Successful implantation of a permanent pacemaker through a persistent left superior vena cava by using a right subclavian approach

Uspešna implantacija trajnog vodiča ritma kroz perzistentnu levu gornju šuplju venu koristeći desni supklavikularni pristup

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Abstract

Introduction. Persistent left superior vena cava, a rare congenital abnormality, can complicate placement of pacemaker leads through the subclavian vein. A left-sided approach is usually preferable in such cases. Case report. We reported a case in which we began a single-chamber pacemaker implantation procedure via a right subclavian approach (because of scarring beneath the left clavicle) and then discovered intraoperatively that the patient had a persistent left superior vena cava. After a few attempts, we succeeded in placing the head of the electrode in the septum, near the top of the right ventricle, and the rest of the procedure was completed without complication. Conclusion. To our knowledge, this is the first reported case of pacemaker implantation, with passive electrode, through a persistent left superior vena cava via the right subclavian vein. This case demonstrates that such an approach, when necessary, can be used successfully.

Key words: vena cava, superior; congenital abnormalities; subclavian vein; pacemaker, artificial; heart catheterization.

Introduction

Persistent left superior vena cava is a relatively rare persistent congenital anomaly. Its estimated prevalence is about 0.3% in the general population and up to 4.4% in patients with congenital heart disease. This condition, often found incidentally, can complicate the placement of pacemaker leads through subclavian routes. We reported a case of successful single-chamber pacemaker implantation through a persistent left superior vena cava by using a right subclavian approach.

Case report

An 88-year-old man with a long history of hypertension, diabetes mellitus, and adenoma of the prostate was admitted to our hospital for implantation of a permanent pacemaker. A Holter electrocardiogram (ECG) showed atrial fibrillation with 482 pauses of more than 2 seconds and 14 pauses of more than 2.5 seconds. All episodes were registered during the night.

Echocardiography revealed a preserved ejection fraction of 55% and a left ventricle of normal dimensions. The
left atrial diameter was 4.5 cm. There was a mild aortic regurgitation and mild to moderate mitral regurgitation. A chest radiogram was normal. An ECG showed atrial fibrillation with heart rate of about 60 beats per minute.

After medical preparation with 10 mg intramuscular diazepam, the patient was sent to the catheterization laboratory to receive a permanent pacemaker. We used the right subclavian approach to introduce a wire, because the patient had a large scar on the left side of the chest under the clavicle. We made 3 attempts to advance the wire into the superior vena cava, but we were unsuccessful because the wire was going in the wrong direction, toward the left side of the heart and downward.

We then performed contrast-enhanced computed tomography of the right heart system (Figure 1) and noticed the persistent left superior vena cava. We continued the procedure, knowing that the right subclavian approach we had used would make it difficult to introduce the electrode into the right ventricle through the left superior vena cava. After few attempts, we succeeded in placing the head of the electrode in the septum, near the top of the right ventricle (Figure 2).

Fig. 2 – A chest radiograph showing VVI pacing through the patient’s left superior vena cava

There were no other complications of the procedure, and the patient was stable throughout it. We achieved a stimulation threshold with an amplitude of 0.5 V and a pulse width of 0.48 ms. Electrode resistance was 840 ohms.

Six months after the pacemaker implantation, the patient was doing well, and the pacemaker’s electronic controls showed normal functioning.

Discussion

The left superior vena cava complicates pacemaker implantation. All implantations of pacemakers through the left superior vena cava that have been described in the literature to date have been done from the left side, through the left subclavian vein. The right subclavian approach, when necessary, is even more complicated than the left-sided approach. An additional problem is that the long distance that has to be traversed to reach the apex of the right ventricle exceeds the standard length of the pacemaker’s lead. In our case, at the end of the procedure, only a short segment of the electrode extended out of the body, just enough to connect to the generator.

Our case differs from previously reported cases of pacemaker implantation through a persistent left superior vena cava, because we did it from the right side, through the right subclavian vein. Undeniably, in these situations, a left-sided approach is preferable. However, in situations when a left-sided approach is not possible, it is good to know that, although it is more difficult, a right-sided approach is an option.

Conclusion

To our knowledge, this is the first reported case of pacemaker implantation, with passive electrode, through a persistent left superior vena cava via the right subclavian vein. This case demonstrates that such an approach, when necessary, can be used successfully.

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