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Commentary: Combined heart-lung procurement: Avoiding the bottleneck effect

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Although primary graft dysfunction (PGD) is uncommon after cardiac transplantation, it remains the most common cause of early mortality.¹ Transplantation services balance the need for organs with the additional risk of PGD when using marginal donors. Retrieving multiple organs from a single donor is a simple way to maximize organ availability; however, whether this carries additional risks is not entirely clear. Owing to an ongoing donor shortage worldwide, new techniques have been developed in an attempt to expand the donor pool, such as donation after cardiovascular death and ex vivo perfusion.^{2,3}

The very interesting and important article by Ram and colleagues⁴ published in this issue of the *Journal* demonstrates that combined heart and lung (CHL) procurement dramatically increases the risk for PGD following heart

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CENTRAL MESSAGE

The importance of left ventricular decompression cannot be over-emphasized, particularly during combined procurement of the heart and the lungs.

transplantation compared with isolated heart (IH) procurement. A multivariable analysis confirmed that CHL was independently associated with an increased risk of PGD. Interestingly, although there was a somewhat longer ischemic time in the CHL group, the absolute difference was just over 15 minutes, and the mean ischemia time was well below the threshold of 240 minutes, which previously has been demonstrated to confer higher risk.⁵

Why then should there be increased PGD, when the ischemia time is only marginally longer? Perhaps the additional ischemia time may indeed contribute to some degree. Although the impact of somewhat marginally prolonged ischemia time or amiodarone use was surprisingly unclear, the most striking feature was the fact that, compared with 1 L for IH procurement (Figure 1, A), the combined infused volume of cardioplegia and pneumoplegia was 6 L for CHL procurement (Figure 1, B). In the CHL procurement group, the initial infusion of 1 L of cardioplegic solution was

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FIGURE 1. A, Isolated heart procurement with standard cardioplegia and left atrial venting via an incision in the left atrial appendage. B, Combined heart and lung procurement with left atrial venting via an incision in the left atrial appendage. C, Combined heart and lung procurement with left atrial venting via an additional incision in the left atrium between the atrioventricular groove and the pulmonary vein.

followed by infusion of an extra 1 L of cardioplegic solution to allow continued distention of the ascending aorta for the duration of pneumoplegia administration, in an attempt to prevent inadvertent coronary perfusion by the lung perfusate. The venting of the heart was done via an incision in the left atrial appendage in all patients. The additional infused volume of pneumoplegia may have contributed to distension of the donor ventricle, especially if it was not effectively vented.

Can this problem be solved? An immediate, intuitive simple step would be to ensure proper venting to avoid left ventricular distention. Instead of forcing many liters of solution through the incision in the left atrial appendage, a wide opening in the left atrium would be helpful to prevent a bottleneck effect (Figure 1, C). Such left atrial incision placed between the atrioventricular groove and the pulmonary veins will ensure excellent decompression, provided that a sucker is immediately placed through it into the left atrium.⁶ Effective decompression of the left atrium would eliminate the need for an extra 1 L of cardioplegia to prevent inadvertent coronary perfusion by the lung perfusate.

Inadvertent perfusion of the coronary arteries with pneumoplegia will not occur if the left atrium is properly drained, the left ventricle is decompressed, and aorta is widely open.

The importance of left ventricular decompression cannot be overemphasized, particularly during combined procurement of the heart and lungs.

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