Late resolution of pacemaker lead–related severe tricuspid regurgitation and right ventricular dysfunction after percutaneous lead extraction: A case report and review of the literature

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Introduction

Endocardial lead–related tricuspid regurgitation (ELTR) is an increasingly recognized complication of cardiac device implantation that can result in right ventricular (RV) dysfunction and right heart failure.[1] Several mechanisms of ELTR have been proposed, including lead impingement on tricuspid valve (TV) leaflets; leaflet perforation; entanglement within the valve apparatus; adherence to TV leaflets, chordae, or papillary muscles; and altered RV activation or geometry owing to RV pacing.[1,2] Irrespective of the mechanism(s) involved, it has been postulated that the mechanical and hemodynamic consequences of ELTR on the TV and RV should manifest by 6 months post–device implantation, delineating the time period during which compatible signs and symptoms should most raise suspicion for this condition and suggesting that early intervention may be important.[1]

Though both surgical and percutaneous treatment options for ELTR have been reported, surgery has been advocated as the default treatment by some, in part because of a perceived high risk of procedural complications with percutaneous options, including damage to the TV.[3] However, case series of patients undergoing TV surgery for isolated severe tricuspid regurgitation (TR), including cases of ELTR, have reported considerable operative morbidity and short-term mortality as high as 19%.[4–6] In contrast, major complications occur in $<0.8\%$ of patients undergoing contemporary percutaneous lead removal at experienced centers[7] and in as little as 0% of cases involving leads less than 1 year old.[8] Nevertheless, the role of percutaneous interventions for ELTR remains unclear, with 3 reports suggesting unpredictable improvements in TR and RV function with this approach.[9–11] We describe a patient with severe, symptomatic ELTR associated with RV dysfunction and tricuspid annular dilatation that resolved between 10 and 12 months after percutaneous ventricular lead extraction.

KEYWORDS Tricuspid regurgitation; Pacemaker; Lead extraction; Iatrogenic disease (Heart Rhythm Case Reports 2016;2:324–327)

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Case report

An 84-year-old woman with paroxysmal atrial fibrillation (AF), hypertension, mild cognitive impairment, and remote upper gastrointestinal bleed presented to hospital with palpitations. She was noted to have prolonged postconversion sinus pauses on telemetry with presyncope and therefore underwent an uncomplicated dual-chamber permanent pacemaker (PPM) implantation (Sensia; Medtronic, Minneapolis, MN). A transthoracic echocardiogram (TTE) performed prior to device implantation documented normal biventricular size and systolic function, as well as mild mitral regurgitation and mild TR.

Within several weeks she began to complain of "fluid retention," requiring readmission to hospital approximately 6 months post–PPM implantation because of progressive dyspnea, fatigue, marked peripheral edema, and gross ascites. TTE showed new severe TR (Figure) and moderate RV dysfunction, as well as mild left ventricular (LV) dysfunction with an LV ejection fraction (LVEF) of 45%–50% (see Supplementary Table 1 and Video, available online, for details of all echocardiographic studies). Interrogation of her PPM revealed sustained AF and minimal RV pacing. A 3-dimensional echocardiogram (3DE) demonstrated that the ventricular lead ran in the TV posteroseptal commissure with evidence of resultant restriction predominantly of septal leaflet excursion (Figure). Clinically, the patient continued to deteriorate despite aggressive diuresis.

Following discussions with the patient and her family, it was decided to percutaneously remove the RV lead. This was performed using a lead locking device and gentle traction without complication 10 months after device implantation. A ventricular lead was not reimplanted in an alternate

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KEY TEACHING POINTS

- Endocardial leads from cardiac devices have the potential to interfere with tricuspid valve function. This process should be considered in patients who present with signs or symptoms compatible with tricuspid valve dysfunction after device implantation.
- Surgical management of endocardial lead–related tricuspid regurgitation (ELTR) is generally favored in the literature; however, there are limited data to guide treatment.
- Our case suggests that percutaneous lead removal may have a role even in advanced cases of ELTR and that subsequent recovery of right ventricular function can be delayed.

position (ie, coronary sinus) because the patient had remained in persistent AF.

When seen in clinic 3 months afterwards, she continued to have marked right heart failure. A repeat TTE showed persistent severe TR with severe RV dysfunction and moderate RV dilatation but normalized LVEF. At 5 months post–lead extraction, she was readmitted to hospital for diuresis and paracentesis, and to explore the option of TV surgery. However, given her frailty, advanced age, and high procedural risk of surgical options, it was decided to continue conservative management. After a prolonged stay in hospital, Palliative Care was consulted and she was discharged home with a guarded prognosis, briefly requiring a stay in a palliative care hospital unit for delirium attributed to aggressive diuresis. A repeat TTE the following month was unchanged.

However, over the subsequent few months her symptomatic status progressively improved and a TTE performed 12 months post–lead extraction revealed only mild TR with normal biventricular size and function. She was once again living in her retirement home, was walking on a daily basis, and had not required any further hospital admissions.

Discussion

Clinically significant ELTR is thought to be relatively rare, but its incidence, prevalence, and clinical impact are unknown and likely underappreciated.[1,3] In addition to the potential morbidity associated with the condition, it likely

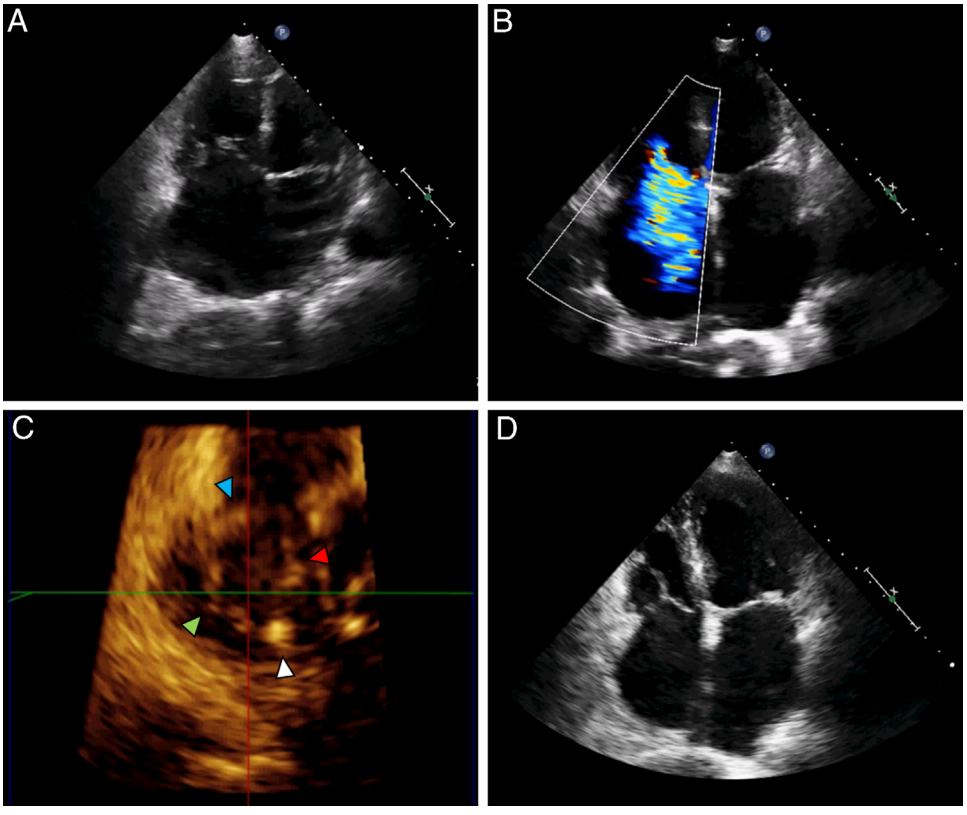

Figure Echocardiographic images. **A:** Apical 4-chamber view demonstrating poor coaptation of tricuspid valve (TV) leaflets, biatrial enlargement, and right ventricular (RV) dilatation 6 months after pacemaker implantation. **B:** Doppler signal confirmed severe tricuspid regurgitation (TR), but its etiology could not be determined. **C:** Three-dimensional echocardiogram showing the pacemaker lead (*white arrowhead*) lying in the commissure between the posterior (*green*) and septal (*red*) TV leaflets. Restriction of septal leaflet systolic excursion was observed and attributed to the lead. The anterior leaflet (*blue*) is also visible. **D:** Apical 4-chamber view demonstrating improved TV leaflet coaptation and normalization of RV size 12 months after percutaneous lead extraction. Mild TR was noted (*not shown*).