Case Report

Successful Implant of a Subcutaneous ICD System in a Patient with an Ipsilateral Epicardial Pacemaker

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Case

A 25 year old female with a history of intravenous drug abuse developed Staph Aureus endocarditis and required mitral and tricuspid valve replacement with tissue bioprostheses. Her recovery was complicated by new, severe aortic regurgitation requiring a bioprosthetic aortic valve replacement several days later. She was noted to be in third degree AV block during the second operation and a permanent bipolar epicardial pacing lead was placed intra-operatively on the right ventricle. Subsequently this lead was tunneled subcutaneously from the epigastrium to the left pre-pectoral position and attached to a single-chamber pacemaker pulse generator.

Whilst convalescing on the ward the patient suffered two cardiac arrests due to polymorphic VT despite consistent pacing at 50 bpm. There was no evidence of QT prolongation or coronary artery disease and therefore overdrive pacing was not originally indicated. Moreover, her left ventricular systolic function was also within normal limits.

However; the treating team felt that given the patient's valve disease and two cardiac surgical procedures, that there had to be a substrate for recurrent arrhythmia, presumably small areas of myocardial scar. In addition to increasing the lower pacing rate to 90 bpm, the decision was taken to implant a subcutaneous ICD (S-ICD system, Boston Scientific/Cameron Health). An S-ICD was selected due to the risk of further infection with a transvenous ICD; however we were concerned about possible device-device interaction. We had also considered connecting the epicardial pacing lead to a standard ICD and adding a subcutaneous array but we felt the S-
ICD to be the best option.

Prior to the procedure, pre-implant screening was undertaken to ensure adequate sensing by the S-ICD system of the subcutaneous ECG signals. In this patient, both her paced rhythm and her intrinsic junctional escape rhythm were screened to ensure that neither posed an issue with T-wave over-sensing.

Implantation of the S-ICD system was undertaken using standard techniques. Our main concern was ensuring there was no potential interaction between the proximal sensing electrode of the S-ICD lead with the main loops of the epicardial pacemaker lead subcutaneously adjacent to the xiphisternum. Pre-procedure fluoroscopy was used to guide generator placement and the lead tunneling process. During the procedure, careful palpation and dissection ensured that the ICD lead did not come into contact with the epicardial pacemaker lead. We were able to confirm fluoroscopically that the proximal sensing electrode of the ICD was placed beyond the epicardial lead loops. The 8cm defibrillation coil was then positioned in the usual manner. There were no acute complications from the implant. Lead parameters on both the ICD and the pacemaker were satisfactory post-implant. (Figures 1 and 2).

![Figure 1](image.png)

**Figure 1:** PA x-ray view post implant of the S-ICD system. The arrows denote the two poles of the bifurcated bipolar epicardial pacing lead. The asterisk marks the position of the proximal sensing electrode of the S-ICD system.

Additionally no interference was detected on the sensing circuit of either device. Defibrillation threshold testing was conducted post procedure, but no ventricular arrhythmias were inducible. However, three weeks post-implant, she presented with polymorphic VT which was successfully detected and defibrillated by the S-ICD system (Figure 3). She remains well currently although she continues to be followed up closely. Analysis of both devices at 6 weeks post procedure revealed no issues.
Figure 2: Lateral x-ray view, with the arrow denoting the S-ICD lead coursing superiorly over the loops of the epicardial pacing lead. The asterisk marks the position of the proximal sensing electrode of the S-ICD system.

Figure 3: A run of polymorphic VT caught on ECG telemetry culminating in an 80 J shock from the S-ICD system. The pacemaker can be observed pacing through the VT in noise-reversion mode.

Registry data suggest that the S-ICD is comparable to standard ICDs in terms of performance and inappropriate shock rates [1]. This is the first reported case of the combination of a permanent pacemaker utilising an epicardial lead with an ipsilateral subcutaneous ICD implant. Judicious pre-planning of the surgery as well as careful dissection and tunnelling within the surgical field ensured no damage or manipulation of the existing epicardial lead and also optimal placement of the subcutaneous ICD system. In our particular experience, although fluoroscopy is usually not required for an S-ICD implant, it was vital in this case in the planning of the final lead positioning as well as documenting, in real-time, the course of the epicardial pacemaker lead. In addition, it was important that pre-implant screening ensured that the S-ICD system did not experience T-wave over-sensing with both the patient's paced and intrinsic rhythms.

References