



Recirculation phenomena in double cannula veno-venous extra corporeal membrane oxygenation

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We would like to thank Drs. Carvalho and Keshavamurthy (1), for their letter and clarification on our article entitled “Extra corporeal membrane oxygenation (ECMO) review of a lifesaving technology” (2). Recirculation in double cannula techniques is a well-described and known phenomenon in veno-venous ECMO mode of support (3,4). Whether the cannulation is via bicaval or bifemoral approach, avoidance of recirculation requires careful cannula position and even repositioning.

As astutely pointed out by Drs. Carvalho and Keshavamurthy, the configuration illustrated in our 2015 article (*Fig. 1A*) would lead to recirculation. In our practice then and now, bi-femoral veno-venous cannulation utilizes (I) a multi-stage drainage cannula in the inferior vena cava (IVC); and (II) a long single-stage return cannula placed with the tip in mid-right atrium (mid-RA). We thank Drs. Carvalho and Keshavamurthy for their correction with *Fig. 1B*. In terms of the specific gap between the tips of the drainage and return cannulae, that distance may need to be optimized for individual patients and less dogmatic.

We typically favor placing the return cannula tip in mid-RA with the drainage cannula tip at or below the RA-IVC junction. Patient size, volume status, flow, and so on may impact the efficiency of the configuration. For example, as the patient is being diuresed and the IVC diameter decreases, the drainage cannula placed squarely in the IVC may not allow adequate flow. The bedside team should decide the optimal patient support by balancing the matrix

of parameters: cannula configuration, circuit flow, cardiac function, volume status, measured blood gas samples from patient and circuit [pre- and post-membrane partial pressure of arterial oxygen (PaO₂)]. Balance is the operative word. For example, accepting small amount of recirculation might be acceptable while repositioning the cannula to generate enough flow in oversized patients depending on the amount of support needed and the optimal oxygenation level we are providing.

Again, we thank the author for clarifying this important point and providing the corrected information.

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aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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