Authors have nothing to disclose with regard to commercial support.

ischemia than the previously used 8F to 10F cannulae. We believe that this small but adequate distal perfusion cannula allows for both forward flow and flow around the cannula into a potentially nonperfused area between the 2 cannulae. (5) Finally, we directly connect the side-arm of the distal perfusion cannula to the arterial return cannula, limiting the length of tubing between the 2 cannulae (Figure 1).

We do not routinely perform open cannulation for access to the SFA or verify flow to the lower extremity via angiography. As stated in the article,¹ this cohort of patients are often critically ill, are in cardiopulmonary shock, and have poor physiologic reserve. Therefore, we believe transport to the operating room for open cannulation and angiography may be imprudent. Furthermore, in our experience, open cannulation is associated with a significant risk of wound infection. With the percutaneous strategy proposed, our rate of ischemia is acceptably low and avoids the potential morbidity associated with transport to the operating room. We advocate bedside, ultrasound-guided, percutaneous cannulation of the SFA with a 6F wire-reinforced distal perfusion cannula.

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ACHIEVING SAFE AND EXPEDITIOUS DISTAL LIMB PERFUSION IN FEMORAL VENOARTERIAL EXTRACORPOREAL LIFE SUPPORT

Reply to the Editor:

We appreciate the letter of Pasrija and colleagues regarding our recently published article investigating lower extremity complications after femoral access for extracorporeal membrane oxygenation (ECMO).¹ As hospitals develop more aggressive and mature extracorporeal life support programs, ECMO use will continue to increase. The establishment of safe protocols for preserving distal limb perfusion is therefore imperative.

In their letter, Pasrija and colleagues briefly recount their past 3-year experience with patients who underwent peripheral venoarterial ECMO. They describe a 7% complication rate, which is commendable. As they state, distal limb malperfusion has been cited as the Achilles' heel of peripheral venoarterial ECMO support.² In their detailing of their institution's approach to percutaneous access of the superficial femoral artery, it is implied that this approach has been used in all settings during the past 3 years. At our institution, whenever technically possible we use a similar strategy to achieve percutaneous access for a distal limb perfusion catheter. Whether we use the hybrid operating room, cardiac catheterization laboratory, or intensive care unit (using bedside fluoroscopy), we have adopted a more aggressive approach toward angiographic confirmation of proper catheter positioning.

In addition, there are several frequent clinical scenarios that in our opinion preclude the bedside approach to percutaneous superficial femoral artery (SFA) access described by Pasrija and colleagues. For one, in our study one-third of the patients were placed on ECMO in the setting of cardiac arrest and while undergoing full cardiopulmonary resuscitation. In this setting, we believe that the highest priority is to initiate ECMO flow as expeditiously as possible. We place the large-bore venous and arterial catheters for venoarterial ECMO flow and initiate full ECMO support. We then address the distal limb perfusion cannula once stable ECMO flows have been achieved. In our experience, it is often difficult to achieve percutaneous access with the large-bore femoral arterial cannula in place, which mandates an open approach in these instances. Also, these patients are typically receiving very high doses of inotropic and pressor support. We have found that typically the SFA is severely vasoconstricted in these situations, making bedside access and percutaneous placement more precarious. In the case of patients who require venoarterial ECMO support and have suitable hemodynamics to permit careful placement of the distal perfusion cannula first, we do prefer the percutaneous

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bedside approach of Pasrija and colleagues, but we do not use this strategy in the setting of cardiac arrest.

Second, patients with significant obesity often have a body habitus that prevents successful visualization of the superficial femoral artery to confirm wire placement with ultrasonography as the sole modality, especially in the post-cardiac arrest situation. For these patients, we prefer angiographic confirmation of superficial femoral artery placement of the distal limb perfusion cannula. Our preferred approach is therefore to confirm SFA placement in the operating room, either with a percutaneous or an open surgical approach.

Finally, the approach described by Pasrija and colleagues does not address the scenario in which patients are transferred from outside institutions with venoarterial ECMO already in place. These patients often require SFA cannula placement in the operating room with either percutaneous or open technique for a variety of reasons. Frequently, these patients either have sepsis, have multiorgan malperfusion or failure, are severely coagulopathic, and are unstable even with venoarterial ECMO. Not uncommonly, they arrive with groin hematoma or malpositioned catheters requiring revision. In our experience, these patients are at higher

risk for complications associated with bedside ultrasonographically guided SFA cannulation.

Patients requiring venoarterial ECMO are extremely critically ill, and we recognize the relative merits of successful bedside SFA cannula placement as Pasrija and colleagues describe. In our opinion, however, there are scenarios in which percutaneous access and ultrasonographic confirmation are not suitable. In these instances, we have adopted an aggressive approach toward angiographic confirmation and open surgical exposure when necessary. It is critical to have a protocol-based approach to venoarterial ECMO and SFA cannulation, but it is equally critical that the sequence of cannulation, timing, location, and approach (percutaneous versus open) be tailored to the patient and the clinical picture.

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