



Case Report

Simple and effective solution for diaphragm pacing by that uses the transvenous femoral approach in a patient treated with cardiac resynchronization-defibrillator therapy: The wrapping method

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ABSTRACT

The use of cardiac resynchronization therapy (CRT) has become widespread in patients with heart failure who meet the criteria for implantation. Coronary sinus lead positioning is important to provide the intended biventricular stimulation. Diaphragm pacing is a lead-related complication which occurs secondary to phrenic nerve stimulation. We present the case of a 58-year-old male patient who had diaphragm pacing after CRT with defibrillator implantation. The complication was resolved by using the transvenous femoral approach with the wrapping method.

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1. Introduction

Cardiac resynchronization therapy (CRT) is recommended for symptomatic patients with heart failure based on sinus rhythm and QRS duration of > 150 ms and left bundle branch block (LBBB) QRS morphology [1]. Complications of CRT implantation are categorized as traumatic, lead-related, pocket, and clinical. Diaphragm pacing is involved in lead-related complications and occurs in 1.5–5% of patients receiving CRT secondary to phrenic stimulation [2]. We present a case of CRT with defibrillator implantation (CRT-D) with phrenic nerve stimulation that was resolved by using an ablation catheter wrapped around the coronary sinus lead.

2. Case Report

A 58-year-old male patient who underwent percutaneous coronary intervention to the right coronary artery in 2007 was admitted to our cardiology service for further evaluation. He was diagnosed as having reduced ejection fraction (EF 25%) heart failure on the basis of the last coronary angiography, which demonstrated a slow coronary flow in the left anterior descending and circumflex arteries. His medications included ramipril 10 mg,

carvedilol 25 mg, spironolactone 25 mg, acetylsalicylic acid 100 mg, and ivabradine 10 mg. Despite the optimal medical therapy for 6 months, his dyspnea and ankle edema worsened recently and exercise tolerance progressively decreased (New York Heart Association class III). His electrocardiogram showed sinus rhythm and LBBB with QRS of 160 ms. CRT-D was implanted (Fig. 1A). During the procedure, no diaphragmatic stimulation was revealed with 10 V of coronary sinus pacing. Even though the patient was immobile for 24 h after the implantation procedure, diaphragm pacing was detected; therefore, another intervention was planned. The patient refused to undergo another procedure to be performed from a device pocket because of severe pain and personal preference. The diaphragm pacing could not be solved by reprogramming. Another solution was offered by using a transfemoral venous route. The transfemoral venous approach was less invasive and infectious than the other traditional methods. All aspects of the potential complications of the new method were explained to the patient, and the patient's informed consent was obtained. During the procedure, the coronary sinus lead was wrapped around by an ablation catheter, which was placed in the great cardiac vein. The coronary sinus lead was in the posterolateral vein. The coronary sinus lead was pushed upward from the posterolateral vein gradually with a maneuver provided by the ablation catheter (Fig. 2). The measurements were repeated after each movement of the ablation catheter to determine the safest position. The lead was gradually positioned in its new position, with acceptable measurements obtained with CRT-D (pacing threshold,

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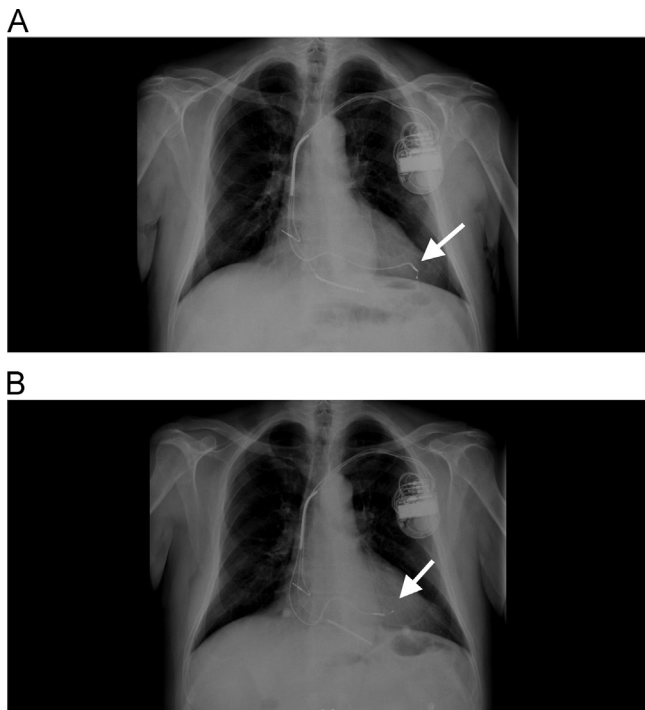


Fig. 1. (A) presents chest radiography after first implantation of CRT-D, (B) presents chest radiography after the wrapping method procedure.

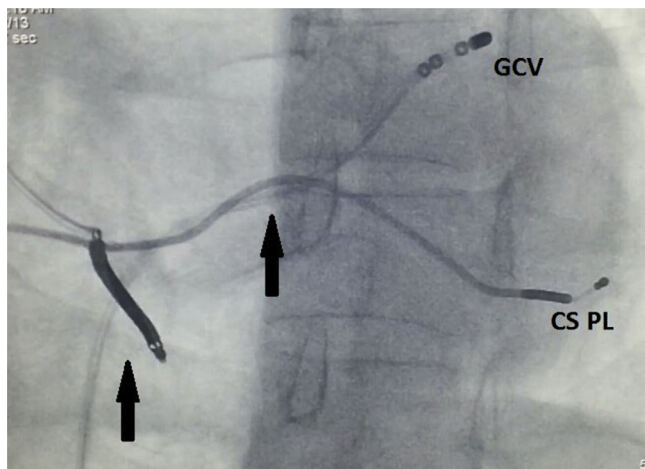


Fig. 2. Shows coronary sinus lead wrapped by the ablation catheter.

1.75 V; impedance, 900 Ω) After the procedure, chest radiography was performed to confirm the final position of all the leads (Fig. 1B). The patient was monitored and followed up for 24 h in the coronary care unit. Repeated bedside transthoracic echocardiographies were performed for controlling (check) (or we can delete controlling)[A1]. The patient was stable and discharged under the same medical therapy on the ninth postoperative day.

After 3 months of follow-up, he was asymptomatic. Chest radiography revealed the same positions of the leads as those after the procedure. The pacing threshold and impedance also remained stable. As in our case, coronary lead repositioning is possible with an ablation catheter via the femoral approach.

3. Discussion

The stability of the coronary sinus lead is highly important to provide effective biventricular stimulation in cardiac synchronization therapy. The position change of the coronary sinus lead may cause an increase in threshold, capture loss, or phrenic nerve stimulation [2]. In patients with diaphragm pacing, if the problem cannot be solved with device reprogramming, reoperation becomes obligatory. Bleeding risk significantly increases during reoperation in patients receiving anticoagulation therapy. Repeated interventions at the device pocket also increase infection risk. Thus, repositioning the coronary sinus lead without an intervening device pocket provides remarkable advantages. As in our case, the coronary sinus lead position can be changed by using an ablation catheter via the transvenous femoral approach.

Despite the remarkable advantages of our method, some concerns remain. First, the coronary sinus anatomy plays the leading role. The initial position of the coronary sinus lead together with the coronary sinus anatomy allows for designing an approach. This method can be applied only when a good fork is available in front for placing the coronary lead in. Second, the period following the first implantation of a coronary sinus lead influences the ease of the unwrapping maneuver. Wrapping the coronary sinus lead may be easy, but the unwrapping maneuver may be difficult because of the floppiness of the lead, which is unlike the ablation catheter. After assignment of the coronary sinus anatomy, adequate tension should be formed to unwrap the coronary sinus lead. Moreover, acute displacement of the coronary sinus lead occurs mostly within 24 h [3]. As the coronary sinus anatomy is known during the first implantation, performing the transfemoral approach will be easy. Third, pushing upward the ablation catheter poses a risk for minor complications. The coronary sinus is fragile, so the procedure should be performed with echocardiographic guidance.

4. Conclusion

In this report, we describe our first successful intervention for diaphragm pacing by using the transvenous femoral approach with the wrapping method. We did not experience any complication during or after the procedure.

Conflict of Interest

All authors declare no conflict of interest related to this study.

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