

# An Unusual Case of Embolic Stroke:

## A Permanent Ventricular Pacemaker Lead Entirely Within the Arterial System Documented by Transthoracic and Transesophageal Echocardiography

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*A pacemaker lead in the left ventricle is a rare complication of implantation. Recognition of this complication is important because thromboembolic events are associated. We report the first case, to our knowledge, of a patient who had a permanent pacemaker implanted via the left subclavian artery to the left ventricle, which is documented by electrocardiography, chest radiography, thoracic echocardiography, and transesophageal echocardiography. (ECHOCARDIOGRAPHY, Volume 16, May 1999)*

*embolic stroke, permanent pacemaker, transesophageal echocardiography*

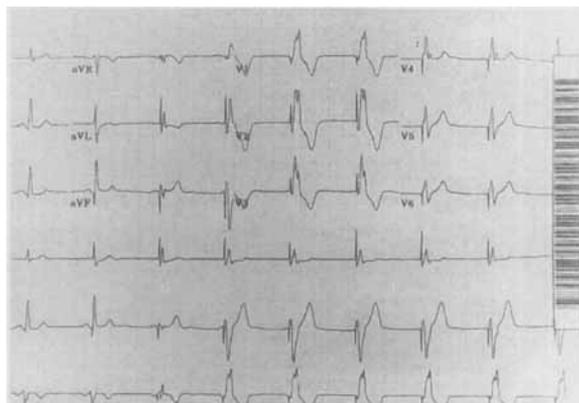
Malposition of a permanent ventricular pacemaker lead into the cavity of the left ventricle (LV) is a rarely reported but well recognized complication of pacemaker insertion. To our knowledge, there are only 30 reported cases in the English literature of a permanent pacemaker lead tip within the LV.<sup>1-14</sup>

We report the case of a patient with a pacemaker lead permanently inserted via the left subclavian artery, retrograde through the aorta and the aortic valve, into the LV. This is the first reported case, to our knowledge, of documentation by transthoracic echocardiography (TTE) and transesophageal echocardiography (TEE) of the abnormal course of a permanent pacemaker lead inserted through the left subclavian artery.

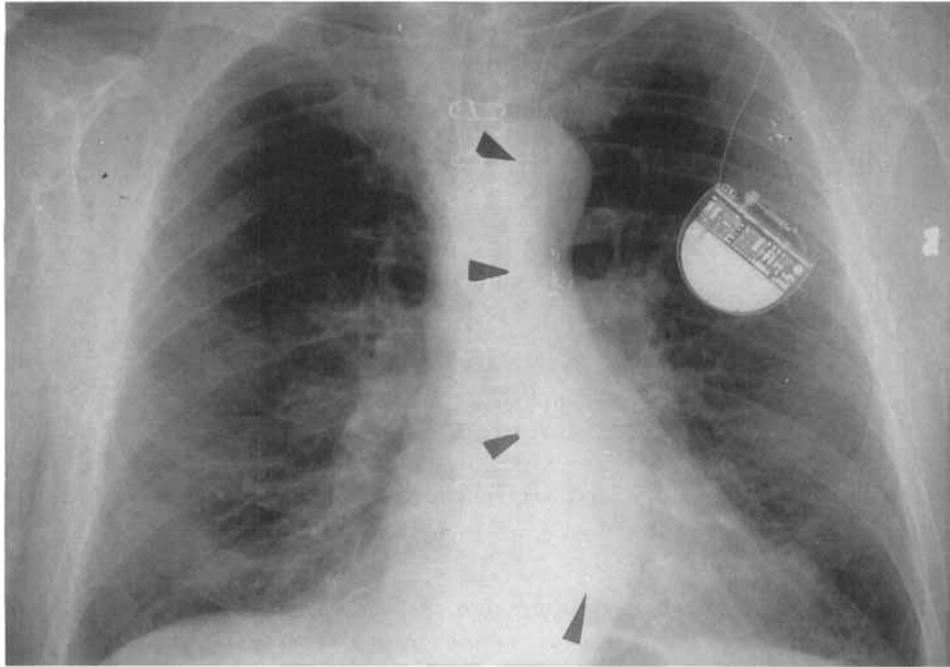
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### Case Report

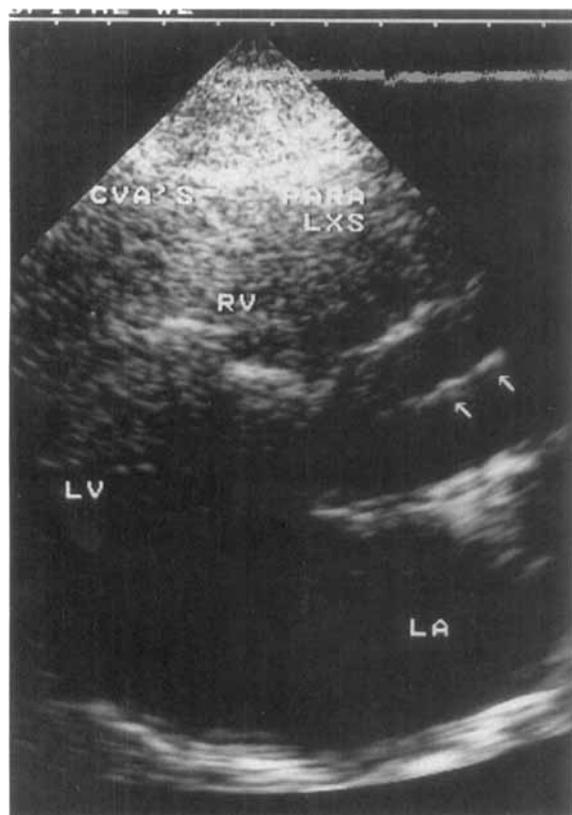
A 65-year-old man presented to his local hospital with slurred speech and weakness of the



**Figure 1.** Twelve-lead electrocardiogram demonstrates the patient's own rhythm becoming a pacemaker rhythm with a right bundle-branch block morphology.



**Figure 2.** Posteroanterior and lateral chest radiographs. Posteroanterior view demonstrates the pacemaker lead remaining on the left side of the thoracic spine (arrows). Lateral view demonstrates the tip directed posteriorly.



**Figure 3.** Parasternal long-axis transthoracic echocardiography demonstrates a bright linear structure (arrows) in the proximal ascending aorta. LA = left atrium; RV = right ventricle.

right side of his body. He was diagnosed with an acute neurological event and treated with intravenous heparin, and his symptoms improved.

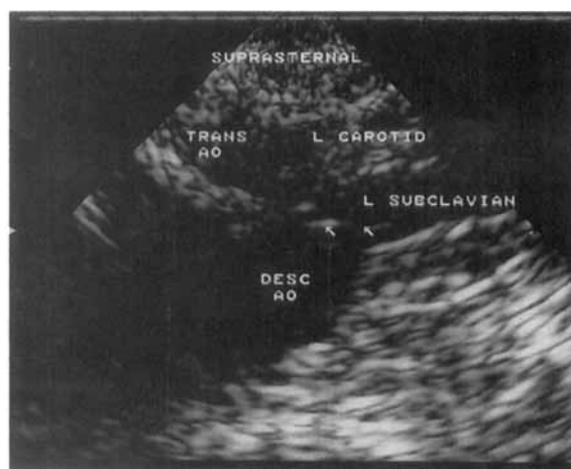
Significant past history included a coronary artery bypass graft surgery 10 years earlier. A gunshot wound to the left chest 16 years before the present illness was asymptomatic. A permanent VVI pacemaker was inserted 6 years earlier, and two reversible neurologic events were reported 2 years before the present illness.

On presentation, the patient was taking 325 mg/day aspirin. A computed tomography scan of the brain was consistent with multiple scattered old embolic strokes. The admission electrocardiogram revealed a ventricular pacemaker rhythm with a right bundle-branch

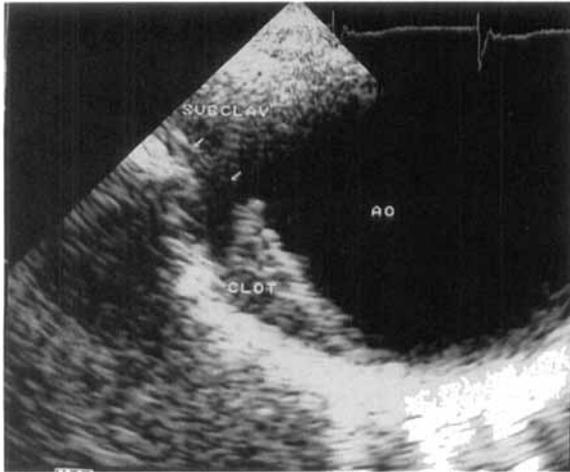
block (RBBB) morphology (Fig. 1). Chest radiography (Fig. 2) revealed an abnormal course of the pacer wire. The patient was subsequently referred to our institution for further evaluation and treatment.

TTE revealed an abnormal bright linear structure consistent with a pacemaker lead crossing the aortic valve (Fig. 3). Suprasternal TTE imaging (Fig. 4) also revealed a bright linear structure entering the thoracic aorta from the left subclavian artery. The patient underwent a TEE examination. The pacemaker lead was noted to enter the thoracic aorta via the left subclavian artery (Fig. 5). A mass, suggestive of a laminated thrombus, was noted between the wall of the aorta and the pacemaker lead. The pacemaker lead was noted arching around the transverse aorta (Fig. 6). It then crossed the aortic valve (Fig. 7), across the left ventricular outflow tract (Fig. 8), and inserted into the wall of the LV, under the posterior mitral valve leaflet (Fig. 9), above the papillary muscle. Attached to a head of the papillary muscle was a 0.5-cm mobile mass, consistent with thrombus. The tip of the pacer wire did not have thrombus attached.

The patient was offered surgical extraction, but he refused. He has been receiving warfarin



**Figure 4.** Suprasternal transthoracic echocardiography demonstrates a bright linear structure (arrows) entering the aorta (DESC AO) from the left subclavian artery (L Subclavian). L CAROTID = left carotid artery; TRANS AO = transverse aorta.



**Figure 5.** Transesophageal echocardiography in the upper esophagus with a 30° angle demonstrates pacemaker wire (arrows) entering the aorta (AO) from the left subclavian artery (SUBCLAV). Thrombus (CLOT) is noted between the wall of the aorta and the pacemaker wire.



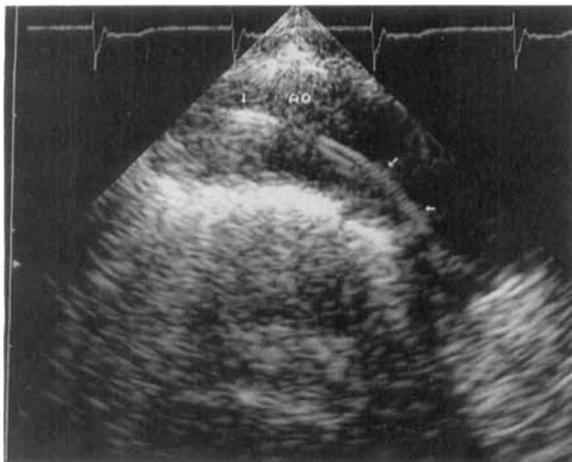
**Figure 7.** Transesophageal echocardiography in the mid-upper esophagus with 135° angle demonstrates the pacemaker wire (arrows) crossing the aortic valve, entering the left ventricle. There was no aortic regurgitation. AO = proximal ascending aorta; LA = left atrium.

therapy and has not had any further clinical events by 8 months.

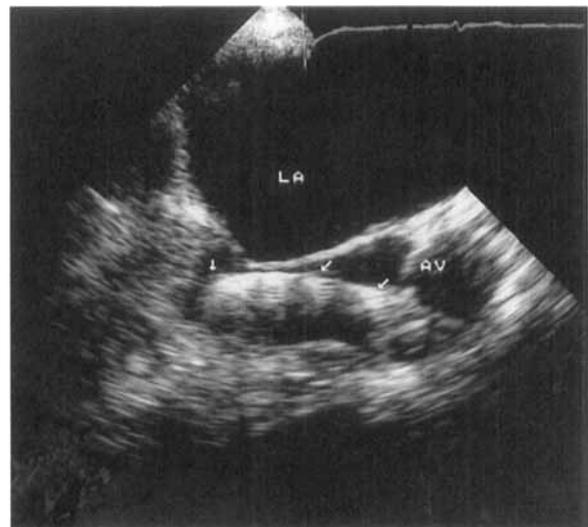
### Discussion

Malposition of a permanent pacemaker lead inserted into LV is a well recognized but un-

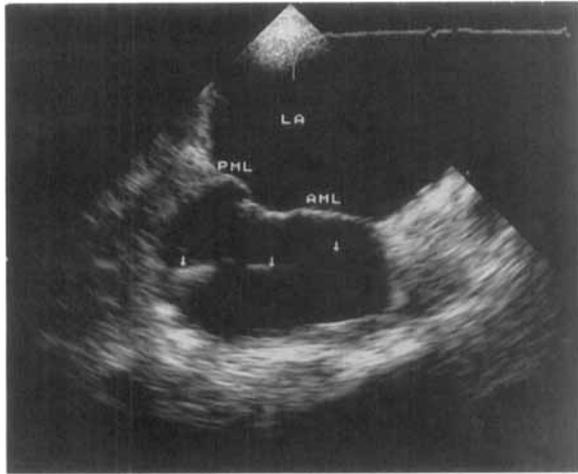
common complication.<sup>1-14</sup> Insertion of the tip into the LV may occur several ways. Most commonly, the pacer lead is inserted via the venous system, but it crosses the atrial septum (patent



**Figure 6.** Transesophageal echocardiography from the upper esophagus of the thoracic aorta (AO). The pacemaker wire (arrows) courses retrograde.



**Figure 8.** Transesophageal echocardiography in the mid-upper esophagus at 75° demonstrates pacemaker wire (arrows) within the left ventricular outflow tract. AV = aortic valve; LA = left atrium.



**Figure 9.** Transesophageal echocardiography in the mid-upper esophagus at 75° demonstrates the pacemaker wire (arrows) insertion site below the posterior mitral valve leaflet (PML) into the left ventricular wall. The papillary muscle was below the insertion site. A thrombus was noted by real-time imaging, attached to a papillary head. AML = anterior mitral valve leaflet; LA = left atrium.

foramen ovale or atrial septal defect), from the right atrium into the left atrium and then into the LV.<sup>1-10</sup>

We are aware of at least six case reports in which a permanent pacemaker lead was inadvertently placed initially into an artery and guided across the aortic valve, into the LV.<sup>1,8,10-13</sup> One case was confirmed by TEE; this lead was implanted in the right subclavian artery.<sup>11</sup>

The diagnosis of a pacemaker tip within the LV may be suspected on the basis of a 12-lead electrocardiogram demonstrating an RBBB pattern while in the paced mode. However, an RBBB pattern may also occur with a lead positioned in the coronary sinus, penetration of the ventricular septum, perforation of the right ventricle, pacing of an enlarged right ventricular apex, and LV epicardial pacing.<sup>14</sup>

Posteroanterior (PA) and lateral chest radiographs help localize the abnormal position of a pacemaker lead. A lead normally positioned in the right ventricular apex has a right lateral course through the right atrium on PA projection, with a slight bowing at the right ventric-

ular apex. The lateral projection normally reveals an anterior course of the lead to be adjacent to the sternum.<sup>3</sup>

This patient's PA projection chest radiograph revealed that the lead never crossed the midline, originating from the left subclavian artery. The lateral view documented a posteriorly directed tip within the cardiac shadow.

The combined use of TTE and TEE fully documented the course of a chronically implanted pacemaker lead beginning from the left subclavian artery, entering the thoracic aorta, crossing the aortic valve, and going into the posterior wall of the LV. Importantly, thrombus was detected within the aorta and the LV cavity.

### Conclusion

TTE and TEE together were used to document the entire arterial course of a pacemaker lead implanted through the left subclavian artery. Importantly, thrombus was noted both in the thoracic aorta and the LV cavity.

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