

LETTER TO THE EDITORS

Agonal period in donation after cardiac death donors

doi:10.1111/tri.12056

Sirs,

We read with great interest the letter by Blok *et al.* [1] regarding our recently published article on liver transplantation using liver grafts from donation after cardiac death (DCD) donors [2].

We agree with Blok and colleagues that there is currently no worldwide consensus on the definition of warm ischemia times (WIT). While more data are emerging from individual transplant programs, readers should pay attention to the varying definitions of WIT (i.e. time points between withdrawal of life support and aortic cross clamp). As the experience in using liver grafts from DCD donors increases especially from high volume programs with relatively uniform protocols, we believe a clearer picture of the events during procurement will continue to emerge. As one of the largest transplant programs regularly using liver grafts from DCD donors, our rate of biliary complications from ischemic injury has been lower compared with other reports from transplant programs in the US. Our observation of different procurement practices in individual transplant programs combined with a significant difference in rates of ischemic-type biliary injuries between our and others' experience motivated us to analyze our procurement data.

Our DCD practice started in 1998 and continues to be a significant part of our practice. The analyses in our paper comprised of data collected between 1998 and 2010. We took *systolic* blood pressure less than 50 mmHg as measure points for several reasons:

1. We based our analysis on a previous study published in 2008 by Ho *et al.* [3]. That study examined DCD donor postextubation hypotension and subsequent liver and kidney graft outcomes (reference 18 in our paper). To the best of our knowledge, this paper was first to report that the interval between *systolic* blood pressure of less than 50 mmHg to aortic flush was the best predictive test for their composite end-point. However, because of low number of liver grafts used in that analysis, a concrete recommendation was not given. Therefore, with a much larger data from 215 liver transplants using DCD donors, we aimed to bring granularity to this issue.

2. ASTS recommendations published in 2009 states that "Controlled DCD liver transplantation beyond the following time frames may be associated with increased complications: True warm ischemia time (interval between significant ischemic insult, such as a drop in *mean* arterial blood pressure below 60 mmHg, and initiation of perfusion) longer than 20–30 min" [4].

There are two problems with this specific recommendation: First, in contrary to the above mentioned recommendations, the authors referenced a study published in 2005 by Muiesan *et al.* (reference 37 in ASTS recommended guidelines) which actually takes warm ischemia time as the interval from *systolic* blood pressure of less than 50 mmHg to aortic perfusion [5]. Second, the authors of ASTS recommendations put themselves in a relatively noncommittal situation with their wording by suggesting some of the time frames "may be associated with increased complications".

3. ASTS recommendations do not include oxygen saturation as one of the criteria. In our experience, pulse oxymetry (usually measured at upper extremity finger) is not a reliable method of measuring oxygen saturation overall and at the end-organ level (liver in this specific paper). In fact, our analysis did not identify oxygen saturation <30% as a significant factor for development of ischemic-type biliary strictures and overall biliary complications.

We sincerely appreciate the interest in our paper. We hope that this letter clarifies the reasons behind our analysis.

C. Burcin Taner, Ilynn G. Bulatao, Dana K. Perry,
Lena Sibulesky, Darrin L. Wllingham,
David J. Kramer, and Justin H. Nguyen
*Department of Transplantation, Mayo Clinic Florida,
Jacksonville, FL, USA
e-mail: taner.burcin@mayo.edu*

References

1. Blok JJ, Braat AE, Ringers J. Reply to: Asystole to cross-clamp period predicts development of biliary complications in liver

- transplantation using donation after cardiac death donors. *Transplant International* 2013; **26**: e15.
2. Taner CB, Bulatao IG, Perry DK, *et al.* Asystole to cross-clamp period predicts development of biliary complications in liver transplantation using donation after cardiac death donors. *Transpl Int* 2012; **25**: 838.
 3. Ho KJ, Owens CD, Johnson SR, Khwaja K, *et al.* Donor postextubation hypotension and age correlate with outcome after donation after cardiac death transplantation. *Transplantation* 2008; **85**: 1588.
 4. Reich DJ, Mulligan DC, Abt PL, *et al.* ASTS Standards on Organ Transplantation Committee. ASTS recommended guidelines for controlled donation after cardiac death organ procurement and transplantation. *Am J Transplant* 2009; **9**: 2004.
 5. Muiesan P, Giralanda R, Jassem W, Melendez HC, *et al.* Single-center experience with liver transplantation from controlled non-heartbeating donors: a viable source of grafts. *Ann Surg* 2005; **242**: 732.