

LETTER

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# Endovascular cooling is superior to surface cooling in terms of effectiveness by improving the neurological prognosis, but what about the safety?

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We read with interest the recent article by Liao et al. who concluded that patients in the endovascular cooling (EC) group had shorter intensive care unit (ICU) hospitalization and a better neurological prognosis than those in the surface cooling (SC) group [1]. In their discussion, they noted several adverse events associated with both techniques including arrhythmia, infection, pneumonia, and bleeding [1]. We would like to speak about a very important and frequent complication linked to EC that the authors neglected to mention. Andreumont et al. matched an endovascular cooling catheter cohort of 108 patients with a retrospective historical cohort of 512 patients with femoral venous catheters to compare thrombotic and infectious complications [2]. The duration of catheterization was 4.9 days in the control group vs. 4.2 days in the endovascular cooling group. After propensity score matching, there were significantly more thrombotic complications in the cooling group (12 of 75, 16%) than in the control group (0 of 75, 0%), and 4 patients presented major complications. In another study, Maze et al. investigated the risk of catheter-related thrombosis associated with the use of endovascular cooling catheters in a cohort of 80 patients initially treated with therapeutic hypothermia (TH) of which 61 completed the cooling protocol using an EC device [3]. They further evaluated the incidence of thrombosis between patients on dose-adjusted intravenous unfractionated heparin compared to those on a subcutaneous prophylactic regimen alone. Catheter-related thrombosis

was observed in 9/61 (14.7%), with nine events in the prophylaxis group compared to none in the full-dose unfractionated heparin group (22.0% vs. 0.0%). Jung et al. [4] reported a case of an endovascular cooling catheter-related right atrial thrombus (RAT) in a 17-year-old boy treated with therapeutic hypothermia using an endovascular cooling catheter following ventricular fibrillation cardiac arrest. The RAT 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.

#### Abbreviations

EC: Endovascular catheter; ICU: Intensive care unit; SC: Surface cooling; TH: Therapeutic hypothermia; RAT: Right atrial thrombus

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#### Authors' contributions

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**Competing interests**

The authors declare to have no competing interests.

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**References**

1. Liao X, Zhou Z, Zhou M, Tang H, Feng M, Kou B, Zhu N, Liao F, Wu L. Effects of endovascular and surface cooling on resuscitation in patients with cardiac arrest and a comparison of effectiveness, stability, and safety: a systematic review and meta-analysis. *Crit Care*. 2020;24(1):27. <https://doi.org/10.1186/s13054-020-2731-z>.
2. Andreumont O, du Cheyron D, Terzi N, Daubin C, Seguin A, Valette X, Lecoq FA, Parienti JJ, Sauneuf B. Endovascular cooling versus standard femoral catheters and intravascular complications: a propensity-matched cohort study. *Resuscitation*. 2018;124:1–6. <https://doi.org/10.1016/j.resuscitation.2017.12.014> Epub 2017 Dec 12.
3. Maze R, Le May MR, Froeschl M, Hazra SK, Wells PS, Osborne C, et al. Endovascular cooling catheter related thrombosis in patients undergoing therapeutic hypothermia for out of hospital cardiac arrest. *Resuscitation*. 2014;85(10):1354–8. <https://doi.org/10.1016/j.resuscitation.2014.05.029> Epub 2014 Jun 27.
4. Jung YH, Lee BK, Lee HY, Jeung KW. Early onset of cooling catheter-related right atrial thrombus following cardiac arrest. *Am J Emerg Med*. 2013;31(4):761.e3–5. <https://doi.org/10.1016/j.ajem.2012.12.014> Epub 2013 Jan 18.

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