

Is ablation using high power short duration always suitable?



Marc Kottmaier, MD, Isabel Deisenhofer, MD

From the German Heart Center Munich, Munich, Germany.

Golian and colleagues¹ present an interesting investigation of high-power short-duration (HPSD) application for the ablation of the cavotricuspid isthmus (CTI) in typical atrial flutter. The investigators could demonstrate that HPSD ablation leads to a significant reduction in radiofrequency (RF) time and to a lower requirement of opiate analgesia, a result on which we congratulate the authors.

For the last couple of years HPSD ablation has gained growing interest. Early *ex vivo* data could demonstrate that HPSD leads to a beneficial shift from conductive to resistive heating, resulting in larger but shallower lesions. Through this changed lesion geometry, better lesion-to-lesion contiguity (through larger diameter) and sparing of surrounding structures (through less deep lesions) are achieved. Still, transmural ablation in atrial tissue with a mean of 1.5–2 mm wall thickness is attained, achieving effective pulmonary vein isolation.²

However, this lesion depth may be insufficient in structures with thicker myocardial tissue.

Thus, the question arises if the CTI really is a suitable region for HPSD ablation. Cabrera and colleagues³ demonstrated in 30 postmortem specimens that the pretricuspid, anterior region of the CTI showed a mean wall thickness of 3.5–4.3 mm, even at the central isthmus. Bourier and colleagues⁴ could demonstrate that lesions with 50 watts applied for 13 seconds and 15–20g of contact force resulted in a mean lesion depth of 4.7 ± 0.6 mm. Since Golian and colleagues¹ applied 50 watts for 9 seconds (an approximately 30% reduction in RF time), it can be speculated that the applied lesions were maybe of insufficient depth. The short- or mid-term outcome in these patients was not different and may be due to the high success rates in terms of recurrence-free survival in typical atrial flutter patients, irrespective of power settings, and due to the rather low case numbers.

The mitral isthmus shows roughly a similar myocardial thickness compared to the CTI. Yavin and colleagues⁵ could demonstrate that using HPSD ablation with 50 watts for the ablation of the mitral isthmus only led to successful mitral isthmus block in 43% of patients, whereas a block could be

achieved in 70% of the control group using standard power settings. The results support the assumption that for thicker myocardial structures the application of lower power for longer duration may be more effective, since it achieves deeper and therefore more sufficient lesions—although there might be more edema and the definitive lesion might be 20% smaller than the acute.

A very important finding of the study by Golian and colleagues¹ is the number of steam pops that were present after 10 seconds of HPSD ablation, leading to a reduction of RF time to 9 seconds by the authors. Yavin and colleagues⁵ demonstrate that 10 to even 15 seconds applications time using 50 watts for pulmonary vein isolation was not associated with a high number of steam pops. Again, the anatomical architecture of the CTI may be the reason for this finding, pointing again to the fact that the CTI is not an ideal substrate to use HPSD. Above-mentioned analysis by Cabrera and colleagues³ could demonstrate that besides anatomical variations of the CTI, pouches or pouch-like regions occur even in the central isthmus. In those pouches the amount of ablation catheter tip that is covered by tissue can be significantly higher compared to, for example, the posterior wall of the left atrium. This different tissue–tip relation may result in different conductive (from the blood pool) and irrigative (from the irrigated catheter) cooling and therefore higher local temperatures or a steeper local temperature increase. Furthermore, owing to a larger contact area between tissue and catheter tip, more RF current and thermal energy is transferred into the tissue and less diverted by the blood pool, providing a possible explanation for the higher occurrence of steam pops in pouches or pouch-like regions.

To us, one of the most interesting aspects of the presented study was the impact of electroanatomical mapping on the procedure. Even if the ablation of the CTI sometimes is considered a rather simple procedure, anatomical variances with enlarged inferior isthmus and pouch-like recesses can lead to longer procedure times. Especially, in those cases, electroanatomical mapping can help to identify the “shorter” central isthmus and, if necessary, identify gaps, leading to a faster procedure.

Address reprint requests and correspondence: Dr Marc Kottmaier, German Heart Center Munich, Lazarettstr. 36, 80636 München, Germany. E-mail address: kottmaier@dhm.mhn.de.

Funding Sources

The authors have no funding sources to disclose.

Disclosures

The authors have no conflicts of interest relevant to this study.

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