Non-zoonotic Pasteurella multocida Infection as a Cause of Septic Shock in a Patient with Liver Cirrhosis: A Case Report and Review of the Literature

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ABSTRACT

Pasteurella multocida is a Gram-negative organism characterized morphologically as coccobacillus. It is the commonest organism infecting pet bites. However, severe infections may occur in the absence of animal bites or scratches. Pasteurella multocida serves as an opportunistic pathogen in humans, especially in patients with depressed immune system. Few cases in the literature identify Pasteurella multocida as the causative agent of septic shock, especially in cirrhotic patients. We report a patient who presented with septic shock as a result of Pasteurella multocida bacteremia, without prior history of animal exposure.

Key words: Pasteurella multocida, Pasteurellosis, Liver cirrhosis, Bacteremia

INTRODUCTION

Pasteurellosis is a zoonosis with a world-wide distribution that occurs sporadically. Pasteurella multocida was first described by Revolee in 1877 and further characterized by Pasteur in 1880.[1] Pasteurella species usually have low virulence in humans, but serious manifestations sometimes occur and can lead to bacteremia. We present a patient who developed septic shock as a result of P. multocida bacteremia, presumptively from an intra-abdominal infection.

CASE REPORT

A 52-year-old African American female was brought to the emergency department for generalized abdominal discomfort, altered mental status, diarrhea, fevers and chills for 4-5 days. Her past medical history was significant for alcohol abuse and alcohol-related liver cirrhosis. In the emergency department, vital signs were as follows: Blood pressure of 74/42 mmHg, heart rate of 112 beats/min, respiratory rate of 20 breaths/min and temperature of 98.6 F. Remarkable findings on physical examination included jaundice as well as abdominal distention and tenderness to palpation, especially in the right upper quadrant. There was no rash or ulcers. As per family, she did not have recent travels or exposure to sick people. They denied having domestic animals at home or any contact to the patient with pets. She was placed on mechanical ventilation and admitted to the medical intensive care unit. Admission diagnosis was systemic inflammatory response syndrome with sepsis and septic shock with multi-organic dysfunction syndrome, presumptively secondary to community-acquired pneumonia, possible biliary tract infection (ascending cholangitis), probable spontaneous bacterial peritonitis (SBP) and alcoholic hepatitis. Aggressive intravenous fluids resuscitation with crystalloids along with vasopressors was initiated. Blood, urine, respiratory cultures and Legionella urine antigen were obtained. Empiric intravenous antimicrobial therapy, composed by piperacillin/tazobactam (2.25 g every 8 h) and azithromycin (500 mg every 24 h), was initiated.

Laboratory results on admission were: A complete blood cell count of 21,000/mm³ (90% neutrophils), a platelet
count of $51,000/mm^3$, a sodium level of 127 mEq/L, a potassium level of 5.3 mEq/L, a bicarbonate level of 15 mEq/L, and a creatinine level of 6.3 mg/dl. Aspartate aminotransferase and alanine aminotransferase levels were 121 and 65 IU/L, respectively. Alkaline phosphatase level was 290 IU/L, gamma-glutamyl transpeptidase level was 290 U/L and lactate dehydrogenase level was 482 U/L. Total bilirubin level was 14.5 mg/dl, with a direct bilirubin level of 10.1 mg/dl. Lactic acid level was 6.4 mg/dl. Prothrombin time was 25.2 s, with an INR of 2.29. Serum alcohol level was within the normal limits. Arterial blood gases showed a pH of 7.15, a pCO$_2$ of 23, and a pO$_2$ of 132 while the patient was receiving mechanical ventilation with FIO$_2$ of 60%. Chest X-ray showed left lung infiltrate with pleural effusion.

After 24 h of admission, patient remained in critical condition and requiring maximum doses of vasopressors, despite of what it seems to be the appropriate empiric antimicrobial therapy. Blood cultures drawn of admission grew \textit{P. multocida}. Blood culture system Bact-Alert 3D$^\text{®}$ was used for the recovery of the organism. No polymerase chain reaction analysis was performed. Isolate was tested sensitive to piperacillin/tazobactam and azithromycin. No minimal inhibitory concentrations for these antimicrobials were reported. In spite of all medical efforts, general medical condition deteriorated and patient expired on day 3 of admission.

**DISCUSSION**

\textit{P. multocida} is a small Gram-negative non-spore forming facultative anaerobe organism that is a natural inhabitant of the normal gastrointestinal flora and the upper respiratory tract of wild and domestic animals, especially cats and dogs. It is easily overgrowing by other flora in the sputum and might be regularly missed, as it resembles \textit{Haemophilus influenzae}, \textit{Francisella tularensis} and \textit{Yersinia pestis}. The five species that cause the majority of pasteurellosis are: \textit{Multocida, septica, canis, stomatis}, and \textit{dagmatic}.\cite{1,2} Human \textit{P. multocida} infections have been reported to occur with and without animal exposure, the former mostly associated with the domestic cat and dog bites or scratches. Most of the infections involve the skin and soft-tissues and they can be complicated by abscess formation, osteomyelitis or septic arthritis.\cite{3,4} The respiratory tract is the second most common site of infection with a wide spectrum of diseases that includes rhinosinusitis, tracheobronchitis, epiglottitis, pneumonia, empyema and lung abscesses. The majority of \textit{P. multocida} pneumonia cases occur in elderly patients with underlying chronic pulmonary disease. Bacteremia has been reported in up to 55% of patients with pneumonia.\cite{5,6} Invasive forms of \textit{P. multocida} infection usually occur in immunocompromised patients, such as those with advanced age, chronic renal failure, solid tumors, hematological malignancies, diabetes mellitus or liver cirrhosis.\cite{5,6,7} \textit{P. multocida} causes a wide variety of disease, including abdominal and pelvic infections, endocarditis, meningitis and endophthalmitis.\cite{8} Von Graevenitz \textit{et al.} reviewed 21 proven cases of \textit{P. multocida} bacteremia. A remarkable number of those cases involved patients with liver diseases, including liver cirrhosis of any etiology, hepatitis and infiltrating tumors.\cite{9} Impaired function of the reticuloendothelial system and the presence of portosystemic shunts in patients with liver disease seem to play a major role in the development of bacteremia.\cite{10,11} This case seems peculiar in that no direct contact with a domestic animal could be documented. Our patient had a history of alcohol-induced liver cirrhosis, which predisposed her to the development of bacteremia. However, retrospectively, it is difficult to establish the primary source of infection in this case. The findings of the abdominal examination may suggest that the primary source was the intra-abdominal cavity. Unfortunately, the medical team was not able to performed paracentesis to obtain ascitic fluid for cytology and cultures due to patient’s medical condition. No abdominal imaging was available. On the other hand, the chest radiography findings of infiltrate and pleural effusion may point the respiratory tract as the primary source of infection. We believed that, given the history of symptoms on admission and the presence of underlying liver disease, the intra-abdominal cavity was the most likely primary source of infection in this patient. Respiratory and intra-abdominal infections have been associated with inhalation of the organism. Nasopharyngeal colonization with \textit{P. multocida} with transient bacteremia and seeding of the peritoneal cavity in immunosuppressed cat owners could play an important role in the development of SBP.\cite{11,12} SBP caused by \textit{P. multocida} is rare. Tamaskar \textit{et al.} reviewed 13 patients with \textit{P. multocida} SBP. Ten of these patients were exposed to animals, nine had positive blood cultures and four patients died.\cite{13}

The treatment of choice of \textit{P. multocida} infections is penicillin. However, penicillin-resistant strains in human infections have been described. In these cases, 2$^{nd}$ and 3$^{rd}$ generation cephalosporins, macrolides, fluoroquinolones, tetracyclines, and trimethoprim-sulfamethoxazole are recommended as an alternative therapy.\cite{2,14,15}

Mortality rate ranges from 15% to 30% among bacteremic patients. Outcome is associated with severity of the infection, the extent of the underlying disease and the early initiation of appropriate therapy.\cite{16,17}
CONCLUSION

Although cases of bacteremic *P. multocida* infections has been infrequently reported in the literature, clinicians should considered this organism as an important and potentially lethal pathogen in humans, where it can cause life-threatening infections. *P. multocida* should be included in the microbiologic differential diagnosis in patients with underlying chronic liver diseases who presents with possible intra-abdominal infection, even without history of exposure to domestic animals.

REFERENCES

1. Henderson A. *Pasteurella multocida* infection in man; A review of the literature. Antonie Van Leeuwenhoek 1963;29:359-67.
2. Zurlo JJ. *Pasteurella* species. In: Mandell GL, Douglas RG, Bennet JE, editors. *Principles and Practice of Infectious Diseases*. 6th ed. New York: Churchill Livingstone; 2005. p. 2687-91.
3. Weber DJ, Wolfson JS, Swartz MN, Hooper DC. *Pasteurella multocida* infections. Report of 34 cases and review of the literature. Medicine (Baltimore) 1984;63:133-54.
4. Furie RA, Cohen RP, Hartman BJ, Roberts RB. *Pasteurella multocida* infection; report in urban setting and review of spectrum of human disease. N Y State J Med 1980;80:1597-602.
5. Klein NC, Canha BA. *Pasteurella multocida* pneumonia. Semin Respir Infect 1997;12:54-6.
6. Raffi F, Barrier J, Baron D, Drugeon HB, Nicolas F, Courtieu AL. *Pasteurella multocida* bacteremia: Report of thirteen cases over twelve years and review of the literature. Scand J Infect Dis 1987;19:385-93.
7. Nweir W, Giladi M, Moroz I, Moses AE, Benenson S, Finkelstein R, et al. A retrospective six-year national survey of *P. multocida* infections in Israel. Scand J Infect Dis 2009;41:445-9.
8. Von Graevenitz A, Sabela W. Rare bacteremias due to commonly isolated Gram-negative rods. In: Holloway W, editor. *Infectious Disease Reviews*. Vol. 5. Mount Kisco, NY: Futura Publishing Company; 1978. p. 11-24.
9. Patton F, Dumas M, Cannon NJ. *Pasteurella multocida* septicemia and peritonitis in a cirrhotic cock trainer with a pet pig. N Engl J Med 1980;303:1126-7.
10. Fernández-Esparrach G, Mascaro J, Rota R, Valerio L. Septicemia, peritonitis, and empyema due to *Pasteurella multocida* in a cirrhotic patient. Clin Infect Dis 1994;18:486.
11. Holst F, Rollof J, Larsson L, Nielsen JP. Characterization and distribution of *Pasteurella* species recovered from infected humans. J Clin Microbiol 1992;30:2084-7.
12. Koch CA, Mahee CL, Robyn JA, Koletar SL, Metz EN. Exposure to domestic cats: Risk factor for *Pasteurella multocida* peritonitis in liver cirrhosis? Am J Gastroenterol 1996;91:1447-9.
13. Tamaskar I, Ravakhah K. Spontaneous bacterial peritonitis with *Pasteurella multocida* in cirrhosis: Case report and review of literature. South Med J 2004;97:1113-5.
14. Spagnuolo PJ, Friedman RI. Penicillin sensitivity of invasive and non-invasive *Pasteurella multocida*. J Antimicrob Chemother 1979;5:324-5.
15. Naas T, Benaoudia F, Lebrun L, Nordmann P. Molecular identification of TEM-1 beta-lactamase in a *Pasteurella multocida* isolate of human origin. Eur J Clin Microbiol Infect Dis 2001;20:210-3.
16. Christidou A, Maraki S, Gitti Z, Tselentis Y. Review of *Pasteurella* infections over a 12-year period in a tertiary care hospital. Am J Infect Dis 2005;1:107-10.

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