

Editorial



Esophageal Endoscopy after High-power and Short-duration Ablation in Atrial Fibrillation Patients

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► See the article “Esophageal Thermal Injury after Catheter Ablation for Atrial Fibrillation with High-Power (50 Watts) Radiofrequency Energy” in volume 51 on page 143.

Atrial fibrillation (AF) remains the most common arrhythmia in clinical practice worldwide,¹ and the management of known risk factors is an important component of AF management.² Also, radiofrequency catheter ablation (RFCA) has been proven as an effective therapeutic method for AF and is being performed exponentially. However, procedure-related complications still cannot be ignored and esophageal thermal injury (ETI) is one of the most serious complications. Although the precise mechanism of ETI is not completely understood, potential mechanisms of ETI include direct thermal injury, acid reflux exacerbated or caused by RFCA, infection from the lumen, and ischemic injury through thermal occlusion of end arterioles.³

The use of general anesthesia, energy application duration, energy setting (temperature and power), and ablation over the posterior wall of the left atrium (LA) are associated with the development of ETI. The main mechanism of ETI is related to the time-dependent heating of the esophagus. Therefore, long ablation duration with enhanced catheter contact and stability, resulting in more deep lesion formation, is closely related to ETI. With advancements in ablation technology including the use of contact force (CF) sensing ablation catheter, ablation method on LA posterior wall without exceeding CF of 20 g may offer improvement in preventing ETI. However, ETI still is being reported and the safety and efficacy of procedural techniques for minimizing ETI remain undefined.

With understanding of RFCA biophysics, there is a trend toward higher maximal power energy setting in AF ablation. Theoretically, high-power and short-duration (HPSD) ablation may produce improved linear continuity and lesion-to-lesion uniformity by increasing the resistive heating area compared to conventional RFCA (energy application during >20 seconds with 25W–30W). Furthermore, it may avoid injury to neighboring structures by limiting the conductive heating area through a shorter energy application time, resulted in decreasing lesion depth and limiting collateral tissue damage.^{4,5} In this regard, previous observational studies have demonstrated the efficacy and safety of HPSD ablation.⁴⁻⁷ Also, one prospective randomized controlled trial demonstrated that HPSD ablation was a safe and effective strategy with reduced ablation number and shortened procedure time compared to conventional ablation.⁶ Nevertheless, most clinicians still have not yet applied HPSD because of complication concerns.

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In a recent article in the *Korean Circulation Journal*, Do et al.⁸⁾ evaluated the incidence and characteristics of ETI in 196 patients underwent HPSD ablation (RF energy setting: 50W for 5 seconds or 50W for 10 seconds at anterior and 6 seconds at posterior). Their results showed that only 4 (2.5%) patients had ETI including erythematous erosion or superficial ulcer of the esophagus and 25 (15.7%) patients had gastric hypo-motility. There were no fatal complications including atri-esophageal fistula. Therefore, they suggested that HPSD ablation was a safe ablation strategy with very low incidence of ETI. However, contrary to this study, Kaneshiro et al.⁹⁾ reported that HPSD ablation was a strong predictor of esophageal mucosal injury and peri-esophageal nerve damage. Therefore, we cannot conclude the safety aspect of HPSD ablation because both studies were a single arm research.

The main limitation of this study is that they didn't assess the quality of ablation lesion. We don't know whether or not the characteristics of each ablation lesion were associated with ETI because they only described the energy application duration and power. Therefore, a further analysis with ablation lesion quality such as ablation index or force-time-power integral should be necessary because the lesion size or depth is determined by ablation lesion quality.¹⁰⁾ Another weak point is that they didn't describe ablation protocol in the right atrium, specifically. Wall thickness, surrounding structures, and anatomical variation should be considered for energy setting. Usually, high power may not be safe for the isolation of superior vena cava, because of thin and sparse muscular sleeve and close proximity of phrenic nerve. On the other hand, long duration ablation with an intermediate power (40W) for deeper lesion formation may be needed to create complete bidirectional block on cavotricuspid isthmus (CTI) because of thick and abundant muscles in CTI area. Finally, it is unclear whether ETI was caused by ablation procedure itself because all of patients with ETI in this study were asymptomatic.

Most clinicians strongly believe that CF, lesion duration, catheter tip size, energy power, and irrigation flow rate should be optimized for the safety of LA posterior wall ablation. Furthermore, the improvement in monitoring lesion size and depth will be required to help limit ETI.

REFERENCES

1. Joung B, Lee JM, Lee KH, et al. 2018 Korean Guideline of atrial fibrillation management. *Korean Circ J* 2018;48:1033-80.
[PUBMED](#) | [CROSSREF](#)
2. Joung B. Risk factor management for atrial fibrillation. *Korean Circ J* 2019;49:794-807.
[PUBMED](#) | [CROSSREF](#)
3. Kapur S, Barbhuiya C, Deneke T, Michaud GF. Esophageal injury and atri-esophageal fistula caused by ablation for atrial fibrillation. *Circulation* 2017;136:1247-55.
[PUBMED](#) | [CROSSREF](#)
4. Barkagan M, Contreras-Valdes FM, Leshem E, Buxton AE, Nakagawa H, Anter E. High-power and short-duration ablation for pulmonary vein isolation: Safety, efficacy, and long-term durability. *J Cardiovasc Electrophysiol* 2018;29:1287-96.
[PUBMED](#) | [CROSSREF](#)
5. Reddy VY, Grimaldi M, De Potter T, et al. Pulmonary vein isolation with very high power, short duration, temperature-controlled lesions: the QDOT-FAST trial. *JACC Clin Electrophysiol* 2019;5:778-86.
[PUBMED](#) | [CROSSREF](#)
6. Shin DG, Ahn J, Han SJ, Lim HE. Efficacy of high-power and short-duration ablation in patients with atrial fibrillation: a prospective randomized controlled trial. *Europace* 2020;22:1495-501.
[PUBMED](#) | [CROSSREF](#)

7. Bunch TJ, May HT, Bair TL, et al. Long-term outcomes after low power, slower movement versus high power, faster movement irrigated-tip catheter ablation for atrial fibrillation. *Heart Rhythm* 2020;17:184-9.
[PUBMED](#) | [CROSSREF](#)
8. Do U, Kim J, Kim M, et al. Esophageal thermal injury after catheter ablation for atrial fibrillation with high-power (50 Watts) radiofrequency energy. *Korean Circ J* 2021;51:143-53.
[CROSSREF](#)
9. Kaneshiro T, Kamioka M, Hijioka N, et al. Characteristics of esophageal injury in ablation of atrial fibrillation using a high-power short-duration setting. *Circ Arrhythm Electrophysiol* 2020;13:e008602.
[PUBMED](#) | [CROSSREF](#)
10. Calzolari V, De Mattia L, Indiani S, et al. In vitro validation of the lesion size index to predict lesion width and depth after irrigated radiofrequency ablation in a porcine model. *JACC Clin Electrophysiol* 2017;3:1126-35.
[PUBMED](#) | [CROSSREF](#)