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Fungal Empyema Thoracis due to *Candida* species: A diagnosis on fine needle aspiration cytology

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Abstract:

Fungal empyema thoracis is a rare and emerging entity, and the increase in the rate of fungal infections is mainly due to the increasing use of broad-spectrum antibiotics, intravascular devices, and hyperalimentation, as well as to the increasing number of critically ill or immunocompromised patients. *Candida* species are the most common pathogens in fungal empyema thoracis, and it is extremely rare to isolate fungi as such in pleural fluid. We report here a 60-year-old male with a case of gastric carcinoma with perforation peritonitis who underwent laparotomy and partial gastrectomy and developed pleural effusion postsurgery. Cytological examination of the pleural fluid showed many yeast, budding, and pseudohyphae forms of fungal organisms morphologically consistent with *Candida* species in the background of inflammation.

Keywords:

Candida, Fungal empyema thoracis, gastric carcinoma, pleural effusion

Introduction

Fungal empyema thoracis is usually associated with high morbidity and mortality. Early diagnosis and antifungal therapy may improve the outcome. According to the CDC national database, *Candida* species is the sixth most common cause of nosocomial infections, accounting for 7.2% of the total.^[1] Empyema thoracis due to *Candida* is rare and has been reported following abdominal surgeries, spontaneous esophageal rupture, gastropleural

fistula, and other invasive surgical procedures.^[2] We present here a case of fungal pleural effusion where cytology played a key role in the diagnosis of candidiasis.

Case Report

A 60-year-old male with a case of gastric carcinoma with liver metastasis had developed perforation peritonitis for which the patient underwent partial gastrectomy with peritoneal lavage. His peritoneal fluid grew gram-negative *Enterococcus* and *E.*

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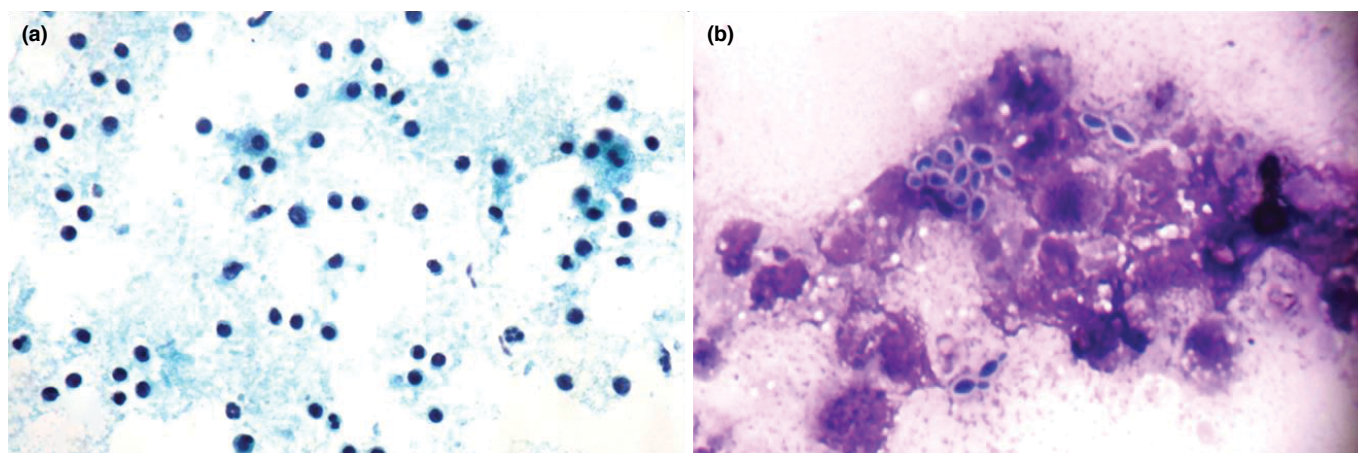


Figure 1: Pleural fluid showing inflammatory cells with (a) yeast and (b) budding forms of *Candida* species (Pap: 100×; MGG: 400×)

coli. On day 3 of postsurgery, he developed fever spikes and features of septicemia. The hemogram showed leukocytosis (11 000 cells/cumm) and thrombocytopenia (70 000 cells/cumm) with neutrophilic toxic change on the peripheral smear, features suggestive of sepsis. On day 5, he developed breathlessness on exertion and was found to have right-sided pleural effusion. A pleural tap was done and sent for investigation. Meanwhile, the patient succumbed to his disease due to septicemia. The pleural fluid cytology showed many yeasts, budding, and pseudohyphae forms of fungal organisms morphologically consistent with *Candida* species in the background of inflammatory cells comprised of neutrophils and lymphocytes [Fig. 1a, b]. The pleural fluid did not grow any bacteria, and further samples could not be sent for fungal culture as the patient succumbed to the disease.

Discussion

Morbidity from fungal infection is on the rise all over the world. The common sites of fungal nosocomial infections are the blood, urinary tract, and respiratory system. The incidence of fungal empyema thoracis is increasing, with high mortality, and requires early and aggressive treatment.^[3]

According to Light et al.,^[4] the following criteria are required for the diagnosis of fungal empyema thoracis: (1) isolation of a fungal species from the pleural effusion belonging to the exudate category; (2) significant signs of infection, such as fever (body temperature $>38.3^{\circ}\text{C}$) and leukocytosis (white blood cell $>10\,000$ cells/ μL); and (3) isolation of the same mold species from pleural effusion on more than one occasion, or serological tests or

polymerase chain reaction-based assays may be useful in cases requiring rapid diagnosis.

This patient had many risk factors like malignancy, usage of broad-spectrum antimicrobials, abdominal surgery, and drain tube insertion, which increased his risk for fungal empyema thoracis. He also met the criteria for fungal empyema thoracis diagnosis, such as signs of infection (fever and leukocytosis) and fungus detection in pleural fluid.

Candidiasis accounts for most of the cases of fungal empyema thoracis^[3]; other fungi as causative organisms are rare and only a few cases have been reported. Pleural cryptococcosis and aspergillus empyema thoracis have also been reported as a result of a ruptured aspergilloma cavity or as a complication of a preexisting chronic empyema,^[5-7] but it is extremely rare to isolate fungi in pleural fluid. Alkrinawi and Chernick studied cases of pleural effusions in 105 children, of which only one case grew *Candida* from the pleural aspirate.^[8] Chen isolated fungi in pleural effusion in 16 of 140 patients with pulmonary fungal infection.^[9]

In a study by Ko et al.,^[3] fungal pulmonary infections are more commonly a parenchymal problem; fungal empyema thoracis acquired in the hospital was 84%, mostly in ICUs, and the overall mortality accounted for 73%. *Candida* and *Torulopsis* species accounted for 82% of the fungal isolates from pleural effusion, with *Candida albicans* representing 60% of all *Candida* species isolates. Their findings were consistent with the data from the Centers for Disease Control and Prevention's National Nosocomial Infection Surveillance, which showed *Can-*

didia and *Torulopsis* species accounting for 80% of the fungal isolates associated with nosocomial infections.^[10] In this study, intra-abdominal diseases (30%) accounted for most of the fungal empyema thoracis as observed in our case. And it is proposed that subdiaphragmatic infection may extend to the lung or pleural space by way of lymphatics or directly through the diaphragm or a defect in it, or by way of the bloodstream.

In a retrospective analysis by Caires et al.,^[11] fungal isolates were obtained from 15 patients, of which 12 were yeasts. Twelve patients (80%) were immunocompromised. The mean overall survival in the study was 375 days.

Nigo M et al.^[12] studied 106 fungal isolates and found that *Candida* species (58%) were the most frequent pathogens, followed by *aspergillus*, and were frequently associated with recent abdominal or thoracic surgical procedures (44%).

Treatment includes antifungal drugs and tube thoracotomy or an indwelling pigtail catheter for continuous closed drainage.

Conclusion

Fungal empyema thoracis is a rare and emerging clinical entity with a grave prognosis. Pleural effusion from patients with risk factors for fungal empyema thoracis should be cultured for both bacteria and fungi at the same time, along with a cytology sample. The cytological examination can help in early diagnosis, direct further investigations, and reduce mortality and morbidity by early intervention.

Informed Consent

Written informed consent was obtained from the patient for the publication of the case report and the accompanying images.

Conflicts of interest

There are no conflicts of interest.

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Peer-review

Externally peer-reviewed.

Authorship Contributions

Concept – K.S., P.C.T., N.S.; Design – K.S., P.C.T.; Supervision – P.C.T., N.S.; Funding – None; Materials – K.S.; Data collection &/or processing – K.S.; Analysis and/or interpretation – K.S., P.C.T., N.S.; Literature search – K.S.; Writing – K.S.; Critical review – P.C.T., N.S.

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