^{85}Sr LUNG SCAN IN A CASE OF PULMONARY OSSIFICATION

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Strontium-85 lung scanning has been performed in patients with thoracic calcification, but to our knowledge it has never been attempted in a case of idiopathic pulmonary ossification. This report of a case of pulmonary ossification, proved by lung biopsy, includes the findings of a ^{85}Sr lung scan.

Pulmonary ossification is a rare disease, particularly of the idiopathic type (*1–4*). It has been mainly divided into two types: racemose or branching which is usually idiopathic, and granular which is secondary to various diseases such as mitral stenosis, histoplasmosis, osteogenic sarcoma with pulmonary ossification, plasmacytoma, pulmonary amyloidosis, and pulmonary metastases (*3,5–11*). Strontium-85-nitrate is used for the detection of bone lesions, particularly bony metastases or osteogenic sarcomas, even before these lesions can be picked up on radiologic examination (*10*).

CASE REPORT

CRM is a 27-year-old Negro male whose history dates back to January 1969 when he first noted bilateral anterior pleuritic pain, cough productive of whitish yellow sputum occasionally containing streaks of blood, and dyspnea on exertion. He continued his occupation of bricklaying until dyspnea progressed to such an extent that he had to stop work. In September 1969 he saw his family physician, who prescribed antibiotics and cough medicine, but he did not improve. A chest x-ray was taken which revealed extensive nodular infiltrates in both lungs (Fig. 1). Subsequently he was admitted to the West Tennessee Chest Disease Hospital. On physical examination he was a well-developed, well-nourished, muscular Negro male in no acute distress. Vital signs: T. 98°F, BP 120/92, Resp. 18, P. 72 regular, weight 189 lb. Physical examination was entirely negative. Hct., WBC count with differential, and urinalysis were all within normal limits. Using the Technicon S.M.A. 12–60 the serum calcium was found to be 12.6 mg%, alkaline phosphatase 120 mμ/ml (normal 30–85 mμ/ml) with otherwise normal results. Sputa cultures were negative for AFB and fungi. Skin tests: P.P.D. intermediate strength negative, histoplasmin 20 mm, fungal serology negative on admission but repeated 3 weeks later (after the skin tests) showed histoplasmin antigen (HM-CF) 1:8, hemaglutination 1:8. Pulmonary function tests showed a restrictive defect with impairment of diffusion. Diffusion capacity for carbon monoxide was 15.6 ml/min/mmHg (normal 25–40). On November 5, 1969, the patient underwent an open lung biopsy from the right lower lobe. At thoracotomy the pleura was normal and two firm nodules measuring approximately 0.8 cm

Received June 30, 1971; revision accepted Sept. 27, 1971.

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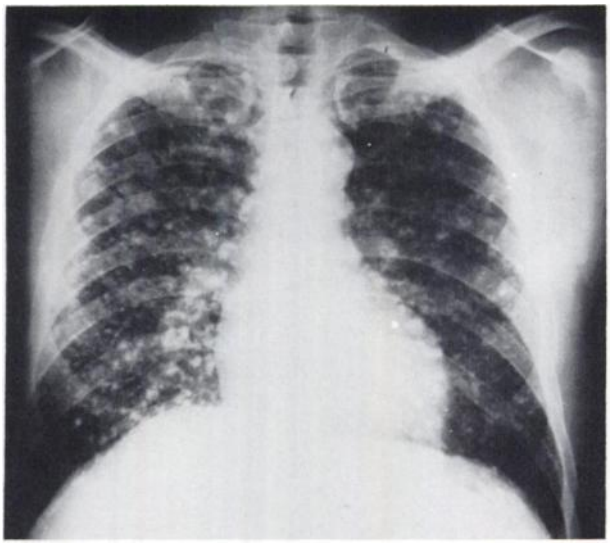

FIG. 1. PA teleo of chest made 10-14-69. There are diffuse extensive nodular infiltrates in both lung fields varying in size from 0.3 to 1.5 cm in diam.

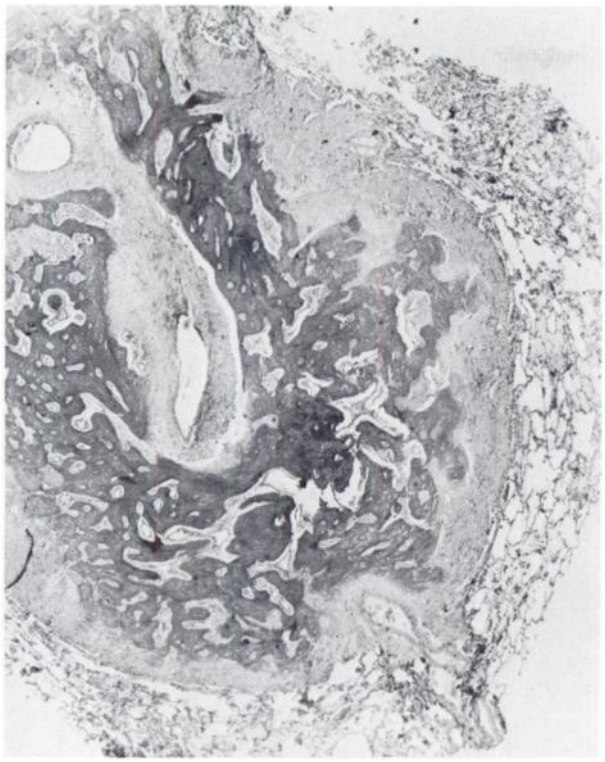

FIG. 2. Lung biopsy from right lower lobe made 11-5-69. Microscopically lesions were composed of what appeared to be adult bone. Process was not thought to represent malignancy or be result of granulomatous disease. On periphery of demonstrated lesion is normal lung tissue.

in diam were excised from the lung. The histological section was interpreted as "multinodular pulmonary ossification of undetermined etiology"* (Fig. 2). Since the exact nature of the disease was not known, the patient was discharged without treatment.

On November 27, 1970, he returned with a history of progressive dyspnea to the point that walking 25–30 yards at a normal pace would make him dyspneic. He also had a cough productive of whitish sputum, sometimes blood stained. He noted pleuritic chest pain but denied fever, chills, sweating, or weight loss. Past history was entirely negative. Occupational history: He was raised on a farm and had been a farmer until 5 years before admission when he took up bricklaying. Since the onset of the present illness he changed to janitorial work but for the last 10–12 months was unable to work. Family history was noncontributory. Physical examination revealed a well-developed, well-nourished Negro male in no acute distress. Vital signs: T. 98°F, P. 72, regular, BP 110/80, Resp. 18. The rest of the examination was within normal limits. Lab data: Hct. 52%, WBC count, ESR, serum Ca, serum P, BUN, electrolytes, serum proteins, and urinary Ca, P, and creatinine were all within normal limits. Skeletal survey for malignancy was negative though the chest film revealed progressive disease (Fig. 3). ECG was normal. Alkaline phosphatase was 25–33 K.A. units. Sputa cultures were negative for AFB and fungi. Fungal serology was negative. Skin tests: P.P.D. negative, histoplasmin 16 mm. Pulmonary function tests showed further deterioration with vital capacity reduced to 45% of normal and blood gases consistent with diffusion defect. Five days after 100 μCi of ^{85}Sr-nitrate intravenously a scan of the lung fields revealed significant radioactivity bilaterally (Fig. 4).

* Lung biopsy cultures were negative for AFB and fungi.

DISCUSSION

In this patient we searched for all the specific causes of pulmonary ossification and could find none. Since the histoplasmin skin test was positive, perhaps his disease should be classified as idiopathic pulmonary ossification with incidental healed histoplasmosis or possibly may represent histoplasma granulomatosis leading to pulmonary ossification. Though idiopathic pulmonary ossification has been described in old people as a relatively benign process, our patient is young and his lesion is progressive and disabling. This type of ossification should not be confused with pulmonary alveolar microlithiasis in which the alveoli are filled with concentric layers of calcium without ossification (*12*).

Strontium-85 is deposited in osteoblastic tissue and hence found in epiphyses of growing bones. Pathologically it is deposited in bones at fracture sites, primary or secondary neoplastic lesions, osteomyelitis, active osteoarthritis, rheumatoid arthritis, and Paget's disease of bone. Strontium-85 and ^{47}Ca are metabolically handled in an analogous way.

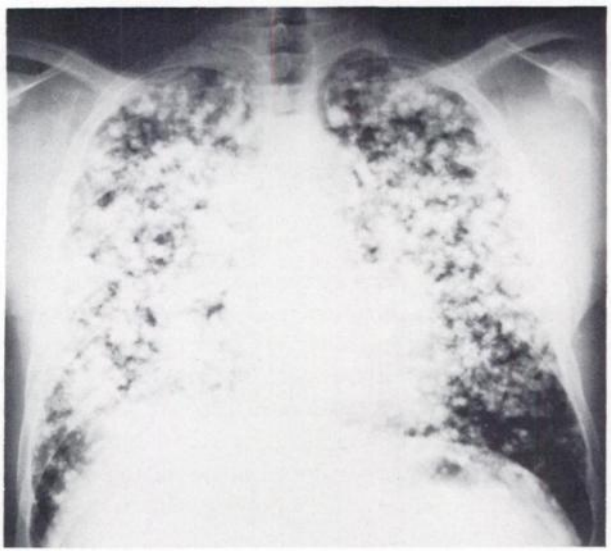

FIG. 3. PA teleo of chest made 12-17-70. Nodular infiltrates have become more extensive, confluent in many areas and are of bone density.

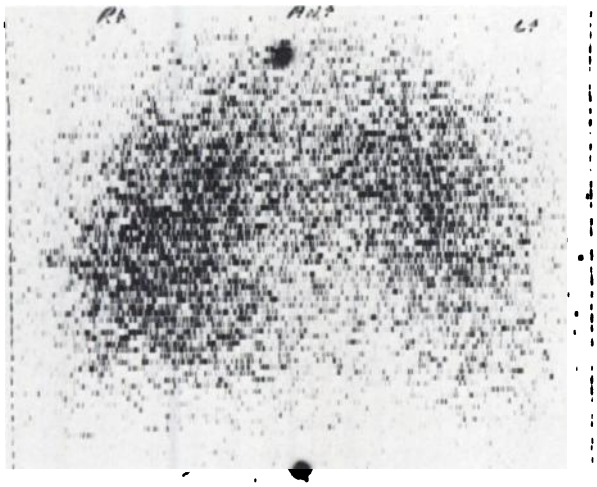

FIG. 4. ^{85}Sr-nitrate pulmonary scan, anterior view, made 12-7-70. There is diffusely distributed radioactivity throughout both lung fields compatible with pulmonary osteoblastic activity.

Within 72 hr of injection, the extra-skeletal ^{85}Sr is excreted from the body through the kidneys and gastrointestinal tract. When this patient was reevaluated, we felt that osteoblastic activity in the lungs could be determined by a ^{85}Sr scan. If these lesions had represented burnt-out, inactive areas of calcification, ^{85}Sr would not have been observed. Since there is extensive distribution of radioactivity in the pulmonary scan, it is obvious that the patient was actively depositing calcium in the lung fields at the time of examination.

SUMMARY

The patient is a 27-year-old Negro male who presented with a 2-year history of progressive exertional dyspnea and is now a respiratory cripple. His vital capacity diminished from 4 to 2 liters over a 1-year period as a result of involvement of his lung parenchyma by diffuse deposition of bone. We have not found the etiology of this pulmonary ossification. The lesion was proved by lung biopsy, and the ^{85}Sr lung scan showed an active process of bone production in the lung parenchyma.

REFERENCES

1. FELSON B: Thoracic calcifications. *Disease Chest* 56: 330, 1969

2. BUECHNER H, RAKIN C, SCHEPERS GWH, et al: Panel discussion. Diffuse pulmonary lesions: The problems of differential diagnosis. *Disease Chest* 43: 155, 1963

3. PEAR BL: Idiopathic disseminated pulmonary ossification. *Radiology* 91: 746, 1968

4. REINGOLD LM, MIZUNOVE GS: Idiopathic disseminated ossification. *Disease Chest* 40: 543–546, 1961

5. LEGGE DA, MILLER W, LUDWIG T: Pulmonary findings associated with mitral stenosis. *Chest* 58: 403, 1970

6. CASTLEMAN B, MCNEELY BU: Case records of Massachusetts General Hospital. *New Eng J Med* 273: 1268, 1965

7. SUSESH P, MASO CJ: Ossification in metastasis from carcinoma of breast. *JAMA* 198: 1309, 1966

8. KINARE SG, PARULKAR GB, PANDAY SR, et al: Extensive ossification in pulmonary plasmacytoma. *Thorax* 20: 206, 1965

9. SCHALL GL, TEIGER L, PRIMACK A, et al: Uptake of ^{85}Sr by an osteosarcoma metastatic to lung. *J Nucl Med* 12: 131–133, 1971

10. ROSENTHAL L: The role of Sr^{85} in detection of bone disease. *Radiology* 84; 75–82, 1965

11. BRIGGS RC, WEGNER GP: Osseous metaplasia in soft tissue. *JAMA* 195: 1061–1064, 1966

12. BADGER TL, GOTTLIEB L, GAENSLER E: Pulmonary alveolar microlithiasis or calcinosis of the lungs. *New Eng J Med* 253: 709, 1955