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ORIGINAL ARTICLE

Clinical and Echocardiographic Factors Associated with 12-Month Mortality After Living-Donor Kidney Transplantation: A Single-Center Cohort

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ABSTRACT

Background: Cardiovascular abnormalities are highly prevalent among candidates for kidney transplantation and significantly affect post-transplant outcomes. Pre-transplant echocardiographic findings and circulating biochemical markers may assist in identifying recipients at increased risk prior to transplantation.

Aim: To determine whether pre-transplant echocardiographic parameters and biochemical markers are predictive of 1-year survival among recipients of living-donor kidney transplants.

Study Design: This study was designed as a single-center retrospective cohort analysis.

Methods: We analyzed data from 178 adult patients who underwent living-donor kidney transplantation between 2021 and 2025. Echocardiographic variables included left ventricular ejection fraction [(LVEF); categorized as reduced <55% vs. preserved ≥55%], hypertrophic cardiomyopathy (HCM), moderate-to-severe valvular regurgitation, and ascending aortic dilatation (defined as ≥40 mm). Biochemical variables comprised N-terminal pro–B-type natriuretic peptide [(NT-proBNP); ≥130 pg/mL) and low-density lipoprotein cholesterol categories. One-year survival was evaluated using Kaplan–Meier survival analysis with log-rank testing. Exploratory univariable Cox proportional hazards regression analysis was conducted to assess associations between clinical variables and mortality.

Results: During the 1-year follow-up period, 13 deaths occurred, corresponding to a mortality rate of 7.3%. In univariable Cox regression analysis, older age, longer duration of dialysis, HCM, and reduced LVEF (<55%) were significantly associated with 12-month mortality. Specifically, reduced LVEF was associated with a higher risk of death (hazard ratio: 4.18, 95% confidence interval: 1.29–13.58; p=0.017). NT-proBNP levels were not significantly associated with mortality.

Conclusion: Older age, prolonged dialysis duration, HCM, and reduced LVEF were associated with increased 12-month mortality in univariable analyses. NT-proBNP was not significantly associated with mortality. Given the limited number of events, these findings should be interpreted with caution and require validation in larger, adequately powered cohorts.

Keywords: Echocardiography, ejection fraction, hypertrophic cardiomyopathy, kidney transplantation, survival

INTRODUCTION

Cardiovascular disease remains the leading cause of both early and late mortality following kidney transplantation, highlighting the critical importance of comprehensive pre-transplant cardiovascular assessment in transplant candidates.[1,2] Although kidney transplantation is considered the gold standard treatment for end-stage renal disease, this high-risk population continues to experience substantial rates of perioperative cardiovascular complications, including myocardial infarction, stroke, and pulmonary embolism.[3] Echocardiographic abnormalities and elevated cardiac biomarkers are highly prevalent among transplant candidates and have consistently been associated with unfavorable postoperative outcomes.[3-5]

Previous studies have demonstrated that reduced left ventricular ejection fraction (LVEF) and elevated natriuretic peptide (NT) levels are strong predictors of mortality among patients receiving dialysis and in deceased-donor transplant cohorts.[6] However, evidence specifically focusing on living-donor kidney transplant recipients in middle-income countries remains scarce. This gap in knowledge is clinically relevant because patient characteristics, perioperative care, and long-term cardiovascular risk profiles may differ substantially from those reported in high-income settings.[7]

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To our knowledge, this study represents the first single-center Turkish cohort to systematically evaluate both LVEF and N-terminal pro–B-type natriuretic peptide (NT-proBNP) levels as prognostic markers in living-donor kidney transplant recipients. By concentrating on this relatively homogeneous population, the present analysis offers region-specific data that complement the existing international literature, in which deceased-donor transplant series predominate.[8]

The present study aimed to determine whether pre-transplant echocardiographic and biochemical markers—including LVEF, hypertrophic cardiomyopathy (HCM), moderate-to-severe valvular regurgitation, ascending aortic dilatation, serum NT-proBNP, low-density lipoprotein (LDL) cholesterol, and dialysis duration (hemodialysis or peritoneal dialysis)—are predictive of 1-year survival in Turkish kidney transplant recipients.[9]

METHODS

Study Design and Population

We performed a single-center retrospective cohort study that included adult patients who underwent living-donor kidney transplantation between June 2021 and August 2025. All recipients were required to have a minimum of 12 months of post-transplant follow-up.

Among the 301 consecutive patients screened for eligibility, 22 were excluded due to incomplete baseline clinical or echocardiographic data, and 3 were excluded because of acute rejection occurring within the first 3 months after transplantation. An additional 98 patients were excluded because 12-month vital status could not be verified, owing to insufficient follow-up duration and/or incomplete medical records. Consequently, the final analytical cohort comprised 178 patients (Figure 1).

Due to the retrospective design using fully anonymized data, this study did not require ethics committee approval or informed consent in accordance with institutional and national research regulations.

Exposure Variables

Pre-transplant echocardiographic variables included LVEF, the presence of HCM (defined as maximum wall thickness ≥15 mm), moderate-to-severe valvular regurgitation, and ascending aortic dilatation (≥40 mm). LVEF was dichotomized as preserved (≥55%) or reduced (<55%) according to institutional reference values and guideline-based definitions of the lower limit of normal systolic function. HCM was defined in accordance with contemporary guideline criteria as a maximal left ventricular wall thickness ≥15 mm in one or more myocardial segments, measured at end-diastole using parasternal long- and short-axis views. These measurements were derived from routine pre-transplant transthoracic echocardiography reports and reflected the maximum recorded wall thickness.

The LVEF threshold of <55% was selected to represent the lower limit of normal systolic function as defined by echocardiographic guidelines and to identify even mild or subclinical systolic dysfunction in this high-risk transplant population. In patients with end-stage renal disease, subtle reductions in LVEF within the traditionally "normal" range may have prognostic significance because of underlying uremic cardiomyopathy and chronic volume overload.

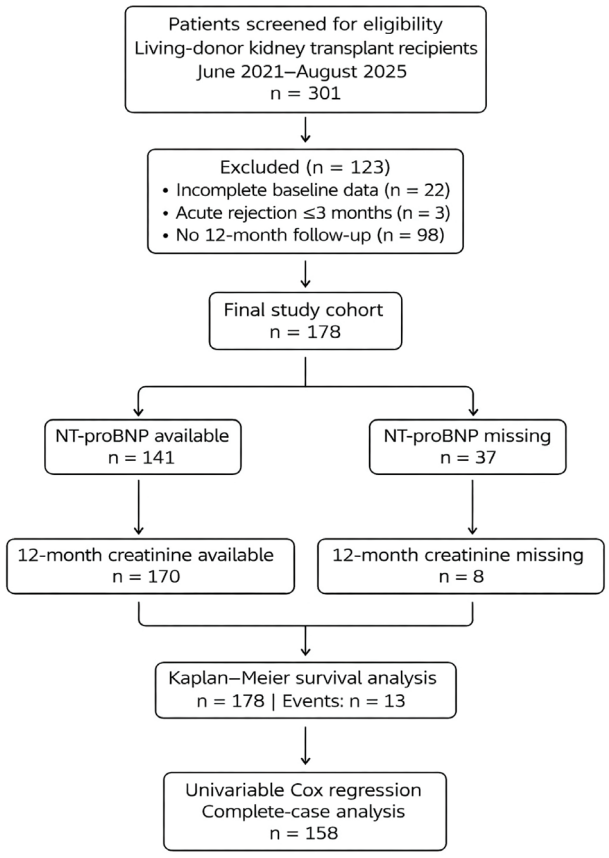

Figure 1. Flow diagram of patient selection and study cohort. A total of 301 consecutive living-donor kidney transplant recipients were screened for eligibility between June 2021 and August 2025. Patients were excluded due to incomplete baseline clinical or echocardiographic data (n=22), acute rejection within the first 3 months after transplantation (n=3), or unavailable 12-month vital status (n=98). The final analytical cohort consisted of 178 recipients, all of whom had complete follow-up for the primary endpoint of 12-month all-cause mortality. NT-proBNP measurements were available in 141 patients, and ascending aortic diameter measurements in 177 patients. All 178 recipients were included in the Kaplan–Meier survival analyses, during which 13 deaths occurred within 12 months

NT-proBNP: N-terminal pro B-type natriuretic peptide

To reduce the risk of misclassification, secondary causes of left ventricular hypertrophy were systematically reviewed using available clinical and echocardiographic data. Patients with concentric hypertrophy attributable to long-standing uncontrolled hypertension, advanced uremic cardiomyopathy, or significant valvular disease (including moderate-to-severe aortic stenosis) were not categorized as having HCM. The presence of systolic anterior motion of the mitral valve and left ventricular outflow tract (LVOT) gradients was documented when observed, and provocative maneuvers were performed when clinically indicated.

Biochemical variables included pre-transplant NT-proBNP levels, dichotomized at ≥130 pg/mL, and LDL cholesterol categorized as <130, 130–189, and ≥190 mg/dL. The ≥130 pg/mL threshold was selected based on prior chronic kidney disease and transplant literature as well as local laboratory reporting standards. Dialysis exposure was

quantified as the total duration of renal replacement therapy before transplantation.

Dialysis duration was defined as the cumulative time on renal replacement therapy prior to transplantation, calculated from the date of dialysis initiation (hemodialysis or peritoneal dialysis) to the date of transplantation and expressed in months. Pre-emptive transplant recipients were assigned a dialysis duration of 0 months.

Pre-transplant transthoracic echocardiography was performed as part of the routine evaluation within 3 months prior to transplantation. LVEF was measured using the biplane Simpson method in accordance with current guideline recommendations. All measurements were obtained by experienced cardiologists and extracted from standardized echocardiographic reports. Systolic anterior motion and LVOT gradients were assessed at rest, with provocation performed when clinically indicated.

Outcome

The primary endpoint of the study was all-cause mortality within 12 months following kidney transplantation.

Statistical Analysis

Survival probabilities were estimated using the Kaplan–Meier method, and between-group comparisons were conducted using the log-rank test. Follow-up time was administratively censored at 12 months for all patients.

Associations between prespecified candidate variables and 12-month mortality were examined using separate univariable Cox proportional hazards (PHs) regression models. Owing to the limited number of events (n=13), multivariable regression analyses and formal interaction testing were not performed to minimize the risk of model overfitting.

The PH assumption was not formally assessed because of the small number of events; therefore, the Cox regression results should be considered exploratory.

Missing data were addressed using a complete-case analysis approach. Continuous variables are reported as mean±standard deviation, whereas categorical variables are presented as counts and percentages. All statistical analyses were conducted using IBM SPSS Statistics version 26 (IBM Corp., Armonk, NY, USA). A two-sided p value <0.05 was considered statistically significant. For predictors with sparse event counts in one category, effect estimates may be unstable and associated with wide confidence intervals (CIs); therefore, these analyses should be interpreted cautiously given the limited number of deaths.

This study was conducted and reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology guidelines for observational cohort studies.

RESULTS

Study Population and Follow-up

A total of 178 living-donor kidney transplant recipients were included in the final analysis. The mean age of the cohort was 45.4±13.8 years, and 65.7% were male. Although patients were followed longitudinally for up to 4 years post-transplantation, this analysis focused on outcomes within the first 12 months, which constituted the predefined primary endpoint.

During the first year post-transplantation, 13 deaths occurred, corresponding to a 12-month mortality rate of 7.3%. Vital status at 12 months was available for all 178 recipients, ensuring no loss to follow-up for the primary endpoint. NT-proBNP measurements were available for 141 of 178 recipients, and ascending aortic diameter was recorded in 177 of 178. Each univariable Cox model was analyzed using complete-case data; consequently, the effective sample size varied by predictor.

Baseline demographic, clinical, biochemical, and echocardiographic characteristics are summarized in Table 1.

Kaplan–Meier Survival Analysis

Kaplan–Meier survival curves were generated using time-to-event data, with administrative censoring at 12 months, to evaluate early post-transplant outcomes. The estimated overall 12-month survival rate was 92.7% (95% CI, 87.8–95.8). Survival probabilities over time were compared between groups using the log-rank test. The primary summary measure was the 12-month survival probability.

Recipients with reduced LVEF (<55%) had significantly lower 12-month survival compared with those with preserved systolic function (log-rank χ^2=5.589, p=0.018) (Figure 2). In univariable Cox regression, reduced LVEF was also significantly associated with higher 12-month mortality [hazard ratio (HR): 4.18, 95% CI, 1.29–13.58, p=0.017].

Recipients with elevated NT-proBNP levels (≥130 pg/mL) showed a trend toward lower 12-month survival; however, this difference did not reach statistical significance (log-rank p=0.066). In univariable Cox regression, elevated NT-proBNP was not

Table 1. Baseline demographic, clinical, and echocardiographic characteristics

Variable	Value
N (total)	178
Age, years (mean±SD)	45.39±13.80 (n=178)
Male, n (%)	117 (65.7%)
Diabetes mellitus, n (%)	30 (16.9%)
Hypertension (controlled), n (%)	134 (75.3%)
Hypertension (uncontrolled), n (%)	29 (16.3%)
Hemodialysis history, n (%)	88 (49.4%)
NODAT, n (%)	9 (5.1%)
Reduced EF (<55%), n (%)	18 (10.1%)
Ascending aorta ≥40 mm, n (%)	25 (14.1%) (n=177)
Hypertrophic cardiomyopathy, n (%)	19 (10.7%)
Moderate valvular regurgitation, n (%)	34 (19.1%)
NT-proBNP ≥130 pg/mL, n (%)	66 (46.8%) (n=141)
LDL (coded 0/1/2), n	0: 119; 1: 44; 2: 15
All-cause mortality within 12 months, n (%)	13 (7.3%)

SD: Standard deviation, EF: Ejection fraction, NT-proBNP: N-terminal pro B-type natriuretic peptide, LDL: Low-density lipoprotein, NODAT: New-onset diabetes after transplantation

significantly associated with 12-month mortality (HR: 2.16, 95% CI, 0.72–6.45, p=0.167).

No significant differences in 12-month survival were observed according to HCM, moderate-to-severe valvular regurgitation, ascending aortic dilatation (≥40 mm), or LDL cholesterol categories (all log-rank p>0.05). Kaplan–Meier–derived 12-month survival estimates for echocardiographic and biochemical subgroups are summarized in Table 2.

Exploratory univariable Cox Regression Analysis

Exploratory univariable Cox PH regression analyses were performed to evaluate associations between individual echocardiographic and biochemical parameters and 12-month mortality. Candidate variables included age, sex, diabetes mellitus, hypertension status, dialysis duration, LVEF category, NT-proBNP category, HCM, valvular regurgitation severity, ascending aortic dilatation, and LDL cholesterol category.

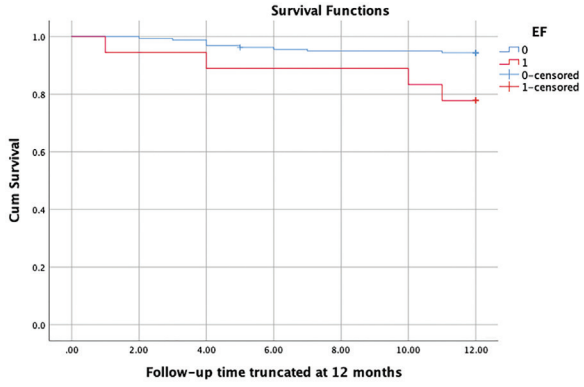

Figure 2. Kaplan–Meier survival curves stratified by ejection fraction (EF ≥55% vs. EF <55%). Patients with reduced EF showed significantly worse survival. Log-rank p=0.018; univariable Cox HR: 4.18 (95% CI: 1.29-13.58), p=0.017
EF: Ejection fraction, HR: Hazard ratio, CI: Confidence interval

In univariable Cox regression, older age (HR: 1.06 per year, 95% CI, 1.01–1.11, p=0.014), longer dialysis duration (HR: 1.16 per month, 95% CI, 1.04–1.29, p=0.006), HCM (HR: 3.43, 95% CI, 1.08–10.94, p=0.037), and reduced LVEF (<55%) (HR: 4.18, 95% CI, 1.29–13.58, p=0.017) were significantly associated with 12-month mortality. The NT-proBNP category was not significantly associated (HR: 2.16, 95% CI, 0.72–6.45, p=0.167) (Table 3).

Subgroup and Sensitivity Considerations

In exploratory subgroup analyses stratified by LVEF and NT-proBNP, recipients with both reduced LVEF and elevated NT-proBNP exhibited numerically higher 12-month mortality, whereas those with preserved LVEF and low NT-proBNP had the most favorable outcomes.

Although follow-up extended beyond 12 months for many patients, restricting analyses to the first post-transplant year enabled a focused assessment of early risk while minimizing heterogeneity from late non-cardiovascular events. Results were directionally consistent across both Kaplan–Meier and Cox regression analyses, supporting the robustness of these findings.

DISCUSSION

This single-center retrospective study evaluated echocardiographic and biochemical predictors of 1-year survival in living-donor kidney transplant recipients from Türkiye. Age, dialysis duration, HCM, and reduced LVEF were associated with 12-month mortality in univariable analyses.[10] NT-proBNP demonstrated a non-significant trend and should be interpreted as exploratory.

Importantly, the combined analysis of LVEF and NT-proBNP was exploratory and underpowered; no causal or synergistic conclusions should be drawn from these subgroup observations.[6,11,12] The absence of statistical significance in unadjusted analyses is likely due to limited statistical power, particularly given the directionally consistent trends observed across Kaplan–Meier and Cox regression analyses.

Table 2. Kaplan–Meier survival analysis of laboratory and echocardiographic parameters

Parameter	Group	12-month survival (%)	Log-rank χ^2	p value
Ejection fraction	≥55%	93.5	5.589	0.018
	<55%	77.8		
NT-proBNP	<130 pg/mL	94.3	3.389	0.066
	≥130 pg/mL	84.8		
HCM	Absent	92.9	1.893	0.169
	Present	83.3		
Ascending aorta	<40 mm	91.9	0.001	0.981
	≥40 mm	91.7		
Valve insufficiency	None/mild–moderate	92.1	0.059	0.808
	Severe	90.9		
LDL	0	91.4	1.257	0.533
	1	95.2		
	2	86.7		

NT-proBNP: N-terminal pro B-type natriuretic peptide, LDL: Low-density lipoprotein, HCM: Hypertrophic cardiomyopathy

Table 3. Exploratory univariable Cox proportional hazards analysis for 12-month mortality

Variable	n	HR	95% CI	p value	Model
Age (per year)	178	1.06	1.01-1.11	0.014	Univariable Cox
Male sex	178	0.88	0.50-1.58	0.577	Univariable Cox
Diabetes mellitus	178	0.82	0.19-3.68	0.801	Univariable Cox
Hypertension (controlled)	178	1.21	0.34-4.33	0.772	Univariable Cox
Dialysis duration (per month)	178	1.16	1.04-1.29	0.006	Univariable Cox
Reduced EF (<55%)	177	4.18	1.29-13.58	0.017	Univariable Cox
NT-proBNP ≥130 pg/mL	141	2.16	0.72-6.45	0.167	Univariable Cox
Hypertrophic cardiomyopathy	178	3.43	1.08-10.94	0.037	Univariable Cox
Severe valvular insufficiency	178	1.18	0.33-4.22	0.802	Univariable Cox
Ascending aorta ≥40 mm	177	1.01	0.23-4.52	0.988	Univariable Cox
LDL 130-189 vs. <130	178	0.61	0.13-2.79	0.524	Univariable Cox
LDL ≥190 vs. <130	178	0.32	0.05-2.28	0.256	Univariable Cox

EF: Ejection fraction, NT-proBNP: N-terminal pro B-type natriuretic peptide, LDL: Low-density lipoprotein, CI: Confidence interval, HR: Hazard ratio

Left Ventricular Ejection Fraction

Reduced LVEF (<55%) was associated with inferior post-transplant survival on unadjusted analysis, reaffirming its prognostic importance in kidney transplant candidates. Although impaired EF was present in a relatively small proportion of recipients (10.1%), these patients experienced substantially worse early outcomes. This finding aligns with previous literature showing that even mild systolic dysfunction increases cardiovascular vulnerability in transplant populations. These results emphasize the importance of careful pre-transplant cardiac assessment and optimization of heart failure management.

Consistent with Kaplan–Meier results, reduced LVEF remained significantly associated with 12-month mortality in univariable Cox regression (HR: 4.18, p=0.017), although CIs were wide due to the limited number of events.

NT-proBNP

Elevated NT-proBNP was not significantly associated with 12-month mortality in univariable Cox regression (p=0.167), although Kaplan–Meier analysis suggested a non-significant trend (log-rank p=0.066). Thus, NT-proBNP findings should be considered exploratory and hypothesis-generating (Figure 3).

Severe Valvular Insufficiency

Severe valvular insufficiency was not associated with 1-year mortality in this cohort. This finding contrasts with reports from chronic kidney disease and dialysis populations, in which advanced valvular disease has been linked to adverse outcomes. The absence of an observed association in our study likely reflects the small number of patients with severe valvular lesions as well as careful pre-transplant selection, whereby individuals with symptomatic or advanced disease are typically excluded from transplantation. Nevertheless, given the recognized progression of valvular abnormalities after transplantation, continued echocardiographic surveillance remains warranted (Figure 4).

Hypertrophic Cardiomyopathy

Although Kaplan–Meier analysis did not demonstrate a statistically significant difference according to HCM status (log-rank p=0.169), HCM was significantly associated with 12-month mortality in univariable Cox regression (HR 3.43, p=0.037). However, CIs were wide because of the limited number of deaths. Accordingly, this finding should be

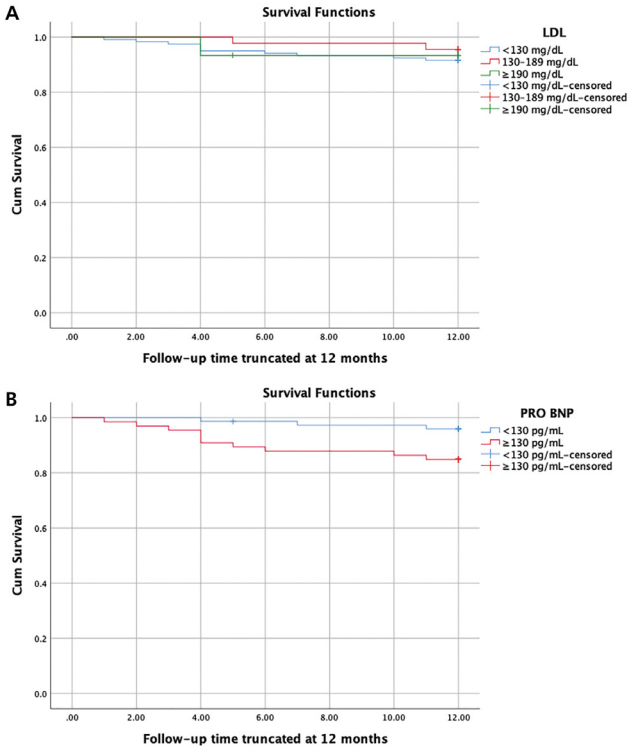

Figure 3. (A) Forest plot showing the association between elevated NT-proBNP (≥130 pg/mL) and 12-month mortality (HR: 2.16, p=0.167). (B) Forest plot of LDL cholesterol categories (<130 mg/dL, 130-189 mg/dL, ≥190 mg/dL) and survival outcomes. No significant associations were observed. p=0.953

NT-proBNP: N-terminal pro B-type natriuretic peptide, LDL, Low-density lipoprotein, HR: Hazard ratio, BNP: B-type natriuretic peptide

interpreted with caution and requires confirmation in larger cohorts (Figure 5).

Ascending Aortic Dilatation

Ascending aortic dilatation (≥40 mm) was not associated with 1-year mortality in this cohort. Although aortic dilatation has been linked to long-term cardiovascular risk in the general population, its prognostic impact may be attenuated in living-donor kidney transplant recipients, who are generally younger and undergo routine imaging surveillance. These findings suggest that baseline aortic diameter alone has limited predictive value for early post-transplant outcomes, underscoring the importance of longitudinal follow-up rather than reliance on isolated pre-transplant measurements (Figure 6).

Clinical Context and Implications

Compared with deceased-donor cohorts from the United States and Europe, living-donor recipients in Türkiye are typically younger, have fewer comorbidities, and benefit from closer perioperative monitoring. These characteristics may partly explain why LDL cholesterol, valvular abnormalities, and aortic dilatation were not associated with early mortality in this cohort, whereas such factors have been linked to long-term outcomes in more heterogeneous and comorbid populations.[13]

From a clinical standpoint, assessment of LVEF and measurement of NT-proBNP may assist in unadjusted risk stratification and in identifying patients who may benefit from closer perioperative cardiovascular monitoring; however, these findings should be considered exploratory. In summary, age, dialysis duration, HCM, and reduced LVEF were associated with 12-month mortality in univariable analyses.

NT-proBNP demonstrated a non-significant trend and should be interpreted as hypothesis-generating.[14]

Study Limitations

A major strength of this study is the inclusion of a homogeneous cohort of living-donor kidney transplant recipients managed under standardized follow-up protocols, thereby minimizing variability in clinical care. The availability of comprehensive echocardiographic parameters and biomarker measurements further enhances the analytical robustness.

Several limitations merit consideration. First, the single-center retrospective design restricts the generalizability of the findings. Second, the limited number of deaths reduced statistical power, potentially obscuring associations with less prevalent variables, such as severe valvular disease or pulmonary hypertension. Third, unmeasured confounders—including variations in immunosuppressive regimens, rejection episodes, and metabolic factors—may have influenced outcomes. Finally, although LDL cholesterol and valvular disease were not significantly associated with mortality in this cohort, the small subgroup sizes necessitate cautious interpretation.

Because this study involved a fixed single-center cohort with only 13 events, formal power calculation was not feasible. Univariable Cox regression was therefore restricted to clinically relevant variables to minimize overfitting, and effect estimates were interpreted with careful consideration of CIs. Larger multicenter cohorts are needed to confirm these associations with greater statistical precision.

Future Directions

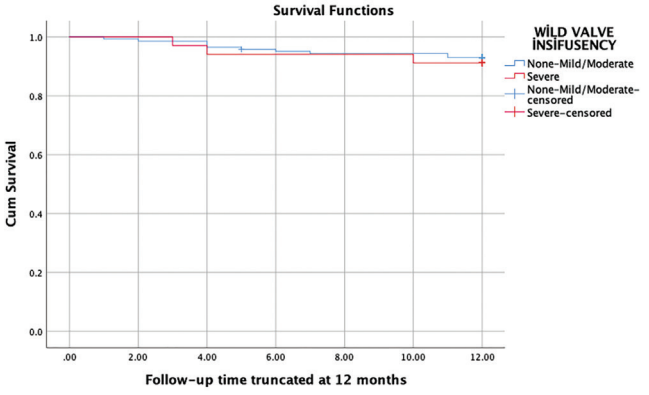

Figure 4. Event-free survival curves according to presence of severe valvular insufficiency. No significant survival difference was detected between groups. Log-rank p=0.808

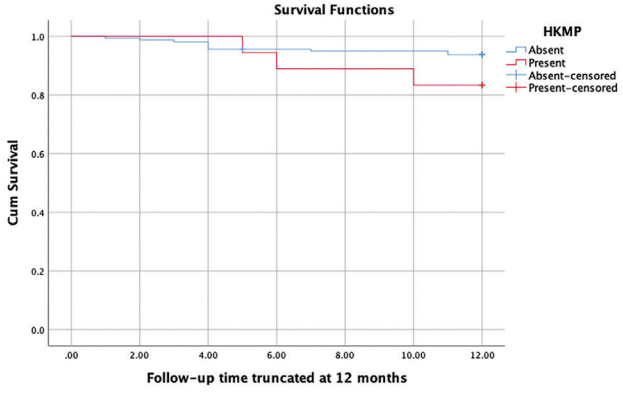

Figure 5. Kaplan–Meier survival curves stratified by hypertrophic cardiomyopathy (HCM). Patients with HCM showed numerically lower 12-month survival, not statistically significant, though the difference was not statistically significant. Log-rank p=0.169

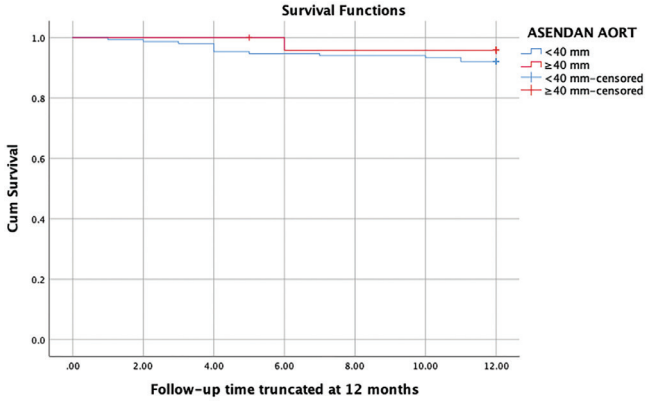

Figure 6. Kaplan–Meier survival curves stratified by ascending aortic dilatation (≥40 mm vs. <40 mm). No survival difference was observed between groups. Log-rank p=0.981

Prospective, multicenter studies with larger sample sizes are required to validate these findings and to further elucidate the interaction between established cardiovascular risk factors and emerging echocardiographic markers, including diastolic dysfunction and right ventricular strain as well as biomarkers such as NT-proBNP and cardiac troponins. Particular attention should be directed toward the prognostic significance of pulmonary hypertension and severe valvular insufficiency, which remain understudied yet clinically important in the transplant population.

CONCLUSION

In this single-center cohort of living-donor kidney transplant recipients, older age, prolonged dialysis duration, HCM, and reduced LVEF (<55%) were associated with 12-month mortality in univariable Cox regression analysis. NT-proBNP was not significantly associated with mortality. Given the limited number of events, these findings should be regarded as exploratory and require confirmation in larger, multicenter studies.

Ethics Committee Approval: This study did not require ethics committee approval due to its retrospective design and the use of fully anonymized data, in accordance with institutional and national research regulations.

Informed Consent: Informed consent was not required because the study was based on fully anonymized retrospective data.

Authorship Contributions: Surgical and Medical Practices: N.N.Ö., İ.S.B., Concept: M.T.Ö., Design: A.K., Data Collection or Processing: A.K., Analysis or Interpretation: S.A., Literature Search: M.T.Ö., S.A., Writing: M.T.Ö.

Conflict of Interest: No conflict of interest was declared by the authors.

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REFERENCES

1. Lentine KL, Costa SP, Weir MR, et al; American Heart Association Council on the Kidney in Cardiovascular Disease and Council on Peripheral Vascular Disease; American Heart Association; American College of Cardiology Foundation. Cardiac disease evaluation and management among kidney and liver transplantation candidates: a scientific statement from the American Heart Association and the American College of Cardiology Foundation: endorsed by the American Society of Transplant Surgeons, American Society of Transplantation, and National Kidney Foundation *Circulation*. 2012;126:617-663.
2. Lentine KL, Hurst FP, Jindal RM, et al. Cardiovascular risk assessment among potential kidney transplant candidates: approaches and controversies. *Am J Kidney Dis*. 2010;55:152-167.
3. Kasiske BL, Maclean JR, Snyder JJ. Acute myocardial infarction and kidney transplantation. *J Am Soc Nephrol*. 2006;17:900-907.
4. Wang LW, Fahim MA, Hayen A, et al. Cardiac testing for coronary artery disease in potential kidney transplant recipients. *Cochrane Database Syst Rev*. 2011;2011:CD008691.
5. Karatasakis A, Kiamanesh O, Cheng RK, Kirkpatrick JN, Dudzinski DM. Echocardiographic evaluation of the post-heart transplant patient. *Curr Cardiol Rep*. 2025;27:63.
6. Yeung SMH, van Londen M, Nakshbandi U, et al. Pretransplant NT-proBNP, dialysis vintage, and posttransplant mortality in kidney transplant recipients. *Transplantation*. 2020;104:2158-2165.
7. Sharma A, Gilbertson DT, Herzog CA. Survival of kidney transplantation patients in the United States after cardiac valve replacement. *Circulation*. 2010;121:2733-2739.
8. Visseren FLJ, Mach F, Smulders YM, et al; ESC National Cardiac Societies; ESC Scientific Document Group. 2021 ESC Guidelines on cardiovascular disease prevention in clinical practice. Eur Heart J. 2021;42:3227-3337. Erratum in: Eur Heart J. 2022;43:4468.
9. Yakhimovich Y, Bekbossynova M, Aripov M, Myrzakhmetova G, Lesbekov T. Imaging hope: the essential role of echocardiography in heart transplantation. *Cardiol Rev*. 2025.
10. Schwager Y, Littbarski SA, Nolte A, et al. Prediction of three-year mortality after deceased donor kidney transplantation in adults with pre-transplant donor and recipient variables. *Ann Transplant*. 2019;24:273-290.
11. Paniagua R, Ventura MD, Avila-Díaz M, et al. NT-proBNP, fluid volume overload and dialysis modality are independent predictors of mortality in ESRD patients. *Nephrol Dial Transplant*. 2010;25:551-557.
12. Mallamaci F, Zoccali C, Tripepi G, et al; CREED investigstors. The cardiovascular risk extended evaluation. Diagnostic potential of cardiac natriuretic peptides in dialysis patients. *Kidney Int*. 2001;59:1559-1566.
13. deFilippi CR, Herzog CA. Interpreting cardiac biomarkers in the setting of chronic kidney disease. *Clin Chem*. 2017;63:59-65.
14. Wang LW, Fahim MA, Hayen A, et al. Cardiac testing for coronary artery disease in potential kidney transplant recipients: a systematic review of test accuracy studies. *Am J Kidney Dis*. 2011;57:476-487.