ARCHIVES OF THE TURKISH SOCIETY OF CARDIOLOGY

Official journal of the TURKISH SOCIETY OF CARDIOLOGY

Left Bundle Branch Area Pacing in a Patient with Ventricular Septal Defect

Ventriküler Septal Defektli Bir Hastada Sol Dal Bölgesi Uyarımı

CASE IMAGE
OLGU GÖRÜNTÜSÜ

A 45-year-old male patient with a ventricular septal defect (VSD) and high-degree atrioventricular block was referred for permanent pacemaker implantation (Figure 1). Previous echocardiographic evaluations revealed a small hemodynamically insignificant perimembranous VSD, a small hemodynamically insignificant secundum-type atrial septal defect, an incomplete form of the Shone complex, and a left ventricular ejection fraction (LVEF) of 62%. Given his young age, long life expectancy, and sufficient landing zone in the interventricular septum, left bundle branch area pacing (LBBAP) was selected. A standard, stylet-driven active-fixation pacing lead (Solia S60 ProMRI, Biotronik) was implanted in the left bundle branch area approximately 2 cm apical from the superior margin of the tricuspid annulus. This placement considered the perimembranous location of the VSD, utilizing a pre-shaped delivery catheter (Selectra 3D, Biotronik) (Video 1). Both unipolar and bipolar modes yielded good sensing (R wave >10 mV) and pacing (capture threshold <1 V @ 0.4 msec, impedance of 800 Ω) results. Following the implantation of the standard atrial lead (Solia S53 ProMRI, Biotronik), a dual-chamber pulse generator was secured within the pocket. Throughout the 18-month follow-up, consistently steady sensing and pacing parameters, along with stable lead positions, were documented (Figure 2).

Pacing requirements may arise due to underlying conditions and interventional procedures in patients with congenital heart disorders. For complex cases that involve unusual locations of the conduction system, 3D electroanatomic mapping systems can assist operators in precisely identifying landing zones for pacing lead implantation to capture the conduction system effectively. However, in patients without complex congenital heart defects, as in our case, standard approaches such as fluoroscopy, intracardiac signal analysis, and pacing maneuvers can successfully guide the implantation of the pacing lead into the conduction system. Periprocedural imaging using computed tomography, magnetic resonance imaging, and/or transesophageal/intracardiac echocardiography is also useful for defining congenital cardiac anomalies, their association with cardiac structures, and aids in decision-making for procedural steps and the selection of implantation tools.

During the peri-procedural period and subsequent follow-up, several factors are crucial. First, achieving precise placement of the pacing lead in the left bundle branch area can be challenging due to anatomical variations, including those in the conduction system caused by the VSD. Navigating catheters and placing pacing leads accurately is technically demanding. Careful mapping and navigation are crucial to avoid complications such as inadvertent septal perforation, dislodgement, or damage to nearby structures. Additionally, patients with VSD may have existing conduction abnormalities or be at higher risk for developing them. Thus, LBBAP could exacerbate these issues or lead to new ones, such as bundle branch block or heart block. Second, the lead implantation site should be positioned sufficiently far from the defect to prevent interference with future surgical or percutaneous closure procedures. Third, special attention should be paid to certain aspects during follow-up. The presence of a VSD may affect lead stability over time due to the altered anatomy and mechanical stresses. Regular follow-up is necessary to monitor lead position and function. Patients with VSD are at an increased

Serkan Çay
Özcan Özeke
Fırat Özcan
Meryem Kara
Elif Hande Özcan Çetin
Ahmet Korkmaz
Serkan Topaloğlu

Division of Arrhythmia and Electrophysiology, Department of Cardiology, University of Health Sciences, Yuksek Ihtisas Cardiovascular Building, Ankara City Hospital, Ankara, Türkiye

Corresponding author:
Serkan Çay
✉ cayserkan@yahoo.com

Received: March 16, 2024
Accepted: May 20, 2024

Cite this article as: Çay S, Özeke Ö, Özcan F, et al. Left Bundle Branch Area Pacing in a Patient with Ventricular Septal Defect. *Turk Kardiyol Dern Ars.* 2025;53(1):77-79.

DOI:10.5543/tkda.2024.40558

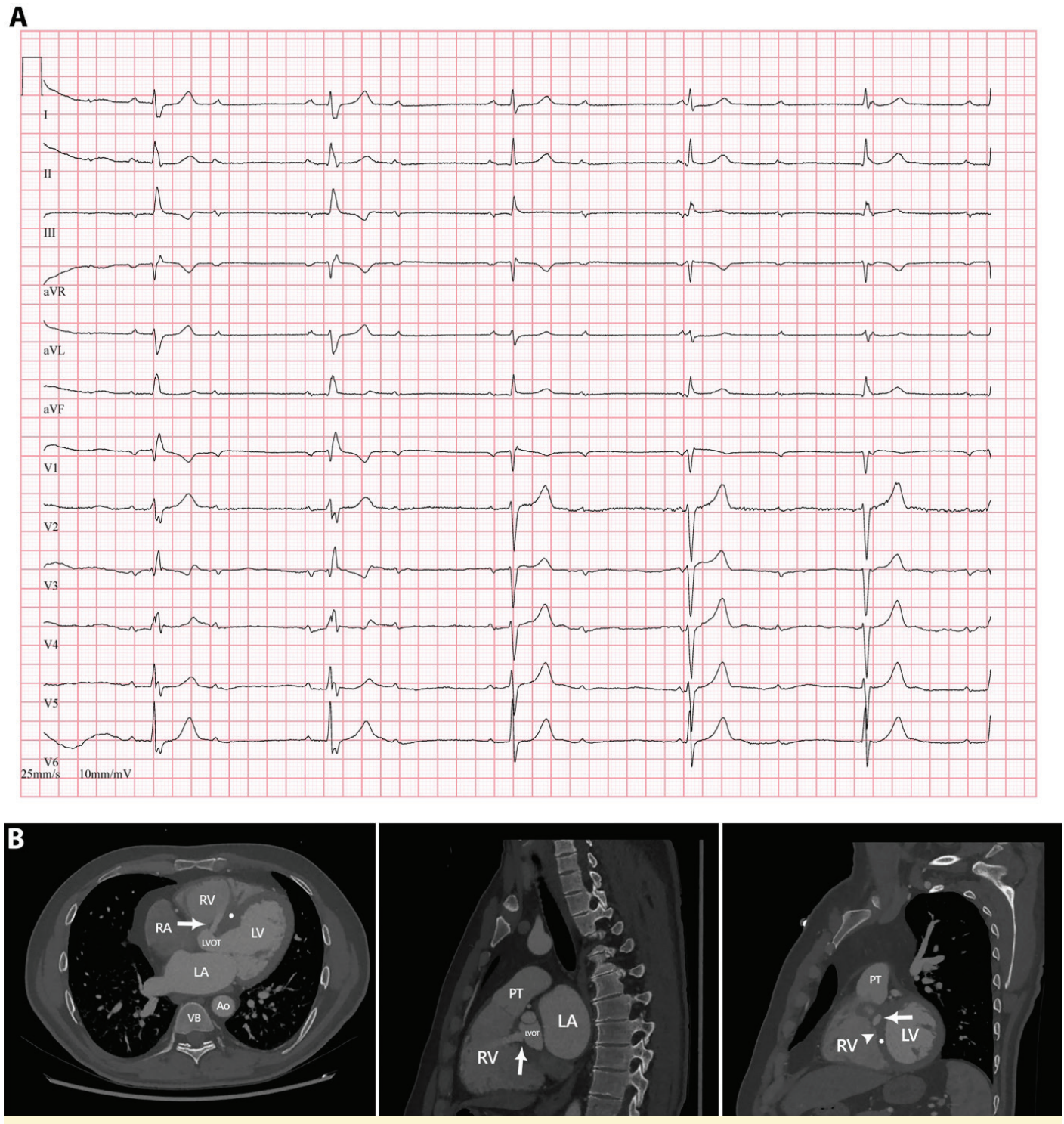

Figure 1. Preprocedural 12-lead surface electrocardiography shows complete heart block, variable sinus rates including bradycardia, and escape ventricular rhythms with intermittent junctional and right bundle branch block morphology (Panel A). Chest CT images display a perimembranous VSD with a left-to-right shunt beneath the aortic valve (indicated by white arrows) in both the axial (left panel) and sagittal (middle and right panels) planes. Just beneath the VSD, sufficient landing zone and interventricular septal thickness are visible (indicated by the arrowhead) (Panel B).

Ao, Aorta; CT, Computed Tomography; LA, Left Atrium; LV, Left Ventricle; LVOT, Left Ventricular Outflow Tract; PT, Pulmonary Trunk; RA, Right Atrium; RV, Right Ventricle; VB, Vertebral Body; VSD, Ventricular Septal Defect.

A small white asterisk denotes the interventricular septum.

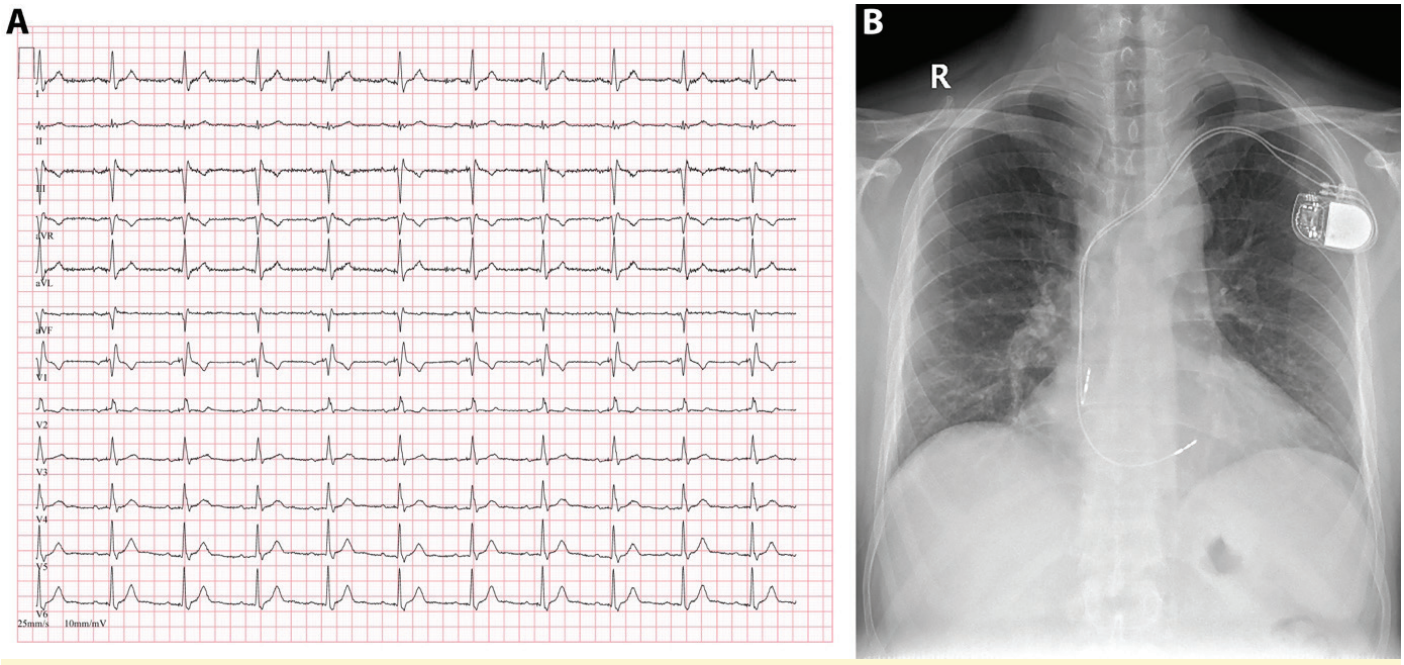

Figure 2. Postprocedural 12-lead surface electrocardiography illustrates atrial-sensed selective LBBP with an R-wave peak time of 66 msec in lead V6, an interpeak delay of 55 msec between leads V1 and V6, and a QRS duration of 116 msec (Panel A). The posteroanterior chest X-ray depicts the dual-chamber pacemaker, with the RA electrode and a ventricular septal electrode positioned in the appendage and upper septum, respectively (Panel B).

LBBP, Left Bundle Branch Pacing; RA, Right Atrium.

risk of infections, and the introduction of pacing leads further elevates this risk. Vigilant monitoring for signs of infection during follow-up is also essential.

Informed Consent: Informed consent was obtained from the patient for the publication of the case image and accompanying images.

Peer-review: Internally peer-reviewed.

Author Contributions: Concept – S.Ç.; Design – S.Ç.; Supervision – S.Ç.; Resource – S.Ç.; Materials – S.Ç.; Data Collection and/or Processing – S.Ç.; Analysis and/or Interpretation – S.Ç.; Literature Review – S.Ç.; Writing – S.Ç.; Critical Review – Ö.Ö., F.Ö., M.K., E.H.Ö.Ç., A.K., S.T.

Conflict of Interest: The authors declare that there are no conflicts of interest.

Funding: The authors declared that this study received no financial support.

Video 1. Contrast injection through the delivery sheath demonstrates the depth of the ventricular electrode in the septum (septography). Implanted RA and septal leads are visible in the RAO and LAO views. Additionally, LV angiography highlights the perimembranous VSD, interventricular septum, and the positioning of the pacing lead in the upper septum.

LAO, Left Anterior Oblique; LV, Left Ventricular; RA, Right Atrium; RAO, Right Anterior Oblique; VSD, Ventricular Septal Defect.