Original Research Article

Profile of CT Brain in COVID 19 (Retrospective Study)

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Abstract

Background: Corona virus disease (COVID-19) is an infectious disease caused by a newly discovered coronavirus. Most people infected with the COVID-19 virus experienced mild to moderate respiratory illness. Elderly people and those with medical problems like cardiovascular disease, diabetes, chronic respiratory disease, and cancer are more likely to develop serious illness. **Aims and Objectives:**To study CT Brain findings in COVID-19 patients and their correlation with clinical profile and outcome. **Material and Methods:** Retrospective study involved 22 patients admitted in MGM hospital, Kamothe MICU and wards from 1st April to 31st July 2020. **Results:**Out of 22 patients, maximum number of patients were male i.e. 20(90.90%) and 2(9.10%) were female. Mean age of the patients was 64.59±12.97 years. Ischemic stroke was observed in 12(54.54%) patients and haemorrhagic stroke was found in 2(9.10%) patients. In 14(63.64%) patients, CT brain findings were found to be abnormal and in 8(36.36%) patients, it was normal. Seven(31.81%) patients needed ventilator support, 3(13.63%) used BiPAP, 1(4.54%) patient used Hudson mask and 4(18.18%) with NRM. Out of 7 patients, who were on ventilator support, 6 died and one discharged from the hospital. **Conclusion:**High percentage of abnormal brain CT patients with severe COVID-19 infection was observed in the study. Ischemic stroke occurred in most of the cases with abnormal CT findings.

Keywords: CT Scan, Corona virus, COVID-19.

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Introduction

COVID 19 is a life threatening disease and a global burden caused by SARS COV-2,2019-nCoV. The disease was first reported in Wuhan, China in December 2019. It initially considered to be spread by Zoonotic transmission with high rate of human to human transmission and rapidly spread to rest of the world and declared as pandemic by WHO on March 11th 2020[1].Due to very high rate of transmission, it has become global burden to health and economy of the world facing first time in decades. It is a rapidly spreading disease involving the upper and lower respiratory tract, and has high morbidity and mortality.COVID 19 is also known as 2019 novel corono virus nCoV, human corona virus (HCoV or HCoV19) and MERS (middle east respiratory syndrome). Like other viral diseases, it had also mild to moderate symptoms, more infectious and spread from person to person by disease transmission in close contacts by droplets within 6 feet of distance for more than 15 minutes. Its incubation period is 2-14 days and recovery period ranges from 2 weeks in mild cases and 3-6 weeks in severe cases. Persons with smoking habits are greater risks of getting transmission from hand to mouth contact, older people >60 years with comorbid conditions such as CVD, diabetes mellitus, hypertension, surgery, cancer and COPD etc. Children, neonates are less prone to this infection but can get this. The virus enters the oral cavity (oropharynx, nasopharynx under the nasal sinuses) and spreads to lower respiratory tract and attached to some receptors (ACE) on the pulmonary alveoli and starts replicating and destroying the alveolar cells of lungs basis and other lobes of lungs (3 on right side and 2 on left side). Depending on the immunity of person and virulence of virus strain it can cause havoc leading to inflammation in severe cases. Blood clotting also occurs in lungs (previously diagnosed or pneumonias). In critical cases more toxins like cytokines are liberated and create on cytokine storm which leads to acute respiratory distress having oxygen saturation in lungs. The coronavirus disease 2019 (COVID-19) pandemic has been spreading rampantly throughout the world, with more than 2.8 million confirmed cases to date[2]. While at the initial stages, the focus has been on the typical respiratory symptoms with which patients present, which included fever, cough, and dyspnea; increasing evidence revealed that it is essentially a multi-system disease. Researchers around the globe are noticing confirmed COVID-19 patients manifesting with neurological signs and symptoms – adding to the complexity in management of these patients. A study conducted by Mao et al reported various neurological manifestations of confirmed COVID-19 patients[3]. In their study, they included 214 patients out of which 78 (36.4%) were found with neurological manifestations which included skeletal muscle injury, impaired consciousness and acute cerebrovascular diseases.Neurological menifestations of Covid-19 include various symptoms such as headache (Anosmia and Agusia), impaired consciousness(encephalopathy,encephalitis,ADEM(acute dissem-inated encephalomyelitis), seizures, stroke (ischemic haemorrhagic CVT), ataxia, transverse myelitis and AHNE (acute haemorrhagic necrotizing encephalopathy.Recently, a study reported that poor hygiene behind India's low Covid death rate. Study reported countries like India with poor hygiene, sanitation and quality of water appear to have a lower covid-19 case fatality rate as compared to rich countries with better hygienic conditions. In India, Bihar state

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which lags behind most states on socio economic development parameters, managed to keep the death rate at 0.5% or one third the national average (1.5% national fatality ratio). Similarly, Kerala and Assam also had a 0.4% rate, Telangana 0.5% and Jharkhand and Chhattisgarh at 0.9% have CFR less than one but Maharashtra, Gujarat and Punjab had CFS values 2 or higher[4].There is limited information about the natural history of this disease. Host defense mechanisms are known to play critical role in disease prevention and control. The best way to prevent and slow down transmission is to be well informed about the COVID-19 virus, the disease it causes and how it spreads. COVID-19 being an emerging disease so sufficient data of disease is not available so further study is needed. Thus, the present study was carried out to study CT Brain findings in COVID-19 patients and their correlation with clinical profile and outcome.

Material and methods

The present study is a retrospective study whichinvolved 22 patients admitted in MGM hospital,Kamothe MICU and wards from 1ST April to 31st July 2020. Confirmed COVID 19 cases by real time PCR irrespective of sex, age more than 18 years and above admitted between 1stApril to 31st July 2020 with neurological symptoms of COVID 19 at time of admission or during hospital stay were included in the present study. Patients who were not detected on real time PCR were excluded from the study. CT Brain plain of patients of COVID 19 with neurological manifestations at time of admission or during hospital was done once during hospital stay. CT Brain plain manifestations correlated with CNS symptoms, course during hospital stay and outcome of the patients were noted.Various investigations viz.RT PCR FOR COVID 19, CT Brain plain, complete blood count, liver function tests, renal function tests with electrolytes were carried out.

Statistical analysis-At the end of the study, the data was analysed statistically by using Independent t-test and Chi-square test. A p value of <0.05 was considered significant.

Results

In the present study, out of 22 patients, maximum number of patients were male i.e. 20(90.90%) and 2(9.10%) were female. Mean age of the patients was 64.59±12.97 years with a range of 37-86 years. Mean haemoglobin of the patients was 10.93±2.58 (range 4-15 g/dl), TLC was 15560±7860.64 (range 2590 – 33580), mean platelet was 2.01±1.48 / lacs (0.23 – 5.1), NLR was 15.02±14.47 (range 1.26-48.5), mean LDH 989.14±1023.52 (range 216-4750) and Hs-CRP was 167.19±108.81 (range 2.8-326.6).Ischemic stroke was observed in 12(54.54%) patients and haemorrhagic stroke was found in 2(9.10%) patients. In 14(63.64%) patients, CT brain findings were found to be abnormal and in 8(36.36%) patients, it was normal. Seven(31.81%) patients needed ventilator support, 3(13.63%) used BiPAP, 1(4.54%) patient used Hudson mask and 4(18.18%) with NRM. Out of 7 patients, who were on ventilator support, 6 died and one discharged from the hospital. Similarly, out of 12 patients have ischemic stroke, 5 patients died. Two patients had haemorrhagic stroke and both died.CT brain findings was found to be normal in 8 patients, out of which 7 patients discharged from the hospital and 1 died. Further analysis of the study showed comparison of abnormal and normal CT brain findings (Table 1).

Table 1:Parameters

Parameters	Abnormal (n=14)	Normal (n=8)	Statistical analysis
Age (Mean±SD)	66.28±12.18	61.62±14.59	0.459
Sex Male Female	 14(100%) 0	 6(75%) 2(25%)	0.04 (Significant)
Hb (Mean±SD)	11.13±2.83	10.57±2.20	0.612
TLC (Mean±SD)	16586.42±6629.38	13763.75±9897.25	0.487
Platelet (Mean±SD)	2.11±1.53	1.84±1.48	0.688
NLR (Mean±SD)	16.95±14.58	11.65±14.59	0.424
LDH (Mean±SD)	936.61±657.78	1074.5±1495.97	0.811
Hs-CRP (Mean±SD)	187.43±110.88	131.76±102.13	0.250
Ventilator support during hospital stay	5(35.71%)	2(25%)	0.603
Ischemic stroke	12(85.71%)	0	<0.001 Significant
Haemorrhagic shock	2(14.28%)	0	0.262
Discharge from hospital	7(50%)	7(87.5%)	0.07
Death	7(50%)	1(12.5%)	0.07

Finally, out of 22patients, 14(63.64%) patients discharged from the hospital and 8(36.36%) patients died.

Discussion

As of 8 September 2020, severe acute respiratory syndrome coronavirus type 2 (SARS-CoV-2) has led to over 26.5 million confirmed infections and 875,000 deaths from coronavirus disease-2019 worldwide[5].Like most infections caused by members of the coronavirus family,SARS-CoV-2 manifests itself with upper respiratory tract infections and flu-like symptoms ofvarying severity [6]. However, Covid-19 is unique in itsability to cause a multi-organ disease, with involvement of the central and peripheral nervous system in some individuals.Liotta et al in their study examined neurologic manifestations in 509 consecutive patients admitted with confirmed Covid-19. They compared the severity of Covid-19 and outcomes in patients with and without neurologic manifestations. Neurologic manifestations were present at Covid-19 onset in 215 (42.2%), at hospitalization in 319 (62.7%), and at any time during the disease course in 419 patients (82.3%). The most frequent neurologic manifestations were myalgias (44.8%), headaches (37.7%), encephalopathy (31.8%), dizziness (29.7%), dysgeusia (15.9%), and anosmia (11.4%). Strokes, movement disorders, motor and sensory deficits, ataxia, and seizures were uncommon (0.2 to 1.4% of patients each). Severe respiratory disease requiring mechanical ventilation occurred in 134 patients (26.3%)[7].Similar to the present study, Castellano et al in their retrospective analysis reported brain CT findings in 23 patients with COVID-19 infection (21 males, 2 females, mean age 60.2±7.9 years). CT scans demonstrated acute lesions in 9 out of 23 cases (39%). Multifocal, linear hyperdensities suggestive for hemorrhages, involving both the cortex and the adjacent subarachnoid space, were evident in seven out of nine cases (30% ofall the patients), with very subtle superficial enhancement after contrast administration. The remaining two cases (8.6%) showed cortical–subcortical areas of hypoattenuation with sulcal effacement, consistent with acute–subacute ischemia, with hemorrhagic transformation in one case (4.3%). CT-positive patients had significantly higher C-reactive protein (173.4 vs. 64 mg/L, p = 0.002) and elevated D-dimer (2.96 vs. 1.54 µg/mL, p=0.018) than CT-negative patients. A significantly lower PaO2/FIO2 ratio was observed in brain CT-positive patients (116 vs. 161, p = 0.033) [8].Radmanesh et al in their retrospective observational case series reported two hundred forty-two patients with COVID-19 who underwent CTor MRI of the brain within 2 weeks after the positive result of viral testing (mean age, 68.76±16.5 years; 150 men/92 women[62.0%/38.0%]). The 3 most common indications for imaging

were altered mental status (42.1%), syncope/fall (32.6%), and focal neurologicdeficit (12.4%). The most common imaging findings were nonspecific white matter microangiopathy (134/55.4%), chronicinfarct(47/19.4%), acute or subacute ischemic infarct (13/5.4%), and acute hemorrhage (11/4.5%). White matter microangiopathy was associated with higher2-week mortality (P <0.001). Their data suggested that in the absence of a focal neurologic deficit, brain imaging in patients with early COVID-19 with altered mental status may not be revealing[9].There is lack of published data till date discussing the brain imaging findings of patients with confirmed COVID-19 infection. Study reported by Filatov et al[10] described an elderly male who came with headache and altered mental status, with brain computed tomography (CT) findings of an old posterior cerebral artery infarct. Another study reported by Zhang et al[11] described a young patient with dysphagia, dysarthria, and encephalopathy, who was found to have imaging findings consistent with acute disseminated encephalom-yelitis (ADEM) on CT and MRI. Ferro et al[12] reported 2 patients with headache and eye symptoms, with imaging evidence of cerebral venous thrombosis on CT and MRI. In these patients, the postulation that COVID-19 infection possibly causes hyperactivation of inflammatory factors and damage to the coagulation system, leading to D-dimer and platelet abnormalities, may potentially play a significant role. Hoffmann et al[13] in their study revealed neurologic symptoms and brain imaging. In their series of 13 patients, imaging was carried out to unexplained encephalopathy which revealed 8 with leptomeningeal enhancement (62%), 3 patients with ischemic stroke (23%) and 11 out of 11 patients (100%) with perfusion abnormalities.In July 2020, India's Ministry of Information and Broadcastingreported country's case fatality rate lowest in the world i.e. 2.41% which is steadily declining[14]. On mid-May 2020, a total of six cities accounted for around half of all reported cases in the country viz. Delhi, Mumbai, Chennai, Ahmedabad, Pune and Kolkata[15] As of 10th September 2020, Lakshadweep was the only region without any positive case[16]. On 10th June, India's recoveries exceeded active cases for the first time[17].Infection rates started to drop significantly in September, and the number of daily new cases and active cases started to decline rapidly[18]. A Government panel on COVID-19 announced in October that the pandemic had peaked in India, and may come under control by February 2021[19] India has over 30 anti-COVID vaccines in various stages of development and the first of these is expected to be introduced in early 2021.Today, COVID-19 is a common pathology which also affect central and peripheral nervous system. The neurologicalsymptoms caused by CoV are headache, dizziness and altered consciousness and affect any age group of patients. Due to lack of published data, new studies are required which focus on neurological alterations in Covid 19 patients. In conclusion, in the present study we noted a high percentage of abnormal brain CT patients with severe COVID-19 infection. Ischemic stroke occurred in most of the cases with abnormal CT findings. We recommend association between abnormal brain CT and patients' outcome deserves further confirmation in a larger cohort of patients.

Conflict of Interest: Nil
Source of support:Nil

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