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Case Report

Malplacement of endocardial pacemaker lead in the left ventricle

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through the right subclavian vein on 28 Feb 2006. The position of the pacemaker leads was considered satisfactory on the chest radiograph. Atrial and ventricular lead thresholds, and impedance were within normal limits at discharge. She was lost to follow up for over six years and reported for a routine review. She was asymptomatic with a normal general and cardiovascular examination. There was no clinical evidence of any thromboembolic episode.

An electrocardiogram (Fig. 1) revealed a paced right bundle branch block pattern, which raised the suspicion of an inappropriate lead in the left ventricle (LV). A transthoracic (Fig. 2) followed by a transoesophageal echocardiogram (Fig. 3), confirmed the abnormal course of the lead across the foramen ovale and implanted in the LV apex.

Case report

A 65-year-old lady presented with recurrent non-exertional syncopal episodes of 4 months duration, without any past history of hypertension, diabetes, renal or thyroid disease. A holter examination showed symptomatic sinus pauses of >3 s in the awake state.

A transvenous dual-chamber pacemaker (DDDR, Medtronic SIGMA SD203 along with Medtronic CAPSURE SP NOVUS 4592-53 cm and 4092-58 cm leads) was implanted

Discussion

Cardiac pacemaker implantation involves the placement of transvenous pacing leads into the right ventricle, right atrium or both. The ventricular lead is generally positioned at the RV apex, while the atrial lead is usually placed into the right atrial appendage.

Malposition of the ventricular lead has been described in several different locations like the left ventricle, coronary

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Fig. 1 – 12-Lead surface electrocardiogram showing sequential atrial and ventricular pacing with a right bundle branch block morphology.

sinus, cardiac veins, and the pulmonary tract. Malposition of the transvenous pacing leads in the left ventricle is the commonest and was first reported by Stillman and Richards (1969).¹

Though the incidence of this complication is not known because of underreporting, a Medline search revealed over 40 cases of inadvertent LV lead placement.² It is more likely to occur when fluoroscopic examination is misinterpreted because of distorted cardiac anatomy or abnormal ventricular dimensions.³

On the venous side the lead could pass through a sinus venosus defect, a patent or perforated foramen ovale or through an atrial or ventricular septal defect, while on the arterial side it could result from a transarterial access across the aortic valve.⁴ Recognition of this inadvertent placement requires a high degree of suspicion. A right bundle branch

block pattern on a 12-lead surface ECG is a sensitive marker towards an inadvertent LV lead placement, and is often the first cause of suspicion. However, an early activation of the LV may also be produced by a RV septal or coronary sinus pacing lead and thus must also be considered. The pattern of RBBB during septal RV pacing has been differentiated from LV pacing by using the following criteria given by Okmen et al: left superior axis deviation in the frontal plane between -30° and -90° , precordial transition at V3, the absence of S wave in lead I and qR or RS in V1 (sensitivities and specificities are 97, 100%; 97, 100%; 94, 100%; and 97, 100%, respectively).^{5,6}

Radiography and echocardiography also assist in the localization of the malpositioned lead. On posteroanterior (PA) and lateral chest radiography a correctly positioned right ventricular lead has a smooth right lateral course through the

Fig. 2 – Transthoracic echocardiogram in the apical 4-chamber view showing the ventricular lead passing across the mitral valve and lying at the left ventricular apex.

Fig. 3 – Transoesophageal echocardiogram showing the ventricular lead passing from the right atrium to the left ventricle across the patent foramen ovale.

right atrium, with slight bowing at the right ventricular apex giving it a 'ballerina foot' like appearance. The lateral projection shows that the tip of the lead is located anteriorly. In contrast, the tip of a malpositioned left ventricular lead is characteristically to the left and farther superior on the posteroanterior view and farther posterior in the cardiac silhouette on the lateral view.¹ It however, may face and point anteriorly like in our patient and give a false impression that it lies in the RV. Chest CT scans can also show the lead location accurately and help differentiate malpositioned leads in the coronary sinus, cardiac veins and the left ventricle.⁷ Radiologically, it may be difficult to distinguish lead malposition in the LV from that in coronary sinus (CS) or the middle cardiac vein as the radiological appearance may look similar on the PA radiograph. However, the lateral radiograph shows the CS lead to be posteriorly and anteriorly placed.

Two-dimensional transthoracic and transesophageal echocardiography can also delineate the course of the lead accurately, though the acoustic shadowing may cause echo dropouts.⁸

The left ventricular lead may cause cardioembolic complications especially in the cerebral circulation leading to transient ischemic attacks or strokes thus causing significant morbidity and mortality.⁹ These thromboembolic episodes may occur in upto 40% patients and occur anytime after the procedure. Other complications such as mitral insufficiency, diaphragmatic pacing, loss of capture, pericardial effusion, endocarditis, vascular damage and peripheral arterial damage may also occur.¹⁰

The evidence for the management strategies for a malpositioned lead is controversial. Probably if it is diagnosed early, that is less than one year after implantation (when it is easily extractable) with or without any associated thromboembolic episode it should be percutaneously removed and repositioned. If the malpositioned lead is detected late and is not associated with any thromboembolic event the patient should be anticoagulated to maintain an INR of 2.5–3.5. However, recurrent thromboembolic episodes should be managed with percutaneous or surgical removal, and repositioning of the lead.¹¹

Since our patient was asymptomatic we placed her on anticoagulation therapy, and did not plan any percutaneous or surgical extraction of the lead.

Conclusion

Inadvertent LV lead placement is a rare but potentially serious complication of endocardial pacing. It may be suspected and

diagnosed by electrocardiography, X-ray, echocardiography, CT-scan or MRI. Though the management strategies remain uncertain, in the absence of thromboembolic episodes, the patient can be successfully managed with anticoagulation alone.

Conflicts of interest

All authors have none to declare.

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