

CASE REPORT

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Case report of a *Saccharomyces cerevisiae* lung parenchyma infection in an immunocompetent 64-year-old male with a Zenker diverticulum

Haroon Nawaz¹, Ayesha A. Choudhry² and William Morse^{3*} 

Abstract

Saccharomyces cerevisiae is a yeast microorganism known to inhabit the gut micro-biome. It is commonly used in the fermentation process of beer, wine, bread making, and is naturally found in soil, plants, and fruit. *Saccharomyces boulardii* (subtype of *Saccharomyces*) and *cerevisiae* are closely related and are commonly used as a probiotic and in treatment for diarrhea. In rare circumstances, *Saccharomyces* has been shown to cause infection in the immunocompromised and intensive care unit (ICU) patients, with antibiotic use, and central venous catheter use. This prompts us to present one of the only documented case reports of a lung parenchyma infection with *Saccharomyces cerevisiae* in a 64-year-old immunocompetent male with a past medical history of chronic obstructive pulmonary disorder (COPD), atrial fibrillation, atrioventricular (AV) nodal ablation, heart failure with preserved ejection fraction (HFpEF (post-status automated implantable cardioverter-defibrillator)), coronary artery bypass graft (CABG), gastric esophageal reflux disease (GERD), and a Zenker diverticulum.

Keywords: *Saccharomyces cerevisiae*, Zenker diverticulum, Aspiration, Lung parenchymal infection

Introduction

Saccharomyces is quite a ubiquitous fungus that rarely infects humans. Infections consist of but are not limited to pneumonia, urinary tract infection (UTI), hepatic abscess, and endocarditis [1]. In 2005, a review of case reports regarding *Saccharomyces cerevisiae* infection discovered that the majority of infectivity came from intravascular catheter and antibiotic therapy [2]. A study consisting of three patients infected with *Saccharomyces* in an intensive care unit (ICU) setting was attributed to being in the intensive care unit (ICU) and receiving enteral or parenteral nutrition [5]. These aforementioned cases highlight the vast spectrum of infectivity and may change one's preconceived notion that a non-pathogenic

organism may be more opportunistic than once thought. Lung parenchyma infection caused by *Saccharomyces* has a minute amount of evidence-based medicine in immunocompetent individuals not taking a probiotic containing *Saccharomyces*. That prompts one to segway into a modern-day case report of a lung parenchyma infection caused by *Saccharomyces cerevisiae* in a 64-year-old immunocompetent male with a past medical history of chronic obstructive pulmonary disorder (COPD), atrial fibrillation, atrioventricular (AV) nodal ablation, heart failure with preserved ejection fraction (HFpEF (post-status automated implantable cardioverter-defibrillator)), coronary artery bypass graft (CABG), gastric esophageal reflux disease (GERD), and a Zenker diverticulum. A prior study consisted of patients with a median age of 72 years old who received trans-oral septum stapling for a Zenker diverticulum had significantly lower post-operation episodes of recurrent pneumonia, chronic cough,

*Correspondence: Wmorse001@gmail.com

³ Ross University School of Medicine, Miramar, USA

Full list of author information is available at the end of the article

dysphagia, and regurgitation compared to no surgery [7]. This leads one to believe that a combination of chronic obstructive pulmonary disease and a Zenker diverticulum could be a culprit in this unique case report, which can warrant similar future case presentations to take into consideration of a Zenker diverticulum and chronic obstructive pulmonary disease to be a risk factor for a fungal lung parenchyma infection.

Case presentation

A 64-year-old immunocompetent man presents to the emergency department with a complaint of shortness of breath for 3 days. He has a significant past medical history (PMH) of gastric esophageal reflux (GERD), Zenker diverticulum, atrial fibrillation post-status, atrioventricular (AV) nodal ablation, heart failure with preserved ejection fraction (HFpEF (post-status automated implantable cardioverter-defibrillator)), coronary artery bypass graft (CABG), and advanced chronic obstructive pulmonary disease (COPD) (on home O₂). Concerning lab reports on admission were a leukocyte count of 17,600 cells/mm³. The patient was afebrile, and vitals were stable throughout the hospital course. A chest X-ray shows multifocal airspace opacities concerning for multi-focal pneumonia. A chest computed tomography was conducted without contrast that displayed scattered bilateral nodular glass opacities that were most significant in the left upper lobe, concerning for pneumonia. Recommendations were to add vancomycin, zosyn, and mycamine for resolution while culture was pending. The cultures came back positive for gram-positive cocci in clusters (methicillin-resistant *Staphylococcus aureus* (MRSA)). Patient condition rapidly deteriorated over a period of 7 days prompting a necessity for a chest X-ray (Fig. 1) demonstrating complete collapse of the left lung, which was confirmed with a chest computed tomography.

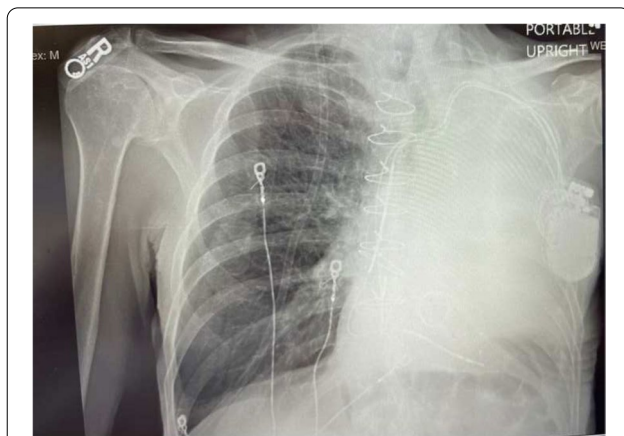


Fig. 1 Chest X-ray demonstrating complete collapse of the left lung

Next, the patient was transferred to the intensive care unit (ICU) for bronchoscopy and then intubated. A bronchoscopy displayed complete collapse of the left lung and tenacious secretions occluding the left bronchus, which were aspirated multiple times. At completion, all segments were patent. Samples were sent to microbiology and cytology; blood cultures were taken. A post-op bronchoscopy chest X-ray was conducted to compare to previous radiographic findings that found significant improvement in aeration in the left hemithorax (Fig. 2).

Then, the patient was extubated and transferred back to the medical floor. Cultures came back positive for *Saccharomyces cerevisiae* and amphotericin B (5 mg/kg/dose intravenous every 24 h) was started. Blood cultures displayed no growth. The patient's immunocompetent workup was within normal limits. After 3 days, the patient's left lung collapsed again, warranting a repeat bronchoscopy that demonstrated the same tenacious secretions occluding the left bronchus completely, as well as, partially affecting the right bronchus. These findings show no improvement with current treatment, leading to the patient being intubated. After a couple of days, the patient's condition worsened, and the family was consulted regarding the next steps of patient care. In the best interest of the patient, the patient's family decided that hospice care was the right option.

Discussion

Saccharomyces cerevisiae has become more opportunistic than in the past. According to Martin et al. [4], the number of sepsis cases caused by fungal infections has increased between 1979 and 2000. Another article mentions how the increased number of *Saccharomyces* infections are due to the use of broad-spectrum antibiotics



Fig. 2 Post-op bronchoscopy chest X-ray demonstrating improvement in patency

and an increase in impaired-immunity patient population [6]. In 1989, a study involved a patient with acquired immunodeficiency syndrome (AIDS) being infected with *Saccharomyces cerevisiae*. Infection of the oral mucosa, intestine, spleen, and lungs were hypothesized to be from *Saccharomyces* colonization of the oropharynx, then was aspirated into the lungs, and dispersed hematogenously [8]. In 1990, three cases were documented regarding *Saccharomyces* infection leading to pneumonia, liver abscess, sepsis, and cardiac tamponade. Risk factors in this patient population pool were immunosuppression, hospitalization stay, antibiotic use, and prosthetic cardiac valves [1]. Another risk factor is the use of *Saccharomyces* as a probiotic in the treatment of diarrheal illnesses [3]. These previous cases make this case report very interesting due to the fact that a 64-year-old immunocompetent male with a past medical history of chronic obstructive pulmonary disorder (COPD), atrial fibrillation, atrioventricular (AV) nodal ablation, heart failure with preserved ejection fraction (HFrEF (post-status automated implantable cardioverter-defibrillator)), coronary artery bypass graft (CABG), gastric esophageal reflux disease (GERD), and a Zenker diverticulum being infected with *Saccharomyces cerevisiae*. We postulate that *Saccharomyces* colonized the pharyngoesophageal junction and was aspirated into the lungs leading to pneumonia.

Conclusion

In essence, prior documented cases of infection caused by *Saccharomyces cerevisiae* have been shown to rarely infect individuals that are immunocompromised, intensive care unit patients, with antibiotic use and central venous catheter use. This case presents one of the only documented case reports of a lung parenchyma infection with *Saccharomyces cerevisiae* regarding this patient population. This case will aid in cultivating a foundation for future research to build on to find a resolution.

Acknowledgements

Not applicable.

Authors' contributions

"WM" was a major contributor to the writing of the manuscript. "HN" oversaw the patient with the attending physician and contributed to the editing of the paper. "A.A.C." helped with the interpretation of the patient data. The authors have read and approved the final manuscript.

Funding

Not applicable.

Availability of data and materials

The datasets generated and/or analyzed during the current study are not publicly available due to HIPAA but are available from the corresponding author on reasonable request, if permissible by the patient.

Declarations

Ethics approval and consent to participate

Approved informed consent.

Consent for publication

Approved verbal informed consent. Approved by Westside Regional Medical Center and Northwest Medical Center. All authors approved the manuscript.

Competing interests

The authors declare that they have no competing interests.

Author details

¹Westside Regional Medical Center, Plantation, USA. ²Fatima Jinnah Medical University, Lahore, Pakistan. ³Ross University School of Medicine, Miramar, USA.

Received: 8 December 2021 Accepted: 1 March 2022

Published online: 10 March 2022

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