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Incidence and clinical impact of coronary artery disease confirmed by coronary CT angiography in patients with interstitial lung disease

Hyun Seok Kwak[1], Ho Cheol Kim[2], Hyun Jung Koo[3], Seung-Whan Lee[4], Pil Hyung Lee[4] and Tae Oh Kim[4*]

Abstract

Background Patients with interstitial lung disease (ILD) who undergo routine chest computed tomography (CT) often have findings suggestive of coronary artery disease (CAD). However, the incidence and prognostic impact of significant CAD, confirmed by coronary CT angiography (CCTA), are not well established.

Methods From January 2013 to February 2024, we evaluated 215 patients from a retrospective ILD registry at our institute, who underwent CCTA as part of ILD management. Using the CAD-Reporting and Data System, we investigated the incidence of significant CAD and evaluated its impact on 5-year mortality and rehospitalization for respiratory or cardiovascular causes through multivariable Cox proportional hazards regression.

Results During a median follow-up of 2.3 years, CCTA was performed at a median of 5 months postdiagnosis of ILD in the cohort. Significant CAD was identified in 92 patients (42.8%), with 27 (12.6%) undergoing coronary revascularization. The presence of significant CAD was significantly associated with an increased risk of mortality (adjusted hazard ratio [HR]: 2.31; 95% confidence interval [CI]: 1.07 – 5.01; $P = 0.03$) and a higher risk of rehospitalization (adjusted HR: 2.03; 95% CI: 1.23 – 3.34; $P = 0.01$). Key clinical variables associated with significant CAD included older age (≥ 63 years), hypertension, and coronary calcification observed on non-gated chest CT.

Conclusions CCTA-identified CAD was associated with a worse clinical prognosis in patients with ILD, with significant risk factors including older age, hypertension, and coronary calcification observed on non-gated chest CT. These findings suggest that obtaining CCTA may be beneficial for managing patients with ILD, particularly those with identified risk factors.

Keywords Computed tomography angiography, Coronary artery disease, Interstitial, Lung disease, Mortality

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Introduction

Interstitial lung disease (ILD) is defined as inflammation and fibrosis within the alveolar interstitium of the lung and has about 200 subtypes [1]. Although antifibrotic drugs that slow the progression of the disease have been approved and used recently [2], idiopathic pulmonary fibrosis (IPF), the prototype of ILD, classically shows a poor prognosis with a median of 3–5 years [3], and ILDs other than IPF might also show a progressive course [4]. Patients with ILD may be accompanied by pulmonary comorbidities such as pulmonary hypertension, lung cancer, and various non-pulmonary conditions [5]. Consequently, early identification and treatment of comorbidities are critical, as they can significantly increase morbidity and mortality in these patients [6].

Ischemic heart disease is a leading cause of mortality in the general population, and its prevalence is notably higher in conditions associated with systemic inflammation, such as ILD [7]. Additionally, IPF and other forms of ILD are relatively well-known risk factors for coronary artery disease (CAD) [8, 9]. However, diagnosing CAD in patients with ILD is particularly challenging because its symptoms are often indistinguishable from or masked by those of lung disease. Moreover, advanced ILD complicates diagnostic procedures due to limitations in exercise capacity, poor tolerance for pharmacological stress tests, and reduced accuracy of echocardiography caused by impaired acoustic windows [10]. To address this gap, we conducted a study to evaluate the incidence of significant CAD in patients with ILD through coronary computed tomography angiography (CCTA). Furthermore, we assessed the impact of CCTA-identified CAD on clinical outcomes, including mortality and rehospitalization, during ongoing ILD management.

Methods

Study population and data sources

This study retrospectively analyzed patients with ILD who underwent CCTA at our institution between January 2013 and February 2024. The study included patients identified by their treating physicians as being intermediate to high risk for atherosclerosis, thereby warranting coronary evaluation through CCTA. Patients with a prior diagnosis of CAD or those who had undergone CCTA before their ILD diagnosis were excluded. This study was approved by the Institutional Review Board of our institution (IRB 2023 – 1394), and the requirement for written patient consent was waived due to the retrospective nature of the study. This study was conducted in accordance with the Declaration of Helsinki.

Clinical data collection and CAD management

All clinical information collected was obtained during routine patient care. Underlying diseases and CAD risk factors (smoking history, hypertension, diabetes, and dyslipidemia), medication history, pulmonary function tests, electrocardiograms (ECG), and echocardiographic data were collected within 6 months of the date of the ILD diagnosis. To check the clinical course and outcome of CAD, the use of antiplatelet and lipid-lowering agents, coronary angiography (CAG), revascularization procedures (percutaneous coronary intervention [PCI], and coronary artery bypass graft surgery [CABG]) were collected from the date of CCTA.

Assessment of CAD severity using CCTA

All study patients were assessed by ECG-gated CCTA with radiocontrast. The severity of CAD was assessed using the Coronary Artery Disease-Reporting and Data System (CAD-RADS), which grades CAD severity on a scale of 0–5 [11, 12]. Based on their CAD-RADS category, which is detailed in Table S1, patients were divided into two groups: the significant CAD group, which included patients with CAD-RADS categories of 3, 4 A, 4B, or 5, and the nonsignificant CAD group, which included patients with CAD-RADS categories of 0, 1, or 2. In addition, information on Agatston calcium scores from gated CT scans and the presence of coronary calcification from non-gated thoracic CT scans based on visual assessment was included. Reasons and timing for performing CCTA after ILD diagnosis were recorded.

Endpoints definition

The primary endpoint of this study was all-cause mortality following ILD diagnosis, with lung transplantation considered equivalent to death. Secondary endpoints included rehospitalizations due to respiratory and cardiovascular causes. Endpoint data were collected from electronic medical records and the National Health Insurance of Korea database.

Statistical analysis

All values for continuous variables are expressed as medians with interquartile ranges (IQRs), and those for categorical variables are expressed as frequencies (percentages). The Mann-Whitney U-test was used to compare continuous variables, whereas the chi-square or Fisher's exact test was employed to compare categorical variables. Kaplan-Meier estimates and the log-rank test were used for survival analysis of 5-year mortality and 5-year rehospitalization. Follow-up time was calculated from the date of ILD diagnosis to the date of death, rehospitalization, or time of censoring. Cox proportional hazards analysis was performed to identify prognostic factors for all-cause 5-year mortality and rehospitalization, whereas logistic regression was used to determine predictors for significant CAD. Variables with P-values < 0.2 in the univariable analysis, including CAD risk

factors, were entered into multivariable models. Receiver operating characteristic (ROC) curve analysis was conducted to determine the optimal cutoff value of significant continuous variables for predicting significant CAD, mortality, and rehospitalization. *P*-values were two-tailed, with statistical significance set at $P < 0.05$. All statistical analyses were performed using SPSS version 23.0, MEDCALC version 8.1.0.0, and R version 4.4.1.

Results

Study population and follow-up duration

A total of 215 patients with ILD were analyzed in this study. Among these patients, the diagnosis of IPF represented the majority, accounting for 40% of cases (86 of 215 patients). Detailed diagnostic information can be found in Table S2. The median duration of clinical follow-up was 2.3 years (IQR: 1.2–3.8 years), with 2.0 years (IQR: 1.2–3.2 years) for the CAD group and 2.4 years (IQR: 1.3–4.1 years) for the non-CAD group. Analyses were truncated at 5 years of follow-up to account for differences in follow-up duration.

Reasons for coronary workup and CAD timeline

A significant number of patients underwent CCTA for coronary calcifications identified on non-gated chest CT, for preoperative evaluation, and for symptoms associated with angina, with the detailed rationale for the coronary work-up provided in Fig. 1. Representative images of a patient diagnosed with interstitial pulmonary fibrosis who underwent CCTA due to these calcifications, leading to the diagnosis of definite CAD by coronary angiography and subsequent coronary revascularization, are shown in Fig. 2.

During the entire follow-up period, 92 (42.8%) patients were identified as having significant CAD. The distribution of patients according to CAD-RADS categories is presented in Table S3. The median time to CAD diagnosis was 0.3 years (IQR: 0.1–1.0 years) after the initial ILD diagnosis. Including cases where CAD was identified concurrently with the ILD diagnosis, most patients (68 of 92, 73.9%) were diagnosed within the first year of their ILD diagnosis (Figure S1). A smaller proportion

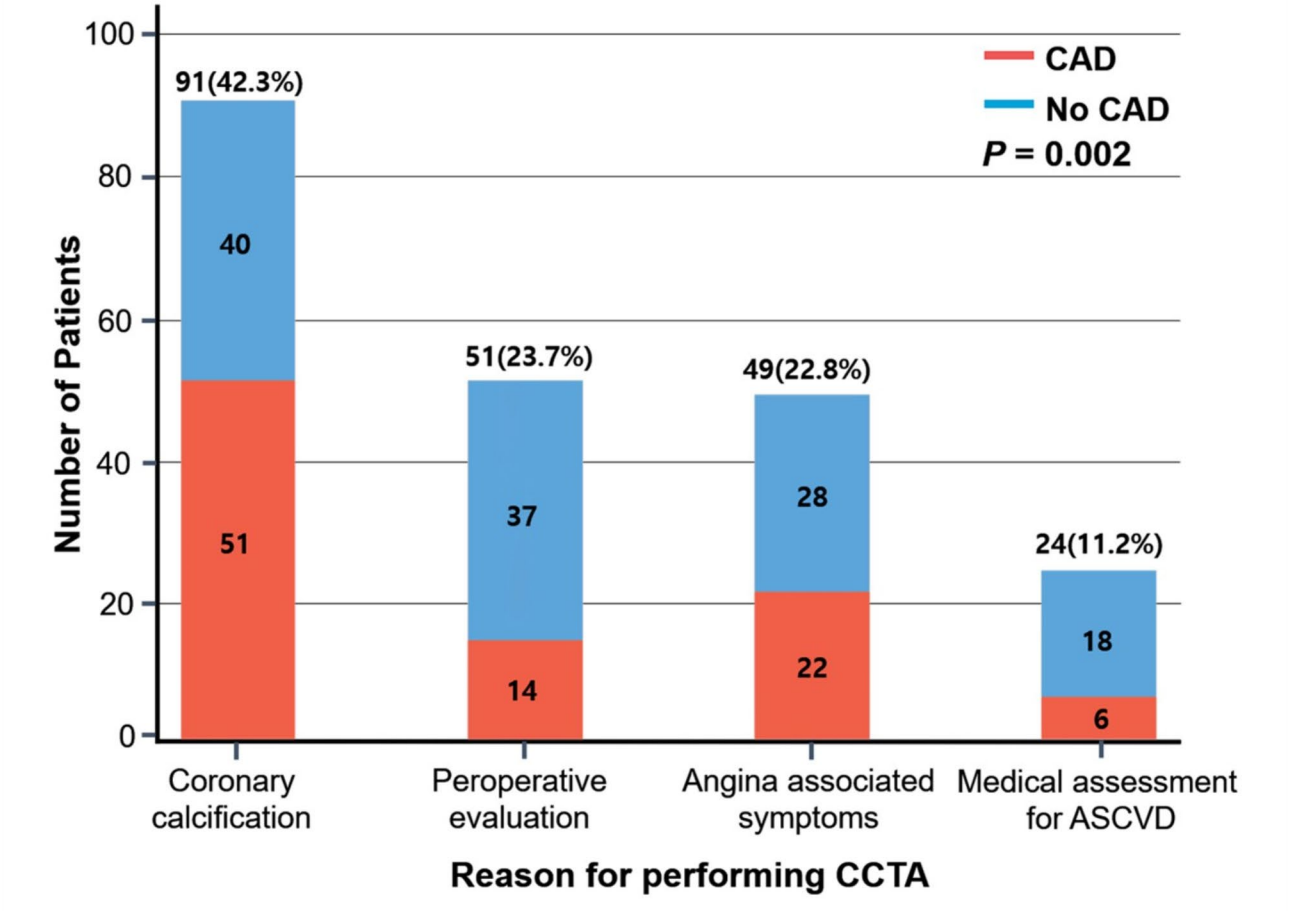

Fig. 1 Rationale for coronary evaluation in the study population
CAD = coronary artery disease; CCTA = coronary computed tomography angiography; ASCVD = atherosclerotic cardiovascular disease

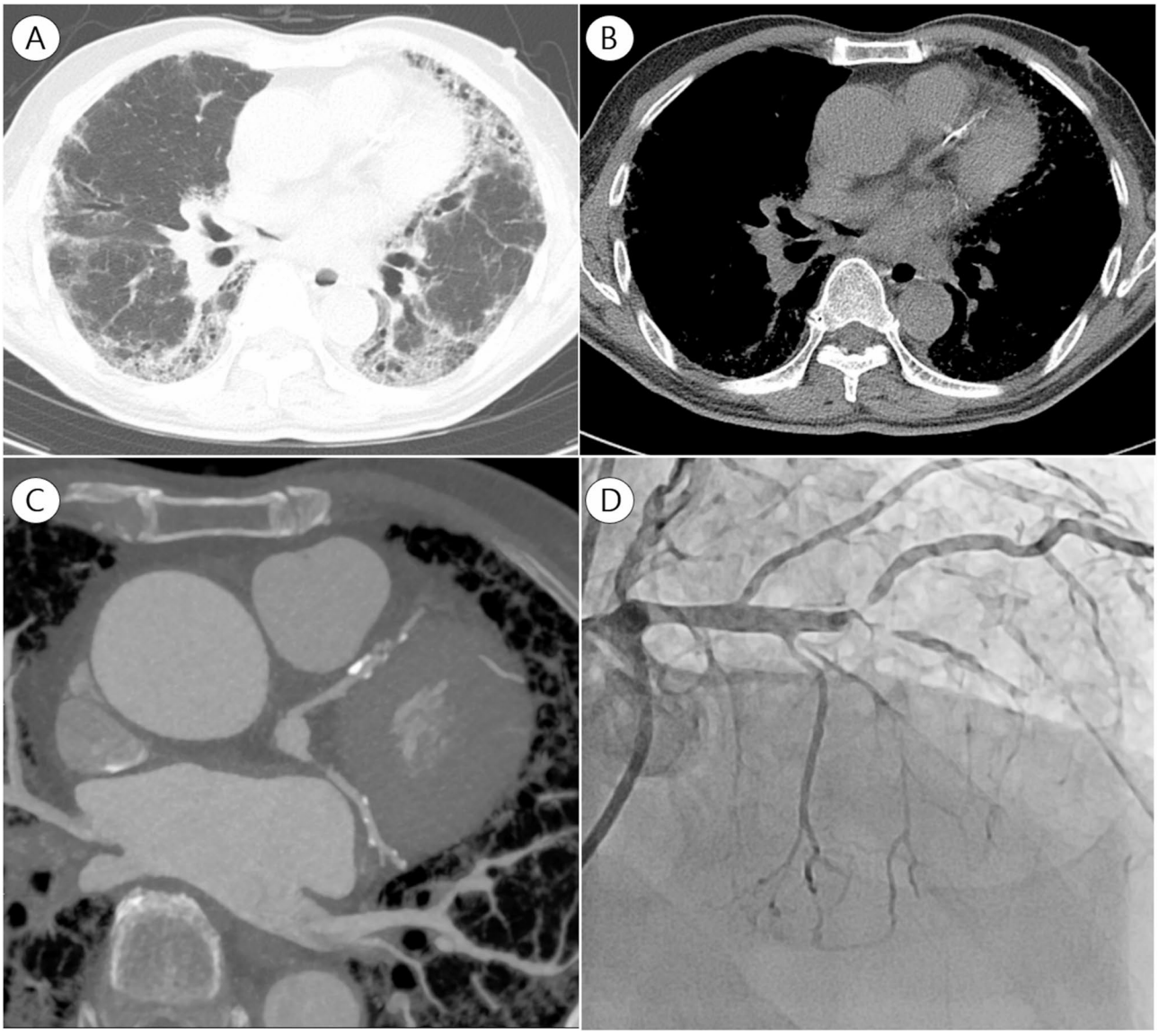

Fig. 2 Representative images of patients with significant CAD. (**a**) High-resolution computed tomography (HRCT) of the lungs showing ILD with a typical pattern of reticulation and honeycombing (**b**) Mediastinal view of HRCT highlighting cardiac structures, showing coronary artery calcification in the left anterior descending (LAD) artery. (**c**) CCTA showing significant stenosis of the LAD artery, (**d**) Coronary angiogram providing a detailed view of the LAD artery leading to revascularization

ILD = interstitial lung disease, CAD = coronary artery disease; CCTA = coronary computed tomography angiography; HRCT = High-resolution computed tomography; LAD = left anterior descending

of patients were diagnosed with CAD more than 1 year after their ILD diagnosis.

Baseline characteristics

Baseline characteristics of patients according to significant CAD status are shown in Table 1. Overall, the CAD group was older, predominantly male, and had a higher prevalence of smoking history compared with the non-CAD group. Among traditional cardiovascular risk factors, the incidence of hypertension was higher in the CAD group; however, no significant differences in diabetes or dyslipidemia were observed between the groups.

Regarding lung disease characteristics, no significant difference was noted in the composition of IPF and non-IPF ILD between the groups. Spirometry findings, including forced vital capacity (FVC) and diffusing capacity for carbon monoxide (DLco), showed no significant differences between the CAD and non-CAD groups, and no differences were noted in left ventricular ejection fraction between the groups. However, a significant difference was observed in Agatston calcium scores between the

Table 1 Baseline clinical characteristics of the patients

Variables	Overall (*N* = 215)	CAD (*N* = 92)	Non-CAD (*N* = 123)	*P*-Value
Age, years	64 (59–71)	67 (63–73)	61 (56–68)	**< 0.001**
Male sex	152 (70.7)	74 (80.4)	78 (63.4)	0.007
Body mass index*	24.9 (22.7–26.9)	25.1 (22.4–26.8)	24.9 (22.9–26.8)	0.629
Smoking history	132 (61.4)	64 (69.6)	68 (55.3)	**0.033**
Comorbidities				
Hypertension	89 (41.4)	51 (55.4)	38 (30.9)	**< 0.001**
Diabetes	76 (35.3)	38 (41.3)	38 (30.9)	0.114
Dyslipidemia	121 (56.3)	48 (52.2)	73 (59.3)	0.294
ILD diagnosis				
IPF	86 (40.0)	42 (45.7)	44 (35.8)	0.143
NonIPF ILD	129 (60.0)	50 (54.3)	79 (64.2)	
Spirometry†				
FVC, predicted %	74 (60–86)	72 (60–85)	77 (61–87)	0.455
DLco, predicted %	58 (38–72)	58 (45–71)	58 (36–72)	0.458
LV ejection fraction‡	62 (60–65)	63 (60–66)	62 (60–65)	0.166
TWI on ECG	36 (16.7)	20 (21.7)	16 (13.0)	0.090
Agatston calcium score§	226 (1–781)	765 (302–1,309)	33 (0–226)	**< 0.001**

Values are presented as median (interquartile range) for continuous variables and as percentages for categorical variables. Analysis parameters with statistically significant differences are shown in bold

*Body mass index is the weight in kilograms divided by the square of the height in meters (kg/m^2)

†In the total population, spirometry was performed in a subset of patients to assess FVC (*n* = 207) and DLCO (*n* = 201). Median (interquartile range) values are presented for each group

‡In the total population, echocardiography was performed on a subset of patients to assess LVEF (*n* = 192). Median (interquartile range) values are presented for each group

§In the total population, Agatston calcium scores were available for a subset of patients (*n* = 189), with median (interquartile range) values presented for each group

CAD = coronary artery disease; DLco = diffusing capacity for carbon monoxide; ECG = electrocardiogram; FVC = forced vital capacity; LV = left ventricle; ILD = interstitial lung disease; IPF = idiopathic pulmonary fibrosis; TWI = T-wave inversion

Table 2 Clinical management and outcomes of patients with ILD with and without CAD

Variables	Overall (*N* = 215)	CAD (*N* = 92)	Non-CAD (*N* = 123)	*P*-Value
Use of antiplatelet agent	75 (34.9)	70 (76.1)	5 (4.1)	**< 0.001**
Use of lipid lowering agent	120 (55.8)	83 (90.2)	37 (30.1)	**< 0.001**
Diagnostic CAG	49 (22.8)	47 (51.1)	2 (1.6)	**< 0.001**
Revascularization*	27 (12.6)	27 (29.3)	0 (0.0)	**< 0.001**
5-year rehospitalization‡	76 (49.7)	41 (55.6)	35 (44.2)	**0.001**
5-year all-causes mortality‡	39 (33.4)	24 (52.6)	15 (20.8)	**0.001**

Data are presented as the numbers (No.) and percentages (%). Analysis parameters with statistically significant differences are shown in bold

*Revascularization includes both percutaneous coronary intervention and coronary artery bypass grafting

‡5-year rehospitalization and all-cause mortality incidences are shown as numbers and percentages. Cumulative risk was calculated using Kaplan-Meier analysis, with *P*-values from the log-rank test, as shown in Fig. 3

ILD = interstitial lung disease, CAD = coronary artery disease; CAG = coronary angiography

two groups, with the CAD group having a median score of 765 versus 33 in the non-CAD group ($P < 0.001$).

Association of CAD and clinical outcomes

During the 5-year follow-up period, 39 deaths and 76 rehospitalizations occurred. Patients with CAD identified by CCTA were more likely to receive antiplatelet therapy, lipid-lowering therapy, and revascularization via invasive coronary angiography than were patients without CAD. Of the 92 patients with CAD, 27 underwent revascularization (2 CABG and 25 PCI), as summarized in Table 2.

The observed (unadjusted) event rates for 5-year all-cause mortality and rehospitalization were 52.6% and 55.6%, respectively, in patients with CAD, compared to 20.8% and 44.2% in patients without CAD (Fig. 3). After a multivariable adjustment for a wide range of baseline covariates, the adjusted risk of all-cause mortality over 5 years was significantly higher in patients with CAD compared to those without CAD (hazard ratio [HR]: 2.31; 95% confidence interval [CI]: 1.07 – 5.01; $P = 0.034$) (Table 3). Similarly, the adjusted risk of 5-year rehospitalization was also significantly higher in the CAD group than in the non-CAD group (HR: 2.03; 95% CI: 1.23 – 3.34; $P = 0.005$) (Table S4). To further stratify risk in these patients, we performed ROC curve analysis of calcium scores. This analysis identified a calcium score of 40 as the optimal cutoff for mortality prediction (C-index = 0.63, Figure S2A), while showing no significant value for rehospitalization (C-index = 0.53, Figure S2B). In univariate analysis, patients with calcium scores ≥ 40 demonstrated higher mortality (38.9% vs. 10.5%, HR: 5.21, 95% CI: 1.57–17.31, $P = 0.007$, Figure S3).

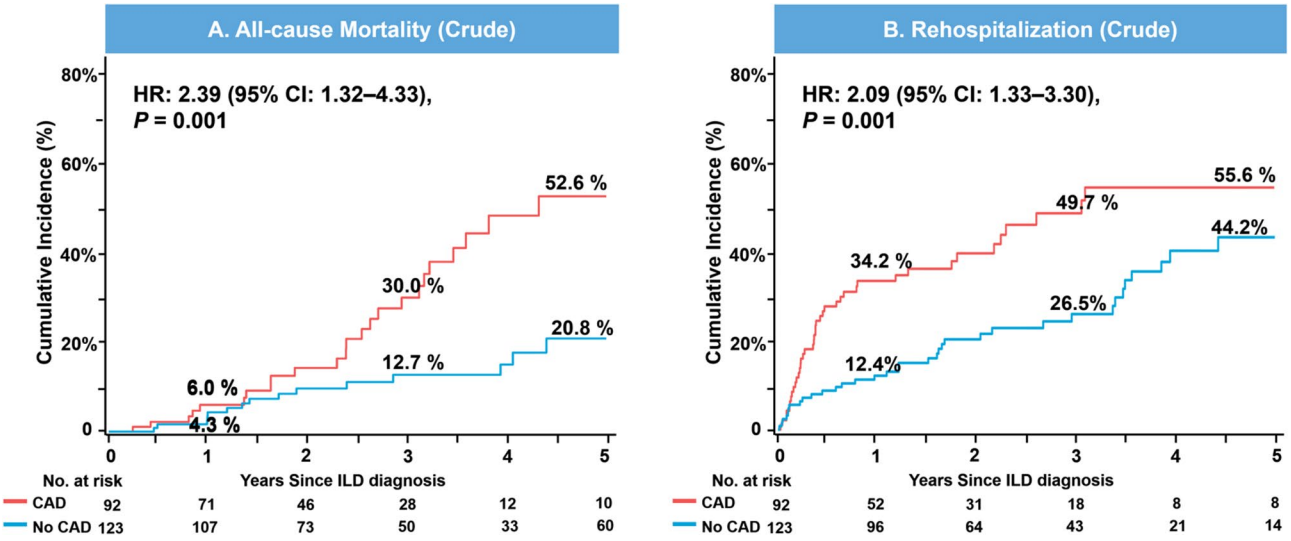

Fig. 3 Mortality and rehospitalization in patients with ILD with and without CAD. The 5-year cumulative incidence of (**a**) all-cause mortality and (**b**) rehospitalization in patients with ILD is visible, comparing those with CAD (red line) to those without CAD (blue line). Significantly higher rates of (**a**) mortality (HR: 2.39, 95% CI: 1.32 – 4.33, *P* = 0.001) and (**b**) rehospitalization (HR: 2.09, 95% CI: 1.33 – 3.30, *P* = 0.001) are observed in patients with CAD compared to those without CAD

ILD = interstitial lung disease, CAD = coronary artery disease, HR = hazard ratio, CI = confidence interval

Table 3 Hazard ratio of covariate of all-cause mortality

Variables	Univariate analysis		Multivariable analysis	
	HR (95% CI)	*P*-Value	HR (95% CI)	*P*-Value
Age*	1.05 (1.01 – 1.09)	**0.009**	1.04 (1.00 – 1.08)	**0.035**
Male sex	1.32 (0.63 – 2.78)	0.468		
Body mass index†	0.89 (0.79 – 0.99)	**0.033**	1.01 (0.88 – 1.16)	0.932
Smoking history	0.78 (0.51 – 1.87)	0.948		
IPF	2.32 (1.21 – 4.48)	**0.012**	1.58 (0.77 – 3.23)	0.209
Hypertension	1.77 (0.94 – 3.32)	0.077	1.25 (0.62 – 2.51)	0.529
Diabetes	1.24 (0.63 – 2.42)	0.529		
FVC†	0.97 (0.95 – 0.98)	**< 0.001**	0.99 (0.97 – 1.02)	0.568
DLco†	0.97 (0.96 – 0.99)	**< 0.001**	0.97 (0.95 – 1.00)	**0.016**
TWI on ECG	1.07 (0.45 – 2.55)	0.882		
LV ejection fraction†	1.01 (0.95 – 1.07)	0.875		
Significant CAD	2.79 (1.46 – 5.33)	**0.002**	2.31 (1.07 – 5.01)	**0.034**
Agatston calcium score ≥ 40‡	5.21 (1.57–17.32)	**0.007**		

Analysis parameters with statistically significant differences are shown in bold

*HR changes are shown for each 1-year increase in age

†HR changes were shown for each 1 kg/m^2 decrease in BMI and each 1% decrease in predicted FVC and DLco

‡Agatston calcium score ≥ 40 (as a dichotomized variable) was not included in the multivariable analysis as scores were available for only 189 out of the total 215 patients

CAD = coronary artery disease; CI = confidential interval; DLco = diffusing capacity for carbon monoxide; ECG = electrocardiogram; FVC = forced vital capacity; HR = hazard ratio; IPF = idiopathic pulmonary fibrosis; LV = left ventricle; TWI = T-wave inversion

Independent predictors for significant CAD

In a univariate logistic analysis, older age, male sex, smoking, hypertension, and coronary calcification on non-gated chest CT were identified as risk factors for significant CAD. After adjustment for variables, older age (odds ratio [OR], 1.05; 95% CI, 1.01–1.09; *P* = 0.011), hypertension (OR, 2.00; 95% CI, 1.02–3.93; *P* = 0.043), and coronary calcification on non-gated chest CT (OR, 2.26; 95% CI, 1.13–4.58; *P* = 0.022) remained independent predictors for significant CAD (Table 4).

In the ROC analysis, the optimal cutoff age for significant CAD was 62.5 years (C-index = 0.69, *P* < 0.001) (Figure S4). The proportion of significant CAD was higher in patients older than 63 years (55.6% vs. 24.7%, *P* < 0.001) compared to patients younger than 63 years. Other characteristics between the two groups are shown in Table S5.

Table 4 Predictors of significant CAD identified by CCTA

Variables	Univariate analysis		Multivariable analysis	
	OR (95% CI)	*P*-Value	OR (95% CI)	*P*-Value
Age*	1.08 (1.04 – 1.11)	**< 0.001**	1.05 (1.01 – 1.09)	**0.011**
Male sex	2.37 (1.28 – 4.55)	**0.007**	1.97 (0.72 – 5.45)	0.186
Body mass index*	0.98 (0.89 – 1.07)	0.624		
Smoking history	1.85 (1.05 – 3.29)	**0.034**	1.17 (0.48 – 2.88)	0.730
IPF	1.51 (0.87 – 2.63)	0.144	1.13 (0.57 – 2.24)	0.724
Hypertension	2.78 (1.60 – 4.91)	**< 0.001**	2.00 (1.02 – 3.93)	**0.043**
Diabetes	1.57 (0.90 – 2.78)	0.115	0.84 (0.42 – 1.66)	0.612
FVC*	0.99 (0.98 – 1.01)	0.468		
DLco*	1.01 (0.99 – 1.02)	0.434		
TWI on ECG	1.86 (0.91 – 3.88)	0.093	2.01 (0.88 – 4.70)	0.101
LV ejection fraction*	1.03 (0.99 – 1.09)	0.197	1.05 (1.00 – 1.11)	0.063
Coronary calcification†	2.58 (1.48 – 4.54)	**< 0.001**	2.26 (1.13 – 4.58)	**0.022**

*Odds ratios for CAD identified by CCTA were calculated by dichotomizing age at 63 years, BMI at 25 kg/m², FVC at 0.8, DLCO at 0.6, and LVEF at 40%. Analysis parameters with statistically significant differences are shown in bold

†This refers to coronary calcification identified by visual estimation on non-gated chest CT

CAD = coronary artery disease; CCTA = coronary computed tomography angiography; CI = confidential interval; DLco = diffusing capacity for carbon monoxide; ECG = electrocardiogram; LV = left ventricle; ILD = interstitial lung disease; IPF = idiopathic pulmonary fibrosis; OR = odds ratio

Discussion

In this single-center, retrospective study, we evaluated the impact of CAD identified by CCTA in patients with ILD. Major findings include: (1) significant CAD (≥ CAD-RADS 3) was found in 42.8% of patients, (2) CCTA-identified CAD effectively predicted worse outcomes, including higher 5-year mortality and rehospitalization, and (3) older age, hypertension, and coronary calcification on non-gated chest CT were strong predictors of significant CAD. These findings highlight the importance of CCTA in assessing CAD and predicting long-term outcomes in patients with ILD, improving prognosis and management.

Despite advancements in diagnosing ILD subtypes and developing tailored treatments, non-pulmonary comorbidities driven by systemic inflammation remain a significant clinical challenge [2, 3]. As ischemic heart diseases have become the leading cause of death in patients with ILD, the need for accurate CAD diagnosis is increasingly recognized as essential for improving long-term outcomes [8, 13, 14]. Several studies have noted the clinical risks of significant CAD in patients with ILD identified via invasive CAG [15, 16]. However, data on CAD identified through noninvasive methods and their prognostic impact on long-term mortality remain limited [17]. Given the advancements in cardiovascular imaging techniques, investigating the process of diagnosing CAD via CCTA in long-term tracked cohorts is crucial. From this clinical perspective, the present study offers valuable insights into the incidence and prognostic significance of CCTA-identified CAD in patients with ILD. A comprehensive understanding of the characteristics and prognostic impact of CCTA-identified CAD could aid in the development of risk stratification and primary prevention strategies for ASCVD in patients with ILD during routine clinical practice.

One of the principal aims of the current study was to evaluate the incidence, timing, and predictors of significant CAD after ILD diagnosis. The prevalence of CAD in patients with ILD has been reported to vary with ranges of 7–65.8% [9, 10, 14–16, 18–20], depending on the study design and target population. In our current study, CAD confirmed by CCTA accounted for 42.8% of patients with ILD, which is slightly higher than that in previous studies that used CAG [9, 15, 16]. One possible explanation is that 42.3% of the patients had coronary calcification on non-gated chest CT. Moreover, our current study found that most cases of CAD were diagnosed within the first year of follow-up after ILD diagnosis, suggesting that CAD is likely to coexist with ILD for a longer period of time, given that ILD is a predisposing factor for atherosclerosis [21]. The exact mechanism by which ILD influences coronary artery disease has not yet been elucidated. However, various inflammatory and immunologic pathways, including the T1 cell pathway, may have contributed to the development of CAD in ILD patients [9, 22, 23]. The relatively high prevalence of CAD in patients with ILD at intermediate or higher ASCVD risk highlights the importance of proactive coronary evaluation in this patient population. Traditional CAD risk factors such as older age and hypertension, further emphasize the need for coronary evaluation [24, 25]. Interestingly, coronary calcification on non-gated chest CT was independently associated with significant CAD, as confirmed by CCTA. Patel et al., in a study of 254 patients with ILD, reported that coronary calcification was identified on non-contrast chest CT in 43.7% of patients and was significantly associated with adverse cardiac events [24].

Taken together with ours, these findings suggest that further work-up might be necessary for patients with ILD with coronary calcification on non-gated chest CT.

The primary goal of this study was to investigate the relationship between CCTA-identified CAD and its impact on mortality and rehospitalization during a 5-year follow-up period after ILD diagnosis. CCTA-identified CAD provides an objective assessment of CAD severity using the CAD-RADS, which evaluates plaque burden, luminal stenosis, and coronary calcification [26]. The impact of CAD on prognosis in patients with ILD has shown conflicting results in previous studies. Nathan et al., in 73 patients with IPF, showed that significant CAD group had worse outcomes compared to those with no or nonsignificant CAD [15]. Likewise, Caminati et al. reported that a higher calcium score was associated with mortality and cardiovascular events in 79 patients with IPF [27]. However, Kato et al. showed that prognosis did not significantly differ between patients with CAD and those without CAD, both in the non-IPF ($n = 790$) and IPF groups ($n = 568$) [19]. In the study by Kato et al., death was confirmed in only 152 of 1,136 patients (13.4%), and the clinical diagnosis of angina pectoris was also included in the CAD group. These might have contributed to the difference in results. Importantly, this study demonstrated a significant association between CCTA-identified CAD, increased mortality, and higher rates of rehospitalization. Rehospitalizations, which frequently complicate the course of ILD, negatively impact quality of life, and are associated with substantial morbidity and mortality, were strongly correlated with the presence of significant CAD [28]. This finding suggests that CCTA-identified CAD may serve as a critical prognostic marker in patients with ILD and indicates that treating CAD could potentially improve the clinical course.

There are some limitations to our current study. First, as a retrospective study, CCTA was performed based on clinical assessment and our standard CCTA protocol rather than predefined research criteria, which may have introduced selection bias. Additionally, since we did not incorporate coronary calcium scoring from non-gated chest CT scans as complementary data, it is difficult to generalize the findings to all ILD patients. Second, we could not establish a control group without ILD, making direct comparisons with the general population impossible. Third, in some patients, the exact cause of death was unknown, making a detailed analysis by cause of death impossible. Finally, coronary calcification on non-gated chest CT was subjectively confirmed. Despite these limitations, our study has the strength of evaluating the clinical role of CCTA in patients with ILD, and to our knowledge, this represents the first such report.

Conclusion

In conclusion, CCTA-identified CAD was associated with the prognosis of patients with ILD, with risk factors including older age, hypertension, and coronary calcification on non-gated chest CT. Therefore, obtaining CCTA might have important management implications for ILD patients with risk factors and warrants further study.

Abbreviations

ASCVD	Atherosclerotic Cardiovascular Disease
CABG	Coronary Artery Bypass Graft Surgery
CAD	Coronary Artery Disease
CAG	Coronary Angiography
CCTA	Coronary CT Angiography
CI	Confidence Interval
CT	Computed Tomography
DLco	Diffusing Capacity for Carbon Monoxide
ECG	Electrocardiogram
FVC	Forced Vital Capacity
HR	Hazard Ratio
HRCT	High-resolution Computed Tomography
ILD	Interstitial Lung Disease
IPF	Idiopathic Pulmonary Fibrosis
LAD	Left Anterior Descending
OR	Odds Ratio
PCI	Percutaneous Coronary Intervention
ROC	Receiver Operating Characteristic
TWI	T-wave Inversion

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12890-025-03554-8.

Supplementary Material 1

Author contributions

Hyun Seok Kwak: Investigation, Writing–original draft, Data collection, and Formal analysis. Ho Cheol Kim: Conceptualization, Data curation, Investigation, Visualization. Pil Hyung Lee: Investigation. Seung-Whan Lee: Investigation. Hyun Jung Koo: Investigation. Tae Oh Kim: Supervision, Investigation, Visualization, Writing – original draft, and Writing – review & editing.

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Data availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

This study adhered to the principles outlined in the Declaration of Helsinki and was carried out with the approval of the Institutional Review Board of Asan Medical Center (IRB no. 2023 – 1394). The requirement for informed consent was waived by the Institutional Review Board due to the retrospective nature of the study and the use of anonymized clinical data.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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