

# Expressive aphasia in a patient with recent dual-chamber cardioverter-defibrillator implantation: A preventable complication

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## Abstract

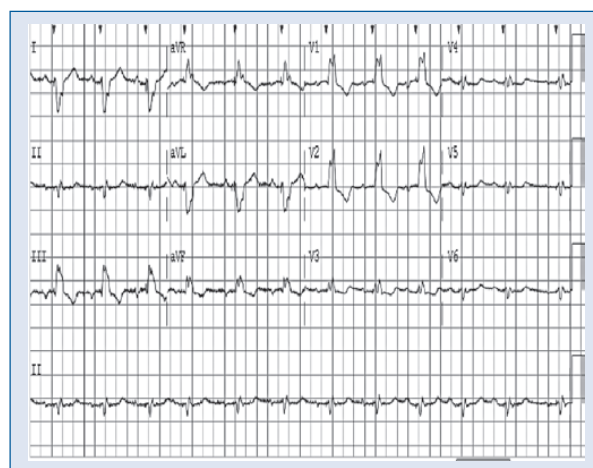
*Transvenous pacemaker and/or defibrillator lead placement into the left heart chambers is rarely done. Approximately a third of such cases reported in the literature presented with signs of thromboembolism, mostly neurological deficits. We describe a patient who presented with a cerebrovascular accident three months after inadvertent and unrecognized lead placement into the left atrium and ventricle through a sinus venosus atrial septal defect. Implant techniques to avoid this complication are discussed. (Cardiol J 2011; 18, 2: 197–199)*

**Key words:** implantable cardioverter-defibrillator, atrial septal defect, complication, cerebrovascular accident

## Case report

A 63 year-old female presented with new-onset expressive aphasia three months after a dual-chamber implantable cardioverter-defibrillator (ICD) was placed for ventricular tachycardia and high-grade atrioventricular block. She was transferred to our institution for further evaluation. Her presenting electrocardiogram (ECG) is displayed in Figure 1. The ECG shows appropriate atrial sensing and a paced ventricular rhythm. The QRS complex of the ventricular paced beats is a right bundle branch block (RBBB) pattern with a limb lead axis pointing away from the left sided limb leads I and AVL and towards the more rightward limb leads III and AVR. Because a RBBB pattern usually does not occur with right ventricular pacing, a posteroanterior (PA) and lateral chest X-ray were ordered (Figs. 2A, B), as well as a transthoracic echocardiogram.

The PA chest X-ray shows the presence of an atrial and a ventricular lead but does not clarify the chamber position, either right or left-sided. On the lateral chest X-ray, the leads are clearly positioned



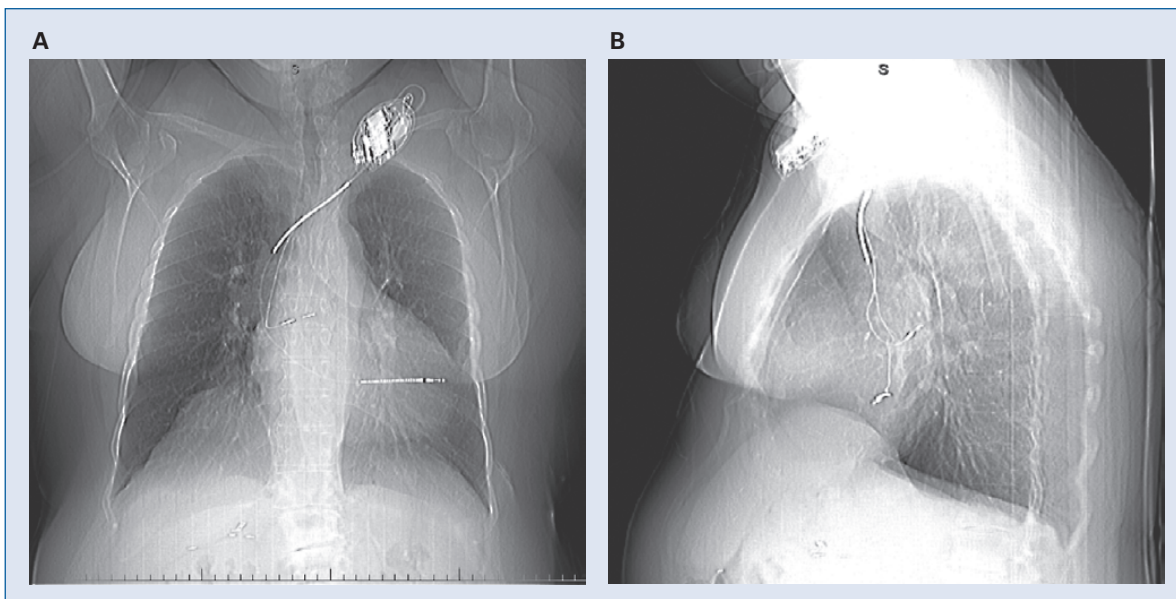
**Figure 1.** Electrocardiogram showing ventricular pacing with right bundle branch block morphology.

posteriorly, consistent with lead placement in the left atrium (LA) and left ventricle (LV). A transthoracic echocardiogram demonstrated the presence of pacing leads in the LA and LV, but the course of the leads to the left-sided chambers was not clear-

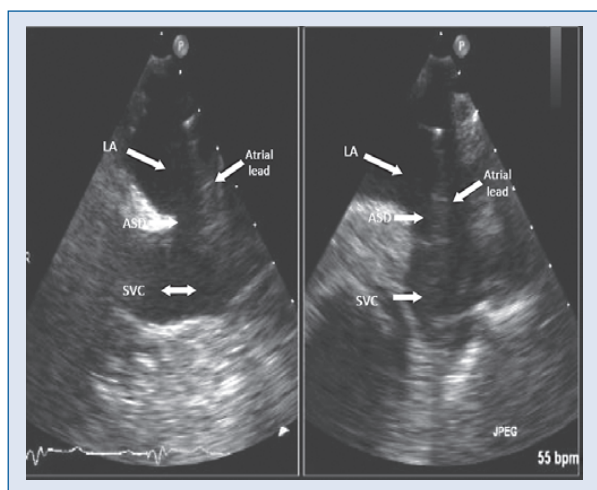
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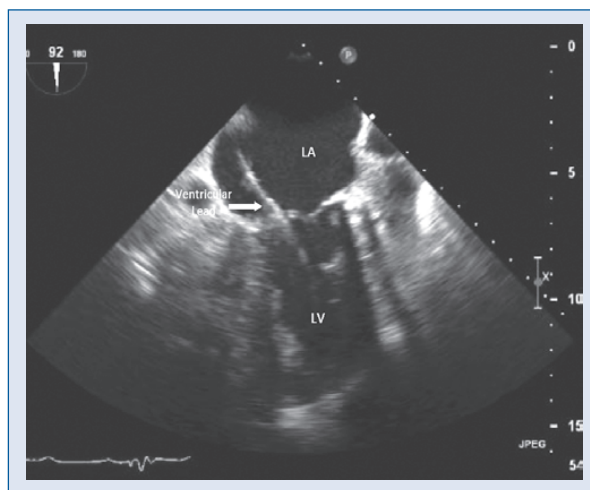
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**Figure 2.** A. Chest X-ray: posteroanterior view; B. Chest X-ray: lateral view.



**Figure 3.** Transesophageal echocardiogram: atrial lead coursing through atrial septal defect (ASD) into left atrium (LA); SVC — superior vena cava.



**Figure 4.** Transesophageal echocardiogram: ventricular lead fixed in the left ventricle (LV); LA — left atrium.

ly delineated. Transesophageal echocardiography (Fig. 3) revealed the presence of a sinus venous atrial septal defect with anomalous pulmonary venous drainage. Both leads coursed from the superior vena cava, through the atrial septal defect and into the LA. The ventricular lead then crossed the mitral valve to its insertion on the LV posterolateral wall (Fig. 4). A small, mobile density, possibly representing thrombus or fibrin, was present on the defibrillator lead.

### Discussion

LA and LV endocardial pacemaker/defibrillator lead placement is rare, but can cause devastating embolic complications if not recognized and treated. There are many ways in which inadvertent lead placement into a left-sided heart chamber can happen, including:

- passage of a lead through a patent foramen ovale or atrial septal defect and theoretically a ventricular septal defect;

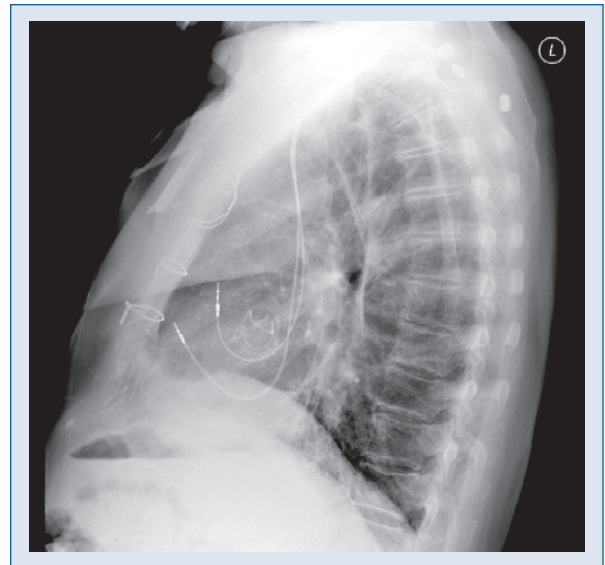
- perforation of the intraventricular or intraatrial septum during lead placement or with lead migration;
- erroneous peripheral access into the axillary or subclavian artery and passage into the LV across the aortic valve;
- perforation of the right ventricle (RV) apex with migration to the LV in the epicardial/pericardial space [1].

As reports of inadvertent left-sided lead malposition and related complications continue to emerge, it is important to review a few simple implantation techniques that could be used to avoid such an error [1–4]. When crossing the tricuspid valve with the RV lead, advancement of the lead superiorly into the right ventricular and pulmonary outflow tracts helps to confirm right-sided chamber location. If the lead is advanced far enough, it will be visualized heading into the right or left main pulmonary artery; quite different from the course the lead would take heading out of the left ventricular outflow tract.

Once the lead is placed in a suitable position, with adequate sensing and capture thresholds, a steep LAO view (30 degrees or greater on fluoroscopy) will confirm RV versus LV lead position. During right atrial lead placement, clockwise torque on the stylet will rotate the lead anteriorly towards the right atrium. Finally, a post-procedure ECG with ventricular capture (may require magnet placement) and a PA and lateral chest X-ray should be performed and reviewed on every patient. With the exception of bi-ventricular pacing, any RBBB pacing morphology should raise the suspicion of inadvertent LV lead placement. On lateral chest X-ray, the right atrium (RA) and RV leads should be seen in the anterior chambers of the heart (Fig. 5).

Inadvertent left-sided endocardial lead placement may be diagnosed during routine follow-up in asymptomatic patients. Approximately a third of reported cases initially presented with embolic complications. If diagnosed in the immediate post-operative period, the leads should promptly be repositioned. For left heart lead placement diagnosed late after implantation, treatment options include anti-coagulant therapy with warfarin or lead removal. Anti-platelet therapy does not appear to give sufficient protection from embolic complications. Although there is limited data, warfarin has been used successfully for primary and secondary prevention of thromboembolic events.

Percutaneous lead extraction with sheath systems is not recommended because of the high risk of dislodging thrombi or fibrous tissue into the arterial circulation. Surgical removal of the leads can be



**Figure 5.** Chest X-ray: lateral view, demonstrating correct placement of atrial and ventricular leads.

performed, particularly if surgery is warranted for other indications; as in our patient who had right heart enlargement due to a large intra-cardiac shunt [1].

Unfortunately, our patient's thrombotic cerebrovascular accident transformed into a hemorrhagic cerebrovascular accident, thus precluding immediate, anti-coagulant therapy or repair. Eventually, the patient underwent surgical extraction of her left-sided leads with implantation of RA and RV leads. Her clinical course emphasizes the importance of taking the necessary steps to avoid this complication and, if necessary, to recognize and rectify it in the immediate post-operative period.

## Acknowledgements

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