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Key Words: lung transplantation, donation after circulatory death, heart transplantation

Discussion

Presenter: Dr Stefan Schwarz

Dr Ashish Shah *(Nashville, Tenn)*. Well, thank you for the opportunity to review your manuscript and your paper and the opportunity by the society. So the authors have reviewed a relevant, albeit small, experience in the world of DCD donation that addresses the question of whether heart-recovering delays in lung ventilation, presumably prolonged warm ischemia, and potential injury to the lung are associated with worse lung outcomes. The authors conclude that a short delay is not associated with worse post-transplant outcome. It is important to note, as you have noted in your talk, this is really about direct procurement and not about normothermic regional perfusion, which will be a completely different [inaudible], I believe. In your manuscript, you actually mention that heparin is given when allowed. Have any of these cases involved donors that did not get heparin prior to withdrawal?

Dr Stefan Schwarz *(Vienna, Austria)*. So, since we procure lungs across the Eurotransplant region, this is different according to centers and jurisdictions. At some centers, it is allowed to give medication such as heparin before withdrawal, and this was the case in some of these cases. In donors where this was not allowed, we put 10,000 units of heparin in the first bag of prophylactic perfusion and performed explanation this way.

Dr Shah. Did you recover hearts when you were not allowed to give heparin?

Dr Schwarz. It's likely that this was only cases where the heart was procured.

Dr Shah. Okay. My second question is the actual warm ischemic times are really quite short in both groups. So, in your team's mind, what would be the limits to where you wouldn't utilize the lung? How long would you wait for that heart team to get their act together?

Dr Schwarz. So, what gave us the confidence to set aside and leave the thoracic cavity to the cardiac colleagues was our confidence in the ability of the lung to accept prolonged periods of warm ischemia. We would wait for up to 2 hours for circulatory arrest to set in, so we're well within those limits. Of course, ventilation is also a factor, and we know that the lung is more tolerant to cessation of perfusion as long as ventilation is reinstituted early. I think, for these reasons, it's not really up to us, or we won't come into the range where we will have fears, probably, because the heart warm-ischemia time will be the limit in this question.

Dr Shah. I'll just conclude with just a comment. I think we're at the very beginning of really understanding the limits of warm ischemia and novel strategies to rescue these organs. DCD for heart transplant is here to stay. And the challenges associated with multiorgan recovery will grow unless we truly understand what actually matters and what doesn't matter during these recoveries. So, I applaud the authors' initial look at this issue and look forward to future work by your very esteemed group to see what the true physiologic limits are and for other groups to really understand, ultimately, where NRP fits in this. Because I have a sneaking suspicion this will be very different. So, we look forward to it. I think your presentation's a very nice presentation.

Dr Schwarz. Thank you.

Dirk Van Raemdonck *(Leuven, Belgium)*. A very nice presentation, and congratulations with the excellent results. I have a question regarding your heart and lung group, with regards to the numbers. So were these hearts and lungs transplanted all in Vienna, or were there cases where the heart was taken by another group and only the lungs were transplanted in Vienna and, vice versa, when lungs were taken by another group, and these were not included in this series?

Dr Schwarz. So this study was purely from the outlook of [inaudible] Lung Transplant Center. Some of these hearts were procured by the Vienna heart transplant team, some of those by other teams.

Dr Van Raemdonck. But the results on the outcome of the lungs was…it's only on the lungs that were transplanted in Vienna?

Dr Schwarz. Yes. Exactly.

Unidentified speaker 2. I'll ask one question, if I may. So, I apologize if I've missed it, but so you transplanted 7 sets of lungs from situations where the heart was procured with DPP, correct?

Dr Schwarz. Yes.

Unidentified speaker 2. Were there any situations where you went out with the intent to procure lungs when a heart was being procured and ended up declining those lungs?

Dr Schwarz. There were instances where there was pneumonia, for example, but there were no exclusions based on the prioritized heart procurement.

Unidentified speaker 2. Okay. So, what criteria did you use when you went out to look at the lungs after you were there in the chest? Basically, I'm asking under these situations, what would make you decline a set of lungs where the heart was being procured? Do you look at compliance, the bronchi, other sorts of strategies like that, or did you have a defining time period for warm ischemia as well?

Dr Schwarz. Since we are confident that the lung will tolerate the warm ischemia, there was no fixed limit. But we looked, as you said, at the bronchoscopy, at the elastic recoil, and of course, at the parenchyma quality at the back table. But we always explanted the lungs and [inaudible] them on the back table before accepting or declining.

Unidentified speaker 2. Great. Anyone else? A very nice presentation. And I think as Dr Shah alluded to, I mean, this is a very dynamic and changing field, and I think this adds significantly to the literature. But one of the real questions is what's going to be the impact of NRP. Does anyone in the audience have experience with transplanting lungs from a donor where NRP was used to procure the heart?

Dr Van Raemdonck. Yes, we did 2 cases in our center. And we had the medical student who did their survey, and she collected 5 cases. And I think your case is included in that as well.

Unidentified speaker 2. So, to be clear…I'm sorry. You transplanted how many?

Dr Van Raemdonck. Two.

Unidentified speaker 2. Two?

Dr Van Raemdonck. Two out of 8 NRP—thoracoabdominal NRP procedures. We declined 2 other lungs because of bad quality.

Unidentified speaker 2. Because of back table assessments?

Dr Van Raemdonck. Yeah.

Unidentified speaker 2. And you transplanted both of those directly, or with EVLP?

Dr Van Raemdonck. Directly.

Unidentified speaker 2. Directly? Okay. Ashish?

Dr Shah. I'll say I think we…I think there's probably 5 or 6 NRP cases we've gone out for. Two we utilized for lung transplant. The other 4, I'd say, Matt Bacchetta, who runs our program, elected to send those to a lung bioengineering [inaudible]. They all failed.

The last 2—so I'm going to add another 2—as soon as we reperfused on NRP, those lungs really failed badly. And we're in the midst of trying to understand if this is just couple case. Again, these are small cases, so it's really hard to know. But I suspect there may be another injury that's possible with reperfusion. It could be neurogenic, also. Even though we do interrupt the cerebral circulation, there may be some other element here we're missing. So, as you said, we're going to see how this shakes out in the future.

Unidentified speaker 2. Yeah. I think, really quickly, our experience in Cleveland has been, I think, we've done 3. One set of lungs for NRP, we transplanted directly. Actually, Dr Ahmad transplanted those. I think Vanderbilt took the heart. And the other 2, we put both those on EVLP because we had concerns. And both of those of those sets of lungs ended up not being transplantable.

Dr Shah. Yeah. And I think one of the things that Matt is a little worried about is that maybe even that second EVLP run might—there's some priming that may be going—I mean, I don't want the audience to think that we have a total grasp of this. These are very potentially unique cases, but there's definitely a signal there that we need to look into this a little bit closer.

Unidentified speaker 2. Yes. Yeah, I completely agree. Okay. Thank you very much.