Cardiology in the Young

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A reversible cause of epsilon waves: left ventricular diverticulum

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Abstract

The genesis and significance of epsilon waves still remains an enigma. In this case report, we document occurrence of epsilon waves in a neonate with left ventricular diverticulum and its disappearance after the surgical division of the diverticulum. We postulate that the presence of myocardial cells in the diverticulum was the cause for epsilon waves.

Case Report

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Case report

A 16-day-old male baby presented to our emergency department for evaluation of a pulsatile umbilical mass and bluish discoloration of hands and feet since birth. The parents did not give history of recurrent respiratory infections or feeding difficulty. On examination, the saturation was 85% on room air. Auscultation revealed an ejection systolic murmur in the left second intercostal space. ECG showed sinus rhythm and distinct epsilon waves best seen in the inferior leads (Figure 1). Echocardiography revealed a double outlet right ventricle with severe valvular and sub valvular pulmonary stenosis and a large ventricular septal defect. The ventricular function was normal. The mass seemed to be in continuity with the heart on echocardiography. Cardiac CT revealed the anomalous vascular channel to be a ventricular diverticulum from the apex of the left ventricle extending to the umbilical region (Figure 2a). No additional midline defects were noted on CT scan, and other findings of Pentalogy of Cantrell were absent.



Figure 1. Computer tomography image of the heart showing a dilated vascular channel communicating between umbilical vein to apex of left ventricle.

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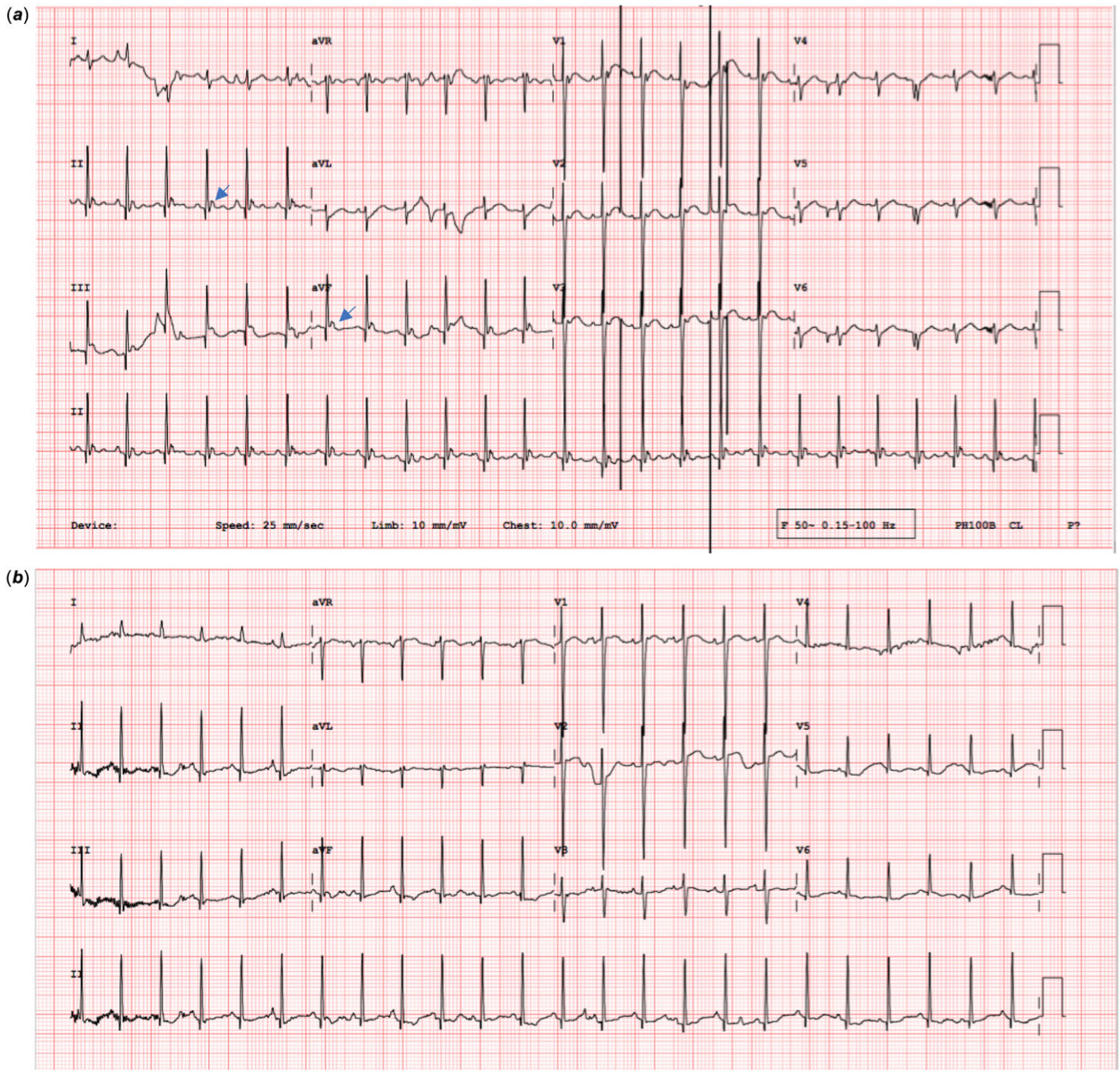


Figure 2. Epsilon waves (blue arrows) seen as a late potential located between the end of the QRS complex and the beginning of the ST segment, best seen in the inferior leads in the ECG above (a). Disappearance of epsilon wave after surgical division of diverticulum in the ECG below (b).

Epsilon waves on ECG are late deflections, notches, or oscillations located between the end of QRS complex and the beginning of ST segment.[1] The genesis and significance of epsilon waves continue to be debated. It is postulated that this post excitation potential is due to slow interventricular conduction between surviving myocytes embedded in between areas of fatty replacement and fibrous tissue. Although discussed mostly in the context of arrythmogenic right ventricular cardiomyopathy, such waves are well described in many other situations including giant cell myocarditis,[1] Brugada syndrome,[2] idiopathic ventricular fibrillation,[3] right ventricular, inferior or lateral wall myocardial infarction,[4] sarcoidosis,[5] and post repair in Tetrology of Fallot.[6] Its occurrence in this patient with left ventricular diverticulum is likely due to the delayed activation within the diverticulum. It is interesting to note that epsilon waves are most prominent in leads V1 to V3 in arrhythmogenic cardiomyopathy, while patients with significant left ventricular involvement have epsilon waves in the lateral and inferior leads.[7] In our patient with diverticulum involving the left ventricular apex, the epsilon waves were most prominent in the inferior leads further lending credence to the possibility that the epsilon waves in this patient are due to the diverticulum.

A surgical approach was chosen to treat the diverticulum. The diverticulum was resected, and the entry site was closed with a patch. At the same time, corrective heart surgery was performed as the ventricular septal defect was routable and biventricular repair

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was possible. The baby was extubated on the second day after surgery and recovered uneventfully. After closure of the diverticulum, the epsilon waves disappeared (Figure 2b). We documented occurrence of epsilon waves in a case of ventricular diverticulum and its disappearance after the surgical division of the diverticulum. This report will aid in the understanding of the pathogenesis of epsilon waves, especially its occurrence in situations other than arrythmogenic cardiomyopathy.

Author contribution. Krishna Prasad Akkineni: Writing—original draft preparation. Souvik Sardar: Resources, editing images. Aseem Basha: Conceptualisation, resources, and writing—editing.

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Competing interests. The authors declare that there is no conflict of interest to disclose.

Ethical standard. Informed consent was obtained from the parents to share patient clinical information and imaging photographs anonymously for the scientific purposes.

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