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Chest contrast-enhanced computed tomography assessment of ESC/ERS pulmonary hypertension clinical classification: a study of reliability.

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Purpose/Objectives

Pulmonary hypertension (PH) is a multifaceted disease with different etiologies and clinical presentation. The European Society of Cardiology (ESC) and the European Respiratory Society (ERS) recently released a joint update on PH classification, including recommendations on the use of imaging techniques [01]. While chest contrast-enhanced computed tomography (CECT) plays a pivotal role in this setting [02] [03], there is limited information on its reliability in classifying PH. In this light, we aimed to assess the inter-reader agreement in the classification of PH on CECT.

Methods & Materials

The study retrospectively included 60 consecutive patients diagnosed with PH who underwent chest 64-row multidetector CECT between 2014-2022 at our University Hospital. In the case of multiple examinations, the one nearest to the time of PH diagnosis was selected. Two readers experienced in thoracic imaging, i.e., reader 1 (R1) and reader 2 (R2), independently reviewed all the CECT scans. Readers reported any abnormality among diffuse lung diseases (fibrosis and emphysema), heart abnormalities (including left chambers dilatation/wall thickening, coronary calcifications, and valvular abnormalities), vascular signs of chronic thromboembolism, and esophageal dilatation. Based on such findings, they were asked to classify each PH case into groups 1-5 according to the 2022 ESC/ERS guidelines [01]. Using unweighted Cohen's kappa (k) statistic with 95% confidence intervals (CI), we evaluated the agreement between R1 and R2 in detecting CECT abnormalities and defining PH groups. The k coefficients were interpreted according to Landis and Koch [04].

Results

Table 1 reports the prevalence values of CECT abnormalities with corresponding inter-reader agreement results.

Chest CECT findings	Readers		Inter-reader agreement k (95%CI) [4]	
	R1 N (%)	R2 N (%)		
Lung [1]	17 (28.3)	15 (25)	0.77 (0.59-0.94)	Substantial
Heart [2]	22 (36.7)	22 (36.7)	0.33 (0.09-0.57)	Fair
Pulmonary vessels [3]	11 (18.3)	7 (11.7)	0.69 (0.46-0.92)	Substantial
Esophageal dilatation	11 (18.3)	10 (16.7)	0.69 (0.46-0.92)	Substantial

Notes:
CECT, contrast-enhanced computed tomography; R1, reader 1; R2, reader 2; k, kappa value; CI, confidence interval
[1] Fibrosis and/or emphysema
[2] At least two of the following three findings: left chambers dilatation/wall thickening, coronary calcifications, and valvular abnormalities
[3] Vascular signs of chronic thromboembolism
[4] Kappa values interpretation was according to Landis and Koch (Biometrics, 1977)

Prevalence values of CECT abnormalities with corresponding inter-reader agreement results
The inter-reader agreement was substantial for most CECT findings (k ranging 0.69-0.77), except for heart abnormalities (fair agreement, k=0.33 [0.09-0.57]). The inter-reader agreement for defining PH groups was almost perfect (k=0.81 [95%CI 0.70-0.93]). Figure 1 resumes the results via radial charts.
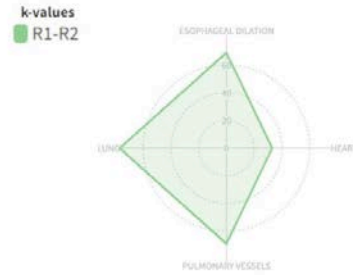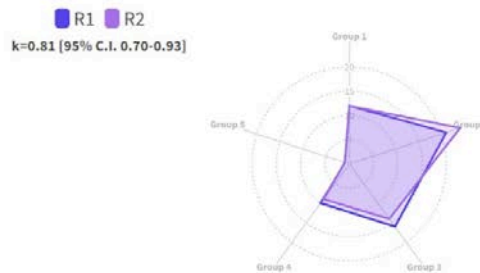
Pulmonary Hypertension

(a) Chest CT findings' distribution according to the two readers

■ R1 ■ R2
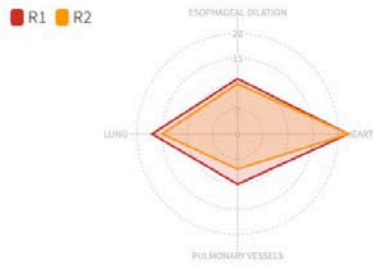
**(b)** Inter-reader agreement for each chest CT finding

k-values
■ R1-R2

(c) Patients' distribution across the five PH groups according to the two readers

■ R1 ■ R2

k=0.81 [95% C.I. 0.70-0.93]

Radar charts illustrate: (a) the chest CT findings' distribution according to the two readers (R1 and R2), (b) the inter-reader agreement for each CT finding, and (c) the patients' distribution across the five pulmonary hypertension (PH) groups according to R1 and R2.

Figure 2 illustrates PH groups' example cases from the series.
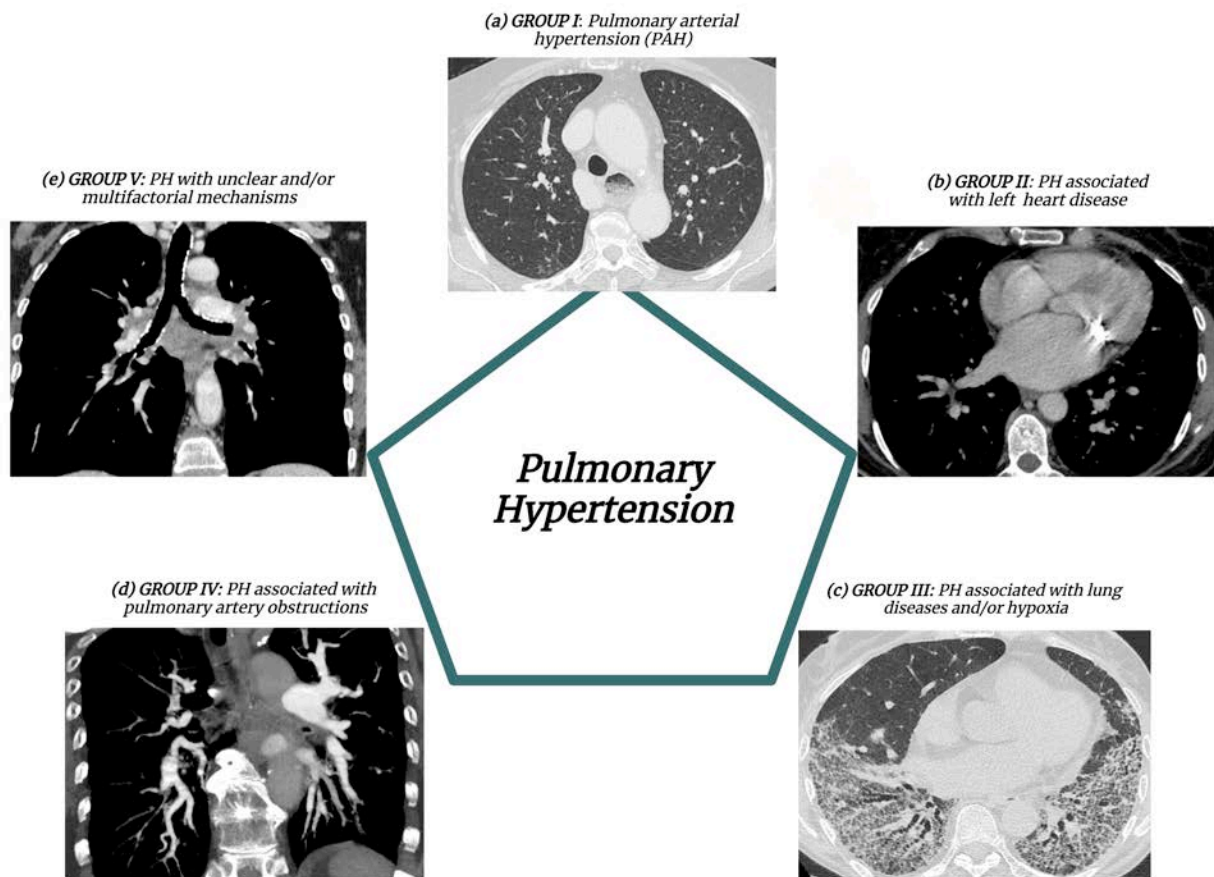
Typical group-specific pulmonary hypertension (PH) signs: (a) esophageal dilatation with no lung abnormalities; (b) left atrium dilatation and mitral valve calcifications; (c) extensive lung fibrosis; (d) signs of chronic thromboembolic pulmonary disease; (e) multiple mediastinal enlarged lymph nodes in sarcoidosis.

Conclusion

Despite poor reliability in assessing heart abnormalities, the inter-reader agreement in classifying PH was high when experienced radiologists interpreted CECT. Our results suggest that radiology-based multidisciplinary decision making in the setting of PH can be done on a reliable basis.

References:

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