An Alternative Approach for Endocardial Pacemaker Lead Implantation in Patient with Persistent Left Superior Vena Cava

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SUMMARY
Introduction Persistent left superior vena cava represents a congenital vascular defect of the venous system, which often makes standard 58 cm endocardial lead placement impossible.
Case Outline A right chamber approach by the left cephalic vein was tried. This was impossible because standard endocardial lead (SJM Isoflex S 1646T, bipolar lead, 58 cm in length, body diameter 7 French) was too short for this patient. A unipolar lead for coronary sinus (Medtronic ATTEIN 4193-88), 88 cm in length, body diameter 4 French, was placed in the posterior branch of the coronary sinus. With such positioning of the lead, a VVI pacemaker pacing was enabled. The operation lasted for 48 minutes, and the time of total X-ray exposure was 9.6 minutes. The values that were achieved were: threshold 0.3 V, pulse width 0.37 ms, maximum R 22.55 mV. Ten months after the implantation, the values were: threshold 0.3 V, maximum R 28.8 mV.
Conclusion Persistent left superior vena cava in some cases makes standard 58 cm endocardial lead placement impossible due to its joining to the right atrium over the dilated coronary sinus. Coronary sinus lead placement in the posterior or lateral coronary sinus branch represents an acceptable alternative approach for pacemaker lead placement in these patients.
Keywords: persistent left superior vena cava; coronary sinus; ventricular lead

INTRODUCTION

Persistent left superior vena cava (PLSVC) represents a congenital vascular defect of the venous system. Regarding the way of joining PLSVC to the heart, two anatomic varieties are described: 1) PLSVC joins the right atrium over the dilated coronary sinus (CS); this variation is seen in 90% of patients; and 2) other variations mean joining PLSVC to the left atrium. These were described in two ways: joining to CS, which has a wall defect and thus communicates with the left atrium, and joining directly into the upper part of the left atrium, between the upper left pulmonary vein and left atrial appendage. This anomaly is always joined by other congenital heart defects [1].

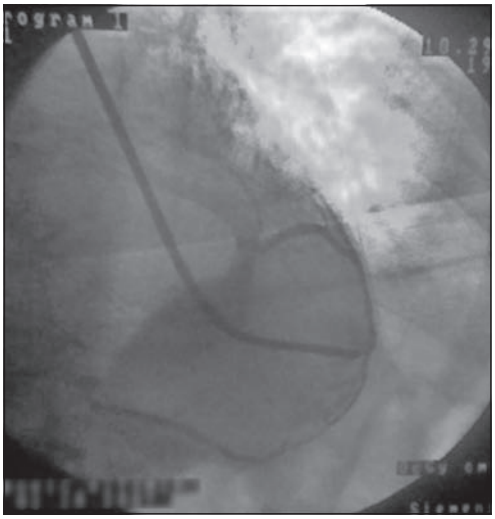

Figure 1. PA chest radiography: venography-coronary sinus (posterior and lateral branch)

CASE REPORT

Our patient was a 76-year-old male. DDD pacemaker implantation was indicated due to sinus node disease manifested as sinus bradycardia accompanied by syncope. A right chamber approach by left cephalic vein was tried. This was impossible because standard endocardial lead (SJM Isoflex S 1646T, bipolar lead, 58 cm in length, body diameter 7 French) was too short for this patient. An alternative method of pacing through the CS was considered. Contrast venography was performed and the branches of CS were visualized (Figure 1). A unipolar lead for coronary sinus (Medtronic ATTEIN 4193-88), 88 cm in length, body diameter 4 French, was placed in posterior branch of CS (Figure 2). The values that were achieved were: threshold 0.3 V, pulse width 0.37 ms, maximum R – 22.55 mV. With such positioning of the lead, a VVI pacemaker SJM Regency SC + model: 2402L pacing was enabled (Figure 3). The decision to go with VVI instead of DDD pacing system was made due to an anatomic anomaly and the age of the patient. The operation lasted for 48 minutes, and the time of total X-ray exposure

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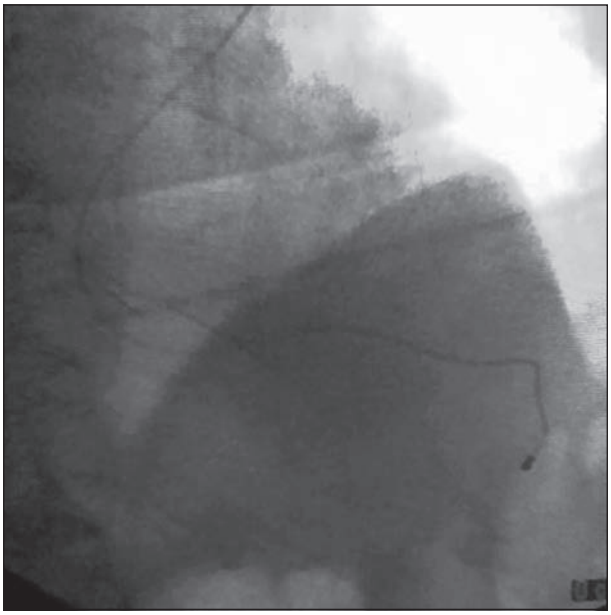

Figure 2. PA chest radiography: lead in coronary sinus (posterior branch)

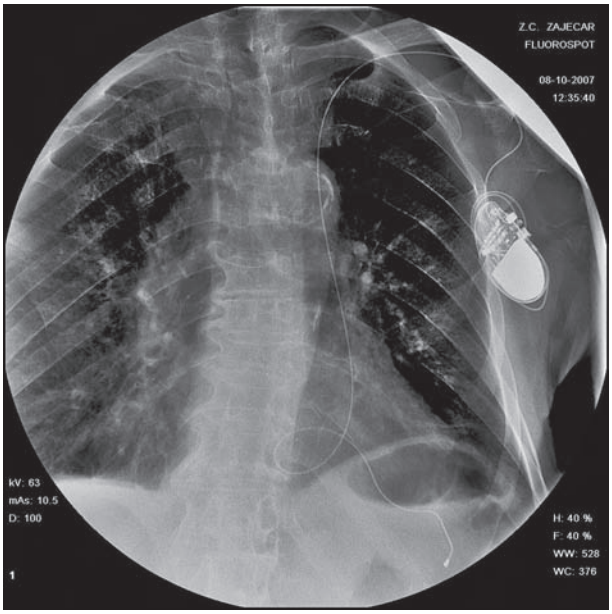

Figure 3. PA chest radiography: lead in coronary sinus and VVI pacemaker

was 9.6 minutes. By the total time of X-ray exposure, we account for the times taken attempt for standard ventricular lead placement, for venography, as well for lead implatation into the CS. Ten months after the implantation, the values were: threshold 0.3 V, maximum R 28.8 mV.

DISCUSSION

Overall incidence of PLSVC is 0.30 to 0.50% in general population and 4% of those having congenital defects [2, 3]. The incidence is similar in patients that need pacemaker therapy, 0.47% [4]. According to data from The National Referral register of Pacemaker centre in Clinical Centre of Serbia, its incidence is 0.20-0.30% per year.

Due to tortuous defect in PLSVC, the placement of standard endocardial lead in the right ventricle is sometimes very difficult or impossible. Dual chamber, multi site or ICD implantation represents a special challenge in those cases [5, 6].

There are several ways of lead placement depicted in such cases, such as: Worley's sheet, open J-loop, when the lead is guided towards the tricuspid valve by the stylet in an anteroinferior way [7]; lead placement in the right atrial appendage with adequate pacing parameters [8]. Also, some good experience is gathered with active fixation electrodes [4, 9].

Due to the unsuccessful attempt of placing the endocardial lead into the right ventricle, we used an alternative approach, by placing it to an atypical place. In PLSVC, the approach to the right ventricle is difficult and in some 90% of the patients it joins the heart over the dilated coronary sinus. Placing the electrode in some of the branches of the CS represents a simple and adequate solution. The time needed for pacemaker implantation and thus for radiation exposure of the patient and staff is reduced to a standard time needed for usual lead placement into the right ventricle. We are presenting the combination of CS electrode and a VVI pacemaker.

CONCLUSION

Persistent left superior vena cava in some cases makes standard 58 cm endocardial lead placement impossible due to its joining to the right atrium over the dilated coronary sinus. Coronary sinus lead placement in the posterior or lateral coronary sinus branch represents an acceptable alternative approach for pacemaker lead placement in these patients.

doi: 10.2298/SARH1002085M

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Алтернативни начин пласирања ендокардијалне пејсмејкер-електроде код болесника с перзистентном левом горњом шупљом веном

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КРАТАК САДРЖАЈ

Увод Перзистентна лева горња шупља вена (*vena cava superior*) је конгенитална аномалија венског система због које је често немогуће поставити стандардну ендокардијалну пејсмејкер-електроду од 58 *cm*.

Приказ болесника Пункцијом леве вене супклавије покушано је пласирање електроде у десну комору. Показало се да то није било могуће јер је стандардна ендокардијална коморска двополарна електрода (*SJM Isoflex S 1646T*, дужине 58 *cm*, дебљине 7 *F*) била кратка за ову процедуру. Једнополарна електрода за коронарни синус (*Medtronic ATTEIN 4193-88*, дужине 88 *cm*, дебљине 4 *F*) пласирана је у постериорну грану коронарног синуса. Оваквим положајем електроде омогућен је пејсинг *VVI* пејсмејкером. Операција је трајала 48 минута, а време укупне експозиције рендгенском зрачењу било је 9,6 минута. Након имплантације измерени су праг од 0,3 *V*, пулсна ширина од 0,37 *ms* и максимални измерени *R* од 22,55 *mV*. Десет месеци касније праг је био 0,3 *V*, а максимални измерени *R* 28,8 *mV*.

Закључак Перзистентна лева горња шупља вена, која се улива у десну преткомору преко дилатираног коронарног синуса, у неким случајевима онемогућава примену стандардних ендокардијалних пејсмејкер-електрода од 58 *cm*. Примена електроде за коронарни синус и њено пласирање у постериорну или латералну грану коронарног синуса је прихватљив алтернативни приступ пејсмејкер-терапије.

Кључне речи: перзистентна лева горња шупља вена; коронарни синус; вентрикуларна електрода

Примљен • Received: 28/01/2009 **Прихваћен • Accepted:** 25/02/2009