Sounding the warning on the potential for oesophageal injury resulting from use of the nMARQ™ for ablation of atrial fibrillation

Omair Yousuf and Hugh Calkins*

Johns Hopkins Hospital, Sheikh Zayed Tower 7125R, 1800 Orleans Street, Baltimore, MD 21287-6568, USA

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This editorial refers to ‘Modified energy settings are mandatory to minimize oesophageal injury using the novel multipolar irrigated radiofrequency ablation catheter for pulmonary vein isolation’ by A. Rillig et al., on page 396–402.

Catheter ablation of atrial fibrillation (AF) is now a commonly performed procedure throughout the world.1 Despite the widespread adoption of this procedure, it is well recognized that important limitations exist. These limitations include (i) less that optimal efficacy, especially when long-term success is considered; (ii) long procedure times and the requirement for considerable skill to perform the procedure safely and effectively; and (iii) a significant risk of complications, some of which may be life threatening. One of the most feared and lethal complications of AF ablation is the development of an atrial oesophageal fistula. Although extremely uncommon (<0.1%), the devastating outcomes of this complication have resulted in great respect for this complication by all who perform AF ablation procedures.2 The nMARQ™ (Biosense Webster), a mutielectrode irrigated circular ablation catheter, has recently been developed with the aim of making AF ablation quicker, easier, safer, and as effective, or more effective than ablation strategies using a standard point-by-point approach or cryoballoon ablation.

In this issue of EP-Europace, Rillig et al.3 report the incidence of oesophageal injury with the nMARQ™ ablation catheter using two different ablation strategies. The nMARQ™ catheter is available as a 10 pole (nMARQ™ circular) or 7 pole (nMARQ™ crescent) mapping and irrigated ablation catheter that allows simultaneous ablation from all (or selected) poles to create a circumferential ablation line while mapping the changes in pulmonary vein (PV) potentials to confirm isolation. The nMARQ circular and crescent catheters both have equidistant 4 mm interelectrode spacing and have distinct loop diameters of 20–35 and 20–40 mm, respectively. A total of 21 patients (66% men; 62 ± 9 years) with symptomatic, drug refractory paroxysmal (32%) or persistent (62%) AF underwent PV isolation with radiofrequency (RF) ablation using the nMARQ™ catheter. Over 98% of PVs (83 of 84) were isolated. All patients underwent continuous oesophageal temperature monitoring using a 7Fr oesophageal temperature probe (Sensitherm™; St. Jude Medical) with three thermisters spaced 5 mm apart that can report temperature changes within 0.5 s. The temperature probe was advanced to the level of the left atrium under fluoroscopic guidance at the start of the procedure and its position was repeatedly adjusted during ablation such that the sensors were adjacent to the respective ablation site. Oesophageal temperature was continuously monitored and RF delivery was immediately halted if the oesophageal luminal temperature exceeded 41°C. Further ablation was performed at the same site, if needed, once the temperature returned to baseline. As part of the protocol, endoscopy was performed in all patients 2 days after ablation to screen for oesophageal injury, which was characterized as minimal lesion (erythema with intact mucosa), ulceration, or perforation. When the study started, a standardized protocol was used for energy delivery on the posterior wall which involved delivery of RF for a maximum duration of 60 s using a maximum power of 20 watts (W) for bipolar ablation and 10 W for unipolar ablation. Among the first six patients, oesophageal injury was observed in 50% of the patients; two patients developed minimal lesions and one had ulceration. Because of this high incidence of oesophageal injury, the operators modified their protocol for energy delivery on the posterior wall. They reduced RF delivery and duration to a maximum power of 15 W and 10 W for unipolar and bipolar ablation, respectively, for 30 s. Among the second group of patients, only 1 of 15 (6.7%) patients developed a minimal oesophageal lesion (P = 0.053). Notably, in both groups, ablation was discontinued with a temperature rise above 41°C; however, the maximum oesophageal temperature reached in group 1 was 42.4°C and group 2 was 42.5°C (P = 0.16).

This study that evaluated the safety and efficacy of AF ablation using a novel multipolar irrigated ablation catheter is a welcome addition to the literature. In writing this editorial we are charged with helping to...
interpret the results and significance of this study. At first sight one could argue that this small single-centre non-randomized study of a particular energy delivery paradigm using a new and not as of yet widely used ablation catheter lacks significance or importance. And for those reading this paper through this lens it is difficult to make a strong argument to counter that point of view. We all know that ablation on the posterior wall of the left atrium may result in oesophageal injury. And we also know that energy protocols that result in the largest lesions are more likely to result in oesophageal injury. Higher power has more risk than lower power. Long RF delivery has higher risk than shorter RF delivery. Greater contact force has more risk than less force. And finally, we know that monitoring the oesophageal temperature provides some feedback as to the degree of oesophageal heating and indirectly, the potential for oesophageal damage. Although reduction in power and limiting ablation duration in response to rises in oesophageal temperature may limit oesophageal injury, this also theoretically reduces the efficacy of AF ablation. Finding the perfect balance will ultimately provide the holy grail of settings for RF delivery in the posterior left atrium.

Despite these many limitations, it is our opinion that this paper is an important contribution to the literature. It is important for several reasons. First, these authors (and enrolled patients) went to great effort to utilize two standardized energy delivery protocols for AF ablation using a newly available ablation catheter. And more impressive yet, they performed screening endoscopy in each patient. Second, this paper defined one unsafe energy delivery protocol. Clearly no one who reads this paper should employ protocol 1 on a routine basis. Protocol 2 seems far superior. And there are limitless other energy delivery and oesophageal temperature monitoring protocols that may be safe and effective. In our opinion, an oesophageal temperature cut-off of 41°C is too high. We routinely stop RF energy delivery (using standard point by point RF ablation catheters) when the oesophageal temperature starts to progressively rise by 0.1°C or more. The ongoing challenge for any study focused on oesophageal injury and methods to avoid it, is that the most feared complication of oesophageal perforation or fistula formation is vanishingly rare (<0.1%) and as a result there never will be an adequately powered study to define what is the best energy delivery and oesophageal monitoring protocol to avoid this devastating complication.

At the end of the day, we applaud Rillig et al. for conducting this important study and adding their experience with the nMARQ™ ablation catheter to the very limited experience thus far reported, for example in EP-Europace.3,4

Conflict of interest: none declared.

References