CASE REPORT

Rescue permanent iliac vein pacing after epicardial lead failure: an unusual reversal of pacing fortune

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Surgical lead placement is generally considered as a last resort for patients who require permanent pacing and who are unable to accommodate transvenous leads. The technique is limited by the need for direct epicardial access and reduced reliability of epicardial leads (compared with modern transvenous leads) [Belott and Reynolds. Permanent pacemaker and implantable cardioverter defibrillator implantation. In Ellenbogen KA, Kay GN, Lau CP, Wilkoff BL (eds). Clinical Cardiac Pacing, Defibrillation, and Resynchronization Therapy. Philadelphia: Saunders Elsevier, 2007; pp. 561–651]. We report a patient with limited venous access and a poorly functioning epicardial ventricular lead, who was successfully upgraded to a dual-chamber endocardial pacing system via the iliac vein. Pacemaker lead implantation from the iliac vein is an often overlooked option for patients with limited central venous access. In our patient, a pacing upgrade was achieved after the presumptive final option had been exhausted.

Case report

Surgical lead placement is generally considered as a last resort for patients who require permanent pacing and who are unable to accommodate transvenous leads. The technique is limited by the need for direct epicardial access and reduced reliability of epicardial leads (compared with modern transvenous leads).1 We report a patient with limited venous access and a poorly functioning epicardial ventricular lead, who was successfully upgraded to a dual-chamber endocardial pacing system via the iliac vein.

A 53-year-old woman with long-standing type II diabetes mellitus, hypertension, renal failure (requiring haemodialysis), and multiple failed atrioventricular fistulae in her upper extremities was diagnosed with sick sinus syndrome. Attempts to implant a permanent pacemaker were thwarted by thoracic vein occlusions. A single-chamber epicardial (non-steroid-eluting) screw-in ventricular lead was surgically implanted, and a pulse generator was positioned subcutaneously in her upper abdomen. Upon presentation to our institution, 17 months later, her native rhythm was symptomatic junctional bradycardia. Her pacing threshold was found to be 6 V at 1.5 ms, and the pacemaker battery was nearly depleted.

Repeat lead implantation (sewing a steroid-eluting electrode to the epicardium would be most appropriate) from a subxiphoid or thoracotomy/thoracoscopy approach was discussed with the patient who was hesitant to proceed. Because the great veins of the thorax were not an option, we elected to implant a new endocardial dual-chamber system from the right iliac vein (Figure 1). Prophylactic intravenous vancomycin was administered according to our usual protocol. A long (145 cm) 0.035 in. guidewire was placed in her right femoral vein and advanced to the level of the right atrium to ensure patency of the inferior vena cava. A small supra-muscular pocket was created in the right lower quadrant of the abdomen above the inguinal ligament. The long guidewire was used as a fluoroscopic marker, and the right iliac vein was punctured through this pocket with an 18 gauge needle. Atrial and ventricular active-fixation endocardial leads were then implanted using introducers (modified Seldinger technique) via the iliac vein (Figure 2).

Current of injury (COI) was assessed via unfiltered electrograms to ensure adequate tissue contact.2 The pre-existing pocket in the upper abdomen was felt to be an appropriate location for the pacemaker generator and cosmetically more desirable than an additional incision. Therefore, the leads were connected to extenders and tunneled to this pocket. The leads were connected to a new dual-chamber pulse generator that was positioned in the pocket. This endocardial pacemaker system has worked well since implant 8 months ago. The patient feels well and has very good pacing and sensing parameters.

Pacemaker lead implantation from the iliac vein is an often overlooked option for patients with limited central venous access. The long-term durability of iliac pacing systems may be limited by lead dislodgement. Ellestad and French3 reported dislodgement rates of 21% for atrial and 7% for ventricular leads. This risk was reduced by ensuring adequate active fixation via assessment of the COI during implantation.2 In our patient, a pacing upgrade was achieved after...
Figure 1  Posterior to anterior chest X-ray demonstrating failed epicardial single-chamber pacemaker electrode (arrow) and endocardial dual-chamber pacemaker leads implanted from the iliac approach.

Figure 2  (A) and (B) Abdominal X-rays demonstrating pulse generator and leads for endocardial pacemaker implanted from the iliac approach.
the presumptive final option had been exhausted. This technique may be preferable to subxiphoid, thoracotomy, or thoracosopic lead placement when standard approaches to endocardial lead implantation fail.

**Conflict of interest**  K.K. reports receiving research grants from Boston Scientific CRM, Medtronic Inc. CRDM, and St Jude Medical CRM; and receiving speakers’ fees or honoraria from Boston Scientific CRM. R.G.T. reports serving as an advisor to Boston Scientific CRM; receiving research grants from Boston Scientific CRM, Medtronic Inc. CRDM, St Jude Medical CRM, and Vitatron; and receiving speakers’ fees or honoraria from Boston Scientific CRM, Medtronic Inc. CRDM, and St Jude Medical CRM.

**References**


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**CASE REPORT**

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Short–long–short sequence caused by ventricular safety pacing inducing ventricular tachycardia in a patient with a dual-chamber implantable cardioverter defibrillator

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Ventricular safety pacing (VSP) is an algorithm used to prevent crosstalk inhibition and ventricular capture during the vulnerable period. We report a 78-year-old man with implantable dual-chamber defibrillator, in whom clusters of ventricular tachycardias (VTs) were provoked by the VSP. During rapid DDDR pacing, the delivery of the VSP after every other atrial-paced beat resulted in short–long–short ventricular sequences and induced VTs. An atrial-based lower rate timing, long atrioventricular pacing interval, and automatic gain control also accounted for this arrhythmogenic ventricular sequence. The VSP and the subsequent VT were eliminated by decreasing the pacing rate.

**Introduction**

Ventricular safety pacing (VSP) is an algorithm used to prevent crosstalk inhibition and ventricular capture during the vulnerable period. It delivers short-coupled ventricular stimuli after atrial pacing when sensing any activation in the ventricular lead after the end of the ventricular blanking period. Although it is a protective feature embedded in many of the pacemakers and implantable cardioverter defibrillators (ICDs) currently used, we experienced a patient with a dual-chamber ICD, in whom clusters of ventricular tachycardias (VTs) were induced by the VSP. Such proarrhythmic effects of the VSP have, to the best of our knowledge, not been described.

**Case report**

A 78-year-old man presented for his regular consultation. He had a history of coronary artery disease with an inferior wall myocardial infarction in 1973. He had experienced spontaneous VT episodes with a cycle length ranging from 480 to 300 ms since 1984 even under the administration of β-adrenergic blocker and amiodarone and received an ICD implantation in 1997. The system at the latest consultation consisted of a Belos DR-T (Biotronik, Berlin, Germany), Kainox RV 75

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