

## Technical considerations during pump controlled retrograde trial off with the Cardiohelp™ system

Perfusion

2022, Vol. 37(4) 432–433

© The Author(s) 2021


Article reuse guidelines:

sagepub.com/journals-permissions

DOI: 10.1177/02676591211000575

journals.sagepub.com/home/prf



Karim Serri,<sup>1,2</sup>  Pierre-Emmanuel Noly,<sup>3,4</sup>  
Yiorgos Alexandros Cavayas,<sup>1,2</sup> Armindo Fernandes<sup>5</sup>  
and Yoan Lamarche<sup>1,2,3,4</sup>

To the Editor,

Recently, different groups have published on the pump controlled retrograde trial off (PCRTO) technique, a new strategy for veno-arterial extracorporeal membrane oxygenation (ECMO) weaning.<sup>1–4</sup> The PCRTO strategy consists of reducing the speed of the centrifugal pump and the antegrade flow in the ECMO circuit until the flow becomes retrograde.<sup>4</sup> The reversed flow generated by the patient's native ejection through the arterial canula causes a controlled arteriovenous shunt. Several studies have suggested that PCRTO is a safe and reproducible approach.<sup>1,3,5</sup>

We read with interest the letter by Mattke et al.<sup>6</sup> raising issues about safety considerations during PCRTO. The authors rightfully point out the risk of blood stagnation because of an unintended PCRTO cessation due to “back flow prevention.” This strategy is commonly used at our centers with the Cardiohelp™ system (Maquet, Rastatt, Germany) and technical aspects of this procedure, which are not detailed in most studies, should be highlighted.

Once the patient is deemed ready for weaning, we usually perform a PCRTO in the absence of contraindications such as an intracardiac shunt or membrane thrombosis. We start by reducing the revolutions per minute (RPM) until we reach a neutral flow (0 L/min). At this point, the backflow alarm may be activated if it senses a flow of –0.1 L/min. We then activate the “global override” mode and transfer the flow probe to the venous line to allow the measurement of retrograde flow as a positive value. The rationale to activate the “global override” mode is to allow sufficient time to transfer the flow probe. This in turn prevents the “zero flow mode” from being activated as well as bubble detection from stopping the pump during transfer of the flow probe. At this point, we reset the bubble detection and “unlink” it, which will allow us to monitor bubbles without stopping the pump. We believe it is important to keep bubble detection activated to assess for the presence of debris or

clot on the pre-membrane side of the oxygenator due to the associated risk of venous side embolization. We then continue to reduce the RPM until achieving a total retrograde flow of 0.5 to 1 L/min and then remove the “global override” mode. The choice of this range of retrograde flow is in accordance with the manufacturer's recommended minimal flow to obtain a washout of the oxygenator and reduce stagnation in the oxygenator, without volume overloading the right ventricle. We use a checklist through the weaning trial to avoid unintended deactivation of the “global override” at the end of the trial. The patient is closely monitored during the entire procedure both clinically and by echocardiography. Once the PCRTO procedure is stopped, we perform the above steps in the reverse order until the desired support is achieved. PCRTO is an effective and safe technique to assess patient's readiness to separate from veno-arterial ECMO while preserving the integrity of the circuit. However, a thorough understanding

<sup>1</sup>Service de Soins Intensifs, Département de Médecine, Hôpital du Sacré-Coeur de Montréal, CIUSSS Nord-de l'Île de Montréal, Université de Montréal, Montréal, QC, Canada

<sup>2</sup>Service de Soins Intensifs, Département de Chirurgie, Institut de Cardiologie de Montréal, Université de Montréal, Montréal, QC, Canada

<sup>3</sup>Service de Chirurgie Cardiaque, Département de Chirurgie, Hôpital du Sacré-Coeur de Montréal, CIUSSS Nord-de l'Île de Montréal, Université de Montréal, Montréal, QC, Canada

<sup>4</sup>Service de Chirurgie Cardiaque, Département de Chirurgie, Institut de Cardiologie de Montréal, Université de Montréal, Montréal, QC, Canada

<sup>5</sup>Service de Perfusion, Département de Chirurgie, Institut de Cardiologie de Montréal, Université de Montréal, Montréal, QC, Canada

### Corresponding author:

Karim Serri, Hôpital du Sacré-Coeur de Montréal, 5400, boul Gouin ouest, Montréal, QC H4J-1C5, Canada.

Email: karim.serri@umontreal.ca

of the system used is crucial to minimize the potential risks of the procedure.

#### Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

#### Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

#### ORCID iD

Karim Serri  <https://orcid.org/0000-0003-4472-883X>

#### References

1. Ling L, Chan KM. Weaning adult patients with cardiogenic shock on veno-arterial extracorporeal membrane oxygenation by pump-controlled retrograde trial off. *Perfusion* 2018; 33: 339–345.
2. Mattke CA, Haisz E, Pandya N, et al. Creating a controlled arterio-venous shunt by reversing the extracorporeal membrane oxygenation blood flow: a strategy for weaning patients off veno-arterial extracorporeal membrane oxygenation. *Pediatr Crit Care Med* 2017; 18: 973–976.
3. Pandya NR, Daley M, Mattke A, et al. A comparison of pump-controlled retrograde trial off to arterio-venous bridging for weaning from venoarterial extracorporeal membrane oxygenation. *Eur J Cardiothorac Surg* 2019; 56: 277–284.
4. Westrope C, Harvey C, Robinson S, et al. Pump controlled retrograde trial off from VA-ECMO. *ASAIO J* 2013; 59: 517–519.
5. Ju MH, Lim MH, Lee SY, et al. Early experience of pump-controlled retrograde trial off for weaning from veno-arterial extracorporeal membrane oxygenation in adult patients with cardiogenic shock. *Perfusion*. Epub ahead of print 13 August 2020. DOI: 10.1177/0267659120941328.
6. Mattke AC, Haisz E, Black A, et al. Pump controlled retrograde trial off using the Cardiohelp console: safety considerations. *Perfusion* 2019; 34: 530–531.