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**REPLY: RIGHT, WRONG,
OR SOMEWHERE IN
BETWEEN?**



Reply to the Editor:

Grunfeld and colleagues¹ provide interesting insight on a potential mechanism for observed increases in right-sided stroke that were recently reported during right axillary venoarterial extracorporeal membrane oxygenation (ECMO).² In addition to embolization, they suggest that mixing between ECMO flow and the native cardiac output may produce an environment predisposing to right-sided stroke, including through blood stasis and leading to innominate artery thrombosis, supported by compelling clinical images.

Differential oxygenation (ie, “North-South” or “Harlequin” syndrome) is a well-known potential downside of peripheral venoarterial ECMO,³ wherein the native cardiac output competes with retrograde ECMO flow and differentially perfuses the right brachiocephalic and carotid arteries with deoxygenated blood. Although we have not experienced this complication as vividly as described by Grunfeld and colleagues, the analogous mechanism is certainly a plausible explanation for the observed findings after axillary cannulation and one for which all peripherally cannulated patients must be closely monitored.

Notably, this complication may be obviated by using central cannulation. One approach that we have taken in carefully selected patients is that of closed-chest central ECMO cannulation. In this approach, a standard aortic arch cannula is tunneled through the right second intercostal space into the ascending aorta while a 2-stage venous cannula is tunneled through the abdominal fascia and into the right atrium with the tip positioned in the inferior vena cava. If desired, an apical left ventricular vent can be inserted with the assistance of a long angiocatheter and modified Seldinger technique for dilation of the apex and a left infra-mammary incision. Standard sternotomy closure may then be performed. This provides the early chest closure benefits of peripheral cannulation, including careful patient mobilization, although hemostasis must be particularly meticulous, given the need for systemic heparinization.

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References

1. Grunfeld M, Kai M, Ohira S. Mechanism of stroke in the setting of postcardiotomy veno-arterial extracorporeal membrane oxygenation support. *J Thorac Cardiovasc Surg Open*. April 12, 2022 [Epub ahead of print].
2. Schaefer A-K, Distelmaier K, Riebandt J, Goliasch G, Bernardi MH, Zimpfer D, et al. Access site complications of postcardiotomy extracorporeal life support. *J Thorac Cardiovasc Surg*. November 25, 2021 [Epub ahead of print].
3. Lorusso R, Whitman G, Milojevic M, Raffa G, McMullan DM, Boeken U, et al. 2020 EACTS/ELSO/STS/AATS expert consensus on post-cardiotomy extracorporeal life support in adult patients. *Eur J Cardiothorac Surg*. 2021;59:12-53.

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