

the blood, negatively affecting mitochondrial function during sepsis. Although Lee's hypothesis is intriguing, it should be noted that there is currently limited empirical evidence to support it. Further research is required to investigate the role of adipose tissue in sepsis and to determine whether the storage of mitochondrial toxins in adipose tissue has a protective effect.

- 1 Division of Allergy, Pulmonary and Critical Care Medicine, Department of Internal Medicine, Pusan National University Yangsan Hospital, Yangsan, Republic of Korea.
- 2 Transplant Research Center, Research Institute for Convergence of Biomedical Science and Technology, Pusan National University Yangsan Hospital, Yangsan, Republic of Korea.
- 3 Department of Internal Medicine, School of Medicine, Pusan National University, Busan, Republic of Korea.

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

REFERENCES

1. Lee DH: Obesity Paradox in Sepsis: Role of Adipose Tissue in Storing Mitochondrial Toxins. *Crit Care Med* 2023; 51:e172–e174
2. Cho WH, Choi YY, Byun KS, et al: Prognostic value of sarcopenia for long-term mortality in extracorporeal membrane oxygenation for acute respiratory failure. *ASAIO J* 2020; 66:367–372
3. Cho WH, Oh JY, Yeo HJ, et al: Obesity survival paradox in pneumonia supported with extracorporeal membrane oxygenation: Analysis of the national registry. *J Crit Care* 2018; 48:453–457
4. Yeo HJ, Kim TH, Jang JH, et al; Korean Sepsis Alliance (KSA) Investigators: Obesity paradox and functional outcomes in sepsis: A multicenter prospective study. *Crit Care Med* 2023; 51:742–752
5. De Bandt JP, Monin C: Obesity, nutrients and the immune system in the era of COVID-19. *Nutrients* 2021;13:610
6. Pepper DJ, Sun J, Welsh J, et al: Increased body mass index and adjusted mortality in ICU patients with sepsis or septic shock: A systematic review and meta-analysis. *Crit Care* 2016; 20:181

Safety Concerns in Intravascular Cooling for Targeted Temperature Management After Cardiac Arrest

To the Editor:

The network meta-analysis done by Ramadanov et al (1), published in a recent issue of *Critical Care Medicine*, suggests that in patients treated with targeted temperature management at 32–34°C after cardiac arrest, intravascular cooling is the most beneficial cooling method for neurologic outcome and survival, followed by surface cooling with temperature feedback. In their discussion, they noted several adverse events associated with intravascular cooling, including infection, hemorrhage, and catheter-related thrombosis—which can lead to pulmonary embolism (1). We would like to emphasize the importance and frequency of certain complications linked to intravascular cooling that the authors mentioned very briefly (1). Andremonet et al (2) compared thrombotic and infectious complications by matching a cohort of 108 patients with an endovascular cooling catheter with a retrospective historical cohort of 512 patients with femoral venous catheters. The duration of catheterization was 4.2 days in the endovascular cooling group versus 4.9 days in the control group. After propensity score matching, there were significantly more thrombotic complications in the cooling group (12/75, 16%) than in the control group (0/75, 0%), and four patients in the cooling group presented major complications (2). In another study, Maze et al (3) investigated the risk of catheter-related thrombosis associated with the use of endovascular cooling catheters in 61 patients who

Patrick M. Honore, MD, PhD, FCCM¹
 Sydney Blackman, MD²
 Emily Perriens, MD²
 Ibrahim Bousbiat, MD²

Copyright © 2023 by the Society of Critical Care Medicine and Wolters Kluwer Health, Inc. All Rights Reserved.

DOI: 10.1097/CCM.00000000000005867

completed the cooling protocol using intravascular cooling from a cohort of 80 patients initially treated with therapeutic hypothermia. They further evaluated the occurrence rate of thrombosis in patients on a subcutaneous prophylactic regimen compared with those on dose-adjusted IV unfractionated heparin. Catheter-related thrombosis was observed in nine of 61 (14.7%), with nine adverse events in the prophylaxis group compared with none in the full-dose unfractionated heparin group (22.0% vs 0.0%) (3). Jung et al (4) reported a case of catheter-related thrombus in a 17-year-old who suffered from ventricular fibrillation cardiac arrest. After being treated with therapeutic hypothermia using an endovascular cooling catheter, a right atrial thrombus was detected 3 days after the placement of the cooling catheter and resolved after treatment with enoxaparin for 2 weeks. Thrombosis is an important and potentially life-threatening complication of cooling catheter use, and its prevention with therapeutic anticoagulation may incur significant side effects like bleeding.

We strongly believe that the advantage of intravascular cooling should be put in balance with the disadvantage of potentially life-threatening complications related to the use of cooling catheters. Ramadan et al (1) minimize the severity and the high occurrence rate of complications, implications that clinicians should be aware of when faced with the option

to use intravascular cooling for targeted temperature management.

1 *CHU UCL Godinne Namur, UCL Louvain Medical School, Namur, Belgium.*

2 *ICU Brugmann University Hospital, ULB University, Brussels, Belgium.*

Dr. Honore designed the article. All authors participated in drafting and reviewing. All authors read and approved the final version of the article.

Ms. Perriens disclosed work for hire. The remaining authors have disclosed that they do not have any potential conflicts of interest.

REFERENCES

1. Ramadanov N, Arrich J, Klein R, et al: Intravascular versus surface cooling in patients resuscitated from cardiac arrest: A systematic review and network meta-analysis with focus on temperature feedback. *Crit Care Med* 2022; 50:999–1009
2. Andremont O, du Cheyron D, Terzi N, et al: Endovascular cooling versus standard femoral catheters and intravascular complications: A propensity-matched cohort study. *Resuscitation* 2018; 124:1–6
3. Maze R, Le May MR, Froeschl M, et al; CARdiovascular Percutaneous Intervention TriAL (CAPITAL) investigators: Endovascular cooling catheter related thrombosis in patients undergoing therapeutic hypothermia for out of hospital cardiac arrest. *Resuscitation* 2014; 85:1354–1358
4. Jung YH, Lee BK, Lee HY, et al: Early onset of cooling catheter-related right atrial thrombus following cardiac arrest. *Am J Emerg Med* 2013; 31:761.e3–e5