



ORIGINAL RESEARCH PAPER

Radio-Diagnosis

ROLE OF CT PULMONARY ANGIOGRAPHY IN EVALUATION OF PULMONARY THROMBOEMBOLISM IN COVID-19 POSITIVE PATIENTS

KEY WORDS: COVID-19, CTPA (Computed Tomography Pulmonary Angiography), HRCT(High Resolution Computed Tomography), pulmonary thromboembolism

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ABSTRACT

Introduction- COVID-19 disease has been strongly associated with a pro thrombotic state and vascular endothelial damage resulting into wide range of thromboembolic phenomena including deep venous thrombosis involving extremities, pulmonary artery thrombo-embolism and eventually pulmonary infarctions. Computed tomography pulmonary angiography (CTPA) was used at our hospital for assessment of patients with risk of pulmonary embolism. It plays a vital role in its establishing its diagnosis, defining its extent, stage and thereby guiding towards further management. **Materials and Methods-** A Retrospective study was performed in Sri Aurobindo Medical College and Post graduate Institute, Indore, Madhya Pradesh, India and was approved by the ethical committee. It was performed on 250 COVID-19 patients with clinically suspected pulmonary thromboembolism who underwent CTPA between the months of December 2021 and May 2021. The scans were analysed by skilled radiologists, having good experience in the field of CT reporting. **Results-** Our study demonstrated that approx. 14% of the patients had pulmonary thromboembolism and these cases were observed in patients with moderate to severe lung involvement. **Conclusion-** In this study, we have thoroughly tried to assess the presence of pulmonary thromboembolism using CTPA and establish its relationship with severity of lung involvement on HRCT.

Introduction-

The reasons behind morbidity and mortality associated with COVID-19 infection are enormous, with respiratory failure from pneumonia and subsequently acute respiratory distress syndrome (ARDS) being the primary reasons. Another very important reason behind respiratory distress is pulmonary thromboembolism, eventually worsening the patient's overall prognosis.[1]

Among the pathological tests that have been used in the evaluation of thromboembolic phenomena, the diagnostic accuracy of D-dimer evaluation has been high but it cannot identify the anatomic vasculature involved. In contrary, CTPA not only identifies the presence of pulmonary thromboembolism, but also defines the vasculature involved and the extent of the disease. [2,3]

Completely obliterating acute pulmonary embolism causes the involved artery to increase in caliber while in partially obliterating acute pulmonary embolism, the embolus is usually centrally placed. However sometimes, the embolus may be eccentrically placed and forms an acute angle with the arterial wall.[4]

Information on COVID 19 related disease manifestations is still evolving. Unfortunately, there is very limited information on the exact epidemiology, pathophysiology and molecular biology behind COVID-19-associated thrombo-embolic disease due to paucity of large multicentre prospective studies. [5]

The most widely accepted pathophysiology is that the corona virus attaches itself to the ACE-2 receptors on the endothelial cells, with resultant endothelial damage, eventually leading to a pro-coagulant state precipitating events like deep venous thrombosis, myocardial infarction, myocarditis, end organ infarcts, pulmonary thromboembolism and infarction, stroke, disseminated intravascular coagulation etc. [6]

CTPA thus plays a pivotal role in the diagnosis of pulmonary thromboembolic disease and eventually facilitating its robust management.

Materials and Method-

A Retrospective study was performed in Sri Aurobindo Medical College and Post graduate Institute, Indore, Madhya Pradesh, India and was approved by the ethical committee. It was performed on 250 COVID-19 patients with clinically suspected pulmonary thromboembolism who underwent CTPA between the months of December 2021 and May 2021.

Patients with history of allergic reactions to contrast agents or with altered renal function tests or patients unwilling to undergo CTPA or not consenting to be part of the study were excluded.

Informed consent was obtained from the patient or patient's relatives before scanning the patient. CT study was performed using 64 Slice CT scanner (Siemens Medical Solutions, Germany). CTPA was done using non-ionic contrast agents. The images were transferred to a dedicated workstation Multimodality Work Place for post-processing.

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

Observations and results-

Table 1- Depicts age distribution of the study population

Age group	Percentage
21-40 yrs	40.0
41-60 yrs	22.0
61-70 yrs	34.0
71-90 yrs	4.0

In our study, maximum patients were 21-40 years old, followed by 41-60 years. There were no patients under 20 years age.

Table 2- Depicts the percentage of lung involvement with respect to age distribution.

Age group	<25% involvement	25-50% involvement	50-75% involvement	>75% involvement
21-40 yrs	20.5	38.5	20.5	20.5

41-60 yrs	11.5	50	15.5	23.0
61-70 yrs	25.3	36.2	27.4	11.1
71-90 yrs	0	66.7	33.3	0

Irrespective of age distribution, maximum patients had lung involvement between 25-50% followed by 50-75% involvement.

Table 3- Depicts gender distribution of the study population

Gender	Percentage
Male	64.5
Female	35.5

Male dominance was noted in the study population

Table 4- Depicts percentage of lung involvement with respect to gender distribution.

Gender	<25% involvement	25-50% involvement	50-75% involvement	>75% involvement
Males	19.8	33.8	28.2	18.2
Females	18.4	55.4	10.5	15.7

Among both males and females, maximum patients had lung involvement between 25-50%, followed by 50-75% involvement among males and <25% involvement among females.

Table 5- Depicts percentage pulmonary thromboembolism in the study population.

Thromboembolism	Percentage
Present	14.0
Absent	86.0

14% of the study population had pulmonary thromboembolism on CTPA.

Table 6- Depicts percentage of patients with pulmonary embolism, with respect to age and gender distribution

Pulmonary embolism	Males	Females	21-40yrs	41-60yrs	61-70yrs	71-90yrs
Present	16.8	7.8	18.1	23.8	5.6	0
Absent	83.2	92.2	81.9	76.2	94.6	100

Pulmonary thromboembolism was more common among males. Majority cases were found in 41-60 years age group followed by 21-40 years.

Table 7- Depicts relationship between pulmonary thromboembolism and lung parenchymal involvement

Thromboembolism	<25% involvement	25-50% involvement	50-75% involvement	>75% involvement
Present	0	0	29.2	42.0
Absent	100	100	70.8	58.0

Pulmonary thromboembolism was not found in patients with <50 percent lung involvement.

Maximum cases of pulmonary thromboembolism were diagnosed in patients with >75% lung involvement.



Figure 1- Axial CTPA image showing central inclusion defect/thrombus in right lower lobe pulmonary artery and axial HRCT image showing shows severe lung involvement

evident by large areas of ground glass attenuation and interstitial thickening.

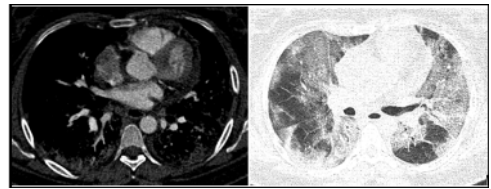


Figure 2- Axial CTPA image showing inclusion defect/thrombus in the lateral basal segment branch of right pulmonary artery and axial HRCT image showing moderate to severe lung involvement evident by large areas of ground glass attenuation and interstitial thickening.

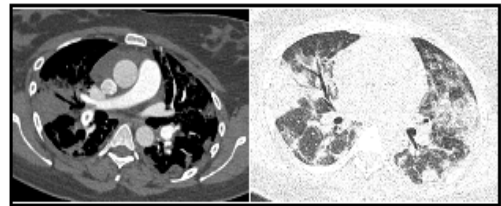


Figure 3- Axial CTPA image showing central inclusion defect/thrombus in right lower lobe pulmonary artery and axial HRCT image showing shows moderate to severe lung involvement evident by areas of ground glass attenuation and consolidation.

Discussion and Conclusion-

Our study comprised of 250 COVID 19 patients who were clinically suspected to have pulmonary thromboembolism and subsequently underwent CTPA.

Most common age group in our study population was 21-40 years with male preponderance. Irrespective of age or gender distribution, maximum patients had lung involvement between 25-50%.

Approximately 14.0% patients were diagnosed with pulmonary thromboembolism on CTPA, which was more prevalent among males and maximum cases belonged to 41-60 years age group.

No cases of thromboembolism were diagnosed in patients with <50 percent lung parenchymal involvement while it was most prevalent in patients with >75% lung parenchymal involvement. Thus our study defines a direct relationship between severity of lung parenchymal involvement on HRCT and presence of pulmonary thromboembolism on CTPA.

Conflicts of interest-None

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