

[PICTURES IN CLINICAL MEDICINE]

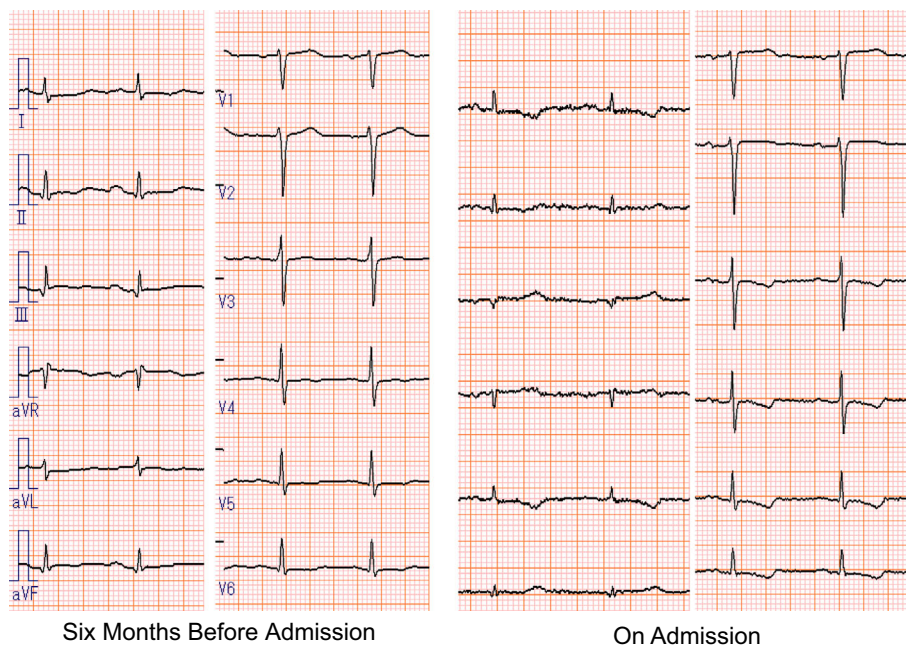
Novel Imaging of Hypoglycemia-induced Myocardial Abnormality by Cardiac Magnetic Resonance T1-mapping

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Key words: hypoglycemia, myocardial metabolism, T1-mapping, cardiac magnetic resonance imaging

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Picture 1.

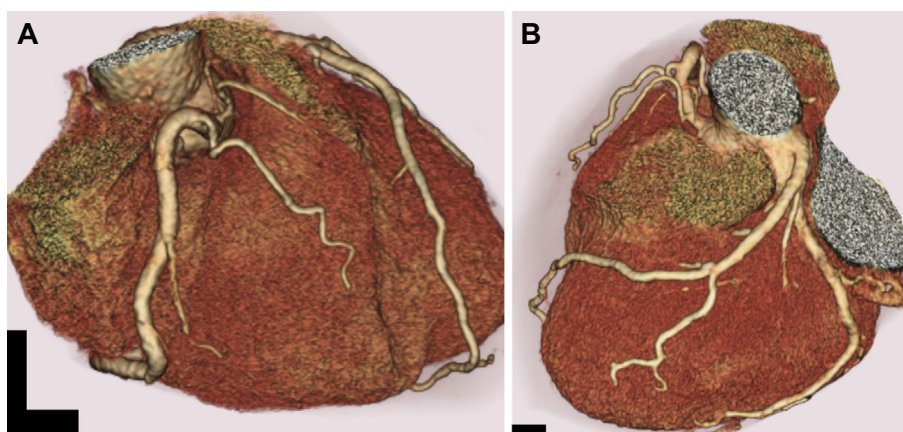
A 66-year-old man was admitted to our department because of chest discomfort. He had a history of anti-insulin-antibody-positive type 2 diabetes and had required insulin for 20 years. Electrocardiography showed new ST-wave depression and T-wave inversion in the left precordial leads (Picture 1). Echocardiography showed normal left ventricular wall motion with no valvular abnormalities. His plasma glucose level was 59 mg/dL, and cardiac-troponin-I was 0.21 ng/mL. Multi-detector row computed tomography coronary angiography revealed non-obstructive coronary artery disease (Picture 2). One month later, to determine the effect of hypoglycemia on myocardium, we performed cardiac

magnetic resonance including T1-mapping, which provides superior detection of diffuse myocardial changes (1). Using the glucose clamp technique, his glucose was controlled to 70 mg/dL for 3 h. Based on modified Look-Locker sequences, the native T1-mapping was diffusely prolonged during hypoglycemia ($1,121 \pm 51$ ms) and normalized (983 ± 47 ms; $p < 0.01$) after recovery to normoglycemia (124 mg/dL glucose) (Picture 3). Treatment-related hypoglycemia increases the risk of adverse cardiovascular events. Multiple mechanisms, such as sympathoadrenal system activation, endothelial dysfunction, inflammation, and blood coagulation abnormalities in hypoglycemia, may affect cardiovascular

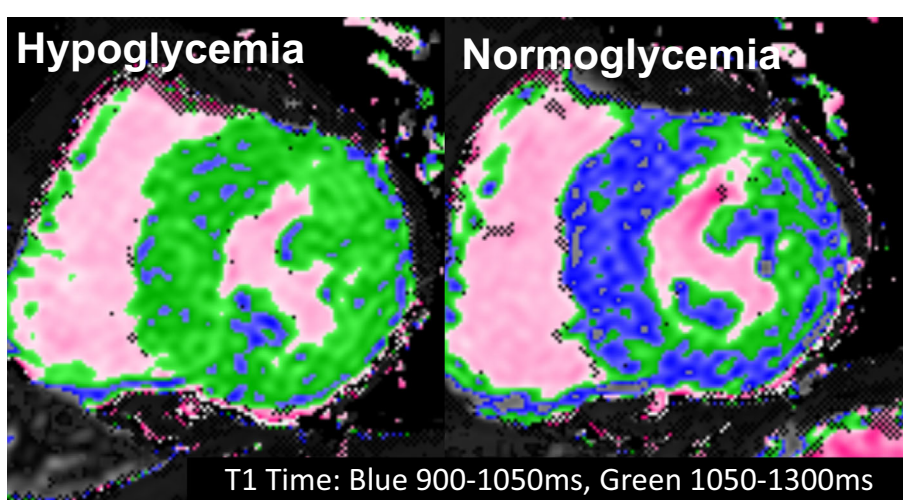
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Picture 2.



Picture 3.

events (2). In the diabetic heart, energy substrate selection is complex. Insulin stimulates a metabolic switch from the predominant use of fatty acid to glucose (3), and a deficient source of fuel might transiently induce myocardial pathological changes by hypoglycemia-triggered mechanisms (4), but conventional imaging and biochemical examinations cannot detect these hypoglycemia-derived myocardial changes. We quantitatively identified for the first time a hypoglycemia-induced abnormal condition in the left ventricular myocardium using T1-mapping imaging.

The authors state that they have no Conflict of Interest (COI).

References

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