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Commentary: When preserving life, do not neglect the limb: The role of axillary artery cannulation in venoarterial extracorporeal membrane oxygenation

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Limb ischemia and groin infections due to femoral arterial cannulation for extracorporeal membrane oxygenation (ECMO) are highly morbid, devastating complications. Critical limb ischemia develops in 12% to 22% of patients supported by peripherally cannulated venoarterial (VA) ECMO. Fasciotomy is required to relieve compartment syndrome in 10.3% of patients, with an amputation rate of 4.7%.¹ To mitigate this risk, the use of concurrent prophylactic antegrade femoral artery perfusion catheters has been recommended; however, even with distal arterial perfusion, limb-threatening ischemia has not been totally eliminated, and thus there is a pressing need for alternative cannulation techniques that eliminate this risk.^{2,3}

In this issue of the *Journal*, Ohira and colleagues⁴ present compelling data supporting the value of axillary artery cannulation via a side graft for systemic arterial outflow in VA ECMO, which was used principally to reduce complications of femoral cannulation, such as limb ischemia and infections (with reduction in differential hypoxemia being another advantage). In their study, despite a higher incidence of chronic peripheral vascular disease (13.8% vs 5.2%; $P = .008$) in the axillary artery group compared with the femoral artery group, the incidence of lower extremity ischemia (6.9% vs 15.7%; $P = .006$), any limb ischemia related to VA ECMO cannulation (0% vs

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CENTRAL MESSAGE

When instituting extracorporeal membrane oxygenation, serious consideration should be given to the use of axillary artery cannulation with a side graft instead of routine femoral artery cannulation to mitigate limb-threatening lower extremity ischemia and infections.

10.5%), need to change the cannulation site (4.6% vs 14.7%), and wound complications (2.8% vs 15%), including infection and additional procedures, were significantly higher in the femoral artery group ($P < .001$).

According to the authors, the primary advantage of axillary artery cannulation for VA ECMO outflow is avoidance of devastating limb ischemia and groin infections, since the purported advantages of reduced stroke rate and other outcomes were not borne out in their study. Importantly, direct cannula insertion retrograde into the axillary artery, similar to the approach used for the femoral artery, should not be as advantageous as the side graft technique with respect to limb ischemic complications, for obvious mechanical reasons.

From a technical standpoint, even in the most obese patients, axillary artery cannulation in experienced hands is a very straightforward procedure. However, it is neither expeditious nor practical in highly (medically?) unstable patients or those in overt cardiac arrest. In such cases, percutaneous femoral artery cannulation remains the preferred approach. Subsequent decannulation typically requires an open procedure (see below).

In general, femoral arteries are more atherosclerotically diseased than axillary arteries, and axillary artery surgical incisions are not commonly infected. Axillary artery

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Disclosures: The authors reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

Received for publication Nov 6, 2020; revisions received Nov 6, 2020; accepted for publication Nov 20, 2020; available ahead of print Nov 30, 2020.

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JTCVS Techniques 2021;5:72-3

2666-2507

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<https://doi.org/10.1016/j.jtc.2020.11.026>

decannulation in general is more straightforward, necessitating ligation of the side graft. In comparison, although percutaneous femoral artery cannulation is very rapid at inception (in contrast to axillary artery cannulation), it frequently requires an open cutdown, with additional procedures ranging from femoral endarterectomies to patch angioplasties, embolectomies, and more.

Concomitant distal arterial perfusion, which has demonstrated a lower incidence of lower extremity ischemia, has not totally eliminated lower extremity ischemia and does not impact wound complications. Obviously, percutaneous distal arterial perfusion catheter placement is more time-consuming and difficult in a patient in cardiogenic shock, especially when VA ECMO is instituted at the bedside in the ICU. If feasible, these catheters are placed before retrograde cannulation of the femoral arteries with the VA ECMO outflow cannula, which of course is not the case in the setting of extracorporeal cardiopulmonary resuscitation VA ECMO cannulation.

Even though the study endorses a conceptually sound idea with theoretical advantages of cannulating via the axillary artery over the femoral artery, it has many biases. There is a mixed etiology of cardiogenic shock in the study group, including postcardiotomy, acute coronary syndrome, primary graft failure following cardiac transplantation, decompensated heart failure, and pulmonary embolism.

There has been no attempt to tease out the outcomes for each individual etiology. One might expect that survival and complications for each would be different; because these etiologies are unevenly distributed among the axillary artery group and the femoral artery group, this introduces bias.

VA ECMO is a well-established lifesaving therapy for patients in cardiogenic shock. However, in instituting VA ECMO support, the authors make a convincing case that consideration should be given to axillary artery cannulation with a side graft, instead of routine femoral artery cannulation, to mitigate limb-threatening lower extremity ischemia and infections.

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