Transarterial Percutaneous Pacemaker Lead Extraction

Inadvertent placement of pacemaker (PMK) leads in the left ventricle (LV) through a subclavian artery is a rare complication during device implantation.

We report the case of a 63-year-old female patient with a history of single-chamber pacemaker implantation due to complete AV block. Routine echocardiography 3 months after the implantation showed the pacing lead crossing the aortic valve and positioned in the LV. The patient was asymptomatic, and was referred to our center. On admission, anticoagulant therapy was started and different diagnostic studies were performed. Transesophageal echocardiography (TEE) confirmed the presence of the lead in the LV crossing the aortic valve, and ruled out the presence of thrombi. A selective venography of the right subclavian vein verified the presence of the lead outside the vein, via the subclavian artery (Figure 1 A). Lead extraction with cardiovascular surgery was suggested once the diagnosis was confirmed in order to avoid lifetime anticoagulation, since the patient had a history of gastrointestinal bleeding. This option was rejected by the patient, so percutaneous extraction was the treatment of choice.

Two days before the procedure, a dual-chamber PMK was implanted in the left hemithorax. Removal was performed in a hybrid operating room under general anesthesia, guided by TEE. First, the PMK pocket was exposed and the lead was disconnected from the battery. Next, the lead was freed from the surrounding tissue up to the subclavian artery. Via a pigtail catheter, the lead point of entry into the artery was located and the necessary steps for covered-stent implantation were followed (Figure 1 B). The lead was then carefully removed manually until the tip was close to its entry site in the subclavian artery. A 7 x 50 mm self-expandable covered stent (Viabahn™ Gore) was inserted through right brachial access and positioned at the lead entry site. The lead was then completely removed with immediate stent deployment, covering the opening left by the lead in the artery (Figure 1 C). Control angiography confirmed adequate stent deployment, without contrast leak (Figure 1 D). The patient recovered uneventfully, and was discharged after a 48-hour observation period. No complications have been reported one year after the procedure.

Malposition of a pacemaker leads in the LV is a rare complication. What makes our case special is that the lead accessed the LV through the subclavian artery. In this rare complication, the lead usually accesses the LV through a foramen ovale of atrial or ventricular septal defects. (1)

These patients can be asymptomatic –suspected of right bundle branch block in ECG during ventricular stimulation– or can present embolic events and structural heart lesions. (2) Their risk of thromboembolism

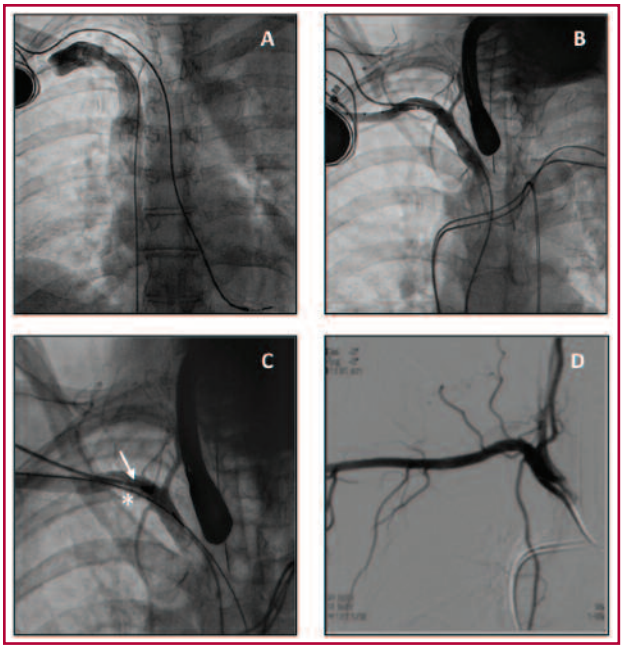

Fig. 1. A. Venography of the right subclavian vein showing the pacemaker lead passing outside the vein through the subclavian artery. **B.** Angiography of the right subclavian artery showing the lead inside the artery, the pigtail catheter, the leads of the new pacemaker and the transesophageal echo probe. **C.** Covered stent (asterisk) and pacemaker lead (arrow) placed at the entry site to the artery, just before the extraction. **D.** Digital subtraction angiography showing correct stent deployment without blood extravasation.

is high due to lead contact with the systemic circulation; therefore, anticoagulation should be started immediately once the diagnosis is confirmed.

With the passage of time, the lead can be surrounded not only by thrombi but also by cell proliferation tissue. Thus, any manipulation of the lead entails risk of embolism. Decision to extract the lead is based on several factors, including time between the implantation and diagnosis, thrombi attached to the lead, and the presence of symptoms, comorbidities, etc. Therefore, a conservative treatment with anticoagulation therapy is recommended in asymptomatic patients. On the other hand, lead extraction is recommended in symptomatic patients, in those with contraindication for anticoagulation therapy, in patients with embolic events despite being correctly anticoagulated or requiring cardiac surgery for other reasons; in these cases, cardiovascular surgery is the method of choice. (3)

In the present case, cardiovascular surgery was strongly rejected by our patient, so percutaneous extraction was the option, which implies two potential risks: thromboembolic complications during lead manipulation, and bleeding at lead entry site into the artery. The use of extraction tools with sheaths or laser is strongly not recommended to avoid embolism dur-

ing lead manipulation. In this patient, the absence of thrombus in the TEE, the short time between implantation and extraction, and the non-use of extraction tools reduced the risk of thrombus detachment.

Isolated cases of complex surgical techniques have been reported to close the arterial puncture site and prevent bleeding through the subclavian artery after lead extraction. (4) Using a vascular management, Kosmidou et al. described two cases of percutaneous lead removal via the left subclavian artery with a novel method employing a covered-stent as hemostatic barrier at the site of lead extraction in the subclavian artery, associated with embolic protection filter in the carotid artery. (5) A similar approach was followed in our patient, but we omitted the use of carotid embolic protection systems due to the short time between the implantation and the extraction, the absence of thrombus in the TEE and the lack of relevant evidence on the usefulness and safety of these devices during carotid angioplasty. (6)

In conclusion, we report the successful percutaneous extraction of a lead inadvertently placed in the left ventricle via the subclavian artery, using a covered stent at the entry site into the subclavian artery. In selected cases, this approach is a safer and less invasive option to cardiovascular surgery.

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Transapical Closure of Left Ventricular to Right Atrial Shunt Following Endocarditis

The communication between the left ventricle (LV) and the right atrium (RA) (Gerbode defect) is a very rare congenital or acquired defect of the septum dividing the right heart from the left heart. In recent years, percutaneous closure with a device has become a therapeutic option to traditional surgical repair. It can be performed using the transfemoral approach and a second option is the transapical approach.

We report the case of a 37 year-old female patient, with a history of two cardiac surgeries: closure of an ostium primum atrial septal defect at 4 years of age, and prosthetic mitral valve replacement (disc valve) for heart failure due to cleft, at the age of 6 years. She presented with late prosthetic valve endocarditis due to S. viridans during her first pregnancy, which was medically treated. At the age of 32 years, the patient was diagnosed with asymptomatic acquired Gerbode defect. She presented dyspnea on moderate exertion at the age of 37. Physical examination revealed a grade 3/6 systolic murmur at the left parasternal edge that radiated to the right of the sternum. It also revealed c-v wave in the jugular venous pulse and pulsating liver as seen in tricuspid regurgitation. The ECG revealed biventricular hypertrophy and right atrial enlargement, whereas the chest x-ray showed cardiomegaly and mechanical prosthesis in mitral position.

The echocardiography showed marked biatrial enlargement, and the color Doppler revealed systolic flow from the LV to the RA, with improved visualization in the transesophageal echocardiography (TEE) showing the defect at the level of the anterior membranous septum below the mitral prosthesis, with flow towards the RA. Three-dimensional (3D) echocardiography images showed that defect directly, and allowed to estimate its borders (Figure 1).

Percutaneous closure of the LV to RA shunt from the femoral artery was decided. In the catheterization laboratory, under general anesthesia, with TEE guidance and accessing via both femoral arteries, a guidewire could be introduced with difficulty through the defect but the catheter with the device could not be positioned. The system had to advance from the femoral artery through the aorta, follow the aortic arch, and from the LV apex make a countercurve to get through the orifice between the ventricular septal defect (VSD) patch and the atrial septum. Since it was more rigid than the guidewire, it could not be positioned properly. The procedure was ended without complications.

In that situation, the transapical approach was chosen. A submammary left anterior thoracotomy through the sixth intercostal space was performed under general anesthesia, and a purse string suture was performed for LV puncture. A 7 Fr introducer sheath