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AN INTERESTING CASE OF PULMONARY ASPERGILLOSIS INFECTION SUPERIMPOSED ON COVID-19 INFECTION AND ITS IMPLICATIONS ON TREATMENT: A CASE REPORT

Radiodiagnosis

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ABSTRACT

COVID-19 (coronavirus disease 2019) is an infectious viral disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Since the first cases detected in Wuhan, China in December, 2019, the virus has spread globally and was declared pandemic by World Health Organization (WHO) on 11th March, 2020.

Lungs tend to be primary site of involvement of the virus. Pulmonary manifestations range from mild asymptomatic involvement with spontaneous resolution to severe life-threatening involvement requiring prolonged hospitalization. Elderly people with preexisting comorbidities and impaired immunity tend to be affected more severely. Some require prolonged hospitalization with ventilatory support in order to maintain blood oxygen saturation. These people in turn are often at increased risk for developing superimposed infections, especially hospital and ventilation acquired pneumonia and other infections.

We present an interesting case of an elderly male with COVID-19 infection who developed Pulmonary Aspergillosis while on treatment for COVID-19 infection.

KEYWORDS

COVID-19, Pulmonary Aspergillosis, Computed Tomography, Hospital acquired Infection

- **CASE REPORT**

A 65 years old male patient presented to hospital with complains of high-grade fever, body ache, breathlessness, coughing and headache for a period of 8-10 days. The patient has a past history of pulmonary tuberculosis 15 years back for which he had completed DOTS regimen.

Physical examination revealed a pulse rate of 100/min, temperature of 98°F, blood pressure of 110/70 mmHg and SpO_2 of 90% on room air. The typical clinical picture led to high suspicion for COVID-19 infection. An RT-PCR test was done and preliminary chest X-ray was obtained. RT-PCR test turned out positive and chest X-ray revealed severe involvement of bilateral lung parenchyma in the form of multiple patches of radiopacities scattered diffusely in bilateral lung fields forming areas of dense consolidation. The person was a truck driver by profession and infection was presumed to be acquired as a result of frequent travelling. Patient's mother also had mild fever for about a week and was tested by RT-PCR test, which turned out to be positive too.

The patient was immediately put on O_2 support via face mask; however, because of failure to maintain SpO2 and poor ventilatory efforts, person had to be intubated. He was admitted in Intensive Care Unit (ICU) and COVID-19 treatment was started immediately.

Preliminary investigations revealed slightly reduced hemoglobin level (12.9 mg/dl), leukocytosis (10500/mm^3) with increased neutrophils and reduced lymphocytes, raised D-Dimer level (674 ng FEU/ml), elevated CRP level (61.34 mg/L), elevated Interleukin-6 level (10.8 pg/ml), slightly elevated SGPT level (41.7 IU/L) and a normal serum creatinine level (1.20 mg/dl). 2-D Echocardiogram revealed a borderline LVEF of 55%.

HRCT Thorax with CT Angiography was obtained to determine the exact degree of involvement of lung parenchyma. Findings included changes of viral pneumonitis in the form of multiple confluent areas of ground glass opacifies with interstitial thickening in bilateral lung parenchyma, predominantly in bilateral lower lobes. Bilateral upper lobes revealed fibro-calcified, fibro-cavitary and bronchiectatic changes consistent with sequelae of old Koch's infection. CT Angiography did not reveal any evidence of pulmonary thromboembolism.

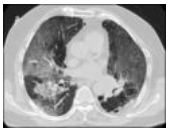

Fig 1: Changes of Viral Pneumonitis in the form of confluent areas of ground glass opacification

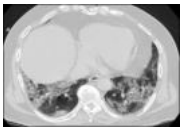

Fig 2: Changes of Viral Pneumonitis in the form of confluent areas of ground glass opacification

Patient failed to show any significant improvement while on treatment with intubation for 22 days. On 23rd day of admission, patient developed hemoptysis in the form of blood-stained aspirate. A chest X-ray was obtained which showed a suspicious radiopacity in left upper lung zone with adjacent radiolucency (Monod sign in retrospect) in addition to patches of viral pneumonitis. An emergent HRCT Thorax was obtained in an effort to find the exact cause of hemoptysis. Repeat HRCT Thorax showed increasing degree of changes of viral pneumonitis; however, also revealed newly developed soft tissue density lesions in left upper lobe cavities with surrounding crescentic halo of air. The radiological picture was suggestive of superimposed fungal infection, aspergillosis was more likely.

Aspergillus antibody test as well as sputum stain and culture for fungus were obtained, which turned out to be positive and a diagnosis of superimposed pulmonary aspergillosis was confirmed.

Patient was started on intravenous Voriconazole for fungal infection along with COVID-19 treatment. Patient was still on same treatment regimen at the time of submission of this case report.

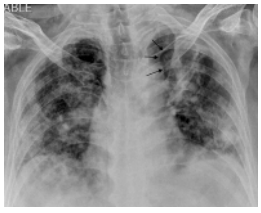

Fig 3: Monod sign of Aspergillosis with Viral Pneumonitis

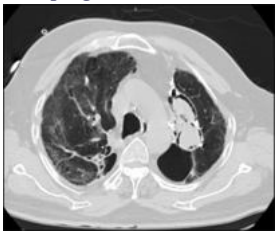

Fig 4: Axial section with Aspergillosis

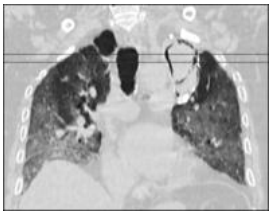

Fig 5: Coronal section with Aspergillosis

- **DISCUSSION**

COVID-19 is a viral infection caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) with primary site of involvement being lungs. Infliction by the virus results in initial inflammation with eventual damage to lung parenchyma leading to pulmonary fibrosis. Infection can also incite coagulopathy with resultant predisposition to thrombosis, including pulmonary thromboembolism which increases infection relation morbidity and mortality. Damage to pulmonary parenchyma affects the ability of lungs for gaseous exchange which results in hypoxia and dyspnea. Thus, severe involvement of lungs can result in inability to maintain adequate oxygenation of blood requiring ventilatory support. Prolonged hospitalization and prolonged ventilation can in turn predispose the patient to several other hospital and ventilation acquired infections, which increases morbidity.

Pulmonary fungal infection is one such superimposed infection that may be acquired on prolonged hospitalization. Manifestations of the same can range from simple colonization of preexisting cavitary lesions to severe life-threatening airway or pulmonary vasculature invasion.

Varied manifestations of pulmonary aspergillosis, in general, are as follows:

- **HYPERSENSITIVTY REACTION YO FUNGAL ANTIGENS:**

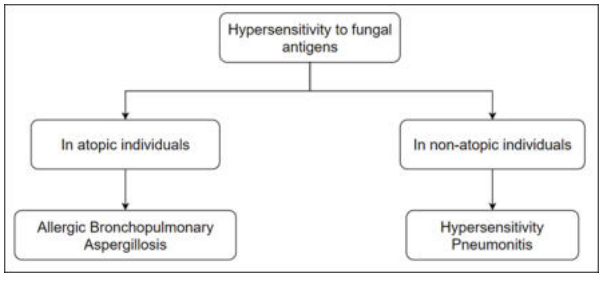

Fig 6: Fungal Infections in Hypersensitive Individuals

Allergic bronchopulmonary aspergillosis arises from hypersensitivity reaction to inhaled spores or germinating hyphae and usually occurs on background of other atopic conditions. Inhaled spores tend to germinate in proximal airways with further mucosal injury and mucus production, ultimately leading to bronchiectasis and mucoid impaction.

It is marked radiologically by central cystic or varicoid bronchiectasis filled with high attenuation mucoid impaction of dilated bronchi. There is resultant thick branching perihilar densities, called as **Gloved Finger appearance**[1].

Bronchioles distal to dilated bronchi may also be distended with mucus and show broncho-centric nodules and mosaic attenuation.

Hypersensitivity reaction to fungal antigens occur in non-atopic individuals. It can be classified as acute, subacute and chronic. Acute form is marked by centrilobular nodules, large areas of ground glass opacification and consolidation with mosaic attenuation due to air trapping, marked in lower lobes. Chronic stage is marked by superimposed fibrosis in the form of interlobular and intralobular septal thickening, tractional bronchiectasis, emphysema and honeycombing[2,3,4].

- **ASPERGILLOMA:**

An inert colonization of pre-existing cavitary pulmonary lesion from other causes, usually tuberculosis, sarcoidosis, pneumatoceles, bronchogenic cysts etc. Imaging findings include well defined rounded or oval lesion, partially occupied by fungal ball with resultant surrounding air crescent sign. Fungal ball is mobile and moves to dependent position on changing position.

Sometimes, it can evolve to complex aspergillosis with enlargement of cystic lesion containing fungal ball and development of surrounding consolidation, new cavitation and pleural thickening[5,6,7].

- **IN IMMUNOCOMPROMISED PATIENTS:**

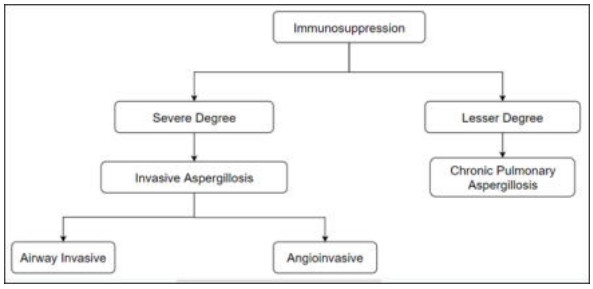

Fig 7: Fungal Infections in Immunocompromised Individuals

Angioinvasion is marked by central well defined and dense radiopacity with surrounding ground glass opacification (representing alveolar hemorrhage) or a halo (representing coagulative necrosis). Lesions progressively coalesce with resultant confluent consolidation. Air crescent sign in angioinvasion is marked by development of circumferential or crescentic area of radiolucency within a patch of consolidation and needs to be differentiated from cavitating neoplasm, bacterial pneumonia, BOOP etc.[8,9,10]

Airway Invasion can affect upper or lower respiratory tract and present as nodular thickening of tracheal and bronchial walls with centrilobular nodules in tree-in-bud pattern representing endobronchial spread with surrounding ground glass opacification and patches of consolidation.[11,12,13]

- **CHRONIC PULMONARY ASPERGILLOSIS:**[14,15]

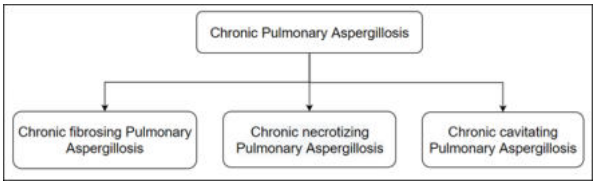

Fig 8: Chronic Pulmonary Aspergillosis

CONCLUSION

The reported case provides important teaching points with regards to clinical and radiological findings of Pulmonary Aspergillosis, which is a relatively rare clinical condition. Early diagnosis and prompt management of this condition is essential since it can lead to fatal outcomes. Adequate knowledge on radiological findings of the condition in conjunction with clinical presentations not only enable a correct diagnosis and meaningful management of Pulmonary Aspergillosis but also rule out other diagnostic entities, which may have a similar clinical presentation. The rarity of this condition prompted us to report this case.

CONFLICTS OF INTEREST

The author declares that there are no conflicts of interest regarding the publication of this paper.

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