CASE REPORT

A RARE CASE OF BILATERAL SPONTANEOUS TENSION PNEUMOTHORAX IN A PATIENT WITH MUCORMYCOSIS

Mahreen Sana, Maha Anwar, Faheem Mahmood Butt, Adnan Amir

Shaukat Khanum Memorial Cancer Hospital and Research Centre, Lahore Pakistan

ABSTRACT

Mucormycosis is an invasive fungal infection seen in immunocompromised hosts. Here a rare case of mucormycosis with pulmonary involvement followed by bilateral spontaneous tension pneumothorax is described. Bilateral spontaneous tension pneumothorax is a rare and fatal condition. We present a case of 3 years old child, diagnosed case of acute Leukemia. During the course of induction chemotherapy, he was hospitalized with fever and diarrhea. He was being managed on lines of neutropenic colitis. During the hospital stay, the child developed sudden respiratory distress and seizures. Chest X-ray showed bilateral spontaneous tension pneumothorax. Immediate bilateral chest tubes insertions were done. He was also electively intubated. After successful lung expansion, the trial of weaning off the ventilator was given and patient was successfully extubated. CT Thorax after lung re-expansion showed few pneumatoceles with no bronchopleural fistulous communication. CT Brain and para nasal sinuses showed fungal rhinosinusitis with intracranial extension. Nasal endoscopy and debridement of necrotic tissue was done. Tissue cultures showed the growth of mucor species. The patient was also started on amphotericin B that was later changed to Posaconazole. He responded well to anti-fungal treatment and there was no recurrence of pneumothorax.

Keywords: Mucormycosis, Tension pneumothorax, Bronchopulmonary fistula

BACKGROUND

Mucormycosis represents a group of fungal infections that can involve any organ. The fungus is found in soiled matter. Most commonly, the organs involved are the skin, paranasal sinuses, orbits, brain, lungs, and gastrointestinal tract.[1] Mucormycosis is known to cause life-threatening infections in immunosuppressed individuals like those with diabetes mellitus, hematologic malignancy, and solid organ or stem cell transplant recipients. Pulmonary mucormycosis is a rapidly progressive and devastating infection.[2] Early recognition is important to avoid complications. We present an unfortunate case of a child with pulmonary mucormycosis who developed bilateral spontaneous tension pneumothorax and became hypoxic. The patient was intubated, and chest drains were passed. Later, the growth of mucor was seen in nasal aspirate cultures. The patient was successfully treated with antifungals.

Correspondence: Dr. Mahreen Sana, Fellow Pulmonology Shaukat Khanum Memorial Cancer Hospital and Research Centre, Lahore Pakistan

Email: mahreensana@skm.org.pk

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CASE REPORT

A 3-year-old male child of Asian ethnicity, diagnosed having Pre – B acute lymphoblastic leukemia, was started on induction chemotherapy. On 23rd day of chemotherapy, he was admitted with fever, loose stools and few pustular lesions on lips. His complete blood count showed an absolute neutrophil count of 0. He was started intravenous piperacillin/tazobactam. After 4 days, his counts started recovering and the fever settled. He developed a seizure like activity on 5th day of admission that was followed by tachycardia and respiratory distress. His oxygen saturations dropped, and the ICU team decided to take him to ICU. Before shifting to ICU, his saturation dropped to 68 %, code blue was announced, and emergency intubation was done. Arterial blood gas showed respiratory acidosis with PH of 7.02 pre intubation. Chest X ray on arrival at ICU showed bilateral tension pneumothorax with a cavitary lesion in left lung (Figure-I). Immediate chest drains insertions were done on both sides.

His CT chest was done to see the underlying cause of the pneumothorax. CT chest revealed scattered cavitary lesions with ground glass haze which were suggestive of fungal infection, a reverse halo sign was present (Figure 2 a and b). However, based on radiological findings suspicion of pulmonary mucormycosis was high.

Child was started on empirical oral anti-fungal treatment with voriconazole, but he continued to spike

fever. Beta D Glucan was positive with value of 277 pg/mL (≥ 80 is positive) suggestive of fungal infection. His CT paranasal sinuses and CT brain were done to look involvement of infectious process. CT para nasal sinuses findings were compatible with fungal rhinosinusitis. CT brain showed an enhancing lesion in anterior cranial fossa that was suggestive of intracranial extension of the process. CSF studies came out to be normal. Voriconazole was switched to intra venous amphotericin B to broadly cover mold infection as there was cerebral extension of the infective process. ENT consultation was sought, and he underwent functional endoscopic sinus surgery. Necrotic tissue was removed and sent for histopathology along with bacterial and fungal cultures. Right sided maxillary enterostomy and ethmoidectomy was done. Histopathology of necrotic tissue showed necro-infalmmatory debris consistent with fungal infection. Ulcerated respiratory mucosa in background. Cultures of the specimen showed growth of mucor species (Figure-III). The patient responded well to treatment, became afebrile after 7 days.

His Chest X ray also showed good lung expansion, followed by removal of chest drains. The child was treated as a case of disseminated mucormycosis with rhino-cerebral and pulmonary involvement. He received 1.5 months of intravenous amphotericin B, and later switched to oral Posaconazole. CT chest showed good resolution of cavitary lesions after 5 months of treatment (Figure-IV). However, CT Para nasal sinuses showed resolution of changes after 3 months (Figure-V). Minimal mucosal thickening was noted in the paranasal sinuses. Child was continued on oral Posaconazole, and his chemotherapy was re-started with good tolerance. The child was planned to be kept on posaconazole till the end of his chemotherapy and until cancer comes in remission.

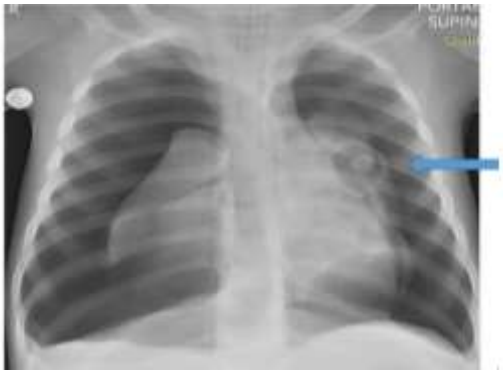
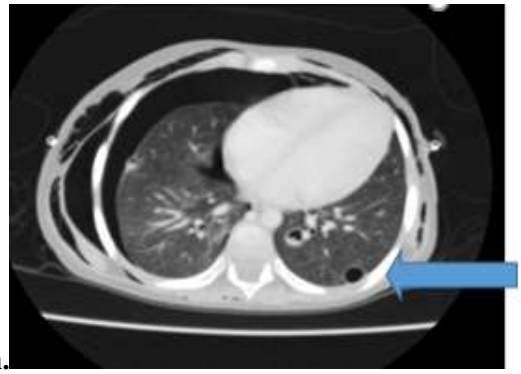


Figure-I: Chest X-ray showing bilateral pneumothorax and cavitary lesion with soft tissue density (arrow)



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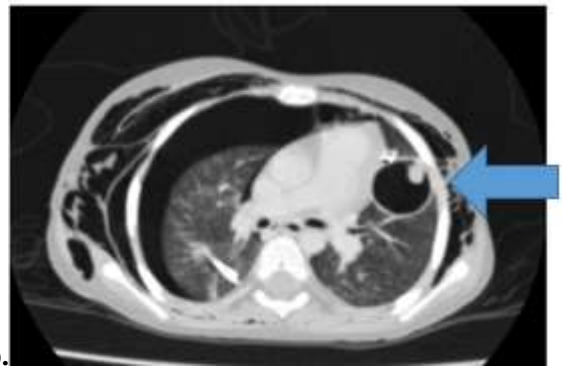
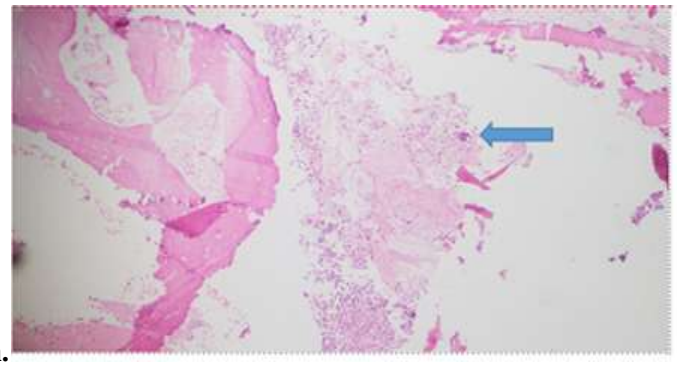


b.

Figure-II: (a and b): CT Chest showing extensive pneumomediastinum and bilateral emphysema, persistent pneumothorax, scattered cavitary lesions with soft tissue density (arrows)



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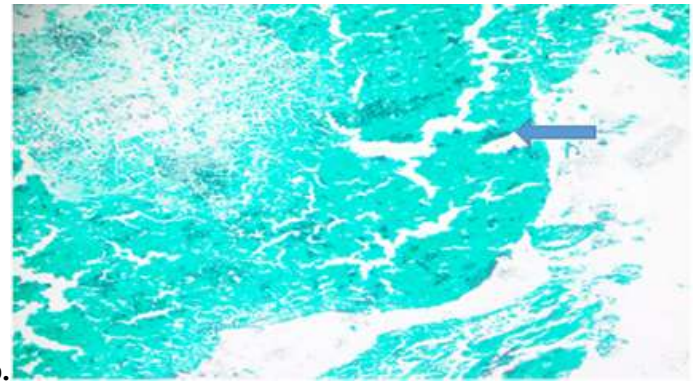

b.

Figure-III: a) Histopathology of nasal mucosa biopsy showing growth of mucor (arrow), b) Grocott's methenamine silver stain showing growth of mucor (arrow).

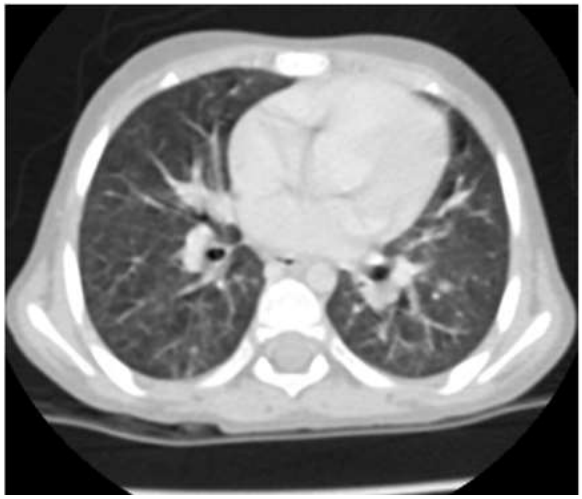

Figure-IV: CT Chest showing good resolution of cavitary lesions.

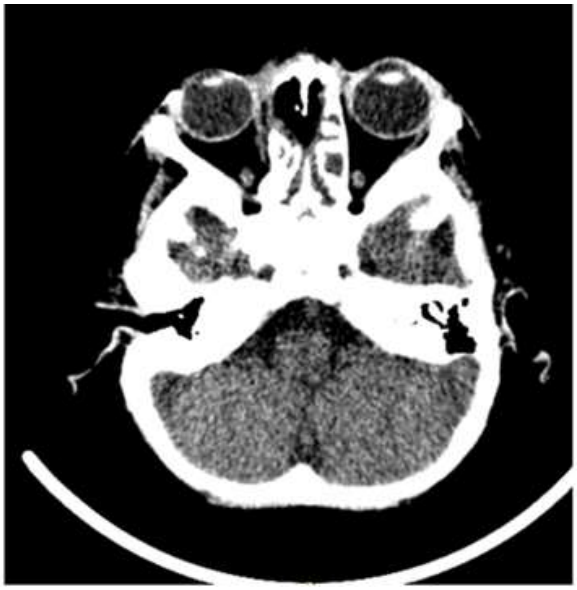

Figure-V: CT para nasal sinuses showing redemonstration of erosive changes in the cribriform plate along with changes of right maxillary enterostomy and ethmoidectomy. Minimal mucosal thickening noted in the paranasal sinuses.

DISCUSSION

The occurrence of pneumothorax in mucormycosis is rare with limited case reports in literature. We report a case of bilateral spontaneous tension pneumothorax due to disseminated mucormycosis, in a child who was immunosuppressed due to active chemotherapy. A case report from New Zealand, stated a patient with diabetes, end-stage renal disease, and sarcoidosis who was on steroids developed large hydropneumothorax due to mucormycosis. CT Chest showed nodular lesions. Bronchoscopy and BAL was negative for any organism. CT guided biopsy revealed growth of mucor.[3] He was successfully treated with amphotericin B, Posaconazole and drainage therapy like in our case. Another case reported from Cincinnati, Ohio included a 48-years old diabetic lady who presented with fever and chest pain. She became hypoxic and developed tension pneumothorax; CT chest showed a classical reverse halo sign. A chest tube was passed and the patient was treated with antibiotics for necrotising pneumonia. She further deteriorated, was intubated and passed away. Lung specimen biopsy on autopsy specimen showed mucor growth. This case highlights the importance of radiological diagnosis of mucormycosis by presence of reverse halo sign.4 Like in our case, bronchoscopy and BAL cultures were negative but presence of reverse halo sign was diagnostic of mucor alongwith growth of mucor in nasal biopsy specimen. A case report from India included a diabetic, alcoholic male who developed hydropneumothorax secondary to mucormycosis. CT chest later on confirmed presence of bronchopleural fistula due to mucor. The patient underwent pneumonectomy and Gomori methenamine silver stain showed aseptate hyphae that was suggestive of mucormycosis. This patient needed surgical management for broncho pleural fistula developed due to mucor.[5] A case of spontaneous pneumothorax by mucormycosis is also reported from USA that occurred in a patient who was COVID-19 positive. The patient underwent pigtail catheter insertion followed by treatment by amphotericin B. Pleural fluid cultures showed growth of mucor –Rhizopus species. Later-on, he was discharged on maintenance dose of Posaconazole.[6] A case report from Iran stated a patient of glomerulonephritis who was on immunosupressive therapy, he developed orbital edema and facial puffiness. During hospital stay he developed pneumothorax and was ventilated due to respiratory distress. Due to immunosuppressed state, he was treated for Pneumocystis jervocii pneumonia and only fluconazole was added for oral thrush. Later on, CT chest showed characteristic reverse halo sign and scattered pulmonary nodules with ground glass haze [7]. He was started on amphotericin B but unfortunately the patient could not survive. Tongue biopsy later showed growth of mucor. This case, like our case, had rhino-orbital mucormycosis alongwith pulmonary mucormycosis. This highlights the importance of early treatment of mucormycosis with presence of reverse halo sign and high clinical suspicion.

Mucormycosis represents fungal infections caused by genus Mucorales and can involve different organs including brain, paranasal sinuses, skin, lungs and gastrointestinal tract. Pulmonary mucormycosis represents 25 % of the cases of mucormycosis with mortality rates reaching up to>50%.[1] It is uncommon in healthy individuals and is seen in immunosuppressed population including those with uncontrolled diabetes, hematological malignancies, chronic renal failure, on immunosuppressive therapy and organ transplant recipients.[4] Pulmonary mucormycosis may have nonspecific symptoms such as fever, cough, chest pain or hemoptysis due to invasion of vasculature. It may have a subacute presentation with extensive subcutaneous emphysema or spontaneous pneumothorax as in our case.[8\] It is easily misdiagnosed due to non-specificity of symptoms. Radiological appearance of pulmonary mucormycosis may vary like its clinical manifestations ranging from consolidation, nodules and cavities.[9]

It remains challenging to diagnose pulmonary mucormycosis. Histopathology on tissue cultures remains the gold standard for diagnosis. As cultures obtained on bronchoalveolar lavage can be negative. Mucormycosis species appears as non-septate hyphae with right angle branching on histopathology.[10\] Tissue sampling may be time consuming and may delay diagnosis. Thus, imaging plays a significant role in diagnosis. CT features may vary from consolidations, pulmonary nodules to Reverse Halo sign. Reverse halo sign is thought to be specific for mucormycosis, which is described as a consolidation with a central ground glass haze.[11] Pneumothorax is a rare finding of mucormycosis. Whenever pneumothorax is suspected due to mucormycosis, further diagnostic imaging and pathology should be done to confirm diagnosis of invasive fungal infection, as delaying it results in increased mortality.[7] Our patient had characteristic cavitary lesions, reverse halo sign on his CT chest, that led to our suspicion of pulmonary mucormycosis along with rhino-cerebral mucormycosis.

Once the diagnosis of mucormycosis is established, treatment should be started without further delays (<6 days). Amphotericin B, a polyene antifungal, is the choice of drug for mucormycosis. However, drug susceptibility is different for different mucor species. Drug concentration in the lungs is lower than in other tissues. Hence, higher doses are needed to treat pulmonary mucormycosis with amounts reaching >10mg /kg. Liposomal amphotericin B is the preferred preparation.[12] Due to necrosis associated with this infection, drug penetration is also compromised. For this reason, surgical debridement is done along with antifungal therapy. Studies have shown better outcomes when surgical treatment is combined with medical therapy. Unless surgery is contraindicated or there are patient dependent risk factors, surgical debridement is advised to combine with antifungal therapy.[13]

For patients who do not tolerate amphotericin B or are not improving despite being on optimal therapy, a triazole fungicide Posaconazole has shown good outcomes. Posaconazole can be used as salvage or maintenance therapy. It can be used in patients who need long term therapy.[14] Isavuconazole is a new triazole, that has shown good antifungal activity against mucormycosis. However, Voriconazole is not shown to be useful in treating mucormycosis. Some studies have suggested use of liposomal amphotericin B in combination with echinocandins (Caspofungin), however there is no data available to use two antifungals as first line therapy.[15]

The duration of treatment varies according to patient related factors. Ideally, it should be continued until complete clinical and radiological recovery has occurred, also there is good control of immunosuppressed state.[14,15]

CONCLUSION

Pulmonary mucormycosis is a rare condition but has high mortality. Whenever it is suspected, physicians should do appropriate investigations promptly to avoid unnecessary treatment with voriconazole. Early diagnosis of mucormycosis is challenging and delayed due to non-specific manifestations. Histopathology is time-consuming. Delaying diagnosis and treatment has high mortality rates. Presence of spontaneous pneumothorax in addition to reverse halo sign and increased nodularity with ground glassing should raise suspicion of mucormycosis specially in immunocompromised population. Once diagnosis is established, appropriate anti-fungal therapy should be started immediately, also surgical options wherever applicable should be used as an adjunct to improve outcomes and reduce mortality in patients with mucormysosis.

CONFLICT OF INTEREST

There is no conflict of interest to declare by any authors.

AUTHOR CONTRIBUTION

Mahreen Sana: Literature search, study design, data analysis, drafting

Maha Anwar: Literature search, data collection, concept, drafting

Faheem Mahmood Butt: Data collection, literature search, concept

Adnan Amir: Literature search, analysis, concept

REFERENCES

1. Luo, Z., Zhang L. Diagnosis and treatment of pulmonary mucormycosis: A case report. Exp Ther Med. 2017; 144: 3788-91. DOI: 10.3892/etm.2017.4986
2. Reid G, Lynch JP, Fishbein MC, Clark NM. Mucormycosis. Semin Respir Crit Care Med. 2020; 41(1): 99-114. DOI: 10.1055/s-0039-3401992
3. Liu Q, Good W, Salmon A, Gow N, Griffith P. A rare case of pulmonary mucormycosis complicated by hydropneumothorax, successfully treated with non-surgical therapies. Respirol Case Rep. 2022; 10(6): e0959. DOI: 10.1002/rcr2.959.
4. Khawar MU, Tiwana M, Sengupta R, Wang J, Indihar V. The reverse halo sign and spontaneous pneumothorax due to pulmonary mucormycosis. Respirol Case Rep. 2021; 9(3): e00712. DOI: doi: 10.1002/rcr2.712
5. Padmanaban E, Kannan P, Amirthalingam U, Pitchumani S, Padma R. Pulmonary mucormycosis presenting as central bronchopleural fistula—a case report with review of literature. Egypt J Radiol Nucl Med. 2021; 52: 161. DOI: doi.org/10.1186/s43055-021-00546-6
6. Ahmad Batool A,Mendoza N, et al. COVID 19 Associated pulmonary mucormycosis presenting as spontaneous pneumothorax: A rare presentation. Chest. 2022; 162(4): A462. DOI: 10.1016/j.chest.2022.08.354
7. Movahed MM, Hosamirudsari H, Mansouri F, Mohammadizia F. Spontaneous pneumothorax followed by reversed halo sign in immunocompromised patient with pulmonary mucormycosis. Med Mycol Case Rep. 2015; 9: 22-25. DOI: 10.1016/j.mmcr.2015.07.003
8. He J, Sheng G, Yue H, Zhang F, Zhang HL. Isolated pulmonary mucormycosis in an immunocompetent patient: A case report and systematic review of the literature. BMC Pulm Med. 2021; 21(1): 138. DOI: doi.org/101186/s12890-021-01504-8
9. Lee FY, Mossad SB, Adal AK. Pulmonary mucormycosis: The last 30 years. Arch Intern Med. 1999; 159(12): 1301-9. DOI: doi101001/archinte159121301
10. Hernández JL BC. Mucormycosis. [Updated 2022 Jun 21]. StatPearls. Treasure Isl StatPearls Publ 2022 Jan. Available from: https://www.ncbi.nlm.nih. gov/books/NBK544364/
11. Hammar MM, Madan R, Hatabu H. Pulmonary mucormycosis: Radiologic features at presentation and Over Time. AJR Am J Roentgenol. 2018; 210 (4): 742-7. DOI: 10.2214/AJR.17.18792
12. Fernandez JF, Maselli DJ, Simpson T, Restrepo MI. Pulmonary mucormycosis: What is the best strategy for therapy? Respir Care. 2013; 58(5): e60-3. DOI: 104187/respcare02106
13. Lin E, Moua T, Limper AH. Pulmonary mucormycosis: Clinical features and outcomes. Infecttion. 2017; 45(4): 443–48. DOI: doi.org/10.1007/s15010-017-0991-6
14. Yuan F, Chen J, Liu F et al. Successful treatment of pulmonary mucormycosis caused by Rhizopus microsporus with posaconazole. Eur J Med Res. 2021: 26(1): 131. DOI: 101186/s40001-021-00602-x
15. Skiada A, Lass-Floerl C, Klimko N , Ibrahim A, Roilides E, Petrikkos G. Challenges in the diagnosis and treatment of mucormycosis. Med Mycol. 2018; 56 (1): S93-S101. DOI: 10.1093/mmy/myx101