ONLINE LETTERS

OBSERVATIONS

Prognosis of Patients Listed for a Heart Transplant During the Pretransplant Period: Does Diabetes Matter?

heart failure and diabetes mellitus (DM) should be listed for heart transplantation (HTx) remains controversial due to conflicting findings regarding their post-HTx survival (1-3). We studied HTx candidates with and without DM during the pre-HTx period, examining multiple waiting list outcomes. Patients were enrolled in the Waiting for a New Heart Study, a multisite observational study of 318 adult (\geq 18 years of age) patients (aged 53 \pm 11 years; 18% female) who were newly listed for HTx with Eurotransplant between April 2005 and December 2006 (4). Informed consent and ethics approval were obtained (4). Characteristics at the time of listing included age, DM, and the Heart Failure Survival Score (1). Outcomes were mechanical circulatory support (MCS) device implantation, death combined with

delisting due to clinical deterioration, high urgency HTx, and elective HTx.

There were 288 patients (75 with DM, 213 without DM) with complete DM data and no MCS device at listing. Patients with DM were older and had more adverse coronary risk factors than those without DM. Outcomes were analyzed as competing events (whichever occurred first), thereby considering that the occurrence of one event (e.g., MCS device implantation) will alter the probability of other events (e.g., death).

During follow-up (median, 326 days; range, 5–1,849 days), 26 patients received MCS (DM, 16%; no DM, 7%; P = 0.0279), 65 patients died or were delisted due to deterioration prior to HTx (DM, 20%; no



Figure 1—*Cumulative incidence functions of waiting list outcomes since time of listing stratified by DM (with DM, without DM). A: MCS device implantation. B: Death/delisting due to clinical deterioration. C: HTx in high urgency status. D: Elective HTx.*

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DM, 24%; P = 0.541), 81 received high urgency HTx (DM, 19%; no DM, 32%; P = 0.0276), and 43 received elective HTx (DM, 12%; no DM, 15%; P =0.541). Cumulative incidence functions for these outcomes (i.e., the proportion of patients having experienced an outcome over time) by DM status are shown in Fig. 1. Overall, patients with DM had similar probabilities across all outcomes, but they were more likely to receive MCS (during the first 6 months on the waiting list!) and less likely to be transplanted in high urgency status than those without DM. These findings were maintained after statistical control for age (Cox regression, not shown). Considering that patients with DM had a worse clinical profile at the time of listing, they appear to be as likely as their nondiabetic counterparts to receive a surgical intervention.

In sum, newly listed patients with advanced heart failure and DM are clinically disadvantaged compared with those without DM. However, patients with DM do not appear to suffer from an elevated mortality risk or clinical deterioration during the pretransplant phase. This may be due to the recent surge of MCS device implantations, even in patients with high medical risk (4,5). Considering that DM may contribute to a worse prognosis after HTx (3), the increased use of MCS in the treatment of advanced heart failure may provide a promising alternative for these patients. Our finding showing that MCS device implantation in patients with DM occurred much sooner after listing than in those without DM supports this reasoning. Whether survival after MCS device implantation in patients with DM is

similar to those without DM remains to be determined.

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References

- Mehra MR, Kobashigawa J, Starling R, et al. Listing criteria for heart transplantation: International Society for Heart and Lung Transplantation guidelines for the care of cardiac transplant candidates–2006. J Heart Lung Transplant 2006;25:1024– 1042
- 2. Ikeda Y, Tenderich G, Zittermann A, Minami K, Koerfer R. Heart transplantation in insulin-treated diabetic mellitus patients with diabetes-related complications. Transpl Int 2007;20:528–533
- 3. Kilic Å, Weiss ES, George TJ, et al. What predicts long-term survival after heart transplantation? An analysis of 9,400 tenyear survivors. Ann Thorac Surg 2012;93: 699–704
- 4. Spaderna H, Weidner G, Koch KC, Kaczmarek I, Wagner FM, Smits JM; Waiting for a New Heart Study Group. Medical and psychosocial predictors of mechanical circulatory support device implantation and competing outcomes in the Waiting for a New Heart Study. J Heart Lung Transplant 2012;31:16–26
- 5. Kirklin JK, Naftel DC, Kormos RL, et al. The Fourth INTERMACS Annual Report: 4,000 implants and counting. J Heart Lung Transplant 2012;31:117–126