A Young Woman Presenting with Acute Onset of Chest Pain

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Patient
36-year-old Caucasian woman.

Chief Complaint
Acute onset of right-sided chest pain.

History of Present Illness
The patient presented to the emergency department early in the morning after having acute onset of pain in the right side of her chest beginning several hours earlier while rolling in bed. The pain was sharp, non-radiating, and worse when breathing. The patient reported no recent injury, but reported 1 week of insomnia of unknown cause; she denied fever, chills, diaphoresis, dizziness, nausea, or vomiting.

Past Medical/Surgical History
The patient reported no chronic internal illnesses (such as hypertension or diabetes) and was taking no regular medications. She did report having had surgical repair of a left clavicle fracture and bilateral minor foot surgery, both many years previously. Upon further discussion with a pulmonary medicine specialist, the patient also noted a history of chronic dental and gum disease, including a dental abscess within the past month.

Family/Social History
The patient was married, had no recent travel history, denied unusual exposure to livestock, birds, or bats, and had no known exposure to tuberculosis. She reported smoking 1.5 packs of cigarettes per day for 23 years, listed herself as a “social drinker” of alcoholic beverages, and reported drinking 3 cups of caffeinated beverages each morning. Additional family history was unremarkable.

Physical Examination
The patient was alert and cooperative, but looked short of breath and was holding her left shoulder. Vital signs: temperature, 97.2°F; pulse, 90 per minute; respiratory rate, 16 per minute; blood pressure, 115/82 mmHg. Her room air oxygen saturation was 100%. Poor dentition and inflamed gums were noted. Breath sounds were decreased bilaterally, but the lungs were otherwise clear to auscultation and percussion. Heart rate was regular with no murmurs. No extremity swelling was present.

Principal Laboratory Findings

Results of Other Initial Diagnostic Tests
Electrocardiogram (ECG) showed no significant abnormalities, venous ultrasound study of both legs showed no evidence of thrombosis, and a chest radiograph showed a possible right lung infiltrate. Computerized tomography (CT) scan of the chest showed no evidence of pulmonary embolus, but did show a mass (3.2 cm in greatest dimension) with an
Questions:
1. Based upon the patient’s clinical presentation, were the laboratory tests and other diagnostic studies ordered on this patient appropriate? Why or why not?
2. What condition(s) does(do) the patient’s clinical presentation, medical history, laboratory, and diagnostic test results suggest?
3. What procedure would be appropriate for evaluation of this patient’s lung mass?
4. What additional follow-up or work-up might be prudent for this patient?
5. What is this patient’s most likely diagnosis?
6. What is the most appropriate treatment for this patient?

Possible Answers:
1. Yes. The patient is a young woman with relatively sudden onset of right-sided chest pain with a “pleuritic” character (ie, the pain worsens with breathing). Patients presenting with acute chest pain pose a common and often difficult diagnostic challenge, with numerous possible etiologies including cardiovascular, pulmonary, and gastrointestinal diseases. Those conditions which could pose immediate and serious danger to the well-being of the patient need to be investigated quickly, such as the possibility of myocardial infarction (MI) or pulmonary embolism. Ordering cardiac enzymes and an ECG reflect appropriate concern for myocardial infarction. Likewise, concern for pulmonary embolism prompted the D-dimer assay, the venous ultrasound of the legs (to look for blood clots which could send emboli to the lungs), and a CT scan of the chest (to look for evidence of emboli in the lungs).

Finally, the complete blood count, ESR, chest radiograph, and chest CT scan seem appropriate to investigate the possibility of pulmonary disease, including infectious conditions.

2. The clinical presentation suggests a number of possibilities, as discussed above. The negative myocardial enzymes and normal ECG effectively exclude myocardial infarction and related entities. Likewise, the negative D-dimer assay, negative venous ultrasound of the legs, and lack of CT evidence of pulmonary embolus virtually eliminate the possibility of pulmonary embolism. The elevated leukocyte count with “left shift” and elevated ESR suggest an inflammatory or infectious etiology. The chest CT documented a mass with a liquid center in the right lung, possibly representing a lung abscess or a necrotic neoplasm. Lung abscesses can be caused by a number of bacteria, mycobacteria, fungi, or parasites, and may co-exist with partially necrotic neoplasms or areas of infarction. Symptoms and physical findings of lung abscess often overlap with pneumonia, and most diagnoses are made radiographically. A very important part of this patient’s clinical history is that of periodontal disease and recent periodontal abscess. Aspiration of organisms in patients with periodontal disease is a well-established cause of pneumonia and lung abscesses in such patients and is likely to have occurred in our patient.

3. Fine needle aspiration (FNA) biopsy. Fine needle aspiration biopsy is a relatively quick and non-invasive technique to both investigate the composition of a lung mass (inflammatory, neoplastic, or both) and to obtain material for microbiological culture studies. Standard sputum collections for cultures are often contaminated by oral flora and the composition of the normal and diseased oral flora is very complex, with organisms such as Streptococcus, Peptostreptococcus, Veillonella, Lactobacillus, Corynebacterium, and Actinomyces comprising more than 80% of the normal flora. Many of the same organisms which can contaminate sputum specimens are possible pathogens if aspirated into the lungs. Evaluation of a lung mass by FNA biopsy avoids the possibility of oral contamination and is therefore preferable to sputum cultures in determining whether a specific microbiological organism is the cause of a lung abscess. Computed tomography-guided FNA biopsy of our patient’s right lung mass was performed on hospital day #2. Cytologic findings included numerous neutrophils and histiocytes, consistent with an inflammatory process, such as a lung abscess. No definitive evidence of malignancy was found. Groups of filamentous bacteria morphologically suspicious for Actinomyces were noted on the cytology slides. Material was obtained during the FNA biopsy for aerobic, anaerobic, fungal, and mycobacterial cultures. Pure (4+) growth of viridans group Streptococcus was the only organism recovered. The viridans group of Streptococci includes many of the species found in the oral cavity, such as Streptococcus mutans, Streptococcus sanguis, Streptococcus mitis, and Streptococcus salivarius. Lung abscesses associated with viridans Streptococci are rare. There are reports, however, of viridans Streptococci as the only isolated pathogen in lower respiratory...
tract infections, although they often occur together with other organisms such as anaerobes. Interestingly, the cytology slides prepared from our patient's lung mass demonstrated the presence of filamentous bacteria resembling *Actinomyces*; however, *Actinomyces* was not isolated by culture.

4. Serial chest radiographs (conventional and/or CT) and serum measurement of biochemical markers of lung cancer. In 10% to 15% of cases of lung abscess there is underlying carcinoma. In this case, the FNA biopsy showed no diagnostic evidence of malignancy, but the entire mass can never be completely sampled by this technique. Serial chest radiographs during the course of antibiotic treatment are helpful in following the size of the abscess and in documenting healing. Even after completion of an appropriate antibiotic course, however, there may be a residual sterile cavity or fibrosis. If the radiographic appearance of the lung abscess does not improve, additional testing (eg, serum M2-PK measurement) to exclude malignancy may be necessary. Type M2 pyruvate kinase (M2-PK) is a serum marker of lung cancer. Moreover, if the abscess improves but there is a residual radiographic abnormality (eg, scarring), future chest radiographs must be interpreted with the patient's history in mind.

5. **Most likely diagnosis:** lung abscess due to viridans group streptococcal infection secondary to chronic periodontal disease.

6. Penicillin and other β-lactam antibiotics are the preferred treatment for viridans streptococcal infections. Resistant strains are common and are usually found in immunocompromised and hospitalized patients. Community-acquired infections are generally susceptible to penicillin. Although our patient may have been co-infected with *Actinomyces*, penicillin is effective against this organism as well. Finally, in patients with possible co-infection with β-lactamase-producing organisms (eg, anaerobes), treatment with a combination of a β-lactam antibiotic plus a β-lactamase inhibitor (eg, amoxicillin/clavulanate) can be used. At least 6 months of oral antibiotic therapy are often necessary to successfully treat patients with viridans streptococcal infection.

**Patient's Treatment and Course**
The patient was begun on oral Augmentin (amoxicillin/clavulanate) therapy and was discharged on hospital day 3 feeling improved with significant decrease of her chest pain.

**Keywords:** chest pain; fine needle aspiration; viridans group Streptococci; Actinomyces

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