Abstract

The coronary sinus, whose electrical features play an important role in cardiac arrhythmias, is the integral part of the cardiac venous system. Here we describe a 67-year-old male patient with congestive heart failure who was referred to our hospital after the failure of the first cardiac resynchronization therapy defibrillator (CRT-D) implantation. During the cannulation of the coronary sinus, the separate orifice of the posterior cardiac vein was demonstrated by the retrograde filling of the coronary sinus via contrast injection into the posterior cardiac vein. Due to the serious tortuosity of the coronary venous sinus, a multipolar left ventricular lead was implanted using the separate ostium of the posterior cardiac vein. In our patient, the posterior cardiac vein directly drained into the right atrium. At 3 months' follow-up with the CRT-D, he was asymptomatic (New York Heart Association functional class I).

Introduction

The coronary sinus, the importance of which has been increasing through its role in providing access for different cardiac procedures, is the integral part of the cardiac venous system. The coronary sinus has a complex structure and its electrical features play an invaluable role in invasive arrhythmic procedures. The cannulation of the coronary sinus provides mapping and ablation therapy in many types of arrhythmias. Moreover, over the past decade, the coronary sinus has become a gateway to the left ventricle for biventricular pacing. Augmenting the success rate of
left ventricular pacing requires a thorough knowledge of the anatomy of the cardiac venous system.

Case Report

A 67-year-old male patient, who had anterior myocardial infarction and undergone percutaneous coronary intervention on his left anterior descending artery in 2009, was referred to our cardiology clinic after the failure of the first cardiac resynchronization therapy defibrillator (CRT-D) implantation. He had also undergone percutaneous coronary intervention on his right coronary artery 2 years previously. He was diagnosed with a reduced ejection fraction (22%) heart failure after transthoracic echocardiography. His medications included enalapril (10 mg twice daily), carvedilol (25 mg), spironolactone (50 mg), acetylsalicylic acid (100 mg), and ivabradine (7.5 mg). Despite optimal therapy for 8 months, his resting dyspnea and pretibial edema worsened gradually and his exercise capacity was very limited (New York Heart Association functional class III). The 6-minute walking test was performed, and the result was reported to be 180 m. His electrocardiogram (ECG) showed sinus rhythm and left bundle branch block with a QRS of 152 ms (Figure 1). The previous cardiology center attempted to implant a CRT-D in order to palliate the symptoms. Following the failure of the implantation, the patient was referred to our department for reassessment. Another implantation procedure was planned because the patient’s cardiac status sufficiently fulfilled the criteria for CRT-D implantation.

After the cannulation of the coronary sinus with an electrophysiology catheter, a coronary sinus access catheter was placed in the coronary sinus. The angiography of the coronary sinus was performed with a balloon catheter. Efforts were made to place the left ventricular lead in the coronary sinus; however, high tortuosity thwarted the attempts. During maneuvers to detect the middle cardiac vein, the posterior vein was observed to be draining directly into the right atrium (Figures 2A, 2B, and 2C). The posterior cardiac vein was demonstrated to have a separate orifice by the retrograde filling of the coronary sinus via contrast injection into the posterior cardiac vein. A multipolar left ventricular lead was targeted; however, tortuosity thwarted the attempt. The lead was repositioned to the posterior cardiac vein, where it was easily placed. The lead was then electrogrammed, and pacing and sensing thresholds were recorded. The lead was then connected to the device, and the device was programmed with appropriate atrioventricular delay and interventricular delay. The patient was discharged the next day with improved symptoms.
A ventricular lead was implanted in the posterior vein through the separate ostium from the right atrium (Figure 2D). After the implantation, no complication was detected in the chest X-ray. The QRS in the ECG after the procedure narrowed significantly (Figure 3). Verification of the separate ostium was also provided via noninvasive venography using multislice computed tomography (Figure 4).

The patient was stable and he was discharged under the same medical therapy on the fifth postoperative day. At 3 months’ follow-up, he was asymptomatic (New York Heart Association functional class I). The 6-minute walking test was repeated, and the result was reported to be 410 m. Accordingly, to the best of our knowledge, we are the first in the relevant literature to achieve a successful intervention by implanting a multipolar left ventricular lead in a separately originated posterior cardiac vein.

**Discussion**

The arterial structure of the heart is well known when compared to venous drainage. The limited knowledge on the venous drainage of the heart renders arrhythmologists unable to solve exceptional problems originating from anatomical variations. The gateway of left ventricular pacing is the coronary sinus, and the coronary sinus system consists of the great cardiac vein with its tributaries. The great cardiac vein is positioned in the atrioventricular sulcus and drains into the posterior portion of the right atrium. The group nearest to the coronary sinus ostium is called “the posterior vein”, the
coronary sinus. We succeeded in implanting a multipolar ventricular lead by using the separate ostium of the posterior cardiac vein and the patient experienced no complication during or after the procedure.

References


Conclusion

In this report, we described an anatomically unique...