



ORIGINAL RESEARCH PAPER

Radio-Diagnosis

ACUTE PULMONARY THROMBOEMBOLISM IN COVID-19 PATIENTS: EVALUATION USING CT PULMONARY ANGIOGRAPHY

KEY WORDS: COVID-19, CTPA (Computed Tomography Pulmonary Angiography), thromboembolism

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ABSTRACT

Introduction- COVID-19 disease has been associated with pro thrombotic state and endothelial damage resulting into thromboembolic events ranging from venous thrombosis of lower limbs to pulmonary thrombo-embolism and subsequently pulmonary infarctions. Computed tomographic pulmonary angiography (CTPA) was the standard of care at our institute for evaluation of patients with suspected pulmonary embolism. It plays a key role in its confirmatory diagnosis, defining its extent and thereby helping in better management.

Materials and Methods- A Retrospective study was done in Sri Aurobindo Medical College and Post graduate Institute, Indore, Madhya Pradesh, India and was approved by the hospital ethical committee. The study was done on 300 COVID-19 patients with clinically suspected pulmonary thromboembolism who underwent CTPA between the months of January 2021 and October 2021. The scans were analysed by experienced radiologists.

Results- Through our study we found that approx. 13.7% patients had pulmonary thromboembolism and it was seen in patients with moderate to severe lung involvement.

Conclusion- Through this study we have tried to assess the presence pulmonary thromboembolism using CTPA and have also tried to establish its relationship with percentage of lung involvement on CT.

Aims and Objectives - To assess for the presence of acute pulmonary thromboembolism in COVID 19 patients using CTPA and to establish its relationship with severity of lung involvement on CT in a single institute in Central India during a span of six months.

INTRODUCTION-

The causes of morbidity and mortality due to COVID-19 are multiple and multifactorial, with respiratory failure from pneumonia and subsequently acute respiratory distress syndrome (ARDS) are the chief contributors. Another most important cause of respiratory distress and mortality is the presence of thromboembolic disease. Pulmonary thromboembolism has been found to be a major factor worsening the patient prognosis.^[1]

Among the pathological investigations used the diagnostic sensitivity of the D-dimer test has been high but it cannot define the vasculature involved. On the other hand CTPA not only accurately identifies the presence of pulmonary thromboembolism, it also helps to define the extent of the disease and on CT we can also find the percentage of lung involvement as well as look for pulmonary infarction.^[2,3]

In completely occluding acute pulmonary embolism the affected artery is often enlarged while in partially occluding ones, the embolus is often centrally located. In few cases the embolus may be eccentrically located where it tends to form acute angles with the vessel wall.^[4]

Knowledge on COVID 19 related disease processes is still evolving. Unfortunately, there is limited information on the epidemiology and the exact pathophysiologic and molecular processes underlying COVID-19-associated thromboembolic disease due to lack of large prospective studies.^[5]

The most widely accepted pathogenesis is that the virus binds to the ACE-2 receptors on endothelial cells, especially within kidney heart, lung, and liver resulting in endothelial damage leading to a prothrombotic state which ultimately leads to processes like deep venous thrombosis, myocardial infarction, end organ infarcts, pulmonary thromboembolism, stroke, disseminated intravascular coagulation etc.^[6]

Imaging (CTPA) thereby plays a key role in the diagnosis of

the pulmonary thromboembolic disease and thereby facilitating its prompt management.

MATERIALS AND METHOD-

A Retrospective study was done in Sri Aurobindo Medical College and Post graduate Institute, Indore, Madhya Pradesh, India and was approved by the hospital ethical committee. The study was done on 300 COVID-19 patients with clinically suspected pulmonary thromboembolism who underwent CTPA between the months of January 2021 and October 2021.

Patients with history of hypersensitivity to intravenous contrast agents or deranged renal functions or patients who were not willing to undergo CTPA or not willing to be part of the study were excluded from the study.

Informed written consent was taken from the patient or patients relatives before subjecting the patient to scanning. CT scanning was performed using Single source 64 Slice CT scanner (Somatom Definition; Siemens Medical Solutions, Germany). CT pulmonary angiography was performed using non-ionic contrast media. The images were then transferred to a dedicated online workstation Multimodality Work Place (MMWP) (SIEMENS SOLUTIONS) for image post-processing techniques.

The scans were analysed by experienced radiologists and the findings were systematically recorded.

OBSERVATIONS AND RESULTS-

Table 1- shows age distribution of the study population

Age group	Percentage
21-40 yrs	40.3
41-60 yrs	23.8
61-70 yrs	33
71-90 yrs	2.9

Maximum percentage of patients belonged to 21-40 years of age followed by 41-60 years age group. No patient was under 20 years of age.

Table 2- shows percentage of lung involvement in different age groups.

Age group	<25% involvement	25-50% involvement	50-75% involvement	>75% involvement
21-40 yrs	20.4	38.6	20.4	20.4
41-60 yrs	11.5	50	15.3	23
61-70 yrs	25	36.1	27.7	11.1
71-90 yrs	0	66.7	33.3	0

In 21-40 yrs age group maximum patients had lung involvement between 25-50% and equal percentage of patients had <25, 50-75 and >75% involvement.

In 41-60 yrs age group maximum patients had lung involvement between 25-50% followed by >75% involvement.

In 61-70 yrs age group maximum patients had lung involvement between 25-50% followed by 50-75% involvement.

In 71-90 yrs age group maximum patients had lung involvement between 25-50% followed by 50-75% involvement.

Table 3- shows gender distribution of the study population

Gender	Percentage
Male	65.1
Female	34.9

Male preponderance was noted in the study population

Table 4- shows percentage of lung involvement as per gender distribution.

Gender	<25% involvement	25-50% involvement	50-75% involvement	>75% involvement
Males	19.7	33.8	28.1	18.3
Females	18.4	55.2	10.5	15.7

In males maximum patients had lung involvement between 25- 50% and followed by 50-75% involvement.

In females maximum patients had lung involvement between 25-50% and followed by <25% involvement.

Table 5- showing prevalence of pulmonary thromboembolism in the study population.

Thromboembolism	Percentage
Present	13.7
Absent	86.3

Overall 13.7% patients had pulmonary thromboembolism on CTPA.

Table 6- showing percentage of patients with pulmonary embolism, their age and sex distribution

Pulmonary embolism	Males	Females	21-40yrs	41-60yrs	61-70yrs	71-90yrs
Present	16.9	7.8	18.1	23.8	5.5	0
Absent	83.1	92.2	81.9	76.2	94.5	100

Pulmonary thromboembolism was more prevalent in males in comparison to females. Maximum cases of pulmonary thromboembolism were in 41-60 yrs age group followed by 21-40 yrs.

Table 7- showing percentage of patients with pulmonary thromboembolism with respect to lung involvement

Thromboembolism	<25% involvement	25-50% involvement	50-75% involvement	>75% involvement
Present	0	0	29.1	42.1
Absent	100	100	70.9	57.9

No cases of pulmonary thromboembolism were found in

patients with <50 percent lung involvement.

29.1% patients with 50-75% and 42.1% patients with >75% lung involvement had pulmonary thromboembolism.

Pulmonary thromboembolism was the most prevalent in patients having >75% lung involvement.

DISCUSSION AND CONCLUSION-

In our study we included 300 COVID 19 patients who were clinically suspected to have pulmonary thromboembolism and thereby underwent CTPA.

Male preponderance was seen in the study population. Most common age group was 21-40 years followed by 41-60 years. Irrespective of age and gender maximum patients had lung involvement between 25-50%.

Approximately 13.7% patients had CTPA proven pulmonary thromboembolism. It was more common in males and maximum cases were in 41-60 yrs age group followed by 21-40 yrs.

No cases of pulmonary thromboembolism were found in patients with <50 percent lung involvement. 29.1% patients with 50-75% and 42.1% patients with >75% lung involvement had pulmonary thromboembolism. Pulmonary thromboembolism was the most prevalent in patients having >75% lung involvement. Therefore our study suggests towards a direct relationship between severity of lung involvement on CT and presence of pulmonary thromboembolic phenomenon.

Our study has few limitations. First, it was a retrospective study. Second, correlation with D-dimer levels was not performed. Third, the sample size was limited.

Conflicts of interest-None

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