Percutaneous Cannulation in Predominantly Venoarterial Extracorporeal Membrane Oxygenation by Intensivists

To the Editor:

In a recent issue of Critical Care Medicine, we welcome the article by Conrad et al (1), which showed that an intensivist-led percutaneous extracorporeal membrane oxygenation (ECMO) cannulation procedure guided by fluoroscopic and ultrasound imaging resulted in a 98% success rate and a remarkable complication rate of just 2%, in a predominantly venovenous (VV) mixed adult and pediatric population. An intensivist model of ECMO cannulation is also possible in cardiorespiratory syndrome. If cannulas are inserted in a region that is a regional cardiothoracic transplantation centre for the southern states of Australia and admits approximately 3,000 ICU patients per year, we use a protocolized ultrasound-guided bifemoral percutaneous cannulation approach for all patients. The internal jugular vein was used for dual access or when femoral route is not possible. Two cannulators are always present. A third operator confirms cannula and wire positions in the inferior vena cava and aorta using either transthoracic echocardiography. Nine-French femoral anterograde perfusion cannulas are usually placed in VA ECMO to prevent distal leg ischemia, and contralateral femoral vessels are cannulated in VA ECMO to avoid leg hyperperfusion syndrome. Once cannulas are in place, they are secured without stitches using adhesive dressings at multiple sites.

Between January 2012 and April 2015, a total of 185 patients underwent actual or attempted cannulation for ECMO. Detailed data were available for 167 patients. A total of 356 cannulations occurred, including 22 dual access configurations. The majority of patients, i.e., 122 of 167 patients (73%), had VA support, of whom 49 were patients who were cannulated during cardiopulmonary resuscitation (CPR), and 45 of 167 patients (27%) had VV ECMO.

Percutaneous cannulations were successfully performed in 127 of 167 patients (76%), whereas surgical cannulation in the theatre was performed in 36 of 167 patients (22%). Cannulas could not be passed in four of 167 patients (2%) (three during CPR who died and one patient was successfully managed without ECMO).

Data for anterograde perfusion cannulas were available for 93 of 122 VA ECMO patients. Cannulas were inserted in 86 of 93 patients (92%), and of these, intensivists inserted in 73 patients and surgeons inserted in 13 patients.

Complications occurred in 14 of 167 VA ECMO patients (8%): four patients had vessel injuries repaired in the theatre and three patients each had embolectomies and fasciotomies. Four further patients had lower limb ischemia but did not require amputation. Of the VV ECMO patients, one of 45 patients (2%) required fasciotomy following a hyperperfusion syndrome after being switched to VA ECMO. Two patients had cannula complications: one patient’s return cannula was damaged as the anterograde perfusion cannula was being secured. A second patient’s internal jugular venous access cannula was accidentally dislodged and removed but was resecured without major consequence.

Overall average ECMO duration was 4 ± 4 days for VA ECMO and 14 ± 4 days for VV ECMO. Survival to hospital discharge was 73 of 122 (60%) for VA ECMO (including extracorporeal CPR) and 32 of 45 (71%) for VV ECMO. In total, seven of 167 patients (4%) had hemorrhagic or ischemic stroke, and there was one blood stream infection, and one confirmed cannula related infection.

In conclusion, intensivist-led cannulation is also possible for a predominantly VA ECMO service and is associated with an acceptable complication rate.

The authors have disclosed that they do not have any potential conflicts of interest.

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REFERENCES


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The authors reply:

The letter by Burrell et al (1) describing the percutaneous cannulation experience by intensivists at Alfred Hospital provides important information for intensivists involved in extracorporeal life support (ECLS) programs and nicely complements our reported experience (2). Our ECLS program has historically provided predominantly respiratory support, and our cardiac support experience is more limited. Our ECLS experience consists mostly of venovenous cannulation with a smaller venoarterial cohort. Burrell et al (1) describe their cannulation experience, which includes a large venoarterial cohort.

Aspects of the Alfred Hospital experience deserve mention. The first is their success with arterial cannulation with a low complication rate. Arterial cannulation entails more inherent risk than venous because arterial injury can lead to substantial more morbidity than venous injury. The 8% arterial complication rate reported, although higher than their venous rate (2%), is not unexpected and would not be considered excessive. Some of their complications required surgical management, so the availability of surgical services would seem advisable.

Another aspect is the larger number of intensivists (16) available to perform cannulations. Although this would seem to dilute the experience of each intensivist, the approach of having more than one intensivist cannulating a given patient (as we do) increases the exposure to the procedure and helps maintain cannulation skills.

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