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Computed tomography measurement of pulmonary artery size in interstitial lung disease to evaluate pulmonary hypertension

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Abstract
Aim: To evaluate whether pulmonary artery size is indicator of pulmonary hypertension in patients with interstitial lung disease.
Objective: To measure main pulmonary artery size in interstitial lung disease on CT. To compare these measurements with 2Decho findings in diagnosing the pulmonary hypertension.
Materials and Methods
Type of study: Prospective study
Duration of study: 1st June 2021 to 1st September 2022
Results and Conclusion: 30 patients with interstitial lung disease with suspicion of pulmonary hypertension were subjected to CT scan
Among the 22 patients with dilated pulmonary artery, 64% were found to show signs of probable pulmonary hypertension on 2DEcho and remaining 36% patients were found to be negative.
In the remaining 8 patients who were not having dilated pulmonary artery, only one patient showed signs of pulmonary hypertension on 2 Decho.
Dilated pulmonary artery was correlated positively with 2Decho findings in pearson correlation of coefficient.
Thus, dilated pulmonary artery can raise a suspicion of pulmonary hypertension in interstitial lung diseases. Therefore, pulmonary artery diameter is key for screening of suspected pulmonary hypertension.

Keywords: Assess refers to process of the critical analysis and valuation and judgement of the status or

Introduction
Pulmonary hypertension is a progressive disease of the pulmonary arteries and is characterized by abnormally elevated pressure in pulmonary circulation, as a result of extensive vascular proliferation and remodelling [1, 2]. Pulmonary hypertension (PH) is defined on right heart catheterisation (RHC), as resting mean pulmonary arterial pressure greater than or equal to 25mm Hg [3, 4].
Lung disease is the most common cause of pulmonary hypertension and presence of pulmonary hypertension in this setting is an unfavourable prognostic sign [5, 6, 7] when present with lung disease, PH is associated with a poor outcome [8].
CT is used to diagnose and phenotype suspected ILD, and is often part of the workup of patients with unexplained breathlessness and suspected PH [9].
As CT is commonly used in the investigation of patients with ILD, it would be useful to use the pulmonary arterial size to screen for the presence of pulmonary hypertension [10].
Dilatation of main pulmonary artery or major branch vessels has been identified as markers of PH and is often the first imaging finding to suggest the diagnosis [11-15]. The CT approach to diagnosis of PH begins with identifying an enlarged pulmonary artery diameter greater than 29 mm, which is usually larger than that of ascending aorta at the same level [16]. The diameter must be measured in the axial plane at the bifurcation, orthogonal to the long axis of the pulmonary artery [17].
Transthoracic two dimensional doppler echocardiography is the first line modality for diagnosis of PH [18]. It is widely available and is the most common imaging modality used to assess ejection fraction, left sided heart disease, or intracardiac shunts [18, 19].

The aim of this study is to evaluate whether pulmonary artery size is indicator of pulmonary hypertension in patients with interstitial lung disease. To measure main pulmonary artery in interstitial lung disease on CT and to compare these measurements with 2Decho findings in diagnosing the pulmonary hypertension.

Materials and Methods

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

Type of study: Prospective study
Duration of study: 1st June 2021 to 1st September 2022
Routine plain CT chest was performed in patients diagnosed with interstitial lung disease in routine chest protocol on 16 slice Alexion Toshiba 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 between main pulmonary artery diameter and 2DECHO findings. Pearson coefficient of correlation was carried out between pulmonary artery diameter measured on CT and 2Decho findings.

Results

Table 1: Distribution of Age among The Interstitial Lung Disease

Age (in years)	Interstitial lung disease patients (n= 30)
20-29	2
30-39	6
40-49	8
50-59	11
60-69	2
70-79	1

Among the 30 patients, 60 % patients belong to age group 40-59 years.

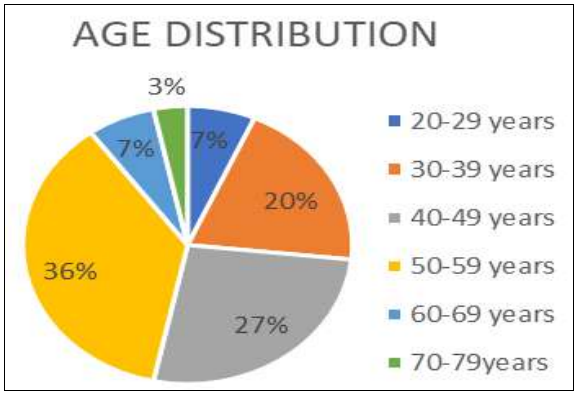

Chart 1: Distribution of age among the interstitial lung disease

Table 2: Distribution of gender among the interstitial lung disease

Gender Distribution	Interstitial lung disease patients (n= 30)
Male	18
Female	12

Among the 30 patients, 60 % are male.

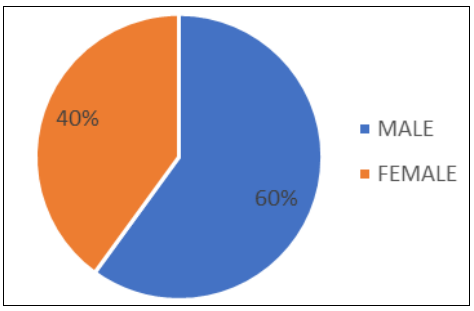

Chart 2: Distribution of gender among the interstitial lung disease

Table 3: Distribution of main pulmonar artery in interstial lung disease

Main pulmonary artery (cms)	Interstitial lung disease patients (n= 30)
1-1.49	0
1.5-1.99	3
2-2.49	5
2.5-2.99	4
3-3.49	6
3.5-3.99	12

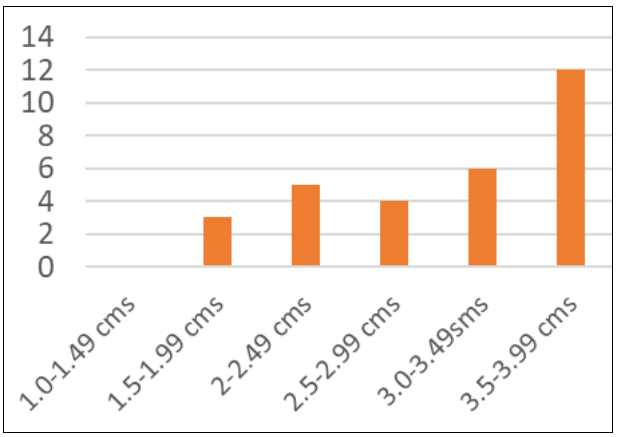

Chart 3: Distribution of main pulmonary artery in interstitial lung disease

Table 4: Mean and standard deviation of pulmonary artery size on ct vs 2decho.

Pulmonary artery size on CT	2D ECHO	
	Positive for pulmonary hypertension (mean± sd)	Negative for pulmonary hypertension (mean± sd)
Dilated pulmonary artery	35.64 ±1.64 mm	30.37±3.46 mm
Normal diameter of pulmonary artery	- *	20.7±2.4 mm
Pearson coefficient r value = 0.78. Result is significant at p <.01 *as number of cases with positive findings on 2Decho with normal diameter of pulmonary artery are 1, mean and standard deviation couldnt be calculated.		

Table 5: Comparison of pulmonary artery diameter on ct vs 2decho findings

Pulmonary artery size on CT	2d echo		Total number of cases
	Positive for pulmonary hypertension	Negative for pulmonary hypertension	
Dilated pulmonary artery	14	8	22
Normal diameter pulmonary artery	1	7	8
Sensitivity = 93.33%		Specificity 46.67%	

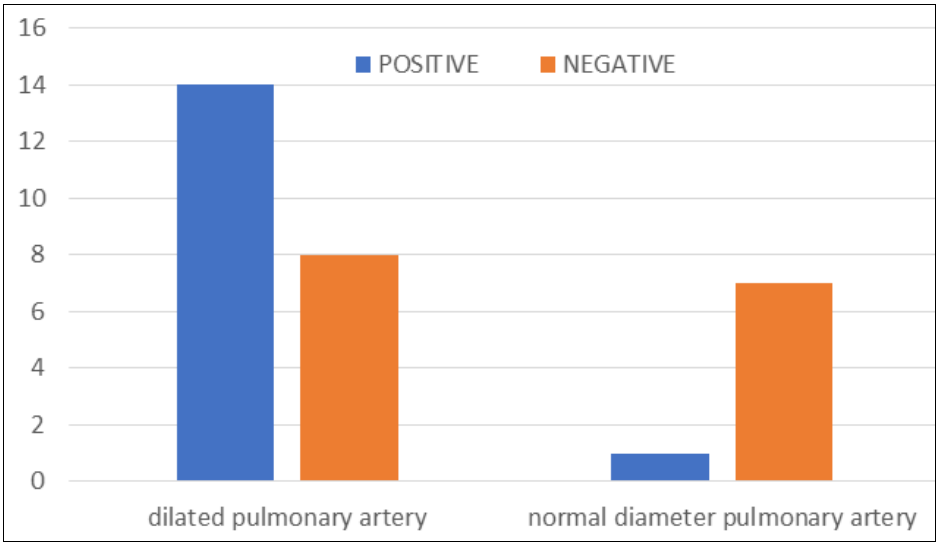

Chart 4: Comparison of pulmonary artery diameter on ct vs 2decho findings

Discussion

In present study, majority of cases were in age group of 40-59 years (60%).

Among the 22 patients with dilated pulmonary artery, 64 % were found to show signs of probable pulmonary hypertension on 2D Echo and remaining 36% patients were found to be negative.

Among 8 patients with no signs of dilated pulmonary artery, only one patient was found to show signs of probable pulmonary hypertension on 2DEcho. Dilated pulmonary artery was correlated positively with 2Decho findings (Pearson coefficient r=0.78 p<.01). Thus, indicating dilated pulmonary artery can raise a suspicion of pulmonary hypertension in interstitial lung diseases.

Similar results were noted in study done by Matthew chin *et al*. [10] where dilated pulmonary artery is correlated with mPAP derived by right heart catherization in ILD cohort with r=0.068 p<.01 in 110 patients with ILD cohort.

In present study, among the 22 patients, the mean pulmonary arterial diameter in ILD cohort with pulmonary hypertension was 35.64±1.64 mm, compared to a mean of 30.37±3.46 mm in patients with ILD without pulmonary hypertension.

In contrary, study done by Matthew chin *et al*. [10] observed the mean pulmonary arterial diameter in ILD cohort with pulmonary hypertension was 32mm, compared to a mean of 25mm in patients with ILD without pulmonary hypertension.

In present study, the sensitivity was found to 93.33% and specificity was 46.67%.

The major limitation in present study is small sample size and lack of utilization of right heart catherization confirmatory test for pulmonary hypertension.

Representative images

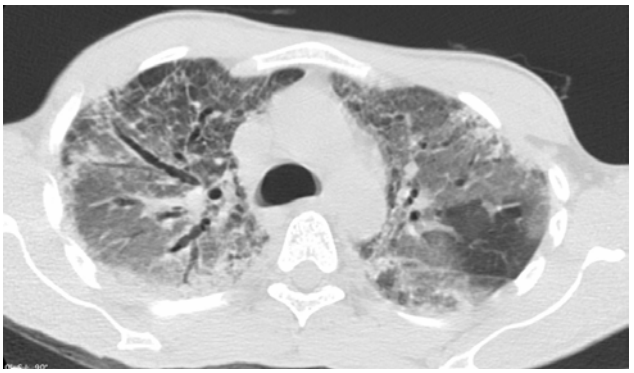

Fig 1: Image showing bilateral diffuse ground glass opacities and bronchiectasis – suggestive of interstitial lung disease

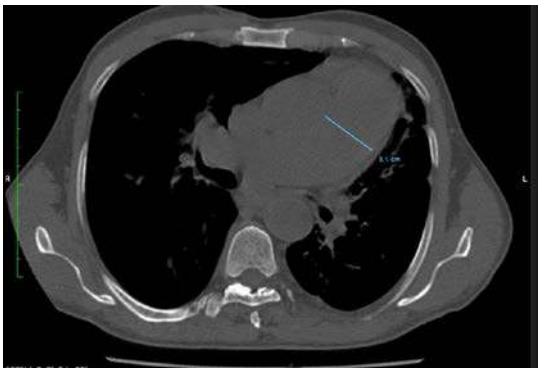

Fig 2: Image Showing Measurement Of Main Pulmonary Artery

Conclusion
Dilated pulmonary artery can raise a suspicion of pulmonary hypertension in interstitial lung diseases. Therefore, pulmonary artery diameter is key for screening of suspected pulmonary hypertension.

Conflict of Interest
Not available

Financial Support
Not available

References
1. Rubin LJ. Primary pulmonary hypertension. NEngl J Med. 1997;336(2):111-117.
2. Runo JR, Lyod JE. Primary pulmonary hypertension. Lancet. 2003;361(9368):1533-1544.
3. Kiely DG, Elliot CA, Sabroe I, Condliffe R. Pulmonary hypertension: diagnosis and management. BMJ. 2013;346:f2028.
4. Galie N, Humbert M, Vachiery JL, Gibbs S, Lang I, Torbicki A, *et al*. ESC/ERS Guidelines for the Diagnosis and Treatment of Pulmonary Hypertension of the European Society of Cardiology (ESC) and the European Respiratory Society (ERS): Endorsed by: Association for European Paediatric and Congenital Cardiology (AEPC), International Society for Heart and Lung Transplantation (ISHLT). Eur Heart J. 2015-2016;37(1):67-119.
5. Moser KM, Fedullo PF, Finkbeiner WE, Golden J. Do patients with primary pulmonary hypertension develop extensive central thrombi? Circulation. 1995;91(3):741-745.
6. Rich S, Dantzker DR, Ayres SM, *et al*. Primary pulmonary hypertension: a national prospective study. Ann Intern Med. 1987;107(2):216-223.
7. Rubin LJ. Pulmonary vasculitis and primary pulmonary hypertension. In: Murray JF, Nadel JA, eds. Textbook of respiratory medicine. 2nd ed. Philadelphia, Pa: Saunders; c1994. p. 1683-1709.
8. Hurdman J, Condliffe R, Elliot CA, Davies C, Hill C, Wild JM, *et al*. ASPIRE registry: assessing the Spectrum of Pulmonary hypertension Identified at a Referral centre. Eur Respir J. 2012;39(4):945-55.
9. Rajaram S, Swift AJ, Condliffe R, Johns C, Elliot CA, Hill C, *et al*. CT features of pulmonary arterial hypertension and its major subtypes: A systematic CT evaluation of 292 patients from the ASPIRE Registry. Thorax. 2015;70(4):382-7.
10. Chin M, Johns C, Currie BJ, Weatherly N, Hill C, Elliot C, *et al*. Pulmonary artery Size in Interstitial Llung Disease and Pulmonary Hypertension: Association with Interstitial Lung disease Severity and Dignostic Utility. Font. Cardiovasc. Med. 2018;5:53.
11. Devaraj A, Wells AU, Meister MG, Corte TJ, Hansell DM. The effect of diffuse pulmonary fibrosis on the reliability of CT signs of pulmonary hypertension. Radiology. 2008;249(3):1042-9.
12. Edwards PD, Bull RK, Coulden R. CT measurement of main pulmonary artery diameter. Br J Radiol. 1998;71(850):1018-20.
13. Shen Y, Wan C, Tian P, Wu Y, Li X, Yang T, *et al*. CT-base pulmonary artery measurement in the detection of pulmonary hypertension: A metaanalysis and systematic review. Medicine. 2014;93(27):e256.
14. Ng CS, Wells AU, Padley SP. A CT sign of chronic pulmonary arterial hypertension: the ratio of main pulmonary artery to aortic diameter. J Thorac Imaging; c1999.
15. Kuriyama K, Gamsu G, Stern RG, Cann CE, Herfkens RJ, Brundage BH. CT-determined pulmonary artery diameters in predicting pulmonary hypertension. Invest Radiol. 1984;19(1):16–22.
16. Frazier AA, Galvin JR, Franks TJ, Rosado-De-Christenson ML. Pulmonary vasculature: hypertension and infarction. Radio Graphics. 2000;20(2):491-524.
17. Castañer E, Gallardo X, Rimola J, *et al*. Congenital and acquired pulmonary artery anomalies in the adult: radiologic overview. Radio Graphics. 2006;26(2):349–371.
18. Pena E, Dennie C, Venoit J, Muniz SH. Pulmonary hypertension: how the radiologist can help Radiographics. 2012 Jan-Feb;32(1):9-32.
19. Francois CJ, Schiebler ML. Imaging of pulmonary hypertension. Radiol Clin North Am. 2016;54(60:1133-1149.+

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