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ORIGINAL RESEARCH

Determining whether the diameter of the pulmonary arteries is a marker of pulmonary hypertension in ILD patients

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ABSTRACT

Aim: The aim of the present study was to evaluate whether pulmonary artery size is indicator of pulmonary hypertension in patients with interstitial lung disease. **Methods:** A total of 30 patients with interstitial lung disease were included in this study who was subjected to CT chest and 2DECHO after obtaining the consent. Institutional ethics committee approval was obtained. **Results:** Patients were mostly 40–59 years old. The research included 20 men and 10 women. Twelve individuals had 3.5-3.99 cm pulmonary arteries in this investigation. In the ILD group with pulmonary hypertension, the mean pulmonary arterial diameter was 34.66 ±1.60 mm, whereas patients without hypertension had a mean of 31.38±3.47 mm. Positive correlation between dilated pulmonary artery and 2Decho results (Pearson coefficient r=0.72 p<.01). In interstitial lung disorders, dilated pulmonary arteries suggest pulmonary hypertension. On 2D Echo, 13 of 23 patients with dilated pulmonary arteries had suspected pulmonary hypertension, whereas 10 were negative. On 2D Echo, only one of 7 patients without dilated pulmonary arteries had suspected pulmonary hypertension. **Conclusion:** Pulmonary hypertension may be suspected in interstitial lung disorders with dilated pulmonary arteries. Thus, pulmonary artery diameter is crucial for pulmonary hypertension screening.

Keywords: pulmonary artery size, pulmonary hypertension, interstitial lung disease

INTRODUCTION

Pulmonary hypertension (PH) is characterized by a resting mean pulmonary artery pressure (mPAP) that is equal to or above 25 mmHg, as determined by right heart catheterization (RHC).[1,2] Pulmonary hypertension (PH) often exacerbates lung illness and chronic hypoxia, particularly interstitial lung disease (ILD). In cases of lung illness, the presence of pulmonary hypertension (PH) is linked to a worse prognosis.[3] Computed tomography (CT) is used for the diagnosis and characterization of suspected interstitial lung disease (ILD), and is often included in the evaluation of patients with unexplained shortness of breath and suspected pulmonary hypertension (PH).Four Enlargement of the main pulmonary artery (PA) or major branch arteries has been recognized as indicators of the presence of pulmonary hypertension (PH) and is often the first imaging observation that suggests the diagnosis.[5-9]

Given the frequent use of CT scans in examining patients with ILD, it would be beneficial to use the size of the pulmonary arteries as a means of detecting the existence of pulmonary hypertension. CT pulmonary angiography is conducted as a regular procedure without the use of ECG gating. The size of the pulmonary artery varies during the cardiac cycle. MRI is often synchronized with the cardiac cycle and enables evaluation of the size of the pulmonary arteries during both systole and diastole. Some writers have proposed that the measurement of the main pulmonary artery diameter may not be reliable in determining the mean pulmonary arterial pressure in individuals with existing lung fibrosis. This is because the main pulmonary artery may expand in patients with pulmonary fibrosis even without the presence of pulmonary hypertension.[5-10]

The diagnostic procedures for Pulmonary Hypertension include echocardiography and right cardiac catheterization.11 Right heart catheterization is considered the gold standard for diagnosing pulmonary hypertension (PH), and most studies indicate that echocardiography is less precise than right heart catheterization in diagnosing pulmonary arterial hypertension (PAH). Nevertheless,

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echocardiography plays a crucial role in the diagnostic algorithm due to its distinct benefits over invasive methods. The process is secure, easily transportable, and can be replicated consistently. Thus, echocardiography is a more pragmatic approach for assessing PAH at the onset of the condition and throughout subsequent monitoring.[12] However, when it comes to assessing pulmonary disorders, particularly interstitial lung diseases (ILD), CT-scan is a more often used method than echocardiography.[13-15] The objective of this research was to assess if the size of the pulmonary artery may serve as an indication of pulmonary hypertension in individuals with interstitial lung disease.

MATERIALS AND METHODS

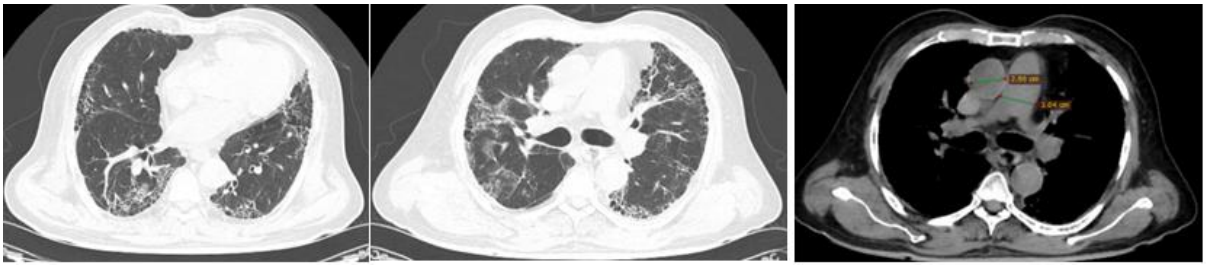
A total of 30 patients with interstitial lung disease were included in this study who was subjected to CT chest and 2DECHO after obtaining the consent.

Methodology

Routine plain CT chest was performed in patients diagnosed with interstitial lung disease in routine chest protocol on CT machine with patient in supine position in suspended deep inspiration with arms extended overhead. The images acquired were viewed on PACS at standard mediastinal and lung window settings.

The widest diameter perpendicular to long axis of MPA is measured with calipers at the level of pulmonary artery bifurcation. These patients were also subjected to 2DECHO to confirm the diagnosis of probable pulmonary hypertension on basis of tricuspid regurgitation velocity (m/s) inferior vena cava diameter, right atrium and right ventricle/left ventricle basal diameter ratio.

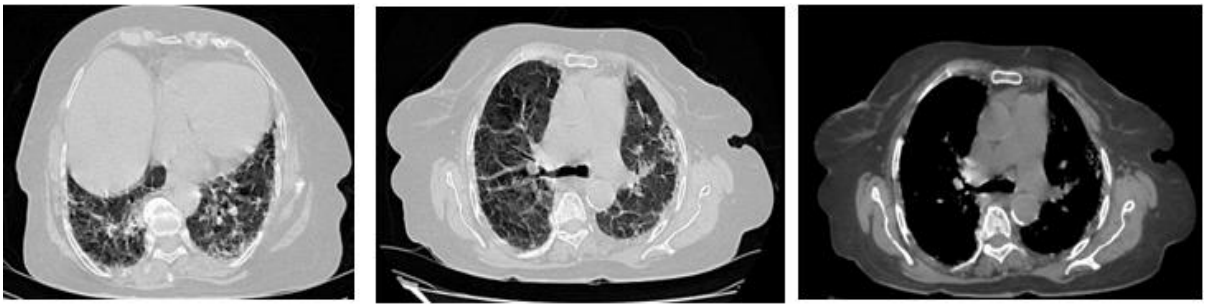
Statistical analysis was carried out using SPSS version 22.



1A **1B** **1C**

1A & 1B: Linear stack like arrangement of cysts of varying sizes with diffuse areas of interlobar and intra-lobar septal thickening noted in bilateral lungs along the subpleural region giving honey comb appearance.

1C: MPA- 30mm, Aorta:29mm, MPA/Aorta ratio>1



2A **2B** **2C**

2A & 2B: E/O areas showing reticular opacities with honeycombing noted in posterior and lateral basal segments of bilateral lower lobes and subpleural areas of anterior segment of Right Upper Lobe, anterior &lingular segments of Left Upper Lobe.

2C: MPA: 33.8mm, Ascending Aorta: 30.0mm, MPA: Ascending Aorta ratio >1

RESULTS

Table 1: Distribution of age and gender among the Interstitial Lung Disease

Variables	N
Age(inyears)	
20-29	3
30-39	5
40-49	9
50-59	10
60-69	2
70-79	1

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Gender	
Male	20
Female	10

Majority of the patients belonged to 40-59 years of age group. There were 20 males and 10 females in the study.

Table 2: Distribution of main pulmonary artery in interstitial lung disease

Mainpulmonaryartery (cms)	
1-1.49	0
1.5-1.99	4
2-2.49	4
2.5-2.99	5
3-3.49	5
3.5-3.99	12

In the present study, 12 patients had pulmonary artery size 3.5-3.99 cms.

Table 3: Mean and standard deviation of pulmonary artery size on CT vs 2D echo

Pulmonary artery size on CT	2DECHO	
	Positivefor pulmonary hypertension (mean±sd)	Negative for pulmonary hypertension(mean±sd)
Dilated pulmonary artery	34.66±1.60mm	31.38±3.47 mm
Normal diameter of Pulmonary artery	-	20.8±2.6mm
Pearson coefficient r value	0.72	
p-value	<.01	

The mean pulmonary arterial diameter in ILD cohort with pulmonary hypertension was 34.66±1.60mm, compared to a mean of 31.38±3.47 mm in patients with ILD without pulmonary hypertension. Dilated pulmonary artery was correlated positively with 2Decho findings (Pearson coefficient r=0.72 p<.01). Thus, indicating dilated pulmonary artery can raise a suspicion of pulmonary hypertension in interstitial lung diseases.

Table 4: Comparison of pulmonary artery diameter on CT vs 2D echo findings

Pulmonary artery size on CT	2decho		Total numberof cases
	Positive for pulmonary hypertension	Negative for pulmonary hypertension	
Dilated pulmonary artery	13	10	23
Normal diameter pulmonary artery	1	6	7
Sensitivity=94.36%		Specificity45.65%	

Among the 23 patients with dilated pulmonary artery, 13 patients were found to show signs of probable pulmonary hypertension on 2D Echo and remaining 10 patients were found to be negative. Among 7 patients with no signs of dilated pulmonary artery, only one patient was found to show signs of probable pulmonary hypertension on 2D Echo.

DISCUSSION

Pulmonary artery hypertension refers to a collection of disorders marked by a progressive elevation in pulmonary artery pressure, which may lead to right heart failure and premature mortality.The number is 16. PAH is characterized as having a mean pulmonary artery pressure (MPAP) of 25 mm or above at rest, according to Echocardiographic standards.Seventeen Furthermore, based on the CT-scan criteria, a measurement of MPAD greater than or equal to 29 mm is a clear indication of pulmonary arterial hypertension (PAH).Eighteen Diagnosing PH is consistently challenging for medical professionals since its clinical symptoms are not defined. However, accurately identifying pulmonary hypertension (PH) and assessing its severity are crucial for predicting the outcome and devising treatment strategies for individuals with PH. lung hypertension (PH) is a major contributor to illness and death in people with lung parenchymal disease.[19-22]

The majority of patients were between the age range of 40 to 59 years. The research consisted of 20 men and 10 girls. Within this investigation, a total of 12 individuals had a pulmonary artery size ranging from 3.5 to 3.99 centimeters. In the ILD cohort with pulmonary hypertension, the average diameter of the pulmonary artery was 34.66 ±1.60 mm, whereas in patients with ILD but without pulmonary hypertension, the average diameter was 31.38±3.47 mm. Pulmonary hypertension is often caused by lung illness, and its presence in this context indicates a poor prognosis[23-25] the presence of pulmonary hypertension (PH) is linked to a worse prognosis.[26] Computed tomography (CT) is used for the diagnosis and characterization of suspected interstitial lung disease (ILD), and is often included in the evaluation

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of patients with unexplained shortness of breath and suspected pulmonary hypertension (PH).[27] Given the frequent use of CT scans in examining patients with ILD, it would be beneficial to use the size of the pulmonary arteries as means of detecting the existence of pulmonary hypertension.[28]

The presence of an enlarged pulmonary artery was shown to have a strong positive correlation with the results from a 2D echocardiogram, as indicated by a Pearson coefficient of 0.72 and a p-value of less than 0.01. Therefore, the presence of an enlarged pulmonary artery might suggest the presence of pulmonary hypertension in cases with interstitial lung disorders. Out of the 23 patients with dilated pulmonary artery, 13 exhibited indications of likely pulmonary hypertension on 2D Echo, whereas the remaining 10 patients tested negative. Out of the 7 patients who did not have any indications of an enlarged pulmonary artery, only one patient had signals suggesting the presence of likely pulmonary hypertension on a 2D Echo examination. Enlargement of the main pulmonary artery or major branch arteries has been recognized as indicators of pulmonary hypertension (PH) and is often the first imaging observation that suggests the diagnosis.[29-33] The diagnostic process for pulmonary hypertension (PH) using CT imaging starts by recognizing a pulmonary artery diameter that is more than 29 mm. This diameter is often greater than that of the ascending aorta at the same level.[34] The diameter should be measured in the axial plane at the bifurcation, perpendicular to the long axis of the pulmonary artery.[35] Transthoracic two-dimensional Doppler echocardiography is the primary method used to diagnose pulmonary hypertension (PH).[36] Magnetic resonance imaging (MRI) is readily accessible and serves as the predominant imaging technique for evaluating ejection fraction, left-sided heart disease, and intracardiac shunts.[36,37]

CONCLUSION

In patients with interstitial lung disorders, a dilated pulmonary artery may be a cause for concern about the presence of pulmonary hypertension. As a result, the diameter of the pulmonary artery is an essential component in the screening process for suspected pulmonary hypertension.

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