

Case Report

Misplacement of Temporary Pacing Wire into the Left Ventricle Via an Anomalous Vein

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We report on a case where a temporary pacing wire that was inserted through the left internal jugular vein was subsequently noted to follow an unusual course on the chest radiograph. A 12-lead electrocardiogram showed right bundle branch block pattern during pacing, suggesting that the lead was pacing the left ventricle. Computed tomography of the chest demonstrated that the likely path of the pacing wire was through an anomalous vein that originated from the left subclavian vein and drained into the left atrium. The importance of paying careful attention to the chest radiograph and electrocardiogram after transvenous pacing are discussed.

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Temporary transvenous pacing is a potentially lifesaving intervention that is commonly required in the emergency management of severe symptomatic bradycardia and for the abolition of some life-threatening tachyarrhythmias. Lead malposition is a recognised complication and the inadvertent placement of pacing leads into the left ventricular cavity is particularly hazardous because of the recognised complications of systemic or cerebral thromboembolic events.

Case presentation

A 74-year-old lady was brought into casualty with syncope. A 12-lead electrocardiogram (ECG) demonstrated complete atrioventricular block with a ventricular escape rate of 37 beats per minute. As the patient was haemodynamically unstable, a temporary pacing wire was inserted via the left internal jugular vein. Ventricular capture was achieved with difficulty and threshold for capture was measured at 4 volts. The ECG during pacing showed a right bundle branch block (RBBB) pattern

(Figure 1) and a chest radiograph showed the pacing wire to follow a left paramedial position prior to entering the heart (Figure 2). The pacing wire was removed and a computed tomogram (CT) of the chest with contrast was performed to check for a suspected venous anomaly. On the CT scan, the left subclavian vein was seen to bifurcate as it entered the chest. The larger anterior division crossed over the midline and joined with the contralateral brachiocephalic vein to form the superior *vena cava*. The posterior smaller division was seen to unite with probably the left superior intercostal vein to form a common trunk. This common trunk was seen to descend inferiorly along the lateral aspect of the aortic arch, left main pulmonary artery and enter the left atrium (Figure 3). It is most likely that the pacing wire had passed down this vessel into the left atrium and crossed through the mitral valve into the left ventricle.

Discussion

There are case reports in the literature that

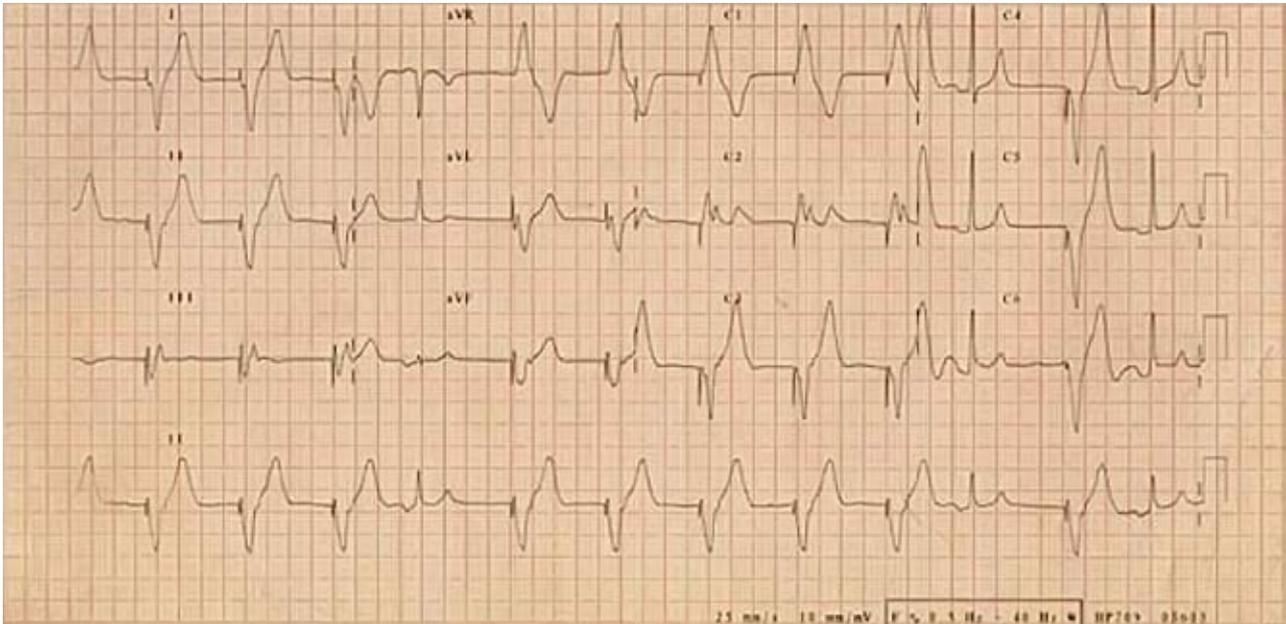


Figure 1. Electrocardiogram demonstrating right bundle branch block pattern during pacing.



Figure 2. Chest radiograph demonstrating the left vertical paramedian course of the pacing wire.

describe passage of the pacing lead into the left heart from the right heart through an atrial septal defect or patent *foramen ovale*.¹ There are also reported cases where the subclavian or internal jugular arteries have inadvertently been cannulated and the pacing electrode has pursued a retrograde course via the aortic valve into the left ventricle.² Occasionally, aggressive manipulation of the lead in the right ventricular cavity can cause perforation of the interventricular septum and the lead can migrate into the left ventricular cavity.³ We believe that this is the first described case where the lead has entered the left ventricle through

an anomalous vessel connecting the left subclavian vein to the left atrium.

It is essential to recognise misplacement of a pacing lead into the left ventricle as soon as possible for several reasons:

1. The presence of the pacing electrode in the left ventricular cavity may signify arterial cannulation or perforation of the interventricular septum.
2. Thrombus formation on the lead can lead to systemic or cerebral embolisation. In one series, 10 out of 27 patients with pacing leads in the left ventricle experienced thromboembolic complications.¹
3. As the left ventricle is not as trabeculated as the right ventricle, it is more difficult to achieve a stable position in the left ventricle, increasing the theoretical risk of lead displacement and loss of capture. This could be potentially fatal in patients who have no underlying rhythm.

The 12-lead ECG and chest X-ray post procedure can provide valuable clues that help in the recognition of lead misplacement. On frontal chest X-ray, a normally positioned pacing wire should follow a right vertical paramedian course, signifying passage through a normal right-sided superior *vena cava* before entering the right heart. A left vertical paramedian position indicates placement into a left internal thoracic vein, persistent left-sided superior *vena cava* or left superior intercostal vein.⁴ A lateral chest radiograph can help distinguish between these possibili-



Figure 3. Parasagittal reformat of computed tomographic scan demonstrating the anomalous vein feeding into the left atrium.

ties. The internal thoracic vein is located anteriorly, a persistent left superior *vena cava* is located centrally and the left superior intercostal vein is located more posteriorly in the thorax.

On the 12-lead ECG, the presence of an RBBB pattern usually signifies left ventricular pacing – although occasionally this pattern may also be seen if the pacing lead is in the right ventricle.⁵ Features on the electrocardiogram that can help correctly identify RBBB due to right ventricular pacing and differentiate it from left ventricular pacing include left superior axis deviation (frontal axis between -30 and -90 degrees), the presence of RS or qR morphology in lead V_1 and

precordial transition in lead V_3 .⁵ RBBB seen in right ventricular pacing can also sometimes be made to disappear if the precordial leads V_1 and V_2 are placed one interspace lower than the standard location.⁶

In conclusion, we have reported on a case where a temporary pacing wire entered the left ventricle through an anomalous vein connecting the left subclavian vein to the left atrium. The malposition was promptly recognised because of the abnormal radiographic and electrocardiographic appearances. This case highlights the importance of careful scrutiny of the chest radiograph and 12-lead ECG in identifying and correcting lead malposition.

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