# Metastatic Pulmonary Calcification in a Patient with Chronic Renal Failure

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ABSTRACT

Metastatic pulmonary calcification characterized by diffuse calcium deposition in the lungs is known to occur in patients with chronic renal failure. We present a case of a 47-year-old man with chronic renal failure presented with dyspnea, high-resolution computed tomography of the chest revealed multiple, centrilobular, calcified nodules and patchy areas of ground-glass opacity throughout both lungs, consistent with metastatic pulmonary calcification. Calcification was also seen in the bronchi and trachea.

## CASE REPORT

### CASE REPORT

A 47-year-old man with chronic renal failure, receiving hemodialysis for 10 years, was presented with persisting dyspnea for 3 months. The chest was clear to auscultation and percussion. Laboratory studies revealed BUN of 20 (7.00-25.00) mg/dl, serum creatinine of 3.27 (0.30-1.40) mg/dl, calcium of 9.73 (8.40-10.20) mg/dl, phosphorus of 5.8 (2.70-4.50) mg/dl, and parathormone of 290 (10-65) pg/ml. Parathyroid ultrasound and scintigraphy were performed showed findings consistent with parathyroid adenoma. Parathyroid scintigraphy was performed 15 minutes and 2 hours after injection of Tc99mMIBI. The Tc-99mMIBI scintigraphy demonstrated a focus of intense uptake in the lower pole of the right lobe on the early and late images. Sputum cultures were negative. He had no clinical history of dust exposure, cardiac problems or malignancy. There was no history of previous tuberculous infection. Chest radiography shows multiple, ill defined, opacities throughout both lungs (Fig. 1). The nodules were predominant in the upper and mid lung zones. High-resolution computed tomography (HRCT) of the chest using 1 mm collimation at 10 mm intervals (Sensation 4; Siemens, Erlangen, Germany) showed multiple, centrilobular, calcified nodules and patchy areas of ground-glass opacity throughout both lungs (Figure 2-7). There was a symmetrical distribution involving both lungs. A thin rim of calcification surrounded the trachea and main bronchi. Lymphadenopathy, pleural effusion, pleural and soft-tissue calcification were not present. There was no evidence of pulmonary fibrosis. Based on these findings, the diagnosis of metastatic pulmonary calcification (MPC) was made. He underwent subtotal parathyroidectomy for secondary hyperparathyroidism. The patient's clinical findings improved after parathyroidectomy.

### DISCUSSION

Metastatic calcification refers to the deposition of calcium in normal tissue. The lung is one of the primary sites of metastatic calcium deposition (1). Metastatic calcifications of lung parenchyma are related to chronically elevated serum

calcium-phosphorus product as in chronic renal failure, primary hyperparathyroidism, D hypervitaminosis, milk alkali syndrome or diffuse myelomatosis (2).

Calcium salts are predominantly deposited in the alveolar walls, and to a lesser extent in bronchial wall, pulmonary arteries, and veins (3). Calcium preferentially deposits in relatively alkaline tissues; therefore, it is not surprising that the lung apex is more commonly involved than the lung base (2). The degree of respiratory distress often does not correlate with the degree of macroscopic calcification. Patients with extensive calcification may be asymptomatic, while others with subtle calcification or normal chest radiographs may have severe respiratory compromise (4).

Metastatic pulmonary calcification is a well known complication of end-stage renal failure and its treatment (5). While common at autopsy in patients with renal failure, the process is often undiagnosed antemortem. Many patients with MPC are asymptomatic, but in some cases can cause fulminant respiratory failure and early death. Symptoms include dyspnea and chronic, non-productive cough (4).

Because chest radiograph is insensitive in depicting small amounts of calcification, it is frequently normal. MPC has been described as confluent or patchy airspace opacities simulating pulmonary edema or pneumonia on chest radiographs. MPC can also appear as a diffuse interstitial process or as discrete or confluent calcified nodules (2, 6).

HRCT, with its excellent sensitivity in the detection of small amounts of calcification, is being increasingly used to diagnose MPC. Several CT patterns have been documented to date. The first pattern is multiple diffuse calcified nodules that are either distributed throughout the whole lung or show a predilection for the apices. The second pattern is diffuse or patchy areas of ground-glass opacity or consolidation. Finally, MPC may appear as a confluent high attenuation parenchymal consolidation in a predominantly lobar distribution, mimicking lobar pneumonia. Associated findings include calcification in the bronchial walls, myocardium and within the vessels of the chest wall (2, 6). In our case showed multiple, symmetrical, centrilobular, calcified nodules and patchy areas of ground-glass opacity throughout both lungs. Additionally, this case also showed calcification in the bronchial and tracheal walls

The other useful technique in detecting early MPC is radionuclide imaging. Technetium-99m-labeled bone scanning radionuclides detect pulmonary calcification. Additionally, 99mTc bone scintigraphy with SPECT may allow detection and localization of abnormality to the pulmonary parenchyma before abnormality is detected on chest radiography (4).

Multifocal pulmonary parenchymal calcification is associated with infection (varicella zoster tuberculosis, histoplasmosis), MPC, silicosis, diffuse parenchymal amyloidosis, alveolar microlithiasis, haemosiderosis secondary to mitral stenosis and fat embolism associated with adult respiratory distress syndrome. It also occurs in treated metastases and in metastatic malignancies such as osteogenic sarcoma, chondrosarcoma, mucin-producing adenocarcinomas and thyroid malignancies (7). The calcified nodules in diffuse parenchymal amyloidosis are located predominantly in the subpleural areas of the mid and lower zones and are associated with hilar lymphadenopathy, interlobular septal thickening, and consolidation and ground-glass opacities. The calcified pulmonary nodules in alveolar microlithiasis are smaller (about 1 mm in diameter), typically occur in the lower zones and the paracardiac regions and may be associated with apical bullae and subpleural cysts. Tuberculoma usually presents as a solitary well-defined calcified nodule. Miliary tuberculosis is characterized by small, well-defined, discrete nodules, 1-2 mm in diameter, evenly distributed throughout both lungs. Occasionally, some may calcify. Hilar lymphadenopathy with a peripheral egg-shell calcification is common in silicosis (8). The most likely cause for multifocal pulmonary parenchymal calcification in the patients with chronic renal failure is MPC. The predilection of calcification for the upper lung area and associated with calcification in the bronchial walls, myocardium and within the vessels of the chest wall may be supported the diagnosis of MPC.

Pulmonary calcification associated with renal failure is potentially reversible, and may resolve after parathyroidectomy, renal transplant, or adequate dialysis. Resolution of symptoms has been seen after correction of hypercalcemia well (4).

In conclusion, HRCT is a valuable imaging technique in the diagnosis of MPC. HRCT may obviate the need for open lung biopsy. Therefore, it is important for the radiologist to recognize the HRCT patterns of this disease process afflicting patients with chronic renal failure.

## TEACHING POINT

Metastatic pulmonary calcification is a well known complication of end-stage renal failure. HRCT is a valuable imaging technique in the diagnosis of metastatic pulmonary calcification. HRCT may obviate the need for open lung biopsy.

## ABBREVIATIONS

HRCT= High-resolution computed tomography
MPC= Metastatic pulmonary calcification

## REFERENCES

1. Kaltreider HB, Baum GL, Bogaty G, McCoy MD, Tucker M. So-called "metastatic" calcification of the lung. Am J Med. 1969 Feb;46(2):188-96.

2. Hartman TE, Müller NL, Primack SL, Johkoh T, Takeuchi N, Ikezoe J, Swensen SJ. Metastatic pulmonary calcification in patients with hypercalcemia: findings on chest radiographs and CT scans. AJR Am J Roentgenol. 1994 Apr;162(4):799-802

3. Bein ME, Lee DB, Mink JH, Dickmeyer J.Unusual case of metastatic pulmonary calcification. AJR Am J Roentgenol. 1979 May;132(5):812-6.

4. Brodeur FJ Jr, Kazerooni EA. Metastatic pulmonary calcification mimicking air-space disease. Technetium-99m-MDP SPECT imaging. Chest. 1994 Aug;106(2):620-2

5. Kuzela DC, Huffer WE, Conger JD, Winter SD, Hammond WS. Soft tissue calcification in chronic dialysis patients. Am J Pathol. 1977 Feb;86(2):403-24.

6. Lingam RK, Teh J, Sharma A, Friedman E. Case report. Metastatic pulmonary calcification in renal failure: a new HRCT pattern. Br J Radiol. 2002 Jan;75(889):74-7

7. Brown K, Mund DF, Aberle DR, Batra P, Young DA. Intrathoracic calcifications: radiographic features and differential diagnoses. Radiographics 1994; 14:1247–61

8. Padley S.P.G, Rubens M.B. Diffuse lung disease. In: Textbook of Radiology and Imaging. Sixth ed. New Y; Churchill Livingstone, 1998; 477-503.

## FIGURES

**Figure 1:** 47 year-old man with metastatic pulmonary calcification due to chronic renal failure. PA chest X-ray image shows bilateral multiple, ill defined, opacities. The opacities are predominant in the upper and mid lung zone. Calcification is not apparent.

**Figure 2:** 47 year-old man with metastatic pulmonary calcification due to chronic renal failure. High-resolution CT image (1-mm collimation, high-spatial-frequency reconstruction algorithm) lung window shows diffuse fluffy, poorly defined nodules in the upper lobes.

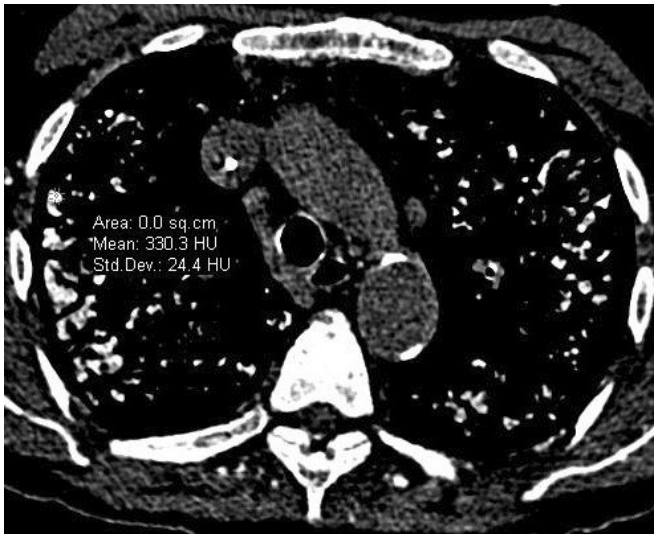


**Figure 3:** 47 year-old man with metastatic pulmonary calcification due to chronic renal failure. High-resolution CT image in mediastinal window shows parenchymal calcifications.

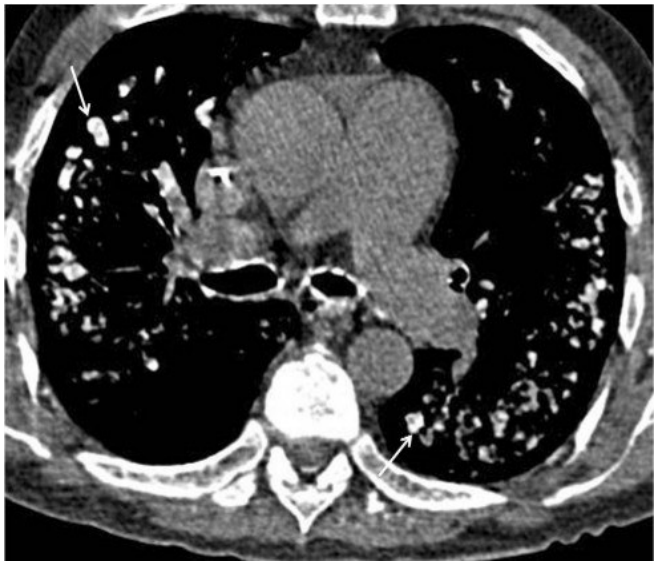

**Figure 4:** 47 year-old man with metastatic pulmonary calcification due to chronic renal failure. High-resolution CT image in mediastinal window at the level of the carina shows multiple, ill-defined, calcified nodules (arrows). There are also calcifications in the bronchial and tracheal walls.

**Figure 5:** 47 year-old man with metastatic pulmonary calcification due to chronic renal failure. High-resolution CT scan at the level of the carina shows multiple, peripheral, centrilobular, calcified nodules and patchy areas of ground-glass opacity throughout both lungs (white arrows). There are also calcifications in the bronchial and tracheal walls. (black arrows)

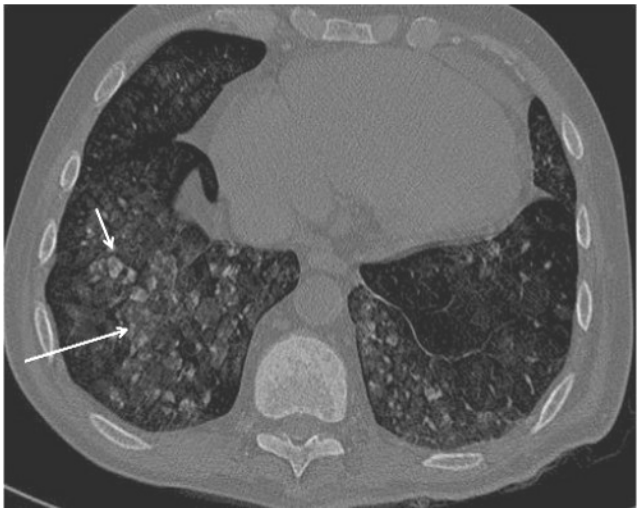

**Figure 6:** 47 year-old man with metastatic pulmonary calcification due to chronic renal failure. High-resolution CT image in lung window shows symmetric, centrilobular, calcified nodules (short arrow) and ground-glass opacity (long arrow) in the lower lung zone.

KEYWORDS

Metastatic pulmonary calcification, HRCT, chronic renal failure

**Figure 7:** 47 year-old man with metastatic pulmonary calcification due to chronic renal failure. High-resolution CT image in mediastinal window shows symmetric, centrilobular, calcified nodules in the lower lung zone.

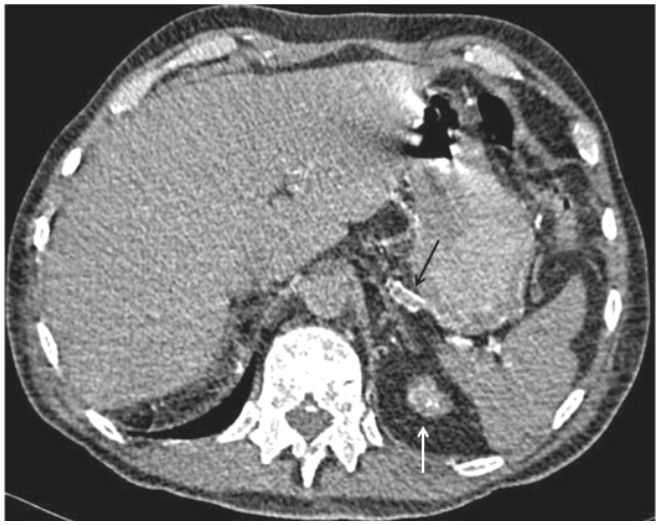

**Figure 8:** 47 year-old man with metastatic pulmonary calcification due to chronic renal failure. Abdomen CT shows renal atrophy (white arrow) and vascular calcification (black arrow).

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