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# March 2022 Pulmonary Case of the Month: A Sore Back Leading to Sore Lungs

*Lewis J. Wesselius MD*[1]
*Brandon T. Larsen MD PhD*[2]

Departments of [1]Pulmonary Medicine and [2]Pathology
Mayo Clinic Arizona
Scottsdale, AZ USA

## *History of Present Illness*

An 82-year-old woman from Colorado was referred because of progressive shortness of breath over the past year. Her primary care physician had prescribed Trelegy® which did not improve her dyspnea. An outside pulmonologist noted abnormal findings on her thoracic CT scan and a bronchoscopy with bronchoalveolar lavage (BAL) was preformed which was positive for Mycobacterium Avium Complex (MAC). She was treated with a 3-drug regimen (azithromycin, rifampin, ethambutol) for 6 months with mild improvement. After the treatment was stopped, she noted more dyspnea and required supplemental oxygen. She underwent a fundoplication and initially improved but a month later her shortness of breath seemed to worsen. She was started on prednisone which was tapered to 10 mg/day. She was referred to the Mayo Clinic for possible VATS lung biopsy.

## *Past Medical History (PMH), Social History (SH), Family History (FH)*

PMH

- Hiatal Hernia/GERD
- Ulcerative Colitis
- Hypertension
- Chronic back pain
- Prior breast implants

SH

- Former smoker (24 pack-years, quit 1988)
- Social use of alcohol, no drug use
- No exposure to birds or down
- No occupational dust exposures
- Home humidifier
- Has indoor hot tub used frequently for back pain

FH

- Unremarkable

## *Medications*

- Prednisone 10 mg daily
- Pantoprazole 40 mg bid
- Pregabalin 25 mg at bedtime
- Oxycodone 5 mg q 6 hours prn pain
- Ondansetron 4 mg tablet q 8hhours prn nausea

## *Physical examination*

- BMI 31.9

- Oxygen saturation at rest 95% on 4 lpm, 88% on RA
- Chest: scattered crackles
- Cardiovascular: regular rate without murmur
- Extremities: no clubbing or edema

Which of the following ***should be done next***?

1. Pulmonary function testing
2. Open surgical lung biopsy
3. Review thoracic CT scan
4. 1 and 3
5. All of the above

**Correct!**
**4. 1 and 3**

Although a VATS lung biopsy may be necessary, it is premature at this time. An open lung biopsy would only add risk above a VATS lung biopsy and is not indicated. Her pulmonary function testing is shown in Figure 1 and her thoracic CT scan is shown in Figure 2.

| | PREDICTED | | CONTROL | |
|---|---|---|---|---|
| | Pred | LLN | Actual | %Pred |
| -- LUNG VOLUMES -- | | | | |
| TLC (Pleth) (L) | 4.49 | 3.59 | 4.04 | 90 |
| SVC (L) | 2.26 | 1.89 | *1.32 | *58 |
| RV (Pleth) (L) | 2.22 | 1.78 | *2.72 | *122 |
| RV/TLC (Pleth) (%) | 48 | 38 | *67 | *140 |
| -- SPIROMETRY -- | | | | |
| FVC (L) | 2.26 | 1.89 | *0.92 | *40 |
| FEV1 (L) | 1.68 | 1.40 | *0.82 | *48 |
| FEV1/FVC (%) | 79 | 66 | 89 | 112 |
| FEF 25-75% (L/sec) | 1.11 | 0.61 | 1.32 | 118 |
| FEF Max (L/sec) | 4.07 | 3.05 | 4.42 | 108 |
| MVV (L/min) | 75 | 63 | *41 | *54 |
| -- DIFFUSION -- | | | | |
| DLCOunc (ml/min/mmHg) | 17.76 | 14.21 | *8.46 | *47 |

Figure 1. Pulmonary function testing (Click here to open Figure 1 in a new window)

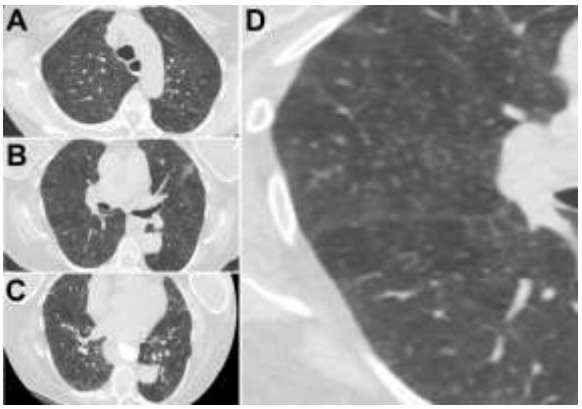


Figure 1. A-C: Representative images from outside thoracic CT scan in lung windows. D: enlarged view of right lung from Panel B. (Click here to open Figure 2 in a new window)

Which of the following represent the ***best interpretation of the thoracic CT scan***?

1. Mosaic ground-glass opacities
2. Honeycombing
3. Small pulmonary nodules
4. 1 and 3
5. All of the above

**Correct!**
**4. 1 and 3**

There are areas of ground-glass opacification best seen in the lower power images (Figure 1A-C). There are also multiple, small pulmonary nodules in no particular patter. There is no evidence of honeycombing which are clustered cystic air spaces (between 3-10 mm in diameter, but occasionally as large as 2.5 cm) that are usually subpleural, peripheral and basal in distribution.

Which of the following are ***causes of small pulmonary nodules and mosaic ground-glass opacities***?

1. Endobronchial spread of tuberculosis
2. Hypersensitivity pneumonitis
3. Respiratory bronchiolitis
4. 1 and 3
5. All of the above

**Correct!**
**5. All of the above**

Ground-glass opacities with or without pulmonary nodules are nonspecific with many underlying causes. This combined with her equally nonspecific thoracic CT scan does not lead us closer to a diagnosis.

Which of the following ***should be done next***?

1. Reinstitute her triple drug therapy for MAC with follow-up in a month
2. Repeat bronchoscopy with BAL
3. VATS lung biopsy
4. 1 and 3
5. All of the above

**Correct!**
**3. VATS lung biopsy**

Reinstituting her therapy seems unlikely to be helpful when 6 months of therapy was not. It also seems there is little to be gained from a repeat bronchoscopy. Therefore, a VATS lung biopsy was performed (Figure 3).

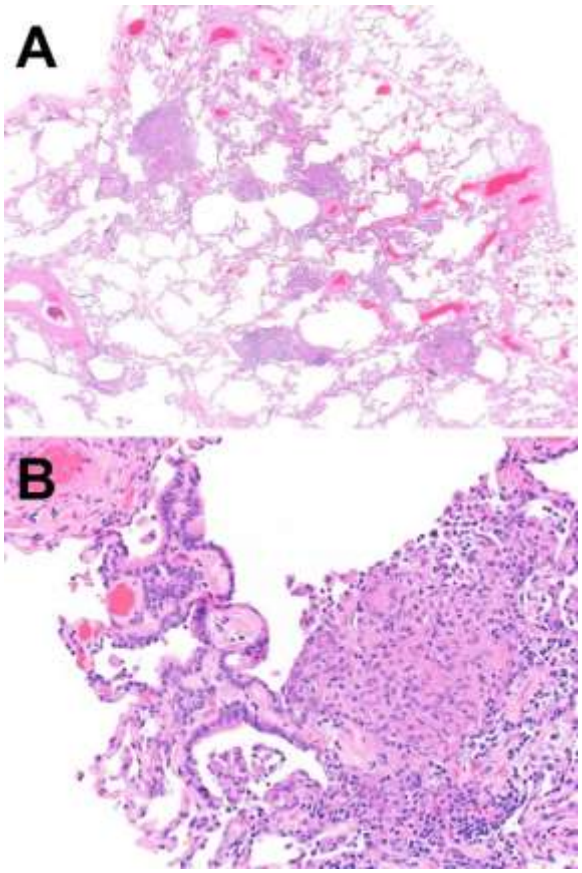


Figure 3. Representative photomicrographs of the patient's VATS lung biopsy. A: At low magnification (H & E, 20X), scattered nodular granulomas (1-2 mm) are present in the peribronchial spaces. B: At higher magnification (H & E, 200X) a relatively well-formed nut non-necrotizing granuloma (right side) is present in the airspace adjacent to a small bronchiole (left of center). (Click here to open Figure 3 in a new window)

What is the ***most likely diagnosis***?

1. Coccidioidomycosis
2. Granulomatosis with polyangiitis
3. Hypersensitivity pneumonitis secondary to MAC
4. Miliary tuberculosis
5. Sarcoidosis

**Correct!**
**3. Hypersensitivity pneumonitis secondary to MAC**

The patient's history of frequent hot tub usage for back pain, growth of MAC from her BAL, small nodules and ground-glass opacities on her thoracic CT scan, and granulomas on her lung biopsy are all compatible with hypersensitivity pneumonitis secondary to MAC or "hot tub lung" (1). All the others are associated with granulomas on lung biopsy but none are compatible with the present clinical situation.

What should be ***done next to treat her hypersensitivity pneumonitis***?

1. Ask the patient to cease her hot tub use
2. Omalizumab
3. Corticosteroids
4. 1 and 3
5. All of the above

**Correct!**
**4. 1 and 3**

"Hot tub lung" was first described in 1997 in 5 healthy subjects who developed bronchitis, fever and flu-like symptoms with radiologic features of hypersensitivity pneumonitis after using hot tubs (1). Cultures of sputum, BAL and lung biopsy specimens obtained in several patients were positive for MAC, but all patients improved with cessation of hot tub use. Subsequent reports indicate hot tub lung may present either with features of acute, subacute or chronic hypersensitivity pneumonitis (2). Although lung cultures are often positive for MAC, this is not thought to represent an infection, but rather a hypersensitivity reaction in the lung to the organism. Typical radiologic features include areas of ground-glass attenuation, centrilobular nodules and air trapping on expiratory images (3).

In mild cases of hot tub lung, cessation of hot tub use may be adequate (1,2). If there are more severe symptoms, treatment is similar to that of subacute hypersensitivity pneumonitis with corticosteroid therapy. Although some patients with hot tub lung have also been treated with drug therapy for MAC, it is not thought that his is generally necessary unless there are other indications of infection. Omalizumab is a monoclonal antibody used for treatment of asthma with high IgE levels.

In our patient the culture of lung biopsy was positive for MAC. The patient was told she should no longer use her hot tub which she had been doing more regularly due to increased back pain. Corticosteroid therapy, initially at 40 mg daily then gradually tapered. She noted improvement in symptoms with reduced cough and less shortness of breath. Subsequent lung function studies improved with FVC increasing to 68% pred)and Dlco increasing to 70% pred and she was no longer required supplemental oxygen

***References***


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