KLİNİKİ MÜŞAHİDƏLƏR **AÇIQ GİRİŞ (OPEN ACCESS)**

CHALLENGES OF LEADLESS PACEMAKER IMPLANTATION IN PATIENTS WITH ANATOMICAL ANOMALIES AND THEIR MANAGEMENT USING CONVENTIONAL METHODS: A CLINICAL CASE.

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Introduction: Situs ambiguus refers to an abnormal arrangement of the internal organs within the body that differs from the normal anatomical configuration. This condition is characterized by a disorganized, atypical, and complex positioning of multiple organs.
Keywords: Situs ambiguus, Leadless pacemaker, Transvenous pacemaker

A leadless pacemaker, unlike conventional pacemakers, does not use transvenous leads and is a small, fully self-contained, wireless pacing device that is implanted entirely within the heart.

Clinical case: A 33-year-old woman presented to our clinic with a 10-year history of recurrent syncope. A thoracic CT scan performed at another medical center revealed situs ambiguus, a dilated coronary sinus anomaly, interrupted inferior vena cava, and a persistent left superior vena cava. Twenty-four-hour Holter monitoring demonstrated episodes of complete atrioventricular (AV) block occurring at different times of the day (Picture 1).

Given the patient's young age, the minimal risk of infection, and the presence of complex anatomical anomalies, a decision was made to proceed with **leadless pacemaker implantation**. The patient was taken to the catheterization laboratory under general anesthesia. Access was obtained via the **right jugular vein**. Using a **23F delivery system**, the pacemaker was initially positioned in the **right atrium** and subsequently advanced into the **right ventricle**. Under **RAO and LAO fluoroscopic views** and with contrast injection, the device was tested in several suitable positions, and optimal placement was confirmed before final implantation (Picture 2a and 2b).

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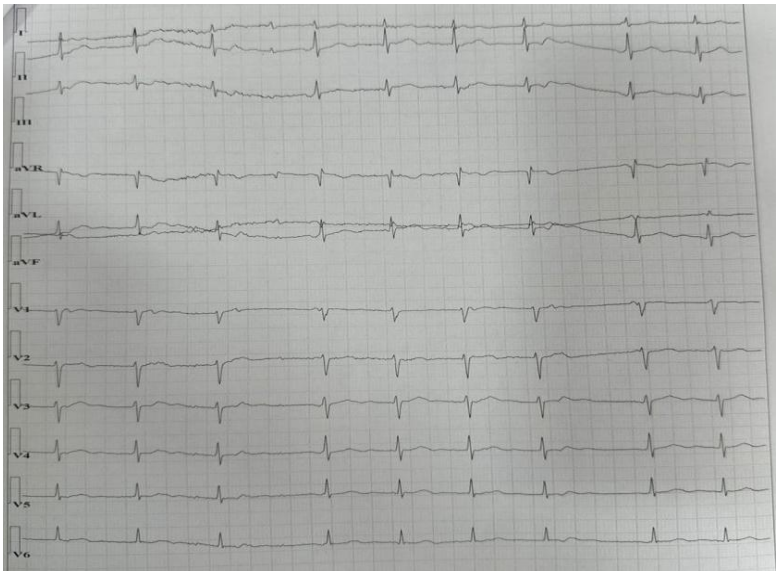
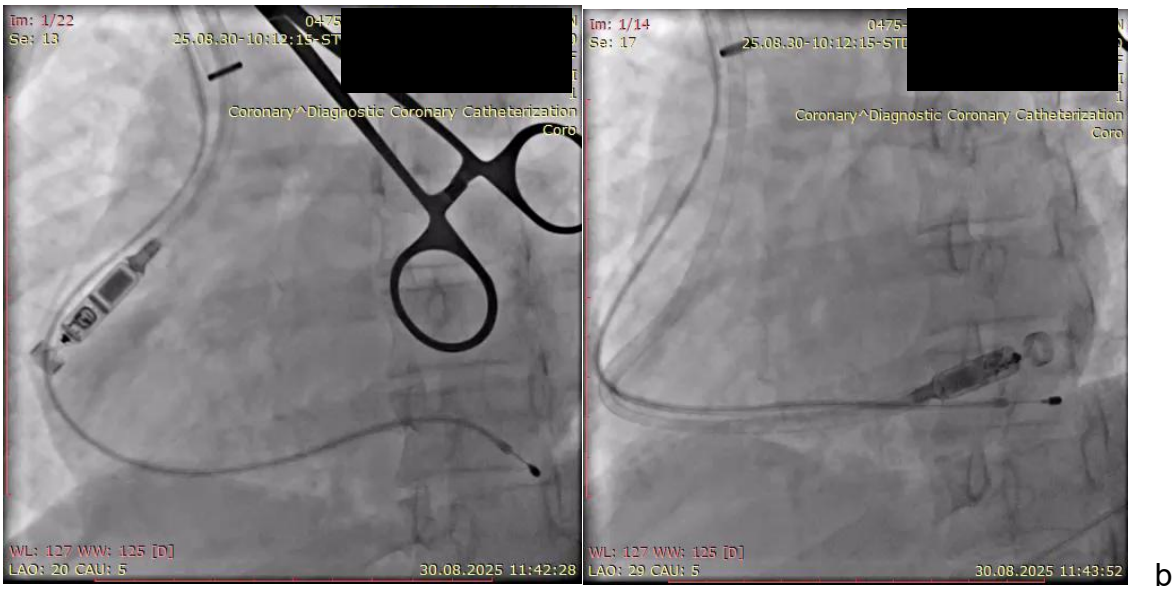


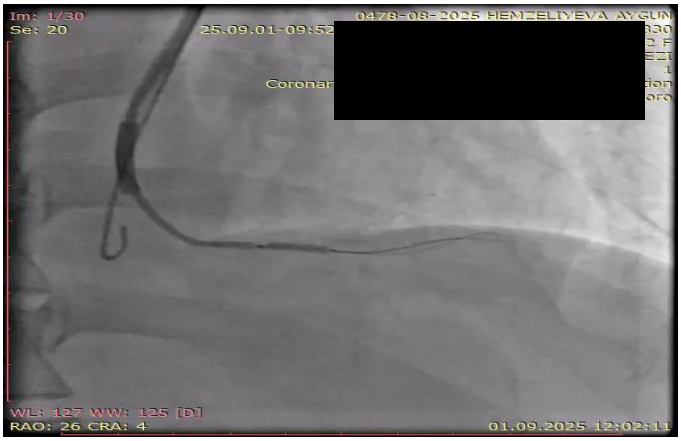
Picture 1. Twenty-four-hour Holter monitoring demonstrated episodes of complete atrioventricular (AV) block occurring at different times of the day.



a b

Picture 2a and 2b. The device tested in several suitable positions, and optimal placement confirmed before final implantation.

However, when all device parameters were checked, capture could not be achieved even at high output, preventing optimal measurements and successful pacing. Therefore, the leadless pacemaker was removed, and a decision was made to implant a transvenous pacemaker providing left ventricular (LV) pacing. Two punctures were performed in the left axillary vein, and a short and a long guidewire were advanced via the persistent vein into the coronary sinus. Selective coronary sinus venography was performed, and after identifying the target coronary sinus branch, the coronary sinus lead was advanced and positioned in the desired location (Picture 3).



Picture 3. The coronary sinus lead advanced and positioned in the desired location.

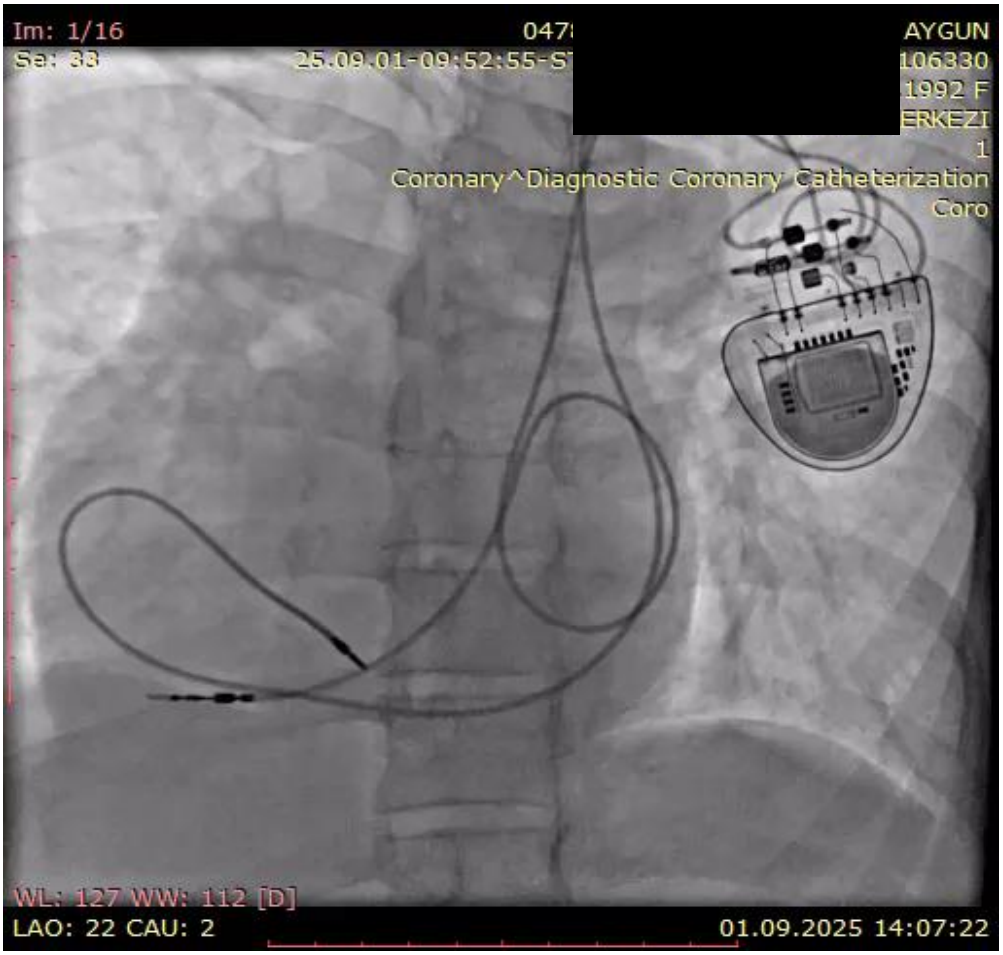
Although the measurements were optimal, the coronary sinus was abnormally dilated and its side branches were short, causing repeated dislodgement of the coronary sinus lead. An active-fixation lead was therefore used and positioned horizontally in the right atrium, with radiographic inferior but anatomically superior-lateral fixation, allowing for stable placement and achievement of optimal pacing parameters (Picture 4).

Picture 4. An active-fixation lead was therefore used and positioned horizontally in the right atrium, with radiographic inferior but anatomically superior-lateral fixation.

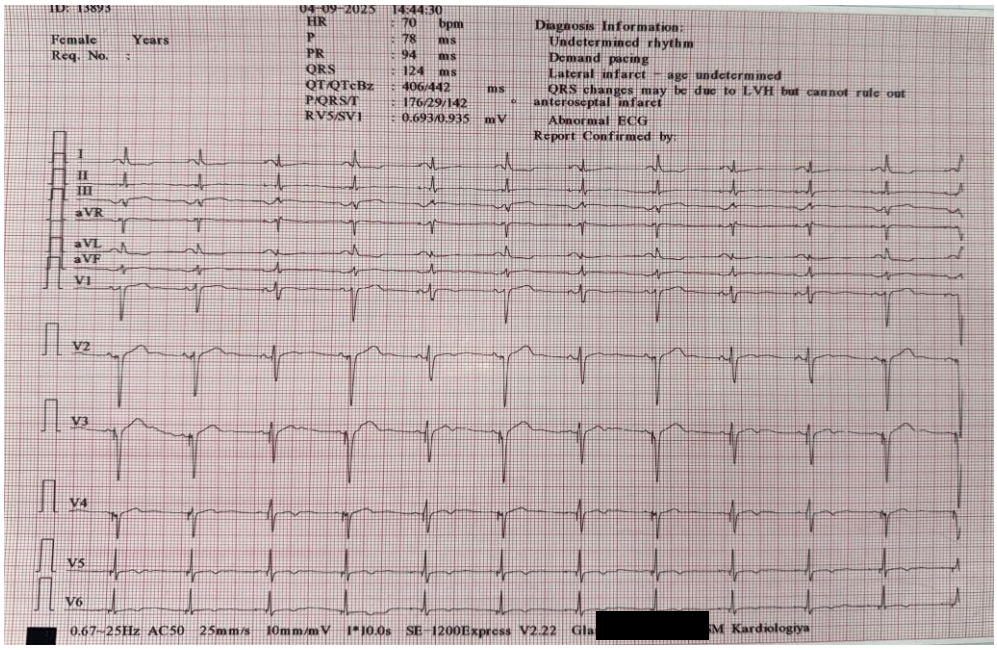
Subsequently, due to an **RV outflow tract anomaly** from the previous procedure, a **long guiding catheter** was advanced through the **LPSVC** and, using a **Tiger catheter**, into the **right ventricle**. For radiographic reference, a **0.014" coronary guidewire** was positioned in the **RVOT** through these catheters. In parallel, an **active-fixation lead** was advanced into the **RV septal region** using the guidewire as a reference, achieving **optimal pacing parameters (Picture 5)**.

Picture 5. **Active-fixation lead** advanced into the **RV septal region.**

As a result, the patient underwent **successful transvenous pacemaker implantation with leads**, achieving **effective septal pacing (Picture 6 and Picture 7)**.



Picture 6. Successful transvenous pacemaker implantation.



Picture 7. Result of effective septal pacing.

Discussion: This clinical case demonstrates that in patients with situs ambiguus, abnormal anatomical structures may hinder leadless pacemaker implantation, as proper positioning and fixation of the device may not be achievable. Conventional transvenous pacemakers remain a reliable alternative in such scenarios. Careful preoperative imaging and assessment of anatomical features are essential for optimal device selection and successful implantation.

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