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## **Ventricular septal hematoma caused by left bundle branch pacing electrode implantation. The role of coils in closing abnormal vascular connections**

**Short title:** Ventricular septal hematoma treated with coils implantation

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Conduction system pacing is the most physiological mode of ventricular stimulation [1]. The procedure requires penetrating the significant depth of interventricular septum (IVS) with an electrode to capture conduction fibers. Ventricular septal hematoma is a rare complication of interventional procedures, but rapidly growing, it can lead to symptoms of tamponade and heart failure [2, 3]. The most often approach is “watchful waiting”, however, other approaches should be taken into consideration even at the early stages of this complication [3].

We present a case of a 69-year-old patient with hypertension who underwent pacemaker implantation due to complex forms of conduction system disturbances (first-degree block, LAH, intermittent RBBB and LBBB at Holter recordings). The Selectra 3D-65-39 sheath was used and 5.6F Solia S 60 cm electrode (Biotronik SE & Co, Berlin, Germany) was implanted according to current recommendations [5]. The bundle of His was localized, but the stimulation threshold was high. Mapping of the septal region was performed and at the 4<sup>th</sup> attempt, the electrode was implanted in the inferior part of the IVS with left septal fascicle pacing (QRS complex 132 ms, R-wave 14 mV, pacing threshold 0.9 V, impedance 1447 Ohm). After that an atrial lead (Solia S 53cm) was implanted (**Figure 1A**). The procedure lasted 45 minutes, with a

fluoroscopy time of 8 minutes. After the procedure, an electrocardiogram (ECG) was performed documenting QRS morphology consistent with LBB pacing (Figure 1B).

After 6 hours, the patient experienced chest pain. The ECG revealed ST-segment elevation in the V1–V3 leads (Figure 1D). Echocardiography showed thickening of the IVS up to 3cm with signs of small hematoma (Figure 1C). Coronary angiography revealed a perforation of the IVS with extravasation of contrast from two small septal branches. Conservative treatment was conducted. In the following days, the patient had a fever without significant cardiac complaints. No hematoma growth was observed on echocardiography. On day 5, computed tomography angiography revealed contrast flow between the septal branch and the interventricular septum suggesting a fistula formation. The repeated coronary angiography confirmed blood flow between the two branches of the septal artery and the cavity in the septum communicating with the coronary sinus and the right atrium (not present on the first angiography, Figure 1E). After insertion of an angioplastic guidewire (Whisper ES) and a dedicated microcatheter into individual branches, coil implantation was performed deploying one OPTIMA coil into the first branch and three Optima coils into the second branch achieving complete closure of vascular connections (Figure 1F). A 1-year follow-up was without complications.

An IVS hematoma can be a consequence of a left bundle branch pacing lead implantation, which is considered a benign complication, but it is a potentially life-threatening situation with unknown long-term sequelae. While interventricular hematoma is suspected, echocardiography and computed tomography angiography should be performed to exclude progression or fistula formation. Similar complications have been reported during retrograde CTO procedures leading to dramatic clinical scenarios [2]. The closure of the artery responsible for the IVS bleeding with coils can be necessary at an early stage of treatment. Cardiologists with various experience in implanting electrodes for conduction system should be aware of the risk of such a complication even later after the procedure, and there is a need for a management algorithm to be worked out [3, 5].

## Article information

**Conflict of interest:** None declared.

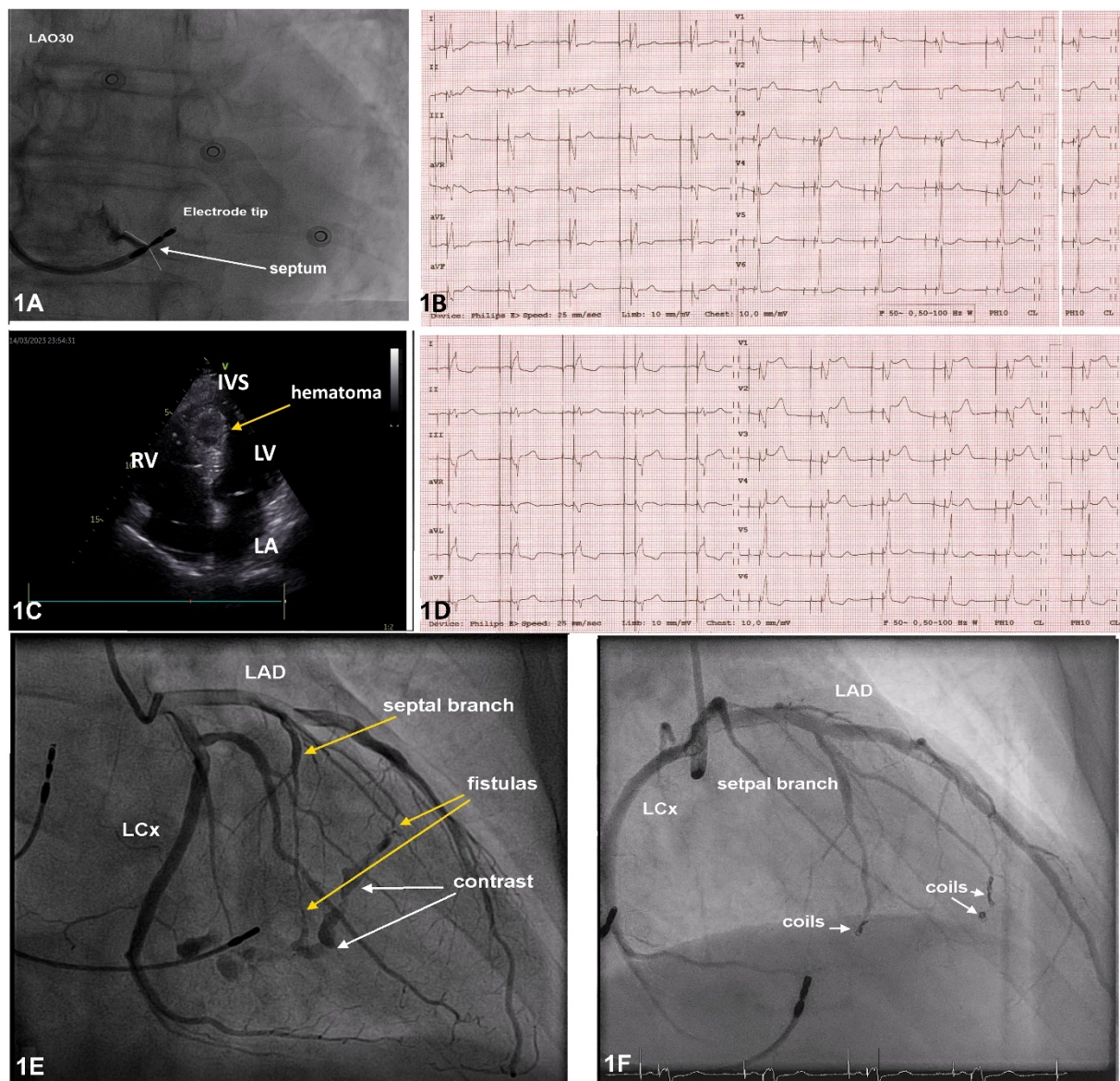
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**Figure 1.** **A.** The location of the ventricular electrode. Contrast injection presents the position of the septum. **B.** The 12-lead ECG after implantation. **C.** The echocardiographic image presenting a septal hematoma. **D.** The 12-lead ECG presenting ST segment elevation in precordial leads. **E.** Coronary angiography presenting the fistulas between septal branches and blood pool within IVS. **F.** The final result of coils implantation

Abbreviations: IVS, interventricular septum; ECG, electrocardiogram; LA, left atrium; LAD, left anterior descending artery; LCx, left circumflex artery; LV, left ventricle; RV, right ventricle