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DCDD Liver Procurement – Time to Consider More Options?

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The ongoing organ shortage has led to an emphasis on expanding the donor pool, especially through the use of donation after circulatory determination of death (DCDD) donors. In the US, team members of the accepting liver transplant center (or a designated surgeon from the organ procurement organization) almost always procure all or some of the abdominal organs. Reasons for sending the teams associated with the accepting transplant center vary but include the opportunity to visualize the liver *in situ*, the power to advocate for certain anatomic division of structures, and the avoidance of graft injury during procurement.

With some of the consequences of DCDD procurement, there are several compounding reasons, both supported in the literature and anecdotal, why accepting surgeons might favor their own team members procuring a DCDD liver. The urgency to minimize warm and cold ischemia times during recovery necessitates rapid removal, leading to perhaps more organ injury in DCDD donors than in donation after brain death (DBD) donors. Literature supports that there may be significantly more liver capsule injuries incurred during a DCDD procurement, but no significant difference in vascular injuries.¹ A large percentage, as high as 80%, of injuries during procurement may go unreported to the implanting team.² This may lead to unplanned backtable reconstructions or unanticipated events at reperfusion. The time pressure for procurement is important because a prolonged hepatectomy time may have a negative impact of graft survival.³ Lastly, in an effort to minimize overall cold ischemia times, the recipient hepatectomy often begins prior to the donor liver arriving at the transplant center and the accepting surgeon inspecting the quality and vasculature of the liver.

In their recent article, *Retrieval Practice or Overall Donor and Recipient Risk – What Impacts on Outcomes after DCD Liver Transplantation in the United Kingdom*, Boteon et al. studied donor retrieval techniques of their center (Birmingham) and the other eight procurement teams in the UK, as well as donor and recipient characteristics, for associations with graft survival, biliary or vascular complications. The authors hypothesized that type and amount of preservation fluid as well as additional liver flushing prior to packing for transport might vary among teams, which could impact outcomes. However, they found small variation in preservation technique. The majority of centers used University of Wisconsin (UW) solution and all centers used similar amount bench flush; with the only

statistically significant difference (albeit not clinically meaningfully different) being the Birmingham center using less *in situ* flush (5L [IQR: 5–6L] vs 6L [IQR: 5–8.2L], $p<0.001$). There was a relatively high rate of graft injuries, with 27.1% of grafts having some injury and a tendency (but not statistically significant) towards more procurement injuries in teams performing faster hepatectomies. They found grafts from other centers did incur more overall injuries (32.0% vs 18.1%; $p=0.02$), with the majority of injuries being capsular (19.6% vs. 8.4%; $p=0.008$).

Importantly, there were no liver discards secondary to procurement injuries and their procurement variables, including duration of donor hepatectomy, total volume of in-situ donor flush, total time from withdrawal of treatment to liver into ice box, retrieval injuries, and the retrieval team did not predict graft survival. The main predictor of survival was their risk score, the UK DCDD risk score, that incorporates donor and recipient factors.⁴ Interestingly, there were more biliary complications in recipients of livers retrieved from other centers (33.3% vs. 15.7%, $p=0.004$), however this did not impact overall graft or patient survival.

It is important to note that there are limitations to this manuscript. First, a key finding was that retrieval practices were not vastly different. That may not be generalizable to other countries and transplant systems. In the UK in 2008, a taskforce convened to address organ donation in the country and recommended only a few dedicated teams should be responsible for organ procurement (ultimately, seven abdominal retrieval teams were created and overseen by the National Organ Retrieval Service).⁵ All centers use a super-rapid recovery technique. In the US, there is no such standardization of procurement teams. The American Society of Transplant Surgeons requires online training modules and a minimum of 25 organ recoveries in fellowship, but no specific quantity of DCDD donor procurements.⁶

However, given the anticipated changes to liver allocation with respect to broader organ sharing leading to increased travel, we believe this study raises an integral question about the logistics behind organ procurement. As allocation changes from the donor service area as the first unit of allocation to acuity circles from the donor hospital, there is a predicted increase in travel time and need to travel by flight, which translates to increased procurement costs and concerns regarding the safety of procurement teams.⁷ Additionally, for centers with fewer transplant surgeons, the increased travel may make it nearly impossible to send their own teams to procure all organs, especially from larger distances. Prior studies have supported dedicated donor retrieval centers as a method to decrease procurement teams' travel and cost.^{8,9} Boteon et al.'s research provides substantial support that perhaps we should consider more standardization and sharing of retrieval responsibilities. Although a transplant surgeon accepting a DCDD liver recognizes the critical importance of a safe and speedy procurement, small variations in procurement technique had no significant impact on the primary clinical outcome of graft survival. However, their study must be repeated in transplant systems with less centralized oversight of organ retrieval teams.

To help generalize and externally validate these results, it would be important to review US data on differences in DCDD outcomes for livers procured from the primary team versus another team. If the UK findings are replicated in the US, this could support the ability for

local teams to procure DCDD livers to decrease travel, costs, and logistics for recipient teams, without compromising graft outcomes.

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