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Case Report

Radiology Section

# Pulmonary Haemosiderosis Secondary to Mitral Valve Stenosis-Known Association of Uncommon Entity: A Case Report

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## ABSTRACT

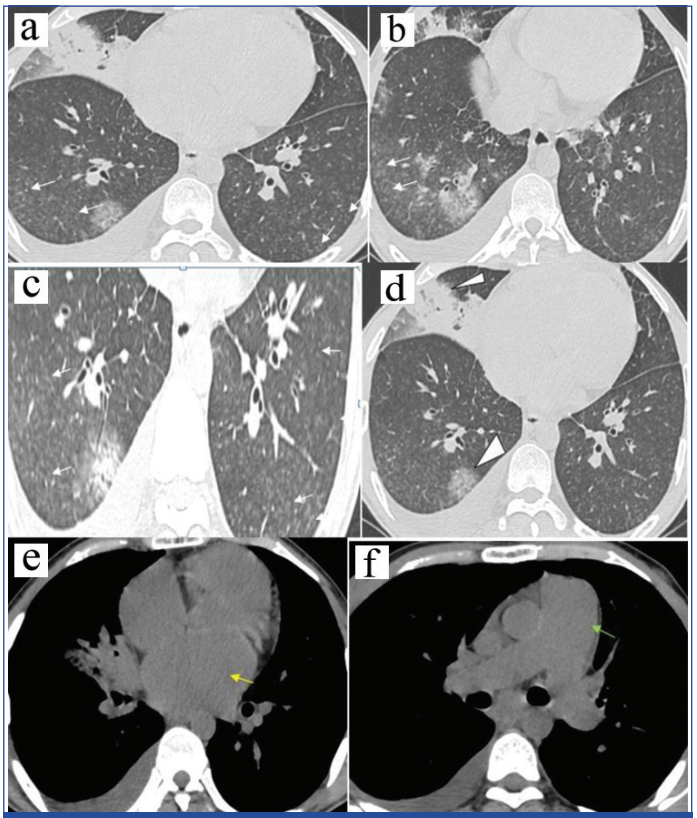
Pulmonary haemosiderosis is a rare lung disease characterised by haemosiderin deposition in the lungs due to recurrent intra-alveolar bleeding. It can be idiopathic or secondary due to mitral stenosis. Affected patients will have symptoms of cough, haemoptysis, and shortness of breath. Radiologically, it is characterised by widespread tiny alveolar nodular opacities with or without septal thickening. Therefore, in the case of mitral valve stenosis, this imaging pattern on High-resolution Computed Tomography (HRCT) should prompt suspicion of secondary pulmonary haemosiderosis. Here, the authors present the case of a 27-year-old male patient with mitral stenosis who presented with progressive shortness of breath, mild atypical chest pain for two months, and a cough with occasional haemoptysis in the last 10 days before the hospital visit, along with typical radiological findings of widespread tiny ground glass alveolar nodules on HRCT. The radiological knowledge of this rare entity is very important for confidently making the diagnosis in the proper clinical context, to avoid unnecessary investigations and treatment.

**Keywords:** Haemoptysis, High-resolution computed tomography, Nodular opacities, Septal thickening

## CASE REPORT

A 27-year-old male patient with a history of Chronic Rheumatic Heart Disease (CRHD) and severe mitral stenosis presented to the hospital with complaints of progressive shortness of breath, mild atypical chest pain for the past two months, and occasional cough with haemoptysis in the 10 days before the hospital visit. There was no history of cold, fever, weight loss, loss of consciousness, or palpitations. On clinical examination, the patient was conscious and coherent with the following vital signs: blood pressure of 110/70 mmHg, pulse 106 bpm, respiratory rate of 38 cycles/min, and peripheral oxygen saturation ($SpO_2$) of 80%. The rest of the physical examination was unremarkable. However, auscultation of heart sounds revealed a loud S1, an opening snap, a diastolic rumble, and fine crackles in bilateral lung bases. A 2D Echocardiography (Echo) was performed due to abnormal auscultatory findings, revealing significant Mitral Stenosis (MS) with a valve area of 1 sqcm, thickened and calcified valve tips, doming of the anterior mitral leaflet with a fixed posterior mitral leaflet, a thickened annulus of the aortic valve (19 mm), and a dilated left atrium measuring 53 mm. The complete blood picture of the patient revealed low haemoglobin of 8.0 gm%, with a normal total leucocyte count of 5400 cells/cumm and platelet count of 3.88 lacs/cumm.

Based on the clinical examination and 2D ECHO cardiography, the patient was diagnosed with moderate pulmonary arterial hypertension {Right Ventricular Systolic Pressure (RVSP)-60 mHg} in addition to severe mitral stenosis, moderate Aortic Regurgitation (AR), and Tricuspid Regurgitation (TR). A chest X-ray was performed on admission, showing mild cardiomegaly. The patient was then advised to undergo HRCT of the chest to look for lung abnormalities. The HRCT chest revealed multiple tiny innumerable centrilobular nodules involving bilateral lower lobes. Segmental consolidation with surrounding glassing was noted involving the right middle lobe, and multifocal patchy ground glassing was noted in the anteromedial segment of the left lower lobe and segments of the right lower lobe [Table/Fig-1a-f]. Given the clinical history, a radiological diagnosis of pulmonary haemosiderosis due to chronic recurrent alveolar haemorrhage secondary to mitral stenosis was made. The patient was advised to undergo bronchoalveolar lavage; however, the patient refused the procedure, which is the ideal investigation for confirmation.




**[Table/Fig-1]:** Widespread tiny alveolar ground glass nodules were seen scattered in bilateral lower lobes with severely dilated left atrium- suggestive of pulmonary haemosiderosis due to mitral stenosis. a,b) Axial HRCT image showing multiple tiny discrete and ill-defined alveolar ground glass nodules (miliary nodules) seen scattered in both lower lobes (white arrows). c) Magnified image of A for better appreciation- reveals multiple miliary ground glass nodules scattered in bilateral lower lobes (white arrows). d) Ground glass patchy opacity in the posterior segment of the right lower lobe and consolidatory patch (arrowhead) in the right middle lobe likely represent acute alveolar haemorrhage. e,f) Axial mediastinal window showing dilated pulmonary trunk measuring 32 mm (green arrow) and dilated left atrium (yellow arrow) due to mitral stenosis and pulmonary arterial hypertension.

The patient was started on methylprednisolone 16 mg BD, which was gradually tapered, montelukast levocetirizine OD, levocloperastine 10 mL TID, ferrous fumarate, and folic acid BD. After the treatment commenced, the patient's symptoms improved during a follow-up of 6 to 7 weeks. Later, the patient was referred to the cardiology unit, where mitral valve replacement was advised.

## DISCUSSION

Pulmonary haemosiderosis is a rare disease that occurs due to the deposition of haemosiderin-laden macrophages in the lungs as a result of repeated alveolar haemorrhages. Pulmonary haemosiderosis is divided into two main types: 1) idiopathic; and 2) secondary due to mitral valve stenosis, collagen vascular diseases, and coagulation disorders.

The pulmonary system responds to haemorrhage via activation of alveolar macrophages. These specialised macrophages phagocytose erythrocytes at a rate six times slower than systemic macrophages [1]. This reduced ability to metabolise the haemorrhaged blood ultimately leads to a build-up of haemosiderin [1]. Idiopathic Pulmonary Haemosiderosis (IPH) is a rare condition in which the patient suffers from recurrent episodes of diffuse alveolar haemorrhage of unknown aetiology [2,3].

The toxic effect of iron is exhibited by the production of highly reactive hydroxyl radicals (Haber-Weiss and Fenton reactions), which in turn, leads to the peroxidation of the lipid layer, carbohydrate and protein degeneration, and consequent fibrogenesis. Inside the pulmonary macrophages, the enzyme heme oxygenase removes the iron from haemoglobin, however, the volume of alveolar macrophages to metabolise the iron is restricted, and the existence of free iron in the alveoli can lead to local injury and fibrosis.

The clinical manifestations of haemosiderosis may include iron deficiency anaemia, repeated episodes of haemoptysis, and diffuse pulmonary infiltrates [4].

Plain radiograph findings are usually non specific and depend on the acuity and severity of alveolar haemorrhage. Radiograph findings may be subtle in pulmonary haemosiderosis or unremarkable [2], however, HRCT of the chest is a more sensitive investigation as it reveals the subtle findings that can be missed on plain radiographs. The imaging features of pulmonary haemosiderosis on HRCT would be ground glassing, consolidation, randomly scattered miliary nodules, or a combination of findings. The crazy paving pattern is also described in pulmonary haemosiderosis, which is due to the deposition of haemosiderin in interlobular septa. In chronic cases, due to repeated haemorrhage, there would be secondary changes of traction bronchiectasis, subpleural honeycombing, bronchiectasis, and even massive pulmonary fibrosis can be seen as long-term complications of pulmonary haemosiderosis [5].

The definitive diagnosis of pulmonary haemosiderosis is usually established by bronchoalveolar lavage and lung biopsy, which demonstrates diffuse alveolar haemorrhage and haemosiderin-laden macrophages in the alveoli and to some extent in the interstitium.

The most common differential diagnosis for pulmonary haemosiderosis with the widespread miliary pattern is tuberculosis and miliary metastasis. In tuberculosis, there will be consolidation, mediastinal lymphadenopathy, and a history of chronic low-grade fever and weight loss in addition to cough with expectoration. Miliary metastasis is usually seen in thyroid and renal carcinomas. In the present case, the tiny military nodules were of ground-glass attenuation, and the close differential for which is hypersensitivity pneumonitis. However, there was no history of exposure to an allergen, and since there is a cough with haemoptysis in the context of severe mitral stenosis, a radiological diagnosis of pulmonary haemosiderosis was made. However, the patient refused to undergo bronchoalveolar lavage, which is the ideal investigation for confirmation. In the present case report, we have referred to a few previous literature cases to support our diagnosis [Table/Fig-2] [6-8].

| Author | Age/ Sex | Chief complaints | Past history | Year of publication | Radiological findings | Study | Follow-up |
|---|---|---|---|---|---|---|---|
| Gyanendra Agrawal G et al., [6] | 32 y/ Male | Fever, dry cough, and worsening breathlessness of 3 day duration | Progressive dyspnea on exertion over the past 12 years | 2011 | Chest radiograph revealed cardiomegaly and diffusely scattered miliary (approximately 3 mm) nodular opacities. CT of the chest showed a dilated pulmonary artery and multiple randomly scattered nodular opacities of 2-3 mm in size | Miliary nodules due to secondary pulmonary haemosiderosis in rheumatic heart disease | The patient was managed conservatively. A balloon mitral valvuloplasty was done, following which, the symptoms improved. |
| Laudelino JS et al., [7] | 30 y/ Male | Chest pain and progressive dyspnea | Progressive dyspnea for 3 years, with deterioration of symptoms for one month. Recent hospitalisation for pneumonia, where he was diagnosed with mitral stenosis and TR | 2023 | Chest radiograph showed bilateral micronodular infiltrates. CT chest shows bilateral centrilobular micronodules | Pulmonary haemosiderosis secondary to mitral stenosis: a case report | Mitral valve replacement with a decalcifying bio prosthesis and tricuspid valve repair. |
| Chamusco RF et al., [8] | 38 y/ Male | An Air Force sergeant came to the hospital with complaints of dyspnea, cough, and a small amount of haemoptysis while hunting at an elevation of 5000 feet | The patient was incidentally found to have mitral stenosis and regurgitation on a physical examination. Mild dyspnea on extreme exertion, then he developed progressive fatigue and weight loss 4 years ago and was found to have severe iron deficiency anaemia | 1988 | Chest X-ray revealed interstitial and alveolar edema with left atrial enlargement | Mitral stenosis: an unusual association with pulmonary haemosiderosis and iron deficiency anaemia | The patient was managed with intravenous furosemide, transdermal nitroglycerin and three units of packed red blood cells, following which the haemodynamic parameters improved. |
| Present case | 27 y/ Male | Progressive shortness of breath, mild atypical chest pain, cough with occasional haemoptysis in the last 10 days | Progressive shortness of breath, mild atypical chest pain for 2 months | -- | Chest radiograph revealed mild cardiomegaly. HRCT chest revealed multiple tiny innumerable centrilobular nodules noted involving bilateral lower lobes. Segmental consolidation with surrounding glassing was noted involving the right middle lobe and multifocal patchy ground glassing was noted involving anteromedial segment of left lower lobe and segments of right lower lobe | Pulmonary haemosiderosis secondary to mitral valve stenosis– known association of uncommon entity | The patient was put on steroid, antitussive and livogen (ferrous fumarate and folic acid) to treat anaemia. The patient's symptoms were improved on follow-up visit and advised for mitral valve replacement. |

**[Table/Fig-2]:** Summary of the findings of the similar cases from the literature [6-8].

The definitive treatment for pulmonary haemosiderosis secondary to heart valve disease includes valve repair and/or valve replacement [5], steroids, and antitussive medications as a supportive agent, while IPH is treated with corticosteroids alone or in combination with other immunosuppressive regimens.

## CONCLUSION(S)

Pulmonary haemosiderosis due to mitral stenosis is a rare disease that can present with multiple miliary nodules in the lung. Therefore, one should have radiological knowledge of these imaging findings to correctly diagnose and avoid misinterpretation, which otherwise can lead to an array of unnecessary investigations and other work-ups. Here, the authors present an uncommon case with classical imaging findings of widespread miliary ground glass lung nodules, which in the context of severe mitral stenosis, strongly suggests pulmonary haemosiderosis.

## REFERENCES

[1] Custer G, Balcerzak S, Rinehart J. Human macrophage haemoglobin-iron metabolism in vitro. Am J Hematol. 1982;13(1):23-36.
[2] Ioachimescu OC, Sieber S, Kotch A. Idiopathic pulmonary haemosiderosis revisited. Eur Respir J. 2004;24(1):162-70.
[3] Ioachimescu OC, Farver C, Stoller JK. Hemoptysis in a 77-year-old male with a systolic murmur. Chest. 2005;128(2):1022-27.
[4] Chen CH, Yang HB, Chiang SR, Wang PC. Idiopathic pulmonary hemosiderosis: Favorable response to corticosteroids. J Chin Med Assoc. 2008;71(8):421-24.
[5] Harte S, McNicholas WT, Donnelly SC, Dodd JD. Honeycomb cysts in idiopathic pulmonary haemosiderosis: High-resolution CT appearances in two adults. Br J Radiol. 2008;81(972):e295-98.
[6] Agrawal G, Agarwal R, Rohit MK, Mahesh V, Vasishta RK. Miliary nodules due to secondary pulmonary hemosiderosis in rheumatic heart disease. World J Radiol. 2011;3(2):51-54.
[7] Laudelino JS, Aguiar FM, Martins FP, de Oliveira RL, Cruz GR, Ramos AL. Pulmonary hemosiderosis secondary to mitral stenosis: A case report. Surgical and Experimental Pathology. 2023;6(1):5.
[8] Chamusco RF, Heppner BT, Newcomb EW 3rd, Sanders AC. Mitral stenosis: An unusual association with pulmonary hemosiderosis and iron deficiency anaemia. Mil Med. 1988;153(6):287-89. PMID: 3133596.

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