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Case Report

Atopobium minutum: An uncommon culprit of severe bacteremia and empyema: A case report and literature review ☆,☆☆

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ABSTRACT

Atopobium minutum (*A. minutum*) has rarely been documented in human infections. However, this report describes a case involving a 52-year-old woman who developed empyema and lung collapse due to *A. minutum*. She initially presented to the emergency department with nausea, vomiting, diarrhea, and abdominal pain. Her condition quickly declined within the first day of arrival, leading to respiratory failure and requiring intubation and ICU-level care. Despite receiving intensive antibiotic treatment, the patient needed prolonged intubation and a tracheostomy. Initial cultures indicated *Streptococcus intermedius* and *Lactobacillus minutus*, but final culture results identified *A. minutum* as the cause. This case highlights the difficulty in diagnosing *A. minutum* infections, often necessitating advanced DNA sequencing, and raises concerns about potential multidrug resistance. It highlights the importance of prompt identification of the pathogen by laboratories to allow for effective treatment of these rare infections.

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Introduction

Atopobium minutum is a Gram-positive, non-spore-forming, nonmotile, and strictly anaerobic bacillus that has been classified in the family Coriobacteriaceae [1]. The bacteria have not been well studied in hospitalized patients as the bacteria rarely is known to be pathogenic. It can be most often found in the oral cavity, abdominal wounds, blood, or pelvic abscesses [2]. Atopobium is difficult to isolate and identify using traditional methods, often requiring advanced laboratory techniques such as 16S rRNA gene sequencing. (7) Our case report presents a 52-year-old woman who developed empyema and lung collapse caused by *A. minutum*. Her rapid decline, and initial misidentificaion of the causative organism, stresses the importance of accurate pathogen identification. This report emphasizes the diagnostic challenges associated with *A. minutum* infections and the critical need for advanced diagnostic techniques to ensure effective treatment.

Case presentation

A fifty-two year-old female patient presented to the hospital with a 2-week history of persistent nausea, vomiting, diarrhea, and chronic abdominal pain. Her significant past medical history included systemic lupus erythematosus (SLE), depression, anxiety, post-traumatic stress disorder (PTSD), and polysubstance use disorder. Her condition worsened daily prior to hospital admission, to the point of being unable to take her oral medications. A CT scan of her chest, abdomen, and pelvis conducted in the emergency department revealed a large, multiloculated fluid collection on the left side, with a thick rim likely indicating an empyema. Additionally, necrotizing pneumonia could not be ruled out due to significant gas present in the periphery within the collapsed left lung field.

Within 24 hours of her arrival to the emergency room, her respiratory status rapidly deteriorated, necessitating rapid sequence emergency intubation and subsequent transfer to the Intensive Care Unit (ICU). A postintubation chest X-ray showed complete opacification of the left lung, necessitating a bedside thoracentesis for both diagnostic and therapeutic purposes. After inserting a chest tube for drainage, thick pustular fluid was drained. Infectious disease specialists were consulted for antibiotic stewardship for the empyema. Fluid analysis showed high lactate dehydrogenase (LDH) and white blood cell (WBC) counts, but low levels of glucose, protein, and albumin. The pH of the fluid was 5.7. The decision was made to escalate antibiotic treatment from Vancomycin and Cefepime to Vancomycin, Meropenem, and Clindamycin until fluid and blood microbiology results were available. A follow-up X-ray showed successful drainage of the fluid, but the patient's left lung remained collapsed. Thoracic surgery was consulted regarding the possibility of decortication of the patient's trapped lung and evaluation of a possible tracheoesophageal fistula, given the high LDH in the pleural fluid. A bronchoscopy was performed without complications and no fistula was found. After several days on broad-spectrum antibiotics, both the pleural and blood cultures began to grow organisms, specifically gram-positive cocci. Broad-spectrum treatment was continued until speciation was obtained from each sample. The final cultures identified Streptococcus Intermedius in the pleural fluid and initially reported Lactobacillus Minutus in the blood. This necessitated a Transthoracic Echocardiogram (TTE) to evaluate potential vegetations due to the patient's history of intravenous drug use. Both a TTE and Transesophageal Echocardiogram (TEE) showed no vegetations or abnormalities. The final cultures for both samples identified Atopobium Minutum as the causative bacteria.

Despite appropriate antibiotic treatment, the patient remained septic, requiring continued norepinephrine and intensive care monitoring. Her lung continued to be collapsed, necessitating prolonged intubation and eventually a tracheostomy. After an extended course of antibiotic treatment, the patient's sepsis resolved and her lung began to slowly open up with continued chest physiotherapy. The patient was transferred to the general medical floor with a tracheostomy and ventilator, with the prognosis of requiring long-term acute care (LTAC) facility care to help wean her from the ventilator. A follow-up 1 month after discharge showed a moderate trapped left lung. After being weaned from the ventilator, a repeat CT scan 4 months later showed minimal to no lung trapping following continued antibiotics and aggressive chest physiotherapy at the LTAC facility.

Discussion

Atopobium Minutum has been rarely studied as a possible pathogenic bacteria causing any complications. Our patient suffered severe sepsis and a collapsed fused lung likely due to inflammatory changes from her empyema. Luckily, the *A. Minutum* which grew was sensitive to almost all antibiotic options, however with the ever rapid growth of pan-resistant bugs, extra care should be taken when treating these lesser seen growths. Aggressive broad spectrum antibiotics were chosen initially with rapid de-escalation once the patient's sepsis resolved. Laboratories need to be equipped to identify organisms quickly and accurately to help clinicians effectively treat these infections. Improperly identifying an infection may lead to inappropriate antibiotic coverage or unneeded medical interventions.

Previously reported cases

A. Minutum is seldom identified in patients and is even more infrequently associated with conditions such as sepsis or shock. One article spotlighted a similar case of bacteremia and severe sepsis. However, at that time, identifying *A. Minutum* proved challenging because the laboratory lacked the capability to identify the bacteria. Instead, advanced rDNA sequencing was employed to aid identification. Fortunately, this advanced sequencing successfully identifies *A. Minutum*, even when it's not detected during initial studies [3]. Another article featured a patient with Fournier's gangrene, where wound cultures grew Atopobium deltae. Although this strain is

similar to *A. Minutum*, the authors employed advanced sequencing, which revealed significant differences, leading to its classification as a new type [4]. Bacteria, which are not known to be pathogenic but are already showing signs of resistance and mutations, could potentially pose significant threats to the healthcare system. Strains of vancomycin resistance were identified in France, Canada, and Australia through the VanB gene mutation [5]. Another study also associated *A. Minutum* with necrotizing fasciitis, a connection that was only established after advanced sequencing [6]. This is yet another example of how difficult it can be to identify this bacteria, often leading to prolonged courses of broad-spectrum antibiotics. In the case we presented, the initial identification of the bacteria was mistakenly thought to be lactobacillus, triggering a complete cardiac vegetation workup. Therefore, prompt and accurate identification of pathogenic bacteria is crucial to prevent unnecessary use of antibiotics and avoid potential harmful side effects from healthcare interventions.

Conclusion

A.Minutum is a bacteria which has very limited studies done on its effects on the body and the severity of disease it can cause. Oftentimes the bacteria were un-identified by standard microbiology testing requiring advanced sequencing. This technique may not be available in most hospital settings. In the case described above, the bacteria were initially described as lactobacillus prompting an extensive workup which otherwise would have been avoided had the identification been correct from the start. Our patient's outcome was largely due to availability of broad spectrum antibiotics and effective microbiology testing to quickly identify the pathogenic culprit.

Patient consent

We would like to confirm that the case information in this manuscript titled "Atopobium Minutum: An Uncommon Culprit of Severe Pleural Effusion - A case report and literature review" has been provided with informed consent from the patient presented. The patient has given permission to appear in the case information in the print, online, and licensed versions of a medical journal. The patient has been offered the opportunity to read the general description of what this manuscript contains and review all the included photographs of the investigations done and submitted for publication.

Ethics approval

Not applicable.

Author Contributions

Paul Karroum: Conceptualization, Writing - original draft, writing - review and editing. **Inderbir Padda:**Overview of manuscript. Final review and editing and submission process. **Sophia Taik:** Writing - original draft, writing - review and editing. **Gianpaolo Piccione:** Writing - original draft, writing - review and editing. **Daniel Fabian:** Writing - original draft, writing - review and editing. **Anusha Kavarthapu:** Writing - original draft, writing - review and editing. **Bhuvana Tantry:** Writing - original draft, writing - review and editing. **Sandra Vandenborn:** Writing - original draft, writing - review and editing. **Juliana Otiwaah:** Writing - original draft, writing - review and editing. **Mahmoud Mahmoud**: Writing - original draft, writing - review and editing. **Keith Diaz:** Supervision, Review, and final approval.

Appendix

Figs. 1–6

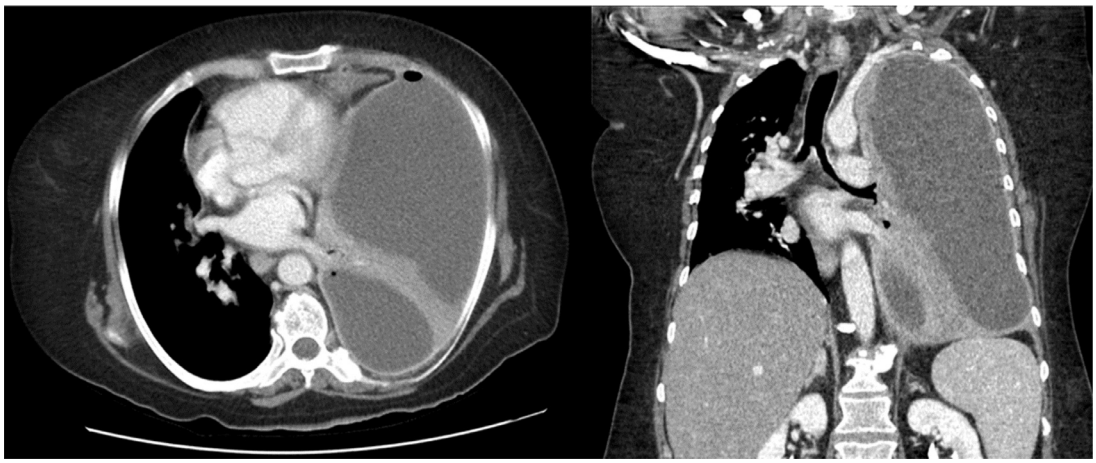

Fig. 1 – Initial CT scan of the chest on presentation in axial (left) and coronal (right) views showing a large complex multi-loculated pleural effusion with thick enhancing rim and a few foci of peripheral free gas within the collection and lung parenchyma with associated rightward mediastinal shift secondary to effusion. Findings initially concerning for empyema however necrotizing pneumonia is not ruled out given presence of peripheral gas.

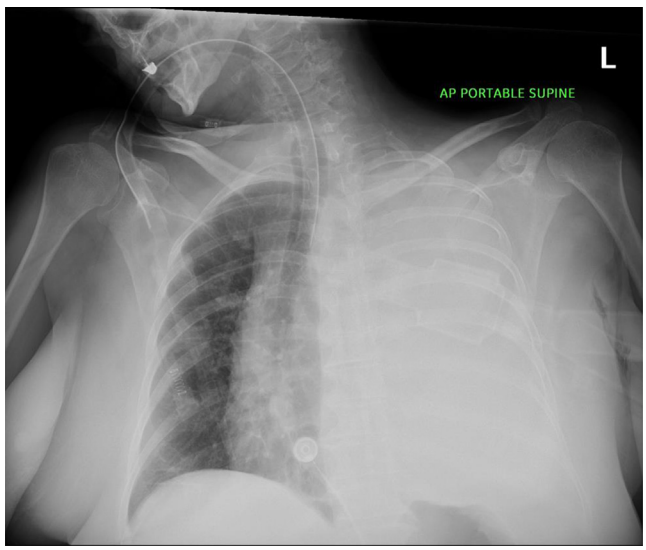

Fig. 2 – Initial Chest X-ray status post intubation showing a Large left-sided pleural effusion with complete opacification of left hemithorax. Endotracheal tube appears in place. The right hemithorax appears clear.

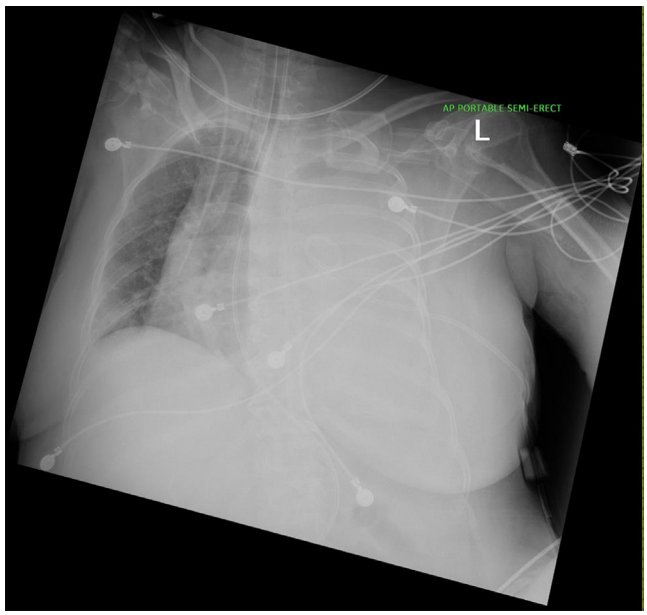

Fig. 3 – Chest X-ray taken 2 days later showing Interval placement of a left-sided chest tube into a large left pleural effusion. No evidence of pneumothorax at this time. The right hemithorax is clear. Interval placement of right-sided central line and feeding tube.

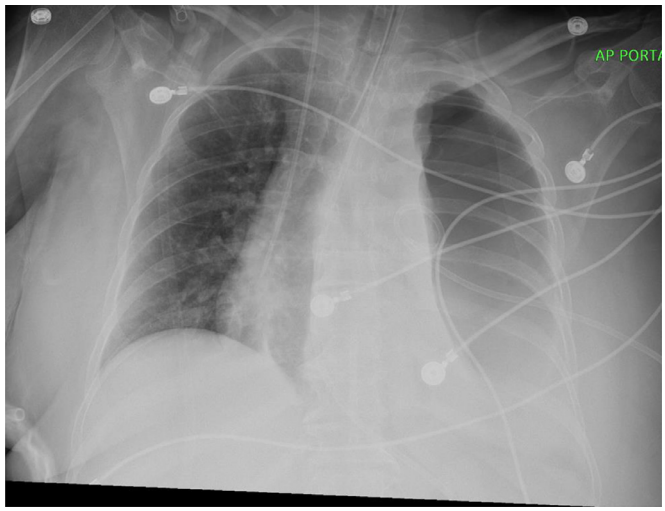

Fig. 4 – Chest X-ray taken 1 day after chest tube insertion now showing large left sided pneumothorax with moderate interval improvement of the left-sided pleural effusion.

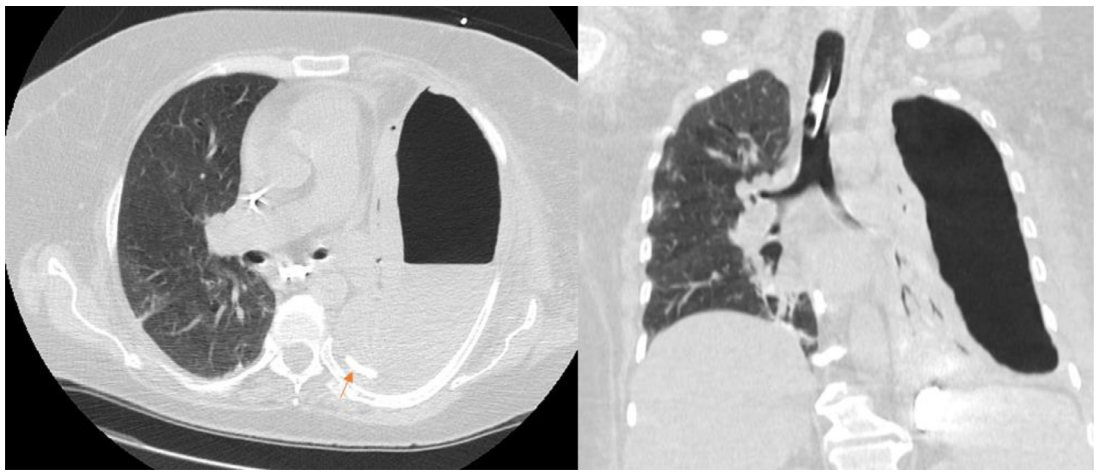

Fig. 5 – CT scan performed following pneumothorax found on X-ray showing Left-sided hydropneumothorax with air fluid levels. Stable positioning of left-sided chest tube (orange arrow). Incidental note of high density material within the trachea, which likely represents aspirated contrast material.

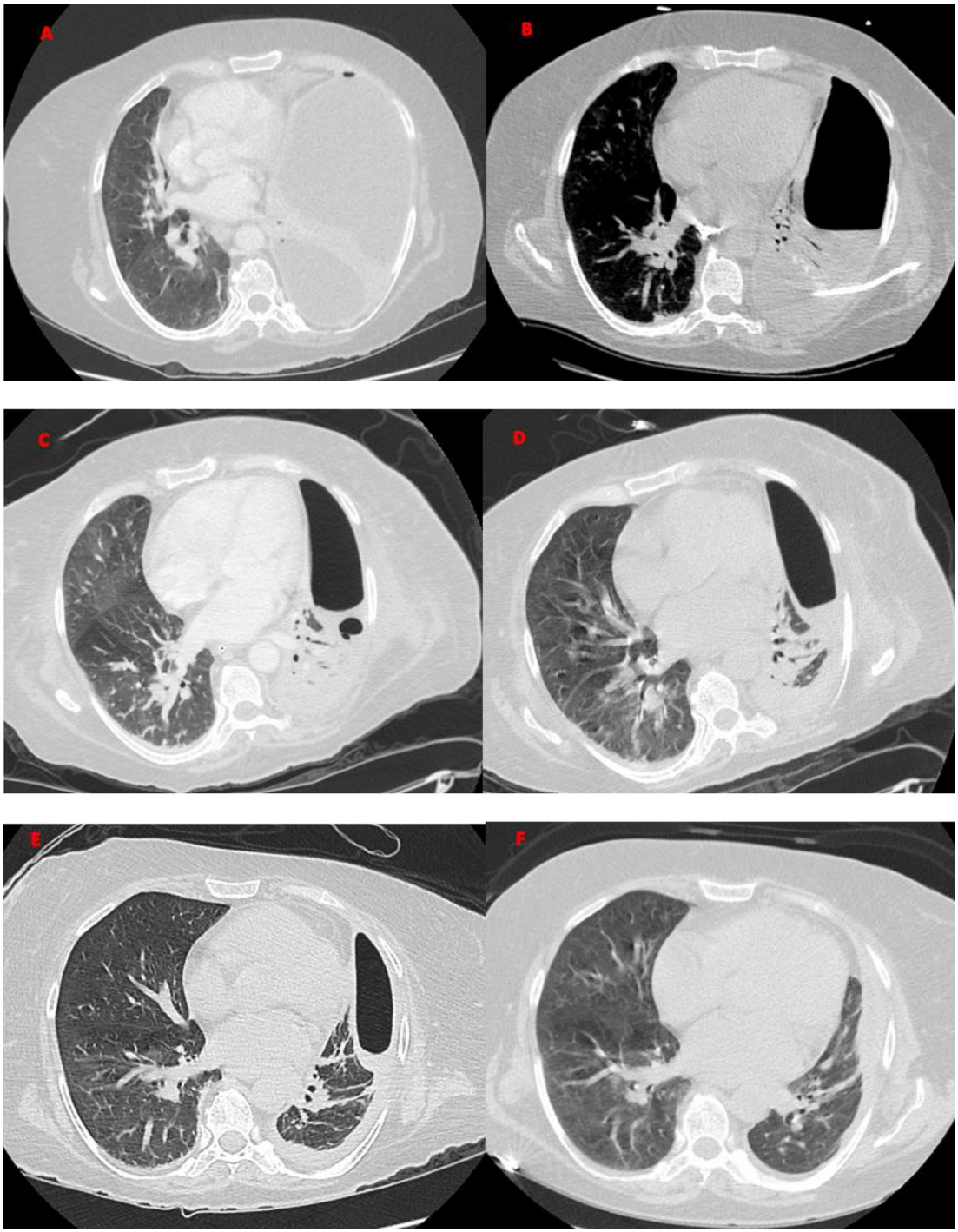

Fig. 6 – Axial CT images of the chest, in approximately the same position, starting from admission (A) followed by subsequent CT images at days 4 (B), 20 (C), 30 (D), 48 (E), and final CT taken 3 months later (F). This shows progression from initially showing large loculated pleural effusion (A) to the hydropneumothorax after chest tube insertion and improvement of overall effusion (B). No significant change occurred in the following 3 weeks (C) which showed removal of the chest tube with stable appearance of the hydropneumothorax without significant expansion of the lung. There is minimal expansion of the lung parenchyma seen on the following scan (D) with stable appearance of the hydropneumothorax. Final images during admission (E) show moderate improvement in overall lung aeration with decreasing size of hydropneumothorax. Final image taken 3 months later (F) shows small left loculated pleural effusion with pleural thickening, with essential resolution of the lung collapse secondary to effusion.

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