JACC: CASE REPORTS VOL. 29, 2024

HEART FAILURE

IMAGING VIGNETTE: CLINICAL VIGNETTE

Multimodality Imaging of Fabry Disease Cardiomyopathy Complicated With Coronary Vasospasm

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ABSTRACT

A 41-year-old man with resting angina was diagnosed with a coronary vasospasm and subsequently with Fabry disease exhibiting low serum α-galactosidase A activity. High computed tomography (CT)–derived extracellular volume was detected in the apical inferior wall of the left ventricle suggesting myocardial fibrosis, potentially from vasospasm-related ischemia and/or microvascular dysfunction. (J Am Coll Cardiol Case Rep 2024;29:102257) © 2024 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

Fabry disease is an X-linked lysosomal storage disorder caused by a hereditary deficiency in α-galactosidase A activity, leading to intracellular accumulation of globotriaosylceramide (Gb3).[1] Cardiac involvement in Fabry disease is based on the accumulation of Gb3 in various cardiac cells, leading to progressive left ventricular (LV) hypertrophy, myocardial ischemia, and conduction disturbances.[1] Additionally, Gb3 accumulation triggers functional impairment in myocytes, leading to myocardial inflammation and fibrosis.[1] Myocardial ischemia in Fabry disease is characterized by altered function of endothelial and smooth muscle cells due to Gb3 accumulation. Kitani et al[2] reported an unexpectedly high prevalence (89%, 8 of 9 cases) of epicardial vasospasm in patients with Fabry disease.

A 41-year-old man presented to the emergency department with resting angina. Echocardiography revealed severe LV hypertrophy without wall motion abnormalities (**Figure 1A**). The high-sensitivity troponin I level was 32 ng/L. Coronary computed tomography angiography revealed no significant stenosis. The mean coronary computed tomography angiography–derived extracellular volume (ECV) value was 36%, with regionally high values at the apical inferior segments, which suggested the presence of myocardial fibrosis (**Figure 1B**). Cardiac magnetic resonance images showed no late gadolinium enhancement (LGE) (**Figure 1C**). Invasive coronary angiography revealed no significant stenosis. The spasm provocation test showed positivity of the left coronary artery at 100 μg acetylcholine administration (Videos 1 and 2) and 50 μg administration for the right coronary artery (RCA) (Videos 3 and 4). Physiological assessment of the left anterior descending artery revealed that the fractional flow reserve, coronary flow reserve, and index of microcirculatory resistance were 0.88, 2.30, and 19.98, respectively. The fractional flow reserve, coronary flow reserve, and index of microcirculatory resistance of the RCA were 0.97, 1.86, and 32.55, respectively, suggesting a regional microvascular dysfunction in the RCA territory. Right ventricular septum biopsy showed diffuse vacuolar degeneration and fiber disarray

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The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the Author Center.

Manuscript received November 5, 2023; revised manuscript received December 29, 2023, accepted January 23, 2024.

ISSN 2666-0849 https://doi.org/10.1016/j.jaccas.2024.102257

ABBREVIATIONS AND ACRONYMS

ECV = extracellular volume

Gb3 = globotriaosylceramide

LGE = late gadolinium enhancement

LV = left ventricle

RCA = right coronary artery

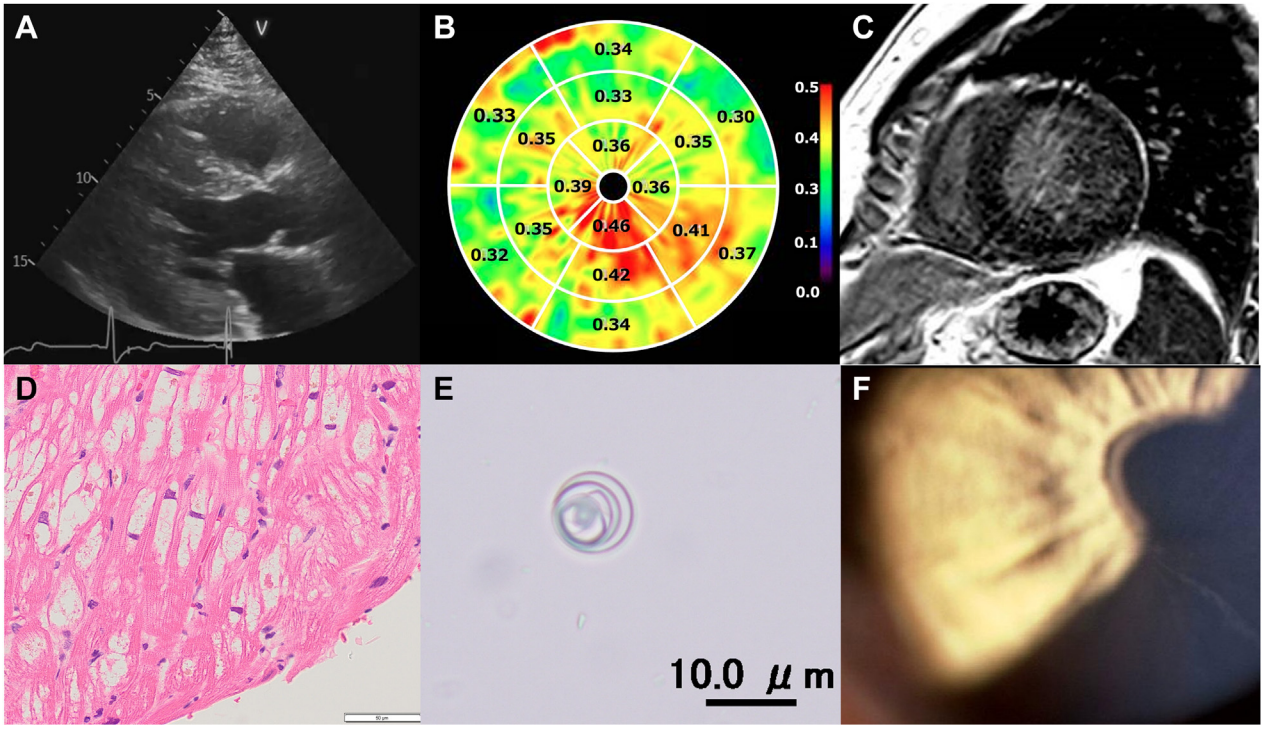
(Figure 1D). Urinary examination revealed Mulberry bodies (Figure 1E). Additional findings included bilateral whorled corneal opacities (Figure 1F). Enzyme activity analysis indicated α-galactosidase A levels below 0.3 nmol/mg protein/h (normal range: 49.8 to 116.4 nmol/mg protein/h), confirming Fabry disease diagnosis.

Fabry disease typically exhibits normal cardiac magnetic resonance-derived ECV values due to intracellular lysosome storage, unlike cardiac amyloidosis, which shows diffusely elevated ECV values from widespread extracellular amyloid infiltration.[3] LGE in Fabry disease usually appears in the basal inferolateral wall, indicating Gb3 storage and myocardial fibrosis.[1] In this case, the LV apical inferior segment displayed elevated ECV without LGE, hinting at an ischemic rather than myopathic cause. The unusual ECV elevation might relate to concurrent coronary vasospasm or microvascular issues. The higher ECV localization aligns with microvascular dysfunction in the RCA territory. This case highlights the usefulness of noninvasive computed tomography of the ECV in exploring associated ischemic factors in Fabry disease.

FUNDING SUPPORT AND AUTHOR DISCLOSURES

The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

FIGURE 1 Multimodality Imaging and Pathological Findings of the Patient With Fabry Disease



(A) Echocardiography shows severe left ventricular hypertrophy. (B) Computed tomography shows high extracellular volume, especially in the left ventricular apical inferior segment. (C) Cardiac magnetic resonance image shows no late gadolinium enhancement. (D) Diffuse vacuolar degeneration and fiber disarray is shown in right ventricular septal specimens. (E) Urinary Mulberry bodies. (F) Bilateral whorled corneal opacities.

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KEY WORDS cardiomyopathy, computed tomography, coronary vasospasm, extracellular volume, Fabry disease

APPENDIX For supplemental videos, please see the online version of this paper.