# Survival in HIV-Positive Transplant Recipients Compared to Matched Registry Controls

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## INTRODUCTION

We designed a 21-center study to address the safety and efficacy of kidney and liver transplantation in HIV-positive recipients (HIVTR) and to address the hypotheses that:

- Immunosuppression does not accelerate HIV disease nor reduce survival in transplant recipients with a relatively intact immune system and well-suppressed viremia.
- HIV+ patients are higher risk but acceptable transplant candidates, similar to other higher risk groups (e.g. >65 years old).

Here we describe 5-year outcomes in 150 kidney and 125 liver recipients compared with HIV-negative controls from the Scientific Registry of Transplant Recipients (SRTR).

## METHODS

- Compared HIV+ cases from the HIVTR study and HIV negative SRTR controls
- Examined time to: 1) graft failure (/loss) and 2) death
- Fit 4 proportional hazards (PH) regression models:
  - risk-matched model examining HIV status (RM)
  - demographic-matched examining HIV status (DM)
  - demo-matched adjusting for risk score (DM/RS)
  - unmatched model (UM)
  - Calculated HIV+ case risk scores from a PH model adjusting for predictors among HIV negative SRTR controls, identifying 4 controls per case after ranking by risk score.
- Demographic-matched sets: randomly selected controls matched for age, gender, race, donor, time of transplant.

## RESULTS

**Table 1. Selected Characteristics of HIVTR Subjects**

| | Kidney (N=150) | Liver (N=125) |
|---|---|---|
| **Age – median [IQR]** | 46 [40-51] | 48 [43-53] |
| **Male– no. (%)** | 117 (78) | 97 (78) |
| **AA– no. (%)** | 103 (69) | 31 (25) |
| **Hep. C– no. (%)** | 28 (19) | 89 (71) |
| **CD4+ T-cell – med. [IQR]** | 524 [385-672] | 291 [210-435] |
| **Nadir CD4+ T-cell** | 239 [106-419] | 191 [82-324] |
| **Prior OI – no. (%)** | 37 (25) | 15 (12) |

## RESULTS: Kidney Recipients

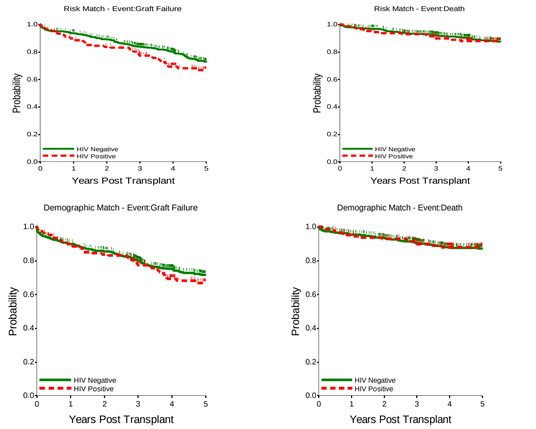
Risk-matched and unmatched analyses show marginally significant HR for graft failure(HR 1.4 [p=0.052] and 1.3 [p=0.07]), but no significant increase in risk of death among HIV-positive kidney recipients (Table 2; Figure 1)

**Table 2. Proportional Hazards Regression Results for HIV Status by Outcome and Match Model - Kidney**

| Outcome | Model | Hazard Ratio (95% CI) | P Value |
|---|---|---|---|
| **Graft Failure** | RM | 1.418 (0.997-2.017) | 0.052 |
| | DM | 1.081 (0.759-1.540) | 0.67 |
| | DM/RS | 1.115 (0.780-1.593) | 0.55 |
| | UM | 1.311 (0.974-1.765) | 0.07 |
| **Death** | RM | 1.172 (0.669-2.055) | 0.58 |
| | DM | 0.995 (0.574-1.725) | 0.99 |
| | DM/RS | 1.089 (0.617-1.920) | 0.77 |
| | UM | 1.145 (0.700-1.873) | 0.59 |

DM: Risk-matched; DM: Demographics-matched;
DM/RS: SM adjusted for Risk Score; UM: unmatched

**Figure 1. Time-to-Event Curves by HIV Status: Kidney**



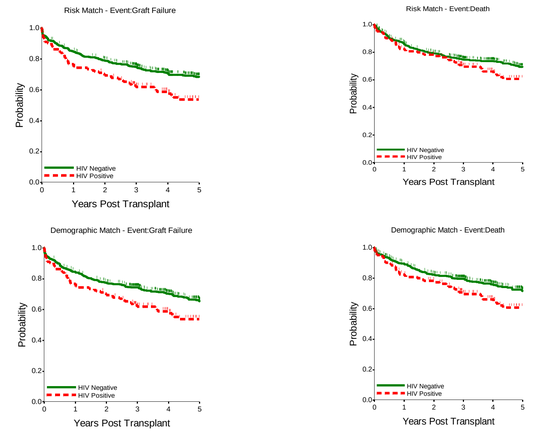

## RESULTS: Liver Recipients

All models show that HIV+ liver recipients had a higher relative hazard of experiencing graft failure than HIV-negative controls, with HRs between 1.5 and 1.6 (Table 3, Figure 2). The relative hazard of death was not significantly higher among HIV+ liver recipients in the risk-matched analysis, but was in the other three models with HRs between 1.4 and 1.6.

**Table 3. Proportional Hazards Regression Results for HIV Status by Outcome and Match Model - Liver**

| Outcome | Model | Hazard Ratio (95% CI) | P Value |
|---|---|---|---|
| **Graft Failure** | RM | 1.530 (1.106-2.115) | 0.01 |
| | DM | 1.601 (1.161-2.209) | 0.004 |
| | DM/RS | 1.607 (1.159-2.227) | 0.004 |
| | UM | 1.518 (1.167-1.974) | 0.002 |
| **Death** | RM | 1.354 (0.941-1.949) | 0.10 |
| | DM | 1.612 (1.120-2.321) | 0.01 |
| | DM/RS | 1.644 (1.134-2.381) | 0.01 |
| | UM | 1.518 (1.129-2.040) | 0.01 |

**Figure 2. Time-to-Event Curves by HIV Status: Liver**




## RESULTS: Liver Recipients

The absolute difference in graft failures was 13.5% using the risk-matched control group and 11.7% using the demographic-matched controls (Table 4).

The absolute difference in the proportion of deaths was 6.7% in the risk-matched control analysis (29.6% of risk-matched controls and 36.3% of HIVTR subjects).

Table 4. **Graft failure and death among HIV-positive liver recipients and uninfected control groups**

| | Number of Events (%) | |
|---|---|---|
| | Graft Failure | Death |
| **HIV-TR** (N=124) | 57 (46.0%) | 45 (36.3%) |
| **RM** (N=496) | 161 (32.5%) | 147 (29.6%) |
| **DM** (N=496) | 170 (34.3%) | 133 (26.8%) |
| **UM** (N=32399) | 10342 (31.9%) | 8475 (26.2%) |

## CONCLUSIONS

**Kidney Transplant Recipients**

- HIV+ outcomes were not statistically different compared with HIV-negative controls, suggesting renal transplantation should be standard of care for HIV-positive patients with end stage renal disease.

**Liver Transplant Recipients**

- The higher risks for HIV-positive liver recipients were modest, supporting transplant among this higher risk population as a viable option.
- Patient selection should be informed by prior analyses identifying low BMI, dual liver-kidney transplant, and HCV co-infection as factors associated with poor outcome.
- The availability of interferon-free regimens and direct acting antivirals are anticipated to improve transplant outcomes among LTR with HIV-HCV co-infection.

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