

# Abstracts of the 2012th Alumni Association Memorial Lectures of the 81st Annual Meeting of the Medical Association of Nippon Medical School

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## Abstracts of the 2012th Alumni Association Medical Research Fund Prize Memorial Lecture (1)

### What Is an Adequate Esophageal Preset Temperature for Sufficient Ablation Lesion Formation While Avoiding Digestive-organ Complications during Catheter Ablation of Atrial Fibrillation?

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Atrial fibrillation (AF) is an arrhythmia, which is frequently seen in elderly persons. At present, more than 800,000 individuals are considered to suffer from AF. During AF, loss of the normal atrial contraction due to rapid fibrillatory electrical activity provokes several disadvantages: 1) palpitations and dyspnea, 2) tachycardia induced cardiomyopathy, and 3) thromboembolisms caused by thrombus formation in the left atrium. Anti-arrhythmic drugs have been the first-line therapy for AF, but they cannot suppress the arrhythmias completely, and increase the risk of provoking more serious ventricular arrhythmias, which is called a proarrhythmic effect.

During the last decade, radiofrequency catheter ablation for a radical cure of AF has evolved, and many patients undergoing the procedure have become free from the uncomfortable AF symptoms, fear of developing cerebral infarctions, and lifelong medical therapy including anticoagulants which sometimes cause life-threatening cerebral hemorrhages. The essence of AF ablation is to create conduction block between the left atrium and pulmonary veins (PVs), which are the main sources of premature ectopic beats triggering AF, by circumferential radiofrequency energy deliveries at the ostium of each PV. The efficacy of PV isolation is satisfactory: sinus rhythm is maintained after the procedure in more than 85% of the patients with paroxysmal AF, but there is also the possibility of serious side effects.

Esophageal damage caused by thermal injury to the esophagus can occur in 1% to 40% of the patients after catheter ablation of AF. This complication varies from a self-healing esophageal erosion to a fatal esophageal fistula. Monitoring the luminal esophageal temperature (ET) and interrupting the energy deliveries at preset temperatures are reported to decrease the potential esophageal damage, however, the influence of such premature termination on the ablation lesion formation remains unknown. We sought to determine the adequate preset ET to create sufficient lesions for PV isolation while avoiding digestive-organ complications.

We started the following clinical study, which was supported by the 2012th Alumni Association Medical Research Fund. In the first phase of the study, we prospectively enrolled 100 consecutive patients (63±11yrs), in

whom the ET reached the preset temperature at left atrial posterior sites during the left PV isolation. The patients were equally divided into four groups according to the preset ETs (41°C, 40°C, 39.5°C, and 39°C groups). A 40 sec point-to-point energy delivery with a 5-mm distance between each ablation site was performed. If the ET, monitored with a 7Fr triple-thermocouple probe (SensiTherm, FIAB-St. Jude Medical, Florence, Italy), reached the preset temperature, the energy application was immediately stopped and the precise location of the site (ET-site) was recorded on an electroanatomical mapping system (EnSite NavX, St. Jude Medical, MN, USA). An energy delivery at the ET-site was repeated if circumferential energy applications could not achieve PVI. The rate of repeat energy deliveries at ET-sites for a PV isolation and incidence of digestive organ complications were evaluated.

As a result, a total of 407 ET-sites were observed (4.1±2.6 sites/patient). The number of ET-sites did not differ among the four groups (P=0.10). Repeat energy applications at ET-sites were required to achieve PV isolation in 0 (0%), 2 (8%), 4 (16%), and 8 (32%) patients in the 41°C, 40°C, 39.5°C, and 39°C groups, respectively, and were significantly more frequent in the lower preset ET group (P<0.001). Periesophageal vagal nerve injury developed after the session in two 41°C group patients (8%). These results indicated that during circumferential left PV isolation for AF, lower preset ETs were safe, but more frequently required a repeat ablation at sites where the energy delivery was interrupted for an ET elevation, and a 39.5°C preset ET was shown to be adequate. The study results were partially presented in the annual scientific congress of the American Heart Association<sup>1</sup>.

Now, we are further examining the validity of the 39.5°C preset ET in additional AF patients. The study will continue until another 200 patients undergo catheter ablation with that preset ET. We believe that the results of this study will contribute to the development of a more safe and effective method of AF ablation.

### References

1. Hayashi M, Miyauchi Y, Iwasaki Y, et al: Adequate esophageal preset temperature for sufficient ablation lesion formation while avoiding digestive-organ complications during catheter pulmonary vein isolation. *Circulation* 2013; 128: A14295.