

CASE REPORT

Intravascular Ultrasound-Assisted Coronary Sinus Lead Implant in Patient with Contrast Anaphylaxis

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Ultrasound imaging has been used in a range of cardiac interventions. We describe the use of intravascular ultrasound to assist in coronary sinus lead implantation in a patient where contrast venography was contraindicated. (PACE 2012;xx:e1–e3)

CRT, imaging, pacing

Background

Cardiac resynchronization therapy (CRT) is dependent on coronary sinus (CS) lead implantation to deliver left ventricular pacing. CS venography is considered one of the principal steps of the procedure,¹ helpful in identifying target veins and selecting optimal leads based on anatomy. Invasive percutaneous ultrasound technology is routinely employed in cardiac interventions using intracardiac echo (ICE),² or vascular interventions using intravascular ultrasound (IVUS) for vessel assessment and stent sizing.³ We present a case of a patient with contrast anaphylaxis precluding use of venography where IVUS was used to assist in lead placement.

Case Report

A patient with cardiomyopathy presented for CRT upgrade of a dual chamber implantable cardioverter defibrillator (ICD). Initial implant was 2 years prior for secondary prevention indication (resuscitated cardiac arrest), and subsequent progression of congestive heart failure symptoms (New York Heart Association Class III–IV), recurrent heart failure hospitalizations, and native QRS duration >160 ms prompted referral for upgrade to a CRT device. He had history of life-threatening contrast anaphylaxis during coronary angiography despite premedica-

tion with steroids and antihistamines, in setting of longstanding contrast allergy, and further use of iodinated contrast was contraindicated. We used an alternate imaging modality, IVUS, to assist in implantation.

Procedure was performed in a hybrid cardiovascular/ electrophysiology suite. After accessing the left subclavian vein percutaneously under fluoroscopy with a 0.035" guide wire, the left pectoral pocket was opened, ICD disconnected, and wire tunneled through into the pocket. A 9F splittable sheath was used to introduce a 6F CS-L curve decapolar catheter (St. Jude Medical, St. Paul, MN, USA) through the CS ostium under fluoroscopy. A CS delivery sheath (Acuity Multipurpose, Boston Scientific, Natick, MA, USA) was advanced over the CS-L catheter into the middle CS. A 200-cm 0.014" guide wire was advanced through the CS sheath attempting to cannulate a vein branch (to deliver an over-the-wire pacing lead), but was unsuccessful. The wire was left distally in the CS and an IVUS catheter (EAGLE EYE, Volcano, San Diego, CA, USA) deployed over the wire. Advancing the probe distally into the CS, IVUS imaging excluded sheath position within a dissection flap, and then demonstrated three venous side branches that were correlated with position of the ICE probe under fluoroscopy (Fig. 1). A lateral branch was chosen, and noting the position of the IVUS-imaging crystals on fluoroscopy, the IVUS catheter was retracted slightly proximal to the branch point, and then the 0.014" wire was used to probe the area of the branch (using the probe as a support) until it was successfully cannulated and wire advanced distally into a tributary vessel (Fig. 2).

The IVUS catheter was then advanced over the wire and confirmed to be at an appropriate position in a lateral coronary vein. The vein

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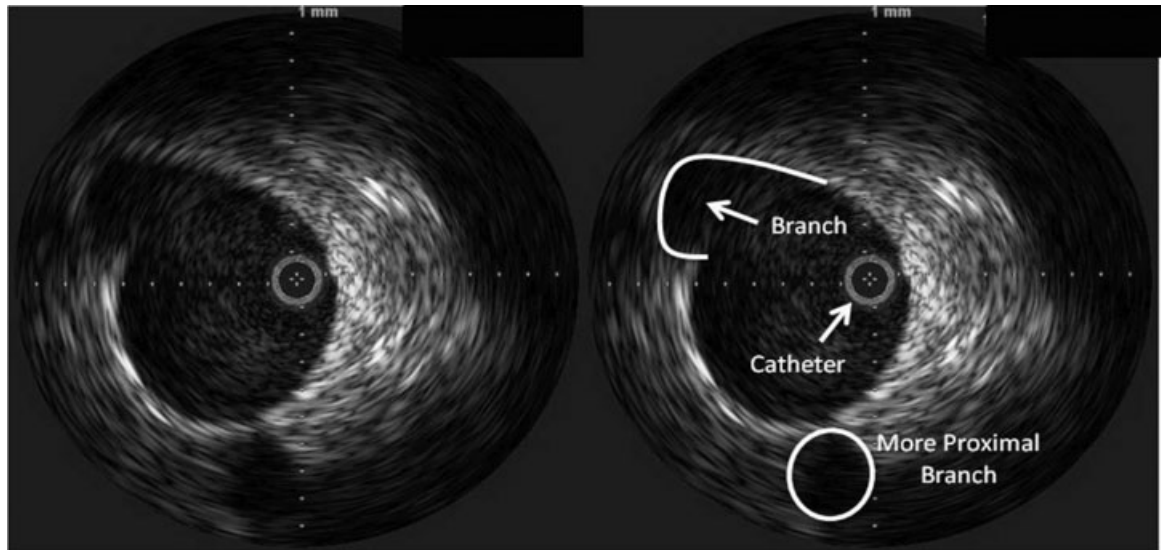


Figure 1. Intravascular ultrasound (IVUS) imaging of mid-coronary sinus. IVUS catheter is at the center of image; the ostium of a lateral coronary vein branch is present, as well as a second vein branch whose ostium is just proximal to the probe.

dimensions were assessed (Fig. 3) and catheter withdrawn, retaining the guide wire in the side branch. Ensuring that the vessel was able to accommodate the pacing lead, an EASYTRAK 2 (Boston Scientific) bipolar pacing lead was advanced easily over the wire and into the target vein. Capture threshold was $<1V/0.5$ ms

without any phrenic nerve stimulation at high output, delivery sheaths were split and the lead secured to the pectoral fascia, the procedure was completed without complications, and the patient was discharged uneventfully the following day. At 3-month follow-up, lead parameters and position were unchanged.

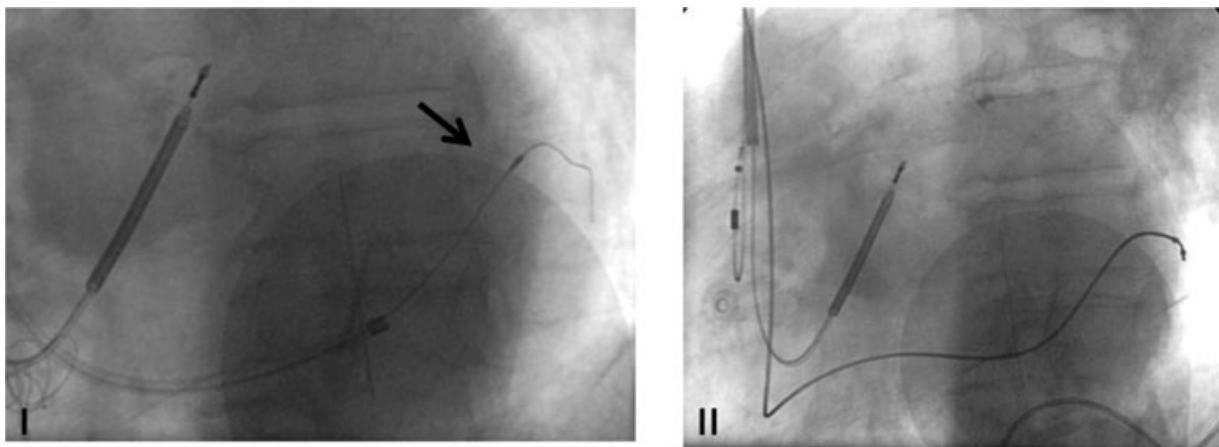


Figure 2. Fluoroscopic left anterior oblique views before and after coronary sinus (CS) lead implantation. (A) Introducer sheath is in proximal CS. A 0.014" guide wire is placed down a lateral CS vein. The IVUS catheter is tracking over the wire with the imaging crystals in the lateral CS vein (arrow). The branch takeoff was identified by IVUS and the position of the imaging crystals identified fluoroscopically, the IVUS catheter was withdrawn, and the region probed with a guide wire until the branch was cannulated. The IVUS catheter was advanced into the lateral CS vein to measure its diameter. (B) Final lead position at conclusion of the procedure with the bipolar pacing lead in the lateral CS vein.

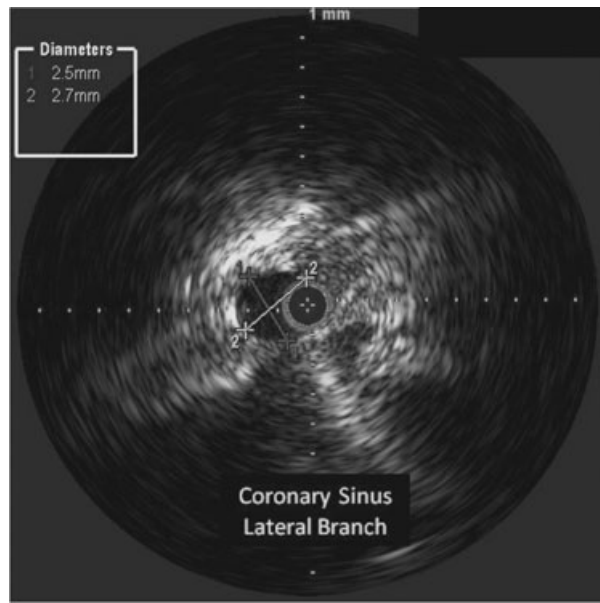


Figure 3. IVUS image of lateral CS branch target vein. Planar vein diameters were measured and used to ensure the vein was able to accommodate an appropriate pacing lead.

Discussion

Successful CS lead implant is a prerequisite for CRT, a life-saving Class I-indicated treatment for many patients with heart failure.⁴ Although not mandatory for CS lead implantation, contrast-based CS venography is a standard practice to guide lead delivery. Ultrasound imaging technology

has been adopted in an increasing number of cardiovascular and ablative interventions, but its use in the CS lead implant procedure has been limited to ICE probes for CRT optimization⁵ and locating and cannulating the CS ostium.⁶

In this case, angiography was contraindicated and IVUS was employed after initial attempts at blind cannulation of a target vein with a guide wire were unsuccessful. Use of an alternate contrast agent (gadolinium) was also considered but concerns over safety made it less attractive.⁷ IVUS imaging demonstrated: appropriate position of sheath in the CS, location of CS branch vessels for selection of lead implant, and size of target vein. The catheter also provided a stable platform for wire manipulation to cannulate the CS branch vessel. The information provided by the IVUS imaging was useful in successful lead implantation. To our knowledge, this is the only reported case of use of IVUS in CS lead implantation. It is notable that the IVUS catheter is also entirely compatible with the 0.014" guide wires used to deliver contemporary over-the-wire CS pacing leads, and interventional techniques and technologies applied to the arterial tree are routinely employed in the venous system for lead implants.⁸

Conclusions

IVUS imaging provided information to assist in CS lead implantation when contrast angiography was contraindicated. Further investigation is required to characterize the role of this imaging modality in the CRT implant procedure.

References

1. Blendea D, Shah RV, Auricchio A, Nandigam V, Orencole M, Heist EK, Reddy VY, et al. Variability of coronary venous anatomy in patients undergoing cardiac resynchronization therapy: A high-speed rotational venography study. *Heart Rhythm* 2007; 4:1155–1162.
2. Kim SS, Hijazi ZM, Lang RM, Knight BP. The use of intracardiac echocardiography and other intracardiac imaging tools to guide noncoronary cardiac interventions. *J Am Coll Cardiol* 2009; 53:2117–2128.
3. Mintz GS, Nissen SE, Anderson WD, Bailey SR, Erbel R, Fitzgerald PJ, Pinto FJ, et al. American College of Cardiology Clinical Expert Consensus Document on Standards for Acquisition, Measurement and Reporting of Intravascular Ultrasound Studies (IVUS). A report of the American College of Cardiology Task Force on Clinical Expert Consensus Documents. *J Am Coll Cardiol* 2001; 37:1478–1492.
4. Epstein AE, DiMarco JP, Ellenbogen KA, Estes NAM, Freedman RA, Gettes LS, Gillinov AM, et al. ACC/AHA/HRS 2008 guidelines for device-based therapy of cardiac rhythm abnormalities. *J Am Coll Cardiol* 2008; 51:1–62.
5. Saksena S, Simon AM, Mathew P, Nagarakanti R. Intracardiac echocardiography-guided cardiac resynchronization therapy: Technique and clinical application. *Pacing Clin Electrophysiol* 2009; 32:1030–1039.
6. Shalaby AA. Utilization of intracardiac echocardiography to access the coronary sinus for left ventricular lead placement. *Pacing Clin Electrophysiol* 2005; 28:493–497.
7. Kalsch H, Kalsch T, Eggebrecht H, Konorza T, Kahlert P, Erbel R. Gadolinium-based coronary angiography in patients with contraindication for iodinated X-ray contrast medium: A word of caution. *J Interv Cardiol* 2008; 21:167–174.
8. Worley SJ. Implant Venoplasty: Dilatation of subclavian and coronary veins to facilitate device implantation: Indications, frequency, methods, and complications. *J Cardiovasc Electrophysiol* 2008; 19:1004–1007.