

CLINICAL VIGNETTE

Empyema - An Old Disease Not to Be Forgotten

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Case Report

A 79-year-old man with Type 2 Diabetes Mellitus, Hypertension and Coronary Artery Disease with previous Coronary Artery Bypass Graft was referred by his Endocrinologist to Primary Care for establishment of care and evaluation of 20lbs. weight loss in the past 5 months. He had a daily cough with some yellowish sputum for months along with some right-sided chest discomfort. He denied any fevers, chills or shortness of breath. In addition he had no difficulty swallowing, couldn't recall any choking episodes and rarely used alcohol. His cancer screening was up to date and his diet was adequate and varied. On physical exam his vital signs were: Temperature 98.4 F, Pulse 81/min, Blood Pressure 125/75 mmHg, Respiratory Rate 14 and Oxygen Saturation 92%. He was a well appearing male in no acute distress, Eye/Ears/Nose/Throat without lesion, swelling or erythema, Neck/Axilla without adenopathy, Lungs were remarkable for decreased breath sounds at right base without wheezing or rhonchi, Abdomen-soft, non-tender without mass, Extremities without edema and well perfused, Skin without rash.

Chest x-ray showed significantly thickened pleural density from the right base to the apex. He was referred to Pulmonology where he underwent ultrasound guided right thoracentesis with removal of 850 cc of purulent fluid. The fluid chemistries showed glucose of 4 mg/dL, LDH of 21,375 units/L, pH of 7.5, protein of 7 gm/dL. The cell count was 198,500 RBC, 374,500 WBC with 90% Neutrophils. Gram Stain showed 2+ GPC which grew Strep viridans. Chest CT showed a large right complex pleural effusion with pleural thickening. It was recommended that patient be admitted for surgical evaluation for Video Assisted Thoracoscopy Surgery (VATS) but he refused due to having to care for his wife with dementia. He was initially started on oral clindamycin as an outpatient but then agreed to an outpatient pigtail catheter placement by Interventional Radiology with another 500 cc of

purulent material removed without re-expansion of the right lung. He finally agreed to surgical drainage two weeks later. At thoracoscopy he was found to have dense thickened pleura with purulent debris and underwent decortication. This time the fluid grew *Pseudomonas aeruginosa* (sensitive to ciprofloxacin and ceftazidime) and MRSA. Pathology showed extensive pleural fibrous thickening. Despite this procedure his right lung did not completely re-expand. He was transitioned to a Heimlich valve drainage bag for his chest tube with IV antibiotics and outpatient follow-up.

After 3 months of chest tube drainage, the right pleural cavity still did not fill. After much discussion, he underwent an Open Window Thoracostomy (Eloesser flap) procedure, which consisted of resecting portions of the overlying ribs, opening the pleural cavity for drainage and suturing the overlying skin flap to the base of the empyema cavity and underlying lung. Surgical pathology showed chronic inflammation and osteomyelitis of the bone. In addition cultures again grew *Pseudomonas*. He was continued on IV antibiotics and twice a day wound packing. After several weeks he was able to be transferred to a sub-acute facility for continued wound care while the wound granulated.

Introduction

Pleural infection is one of the oldest diseases and rapid recognition of empyema is crucial for successful treatment. Observational studies have shown that any delay in initiating effective drainage can result in prolonged hospitalization, more invasive procedures and increased morbidity and mortality. Recent reports suggest that the incidence of empyema is increasing and national empyema hospitalization rates doubled from 1996 to 2008. The overall in-hospital case fatality rates remained unchanged over the same time period at about 6-8%¹.

Pathophysiology

During pneumonia, lung parenchymal infection stimulates local pleura immune activation. These mediators induce changes in the permeability of the pleural membrane and fluid can accumulate. Initially an uncomplicated pleural effusion occurs which is exudative and resolves with antibiotic treatment. If the inflammatory process progresses, a complicated effusion develops as evidenced by increasing neutrophils and decreased glucose without pus or bacteria on Gram stain or culture. The effusion can further progress with bacteria invading the pleural space. As this occurs an empyema forms which is characterized by bacteria seen on Gram stain, culture or frank pus. This causes further inflammation which can progress through stages of empyema. Initially the fluid is free flowing, but development of a fibropurulent deposition over the pleural surface causes loculations which can finally progress to the organizing phase with formal granulation tissue compressing the underlying lung^{2,3}.

Microbiology

Streptococcus milleri (part of the viridans streptococcus group) is the most common isolate in adults with community-acquired empyema, ranging from 30-50% of cases. Other common causes are anaerobes, *Streptococcus pneumoniae*, *Staph aureus*/MRSA, and Gram negative rods. Finding an aerobic organism does not exclude an uncultured anaerobe. In one study, 23% of empyemas were mixed infections^{1,3}.

Presentation

The clinical presentation of an adult with empyema depends upon the timing of presentation and the specific organisms involved. Common features include cough, fever, pleuritic pain, shortness of breath and sputum production. Less virulent bacteria can present later and many complicate indolent anaerobic pneumonias that follow aspiration⁴. Infection with anaerobes tends to have a more insidious course with more generalized symptoms such as poor appetite and weight loss as in this patient¹. He had an extremely indolent course initially without any fevers or respiratory symptoms and only sought medical attention because of weight loss.

Treatment

Management includes sterilization of the empyema cavity with systemic antibiotics, complete drainage of the space and obliteration of the empyema cavity by adequate lung expansion. Antibiotic treatment is aimed at the known organism or the likely cause of the underlying pneumonia. In addition coverage should include anaerobic organisms which may not have been cultured¹. For drainage the options include tube thoracostomy, VATS, open decortication and open thoracotomy. There are few randomized trials regarding the management of pleural infections. Current management is based on local experience⁵. Drainage is most commonly done by intercostal catheter. Imaging by CT scan or Ultrasound allows optimal placement of catheters in the largest collection of fluid. Up until recently it was felt that large bore catheters were better for drainage, but several studies have shown that smaller bore catheters were at least as effective¹. If the initial Ultrasound does not show multiple loculations, small bore chest tubes have an 80% success rate compared to only 50% with loculations. If the drainage is inadequate it may be due to several factors: improper catheter placement, multiple loculations or fibrous coating of visceral pleura preventing lung re-expansion³.

Intrapleural administration of fibrinolytics has been used in an attempt to lyse fibrous adhesions and facilitate drainage with mixed results. The largest randomized study looking at fibrinolytic therapy showed no benefit, but several smaller trials using both DNase and tPA had a reduced frequency of surgical referrals^{2,3}.

Patients who fail to improve with chest tube drainage are then considered for surgical debridement. There is some controversy regarding primary surgical therapy for empyemas, but most centers follow a sequence of more invasive procedures to treat unresolving empyemas^{1-3,5,6}.

The next procedure is usually a VATS with debridement and frequently decortication to remove the visceral pleural fibrosis. In up to 20% of patients, VATS is inadequate and conversion to open thoracotomy is necessary. In the most extreme cases, as in this patient, there is failure of lung re-expansion and an Open Window Thoracostomy is required. This involves creating an opening in the thoracic cavity to allow for adequate drainage and lung re-expansion but can leave the patient with a chest wall

defect. Fortunately this is not very commonly needed. In a 26 year review from Emory University there were only 78 cases performed, evenly distributed over the years.[2,5,6

Discussion

Empyema is one of the oldest diseases with a significant morbidity and mortality. Since it can be quite indolent, evaluation should be considered in any patient with nonspecific symptoms, especially elderly patients who may not mount a typical immune response. It appears the earlier the diagnosis and treatment, the better the outcome. In this case physical findings on simple pulmonary auscultation led to a chest x-ray which made the diagnosis. The patient suffered from a delay in diagnosis which was compounded by his refusal to undergo the recommended treatments and required the most extreme of available procedures to cure him.

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