

# Mucormycosis case essay sample



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Mucormycosis is a rare but highly aggressive and a fatal infection that affects immunocompromised patients. Mucormycosis infections have increasingly become very common. The survival of such infections is also very poor. Iron metabolism plays a very important role in regulating mucor infections.

Deferoxamine predisposes patients to mucormycosis by supplying the fungus containing iron. From these findings, it is possible to treat the infection by using iron chelator as long as the chelator does not supply the fungus containing iron inappropriately. Previous information reveals that the concept of high-dose liposomal amphotericin is the most used monotherapy for mucormycosis (Suresh, 2003). There are, however, several other therapeutic strategies are available. The options include the combination therapy using lipid amphotericin with an azole or an echinocandin (posaconazole or itraconazole) or with all the three.

The main principles of therapy for mucor infection remain rapid diagnosis, urgent surgical debridement, early diagnosis, systemic antifungal treatment and reversal of underlying predisposition. Mucormycosis is known to be the second most frequent mold infection in immunocompromised patients and progresses rapidly in both immunocompetent and immunocompromised individuals. The diagnosis of mucor infection in both laboratories and clinics remains difficult which has led to high mortality rates and unsatisfactory treatment. The most common genus that causes human Mucormycetes is the *Rhizopus*, followed by genera such as *Lichtheimia* and *Mucor* (Jiménez et al., 2002). On the left bottom lung, the lung is eaten away. This is shown by the whitish surface of the lung. The left bottom side of the left lung has been eaten away, showing possible infection by pneumonia.

It is very hard to diagnose pneumonia because at first, it may appear as flu or cold. Pneumonia infection affects one of the lungs, as shown in the picture. Bacteria, fungi, or viruses can cause the infection. It causes inflammation of the lung's air sacs or alveoli. The alveoli are filled with pus or fluid, which makes it difficult to breathe. Symptoms of pneumonia range from mild to life threatening. Pneumonia has been discovered to be the greatest cause of death in the world other than any other disease. The type of organisms or the cause of inflammation determines the severity of pneumonia. Other factors that affect the severity of pneumonia include the person's general health and person's age. There are several types of pneumonia. They include bacterial pneumonia, viral pneumonia, mycoplasma pneumonia, and other types of pneumonia. The bacterial pneumonia affects anybody regardless of the age, and develops on its own or after a serious flu or cold. Bacterial pneumonia is mostly caused by streptococcus. Respiratory viruses cause viral pneumonia.

Pneumonia lasts for a short time; however, the flu virus causes viral pneumonia to be fatal or severe. Neither bacteria nor viruses cause mycoplasma pneumonia. However, they have the traits of both virus and bacteria. Mycoplasma pneumonia is usually mild and is most common in younger adults and older children. Some of the symptoms of pneumonia include shaking skills, chest pain, fever, muscles aches, rapid breathing, rapid heartbeat, difficulty breathing, nausea and breathing and dry cough (Musher, 1992). Looking at the lab results, the pH which stands at 7.50 elevated. This could be as a result of Metabolic alkalosis. PaO<sub>2</sub> at 59 mm Hg on room air is low. This is an indication that the lungs are not receiving

adequate levels of oxygen. PaCO<sub>2</sub> is also low and is an indication of Hyperventilation. HCO<sub>3</sub> levels are also high and this is an indicator that the body is not able to maintain its acid-base balance. WBC are high giving a clear indication that the body is struggling to fight off infection. The level of lymphocytes is low and this is a pointer to a deficiency in the immune system.

The treatment prescribed for pneumonia depends on the type of pneumonia present and its severity. The general treatment of pneumonia includes taking all the medications prescribed and participating in follow up care. A chest x ray is taken to ensure that pneumonia is successfully treated. Bacterial pneumonia is treated by use of antibiotics, which should be used as directed. If the use of the antibiotics is stopped before treatment, the pneumonia can return. Viral pneumonia is treated by use of antiviral drugs. Antibiotics are useless in this case (Menendez et al., 2004).

## References

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POST2

1. Mucormycosis is a very rare infection of the lungs. Mucor is a fungal infection found usually in immunocompromised patients and caused by the group of fungi called Mucoromycotina (Badior, Trigo, Eloy, & Guimaraes, 2013). This fungus is usually found in soil, and organic dying material including leaves, compost piles, and rotten wood (Centers for Disease Control and Prevention, 2012). The disease can also be found in otherwise healthy patients as well, but risk factors include uncontrolled diabetes, cancer, organ transplant patients, neutropenic patients, and patients with skin trauma (Centers for Disease Control and Prevention, 2012). The infection is caused by inhalation of the spores, which then leads to the infection within the lungs (Centers for Disease Control and Prevention, 2012). Symptoms of a lung infection include fever, cough, chest pain, and shortness of breath and the infections spreads by resulting in necrosis of the tissue leading to the formations of empty spaces and hemoptysis (Centers for Disease Control and Prevention, 2012). Nursing interventions for mucor are similar to those for patients with pneumonia and include oxygen therapy, antibiotic administration, and pain control. Nurses can help with breathing by changing position of the patient as well as titrating the oxygen per doctors orders.

1. Majority of the lab values are within normal limits. The WBC count is elevated which is a sign of infection occurring; the body is trying to fight off the infection. The other abnormal lab results are the arterial blood gas

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values, pH and HCO<sub>3</sub> is elevated, while pCO<sub>2</sub> and pO<sub>2</sub> are lower than they should be. In this case it is expected for the arterial blood gases to be off because it is an infection of the lungs causing breathing to be labored and not enough oxygen to be received. These lab values are indicative of respiratory alkalosis where the body is retaining too much CO<sub>2</sub> because the patient is unable to breathe the excess out. This is also occurring because the lung capacity has been decreased due to the infection. Respiratory alkalosis usually occurs from hyperventilation and in patients with pneumonia like sickness it occurs from the hypoxic drive to breathe and not the normal drive dependent on CO<sub>2</sub>.

1. Medications that can be used to treat Mucor include amphotericin B, posaconazole, and other “azole” medications (Medscape, 2014).

Amphotericin B is the primary medication given and is given in high doses. Posaconazole is the second medication given and is an antifungal, if this does not work other anti-fungals are given next including fluconazole or voriconazole (Medscape, 2014). Medical treatments that will be ordered by the physician will include breathing treatments and oxygen therapy, an infectious disease consult, administering IV fluids to keep the patient hydrated and avoid hypotension, and a nutrition consult since these patients will most likely have a decreased appetite. If this patient was immunocompromised important infection control measures must be taken as well to prevent further infection.

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### POST3

Mucor is a species of a Fungi germ that gets into the lung causing a fungal pneumonia. This particular germ is considered opportunistic in general. Meaning that conditions that would make the body less able to protect itself normally are present and the germ is able to overcome the weakened immune system ; conditions that cause immune system decline include cancer, chemotherapy, impaired cough reflex, or human immunodeficiency virus are examples of health problems that put the body at risk for an opportunistic germ to gain entrance and infect a lung or lungs. It is likely that the mucor germ entered the lungs of a weakened immune system during breathing. (NIH, 2014)

Treatment: Respiratory assessment, Sputum Culture & Sensitivity, chest x-ray, arterial blood gas, Adjuvant care, supplemental oxygen, antimicrobial therapy (Antifungal) per physician order. Medications: Oxygen to increase circulating oxygen, Antifungal to decrease germ ability to grow and to infect the body (based on sputum C& S), breathing treatment to loosen thick mucus to make easier to cough up. Nursing Intervention: Educate patient

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about plan of care, administer medications, encourage position of comfort (High Fowler), ensure that ordered tests are performed, rest to allow the body to recover, fluids and balanced diet to promote hydration, to increase energy and to build cells. (Gulanik, 2007) Laboratory blood test results include ABG's:

Abnormal results include: (High 29meq/L) HCO<sub>3</sub>, (Low normal 1.7mg/dl) Mg, (Low Male 13.7g/dl) Hb, (Low Male 39.4%) Hct, (High 15,200) WBC, (Low 10%) Lymphocytes, (High 7.50) pH, (Low 59) PaO<sub>2</sub>, (Low 25) PaCO<sub>2</sub> ABG interpretation: Metabolic Alkalosis with Low PaCO<sub>2</sub>. PaO<sub>2</sub> (Manuel, 2014) on room air is very low (oxygen needed)

Blood Test results: Red blood cells a little low indicating less ability to carry oxygen from lungs to rest of body, lymphocytes are low indicating weakened immune response, white blood cells are high indicating infection. Abnormal results indicate imbalance in homeostasis. An opportunistic germ has overcome the body's normal defenses due to the person's illness which has decreased the immune response. Inflammation is a sign of an autoimmune condition and infection is an injury to tissue. References:

<http://www.nhlbi.nih.gov>

<http://evolve.elsevier.com> (Gulanik, 2007)

<http://www.manuelsweb.com>

POST4

Mucor is a fungus that can be found in decaying vegetables, fruits, and plants and is located in the soil. It is also considered ubiquitous, which

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means it is ever present and found all over the world; including laboratories. It is considered fungi not a bacterium. Mucor is a fungi in a group of infections referred to as zygomycosis. (Blake, n. d). The most common predisposing factors in someone with this type of fungus is immunocompromised patients undergoing chemotherapy. Most often it's a leukemia patient. The other is a diabetic in ketoacidosis. Other research shows that iron metabolism plays a central role in regulating mucor infections and that deferoxamine predisposes patients to this by inappropriately supplying the fungus with iron. These findings raise the possibility that iron chelator therapy may be useful to treat the infection as long as the chelator does not inappropriately supply the fungus with iron. (Blake, n. d) The pathophysiologic progression of the infection into pneumonia happens when a patient inhales the spores.

Hematogenous dissemination occurs in the immunocompromised host. (Spellberg, Edwards, pg 567) In this case our patient's WBC count is elevated showing an infectious process. The lymphocyte count is extremely low showing the body is not making WBC's very fast which could indicate an auto immune process or immunocompromised patient. Without more information, it is difficult to determine. The patient very well may be diabetic with an elevated fasting glucose like we see. If that is the case, mucor thrives in a diabetic. The ABG's indicate an uncompromised Respiratory Alkalosis which would be normal in a patient with pneumonia. The reason for his is that the hypoxic drive is not allowing exhalation of CO<sub>2</sub>. Respiration, or the exchange of oxygen and carbon dioxide across the alveolar-capillary membrane, is due to pressure differences across the membrane.

In a compromised patient this can't occur. On the chest x-ray we see pneumonia clearly, but there is a nodule (or an ECG lead) showing in the upper right lobe of the patient which could be caused from the mucor. If it develops into a mucormycosis, histopathological assessment with a biopsy is the best way to diagnose. ). Angioinvasion results in necrosis of tissue parenchyma, which may ultimately lead to cavitation and/or hemoptysis, which may be fatal if a major blood vessel is involved. (Spellberg, Edwards. pg. 564). Nursing interventions would include: 1) monitoring frequent vital signs to try and avoid sepsis, electrolyte imbalance, and hypoxemia while keeping fever down. 2) Maintain oxygen therapy as prescribed by physician which will keep the patient more comfortable. 3) Position patient accordingly (most likely semi or high fowler's to help promote breathing comfort 4) Maintain isolation on the room for safety of staff and visitors. 5) Collaborate with respiratory therapy for timely treatments of patient which may include percussion, postural drainage/physiotherapy.

We know the patient has an elevated glucose which could be showing diabetes. The elevated WBC count shows infection. Other lab work results are relatively normal. Calcium is very slightly low, but not concerning. Above the ABG's was discussed. The physician knows that mucor can be deadly and therefore will treat aggressively. Some of the medications he may try include: 1) Amphotericin, Itraconazole or Posaconazole. Depending on the virulence of the organism all three medications may be ordered. It is hypothesized that hyperbaric oxygen might be useful for treatment in conjunction with standard therapy because higher oxygen pressure improves the ability of neutrophils to kill the organism. Each of these is an antifungal

agent that permeates the membrane of the organism and produces electrolyte leakage which leads to the fungal cell death.

The physician will most likely provide antiemetics for the patients taking these drugs; such as Phenergan or Zofran because the incidence of nausea and vomiting is high; even though they are administered IV. If a surgical excision of the fungus can be done, it is optimal for treatment of the organism. Other medications would be looked at. If the patient were taking corticosteroids, this would most likely stop because they can increase the survivability of the organism. The physician will most likely get an infectious disease consult. The physician will also have a dietitian consult patient regarding nutrition and keeping blood sugars under control. There would be further evaluation with a Hgb A1c ordered as well as kidney and liver functions.

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#### POST5

Mucor is a common fast growing mold or a fungus which is found both indoors and outdoors. It is usually seen in soil and associated with decaying organic matter, such as leaves, compost piles, or rotten wood and vegetables and fruits. Mucor produces spores, and when these spores get ruptured and dispersed, they go airborne. When people are exposed to this

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fungus, they get infected. These spores can travel through the air, water, and on a host. Mucormycosis or zygomycosis is a fungal infection which can affect the lungs, brain, sinuses and nervous system. This infection is more common in people with weakened immune system and immunocompromised patients. It also seen in poorly controlled Diabetic patients, transplant recipients, cancer, and AIDS patients (CDC, 2012). Pulmonary mucormycosis can progress rapidly and spread to chest cavity, heart and brain.

This kind of pneumonia happens when a person is inhaling the spores through bronchioles and alveoli. Mucormycosis pneumonia is characterized by tissue infarction and acute suppurative inflammation. Nursing intervention includes providing oxygen to the patient via mask or nasal cannula according to the doctor's order and maintaining the oxygen level to be above 90%. Keep the patient in a semi or high fowler's position according to the patient's comfort. Administer appropriate anti-fungal medication to minimize the spread of infection and restore the pulmonary function. The infection disease protocol should be followed according to the hospital policy to avoid getting other patients infected. The WBC count is 15, 200/mm<sup>3</sup>, which is elevated indicating an infection in the body. Decreased lymphocyte count may indicate immune suppression. There are a lot of reason which could cause neutropenia which includes auto immune disease, AIDS, blood cancer and certain inherited diseases. Slightly elevated fasting sugar can be caused by infection.

The body naturally produces more sugar to fight against the infection. ABG results are abnormal, PaO<sub>2</sub> is 59 mm Hg, PaCO<sub>2</sub> is 25 mm Hg, pH is 7. 50 which is high. HCO<sub>3</sub> 29 meg/L is also high, indicating hypoxemia and

respiratory alkalosis. Respiratory alkalosis is usually seen in patient with pneumonia. Chest X-ray shows consolidation in the lungs. Fast and aggressive treatment method is needed for mucormycosis pneumonia because of its rapid progression. Some patients need surgical and medical treatment. Surgical debridement of infected area is necessary for better survival.

Antifungal medication like Amphotericin B can be used for treating this kind of diseases to minimize or stop the progression of the disease. This medication can be given intravenously or orally (CDC, 2012). Other antifungal agents used in the treatment of fungal pneumonia are fluconazole (Diflucan), itraconazole (Sporanox), flucytosine (Ancobon), and ketoconazole (Nizoral). Newer antifungal agents, such as the third-generation triazoles or the echinocandins, are more tolerable than amphotericin B or its liposomal preparations are and may even be more effective in first- or second-line treatment (Medscape, 2013). Another treatment is hyperbaric oxygen treatment which is helpful in certain conditions.

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