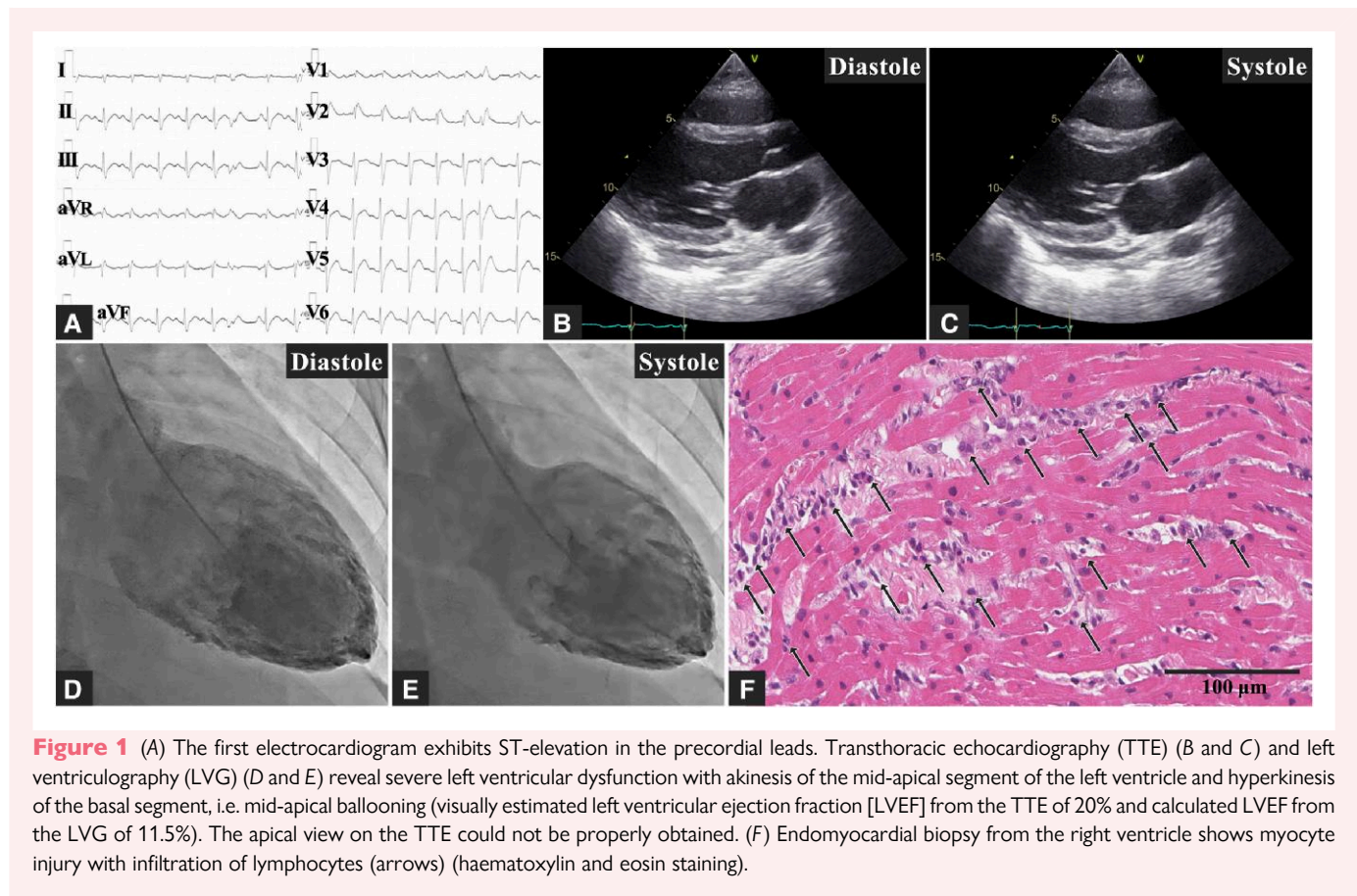


# Endomyocardial biopsy-proven fulminant lymphocytic myocarditis presenting with mid-apical ballooning

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## Case description

A 19-year-old man with an unremarkable medical history was admitted to our hospital with severe cardiogenic shock (CS). He had received three coronavirus disease 2019 (COVID-19) vaccinations more than a month prior, and COVID-19 antigen and PCR tests were repeatedly negative. The electrocardiogram exhibited ST-elevation in the precordial leads (Figure 1A). Transthoracic echocardiography (TTE) and left ventriculography (LVG) revealed severe left ventricular (LV) dysfunction with akinesis of the mid-apical segment of the LV, in contrast to hyperkinesis of the basal segment (Figure 1B–E; see [Supplementary material online, Videos S1–S3](#)). Coronary angiography revealed normal coronary arteries. Takotsubo syndrome (TS) was considered as a differential diagnosis because of the wall motion abnormalities characterized by 'mid-apical ballooning'. However, fulminant myocarditis was suspected because he had flu-like symptoms for 5 days. An endomyocardial biopsy was performed, and he was diagnosed with lymphocytic myocarditis (Figure 1F). ECPELLA, a combination of veno-arterial extracorporeal membrane oxygenation (V-A ECMO) and Impella 5.0 (Abiomed, Danvers, MA, USA), was introduced for treating the CS. On the first day, he only received 200 mg of hydrocortisone for septic shock and no steroid pulse therapy. As his cardiac function gradually recovered, V-A ECMO and Impella 5.0 were removed 3- and 5-day post-implantation, respectively. He was discharged on Day 27. TTE immediately before discharge revealed nearly normal cardiac function with an LV ejection fraction of 55% (see [Supplementary material online, Video S4](#)), and cardiac magnetic resonance (CMR) showed no abnormalities. The serological tests performed in the acute and recovery phases showed a four-fold increase in only the echovirus type 25 antibody titre.

The mechanism of the wall motion abnormalities was not well-understood in our case; however, Bigalke et al.<sup>1</sup> also reported a case of human herpesvirus 6-associated myocarditis with apical ballooning. An absence of myocarditis is regarded as one of the diagnostic criteria for TS. In contrast, the possibility of myocarditis acting as a trigger

factor for TS has also been reported.<sup>2</sup> TTE and LVG are frequently performed before introducing Impella, and in our case, it revealed mid-apical ballooning. CMR could not be performed during the acute phase because he was intubated and introduced to ECPELLA; therefore, an endomyocardial biopsy was considered necessary not only to diagnose the cause of the myocarditis and to select an appropriate treatment but also to distinguish myocarditis from TS. An endomyocardial biopsy should be considered to be performed even if TTE or LVG reveals wall motion abnormalities similar to TS.

## Supplementary material

[Supplementary material](#) is available at *European Heart Journal – Case Reports*.

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**Consent:** The authors confirm that written consent for submission and publication of this case report, including the images and associated text, has been obtained from the patient in line with COPE guidance.

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## References

1. Bigalke B, Klingel K, May AE, Kandolf R, Gawaz M. Human herpesvirus 6 subtype A-associated myocarditis with 'apical ballooning'. *Can J Cardiol* 2007;**23**:393–395.
2. Hassan SY. Myocarditis and takotsubo syndrome: are they mutually exclusive? *Int J Cardiol* 2014;**177**:149–151.