ABSTRACT CI-545:
Lead Extraction: Predicting Complications, Dealing with Vegetations and Effects on the Tricuspid Valve
Saturday, April 30, 2022
10:30 AM - 11:30 AM

CI-545-01
RISK PREDICTION TOOL FOR CARDIAC PERFORATION DURING TRANSENNUS LEAD EXTRACTION: A CANADIAN LEAD EXTRACTION RISK (CLEAR) STUDY SCORE
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Background: Cardiac perforation is a potentially life-threatening complication of transvenous lead extraction. Despite procedural advances in technology and techniques, the incidence is significant at 1 to 3%. A risk prediction tool is warranted to identify patients with an elevated risk of perforation prior to lead extraction to improve surgical planning and safety.

Objective: Our objective was to develop and validate a risk prediction score for cardiac or vascular perforation among cardiac implantable electronic device patients undergoing lead extraction.

Methods: The multicentre Canadian Lead ExtrAction Risk (CLEAR) study was used to develop the score. The study examined patients who underwent transvenous lead extraction to ascertain the incidence and risk factors for perforation (1996-2016). Potential predictors of perforation were incorporated into a multivariable least absolute shrinkage and selection operator (LASSO) logistic regression to determine the risk model. The model was internally validated with bootstrapping and model discrimination was calculated.

Results: Of 2,325 patients who underwent a lead extraction (age 61.9 years, 29.0% women), 63 (2.7%) patients had a perforation within 30 days. Female sex and no prior cardiac surgery were the most significant factors associated with perforation, followed by the number of leads extracted (>2), left ventricular ejection fraction (>40%), and logarithm of lead age (years). Model discrimination was strong [area under the curve (AUC) = 0.79 (95% CI 0.73-0.84)] and the score accurately predicted the risk of perforation (Figure 1).

Conclusion: Individual patient risk for perforation from lead extractions can be accurately predicted from the CLEAR score.

CI-545-02
FEASIBILITY AND SAFETY OF CONCOMITANT PERCUTANEOUS LEAD EXTRACTION AND VACUUM-ASSISTED REMOVAL OF LEAD-RELATED VEGETATIONS
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Background: Cardiac implantable electronic device (CIED) infections associated with lead-related vegetations add to the complexity of lead extraction and are associated with significant patient morbidity and mortality.

Objective: This study assessed the feasibility and outcome of CIED lead extraction concomitant with vacuum-assisted removal of lead-related vegetations.

Methods: This is a single-center retrospective case series of consecutive patients with CIED-related infection, bacteremia, sepsis, or endocarditis who have lead-associated vegetations of >20 mm in size and subsequently underwent immediate CIED lead extraction concurrent with vegetation debulking with vacuum-assisted suction. All procedures were performed in the EP laboratory by an electrophysiologist and interventional cardiologist, under general anesthesia with concurrent transesophageal echocardiography.

Results: A total of 30 patients were included in this analysis (60% female, mean age: 77.3 ± 11.2 years). TLE was attempted for 72 leads with complete success in 69 leads (95.8%), partial success in 3 leads (in the form of retained tips of right ventricular [RV] leads). A laser sheath was required for extraction of 59 leads (in 27 patients). The rest of the leads were extracted with manual traction. The average length of time since lead implantation was 112 ± 54 months (median 56; range 6 to 213 months). Debunking of vegetations was performed concurrent with TLE using vacuum-assisted device suction. There was one in-traprocedural complication related to embolization of a large vegetation into the pulmonary artery, which was retrieved percutaneously. None of the patients required open heart surgery. There was no mortality within 30 days of the procedure.

Conclusion: Our date, the largest series to date, show that concomitant CIED lead extraction and vacuum-assisted removal of lead-related vegetations are feasible and safe for patients with infected CIED systems with large vegetations, and such an approach can help obviate high-risk cardiac surgery.

CI-545-03
TRANSVENOUS LEAD EXTRACTION FOR THE MANAGEMENT OF TRICUSPID REGURGITATION
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Background: Tricuspid regurgitation (TR) secondary to cardiac implantable devices is an under-recognized and under-treated etiology of reduced quality of life and right heart (RH) failure. Early stages of the disease may be managed percutaneously with transvenous lead extraction (TLE). Identifying patients with lead-induced TR who may benefit from TLE continues to be a challenging task.

Objective: We present our center’s protocol for the management of lead-induced TR treated with TLE.

Methods: Patients with 3-D transesophageal echocardiogram (TEE) confirmed TR, and clinical signs of RH failure were referred for extraction. Patients with mild to moderate TR with a tricuspid valve circumference of <40mm and lead impingement of the septal leaflet or patients with a central TR jet were considered candidates for extraction. Between January 2015 and August 2021, 15 patients met the inclusion criteria. Patients underwent laser lead extraction and implantation of MicraTM (Medtronic; Minneapolis, MN)
pacemaker or subcutaneous ICD. Follow-up was performed with TEE in index hospitalization and outpatient transthoracic echocardiogram (TTE). **Results:** Fifteen patients (7 females; average age 65.6 ± 14.2) with 24 total leads met the criteria outlined above. Improvement in TR, confirmed by postoperative TEE, was achieved in the entire cohort. All patients were discharged alive. There were no major or minor complications associated with the use of TLE for the resolution of TR in our series. Follow-up between 4-8 months with TTE confirmed no significant TR. **Conclusion:** Tricuspid regurgitation was successfully reversed with TLE in our cohort. Further clinical studies are needed to validate protocols.

**CI-545-04**

**SINGLE CENTER OUTCOMES OF LEAD EXTRACTION IN PATIENTS WITH SEVERE TRICUSPID REGURGITATION**

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**Background:** Transvenous leads can cause severe tricuspid regurgitation (TR) due to leaflet impingement; however, there is paucity of data evaluating the benefit of lead extraction for improvement in TR and what patient-specific factors might predict TR improvement after lead removal. **Objective:** To investigate (1) the effect of transvenous lead extraction (LE) and change in severity of tricuspid regurgitation, and (2) identify patient characteristics that are associated with improvement in TR. **Methods:** Among consecutive patients with preprocedural electrocardiogram gated CT undergoing LE between Jan 2017 and Aug 2019, patients with severe TR at the time of the procedure were identified. Assessment of severe TR and mechanism of TR was made on pre-extraction TEE. Post procedural TR assessment was done by TTE performed at a median follow up of 4.8 ± 13 months. **Results:** 16/69 patients with native or bioprosthetic tricuspid valve and single right ventricular lead coursing through the tricuspid valve had evidence of severe TR (Table). 9 patients were referred for lead extraction for TR due to impingement of tricuspid valve. 7 patients underwent lead extraction for other reasons. 2/16 patients with RV pacing leads had improvement in TR to mild range, both of which had undergone lead extraction for tricuspid valve leaflet impingement whereas 0/7 patients undergoing lead extraction for other reasons had any improvement in TR. The only significant association with improvement in TR was average lead dwell time of 6.5 months, compared to average lead dwell time of 4.1 years for rest of the patients without improvement in TR. There was no association noted between presence of RV dysfunction/dilation at the time of lead extraction and improvement in TR post extraction. **Conclusion:** None of the patients with leads older than 7 months had any improvement in TR. Potential etiologies include (1) progressive or irreversible leaflet fibrosis, (2) progressive tricuspid regurgitation which, when sustained, may promote further tricuspid annular dilation, reduce RV function, and worsen TR. These factors limit improvement in TR with LE unless LE is performed acutely after recognition of lead impingement. Further studies are needed to evaluate additional patient characteristics associated with TR improvement after LE.