

## Response to “Ischemic Stroke Patients with Non-Valvular Atrial Fibrillation have a Risk for Aortogenic Embolizations”

Masayuki Suzuki<sup>1</sup>, Shigeru Fujimoto<sup>1</sup> and Ryota Tanaka<sup>1,2</sup>

<sup>1</sup>Division of Neurology, Department of Medicine, Jichi Medical University, Tochigi, Japan

<sup>2</sup>Stroke Center, Jichi Medical University Hospital, Tochigi, Japan

We thank Drs. Kojima, Fukamachi, and Okumura<sup>1)</sup> for their interest in our recent study demonstrating the prevalence of complex aortic arch plaques (CAPs) in acute ischemic stroke patients with non-valvular atrial fibrillation (NVAf) and its risk factors<sup>2)</sup>. Aortic arch atherosclerosis, particularly CAPs, is an important cause of embolic stroke. While NVAf is a major risk factor for cardiogenic embolism, CAPs and NVAf often simultaneously co-exist. However, up to now little has been known about the prevalence of CAPs in acute ischemic stroke patients with NVAf. Our latest study demonstrated that 38.7% of these patients had co-existing CAPs, thus indicating that physicians should consider the possibility of an additional embolic source in such patients, especially in elderly cases with NVAf, or those with comorbidities of diabetes and lower HDL-C levels.

Transesophageal echocardiography (TEE) is the gold standard for evaluating the embolic sources in cryptogenic stroke. Atherosclerotic changes are potential risk factor for embolic stroke, especially the presence of aortic arch plaque  $\geq 4$ mm, ulcerative plaque, and mobile components, are independently associated with the risk for developing embolic stroke<sup>3)</sup>. Kojima *et al.* reported an interesting case of stroke in which potential embolic sources were detected by non-obstructive general angioscopy (NOGA), however, they could not be identified by TEE. In this report, the vulnerable aortic plaques were mainly scattered throughout the distal ascending aorta, which happens to be a region where it is difficult to identify lesions by TEE<sup>4)</sup>. TEE is also not suitable for severely disabled patients, or for those who are not able to follow the orders, and also those that are at higher risk for infection. In this regard, NOGA could be an alternative to TEE for the evaluation of

aortic atherosclerosis which is a potential cause of cerebral emboli. However, there are several issues that still require further evaluation regarding the feasibility of NOGA when trying to identify embolic sources. For example, the size or character of the plaques evaluated by TEE (aortic arch plaque  $\geq 4$ mm, ulcerative plaque, and mobile components) are important and independent risk factors for embolic stroke, however, no criteria have yet been established for the characteristics of aortic atherosclerosis detected by NOGA, especially regarding whether such findings could be an independent risk for stroke. In addition, stroke neurologists usually perform TEE to evaluate not only CAPs, but also valvular disease, intracardiac thrombus, and patent foramen ovale (PFO) which are other potential embolic sources.

Other cardiovascular images such as CT angiography (CTA) or cardiovascular MRI are also useful for detecting embolic sources including aortic atherosclerosis<sup>5, 6)</sup>. CTA is useful for detecting plaque locations, size, and calcification, but it is inappropriate for patients with kidney dysfunction. MRI is useful for evaluating the characteristics of plaque, such as the presence of a necrotic core or intraplaque hemorrhage, but MRI can either overestimate or underestimate the actual plaque size<sup>7)</sup>. It is therefore necessary to select the most appropriate vascular imaging test according to each patient's condition.

Aortic atherosclerosis is an important target for the prevention of cerebral emboli. We need more data before we can determine the optimal methodology for evaluating the embolic sources and thus be able detect the higher risk plaques responsible for recurrent cerebral emboli. These are important factors for improving the prevention strategies for the secondary prevention of ischemic stroke.

Address for correspondence: Ryota Tanaka, Stroke Center, Jichi Medical University Hospital, and Division of Neurology, Department of Medicine, Jichi Medical University, 3311-1, Yakushiji, Shimotsuke city, Tochigi, 329-0498, Japan E-mail: [rtanaka@jichi.ac.jp](mailto:rtanaka@jichi.ac.jp)

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## Conflicts of Interests

The authors declare no conflicts of interests.

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