May 2nd, 12:00 AM

Clostridium Perfringens Sepsis from a Hepatic Abscess with Hemolysis and Renal Failure, Requiring Hemodialysis

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Clostridium Perfringens Sepsis from a Hepatic Abscess with Hemolysis and Renal Failure, Requiring Hemodialysis

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Abstract:

The prognosis of sepsis caused by Clostridium perfringens is extremely poor, with a mortality rate of 70%-100%. Management includes antibiotic regimens specific to toxin production as well as source control via surgical or interventional mechanisms. We report a case of a 64-year-old male who presented with right upper quadrant (RUQ) abdominal pain and was diagnosed with Clostridium perfringens bacteremia with associated acalculous cholecystitis, hepatic abscess, and acute renal failure requiring hemodialysis. It is felt that early hemodialysis was an associated factor in the patient's survival.

Case Presentation:

A 64-year-old with past medical history of deep vein thrombosis, Factor V Leiden on rivaroxaban, hypertension, hyperlipidemia, and gastro-esophageal reflux disease presented to the emergency department (ED) with a complaint of right upper quadrant abdominal pain. His temperature at home was noted to have been 102.0 degrees Fahrenheit. He also reported cough and right sided chest pain. He reported an episode of acute right upper quadrant pain approximately one month prior, with a negative workup including a computerized tomography with angiography (CTA) of the chest and computerized tomography (CT) of the abdomen and pelvis. Approximately nine days prior to the current presentation, he had also undergone total right knee arthroplasty. His right upper quadrant pain was described as 10/10, sharp in nature, and was associated with one episode of non-bilious, non-bloody diarrhea. The patient's vital signs were as follows: heart rate 99 beats per minute, respiratory rate 18 breaths per minute, blood pressure 143/76 mmHg and a temperature 102.0 degrees F, with a pain score of 10 out of 10. The physical exam showed right upper quadrant tenderness, with no rigidity, guarding or rebound. The patient's white blood cell count was elevated at 49,000 cells cc/mm., hemoglobin 7.3 g/dL, creatinine slightly above baseline at 1.7 mg/dL The fibrinogen level was elevated at 691 mg/dL (reference range 200-393), transferrin was low at 133 mg/dL (reference range 200-400 mg/dL), and his ferritin was elevated at 31,744 ng/mL (reference range 24-336 ng/mL). Troponins were elevated at 156.0 ng/L (reference range <18.0). Aspartate aminotransferase (AST) was elevated at 3,904 (ref range 0-37 IU/L). Alanine transaminase was elevated at (ALT) 1,933 IU/L (reference range 0-40 IU/L) Alkaline phosphatase was elevated at 183 IU/L (reference range 39-117 IU/L). Direct bilirubin was elevated at 13.9 mg/dL (reference range 0.0-0.3 mg/dL). Total bilirubin was elevated at 19.4 mg/dL (reference range 0.0-1.0 mg/dL). A computerized tomography (CT) scan of the abdomen and pelvis showed pericholecystic infiltration suspicious for cholecystitis. No gallstones were identified. Wall thickening of the hepatic flexure of the colon as it passed immediately adjacent to the gall bladder was noted, which was felt to reflect secondary inflammatory involvement. The was a collection of mottled gas in the superomedial hepatic dome measuring 4.0x5.0x5.8 cm which was new since prior study with likely interval liver abscess with gas forming organism. [Figure 1,2] The received intravenous fluids. Antibiotics were initiated including metronidazole, piperacillin/tazobactam, and vancomycin. Pain medications were given. The patient was admitted from the ED to the intensive care unit. In the ICU, the patient required vasopressor support with norepinephrine. Blood cultures were positive for Clostridium perfringens. He was evaluated by surgery for the liver abscess and acalculous cholecystitis and underwent interventional radiology guided cholecystostomy tube placement. MRCP was obtained that showed no biliary dilatation or choledocholithiasis, decompressed gallbladder status post percutaneous cholecystostomy tube placement and an ill-defined focus of fluid and gas in the right hepatic lobed with slight improvement from previous imaging post drainage and percutaneous drain placement by interventional radiology. His hospital stay was also significant for acute kidney injury secondary to acute tubular necrosis requiring hemodialysis on hospital day 15. Nephrology was involved stated they believed there was a mixed component including but not limited to nephrotoxins from antibiotic therapies such as vancomycin and piperacillin/tazobactam, multiple episodes of hypotension, contrast induced injury, as well as bilirubin toxicity from large volume hemolysis. Broad spectrum antibiotics under infectious disease consultation included cefdinir 300 mg every 48 hours, metronidazole 500 mg three times per day and clindamycin 600 mg three times per day. His hospital course was also remarkable for respiratory insufficiency requiring BIPAP and he was initially weaned to 5L nasal cannula. He was discharged to subacute rehab after twenty-two days of admission to the hospital.

Discussion:

Pathophysiology of Clostridium perfringens:

Clostridium perfringens is a Gram-positive anaerobic bacterium capable of producing multiple different types of toxins. It is a normal inhabitant of the human bowel and genital tract [1]. The prognosis of sepsis caused by Clostridium perfringens is extremely poor, with a mortality rate of 70%-100% [2]. C. perfringens is classified as A, B, C, D, and E based on the toxins produced [2,3]. Type A corresponds to the alpha toxin producing type, responsible for gas gangrene, gastrointestinal infections, as well as hemolysis. This type is responsible for the most severe, massive, and often fatal intravascular hemolysis that takes place in approximately 7-15% of C. perfringens bacteremia cases [1,4]. The alpha toxin contains high activity of phospholipase C and subsequent lysis of erythrocytes [5]. The approximate doubling time of C. perfringens is seven minutes, which is a large contributor to patient deterioration and importance of early recognition and consideration of this diagnosis [6]. Patients with underlying immunocompromised are more vulnerable to C. perfringens infections [7].

Presentation of Clostridium perfringens:

The presentation of bacteremia due to C. perfringens is widely variable. General features include fevers, chills, and malaise. In later presentations patient's may present with tachypnea or even jaundice.

Laboratory studies:

Leukocytosis may be present in C. perfringens, as was seen in this case. A positive blood culture provides a definitive diagnosis [4] Electrolyte abnormalities due to vomiting or diarrhea may be seen on a basic metabolic panel. Liver function tests may give potential clues for underlying liver involvement. Hemolysis, with associated laboratory findings, can occur in 5 to 15% of cases of Clostridium sepsis [4].

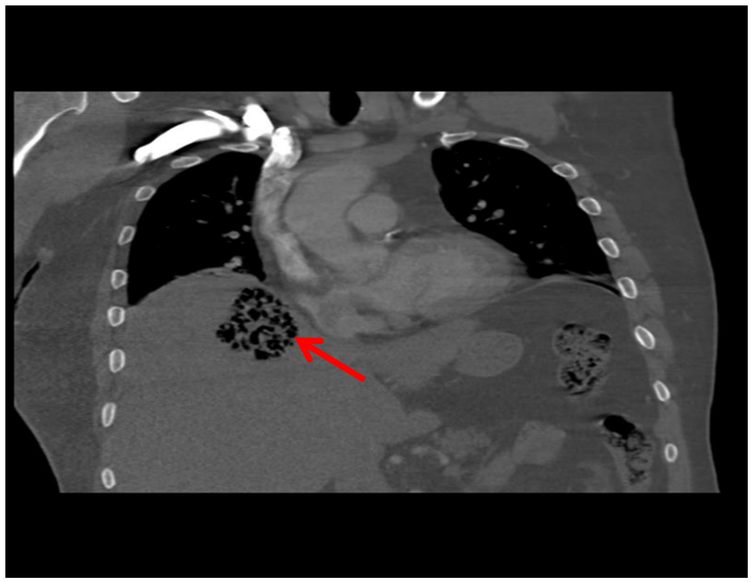

Figure 1: Coronal view of abdominal computerized tomography in scan demonstrating liver abscess (red arrow)

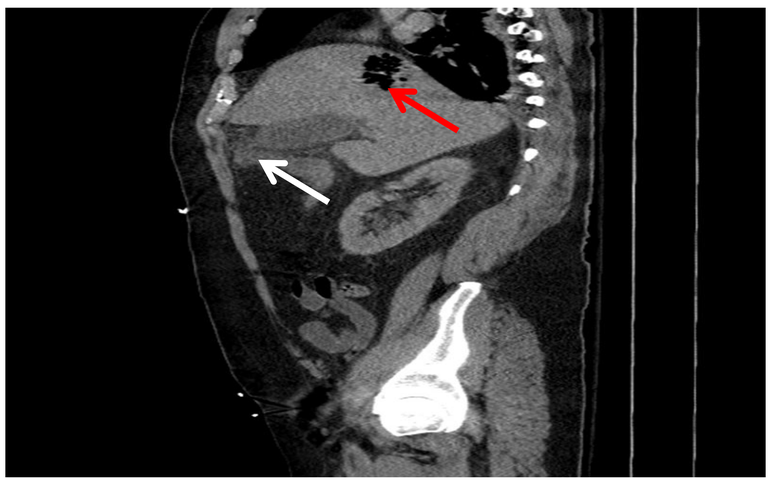

Figure 2: Sagittal view of abdominal computerized tomography in scan demonstrating both liver abscess (red arrow) and acalculous cholecystitis (white arrow)).

Conflict of Interest: There was no funding related to this case report. The authors declare that they have no conflicts of interest.

Discussion:

Imaging:

With underlying fevers and largely elevated white blood cell count and elevated liver enzymes with no apparent source of infection, the appropriate initial choice of imaging is a CT scan of the abdomen and pelvis with intravenous contrast. Ultrasound of the right upper quadrant may needed. Our case was unique in that there was an underlying hepatic abscess as well as acalculous cholecystitis leading to the use of an MRCP.

Management:

C. perfringens should be a suspected source of bacteremia in patients with associated hepatic abscess, gallbladder pathology, recent hepatobiliary procedure, or any suspected gas forming organism found on imaging. Early antibiotic treatment that is focused on neutralizing potential C. perfringens is important. The antibiotic sensitivity of the Clostridium species as a whole is generally susceptible to penicillin G, clindamycin, metronidazole, cefoxitin, and piperacillin/tazobactam[4]. Antibiotic coverage with clindamycin or metronidazole which have anti-toxin activity is indicated when there is suspicion for clostridium perfringens. Rapid removal of identifiable sources of infection is also important, whether it be removal of the gallbladder or through percutaneous hepatic abscess drainage. Large volume hemolysis was also observed and was likely a contributor to renal failure which necessitated intervention with hemodialysis. It is felt that early hemodialysis was an associated factor in the patient's survival.

Surgical treatment:

If the patient is stable and there is an identifiable source such as a gallbladder, prompt removal is highly recommended [4]. Surgical drainage is also an option.

Conclusions:

The patient presented with right upper quadrant abdominal pain and tenderness that was demonstrated on CT scan to be due to a hepatic abscess with associated acalculous cholecystitis and underlying bacteremia which was eventually found to be due to Clostridium perfringens. C. perfringens infections demonstrating hemolysis are rare yet extremely fatal. Early treatment with antibiotics focused on toxin reduction as well as early surgical intervention to remove potential sources improves outcomes. It is felt that early hemodialysis was an associated factor in the patient's survival.

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