



Pulmonary Mycobacterium Avium-Intracellulare Infections in Women

- Mycobacterium avium-intracellulare complex (MAC) pulmonary infection may be seen in elderly women without underlying lung disease, but diagnosis is often delayed due to lack of clinical suspicion
- Chest x-ray findings include multiple nodules and bronchiectasis in the right middle lobe and lingula
- Chest CT has greater sensitivity for detecting bronchiectasis and cavities and is superior to chest x-ray for diagnosis
- Definitive diagnosis of MAC in patients with suggestive radiologic findings requires microbiological studies, which may include bronchoscopy and lung biopsy

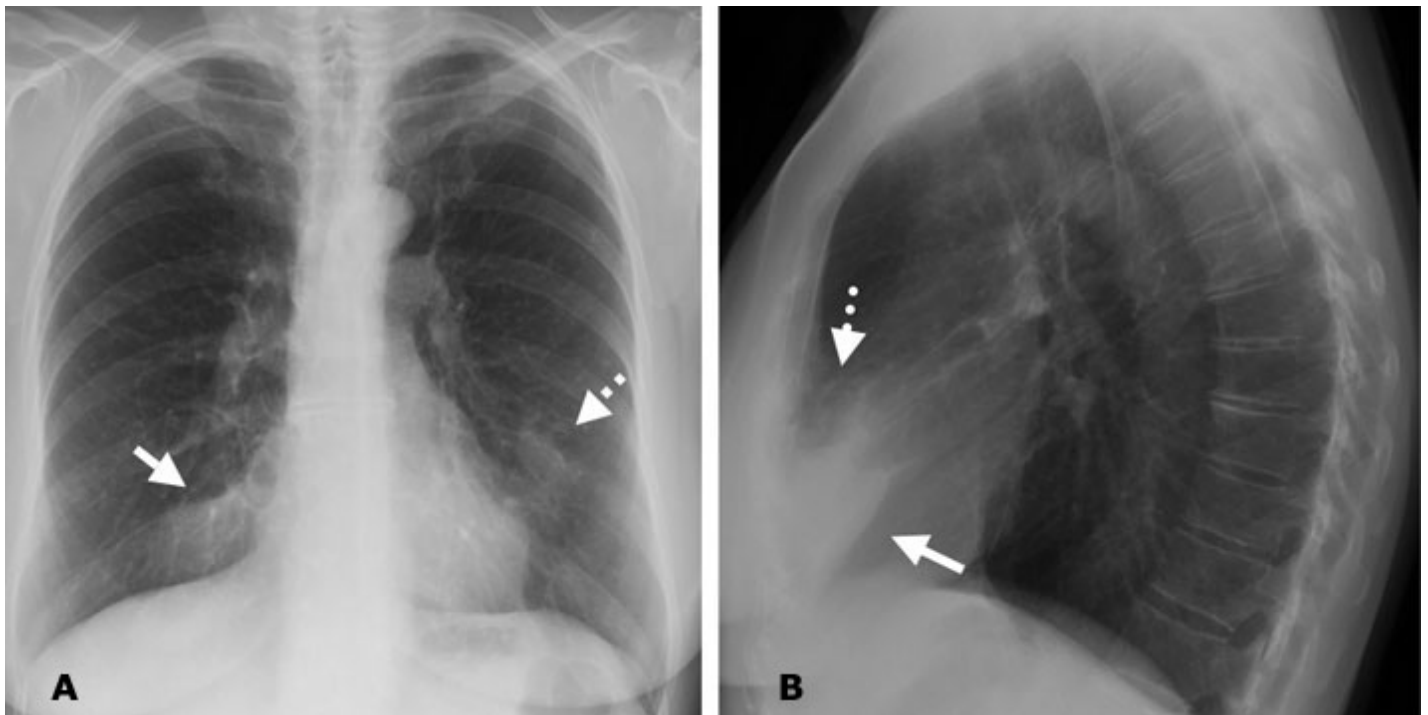


Figure 1. PA (1A) and Lateral chest (1B) radiographs in a 64 year old lady with a chronic cough secondary to MAC. There is air space opacity in the middle lobe (solid arrows) and lingula (dashed arrows)

*P*ulmonary infections due to non-tuberculous mycobacteria (atypical mycobacteria) are rare in the general population and are usually more indolent and harder to treat compared to tuberculosis. These infections are most commonly due to *Mycobacterium avium* or *M. intracellulare*, which are indistinguishable

by standard microbiological techniques and are generally grouped together as *Mycobacterium avium-intracellulare* complex (MAC). Pulmonary infections with MAC have been primarily described in patients with underlying structural lung disease including bronchiectasis and prior granulomatous disease, and

also occur in patients with underlying co-morbidities such as cystic fibrosis and alpha-1 antitrypsin deficiency. Upper lobe cavitory disease with MAC occurs primarily in older men with significant tobacco and alcohol histories – most often in the setting of underlying chronic obstructive lung disease. Though MAC can be detected in the respiratory tract of patients with AIDS, isolated pulmonary infection with MAC in this condition is actually rare.

MAC infections have also been observed in a third group of patients without significant apparent risk factors. About 90% are women over the age of 50 (most commonly over 60), of lower body weight and non-smokers. Certain descriptive studies have noted associations with mitral valve prolapse, pectus excavatum, bronchiectasis and underlying reflux disease (GERD). Clinically, these patients may present with a chronic cough and sputum production and also may report recurrent sinopulmonary infections. They are often treated initially with sequential antibiotics, without long-term success.

Because MAC infection is not suspected in these patients, the diagnosis is often delayed. However, this entity is not rare and about 30-50 cases requiring treatment are seen at MGH per year. Mycobacterial studies must be specifically requested since routine bacteriological cultures do not identify these organisms and they may require repeated sampling to be identified.

MAC is ubiquitous in the environment and can be found in many water and soil sources. Interpretation of microbiological data must be done in the appropriate clinical, pathological and radiographic context, as it is important to distinguish between contamination, colonization, and infection. Therefore, imaging plays an important role in the diagnosis of these patients and the criteria for diagnosis of MAC infection includes certain radiographic findings on chest CT examination as well as at least 3 repeated positive cultures or smears of sputum or bronchial washes. In some cases, lung biopsy may be necessary to confirm diagnosis.

Imaging of MAC Infection

Patients presenting with a chronic cough often receive chest radiographs as an initial screening procedure. The chest x-ray may be normal or demonstrate nodules, mild to moderate bronchiectasis, air-space opacities, and atelectasis (Figure 1). The middle lobe and lingula are most likely to be affected, with generalized disease in severe cases.

If chest x-ray images show abnormalities suggestive of MAC infection or if the symptoms persist with no apparent radiographic findings, it is recommended that the patient be referred for further evaluation with chest CT. Chest CT findings of MAC are quite characteristic, comprised of bronchiectasis, branching centrilobular nodules ("tree-in-bud" abnormalities), cavities, air

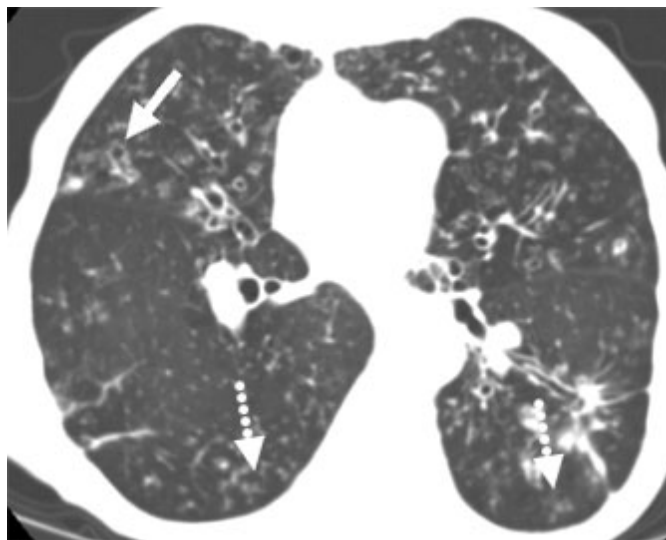


Figure 2. 83 year old lady with a chronic cough. CT scan at the level of the pulmonary artery demonstrates bronchiectasis (solid arrow) and tree-in-bud nodules (dashed arrows) involving the middle lobe, lingula and lower lobes, secondary to MAC



Figure 3. 83 year old lady with a chronic cough. Coronal reformat CT scan through the airways demonstrates extensive bronchiectasis, tree-in-bud nodules (dashed arrow) and right upper lobe segmental atelectasis (solid arrow) secondary to MAC

space disease, and atelectasis predominantly in the middle lobe and lingula (Figures 2,3). In one small series of symptomatic patients, CT findings of bronchiectasis and multiple small nodules were

reported to have a sensitivity of 80%, specificity of 87%, and accuracy of 80% for the detection of MAC infection.

Similar chest CT findings have also been incidentally detected in asymptomatic patients, of whom 50% have no detectable MAC bacilli by routine methods. Additional follow-up of these patients via serial clinical, micro-biological and radiographic monitoring is important, as it is often difficult to establish the diagnosis of true pulmonary disease with MAC and to determine if and when treatment is warranted.

Patient Management and Follow-up

MAC infections are generally much more indolent than those due to *M. tuberculosis*. Treatment requires combination drug therapy over a prolonged period of time (12-18 months or longer) with cure rates of only approximately 50-70% depending on the host and extent of the disease. Drug tolerability is an important issue, and in some series it is estimated that up to 20% of patients will have significant difficulties tolerating anti-MAC therapy. If the disease is confined to a small lung volume or if the patient has other life-threatening conditions, the treating physician may opt to follow the patient with serial CT and microbiological examinations and reassess periodically the need for treatment. For those under treatment, close clinical and radiographic monitoring are essential to assess for response and to monitor for intolerance or toxicity of the combination antimycobacterial therapy.

Scheduling

Chest radiography is performed on the main campus and at all off-campus imaging facilities (Mass General West Imaging Waltham, Mass General Imaging Chelsea, and MGH Revere Health Center). Chest CT imaging is performed on the main campus, Mass General West Imaging Waltham, and Mass General Imaging Chelsea. Both radiography and Chest CT may be scheduled through [Radiology Order Entry and Decision Support](#) or by telephone (617-724-XRAY).

Further Information

For further questions, please contact [Amita Sharma, M.D.](#), Thoracic Radiology at 617-724-4254.

We would like to thank Dr. Sharma and Rocío Hurtado, M.D., Infectious Disease Unit, for their assistance and advice for this issue.

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