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Case Report

Fatal massive hemoptysis: An autopsy study

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Introduction

Invasive pulmonary mucormycosis is an unusual but an emerging cause of fatal massive hemoptysis. The commoner causes of massive hemoptysis are pulmonary tuberculosis, bronchiectasis and lung carcinoma. Pulmonary mucormycosis, unlike rhinocerebral mucormycosis has been reported infrequently. Co-morbidity such as uncontrolled diabetes mellitus is an important predisposing factor for acute fulminant mucormycosis. Herein we report a case of fatal massive hemoptysis caused due to mucormycosis in a young male patient.

Case report

A 33 year old male patient, a known case of type 2 diabetes mellitus, was brought to peripheral hospital in an

unconscious state. He was found to have hypotension and acidotic breath. Preliminary investigations revealed random plasma glucose of 481 mg/dL, urinary ketosis and deranged renal parameters. Left lower lobe of the lung showed non-homogenous opacity on chest radiogram. He was managed as a case of diabetic ketoacidosis with acute renal failure. As soon as his clinical condition stabilized, he was transferred to a tertiary care center for further management.

At the tertiary care center, he complained of cough with mucoid expectoration but his clinical examination did not reveal any fresh findings. Over a period of next 15 days his serial chest radiogram showed fresh pulmonary findings bilaterally. Both the lungs showed non-homogenous opacities initially, with subsequent confluence and formation of multiple thick walled cavitory lesions with pericavitary consolidations and bilateral pleural effusion. Though smear negative for AFB, he was placed on ATT as the clinico-radiological suspicion of tuberculosis was high. In the meantime, he developed high grade fever and sudden onset fatal massive hemoptysis and expired. His total duration of hospital stay was 20 days. A clinical autopsy was carried out to ascertain the cause of this sudden and fatal massive hemoptysis.

Post mortem findings

Gross findings – The most significant findings were confined to both the lungs. Coarse adhesions with exudate were seen bilaterally. Lungs were boggy and oozed frothy hemorrhagic fluid. Cut sections showed multiple cavitory lesions, largest being 6 × 6 × 5 cm in the right upper lobe (Fig. 1). One of the lesions in the left lower lobe showed blood clots and appeared

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to be communicating with left bronchi (Fig. 2). Left bronchi and tracheal lumen were filled with blood clots. Multiple sections from all significant areas were taken and subjected to histopathological examination. Relevant samples for detailed bacteriological and mycological examination were collected. Microbiological study – No pathogenic bacteria was isolated from the blood or lung samples. Tissue pieces inoculated in Saboraud's Dextrose Agar and incubated at 37 °C and room temperature simultaneously exhibited rapid growth of a fungus. The colonies were initially cottony white and then turned into grayish black. 3–4 unbranched sporangiospores were seen arising from the stolons opposite to the rhizoids and terminating into smooth walled sporangia. Based on the phenotypic characters, the fungus was identified as *Rhizopus* species, most probably *Rhizopus oryzae*.

Histopathological findings – Histological sections from both the lungs showed alveolar edema, foci of alveoli filled with fibrin clots and areas of neutrophilic micro abscesses. Multiple sections from the cavities showed thick fibrous wall, infiltrated by mixed inflammatory cells including giant cells. The high power view of these sections revealed fungal elements composed of broad, aseptate filaments with right angle branching (Fig. 3). These fungal hyphae were seen invading cartilage and vessels (Fig. 4). Grocott's stain highlighted the hyphal forms of the fungal elements.

Discussion

Mucormycosis, earlier known as zygomycosis, commonly occurs as opportunistic infection in immunocompromized patients, predominantly in diabetes mellitus. Diabetic patients are predisposed because of the decreased phagocytic function of their neutrophils. Furthermore, the acidosis and hyperglycemia provide an excellent environment for fungal growth.¹ With fall in blood pH, there is an increased release of iron from transferrin that enhances hyphal growth.²

Chakrabarti et al, 2006 in their retrospective study of 178 cases of invasive mucormycosis (54.5% rhino-orbito-cerebral, 14.6% cutaneous, 9.0% disseminated, 8.4% gastrointestinal, 6.7% each of renal and pulmonary mucormycosis) showed

Fig. 2 – One of the lesions in the left lower lobe showed blood clots and appeared to be communicating with left main bronchus.

that 73.6% of cases had uncontrolled diabetes mellitus.³ Our patient was also a case of diabetes with poor compliance that lead to uncontrolled hyperglycemia and ketoacidosis.

Pulmonary mucormycosis in underlying diabetic, may present as fulminant invasive disease. Pulmonary form of disease commonly presents with fever and cough. Other features being dyspnea, malaise, chest pain and hemoptysis. However, none of the clinical features are specific or

Fig. 1 – Cut sections of both lungs show multiple cavitory lesions.

Fig. 3 – Aseptate, broad, fungal hyphae with wide-angled branching suggestive of mucormycosis in lung tissue. (H&E, ×400).

Fig. 4 – Histology of cavitory lesion of lung shows fungal hyphae invading lung parenchyma, cartilage and vessels. (H&E, ×200).

diagnostic for mucormycosis.⁴ In our case, patient complained only of minimal mucoid expectoration to start with but later on he developed fever.

The radiological picture of the disease has variety of non-specific pulmonary patterns. Pulmonary consolidation is a common finding followed by solitary nodule, diffuse lobar involvement, abscesses and cavitations.⁵ Chakrabarti et al, reported two cases of cavitory pulmonary mucormycosis.⁶ In this case the patient had perplexing deteriorating radiological findings, which were out of proportion to clinical condition.

The *Rhizopus* spp. especially *R. oryzae* has a particular predilection for vasoinvasion with subsequent thrombosis leading to extensive necrosis of the parenchyma and cavitory formation.⁷ Rupture of the vessels and erosion of the cavitory lesion into the bronchus leads to fatal massive hemoptysis. The patient developed sudden onset massive hemoptysis and succumbed. Post mortem revealed multiple cavitory lesions with one such cavity communicating with left bronchi. Usually cartilage is spared but in our case, there was extensive parenchymal infiltration and vasoinvasion along with cartilage infiltration, which shows the fulminant nature of the disease.

Diagnostic modality of pulmonary mucormycosis includes culture of sputum, bronchioalveolar lavage or pleural fluid. However, sensitivity of these modalities is very low. Definitive diagnosis is histological demonstration of tissue invasion by hyphae along with culture, for which percutaneous needle biopsy, open biopsy or bronchoscopic biopsy are advocated.⁸

Mucormycosis is a rare but potentially lethal fungal infection caused by fungi from the order of Mucorales. They are found on decaying organic matter and soil. Infection is acquired by inhalation of spores. The fungi appear as broad (10–20 μ in diameter), nonseptate hyphae with branches

occurring at right angles. Among the different agents of mucormycosis, *Rhizopus* spp. are the most commonly implicated agents causing human infections, and *R. oryzae* is the predominant species, being implicated in 90% of the reported cases of invasive mucormycosis.⁹ In our case, we isolated *Rhizopus* spp. probably *R. oryzae*.

Conclusion

Diagnosis of pulmonary mucormycosis is rarely made antemortem because of non specific clinical and radiological picture, aggressive nature of the disease, need for tissue to establish diagnosis and lack of awareness of the condition. High index of suspicion of fungal infection in appropriate setting, early diagnosis in consultation with an Infectious Disease Physician, prompt bronchoscopic biopsy for the histological diagnosis, treatment of underlying predisposing factors and an aggressive combined approach with surgical debridement and combined antifungal therapy is pivotal in improving patients' outcomes.

Conflicts of interest

All authors have none to declare.

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