

## Images in Cardiovascular Disease



# A Case of Isolated Congenital Left Ventricular Diverticulum in a Child

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#### Conflict of Interest

The authors have no financial conflicts of interest.

#### Author Contributions

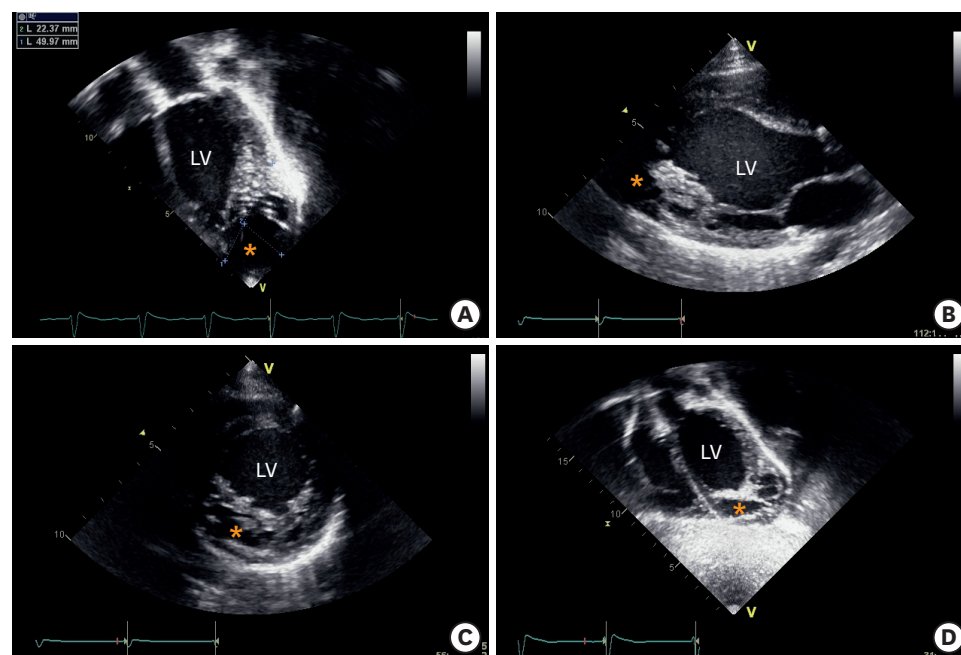
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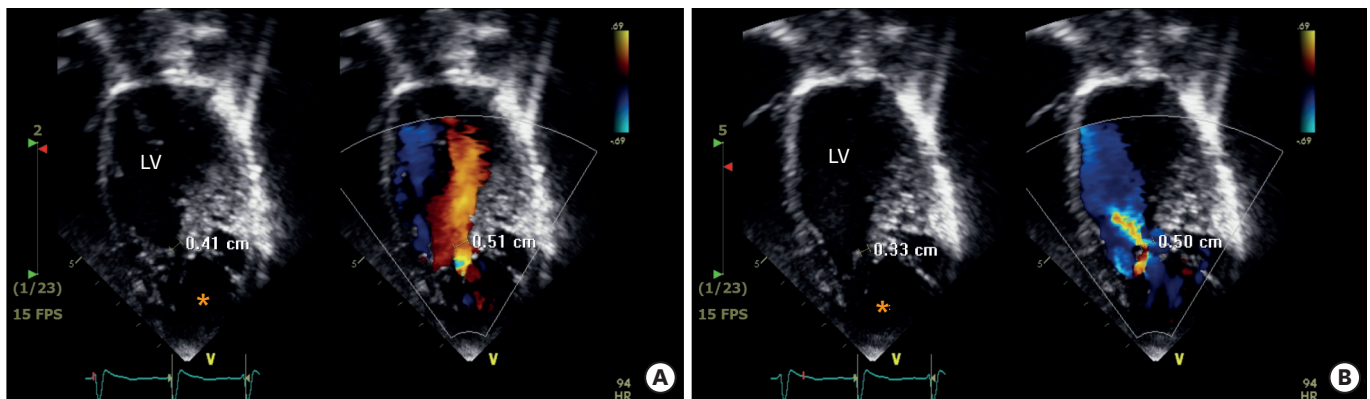
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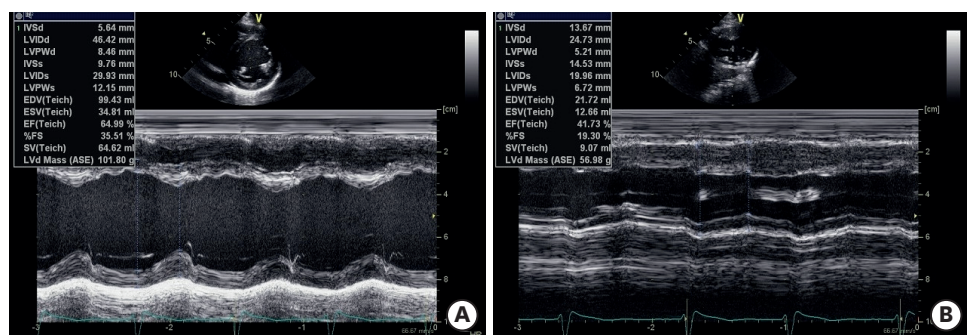
A previously healthy 11-year-old boy visited our hospital to evaluate a heart murmur. On physical examination, a grade 3/6 systolic murmur was audible at the left lower sternal border. The electrocardiogram showed normal sinus rhythm with left ventricular (LV) hypertrophy. The results of a chest x-ray and other laboratory findings were unremarkable. Transthoracic echocardiography showed a moderately dilated LV with a large outpouching located at the inferolateral and apical portion of the LV (**Figure 1, Movies 1, 2, and 3**). The outpouching was connected to the LV with a narrow neck, and the contraction was mild hypokinetic and synchronous with the LV wall (**Figures 2 and 3, Movie 3**). These findings suggested the possibility of a congenital LV diverticulum (LVD). Cardiac magnetic resonance imaging (CMR) confirmed the echocardiographic findings (**Figure 4, Movie 4**). After careful discussion, surgery was performed to prevent possible life-threatening complications. The diverticular neck was closed with 5-0 pledgeted prolene suture. Post-operative CMR showed



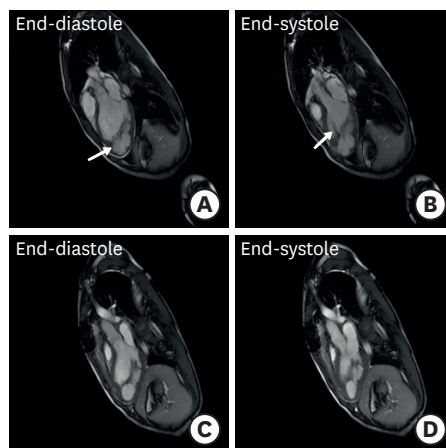
**Figure 1.** Transthoracic 2-dimensional echocardiogram showed a large outpouching (orange asterisk), located at the inferolateral wall and apex of the LV, sized 50 × 22 mm in (A) apical, (B) parasternal long-axis, (C) parasternal short-axis, (D) subcostal view. LV: left ventricle.



**Figure 2.** The apical 4-chamber view showed outpouching (orange asterisk), communicating with the LV through about 5 mm narrow neck. Color flow mapping showed (A) a slow end-diastolic inflow at the neck and (B) a rapid end-systolic outflow toward the LV, with a maximum velocity of 4.03 m/sec. This means the diverticular wall contracted actively and suggested the possibility of a congenital left ventricular diverticulum. LV: left ventricle.



**Figure 3.** (A) The left ventricle excluding the diverticular portion showed normal contractile function, with an ejection fraction of 64%. (B) In contrast, the diverticular portion of the left ventricle showed impaired contractile function, with an ejection fraction of 41%.



**Figure 4.** Pre-operative CMR showed the LVD connected to the dilated left ventricle and (A) the end-diastolic inflow (arrow) and (B) the end-systolic outflow (arrow) through the narrow neck. (C, D) Post-operative CMR showed that the blood flow through the neck disappeared, with a decreased end-diastolic volume index from 69.3 to 43.3 mL/m<sup>2</sup>. CMR: cardiac magnetic resonance imaging, LVD: left ventricular diverticulum.

that the volume of LV significantly decreased after the surgery (**Figure 4, Movie 5**). The patient remained asymptomatic during the 3-year follow-up.

Congenital LVD is a rare cardiac abnormality in children and is often associated with other congenital malformations.<sup>1)</sup> It is crucial to distinguish LVD from other forms of ventricular outpouching, like aneurysm and pseudoaneurysm.<sup>2)</sup> The diagnosis can be made on findings such as synchronous contractility of outpouching, histopathology, connecting neck size, and accompanying other congenital malformations.<sup>1)</sup> LVD contracts synchronously with the ventricular wall and is connected to the LV with a narrow neck.<sup>3)</sup> Aneurysm is an akinetic or dyskinetic pouch with a wide neck and contains fibrous tissue.<sup>3)</sup> Pseudoaneurysm represents when the cardiac rupture is contained by adherent pericardium or thrombus and forms a noncontractile cavity.<sup>4)</sup> Treatment strategy depends on associated symptoms, location, and size of the lesion.<sup>5)</sup>

## SUPPLEMENTARY MATERIALS

### Movie 1

The apical 4-chamber view showed the diverticulum connected to the left ventricle

[Click here to view](#)

### Movie 2

The parasternal long-axis view showed the contractile left ventricular diverticulum

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### Movie 3

The subcostal view of the diverticulum with Doppler color flow imaging showed the end-diastolic inflow and end-systolic outflow

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### Movie 4

Pre-operative cine cardiac magnetic resonance imaging on left ventricle outflow tract

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### Movie 5

Post-operative cine cardiac magnetic resonance imaging on left ventricle outflow tract

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