“Valve-sparing” transvenous defibrillator systems after tricuspid valve intervention

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Introduction
Transvenous defibrillators require a lead that traverses the tricuspid valve (TV). Such leads have been demonstrated to increase the risk of moderate to severe tricuspid regurgitation and accelerate valvular deterioration, especially after TV intervention.1

There have been descriptions of an integrated implantable cardioverter-defibrillator (ICD) lead in the coronary venous tributaries and in the atrium.2 However, a DF-1 lead connector also allows for a “deconstructed” lead approach in these patients. In this way, a separate pace/sense lead(s) is placed in the coronary venous system for pacing/sensing and high-voltage leads can be placed in the azygos/coronary sinus. In this letter, we describe a consecutive series of patients in whom this technique was used after prior TV intervention.

Methods
This study was approved by the institutional review board. In our series, all patients underwent the procedure with moderate sedation in the implant suite similar to a routine device implant. The coronary sinus was cannulated and a coronary vein was selected to place a bipolar IS-1 left ventricular lead. After pacing lead placement, the coronary sinus was either reengaged or the azygos was engaged. A large-caliber sheath was used to advance a transvenous stand-alone high-voltage coil. Finally, a subcutaneous high-voltage lead was tunneled in the anterolateral subcutaneous chest in most cases to enhance the shock vector. Components were connected to a DF-1 impulse generator with the transvenous coil connected to the right ventricular (RV) port and the subcutaneous coil to the superior vena cava port. All patients underwent defibrillator threshold testing (DFT) either during device implantation or at a subsequent date.

Results
The majority of patients (4 of 6) had bioprosthetic valves, with 1 patient having a mechanical valve and 1 with TV repair (Figure 1). The chief underlying cardiac lesion for TV intervention was valvular disease due to Tetralogy of Fallot. The indication for pacing in addition to the defibrillator was heart block (4 of 6) and sinus node dysfunction (2 of 6). The ages of the patients ranged from 31 to 74 years, with 50% being female. Fluoroscopy times averaged 26 minutes (range 7–61 minutes). The transvenous coil was placed in the coronary sinus body in all but 1 patient who had a coil placed in the azygos vein. Four of our patients had an anterior subcutaneous coil placed to enhance shock vector. All attempted implantation procedures were successful, with at least a 5 J “safety margin” on subsequent DFT. A single instance of lead revision due to high thresholds at 2 years was noted (patient 4) with no other device complications requiring intervention over a mean follow-up of 30 months (range 2–91 months).

Discussion
Our description of an implant technique that “deconstructs” the standard components of the defibrillator lead and places them in non–tricuspid-impinging locations reveals a safe, feasible surgical option for those having undergone TV intervention. The techniques described herein employ standard tools used in ordinary implants. Technical difficulty, as evidenced by fluoroscopy times, were comparable to traditional cardiac resynchronization therapy implants. There has been single-patient descriptions in the literature of this technique, but to our knowledge, this represents the first consecutive series of patients all of whom had DFT.3

In our series, several patients had preexisting transvenous hardware. This poses additional challenges to the surgeon and referring cardiologist, as “jailing” the transvenous lead by surgical exclusion essentially necessitates repeat sternotomy in the event of device infection. In these cases, transvenous leads that would otherwise be jailed are clipped in the
Figure 1  A: Labeled example of the tricuspid valve–sparing defibrillator implant with tunneled right ventricular (RV) epicardial leads for biventricular pacing. B: Radiographs of the remaining series of patients who underwent valve-sparing implantable cardioverter-defibrillator implantation after tricuspid valve intervention. The lateral projections illustrate the ideal shock vector using a posterior azygos/coronary sinus (CS) coil with an anterolateral subcutaneous coil.
superior vena cava region and the retained proximal portion is removed during the subsequent TV-sparing device implantation procedure. All of our patients had prior sternotomy, which renders an entirely epicardial system infeasible. Finally, at the time of TV replacement, effective biventricular pacing can be achieved by the intraoperative placement of RV epicardial leads and subsequent transvenous left ventricular lead placement and tunneling of the RV to the device pocket.

**Conclusion**

For those patients requiring pacing and ICD therapy after TV intervention, TV-sparing ICD implantation using azygos or coronary sinus venous high-voltage coils and pacing leads is feasible and is associated with acceptable DFT margins and pacing parameters.

**References**