomatosis and pulmonary hypertension, although limited in the number of reported cases, is a well-documented entity. In this report, we describe a case of talc-induced pulmonary granulomatosis and pulmonary hypertension, in which foreign body embolization with corticosteroid therapy and in which scanning with radioactive gallium was used for initial and follow-up evaluation.

CASE REPORT

In August 1977, a 25-year-old black woman with a two-year history of drug abuse complained of a nonproductive cough of four months' duration and shortness of breath on exertion (on walking six blocks). Abnormal findings at that time included bilateral expiratory rales and roentgenologic evidence of a diffuse pulmonary interstitial infiltrate and bilateral hilar prominence; there was a reduction of total lung capacity (TLC) (75 percent of predicted), hypoxemia at rest and with exercise (arterial oxygen pressure [PaO2] of 83 mm Hg and 85 mm Hg, respectively), and an alveolar-arterial oxygen tension gradient (F[A-a]O2) which increased with exercise.

The patient refused further evaluation and resumed her intravenous injection of methylphenidate (Ritalin) tablets and heroin, both of which she discontinued two months later after beginning a program of treatment with methadone. At that time, she had injected methylphenidate intravenously four times per day for approximately nine months.

The patient was readmitted seven months after the initial evaluation with the history of increasing dyspnea (with one to two blocks of walking) and syncope. On physical examination, she exhibited diffuse expiratory rales throughout the*

From the Departments of Pulmonary Medicine and Pathology, Riverside Methodist Hospital, Columbus, Ohio. Reprint requests: Dr. Brown, 761 Brittingham Court, Columbus 43214

CHEST, 77: 4, APRIL, 1980

TALC-INDUCED PULMONARY GRANULOMATOSIS 561