

A highly effective technique for transseptal endocardial left ventricular lead placement for delivery of cardiac resynchronization therapy



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BACKGROUND Implantation of a left ventricular (LV) lead fails in 5% to 10% of patients in whom cardiac resynchronization therapy (CRT) is attempted. Alternatives for delivery of CRT are surgical epicardial and endocardial transvenous leads. Endocardial transseptal LV lead delivery is challenging because of the absence of dedicated equipment designed for this procedure.

OBJECTIVE The purpose of this study was to describe a new technique for delivery of a transseptal LV lead.

METHODS This dual approach from the right femoral vein and left subclavian vein involves use of an Endrys transseptal needle and Mullins sheath to deliver a gooseneck snare from the left subclavian vein into the right atrium that can then be used to deliver a deflectable sheath into the left atrium. An active fixation lead is advanced into the LV through the sheath and screwed into the lateral wall.

RESULTS The procedure was performed successfully in 12 patients in whom transvenous LV lead implantation had previously failed. The Endrys transseptal needle, ideally suited for this technique,

facilitated passage of the gooseneck snare into the left atrium with no difficulty. Median procedure time was 148 minutes (interquartile range [IQR] 113–176 minutes), and median fluoroscopy time was 16 minutes (IQR 10–19 minutes). There was no need for repeat procedures after median follow-up of 97 days (IQR 36–313 days).

CONCLUSION This approach using an Endrys needle and a gooseneck snare provides a reliable and effective alternative technique for delivery of an endocardial LV lead that is delivered easily through a deflectable sheath inserted transseptally into the LV.

KEYWORDS Transseptal endocardial left ventricular lead; Cardiac resynchronization therapy

ABBREVIATIONS CRT = cardiac resynchronization therapy; INR = international normalized ratio; IQR = interquartile range; LA = left atrium; LV = left ventricle; LSCV = left subclavian vein; RA = right atrium; RFV = right femoral vein; SVC = superior vena cava

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Introduction

Cardiac resynchronization therapy (CRT) has significantly improved the lives of heart failure patients, with improvements in functional class, hospitalization rates, and mortality.^{1–3} Unfortunately, CRT implantation fails in 5% to 10% of patients because of an inability to deliver a left ventricular (LV) lead transvenously, either at *de novo* implantation or when an existing lead fails.^{4–6} The established alternative for transvenous pacing is surgical epicardial LV lead placement under a general anesthetic, which may carry unacceptably high morbidity and mortality for some frail heart failure patients.^{7,8} Surgical LV leads also may have a higher risk for lead failure in the long term compared to transvenous leads.⁹

Endocardial LV lead implantation for delivery of CRT was first described in a case report in 1998.¹⁰ Over the past 16 years, fewer than 150 cases were reported in individual case reports and small case series. This procedure still is not widely used for delivery of CRT, probably because of procedural difficulties, perceived potential complications, and the need for lifelong oral anticoagulation. A number of techniques with varying difficulty and complexity have been described. In this article we describe a novel and relatively simple technique for delivery of an endocardial LV lead via the transseptal route.

Methods

Patients

Patients were offered this procedure if they had a class 1 indication for CRT,¹¹ and an attempt at conventional LV lead placement via the coronary sinus had failed. All options were explained to the patient, including surgical LV lead placement and no further attempt at CRT. The technique described

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here was explained to the patient in detail, including the need for lifelong anticoagulation. All patients consented to the procedure, and the study underwent local review approval.

Implantation technique

The procedure was routinely performed under local anesthesia with conscious sedation. Patients were anticoagulated with warfarin (international normalized ratio [INR] 2.0–3.5) at the time of the procedure. Immediately before the transseptal puncture a bolus of 5000 units of heparin was given intravenously.

The implantation technique is shown in [Figure 1](#). A Medtronic Attain deflectable coronary sinus sheath (model 6227DEF) is advanced through a left subclavian vein (LSCV) puncture and positioned in the superior vena cava (SVC). A 250-mm gooseneck snare (eV3) is advanced through the sheath and left opened in either the SVC or the right atrium (RA). A Mullins transseptal sheath (Cook

Medical) is advanced from the right femoral vein (RFV) through the open snare into the SVC over a 0.035-inch guidewire. The guidewire and the Mullins dilator are withdrawn, and an Endrys transseptal needle and its customized dilator are advanced through the Mullins sheath (and thus also through the snare). The Endrys transseptal needle consists of two needles, one inside the other. The outer needle is blunt, whereas the inner needle is sharp and is delivered through the outer needle in order to puncture the atrial septum. The snare is advanced as far inferiorly as possible over the Mullins sheath. A transseptal puncture is then performed in the usual manner to deliver the Mullins sheath and the Endrys dilator into the left atrium (LA). The inner (sharp) component of the Endrys needle is removed, and a 0.035-inch guidewire is advanced through the outer needle (blunt) and into the left upper pulmonary vein. The Mullins sheath and the Endrys dilator are withdrawn into the RA (leaving the outer Endrys needle in the LA) and the snare is tightened around the outer needle distal to end of the

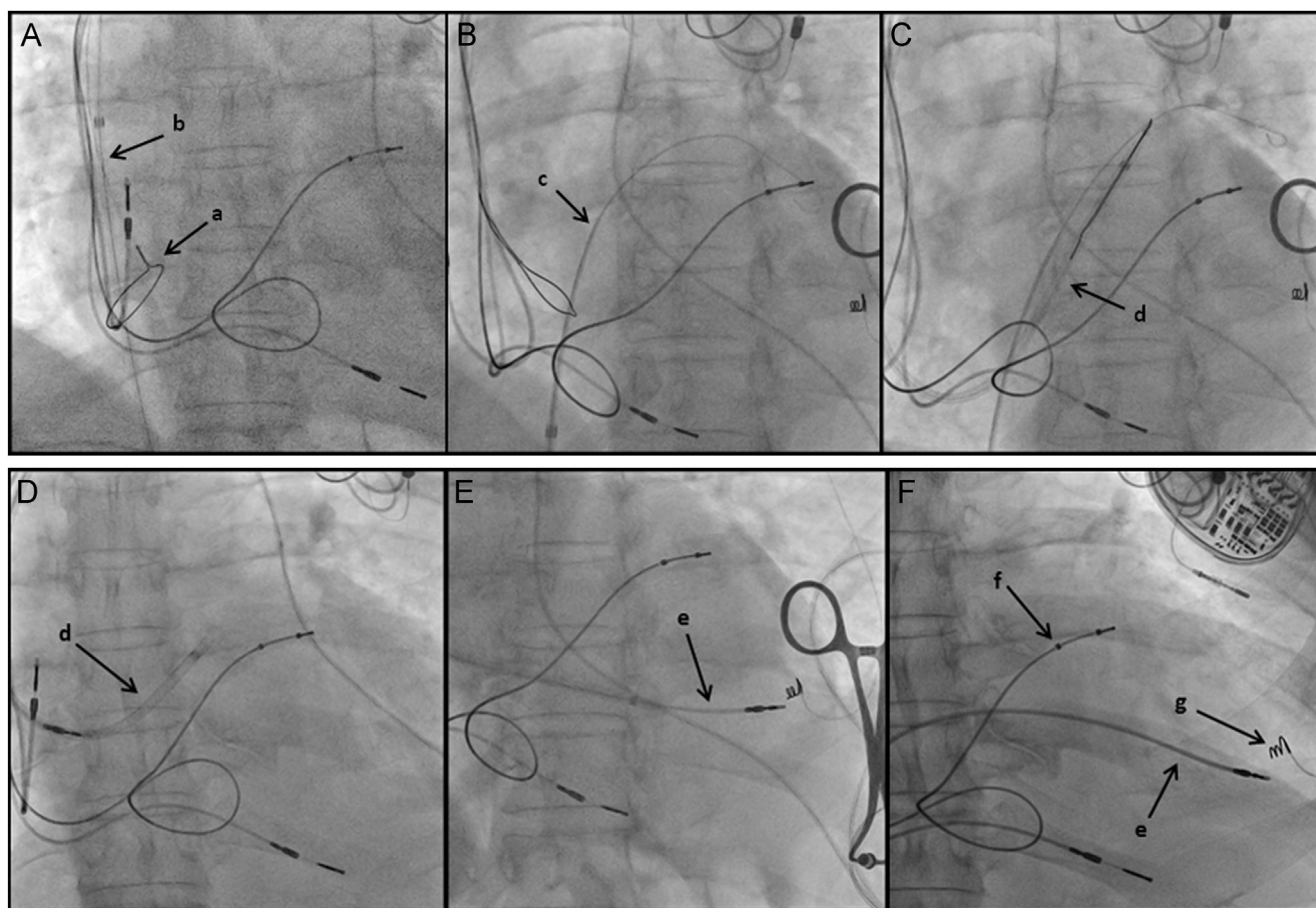


Figure 1 The implantation technique in a patient who had previous transvenous and surgical epicardial leads. **A:** The gooseneck snare (a) is advanced through the Medtronic Attain deflectable sheath, which was introduced via the left subclavian vein. A 0.035-inch guidewire is introduced from the femoral vein access and is manipulated to pass through the gooseneck snare. Over this 0.035-inch guidewire, the Mullins sheath (b) is introduced into the right atrium. **B:** A transseptal puncture is made, and a 0.035-inch guidewire is placed in the left upper pulmonary vein through the Endrys outer needle (c). **C:** The snare is advanced into the left atrium (LA) and the Attain sheath (d) is advanced over the snare. **D:** The snare is removed, leaving the Attain sheath (d) in the LA. **E:** Left anterior oblique view. An active fixation lead (e) is advanced through the sheath into the LV and screwed into the lateral wall. The sheath is next split and removed. **F:** All 3 leads are seen: the previous transvenous lead (f) now lying in the main coronary sinus, the surgical epicardial lead (g), and the new active fixation lead (e), which is screwed into the endocardium opposite the failed surgical epicardial lead.

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