Cardiac resynchronization therapy upgrade in a patient with dextrocardia and situs inversus

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Cardiac resynchronization therapy in patients with congenital heart disease can be technically challenging. We report a case of upgrade of an implantable cardioverter defibrillator to a resynchronization device, in a patient with dextrocardia and situs inversus. The procedure was successfully performed without complication, using a conventional approach and standard equipment.

Case report
A 66-year-old gentleman was referred to our institution for cardiac resynchronization therapy (CRT). He had a background of coronary artery disease (CAD), situs inversus, and dextrocardia with normal segmental cardiac anatomy. He had a single-chamber implantable cardioverter defibrillator (ICD) implanted 7 years before, following recurrent syncope with readily inducible ventricular tachycardia at electrophysiology study. Five years following this, he developed complete heart block and became pacing-dependent. Over the next few months prior to this admission, he had become increasingly breathless and was in New York Heart Association (NYHA)

Figure 1 Balloon occlusion angiogram of the CS in anteroposterior projection (A) demonstrating the target vessel (black arrow). Final position of the left ventricular lead in the target vessel (black arrow) in anteroposterior projection (B). Chest X-ray of the final lead positions in anteroposterior (C) and lateral (D) projections.
functional class III. An echocardiogram demonstrated a left ventricular ejection fraction of 30%. His electrocardiogram showed a ventricular paced rhythm with left bundle branch block morphology. In view of this, he was put forward for upgrade to a biventricular ICD.

The new device was implanted in the existing left-sided pocket. Venous access was gained via the left subclavian vein and an active lead (5568 Medtronic, Minneapolis, MN, USA) inserted through a left-sided superior vena cava into the anterior wall of the right atrium. The coronary sinus (CS) was cannulated using a 9 F Attain 6216A-MB2 guide catheter (Medtronic) with fluoroscopy in the right anterior oblique (RAO) projection. A venogram demonstrated a suitable posterior vein (Figure 1A) and a bipolar left ventricular lead (Attain 4194, Medtronic) was advanced into a suitable position with satisfactory pacing parameters (Figure 1B). There were no complications. The final position of the leads is shown in Figure 1C and D. At 4-month follow-up, the patient was well, his heart failure symptoms had improved to NYHA class II, and the lead parameters were stable.

**Discussion**
Dextrocardia is a congenital abnormality where the heart is located in the right hemithorax, as a result of abnormal embryological cardiac development. It is rare, with an incidence of ~0.4 per 10,000 live births.1 Approximately one-third of the cases are associated with situs inversus, where the major visceral organs, including the heart, are a mirror image of their normal position.1 Although dextrocardia with situs inversus may occur in association with other congenital cardiac anomalies, it can be an isolated finding with normal life expectancy.1

Patients with congenital heart disease may have coexistent CAD and conventional indications for device therapy. However, the implantation of transvenous leads can be technically challenging and the approach needs to be tailored to the patient’s individual anatomy. Our case demonstrates that in patients with isolated dextrocardia and situs inversus, the CS can be accessed and a left ventricular lead inserted using a conventional approach and standard equipment. In contrast, in cases of dextrocardia and situs inversus associated with other congenital cardiac defects, transvenous CRT can be much more challenging.2 The only important difference to note is that when imaging the CS, the RAO view serves as the equivalent of a left anterior oblique projection in the normal heart.

In our case, venous access was gained from the left side, making use of the existing lead and pocket. It could be argued that a right-sided implant may make CS cannulation more straightforward, as well as providing a more effective shocking vector, and if attempting a new device implant in such patients, we would advocate such an approach.

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**References**