

## Letter by Saul and Haemmerich Regarding Article “Comparison of Electrode Cooling Between Internal and Open Irrigation in Radiofrequency Ablation Lesion Depth and Incidence of Thrombus and Steam Pop”

To the Editor:

The article by Yokoyama et al<sup>1</sup> comparing the effects of cooled-tip ablation catheters using either the internal or open irrigation method makes a number of important observations regarding the potential for thrombus and steam pop formation with cooled-tip techniques. However, the study design does not accurately mimic the methodology used in clinical practice. In clinical application of the open irrigation catheter, temperature control is typically used, with a target temperature of 40° to 45°C.<sup>2</sup> Similarly, when using the internally cooled catheter in a clinical setting, power is adjusted to always keep the electrode tip temperature below 40°C.<sup>3,4</sup> It is both recommended by the manufacturer and well known to those who use the system that an electrode temperature above 40°C frequently leads to a pop and/or impedance rise. This observation is nearly identical to the data presented by the authors (their Figure 6b).<sup>1</sup> The constant power methodology used in their study resulted in tip temperatures as high as 60°C for the internally cooled catheter. Only 5 of 63 applications had a tip temperature of less than 40°C, and only 1 of these applications caused thrombus and steam pop. Alternatively, the open irrigation catheter tip temperatures were all below 45°C.

The authors hypothesized in the introduction that “lesion depth would be similar between closed loop and open irrigation electrodes, but the effect of flushing around the electrode . . . would decrease the formation of thrombus during ablation” (p 12). What the authors have demonstrated is that the open irrigation system is a more powerful cooling technique than the closed-loop cooling catheter. Tip electrode and tissue temperatures were lower with the open system than with the closed system (their Figure 6). The increased cooling capacity of open irrigation allows for the safe

application of more power. Had the authors followed the clinical guidelines for the 2 systems, they would have likely found similar rates of thrombus and steam pop, but might have found a larger lesion size with the internally cooled catheter, as more power could be applied. However, the increased cooling would also have carried away more power so that less power would have been delivered to the tissues. Such speculation about lesion size remains speculation in the absence of experiments that more accurately mimic the application methods used clinically.

Yokoyama et al<sup>1</sup> identify important safety issues using cooled-tip ablation technologies, but do not speak directly to the concerns when using these catheters in clinical practice.

## Disclosures

None.

**J. Philip Saul, MD**

**Dieter Haemmerich, PhD**

*Division of Pediatric Cardiology  
Medical University of South Carolina  
Charleston, SC*

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