

## Step-by-Step Double Coronary Sinus Cannulation Approach as a Landmark for Difficult Cardiac Resynchronization Therapy Implantation

Ahmed Mostfa Wedn<sup>\*1</sup>, Sok-Sithikun Bun<sup>2</sup>, Decebal Gabriel Latcu<sup>2</sup> and Nadir Saoudi<sup>2</sup>

<sup>1</sup>Department of critical care medicine, Cairo University, Egypt

<sup>2</sup>Department of cardiology, Princess Grace Hospital, Monaco

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### Corresponding author:

Ahmed Mostfa Wedn  
Department of cardiology, Princess Grace Hospital, Pasteur Avenue, Monaco (Principality), Critical Care department, Kasralainy medical school, Cairo University, Cairo, Egypt, Tel: +201003597079; Fax: +37797989732;  
Email: amostfa85@gmail.com, ahmed.moustafa@kasralainy.edu.eg

### ABSTRACT

An 84-year-old male patient, with highly symptomatic ischemic cardiomyopathy, LBBB (QRS= 160 ms) and LVEF 30 %, was admitted for CRT implantation. Using three separate (ultrasound-guided) axillary vein punctures, the right atrial and ventricular leads were easily positioned, but it was not possible to catheterize the coronary sinus (CS). After about 50minutes, a decision was made to cannulate the CS through the femoral vein, which enabled to landmark its ostium. The CS became permeable enough to successfully introduce a LV lead from the superior approach.

### INTRODUCTION

Failure rates for placement of Transvenous Left Ventricular (LV) leads via the Coronary Sinus (CS) ranged between 7.5% and 10% in the two largest randomized controlled trials for Cardiac Resynchronization Therapy (CRT) [1,2]. Clinical data point to about 3.0% the risk of failure in the CS ostium cannulation, due to inability to locate it, probably because of the prominent thebesian valve [3], or Right Atrial (RA) dilation which also may lead to an abnormally high insertion of the CS ostium, making catheterization with a fixed-shape catheter or wire difficult [4].

### CASE REPORT

An 84-year-old male patient, left bundle branch block (QRS= 160ms) and left ventricular ejection fraction (LVEF 30 %), and NYHA III, was admitted for CRT pacemaker implantation.

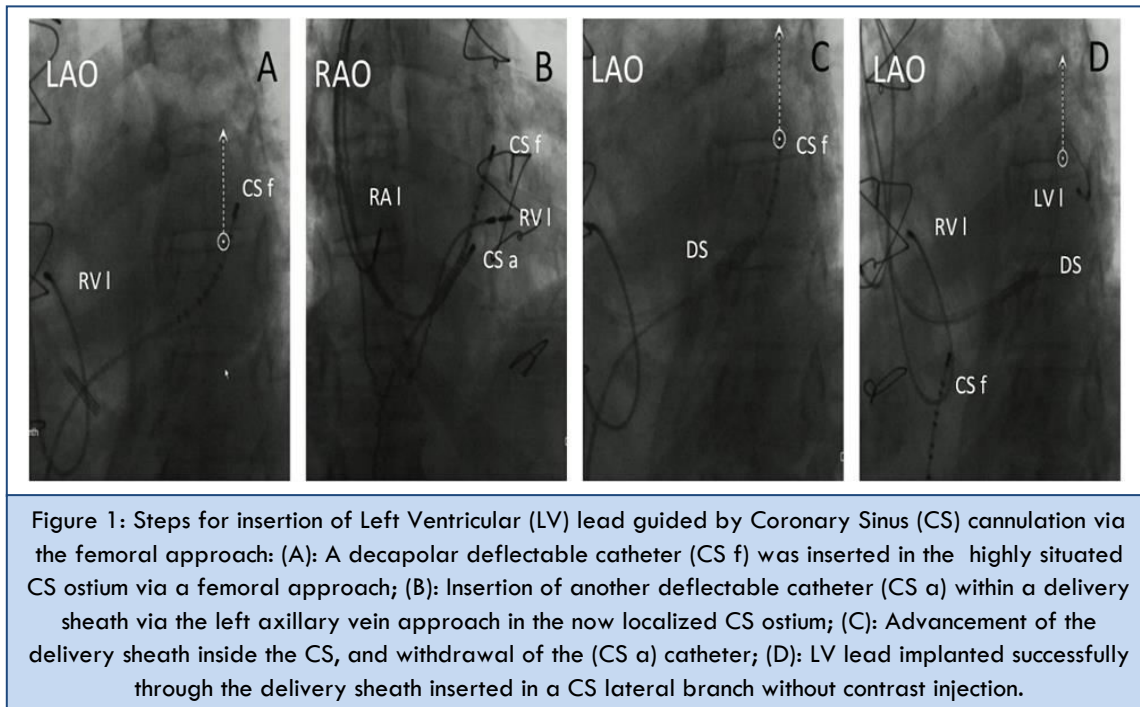
Under local anaesthesia, a triple ultrasound-guided left axillary vein puncture was performed. The Right Atrial (RA) lead was screwed in the posterior wall, with detection at 3.9 mV, and pacing threshold 0.4 V x 0.4ms. The Right Ventricular (RV) lead was screwed septally, with a detection above 9.7 mV and a stimulation threshold at 0.4 V x 0.4ms.

The cannulation of the CS was inaccessible despite using dedicated peel-away delivery sheaths with different curves (Medtronic Inc., Minneapolis, MN, USA; and Saint-JUDE Medical); and even using an electrophysiology deflectable decapolar catheter (Saint-JUDE Medical). Injecting contrast agent at the lower part of the septum did not allow CS ostium localization. Then after about 50 minutes of repeated failed attempts, a decision was made to cannulate the CS from the femoral vein.

Another deflectable decapolar electrophysiology catheter (Saint-Jude Medical) was easily introduced through the right femoral vein into the CS, after ultrasound-guided puncture. Smoothly, the CS ostium was landmarked (after less than 2 minutes from the

puncture), and was significantly highly situated on the septal side. This maneuver facilitated the (double) CS cannulation by the superior approach using the left axillary vein (Figure 1) with the introduction of a bipolar LV lead in a lateral branch, without CS opacification. The pacing threshold was 0.6 V x 0.4 ms, with an impedance of 585 ohms. The absence of phrenic

nerve capture was checked at 10 V before muscular fixation. The pacemaker was then implanted subcutaneously with muscular fixation. Total procedure time was 180 minutes with fluoroscopy duration of 44 minutes. The post-procedural course was uneventful, and the follow-up after 9 months confirmed the super-response of the patient (NYHA I).



CS a: CS catheter from axillary approach; CS f: CS catheter from femoral approach; DS: Delivery sheath; RV I: right ventricular lead; RA I: right atrial lead, LV I: LV lead.

## DISCUSSION

In our case we were able to put the RV and RA leads effortlessly, then we tried to engage the CS through the routine route (left axillary vein) using various techniques (deflectable electrophysiology CS catheter, dedicated sheaths, and injecting contrast at the lower part of the septum and upper part of tricuspid annulus,) but all the trials were in vain. Therefore, after 50 minutes of failed attempts, it was decided to try a transfemoral approach using a deflectable decapolar catheter which enabled us within 2 minutes to detect the highly located CS ostium.

The patient had a significant RA dilation, which was expected from the preprocedural data obtained during echocardiography (5.6cm). In addition, the presence of a thebesian valve could be suggested [5] leading to an

obstruction of its entrance, and that may explain why we were unable to image the CS ostium by injecting contrast agent.

According to our knowledge, this is the first experience of using a femoral approach to cannulate CS as a landmark in order to solve the case routinely in the same setting, but it is worthwhile mentioning another case report [5] of impossible CS cannulation from the subclavian approach. The authors postponed the case until they performed a CT scan to show the anatomy that proved the presence of a prominent Thebesian valve, and then landmarked the CS with a femoral approach.

Hence, transfemoral approach may be used as an alternative route for CS engagement in difficult CRT cases. The major drawback of this technique is the possible increase in the

infectious risk when puncturing the groin during the implantation process. It may be advised to perform a CT scan to have a better understanding of the precise anatomy of the RA/CS ostium. This may help improving the rate of successful CS catheterization. Nevertheless, performing this CT scan as a routine strategy in first intention should be balanced with the additional injection of contrast agent, as well as additional radiation exposure, on top of the resynchronization therapy implantation itself.

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