Dynamic Coronary Artery Compression by Pacemaker Lead

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A 12-year-old girl with corrected transposition (L-transposition of the great arteries with ventricular inversion) and congenital complete atrioventricular block underwent epicardial pacemaker implantation with a single ventricular lead at 1 week of life. Subsequently, she presented for routine follow-up care in the electrophysiology clinic with no symptomatic concerns. She denied chest pain. Her physical examination was unremarkable, with the pacemaker generator palpable in the left subcostal region. ECG at that time demonstrated ventricular pacing with 100% capture and no evidence of atrioventricular conduction. Her chest x-ray revealed that the pacemaker lead completely encircled the cardiac silhouette and prompted concern for cardiac strangulation (Figure 1). A subsequent computed tomography scan showed a likely restrictive effect on both ventricles caused by the pacemaker lead encircling the heart with concern for coronary artery compression (Figure 2), but dynamic evaluation of myocardial wall motion and the relationship of the lead to the coronary arteries could not be assessed because ECG gating was unsuccessful.

Cardiac catheterization with coronary angiography was performed to better delineate the pathway of the pacemaker wire in relationship to the coronary arteries. Selective angiograms of the left coronary artery demonstrated dynamic compression of the left anterior descending artery by the encircling pacemaker lead that was more evident during diastole (Figures 3 and 4 and Movies I and II in the online-only Data Supplement). An ECG at that time did not demonstrate ischemia. The patient underwent surgery for pacemaker generator and lead removal and placement of a new epicardial dual-chamber pacing system. During the surgery there was no obvious injury to the coronary artery system on inspection, and the new leads were positioned away from the coronaries. Follow-up coronary angiography demonstrated complete resolution of the coronary compression, with no residual defects (Figure 5).

Only rare case reports exist regarding cardiac strangulation by pacemaker leads. Cases have more commonly been found postmortem or in patients presenting with symptoms of myocardial ischemia.1–4 This case is unique in that the patient was completely asymptomatic at presentation. Continued awareness of the potential complications of pacemaker lead placement may help to detect further cases before the development of myocardial ischemia or infarction. Careful review of anteroposterior and lateral chest x-rays at routine intervals may be warranted after pacemaker lead placement.

Disclosures

Dr Macicek received a Medtronic Electrophysiology Training Scholarship. Dr Cannon received an honorarium from St. Jude Medical.

Figure 1. Chest radiographs of anteroposterior (A) and lateral (B) demonstrating the epicardial pacing wire encircling the cardiac silhouette.
and serves as an expert witness. Dr Ing is on the speakers’ bureau of AGA Medical, has received honoraria from AGA Medical, and serves as an expert witness. Drs Kyle, Krishnamurthy, and Breinholt had no disclosures.

References

Figure 2. (A) Axial image from an ungated contrast-enhanced computed tomography scan of the chest demonstrates indentation of the myocardium of both the right-sided (black arrow) and left-sided (white arrow) ventricles by the epicardial pacing lead suggestive of restriction. The pacing lead appears white with surrounding dark streaks due to a metallic beam-hardening artifact. A indicates anterior. (B) Three-dimensional volume rendering from the ungated computed tomography scan demonstrates changes of L-transposition of the great arteries with the ECG lead encircling the heart (white arrows). S indicates superior; I, inferior.

Figure 3. Angiography demonstrating compression of left anterior descending coronary artery by an epicardial pacing lead (arrow) noted from an right anterior oblique projection during diastole (A) and resolution of filling defect of the left anterior descending during systole (B) demonstrating the dynamic nature of compression.
Figure 4. Lateral projection angiography demonstrating compression of the left anterior descending coronary artery by encircling pacemaker lead (arrow) during diastole (A) and resolution of filling defect of the left anterior descending during systole (B).

Figure 5. Follow-up angiogram after lead extraction and dual-chamber epicardial pacemaker placement demonstrating unobstructed coronary filling without residual defect.
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