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Key Words: lung transplantation, donation after circulatory determination of death, donation after cardiac death, donation after neurologic determination of death, ex vivo lung perfusion, primary graft dysfunction

Discussion

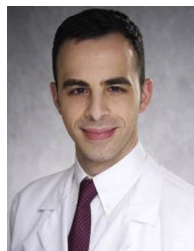
Presenter: Dr Robert Qaqish



Dr Sudish Murthy (Cleveland, Ohio).

Dr Qaqish and colleagues have reviewed their vast experience in LTx and found a significant number of patients who recently received DCDD organs. They've tried to address whether the seemingly artificial limits placed on time from extubation to organ harvest, which is 60 minutes for most centers, is reasonable. They leveraged some heterogeneity within their own practice to find patients at extremes of the interval from extubation to circulatory arrest and reviewed their outcomes. This is an important study given the paucity of organs and vanishingly small amount of data from which to craft reasonable guidelines for use of this unique organ source. The principle finding is that the interval doesn't seem to affect outcome post-transplant given their own institutional-specific pattern of organ use.

Is this a study on the use of DCDD organs or EVLP? The use of EVLP in the DCDD group is approximately 5 times higher than in the general DNDD group. What do you think about that?



Dr Robert Qaqish (Iowa City, Iowa).

I think it's a poignant analysis and a good question. You are right to point out that our EVLP use was higher, although there are reasons for that. There are inherent reasons why DCDD use is so low in the United States, and they are multifactorial. For example, there are complex logistics, and there is an unpredictability that underlies whether or not a donor will progress to circulatory death. Just as there are extended-criteria donors, there are extended-criteria features that sometimes will discourage LTx programs from using DCDD. What EVLP allows us to do specifically for the

DCDD population is that it allows us to evaluate the organs before transplantation. Yes, the use was higher, but all for good reasons. As it relates to our institution, the decision to put lungs on EVLP relates to the donor. For example, if a donor is evaluated and there are no previous clinical concerns, the P/F ratio is greater than 100, and the time to circulatory arrest is short, we leave it up to the discretion of the surgeon on call. Some surgeons are more aggressive than others in their implementation of EVLP. When we have a donor with suspected aspiration, a borderline P/F ratio, and the time to arrest is greater than 60 minutes, it is mandatory that those lungs get placed on EVLP for safety reasons and for evaluation.

Dr Murthy. Perhaps in your article you should consider suggesting that “EVLP may be uncoupling any potential negative impact from delayed extubation to circulatory arrest interval,” just to get that message that you are now relaying here to the reader.

Does your time of EVLP then vary based on the time to circulatory arrest in these patients with extended circulatory arrest? And might that EVLP time be based on some objective data of gas exchange or compliance on the circuit? Have you guys thought about that or what do you think about that?

Dr Qaqish. Yes, we have thought about it. We have published protocols in terms of our acceptance criteria. In general, all lungs are evaluated on EVLP for approximately 4 to 6 hours. We have regimented, strict assessments that we perform every hour as they relate to hemodynamics, as well as compliance of the lungs. At least 2 assessments are required: radiographic at 1 and 3 hours, as well as bronchoscopy at 1 and 3 hours—and the decision is made as early as 3 hours whether or not the lungs are accepted for transplantation. We use these criteria for every single lung that gets placed on EVLP, regardless of the reasons why they were placed on EVLP.

Dr Murthy. Do the standard parameters and descriptors of donor and recipient affect the receipt of an organ in this extended circulatory arrest cohort? In other words, are the donors younger never-smokers or the recipients unable to wait for another chance at an organ? Could this be a potential bias or was it all based on gas-exchange and compliance on the EVLP circuit as the dominant clinical driver to use the organs?

Dr Qaqish. If I understand your question correctly, all of our potential recipients have an equal opportunity to receive brain-death donor lungs or DCDD lungs. We do not select.

Dr Murthy. This is an important study. We don't have real guidelines on these types of organs until perhaps now, and this is a valuable resource in a situation where

the organ shortage is critical. As you have demonstrated with your use of EVLP, you are ramping up your transplants and almost certainly reducing wait times and death before transplant. This may add at least 20% more organs I suspect and unlocks a new source of organs that was simply discarded before. I congratulate you and your group.

Dr Dirk E. M. Van Raemdonck (*Leuven, Belgium*). Your definition of the agonal phase was the ratio between extubation and circulatory arrest. However, the agonal phase does not start until the patient becomes hypotensive or hypoxic. Do you have an idea of the interval between the hypotensive start and the circulatory arrest? Especially in those 20 donors with a long interval.

Dr Qaqish. I think that is an important point that was brought up. We have those data. For the purposes of this analysis, they were not used. In terms of our organ procurement, we do have those data for the majority of those. As you well know, there is sometimes an erratic derangement in hemodynamics in some lung-transplant donors versus more of a stable decline. So to answer your question, yes, we do have those data. We did not consider those decreases in hemodynamics, namely, systolic blood pressure less than 50, and then start the time at that point. It is something that we can go back and look at and supplement our analysis with.



Dr Matthew P. Fox (*Louisville, Ky*).

My question is in the denominator, from how many of the patients who went over 60 minutes from withdrawal of life support to asystole did you actually procure the lungs? Of those patients who were put on EVLP, how many did you decline? I think from a smaller-volume program standpoint, it is kind of hard for us to wait around for 2 or 3 hours for a patient who might not die. It would be interesting to me to know the rate of acceptance. You would think the rate of aspiration would go up. I think this study shows that EVLP works, and if the lungs do good on EVLP, they would do great on the patient. I think from a resource perspective it would be interesting to know.

Dr Marcelo Cypel (*Toronto, Ontario, Canada*). I think I can help answer that. Approximately 30% to 40% of our DCDD donors do not arrest within 3 hours. That's a higher number than observed in Europe. From the lungs we take and put on EVLP, approximately 60% to 70% we end up using for transplant. So, there is still a 30% decline from the time of EVLP.