Epicardial echocardiography for left ventricular epicardial lead placement during cardiac resynchronization therapy in a child

Sir,

Epicardial echocardiography (EPE) is frequently used during congenital cardiac surgery for diagnostic purposes. We describe an incident, wherein, the EPE was used to identify the anatomical location of the left ventricle (LV) during cardiac resynchronization therapy (CRT). A written informed consent was obtained from patient's relatives for the publication of this article.

A 5-yr-old, 12-kg girl diagnosed with tetralogy of Fallot and left pulmonary artery stenosis, underwent intracardiac repair with ventricular septal defect closure, left pulmonary artery reconstruction, monocusp reconstruction of right ventricular outflow tract, and permanent epicardial pacemaker for complete heart block at 9 months of age. She now presented with heart failure with severe biventricular dysfunction, ventricular dyssynchrony, and severe pulmonary regurgitation (PR). She was scheduled for surgical placement of epicardial leads and pulse generator for CRT. After induction of anesthesia, transesophageal echocardiography (TEE) probe was inserted (Philips mini multiprobe; S7-3t) and the heart was inspected using an ultrasound system (iE33, Philips Ultrasound, Bothell, WA, USA), which showed dilated right atrium and right ventricle (RV) with severe PR. The grossly dilated RV was forming the apex of the heart [Figure 1a, Video 1].

The child was positioned in the right lateral decubitus position. As the airway pressure increased after positioning the patient, we suspected tracheal compression by the TEE probe and hence, the probe was removed. Left antero-lateral thoracotomy was performed through 6th intercostal space. However, the surgeon was unable to access the left ventricle (LV) for lead placement due to severe RV enlargement. Hence, the thoracotomy was extended to the 5th intercostal space and the 5th rib was excised to approach the posterolateral surface of the LV [Figure 1b]. As identification of the LV was still not possible despite opening 2 intercostal spaces and excising the rib, we performed EPE with S8-3 probe (Philips). The LV wall was pushed posterolaterally, which was now accessed by extending the thoracotomy incision further posteriorly [Figure 2a, b and Videos 2, 3]. The epicardial lead was placed successfully on posterolateral aspect of LV after retracting the heart [Figure 3]. Unfortunately, the patient developed intractable ventricular arrhythmias and cardiac dysfunction during the CRT activation. She couldn't be revived despite cardiopulmonary resuscitation.

Routinely left antero-lateral thoracotomy approach provides easy access to pericardium and LV wall.[1] It is uncommon to access LV wall through a postero-lateral approach. However, the anatomical location of the LV may be altered in the presence of severe RV enlargement, which may be difficult to identify and access through the anterolateral thoracotomy approach. Accurate location of posterolateral surface of the LV is necessary for the successful institution of the CRT. Although TEE is used as the primary intraoperative imaging modality, the TEE probe may produce compression on surrounding structures such as the distal trachea, bronchi, and heart.[2] As the EPE probe can be placed directly on the cardiac surfaces, we could distinguish the LV from RV by moving the probe in posterolateral direction. It avoided unnecessary extension of the thoracotomy incision into new intercostal space and inappropriate placement of the CRT electrode.

Declaration of patient consent

The authors certify that they have obtained all appropriate

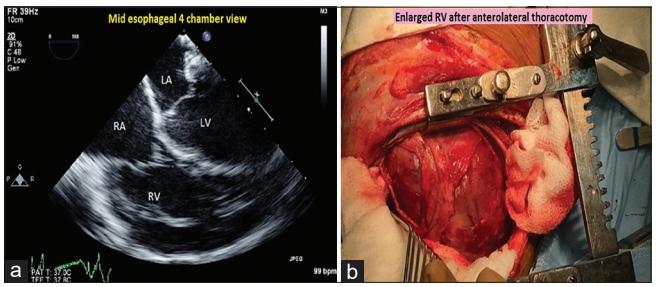

Figure 1: (a) TEE in midesophaheal-4-chamber view showing dilated RA and RV with RV occupying the apex. (b) Enlarged RV seen after 5th rib excision and retraction of 4th and 6th ribs following left antero-lateral thoracotomy approach. 2D- 2 dimensional; C- compression; FR -frame rate; Gen - general frequency; LA- left atrium; LV- left ventricle; P- persistence; PAT - patient temperature; RA- right atrium; Res- resolution; RV- right ventricle; TEE – transesophageal echocardiography

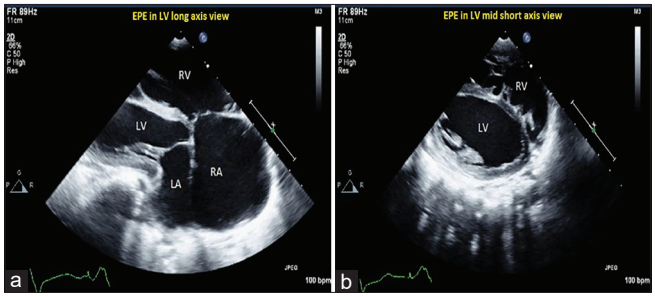

Figure 2: (a) Epicardial echocardiography in LV long-axis view showing dilated RA and RV. LVOT is obscured due to enlarged RV. (b) Epicardial echocardiography LV mid short-axis view showing dilated RV pushing LV posteriorly. Note the thin wall of LV. 2D– 2 dimensional; C- compression; FR -frame rate; Gen - general frequency EPE - epicardial echocardiography; LA- left atrium; LV- left ventricle; LVOT - left ventricular outflow tract; P- persistence; RA - right atrium; Res- resolution; RV- right ventricle

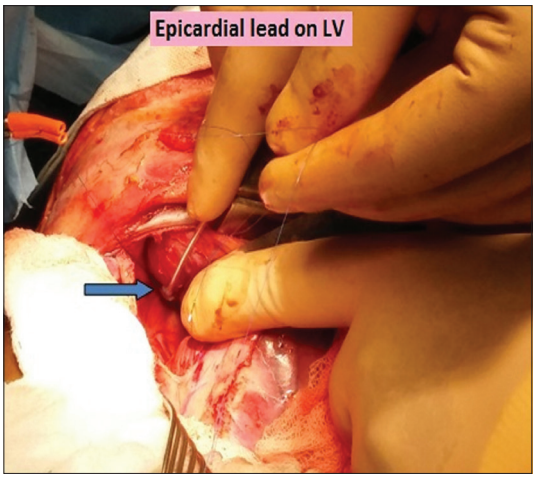

Figure 3: Epicardial lead placed on LV (blue arrow) after postero-lateral extension of incision.

patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest
There are no conflicts of interest.

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