Coronary Sinus Lead Extraction

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KEYWORDS

• Lead extraction • Cardiac resynchronization therapy • Coronary sinus

KEY POINTS

- Coronary sinus (CS) lead extraction presents unique challenges because of the complex anatomy of the coronary venous system.
- Most sites of fibrous adhesions are found outside of the CS; however, a variety of tools and approaches are used once this structure is reached.
- Success rates and complications are comparable to those of other leads in experienced centers.
- Reimplantation may be limited by CS or branch occlusion postextraction.
- Active fixation CS leads present significant challenges to extraction, although limited series have reported acceptable success and morbidity.

INTRODUCTION

Transvenous lead extraction of CS leads presents unique challenges. Indications for cardiac resynchronization therapy (CRT) have recently expanded, in response to several landmark clinical trials, to patients with mild heart failure and frequent ventricular pacing.[1,2] Therefore, it is anticipated that extraction of CS leads will also be required more frequently, especially because patients with CRT are among those at the highest risk of cardiac implantable electronic device (CIED)-related complications.[3] This article reviews the approach, techniques, and outcomes of CS lead extraction.

INDICATIONS FOR CORONARY SINUS LEAD EXTRACTION

The indications for CS lead extraction in general mirror those for other leads, as outlined in a Heart Rhythm Society expert consensus document.[4] Because the risk of developing system infection is higher for patients with multiple leads (such as CRT systems) than for single-chamber or dual-chamber CIEDs,[5] infectious indications for extraction of CS leads are likely more common than for other leads. Extraction and reimplantation due to lead dysfunction are also likely more common, because it may be difficult to implant more than 1 lead in the confined space of the CS and its branches. The prevalence of subclavian or superior caval venous occlusion is increased with multiple leads and, therefore, is seen more commonly with CRT systems.[6–8] This precludes abandonment and replacement of a dysfunctional lead, making lead extraction necessary if ipsilateral access is to be maintained. Specific indications for CS lead extraction not often seen with other leads include extraction due to phrenic nerve stimulation and increased threshold due to changes in underlying myocardium, such as increased epicardial fat or progressive fibrosis. Indications for lead extraction with an emphasis on CS leads are summarized in **Box 1**.

Conflicts of Interest: None (E.M. Cronin); Consultant and Advisor for: Medtronic, Boston Scientific, St. Jude Medical, and Spectranetics (B.L. Wilkoff).

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Card Electrophysiol Clin 7 (2015) 661–671
http://dx.doi.org/10.1016/j.ccep.2015.08.020
1877-9182/15/$ – see front matter

Box 1
Indications for lead extraction that pertain to coronary sinus leads

Infection

Class I

1. Definite CIED system infection (level of evidence B)
2. CIED pocket infection (level of evidence B)
3. Valvular endocarditis without definite lead involvement (level of evidence B)
4. Occult gram-positive bacteremia (level of evidence B)

Class IIa

1. Persistent occult gram-negative bacteremia (level of evidence B)

Class III (not recommended)

1. Superficial infection without involvement of the device and/or leads (level of evidence C)
2. Chronic bacteremia due to a source other than the CIED, when long-term suppressive antibiotics are required (level of evidence C)

Chronic Pain

Class IIa

1. Severe chronic pain (level of evidence C)

Thrombosis or Venous Stenosis

Class I

1. Thromboembolic events associated with thrombus on a lead or a lead fragment (level of evidence C)
2. Bilateral subclavian vein or SVC occlusion precluding implantation of a needed transvenous lead (level of evidence C)
3. Planned stent deployment in a vein already containing a transvenous lead, to avoid entrapment of the lead (level of evidence C)
4. SVC stenosis or occlusion with limiting symptoms (level of evidence C)
5. Ipsilateral venous occlusion preventing placement of an additional lead with a contraindication to the contralateral side (level of evidence C)

Class IIa

1. Ipsilateral venous occlusion preventing placement of an additional lead, without a contraindication to the contralateral side (level of evidence C)

Functional Leads

Class I

1. Life-threatening arrhythmias secondary to retained leads (level of evidence B)
2. Leads that, due to their design or their failure, may pose an immediate threat to the patients if left in place (level of evidence B)
3. Leads that interfere with the operation of implanted cardiac devices (level of evidence B)
4. Leads that interfere with the treatment of a malignancy (level of evidence C)

Class IIb

1. Abandoned functional lead that poses a risk of interference with the operation of the active CIED system (level of evidence C)
2. Functioning leads that due to their design or their failure pose a potential future threat to the patient if left in place (level of evidence C)
3. Leads that are functional but not being used (level of evidence C)
4. To enable MRI when there is no other available imaging alternative for the diagnosis (level of evidence C)
5. To permit the implantation of an MRI conditional CIED system (level of evidence C)