Case Report

Extra-corporeal Membrane Oxygenation in a Patient with Fusobacterium Sepsis: A Case Report and Review of Literature

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An adolescent female was admitted to the pediatric intensive care unit in septic shock. She developed multisystem organ dysfunction including pancreatitis with myocardial dysfunction and hemodynamic instability unresponsive to medical management necessitating veno-arterial extracorporeal support. *Streptococcus Constellata* and *Fusobacterium necrophorum* were isolated from blood cultures. This is the first report of extra-corporeal cardiac support in fusobacterium sepsis.

Key words: fusobacterium, lemerie’s syndrome, ECMO, pancreatitis

Case Report

A fifteen-year-old previously healthy adolescent presented with syncope associated with high fever following two days of sore throat. There was no significant past medical, family or social history. On presentation, she was obtunded with heart rate (HR) 152 beats/min, respiratory rate (RR) 12 breaths/min, blood pressure (BP) 76/54 mmHg, Temp >107 degrees Fahrenheit and SpO2 100% on 100% oxygen via a non re-breather face mask. She was intubated, fluid resuscitated (4 L of normal saline), initiated on dopamine at 10mcg/kg/min and transferred to the pediatric intensive care unit.

The physical examination revealed an intubated, sedated teenager with sinus tachycardia (HR 126 beats/min), BP 100/50 mmHg, delayed capillary refill with feeble pulses and cool extremities. Enlarged tonsils and pharyngeal erythema were noted. An improvement in tissue perfusion and blood pressure was obtained after the addition of milrinone at 0.5 mg/kg/min and epinephrine at 0.2 mcg/kg/min. Admission laboratory test results were notable for an elevated white blood cell count with bandemia, metabolic acidosis, disseminated intravascular coagulopathy, pancreatitis, thrombocytopenia and a mild elevation of troponin I. Meropenem, Vancomycin and Clindamycin were administered as broad-spectrum empiric agents. Head, neck and abdominal computed tomography (CT) scans did not reveal any infectious foci or vascular thromboses. Within twelve hours, the patient became anuric with a worsening anion gap metabolic acidosis (lactate of 15) for which hemodialysis was initiated. The patient tolerated continuous veno-venous hemodiafiltration (CVVHDF) without significant hemodynamic deterioration until hospital day four when she acutely developed non sustained ventricular tachycardia associated with hypotension. An electrocardiogram (EKG) at the time revealed ST segment and T wave changes suggestive of myocardial ischemia. Troponin levels increased precipitously to 27.3. The echocardiogram revealed a moderate left ventricular dysfunction, mild pulmonary hypertension, mitral regurgitation, tricuspid regurgitation, small pericardial effusion, normal coronary anatomy and caliber with an ejection fraction estimated at 40%. Vasopressor support was changed from...
epinephrine to vasopressin, and a lidocaine infusion was initiated. The patient continued to have episodes of non sustained ventricular tachycardia with hemodynamic instability. Veno-arterial extracorporeal membrane oxygenation (ECMO) was initiated due to cardiovascular instability despite medical therapy. The patient’s 140 hour ECMO course was well tolerated without complications, and she was weaned off ECMO support by day 10 of hospital stay. Troponin levels normalized, and a repeat echocardiogram on hospital day 10 was normal. Vaso -pressor support was weaned off by hospital day 12 and the patient was successfully extubated on hospital day 14.

On the initiation of feeds on hospital day 15, the patient had persistent nausea, emesis and abdominal discomfort, secondary to pancreatitis (elevated amylase and lipase). She had gradual improvement in her pancreatic and renal dysfunction, such that the hemodialysis was discontinued on hospital day 30, which was followed by a discontinuation of parenteral nutrition on hospital day 33. At the time of discharge (hospital day 35), her pancreatic and renal function had improved significantly, and she was tolerating a renal low fat diet without emesis.

Blood cultures obtained at admission grew Streptococcus Constellata (Group C streptococcus) and Fusobacterium necrophorum. All other culture results were negative. The antibiotic regimen was tailored, based on the culture results, and the patient completed 6 weeks of parenteral antibiotic therapy. She was found to have normal pancreatic, renal, neurologic and cardiopulmonary functions at the follow up visit, 1 month after discharge.

Discussion

Although Courmont and Cade were the first to describe sepsis syndrome after an acute oropharyngeal infection,1) Lemierre in 1936 was the first to make an association between post anginal sepsis and anaerobic bacterial infections.2) Necrobacillosis refers to the disease states caused by fusobacterium species. Fusobacterium Nucleatum and Fusobacterium Necrophorum are the species most frequently isolated from clinical specimens with Fusobacterium necrophorum being more virulent and the more commonly isolated pathogen.3) Fusobacterium Necrophorum is a gram negative, strictly anaerobic, non motile rod found in the gastrointestinal, genitai, and respiratory tracts,4) and inflamed pharyngeal mucosa may predispose to fusobacterial infections.5) One-third of patients diagnosed with Lemierre’s syndrome (LS) have polymicrobial bacteremia. The concomitant bacteria are usually peptostreptococci, nonhemolytic streptococci, microaerophilic streptococci and beta hemolytic streptococci of group A, B and C.6) Our patient had group C streptococcus (Streptococcus Constellata) co-infection with fusobacterium necrophorum. We did not find any reports of co-infection with this organism. LS and fusobacterium infections typically occur in previously healthy adolescents and young adults similar to our patient. Hagelskjær et al. reported incidences of 0.8 cases per million per year for LS and 1 case per million per year for Fusobacterium sepsis in Denmark,7) whereas, Ramirez et al identified 14 cases of LS over 7 years (1996–2002) in Wisconsin, with the majority of cases occurring in the last 2 years.8)

The classic clinical profile of LS is that of pharyngitis followed by thrombophlebitis of the internal jugular vein and metastatic abscesses. The disease progresses over 7 to 15 days, and, if untreated, can be fatal. LS had a mortality rate as high as 90% in the pre antibiotic era which has dropped to <20% since the advent of antibiotic therapy.6) Metastatic abscesses mostly affect the lungs and major joints, but meningitis, a hepatic abscess or splenic abscess can occur. The majority of patients described in the literature have major pleuro-pulmonary complications needing surgical intervention, at times. Our patient had a very short prodrome progressing rapidly to sepsis and multiorgan dysfunction without any clear evidence of jugular thrombophlebitis or septic emboli. Atypically, she did not have any notable pulmonary complications from the fusobacterial sepsis. Fever with rigors is typical with fusobacterial sepsis but a core temperature as high as 107 degrees Fahrenheit has not been previously described. Our patient had a mild elevation of liver enzymes on presentation, along with significantly elevated serum lipase levels. Though mild liver enzyme elevation has been reported, we did not find any reports of pancreatitis, associated with fusobacterium sepsis.

Myocardial dysfunction with sepsis is well described.9) Echocardiography (ECHO) studies suggest that 40%–50% of patients with prolonged septic shock develop myocardial dysfunction, as defined by a reduced ejection fraction. The ECHO of our patient revealed moderate left ventricular dysfunction, mild pulmonary hypertension, mitral regurgitation, tricuspid regurgitation, small pericardial effusion, normal coronary anatomy and an ejection fraction of 40%. Serum levels of troponin I or T are sensitive markers of myocardial injury and have been found to be elevated in critically ill patients with sepsis. Reversible damage to the myo-contractile apparatus is
speculated to be the cause of the troponin leak. Gowan et al noted cardiac involvement in only three of fifty nine patients with LS. Two patients in this review had myocardial microabscesses, while one had purulent pericarditis, detected postmortem. Kuduvalli et al mentioned myocarditis and tachyarrhythmias in their report, but did not elaborate on the degree of the cardiac dysfunction. They stated that the ECHO revealed myocarditis, consistent with septic shock but no endocarditis. McLean et al described cardiac tamponade in a postpartum woman with Lemierre’s syndrome following mediastinitis and anticoagulation that led to a cardiac arrest, requiring an urgent pericardiocentesis. Our patient had evidence of a troponin leak on admission which worsened over the course of the first 3 days. However, the acute rise of troponin I on day four occurred following sudden hypotension with associated changes in the EKG, consistent with myocardial ischemia. We believe that the acute hypotensive episode may have briefly compromised myocardial blood flow leading to sudden worsening of the troponin leak. The normalization of EKG changes with a return of troponin levels to baseline following an improvement in blood pressures argues against any thrombo-embolic complications in the coronary circulation. No clinical, EKG, ECHO or laboratory evidence of cardiac dysfunction was noted in our patient at the time of discharge, which also refutes the possibility of any coronary thromboembolic event. The recovery of cardiac function without residual dysfunction is usual following effective treatment of the sepsis syndrome.

The clinical practice parameters for hemodynamic support of pediatric and neonatal patients include ECMO as an acceptable intervention in the face of deteriorating hemodynamic status despite maximal medical therapy. ECMO is thus reserved for patients with a highly predicted mortality rate, resulting from a treatable and survivable process. Use of ECMO for sepsis has been well described in neonatal, pediatric as well as in adult patients. We did not find any cases of fusobacterium sepsis supported with veno-arterial ECMO in the literature.

Fusobacterium sepsis is an endovascular disease, and parenteral therapy of 4–6 weeks is recommended, although no randomized controlled trials have been carried out. Clindamycin, metronidazole, anti-pseudomonal penicillins, or ampicillin-sulbactam are all appropriate choices, in view of the development of beta-lactamase producing strains of fusobacterium necrophorum. Untreated fusobacterium sepsis remains fatal, and early identification of appropriate antibiotic therapy can prevent morbidity and mortality.

Septic shock without jugular vein thrombosis or metastatic emboli can occur with fusobacterium necrophorum infections. A high index of suspicion in previously healthy patients presenting with sepsis is needed. Anaerobic coverage should be added early in previously healthy adolescents and young adults presenting with sepsis or symptoms consistent with fusobacterium infections. This report defines several new features of Fusobacterium sepsis including co-infection with Streptococcus Constel lata, pancreatitis and veno-arterial ECMO for cardiovascular support.

References