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Blastocystis hominis infection in a post-cardiotomy patient on extracorporeal membrane oxygenation support: A case report and literature review

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ABSTRACT

INTRODUCTION: Opportunistic pathogens can cause severe damage leading to irreversible complications in immune-compromised patients. Here we describe a patient who sustained *Blastocystis hominis* infection resulting in severe sepsis while on extracorporeal membrane oxygenation (ECMO) support, and the course of treatment taken to treat him.

PRESENTATION OF CASE: Our case, a 34-year-old Filipino man, was hospitalized for valvular disease and received valve replacements. ECMO and an intra-aortic balloon pump (IABP) were implemented when the patient developed progressive heart failure after cardiac surgery. Unfortunately, the patient suffered from sepsis with persistent fever and diarrhea, and subsequent examinations indicated the patient was infected by *B. hominis*. After adequate administration of the antibiotic metronidazole, the patient's symptoms subsided and he was discharged.

DISCUSSION: Blastocystis hominis is a unicellular protozoa commonly found in the intestinal tract, and the prevalence of *B. hominis* is 1.5–10% in developed countries and 30–50% in developing countries. The patient needed the support of ECMO and IABP, was immunocompromised to a certain extent; *B. hominis* can be a harmful opportunistic pathogen for them and lead to severe irreversible complications such as death.

CONCLUSION: This is the first published article showing that the opportunistic pathogen, *B. hominis*, can cause severe infection in patients on ECMO support, a result that should be kept in mind when patients come from a place with a high prevalence of *B. hominis*. The prophylactic medication should be administered routinely when patients live in the region and extracorporeal life-support is used.

1. Introduction

Blastocystis hominis, a unicellular protozoa commonly found in the intestinal tract, can lead to gastrointestinal symptoms such as diarrhea, nausea, abdominal pain, vomiting, and bloating.[1–3] The prevalence of *B. hominis* is 1.5–10% in developed countries, where it can sometimes act as an opportunistic pathogen, resulting in deterioration of health in immune-compromised patients.[4] In Taiwan, use of extracorporeal membrane oxygenation (ECMO), a powerful life-support system, is currently a popular means of keeping patients in critical condition alive. Any type of infection in patients on ECMO support is bound to become a serious complication.[5] Meanwhile, patients on ECMO support are immune-compromised to a certain extent; therefore, they have an increased probability of being infected by *B. hominis*. ECMO patients suffer from hemodynamic instability and weak constitutions, and all factors that might lead to deterioration, including infections, should be carefully considered and prevented. The purpose of this paper is to describe the clinical presentation of this opportunistic pathogen, *Blastocystis hominis*, infecting a patient on ECMO support in the intensive care unit, a scenario never before reported in the literature, and to try to caution clinicians to be aware of the possibility of *B. hominis* infection in ECMO patients in order to prevent an unnecessarily bad outcome.

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2. Case report

Our patient was a 34-year-old Filipino man who had been working in Taiwan for 9 years. He was hospitalized for intermittent edema of the legs, easily induced fatigue, and progressive cough experienced over the 9 months prior to admission. At the time of admission, chest radiography revealed bilateral lung edema with cardiomegaly. Cardiac sonography revealed aortic valve stenosis and mitral valve regurgitation; therefore, double valve replacement including the aortic valve and the mitral valve were suggested and performed. After the surgical intervention, a transesophageal echocardiogram revealed no residual valvular event; however, global hypokinesia was still observed during the examination. Initially, the global hypokinesia was considered as a transient influence of the cardiac manipulation. When hemodynamic status gradually worsened and cardiogenic shock eventually occurred, ECMO and an IABP were employed due to the emergency of the situation resulting from hemodynamic instability. Since electrocardiography showed a diffuse Q wave in the anterolateral lead after cardiogenic shock, cardiac catheterization was performed under support with ECMO and IABP, revealing left main coronary artery stenosis. Percutaneous occlusive balloon angioplasty stenting was performed for that, and hemodynamic instability improved gradually thereafter.

Unfortunately, persistent fever and diarrhea subsequently developed with leukocytosis. A blood test revealed a leukocyte count of 19.58 K/μL with a segment type of 81.4 percent; hemoglobin level of 11.1 g/dL; and platelet count of 42 K/μL. The blood levels of urea nitrogen, creatinine, aspartate transaminase, alanine transaminase, and total bilirubin were respectively 16.5 mg/dL, 0.9 mg/dL, 191 U/L, 103 U/L, and 6.99 mg/dL. Parenteral cefpirome 2000 mg every twelve hours and parenteral teicoplanin 400 mg daily were administered empirically. The infectious diseases physician suggested that the patient should be weaned off ECMO and IABP in order to allow clear identification of the infection. A septic work-up, including atypical infectious pathogens, was completed. Both blood culture and sputum culture obtained negative results. An indirect hemagglutination test for amebiasis was also negative. The titers of coxsackie B virus antibodies including subtypes B1–B6 were 1:2 and not significant. Only the stool culture showed positive for *B. hominis* without development of *Clostridium difficile*. On the basis of these clinical findings and discussion with the infectious diseases physician, we substituted cefpirome and teicoplanin with 500 mg of oral metronidazole three times a day. After 13 days of metronidazole treatment no further fever or abdominal discomfort was noted and the patient was discharged without complications.

3. Discussion

Blastocystis hominis is a unicellular protozoa commonly found in the intestinal tract. It is classified taxonomically within the heterogeneous group of stramenopiles.[6,7] *B. hominis* has 6 life-cycle stages, namely, the amoeboid, avacuolar, vacuolar, multivacuolar, granular, and cystic stages.[1] In each stage, the presence of the central vacuole, the cell wall, the number of nuclei, and the size vary. Nine of the 10 subtypes of *B. hominis* can infect humans, the most common being subtype 3.[8] The cyst form of *B. hominis* is transmitted via the fecal-oral route.[9] The association of *B. hominis* with abdominal discomfort has not yet been elucidated; however, we have been able to isolate *B. hominis* from individuals with gastrointestinal symptoms such as diarrhea, nausea, abdominal pain, vomiting, and bloating.[1–3] It is even known to embed itself in the intestinal mucosa, contributing to large ulcers.[10] The prevalence of *B. hominis* is 1.5–10% in developed countries and 30–50% in developing countries.[2] Various diagnostic tests are available to determine the infection of *B. hominis*, such as examination of direct smears, xenic in vitro culture, formol ethyl acetate concentration, and polymerase chain reaction.[1,11,12] In our case, we identified *B. hominis* by stool culture.

Although asymptomatic carriers account for a large percentage of patients with *B. hominis* and their treatment remains a matter of debate, we administered our treatment based on the following reasons.[1,6,13] In Taiwan, many foreign nationals have migrated for employment in recent decades. Since the prevalence rate of *B. hominis* in these people is 14.1% and higher than the native residents of Taiwan, we should recognize *B. hominis* infection as a priority in the differential diagnosis of gastrointestinal symptoms.[14] *B. hominis* may be silent in its carriers, producing no noticeable symptoms. However, *B. hominis* can be a harmful opportunistic pathogen in immunocompromised hosts such as human immunodeficiency virus (HIV)-positive patients or organ-transplant patients who receive immunosuppressive agents.[4] Our patient, who underwent aortic valve and mitral valve replacements and needed the support of ECMO and IABP, was immunocompromised to a certain extent. Although the powerful life support system, ECMO, is no longer difficult to implement in Taiwan, subsequent infection is a serious problem, which may lead to severe irreversible complications such as death.[5,15] Due to the aforementioned concerns, investigation of the possibility of infection of *B. hominis* deserved high priority in our case, since our patient exhibited no signs of infection except for presence of *B. hominis* in the gastrointestinal tract.

Therefore, we treated our patient for *B. hominis* to prevent his situation from deteriorating when he exhibited hemodynamic instability. Past research has shown that such patients can be effectively treated with a range of antibiotics, including metronidazole, trimethoprim-sulfamethoxazole (TMP-SMX), ketoconazole, pentamidine, iodoquinol, tinidazole, and ornidazole.[13,16] The most common agent is metronidazole, with the standard treatment protocol being oral administration of 500–750 mg three times daily for 7–10 days. In our case, we prescribed oral metronidazole 500 mg three times daily for 13 days. The patient's general condition improved without further fever or abdominal discomfort after administration of metronidazole.

So far as we know, no studies of patients on ECMO support infected by gastrointestinal pathogens such as *B. hominis* have previously been published, nor is there any published research discussing the importance of using prophylactic oral antibiotics to treat possible digestive infections. We suggest that prophylactic medication should be administered routinely when patients live in a region with a high prevalence of *B. hominis* and extracorporeal life-support is used, though further studies are required to validate this assertion.

4. Conclusion

This is the first published article showing that the opportunistic pathogen, *B. hominis*, can cause severe infection in patients on ECMO support, a result that should be kept in mind when patients come from a place with a high prevalence of *B. hominis*. Although *B. hominis* usually is not harmful and has a self-limited course, patients with hemodynamic instability should be treated for it to prevent further complications and mortality.

Conflict of interest

None declared.

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Ethical approval

The authors have obtained the informed consent of the patients and/or subjects mentioned in the article. The author for correspondence is in possession of this document.

Author contributions

Towards the organization of this work, Nai-Kuan Chou contributed original conception of the study. Chih-Hsuan Chen made data acquisition and drafted the manuscript. Hsin-Yun Sun provided opinions about *B. hominis* infection and helped Hong-Shiee Lai in revising the manuscript. Hsiung-Fei Chien performed data analysis and interpretation. Finally, Nai-Kuan Chou approved of the final version of the manuscript for publication.

Key learning points

- This is the first published article showing that the opportunistic pathogen, *B. hominis*, can cause severe infection in patients on ECMO support.
- The patients with hemodynamic instability should be treated for it to prevent further complications and mortality.

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