

## Supporting Stent of Coronary Sinus Lead in Cardiac Resynchronization – Report of 5 cases

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### Introduction

Cardiac resynchronization therapy (CRT) is a modality of artificial cardiac stimulation (ACS), whose finality is to correct electromechanical changes in patients with advanced heart failure (HF)<sup>1</sup>. The major objective of CRT is the reverse remodeling of the left ventricle (LV)<sup>2</sup>, with its direct implications, such as the reduction in mitral insufficiency, the decrease in LV end-systolic and end-diastolic volumes, and the improvement in ejection fraction (EF) and cardiac output (CO). Consequently, CRT improves quality of life (QoL), decreases the number of hospitalizations and increases the survival of patients with HF<sup>3,4</sup>. Cardiac resynchronization therapy is preferentially performed with the implantation of an electrode via the coronary sinus (CS) to stimulate the LV; however, that electrode can be dislodged, which is one of the problems of that ACS modality. We report our experience with that situation.

### Clinical Case 1

The patient is a 32-year-old female, diagnosed with peripartum dilated cardiomyopathy, refractory HF, LV ejection fraction (LVEF) of 19%, and interatrial and ventricular desynchronization. A four-chamber cardiac resynchronizer (CR) was implanted, and a bifurcator for biatrial resynchronization was placed at the exit of the atrial channel; stimulation of the left chambers was performed through the CS. Both functional class (FC) and QoL improved. Three months after implantation, her HF significantly worsened, and cardiorespiratory arrest (CRA) occurred, but the patient recovered. By use of electrocardiography (ECG) and telemetry, loss of command of the CS electrodes was observed, and, on chest radiography (X-ray), displacement of the CS electrodes was evidenced. After clinical stabilization, the CS electrodes were repositioned, and subsequent supporting stent was implanted on the CS electrode that stimulates the LV. An upgrade of the prosthesis was also performed, and a CR was

placed associated with an implantable cardiac defibrillator (ICD). Death occurred after six months of follow-up due to non-cardiovascular problems.

### Clinical Case 2

The patient is a 54-year-old female, diagnosed with idiopathic dilated cardiomyopathy, with a single-chamber pacemaker (VVI) because of atrial fibrillation (AF) with slow ventricular response. The ECG showed stimulated QRS of 220 ms. Her LVEF was 31%. The patient was in FC III-IV with optimized therapy, and upgrade to CRT was performed uneventfully, with improvement of the FC and QoL. After five months, her HF worsened, and CRA occurred, but she recovered. Displacement of the CS electrode was also evidenced. A new upgrade to CRT+ICD was performed with repositioning of the CS electrode. After five years, on chest X-ray, an increase in the command threshold of the CS electrode was observed associated with a discrete and late displacement. The LV command was corrected through programming, when elective replacement of the generator was indicated, and, on the same occasion, the SC electrode was also replaced. However, due to repetitive displacements, a supporting stent was implanted to maintain the electrode fixed in the cardiac vein (Figures 1 and 2). Follow-up of 26 months.

### Clinical Case 3

The patient is a 31-year-old female, diagnosed with peripartum cardiomyopathy for more than eight months, and decompensated HF. The ECG showed sinus rhythm with first-degree atrioventricular block and left bundle-branch block (LBBB). Her LVEF was 16%. During hospitalization, she had CRA, being reanimated. A CR was implanted associated with an ICD. Post-operative control evidenced, on chest X-ray, displacement of the right atrial and CS electrodes, requiring their repositioning. Due to instability of the CS electrode, a stent was placed in the CS to its stabilization and support. Follow-up of 36 months.

### Clinical case 4

The patient is a 56-year-old male, diagnosed with dilated cardiomyopathy. His LVEF was 31%, and ECG showed AF rhythm associated with LBBB. Because of HF refractory to pharmacological treatment, CRT was indicated. During its implantation, the CS electrode was displaced repeatedly. That instability led to the implantation of a supporting stent to maintain the electrode in the desired position. Follow-up of 18 months.

### Keywords

Cardiac Pacing, Artificial; Ventricular Dysfunction; Stents; Coronary Sinus.

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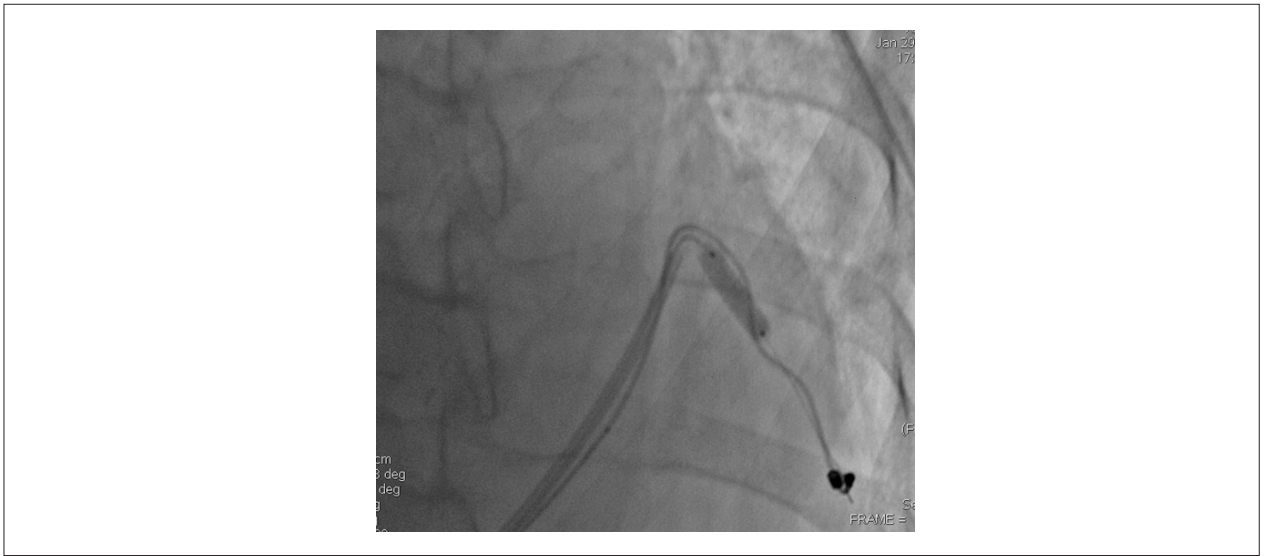


Figure 1 – Stent deployment in CS; Source: Patient 2.

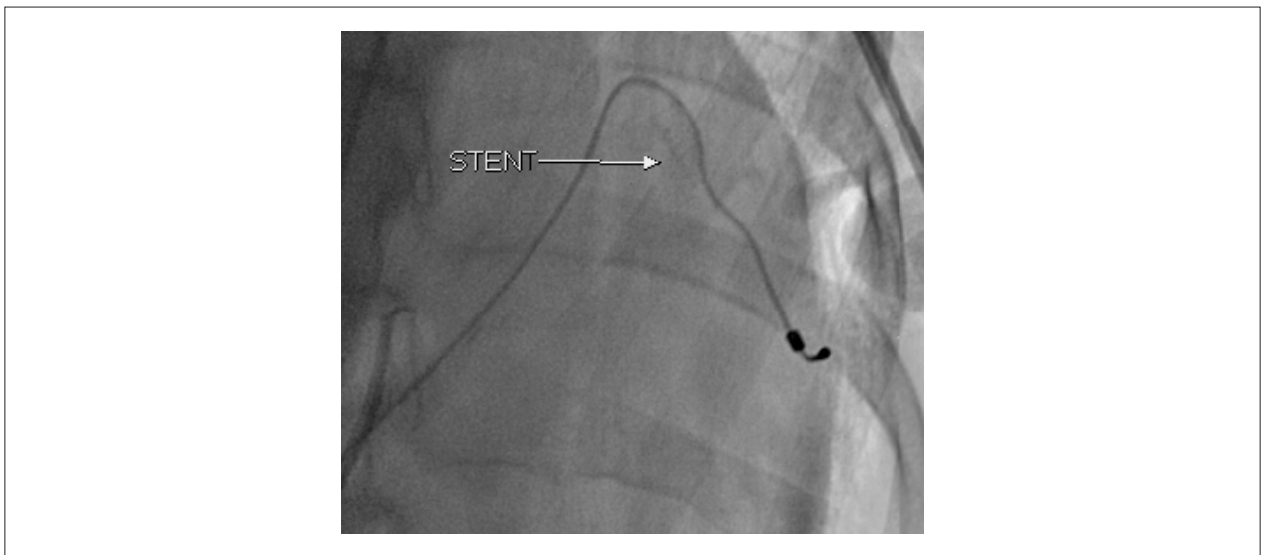


Figure 2 – Supporting stent of CS electrode; Source: Patient 2.

### Clinical Case 5

The patient is a 65-year-old male, with history of ischemic HF (LVEF of 25%) refractory to pharmacological therapy. The ECG showed sinus rhythm with LBBB, and CRT was performed. During implantation of the resynchronizer, repetitive displacement of the CS electrode was observed, requiring implantation of a supporting stent to maintain the electrode inside the cardiac vein. Follow-up of 13 months.

### Discussion

Currently, CRT is part of the therapeutic armamentarium for HF, being indicated in patients with severe ventricular

dysfunction refractory to pharmacological therapy and with ventricular desynchronization<sup>1</sup>.

The procedure is performed with implantation of a lead in the posterolateral LV wall, in addition to the conventional technique used for the atrioventricular pacemaker (right chambers)<sup>1</sup>. The LV is preferentially stimulated through the transvenous route, via the CS. Displacement of the CS electrode during or after implantation (early or late displacement) is one of the limitations to successful CRT, present in 5%-10% of the cases. That is likely due to the fact that the CS electrode is positioned and maintained in the epicardial cardiac vein passively, making its displacement easy and requiring reintervention. Galvão et al.<sup>5</sup> have described the implantation of an anchor electrode aimed at maintaining the electrode inside the CS.

## Case Report

In our five patients, CS electrode displacement was as follows: late, in two; early, in one; and intraoperatively, in two, with lack of CS electrode support. All five patients underwent support stent implantation to fixate the electrode and maintain it in place. All stent implantations were uneventful. Three of our patients required, in addition to resynchronization, an ICD to prevent sudden death, and, in two of them, upgrade to CRT+ICD was performed. This can be due to the difficulty in better stratifying high-risk patients for primary prevention of sudden death<sup>6,7</sup>.

The use of supporting stent has been shown in case reports and studies with a small number of patients, with satisfactory short- and long-term results and no complications related to the procedure<sup>8,9</sup>. Nevertheless, it is worth noting the possibility of damage to the electrode's integrity, CS dissection and obstruction, in addition to limitation in electrode removal in cases of diaphragmatic stimulation or infection, requiring surgery<sup>10</sup>.

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## Conclusion

Our results were similar to those of the literature. Implantation of supporting stent to prevent displacement of the CS electrode is a safe procedure in the short and long run, once its integrity and position are maintained, thus preserving the basic objective of CRT.

## Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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## Study Association

This study is not associated with any post-graduation program.