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Original Research Article

MRI Evaluation of Cases of Mucormycosis after Covid-19

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Abstract

Introduction: COVID-19 spread was due to the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). Even today, COVID cases are being continually recorded. On this basis, it can be said that there is still the danger of COVID-19 cases getting increased at a rapid rate. There is no way of distinguishing the clinical findings and radiological findings of secondary fungal infection from that of COVID-19 pneumonitis and pneumonia.

Aim: To Assess the MRI Evaluation of Cases of Mucormycosis after COVID-19".

Material and Methods: In the current study, the researcher conducted an observational study at Pacific Medical College, Udaipur, Rajasthan, India. Data for all the confirmed mucormycosis cases among patients with and without COVID-19 reported from September 2020 to December 2020, for the current study was collected. The researcher used SPSS Statistics 21.0 for performing an analysis of the data obtained from the health care centre. The descriptive statistics were measured and analysed using frequencies, mean, standard deviations, and median.

Results: Out of the 286 cases, 65% (N = 185) had CAM (COVID-19 Associated Mucormycosis), with the mean age of 52 (SD = 16) years. Furthermore, 75% (N = 214) of the entire study population was male; and the remaining 25% (N = 72) were female. The prevalence of CAM was 0.28% and the range was 0.04% to 0.60%; on the other hand, CAM prevalence in ICU patients was determined to be 1.9% and the range was o.68% to 2%.

Conclusion: From the current results, it can be concluded that Uncontrolled Diabetes Mellitus, found to be among 63% of the participants, was one of the common diseases in both CAM as well as non-CAM groups. In addition, the rhino-orbital area was among the most well-known sites of mucormycosis, with 58% participants, followed by rhino-orbital-cerebral, pneumonic, and other such areas.

Keywords: Coronavirus, Fungal Infections, Mucormycosis, COVID-19

Introduction

Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) is the prime reason for the widespread of the 2019 novel coronavirus disease, also known as COVID-19[1]. Even though the first human case to be infected with the said virus was detected back in December 2019, the world is yet to find a permanent and effective solution to combat the disease. Although the pandemic of COVID-19 has been on rise since late 2019, yet its number of cases are increasing on a very rapid rate[2]. Second wave of the pandemic has resulted in panic and chaos in many parts and countries of the world, India being one of the worst affected countries.

Even today, new reports of SARS-CoV-2 infection are being continually recorded. On this basis, it can be said that there is still the danger of COVID-19 cases getting increased at a rapid rate[3]. This is being considered to be true especially in the case of opportunistic fungi infections like the mucormycosis and pulmonary aspergillosis that can lead to viral symptoms which might even result in death as the infection could invade multiple organs in the human body[4]. Knowledge and experience gained from treating SARS patients showed that the chances of a fungal co0infection were between 15-27%, but it increased to more than 30% in patients who had severe SARS. Chance of pulmonary aspergillosis were higher in influenza patients, but it was found that these chances were even higher in immunocompromised patients[5].

Impairment of the innate defence mechanisms like poor lymphatic immune response against fungal infections and ciliary clearance are considered to be the main reasons for invasive fungi infections[6]. This is true especially when treating patients with pathophysiologic progression of deregulatory immune mechanisms among COVID-19 related acute respiratory distress syndrome (ARDS) [7]. Furthermore, use of corticosteroids, which is regarded as one of the most effective ways of combating against COVID-19, can cause more issues in patients admitted in ICU and lead to opportunistic infections that can cause death. There is still no exact knowledge about the incidences of a person developing fungal involvement. This is mainly because common bronchoscopy is not diagnosed accurately among COVID-19[8].

There is no way of distinguishing the clinical findings and radiological findings of secondary fungal infection from that of COVID-19 pneumonitis and pneumonia [9]. Due to this reason, the process of identifying pathogenic fungi is primarily dependent on the rate of positivity in lower respiratory tract sample tests like endotracheal aspirate, sputum, and bronchoalveolar lavage [10]. Studies have determined that mucormycosis is very rare among healthy people but is very commonly found in patients who display predisposing conditions such as uncontrolled diabetes, haematological and other types of malignancies, along with organ transplantation, immunosuppressive and corticosteroid use, prolonged neutropenia, overload of iron, acquired immunodeficiency syndrome (AIDS), open wound injuries, and intravenous drug abusers[11].

Aim and Objectives

The study aims to *Assess the MRI Evaluation of Cases of Mucormycosis after COVID-19"*. Through this study the researcher has focused on assessing the determine the use and effectiveness of MRI evaluation in cases of patients with mucormycosis after having faced through the COVID-19 virus. By performing this investigation, the researcher has examined the various ways in which Magnetic Resonance Imaging (MRI) can be useful for patients with mucormycosis after they have had the COVID-19 virus[12]. Since 2020, COVID-19 or the Coronavirus has emerged

as the single greatest global health issue; and to combat it, the authorities are developing different frameworks and systems through which they can manage the issue and manage it to the greatest possible extent[13].

In the current study, researcher has focused on evaluating different ways in which MRI can be useful among patients with mucormycosis after having through the virus. This study sheds light on ways in which MRI can be useful for such individuals and help them to combat their health issues to the greatest possible extent[14]. Furthermore, the study also describes the various common and uncommon imaging presentations of biopsy for mucormycosis in a group of patients recruited from five health care centres throughout India.

Materials and Methods

In the current study, the researcher conducted an observational study at Pacific Medical College, Udaipur, Rajasthan, India. Data about confirmed mucormycosis cases among patients with and without COVID-19 reported during the months of September and December 2020 was collected during the current study. Furthermore, COVID-19 tests of those patients whose results for SARS-CoV-2 RNA in the respiratory samples came out to be positive was conducted[15]. Reverse transcriptions PCR (RT-PCR), also known as the positive rapid antigen test (RAT) was used for the respiratory specimens.

Researcher, in the current study focused on collecting data about the patients related to their demographic data, along with data about any underlying diseases like diabetes mellitus, organ transplantation, and haematological malignancy. Along with this, the researcher also collected data such as days to the diagnosis of mucormycosis before or after the onset of COVID-19 diagnosis, diagnostic modalities for mucormycosis, anatomic site of mucormycosis involvement and others. In this regard, the researcher used a hierarchical model for classifying multiple underlying diseases. On the other hand, for those patients who had COVID-19 and pre-existing uncontrolled diabetes, the researcher considered diabetes as the main underlying disease for their condition. Patients, for the current study, were selected only if their diagnosis of mucormycosis was confirmed from the culture, biopsy, autopsy, magnetic resonance images (MRI), or computed tomography (CT). It was ensured by the participants that all of the patients were immunosuppressed, along with using MR imaging of all the patients with a 1.5-T system [16]. These images were then evaluated by the researcher in terms of their density, signal intensity and contract enhancement characteristics [17].

The researcher used SPSS Statistics 21.0 for performing an analysis of the data obtained from the identified health care centres. The descriptive statistics were measured and analysed using frequencies, mean, standard deviations, and median. These helped in obtaining a thorough and detailed understanding of the data and therefore perform a thorough and effective analysis. This way the researcher was able to test and analyse any differences between the continuous data using the Mann-Whitney U test.

Results

In the current study, the researcher obtained data of 294 consecutive mucormycosis cases from the five participating health care centres across India. However, eight cases were excluded from the study due to incomplete data. Out of the remaining 286 cases, 65% (N = 185) had CAM (COVID-19 Associated Mucormycosis), with the mean age of 52 years. Furthermore, 75% (N = 214) of the entire study population was male; and the remaining 25% (N = 72) were female patients.

Table 1: Descriptive Statistics

Variables	CAM (N = 186)	Non-CAM (N = 100)	p-value
Mean Age	52	41	0.000
Gender			0.001
Male Female	214 (75%) 72 (25%)	197 (69%) 89 (31%)	
Underlying Disease			0.000
None Only COVID-19 Glucocorticoids for COVID-19 Diabetes Mellitus Traumatic Inoculation Haematological Malignancy Renal Transplantation Others	0 63 48 116 (59.4%) 4 1 5 7	19 0 NA 170 (40.6%) 7 3 0 5	
Glucocorticoids	148	8	

CAM Prevalence

Data obtained from Pacific Medical College, Udaipur, Rajasthan, India helped in determining the prevalence of CAM. While conducting the study, it was observed that the patients accounted from 26/10,510 COVID-19 patients who were managed and treated in the general wards, while 28/1580 patients were treated in the ICUs. Further it was observed that the prevalence of CAM was 0.28% and the range was 0.04% to 0.60%; on the other hand, CAM prevalence in ICU patients was determined to be 1.9% and the range was o.68% to 2%. As compared to 2019, when a total of 110 cases of mucormycosis were recorded, in 2020 alone more than 230 cases were recorded. However, there was not much difference in the number of mucormycosis cases unrelated to COVID-19 during both the years. But on the basis of the data obtained, it can be said that in 2020 there was an increase in the CAM figures.

Predisposing Factors

Uncontrolled diabetes mellitus was the common diseases among both the CAM and non-CAM groups. It was found among more than 60% of the participants. Here it is worth noting that the frequency of recently diagnosed diabetes mellitus was found to be more while evaluating mucormycosis among the CAM patients than in the non-CAM patients. During the study it was also found that diabetic ketoacidosis was less frequent in the CAM patients (9%) than in the non-CAM patients (29%). In addition, coronavirus was determined to be the key disease among CAM patients, especially those who received glucocorticoid treatment for COVID-19 management.

Computed Tomography Findings

Review of the CT scans were assessed, and it was found that 73% were diagnosed with isodense to muscle/brain lesions while the remaining 25% were diagnosed with hyperdense lesions relative to the muscle/brain in the non-invasive portion.

MRI Signal Intensity

Eighty percent of the patients had isointense lesions relative to the brain, while 18% of the patients shows hyperintensity. Remaining lesions were found to be either isointense or hypointense in the long retention time images.

Discussion

Results shows that the prevalence of CAM was 0.30% among patients who were

managed and treated in hospital wards; and nearly 2% in patients who were being treated in ICUs[16,18]. The researcher further observed a double fold rise in the mucormycosis cases from September 2020 to December 2020 as compared to same time period in 2019[19]. This increase in the number of cases can be attributed to the onset of COVID-19 or the coronavirus. Most of the CAM cases were diagnosed at least after eight days of being diagnosed with COVID-19[20].

The results show that the MRI signal intensity of the mucormycosis lesions was found to be isointense or hypointense in all of the sequences. After providing the patients with gadolinium, it was observed that the lesions had variable enhancement patterns that ranged from homogenous to heterogenous or even non-enhancing at all. On this basis, it can be said that using the contrast-enhanced T1.5-weighted images were helpful to delineate the intracranial spread with the presence of meningeal enhancement[21]. In addition, it was also helpful for identifying the invasion of cavernous portions of the internal carotid artery by the disease.[22]

Conclusion

In the current study, the researcher conducted an observational study among five health care centres across India. In the current study, the researcher obtained data of 294 consecutive mucormycosis cases from the health care centres across India. Uncontrolled diabetes mellitus (63%) was one of the common key diseases in both the groups. Eighty percent of the patients had isointense lesions relative to the brain, while 20% of the patients shows hyperintensity.

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