Undernutrition and Increased Risk of Recurrence After Catheter Ablation for Atrial Fibrillation

— A Glance at the End of a Frontier —

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Catheter ablation (CA) is a well-established treatment for atrial fibrillation (AF) that has become increasingly performed in older patients as the safety and efficacy improve. In 2011, the mean age of patients who underwent CA for AF was 62 years,¹ and in 2018, it was 66 years.² The evidence that CA improves the prognosis of patients with heart failure (HF) with reduced ejection fraction and AF, compared with drug therapy, might have contributed to this change.^{3,4} Moreover, the superiority of

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rhythm control for early AF over rate control has been demonstrated in terms of improving prognosis.⁵ In addition, a lower incidence of overall dementia among those with AF who undergo CA, compared with medical therapy, has been reported.⁶ Until recently, the aim of CA for AF was considered to be mainly improving quality of life for rela-

Figure. Relationship between nutritional status and (1) risk of atrial fibrillation (AF), (2) risk of new-onset AF, and (3) efficacy of catheter ablation (CA). Red line indicates risk of new onset of AF. EAT, epicardial adipose tissue; TE, thromboembolism; vent., ventricular.

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tively young and healthy patients; therefore, the application of CA in patients with AF who are old and frail has been a frontier for further advancement. Today, CA has been expanding its indication to the elderly and patients with HF, successfully.

There are various factors that influence a patient's general condition, such as age, cardiac function, and renal function. Nutritional status is one of the most important factors. The Geriatric Nutritional Risk Index (GNRI)⁷ and the Controlling Nutritional Status (CONUT) score⁸ are used to evaluate undernutrition; these scores have also been reported to correlate with the prognosis of patients with HF.⁹

In this issue of the Journal, Furui et al¹⁰ report a correlation between undernutrition as indicated by these nutritional scoring systems and recurrence of AF following CA: GNRI <98 was an independent determinant of AF recurrence, and CONUT ≥ 2 was independently associated with AF recurrence among patients not receiving lipid-lowering therapy. A CONUT score of 2–3 was deemed mild undernutrition. In this study, a CONUT score of 2 accounted for 99% of patients with undernutrition, and patients with cachexia were not included in this population. Therefore, this study clearly indicates that even subclinical, mild undernutrition is significantly associated with reduced efficacy of CA. This valuable report suggests subclinical undernutrition may diminish the efficacy of CA, and raises some uncertainty about its growing application among the elderly and patients with infirmity.

Undernutrition has 3 categories: starvation-related, chronic disease-related, and acute disease or injury-related.¹¹ Undernutrition of the patients who underwent CA for AF in this study can be classified as having chronic, disease-related undernutrition. Moreover, undernutrition, in this case, corresponded to chronic disease and/or relatively poor general health condition. Considering the projected increase in the number of elderly patients with AF as the population ages in developed countries, there will be more cases where uncertainty haunts the clinical decision about whether this invasive and expensive treatment may benefit elderly patients with comorbidities or varying levels of frailty. Evaluation of nutritional status based on these scores will inform the treatment strategy for patients with AF, in terms of improving effectiveness.

Obesity and overnutrition, on the other hand, also promote AF through atrial remodeling. This occurs due to ventricular adaptation to obesity, epicardial adipose tissue, and comorbidities related to obesity such as hypertension, diabetes, coronary artery disease, HF, and obstructive sleep apnea.¹² It has been reported that AF complicated with overnutrition has a more favorable prognosis than AF not otherwise complicated by overnutrition, and that weight reduction can improve prognosis and ablation outcomes.¹³ The prognosis of AF is poorer among underweight patients than among normal-weight patients, in contrast to persons with AF who also have overnutrition. Being underweight has also been shown to be a risk factor for thromboembolism among patients with AF.¹⁴

Possible mechanisms exist whereby undernutrition may precipitate the onset of AF, reduce the efficacy of CA, and increase the risk thromboembolism. Undernutrition and its comorbidities, such as advanced age, female sex, HF, chronic kidney disease, and so on, portend both the onset of AF and poor outcomes following CA. Another possible mechanism is that undernutrition itself may contribute to the development of arrhythmogenic substrates in the

atria.¹³ It induces a catabolic state, in which there is sympathetic nerve activation and systemic chronic inflammation. This condition occurs due to the presence of elevated tumor necrosis factor- α , lipolysis, and ketogenesis, and increased oxidant stress from a reduction of antioxidants, as a result of amino acid and vitamin deficiency. These changes can cause a disorder in the membrane of the myocardial cells.

Such is the U-shaped relationship between nutritional status and the risk of developing AF. However, because the mechanism of onset and progression of AF is different, the response to CA may differ between overnutrition and undernutrition (**Figure**).

The JCS/JHRS 2019 guideline on nonpharmacologic management for cardiac arrhythmia recommends determining the indication for ablation with particular consideration to age, symptoms, and stage of AF.¹⁵ Although the reports from Furui focuses on nutritional status, other factors pertaining to the patient's general condition, such as cognitive function and intelligence, activity, muscle strength/mass, comorbidities, and organ-specific functional reserve, can be evaluated to identify the patients who would most benefit from CA. The time course of nutrition following the onset of AF is also important because undernutrition may be caused or exacerbated by inactivity and/or depression due to AF symptoms and/or HF. Patients whose AF assumed to contribute to undernutrition should be considered as candidates for ablation, even if ablation is projected to be consequently less effective as a result of nutritional status. As the number of patients with AF increases worldwide, especially among the elderly, analysis of general condition from various aspects and cost-benefit analysis for ablation for each patient with AF, will become more important. Further studies are required to obtain additional insights into the indications for this procedure.

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IRB Information

None.

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