Open Journal of
Clinical & Medical
Case Reports

Volume 4 (2018)
Issue 5

ISSN 2379-1039

Escherichia coli and anaerobic pyopneumopericarditis: A case report and review of literature

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Abstract

Purulent pericarditis is an uncommon disease, carrying high mortality and morbidity with long-term sequelae, especially in those with delayed diagnosis and treatment. Although most commonly caused by hematogenous spread of *Staphylococcus aureus*, purulent pericarditis may be also result from direct spread of anaerobic and/or fungal infections. We report a case of 63 year-old male with erosive esophageal cancer and esophagopericardial fistula causing purulent pericarditis due to *Escherichia coli*, *Candida albicans* and variety of anaerobic microorganisms. This case illustrates the importance of early recognition of pericardial involvement, determining source of infection, prompt surgical and microbial therapy to prevent long-term negative sequelae of constrictive pericarditis.

Keywords

escherichia coli; anaerobes; pyopneumopericarditis; esophagopericardial fistula; stenting

Introduction

Purulent pericarditis, an infection of the pericardial space, is an uncommon disease with high mortality rate. Undiagnosed, it is almost 100% fatal, and more than 50% of the diagnosis is through autopsy [1]. The most common infectious agent causing purulent pericarditis, *Staphylococcus aureus,* is seen in up to 31% of cases [2]. Other common causative microorganisms include *Streptococcus pneumoniae*, *Salmonella*, and, in rare cases, anaerobes [3]. We report a 63 year-old male presenting with pyopneumopericardium growing *Escherichia coli*, *Candida albicans*, and anaerobes secondary to esophagopericardial fistula (EPF) from newly diagnosed esophageal adenocarcinoma. The case illustrates several uncommon pathogens causing purulent pericarditis as a complication from esophageal cancer and critical role of early recognition in order to achieve successful treatment and survival.

Case Report

A 63 year-old male presented with 3-day history of increasing shortness of breath, chest pain, and chills. In last 6 months, he had worsening dysphagia and 35 pounds weight loss. He has not seen a physician in 15 years and has no known medical conditions, but has extensive history of alcohol use and tobacco smoking. On presentation, the patient was hypotensive, tachycardic, and tachypneic, and

required treatment with supplemental oxygen. Laboratory evaluation revealed WBC 21,300/uL, hemoglobin 7.0g/dL, hematocrit 21%, bicarbonate 15 mmol/L, glucose 168 mg/dL, creatinine 7.0 mg/dL, BUN 62 mg/dL, GFR 8 ml/min, procalcitonin 5.98 ng/ml, and troponin 0.01 µg/L. The patient received blood transfusion, placed on bicarbonate drip for anuric acute renal injury, and pantoprazole sodium continuous infusion for suspected gastro-intestinal bleeding. The patient responded appropriately to the 2 units of pRBC transfusion with post-transfusion hematocrit of 29.1% and hemoglobin of 9.8g/dL.

Esophageal leak was suspected on esophagram performed for evaluation of dysphagia. CT of chest revealed a large air-containing pericardial effusion and a thickened irregularity of the distal esophagus (**Figure 1A**). A focus of linear extravasation from the anterior distal esophagus into the pericardial space was noted (**Figure 1B**). An emergent echocardiogram demonstrated normal left ventricular systolic function, large circumferential effusion with right atrial and right ventricular collapse suggestive of cardiac tamponade (**Figure 2**). Patient underwent an emergent esophagoscopy with esophageal stent placement. Long segment of locally advanced esophageal cancer from 28-42 cm was seen, confirmed on biopsy to be esophageal adenocarcinoma. Esophagoscopy was followed by subxyphoid pericardial window. Urine output commenced intra-operatively, immediately after release of cardiac tamponade. Pathology of the pericardium showed chronic pericarditis with fibrosis.

Postoperatively, the patient was managed with fluid resuscitation and broad spectrum antibiotics. The pericardial effusion culture revealed *Escherichia coli*, *Streptococcus mitis*, *Streptococcus agalactiae*, *Rothia mucilaginosa*, and *Candida albicans*. Anaerobic culture was positive for *Fusobacterium necrophorum* and *prevotella nigrescens*. Antibiotic regimen was narrowed down to Piperacillin tazobactam and fluconazole, for total of 14 days each. Acute renal injury was attributed to acute tubular necrosis from acute blood loss and septic shock. The patient was continued on bicarbonate drip with careful monitoring of renal function, which gradually improved and resolved at the time of discharge. Repeat echocardiogram showed resolution of the pericardial effusion. His diet was gradually advanced and he tolerated pureed diet. He was discharged home on additional 7 days of amoxicillin clavulanate and an outpatient follow-up with oncology for further management of his esophageal cancer.

Discussion

Purulent pericarditis is an unusual clinical entity with very high mortality. As reported in an earlier retrospective study, only 33 cases were found among almost 600,000 hospitalized patients, of whom 14 were diagnosed postmortem [4]. Pericardial inoculation may occur hematogenously or directly, from the intra-thoracic or sub-diaphragmatic infections. With increasing antibiotic use, causes for purulent pericarditis have shifted away from infectious etiologies and toward secondary etiologies such as preexisting pericardial disease, uremia, malignancy, surgery, alcohol use, and immuno-compromised states.

Staphylococcus aureus appears to be the most common pathogen in purulent pericarditis, accounting for up to 31% of reported cases [2]. Gram-negatives pathogens and anaerobes are noted rarely and mostly originate from the gastrointestinal source through the direct spread with fistula formation, rather than through hematogenous route. *Escherichia coli,* as a source of purulent pericarditis, is very uncommon [5] and was described in a single case report of a woman with hepatic metastasis and

postoperative sub-diaphragmatic abscess causing purulent pericarditis due to *Enterococcus faecalis* and *Escherichia coli* [6]. Our patient with pyopneumo pericardium has multiple, uncommon for pericarditis infectious pathogens including *Escherichia coli*, *Rothia mucilaginosa*, *Candida albicans*, and anaerobes *Fusobacterium necrophorum* and *Prevotella nigrescens*. Anaerobic purulent pericarditis is extremely unusual [3], however, in the setting of esophageal malignancy with erosion into pericardium, these microorganisms are expected from the gastrointestinal source. Purulent pericarditis due to *Bacteroides fragilis* has been reported in association with the intra-abdominal source, anaerobic *Fusobacterium necrophorum* in retropharyngeal abscess, *Prevotella melaninogenica* in teratoma, and *Propionibacterium acnes* and *Clostridium septicum* in colonic adenocarcinoma [3].

In the presented case, in addition to the purulent pericardial effusion, there was air in the pericardial cavity, the pyopneumo pericardium, due to esophageo-pericardial fistula (EPF). EPF complicated with pyopneumo pericardium may occur secondary to perforated benign esophageal ulcer, chemo and radiation therapy for esophageal cancer [7], after achalasia repair [8] and following the radio-frequency catheter ablation of atrial fibrillation [9]. Non-infectious causes of pneumo pericardium include positive pressure ventilation, post operative, and penetrating trauma. Detected by radiography or ultrasound, air in the pericardial cavity is always abnormal and should prompt evaluation for EPF.

Treatment of infectious pericarditis includes obligatory surgical pericardial drainage, systemic antimicrobial treatment, and controlling the source of the infection. Subxiphoid pericardiotomy is preferred over pericardiocentesis due to complete drainage and direct access to pericardial structures for evaluation and potential lysis of adhesions. Pericardiectomy, although carries a higher mortality and morbidity, is performed in patients with extensive adhesions, thick and purulent drainage, recurrent tamponade, persistent infection, and development of constrictive pericarditis. Intravenous antimicrobial therapy serves as the foundation of medical treatment, and should be started promptly, especially in immuno suppressed patients. Broad-spectrum antibiotics including coverage for anaerobic microorganisms and fungal infections should be instituted. Once the microorganisms and antimicrobial sensitivity are available, the coverage can be accordingly narrowed. In addition to the antibiotic therapy, controlling the source of the infection requires EPF closure, which is performed surgically, unless the patient's critical condition precludes a definite repair. As described in our case report, a less invasive approach of EPF stenting may be utilized. With pericardial drainage, antibiotic treatment, and esophageal stenting, our patient had gradual resolution of sepsis with reduction in leukocytosis and improved multi-organ failure as reflected by normalized renal function and improved liver function tests.

In conclusion, purulent pericarditis may occur due to uncommon pathogens including *Escherichia coli*, *Candida albicans* and multiple anaerobes. Despite development of new diagnostic and treatment modalities, purulent pericarditis still carries mortality rate between 40-75% even with adequate treatment [10]. In the setting of unusual pathogens, it is critical to consider gastrointestinal tract source of infection and possible EPF. For this reason, prompt diagnosis with echocardiogram and CT scan, recognition of need for surgical drainage, as well as antimicrobial therapy are necessary in managing the condition. In unstable patients, EPF can be treated with stent placement instead of more definitive surgical closure.

Figures

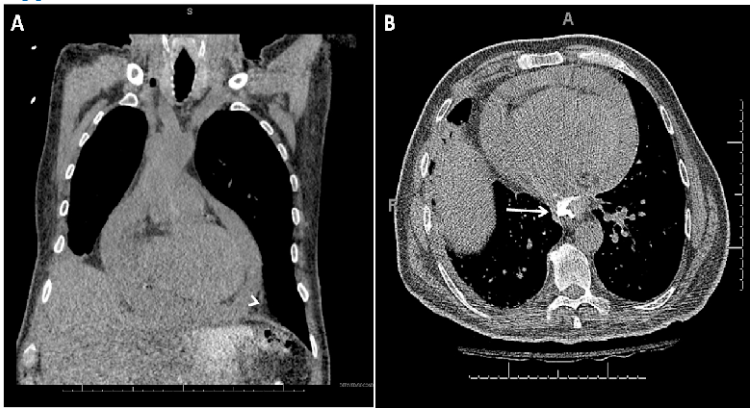

Figure 1: CT of chest showed large pericardial effusion containing air shown by the arrow (A) with thickened irregularity of the distal esophagus and a focus of linear extravasation (white arrow) from anterior distal esophagus into the pericardial space (B).

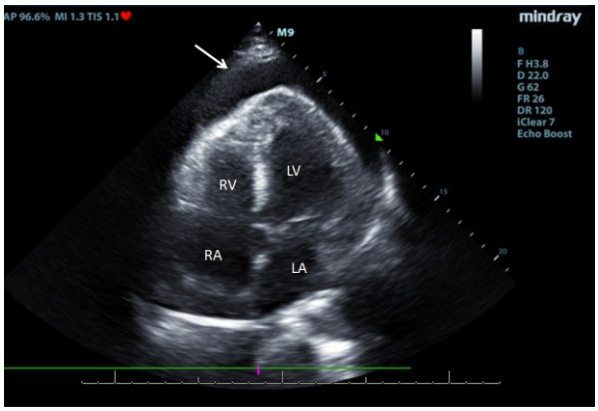

Figure 2: Emergent echocardiogram showing a moderate to large circumferential effusion (arrow) with right atrium and right ventricle collapse consistent with cardiac tamponade. Overall left ventricular ejection fraction was greater than 55%. RA = right atrium, LA = left atrium, RV = right ventricle, and LV = left ventricle.

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Manuscript Information: Received: October 27, 2017; Accepted: March 07, 2018; Published: March 15, 2018

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Citation: Wang SC, Torosoff MT, Lyubarova R. Escherichia coli and anaerobic pyopneumopericarditis: A case report and review of literature. Open J Clin Med Case Rep. 2018; 1386.

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