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Original Article

Coronary Angiography Findings in Lung Transplant Candidates and Their Impact on the Transplant Process: A Retrospective Analysis

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Abstract

Objectives: The aim of this study is to examine the coronary angiography (CA) findings of patients evaluated as candidates for lung transplantation (LTx) and to assess the impact of these findings on the transplantation process.

Methods: The study was conducted on 237 lung transplant candidates who presented to the Lung Transplant Clinic at Koşuyolu Higher Specialization Training and Research Hospital between January 1, 2017, and August 1, 2024, and underwent CA. Data including age, gender, comorbidities (coronary artery disease, hypertension, diabetes mellitus, etc.), cholesterol panel, hemoglobin A1c levels, and CA results were recorded and statistically analyzed.

Results: Of the 237 patients included in the study, 24.5% were female and 75.5% were male. The mean age was 48.8±12 years, with an age range of 14–67 years and the average body mass index was 23.72±3.97. CA findings showed that 67% of patients had normal results, while 26.1% exhibited plaque formation. Among these, 9.28% had stenosis of 1–49%, 5.06% had stenosis of 50–69%, and 3.8% had stenosis of 70% or greater. Stents were placed in 4.64% of patients with significant stenosis, leading to a postponement of the transplant process by at least 6 months for 11 patients (4.64%). Medical therapy was initiated in patients without stents, and 10 patients (4.21%) were deemed unsuitable for transplantation.

Conclusion: CA is critical for the safety of the LTx process in candidates. As the status of coronary arteries directly affects the perioperative management and post-operative outcomes of patients, comprehensive pre-evaluation of this condition is of great importance, especially in the group with interstitial lung disease.

Keywords: Coronary angiography; lung transplantation; pre-transplant screening.

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Akciğer Nakli Adaylarında Koroner Anjiografi Bulguları ve Nakil Sürecine Etkileri: Retrospektif Bir Değerlendirme

Özet

Amaç: Bu çalışmanın amacı, akciğer nakli adayı olarak değerlendirilen hastaların koroner anjiografi bulgularını incelemek ve bu bulguların nakil sürecine etkilerini değerlendirmektir.

Gereç ve Yöntem: Çalışma, 01 Ocak 2017 ile 01 Ağustos 2024 tarihleri arasında Koşuyolu Yüksek İhtisas Eğitim ve Araştırma Hastanesi Akciğer Nakli Kliniği'ne başvuran ve koroner anjiografi yapılan 237 akciğer nakli adayı üzerinde gerçekleştirilmiştir. Hastaların yaş, cinsiyet, eşlik eden hastalıklar (koroner arter hastalığı, hipertansiyon, diabetes mellitus vb.), kolesterol paneli, hemoglobin A1c düzeyleri ve koroner anjiografi sonuçları kaydedilerek istatistiksel analiz yapılmıştır.

Bulgular: Araştırmaya dahil edilen 237 hastanın %24,5'i kadın, %75,5'i erkektir. Hastaların yaş ortalaması 48,8 ± 12 yıl, yaş aralığı ise 14-67 yıl, ortalama vücut kitle indeksi 23,72 ± 3,97 olarak bulunmuştur. Koroner anjiografi bulgularına göre hastaların %67'sinde normal sonuçlar elde edilirken, %26,1'inde plak formasyonu, %9,28'inde %1-49 oranında darlık, %5,06'sında %50-69 oranında darlık ve %3,8'inde %70 ve üzeri darlık tespit edilmiştir. Darlık bulunan hastaların %4,64'üne stent uygulanmış ve 11 hasta (%4,64) nakil süreci en az 6 ay ertelenmiştir. Stent uygulanmayan hastalara medikal tedavi başlatılmış ve 10 hasta (%4,21) nakil için uygun bulunmamıştır.

Sonuç: Akciğer nakli adaylarında koroner anjiyografi, nakil sürecinin güvenliği açısından kritik bir öneme sahiptir. Koroner arter durumu, hastaların perioperatif yönetimini ve postoperatif sonuçlarını doğrudan etkilediğinden, bu durumun özellikle interstisyel akciğer hastalığı (İLD) grubunda önceden kapsamlı bir şekilde değerlendirilmesi büyük önem taşımaktadır.

Anahtar sözcükler: Koroner anjiografi; akciğer nakli; nakil öncesi tarama.

Introduction

Lung transplantation (LTx) is a critical therapeutic option for patients with end-stage lung disease, offering improvements in quality of life and reduced mortality.[1] However, due to organ scarcity, patients considered for LTx are carefully evaluated for comorbidities that may jeopardize surgical success or limit post-operative survival. Although criteria for inclusion on the active waiting list for LTx vary between centers, the presence of coronary artery disease (CAD) is traditionally considered a relative contraindication for LTx.[2] The pathophysiological mechanisms linking CAD and advanced lung diseases are not fully elucidated. However, the association between these two conditions is largely attributed to shared risk factors.

In recent years, the increasing prevalence of organ transplantation has led to an aging donor pool, which in turn raises the likelihood of various comorbidities, including CAD.[3] Studies have shown that the prevalence of CAD is high in patients evaluated for LTx.[3] The presence of CAD is particularly associated with increased morbidity and mortality risks during the perioperative and post-operative periods.[4] While CAD was once considered an absolute contraindication for LTx, advancements in modern revascularization techniques have increased the number of transplantations performed in these patients and improved the management of CAD.[5,6] However, whether CAD should still be considered an absolute contraindication for LTx remains a subject of debate. Present literature presents inconsistencies regarding perioperative assessment and ischemia-induced cardiac load reduction strategies. Therefore, determining the coronary artery status in lung transplant candidates is critical for the safe and effective management of the transplant process.

Present guidelines recommend stress echocardiography and/or coronary angiography (CA) for patients at high risk for CAD. While CA is considered the gold standard for pre-transplant evaluation, it is an invasive procedure and carries specific risks. The lack of clear guidelines for lung transplant candidates complicates the standardization of this process; however, it is common practice at many LTx centers to routinely refer patients over the age of 45 or those with coronary risk factors for CA.[4]

CAD is defined by CA as stenosis of at least 50% in one or more epicardial coronary arteries, while the absence of CAD is defined angiographically by <50% stenosis or the absence of clinically significant CAD, particularly when negative stress tests are used.[7] Factors such as age, gender, obesity, and other comorbidities are key determinants in the development of CAD. In particular, risk factors, such as high body mass index (BMI), hypertension, and diabetes significantly increase the likelihood of CAD.

Laboratory tests play an important role in diagnosing CAD. Lipid profiles are commonly used to assess cardiovascular risk, with high low-density lipoprotein (LDL) cholesterol levels and poorly controlled diabetes being significant indicators for the development of CAD. Furthermore, HbA1c levels are increasingly being studied for their relationship with CAD, with higher HbA1c levels found to increase the risk of CAD.[8–10] Since CAD can often be asymptomatic, its diagnosis can sometimes be challenging. Therefore, the use of lipid profiles and other laboratory tests in the evaluation of lung transplant candidates for CAD is of critical importance for risk identification and management.[7]

CAD is a significant comorbidity in individuals with advanced lung disease and presents clinical challenges in the evaluation of LTx candidates. However, there is a lack of definitive information in the literature regarding the effects of CAD on the LTx process and the management of these patients. In this study, we aimed to investigate the findings of CA in lung transplant candidates and evaluate how these findings impact the transplantation process.

Materials and Methods

This retrospective study was conducted on 237 LTx candidates who presented to the LTx Clinic of Training and Research Hospital between January 1, 2017, and August 1, 2024. The study excluded individuals with incomplete CA results, those excluded from LTx due to a history of significant cardiovascular disease, patients under the age of 25, asymptomatic individuals, and those deemed unsuitable for transplantation due to other comorbidities. Demographic data (age, gender, BMI, smoking status) and clinical and laboratory characteristics (comorbidities such as hypertension and diabetes mellitus, lipid profile including total cholesterol [TC], LDL, high-density lipoprotein [HDL], triglyceride [TG] levels, HbA1c levels) were recorded from the hospital's database.

The participants were categorized into four main age groups: <18, 18–39, 40–59, and ≥60 years. BMI was assessed in four groups: <18.5, 18.5–24.99, 25–29.99, and ≥30. Pulmonary function tests were categorized based on the forced expiratory volume in 1 s (FEV_1) percentage (<40% and ≥40%) and forced vital capacity (FVC) percentage (<50% and ≥50%). The 6-min walk test (6 MWT) was grouped into three categories: <250 m, 250–399 m, and ≥400 m.

The lipid profile was evaluated based on TC, LDL cholesterol, HDL cholesterol, and TG levels. TC levels were categorized as <200 mg/dL, 200–239 mg/dL, and ≥240 mg/dL. LDL cholesterol levels were classified into <100 mg/dL, 100–129 mg/dL, 130–159 mg/dL, and ≥160 mg/dL. HDL cholesterol levels were categorized as <40 mg/dL for males and <50 mg/dL for females. TG levels were grouped as <150 mg/dL, 150–199 mg/dL, and ≥200 mg/dL.[11] In addition, cardiovascular risk indicators based on lipid profile results were examined, including TC/HDL >5, LDL/HDL ratio >3, and TG/HDL ratio >2.[12,13] HbA1c levels were categorized into three groups: <5.7% (normal), 5.7–6.4% (pre-diabetic), and ≥6.5% (diabetes mellitus).[14] CAD was defined by CA as stenosis >50% in at least one epicardial coronary artery; this definition applied regardless of the results of stress tests or myocardial perfusion imaging.[5] The absence of CAD was defined as <50% stenosis in the coronary arteries or the absence of clinically significant CAD, as indicated by negative stress tests. CA results were categorized into groups based on the degree of stenosis: 0–49%, 50–69%, 70–99%, and 100%.[15,16] In addition, patients with multi-vessel disease (two- or three-vessel disease) were specifically noted. Pulmonary hypertension (PH) was defined as a mean pulmonary artery pressure (PAP) >20 mmHg.[17] In this study, artificial intelligence techniques were not directly employed; however, some machine learning methods were utilized during the preliminary data processing and model evaluation stages.

The study was approved by the Ethics Committee (Date: November 05, 2024/Approval No: 2024/19/956). All necessary permissions for patient data confidentiality and adherence to ethical guidelines were obtained. Participants were informed about the study's objectives and written informed consent was obtained. The study was conducted in accordance with the Declaration of Helsinki.

Statistical Analysis

Statistical analyses were performed using Statistical Package for the Social Sciences version 25.0 (IBM Corporation, Armonk, USA) software. Demographic and clinical parameters were presented as mean ± standard deviation, frequencies, and percentages. Comparisons between groups were conducted using independent t-tests or Mann-Whitney U tests, while differences between three or more groups were assessed using ANOVA or Kruskal–Wallis tests. The relationships between the presence of CAD and other variables were analyzed using Chi-square tests, and correlations between continuous variables were assessed using Pearson or Spearman correlation coefficients. Statistical significance was set at $p<0.05$.

Results

Demographic and clinical characteristics of the 237 patients included in the study were as follows: 24.48% (n=58) of the patients were female and 75.52% (n=179) were male (Table 1). The mean age of the patients was 48.8±12 years, with an age range of 14–67 years. Only 0.42% (n=1) of the patients were under the age of 18, with the remaining patients being aged 18 or older. The average BMI was calculated as 23.72±3.97, and 11.8% (n=28) of the patients had a BMI under 18.5, while 4.2% (n=10) had a BMI of 30 or above. Based on the medical history, comorbidities were identified in 25.3% (n=60) of the patients. The most common comorbidities included CAD (6.75%, n=16), type 2 diabetes mellitus (6.3%, n=15), hypertension (3.8%, n=10), and other comorbidities, which were present in 15.6% (n=37) of the patients.

According to CA results, 67% (n=159) of the patients had normal findings, 26.1% (n=62) showed plaque formation, 6.4% (n=5) had ostial stenosis with a narrowing of 20–60%, 9.28% (n=22) had stenosis between 1% and 49%, 5.06% (n=12) had stenosis between 50% and 69%, and 3.8% (n=9) had stenosis of 70% or greater (Table 2). A group of patients with stenosis >50% in at least one epicardial coronary artery was identified in 8.86% (n=21) of the patients. Among those with stenosis, 4.64% (n=11) underwent stent placement, and their transplant processes were delayed for at least 6 months. In patients who did not undergo stenting, medical treatment was initiated, and 4.21% (n=10) were deemed unsuitable for transplantation. The ejection fraction was found to be normal in all the patients included in the study.

Analysis of the age groups in relation to normal and pathological CA (PCA) findings revealed a significant difference between the 18 and 39 age group and the ≥60 age group ($p<0.001$). However, no significant differences were observed in the <18 and 40–59 age groups. In the gender analysis, PCA results were observed in 11.5% (n=9) of females and 88.5% (n=69) of males. Males were more likely to have pathological results than females ($p<0.05$).

The BMI analysis showed significant differences ($p<0.001$); overweight (25–29.9) and obese (≥30) groups were found to be at higher risk for coronary disease. In the low BMI (<18.5) group, normal angiography results were more common, while the highest number of individuals was observed in the 18.5–24.9 BMI group. In the diagnostic group analysis, a significant relationship between CA results and diagnoses was found ($p<0.05$). Specifically, patients with non-idiopathic pulmonary fibrosis interstitial lung disease (Non-IPF ILD) and IPF were more likely to have PCA findings, while patients with cystic fibrosis (CF) had a lower risk.

Analysis of blood groups and Rh factor in relation to CA results showed that individuals with blood group O Rh positive and A Rh positive were more likely to develop coronary disease compared to other groups ($p<0.001$). Analyses comparing (ECHO PAPs) obtained by echocardiography and right heart catheterization (RHC PAPs) did not reveal significant differences for either parameter (ECHO PAPs: $\chi^2=1.626$, $p> 0.05$; RHC PAPs: $\chi^2=1.188$, $p>0.05$). This suggests that ECHO and RHC PAPs measurements did not influence CA results. Furthermore, no significant difference was found in the analysis of pulmonary vascular resistance (PVR) in relation to CA results ($p>0.05$). The analysis of the 6MWT revealed that shorter walking distances were associated with higher coronary disease risk ($p<0.001$). Patients with a walking distance of <250 m were more likely to be in the PCA group, and this group represented the highest risk for coronary disease.

Statistical analysis using the Chi-square test between FEV1% and FVC% values in the normal CA (NCA) group and the PCA group showed a significant difference ($p=0.017$) ($p<0.05$), with

Table 1. Distribution of descriptive features

Characteristic	Subcategory	NCA n=159 (67%)			PCA n=78 (33%)		
		n		%	n		%
Age (years)	Total (%)/mean±SD	159	45.2±12.4	67	78	56.1±6.5	33
	<18	1		0.6	0		0
	18–39	51		32	2		2.6
	40–59	89		56)	49		62.8
	≥60	18		11.4	27		34.6
Sex	Female	49		30.8	9		11.5
	Male	110		69.2	69		88.5
Height (cm) mean±SD			165.2±16.1			168.7±7.7	
Body mass ındex (kg/m^2), mean±SD	<18.5	25	23.2±4.2	15.7	3	24.8±3.2 3.8	
	18.5–24.99	68		42.8	33		42.3
	25–29.99	58		36.5	40		51.3
	≥30	8		5	2		2.6
Blood groups (Rh)	O Rh negative	10		6.3	4		5.1
	O Rh positive	44		27.7	19		24.3
	A Rh negative	7		4.4	7		9
	A Rh positive	71		44.6	35		44.9
	B Rh negative	3		1.9	4		5.1
	B Rh positive	14		8.8	8		10.3
	AB Rh negative	1		0.6	0		0
	AB Rh positive	9		5.7	1		1.3
6MWT (meters), mean±SD	<250	51	323±132	32	29	321±152	37.2
	250–400	58		36.5	30		38.5
	>400	50		31.5	19		24.3
Diagnostic groups	COPD	29		18.2	12		15.4
	IPF	23		14.5	23		29.5
	Non-IPF ILD	24		15	29		37.2
	CF	10		6.3	0		0
	Non-CF BR	33		20.8	5		6.4
	Other	40		25.2	9		11.5
ECHO PAPs (mmHg), mean±SD	<35	74	45.7±22.2	46.5	30	50.1±25.7	38.5
	35–45	46		29	22		28.2
	46–55	18		11.3	7		9
	>55	21		13.2	19		24.3
RHC PAPs (mmHg), mean±SD			39.3±13.6			43.7±18.1	
RHC PAP mean (mmHg), mean±SD	≤20	69	23.5±9	43.4	31	25.4±11.3	39.7
	21–24	29		18.2	16		20.5
	25–39	53		33.4	22		28.3
	≥40 mmHg	8		5	9		11.5
PVR (Wood), mean±SD	<2	64	3±2	40.2	34	3.6±3 43.6	
	2–3	34		21.4	13		16.7
	>3	61		38.4	31		39.7

NCA: Normal coronary angiography; PCA: Pathologic coronary angiography; SD: Standard deviation; 6MWT: 6-min walk test; ECHO PAPs: Systolic pulmonary artery pressure echocardiography; RHC PAPs: Right heart catheterization pulmonary artery pressures systolic; PVR: Pulmonary vascular resistance; COPD: Chronic obstructive pulmonary disease; IPF: Idiopathic pulmonary fibrosis; ILD: Interstitial lung disease; CF: Cystic fibrosis; BR: Bronchiectasis.

the PCA group exhibiting lower FEV1% and FVC% values (Table 3). Smoking was observed in 48.1% (n=114) of the patients. A Chi-square analysis of smoking status and CA results showed no significant relationship between these two variables (p=0.4128). A significant relationship was found between the presence of comorbidities and CA results (p<0.001). Patients with comorbidities were more likely to have PCA findings.

In the analysis of lipid profile and CA results, the TG/HDL cholesterol ratio was found to be close to the significance threshold (p=0.057). However, no significant relationship was found between other lipid parameters and CA results. Analysis of hemoglobin A1c levels and CA results revealed that the average hemoglobin A1c value in the normal group was 5.7±0.53, while in the pathological group, it was 5.9±0.7. Independent samples t-test showed a significant difference between these means (p=0.015), but when the distribution of hemoglobin A1c categories (<5.7%, 5.7–6.4%, ≥6.5%) was examined using the Chi-square test, the p=0.057, which was not statistically significant.

Table 2. Coronary angiography results by diagnosis

Diagnoses (%)	n	%	Coronary angiography results								Total (%)
			Stented patients (%)	Newly stented patients (%)	Normal (%)	Plaque (%)	1–49 (%)	50–69 (%)	70–100 (%)	CABG (%)	
IPF	46	19.4	3 (6.52)	5 (10.8)	23 (50)	20 (43.4)	9 (19.5)	2 (4.34)	4 (8.69)	0 (0)	66 (100)
Non-IPF ILD	53	22.4	3 (5.66)	3 (5.66)	24 (45.28)	25 (47.16)	10 (18.86)	7 (13.2)	2 (3.77)	0 (0)	74 (100)
COPD	41	17.3	0 (0)	1 (2.44)	29 (70.73)	8 (19.5)	2 (4.87)	2 (4.87)	1 (2.44)	0 (0)	43 (100)
CF	10	4.2	0 (0)	0 (0)	10 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	10 (100)
Non-CF BR	38	16	0 (0)	0 (0)	33 (86.84)	4 (10.52)	1 (2.63)	0 (0)	0 (0)	0 (0)	38 (100)
Other	49	20.7	1 (2.04)	2 (4.08)	40 (81.63)	5 (10.2)	0 (0)	1 (2.04)	2 (4.08)	0 (0)	51 (100)
Total %	237	100	7 (2.95)	11 (4.64)	159 (67)	62 (26.16)	22 (9.28)	12 (5.06)	9 (3.79)	0 (0)	282 (100)

CABG: Coronary artery bypass grafting; IPF: Idiopathic pulmonary fibrosis; Non-IPF ILD: Non-idiopathic pulmonary fibrosis interstitial lung diseases; COPD: Chronic obstructive pulmonary disease; CF: Cystic fibrosis, Non-CF BR: Non-cystic fibrosis bronchiectasis.

Table 3. Clinical and lipid profiles of coronary angiography groups

Parameter	Subcategory	NCA n=159 (67%)			PCA n=78 (33%)		
		n		%	n		%
FEV_1%, mean±SD			37.3±18.3			45.9±21.1	
FVC%, mean±SD			44.9±16.6			48.8±18.2	
Smoking	Absent	88		55.3	35		44.9
	Present	71		44.7	43		55.1
Comorbid conditions	Absent	123		77.3	36		46.1
	Present	36		22.7	42		53.9
	Diabetes mellitus type 2	8		5	7		9
	Coronary artery disease	0		0	16		20.5
	Hypertension	3		1.9	7		9
	Other	25		15.8	12		15.4
Total cholesterol (mg/dL), mean±SD	<200	109	182.5±51.3	68.5	40	198±45	51.3
	200–239	30		18.9	24		30.7
	≥240	20		12.6	14		18
LDL cholesterol (mg/dL),mean±SD	<100	75	109.7 ±40.8	47.2	25	122 ± 37.5	32
	100–129	37		23.3	22		28.2
	130–159	27		17	18		23
	>160	20		12.5	13		16.8
HDL cholesterol (mg/dL), mean±SD	<40 (Men)	33	49.4±14.9	20.7	31	49±14.6	39.7
	<50 (Women)	15		9.4	4		5.1
	≥60	32		20.1	11		14.1
Triglycerides (mg/dL), mean±SD	<150	136	114.4±62	85.6	60	129.2±56.4	76.9
	150–199	16		10	13		16.7
	>200	7		4.4	5		6.4
TC/HDL	>5	21		13.2	15		19.2
LDL/HDL	>3	31		19.5	21		26.9
TG/HDL	>2	79		49.7	49		62.8
Hemoglobin A1c %, mean±SD	<5.7	83	5.7±0.53	52.2	34	5.9±0.7	43.6
	5.7–6.4	65		40.9	31		39.7
	≥6.5	11		6.9	13		16.7

NCA: Normal coronary angiography; PCA: Pathologic coronary angiography; FEV_1: Forced expiratory volume in 1; FVC: Forced vital capacity; SD: Standard deviation; LDL: Low-density lipoprotein; HDL: High-density lipoprotein cholesterol, TC: Total cholesterol; TG: Triglycerides.

Discussion

LTx is a critical treatment option that improves the quality of life for patients; however, cardiovascular status must also be considered for a successful transplant. In this context, advanced diagnostics such as CA performed before transplantation can help detect potential cardiovascular issues early, thereby reducing the risk of complications. The aim of this study was to evaluate the impact of CA findings on the transplant process in LTx candidates.

In our study, 33% of the patients exhibited PCA findings. The percentage of patients with more than 50% stenosis in CA was

8.86%, and this rate varies in the literature. For instance, Koprivanac et al.[5] reported a high prevalence of CAD among LTx candidates, with ≥50% stenosis observed in 29% of cases. In our study, 14.3% of patients had stenosis between 1% and 69%, which is lower than the 32.8% reported by Zanotti et al.[16] In our center, the decision for LTx is generally not affected for patients with mild-to-moderate CAD. Lima et al.[18] detected coronary artery damage in 12.8% of 30 patients, with 93.3% of them being over the age of 50. This finding highlights the increased prevalence of CAD with age and the need for careful monitoring, especially in elderly patients.

Similarly, Makey et al.[6] noted that LTx patients with CAD rarely die from cardiac causes, but these patients need to be managed more carefully during follow-up. In our study, the stent placement rate was 4.64%, a figure comparable to the 6% reported by Wild et al.[19] In patients who underwent stent placement, transplant procedures were delayed for at least 6 months due to dual antiplatelet therapy. In patients who did not receive stents, medical treatment was initiated, and 4.21% of them were found unsuitable for transplantation.

In our study, significant relationships were observed between CAD findings and age, BMI, and comorbidities. Specifically, obesity and high BMI emerged as prominent risk factors for CAD. In the literature, obesity is widely recognized as an important risk factor for the development of CAD.[20–22] In our study, PCA findings were more frequently found in males, supporting the effect of gender on CAD prevalence. The effect of blood type and Rh factor on CAD remains a topic of ongoing debate. In our study, O Rh-positive and A Rh-positive blood types were significantly associated with PCA results. A blood type was found to have a significant relationship with CAD risk, while O blood type was identified as a lower-risk group.[23] The relationship between smoking and CAD risk is frequently discussed in the literatüre.[24] However, no significant relationship was found between smoking status and CA results in our study. This suggests that the impact of smoking on CAD is complex and warrants further research.

Regarding lipid profile parameters and their relationship with CA results, the TG/HDL cholesterol ratio was found to be near the threshold of statistical significance (p=0.057), but no significant relationship was observed with other lipid parameters. The high TG/HDL ratio has been highlighted in the literature as being associated with CAD and may serve as a biomarker indicating the progression of atherosclerosis.[25] In addition, a significant relationship was observed between elevated HbA1c levels and pathological CAD findings, although this relationship was near the threshold of statistical significance. The effect of HbA1c on increasing CAD risk is consistent with the literature, suggesting a need for further investigation in LTx candidates.

In our study, patients with non-IPF ILD (37.2%) and IPF (29.5%) were found to have the highest rates of CAD in the PCA group. These findings align with the literature, which shows a strong association between ILD, particularly IPF, and the development of CAD.[6,16] On the other hand, no CAD risk was observed in CF patients, who are generally considered to be "protected" from coronary atherosclerosis.[26]

In our study, lower FEV1% and FVC% values were observed in the PCA group, and this difference was statistically significant. The negative impact of CAD on lung function is emphasized in the literature. Nowak et al.[27] indicated that FEV1 affects the risk of CAD, although the effect of FVC remains uncertain. Further research in this area will likely provide more detailed insights into the relationship between lung function and CAD. In our study, a significant relationship was observed between 6MWT results and coronary disease risk. The association between shorter walking distances and CAD highlights the relationship between physical deconditioning and cardiovascular risk. This finding underscores the importance of a thorough cardiovascular risk assessment before LTx. The literature also suggests that the 6MWT could be an effective method for assessing cardiovascular risk.[7]

In our study, no statistically significant difference was found between ECHO PAPs, RHC PAPs, PVR, and CA findings. These parameters, while important for assessing PH and right ventricular function, do not appear to be directly related to CAD. This finding suggests that the presence of CAD is generally more associated with systemic cardiovascular factors rather than PAPs.

In conclusion, CAD is one of the significant comorbidities in the LTx process, and careful attention is required in the management of these patients. CAD, especially in patients with ILD, is a critical factor that can influence the success of the transplantation process. A comprehensive evaluation of CAD in LTx candidates, management of cardiovascular risks, and the development of personalized treatment strategies are of paramount importance. Our study highlights the impact of HbA1c, age, gender, BMI, comorbidities, diagnostic groups, blood types, and exercise testing on CAD. Future, larger-scale, prospective studies could enable more effective management of these risks and make LTx procedures safer.

Limitations

This study has several limitations. First, as a retrospective study, it does not allow for a clear establishment of cause-and-effect relationships. In addition, since the study was conducted at a single center, the generalizability of the findings is limited. Future prospective studies conducted at multiple centers with larger sample sizes could provide more robust evidence on this topic.

Conclusion

CA plays a critical role in ensuring the safety of the LTx process. Since the coronary artery condition directly affects perioperative management and post-operative outcomes, it is particularly important to conduct a comprehensive pre-transplant evaluation, especially in patients with ILD. In this context, early detection and appropriate management of CAD risks can significantly enhance the success of the transplant process.

Disclosures

Ethics Committee Approval: The study was approved by the Kartal Kosuyolu High Specialization Training and Research Hospital Clinical Research Ethics Committee (no: 2024/19/956, date: 05/11/2024).

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