# How do pre-existing comorbidities influence long-term patient and graft survival and the immunologic outcome in Kidney Transplant Recipients? – An evaluation of comorbid conditions

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**Background:** Comorbid conditions affect patient and graft survival after kidney transplantation. The assessment of relevant comorbidities in kidney transplant candidates can be valuable evaluating the benefit of a possible transplantation and treating patients in an optimal way to improve their post-transplant prognosis. Additionally, the information can facilitate an optimal allocation by forming a functional match between graft and patient. However, detailed data comparing the impact of the most important comorbidities on patient and graft survival as well as assessing their influence on the immunologic outcome are missing.

**Methods:** In a long-term retrospective analysis we investigated 839 deceased donor kidney transplant recipients (KTR) transplanted 1999-2014. Comorbid conditions were determined at time of transplantation. Kaplan-Meier and Cox regression analysis were performed to determine predictors of patient and graft survival as well as rejection episodes.

**Results:** The mean age was 54 years and mean follow-up was 5.9 years. Prevalence of comorbidities at time of transplantation was: coronary artery disease (CAD) 25%, diabetes mellitus (DM) 16%, peripheral artery disease (PAD) 11%, chronic heart failure (CHF) 8% and cerebrovascular disease (CVD) 7%. KTR with pre-existing CAD, DM, PAD and CHF showed a significantly poorer patient survival. Pre-existing CVD did not correlate with an elevated mortality. Multivariate analysis adjusting for all relevant factors and comorbidities identified only CAD and DM as independent risk factors for death (HR 1.65; p=0.003 and HR 1.44; p=0.046). Recipients with both of these two comorbidities showed further elevated mortality (48.5% after 7 years). An analysis according to categorization by age at transplantation (<65 and ≥65 years) revealed a particularly poor 7-year survival rate in elderly recipients (≥65 years) with CAD (44.8%). Young patients (<65) with CAD however, showed a similar survival as old patients without this condition (74.2% versus 69.5%). A multivariate analysis of all examined comorbidities further revealed CHF and PAD as independent risk factors for death censored graft loss (HR 2.21; p=0.003 and HR 1.80; p=0.013). Diabetes was independently and significantly associated with T-cell (HR 1.50; p=0.013) and antibody-mediated rejections (HR 2.27; p=0.03).
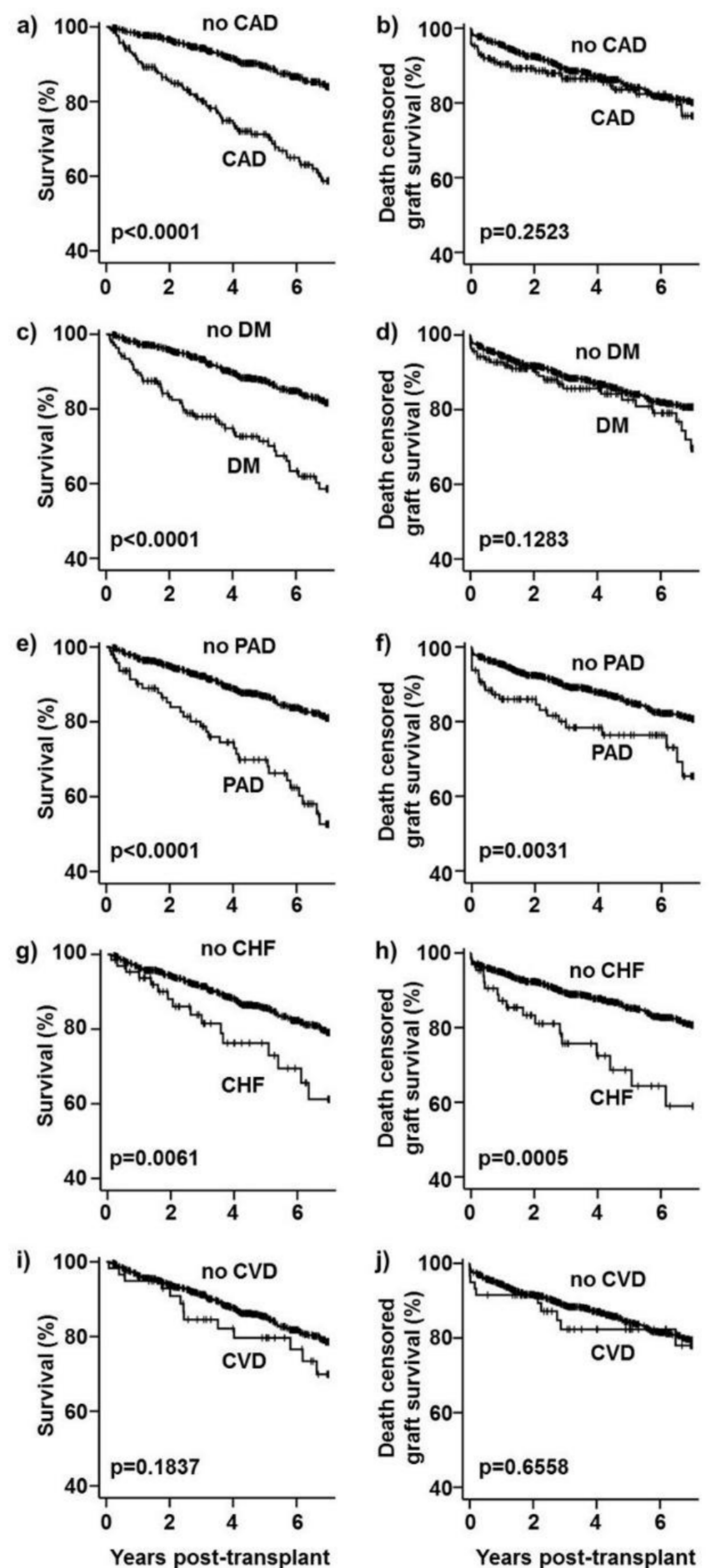
**Figure 1:**



FIGURE 1. Patient survival and death censored graft survival depending on preexisting comorbidities.
a), b): coronary artery disease (CAD). c), d): Diabetes mellitus (DM).
e), f): Peripheral artery disease (PAD). g), h): Chronic heart failure (CHF).
i), j): Cerebrovascular disease (CVD).

**Conclusion:** Pre-existing CAD and DM are independent risk factors predicting mortality in KTR. Pre-existing CHF and PAD are independent predictors of graft loss. DM was independently predictive of T-Cell and antibody-mediated rejections. The evaluation of comorbidities is crucial in the selection of transplant candidates and the optimal management after transplantation. In addition, it may help forming a functional match between an individual patient and graft, potentially influencing allocation rules and broadening the use of marginal kidney offers.

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