On Normothermic Regional Perfusion

Garson Leder
Medical College of Wisconsin

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In “Neither Ethical nor Prudent: Why Not to Choose Normothermic Regional Perfusion” (published May 20, 2024, ahead of print), Adam Omelianchuk and colleagues offer an exceptionally clear and methodical critique of the ethical and legal permissibility of in situ normothermic regional perfusion (NRP). NRP involves, in part, the reperfusion of organs via extracorporeal membrane oxygenation (ECMO) after a declaration of death and the occlusion of the arteries supplying blood to the brain. The authors' main conclusion is that NRP invalidates the declaration of death via the standards set by the Uniform Determination of Death Act (which requires either permanent cessation of circulatory and respiratory functions or irreversible cessation of all brain functions for a determination of death) and thereby violates the Dead Donor Rule (which, minimally, requires that organ recovery not be the cause of death). Their arguments for these points, however, are flawed. Most notably, this conclusion rests on mistaken assumptions about the role of circulation in both the UDDA and DDR. A close examination of the role of circulation in sustaining life shows that NRP is consistent with both the UDDA and the DDR.

The authors' reasoning for their conclusion is straightforward: “With NRP, … circulation is restored through a vascular circuit that supplies oxygen and nutrients to, and removes waste from, the donor's organs and tissues, thereby contradicting the premise on which death was declared, namely, that circulatory functions have permanently ceased…. With the determination of death invalidated, … procuring organs from donors through NRP violates the DDR, since such donors are not dead and the removal of vital organs would cause their death, thus risking a homicide charge.” The authors are correct in noting that, in the case of NRP, circulation *of some kind* has been restored; however, they are mistaken in arguing that this type of circulation invalidates the determination of death via the circulatory criterion of the UDDA. What matters in establishing death via the circulatory criterion is not just *that* organs and tissues are being perfused by a circulatory system but also *which* organs and tissues are being perfused. Specifically, what matters (according to any plausible reading of the UDDA) is that a functioning brain is perfused.

This point is clear if we consider a thought experiment and examine what would happen if, after declaration of death via the cardiac criterion, an ECMO circuit was (somehow) established to perfuse, in situ, a single limb (while the blood flow to the rest of the body was occluded). Circulation would be restored insofar as there is a functioning vascular circuit, but it is implausible to argue that the person should be considered alive according to UDDA criteria. This is because circulation, by itself, does not establish whether a human is alive; it matters

what this circulation does. And, crucially, the UDDA requires a functioning brain as a necessary condition for life (i.e., a human with a functioning circulatory system is still determined to be dead if there is an irreversible cessation of brain functioning). Thus, the cessation of circulation that matters for the identification of death via the UDDA's circulatory criterion is circulation that is (among other things) perfusing a functioning brain. No such circulation is supposed to occur in NRP.

The authors respond to thematically similar defenses of NRP that posit that NRP does not restore circulation, full stop, but merely reperfuses part of the body. The authors argue that this type of argument "misstates the relationship" between circulation and death because "circulation, whether generated naturally or artificially, exists for the purpose of perfusing organs and tissues, and the permanent loss of circulation brings about death because, without oxygen, organs lose the ability to function." Thus, Omelianchuk et al. appear to be arguing, a declaration of death by the circulatory criterion does not apply if NRP restores circulation in the thoracoabdominal space because the circulatory system is still doing what it is supposed to do to sustain life. This response, however, misses the mark: again, it matters which organs and tissues are being perfused. The authors may be assuming (very plausibly) that the circulation necessary for life requires the perfusion of vital organs (and not just a limb), but the perfusion of the vital organs is necessary for life only because of the role they play in sustaining life, and, given the logical entailment of the UDDA criteria, part of this role will necessarily involve perfusing a functioning brain. Thus, perfusion of *some* vital organs (but not the brain) does not play the potentially life-sustaining role attributed to it by the authors. NRP does not restart circulation (or at least the circulation that matters in identifying life) and therefore does not invalidate the initial determination of death via the circulatory criterion. And neither the occluding of the cerebral arteries nor the procuring of organs can reasonably be thought to cause the death of a donor (thus violating the DDR) because both acts are performed on a body already rightly declared dead via the same criterion. NRP, then, is on solid ethical and legal footing as long as the occlusion of circulation to the brain is achieved.