LV Septum Pacing Shown Safe, Feasible Alternative for Antibradycardia Pacing

Written by Mary Mosley

The use of the left ventricular (LV) septum as an alternative site for pacing was shown to be feasible, safe, and effective, without the disadvantages associated with biventricular pacing, according to Kevin Vernooy, MD, PhD, Maastricht University Medical Center, Maastricht, The Netherlands. Work conducted by his research group, which studies LV septum (LVS) pacing, was presented at the European Heart Rhythm Association/Cardiostim Inventors Awards session.

Conventional right ventricular apex (RVA) pacing is not ideal for most patients, because it leads to LV dyssynchrony and can result in LV dysfunction. In LVS pacing, the lead is placed using the same transvenous routes as the traditional right ventricular pacing lead, but a lead with an extended helix is placed through the interventricular septum (IVS) to pace the left side of the IVS.

Prof Prinzen's research group showed in experimental work that LVS pacing was associated with less electrical dyssynchrony and more synchronous contraction [Mills RW et al. *Circ Arrhythm Electrophysiol*. 2009].

The feasibility study presented in this session included 10 patients with sinus node dysfunction who were not dependent on ventricular pacing. The patients had an average age of 72 years; one-half were women; the average LV ejection fraction was 59%; and IVS thickness was 9 mm. All patients were in sinus rhythm with a narrow QRS complex. After the right atrial lead was placed, an angiogram of the right ventricular was performed for close visualization. A catheter delivery system (Medtronic C315 or C304) was used to position an adapted Medtronic 3830 lead with an extended helix (Medtronic 09066) perpendicular to the IVS to provide LVS. A hemodynamic ($LVdp/dt_{max}$) pacing protocol was then performed 10 beats per minute above intrinsic sinus rate at the LVS, right ventricular septum (RVS; ring of LVS lead), and RVA.

LVS lead implantation was successful in all patients on the first attempt. During the course of the study, the time required to place the lead decreased from 90 to 12 minutes. A progressive decrease was also seen for total length of the procedure (237 to 83 minutes) and total fluoroscopy time (44 to 10 minutes). The last procedures were completed without intercardiac echocardiography.

No LVS lead-related complications occurred during the periprocedure period or at 6 months. Lead stability and other pacing parameters were not clinically different at 6 months vs baseline (Table 1).

The average QRS duration at 6 months was significantly shorter during LVS (144 milliseconds), as compared with RVA (172 milliseconds) and RVS (165 milliseconds) pacing ($P < .02$).

Official Peer-Reviewed Highlights From

Table 1. Key Outcomes of Left Ventricular Septum Feasibility Study

Pacing Parameter	Implantation	6 mo
Threshold, V	0.5±0.2	0.9±0.3
R wave amplitude, mV	12.2±6.7	16±8.7
Impedance, Ω	715±83	550±55

Reproduced with permission from K Vernooy, MD, PhD.

Hemodynamic measurements revealed that in healthy hearts, RVA pacing reduced LVdp/dt_{max} by 7.1% and by 6.9% with RVS as compared with normal intrinsic activation. With LVS pacing, LVdp/dt_{max} increased significantly vs RVA and RVS pacing.

In conclusion, during long-term follow-up, the LVS lead remained electrically and mechanically stable, and hemodynamic measures support LVS pacing to be preferable over RVA pacing. These researchers suggest that LVS pacing has the potential to be a better approach than RVA pacing in patients who need pacing for bradycardia.

Earlier Diagnosis of ARVD/C With Novel Software

Written by Mary Mosley

A novel methodology that performs 3D vector analyses of electrocardiograms to better determine the risk of sudden cardiac death (SCD) from arrhythmogenic right ventricular dysplasia/cardiomyopathy (ARVD/C) was developed and reviewed by Ivana I. Vranic, MD, PhD, University Clinical Center of Serbia, Belgrade, Serbia, in the European Heart Rhythm Association/Cardiostim Inventors Awards session. The objective of her work was to diagnose ARVC/D before it is manifest and traditional markers are observable and to follow disease progression.

ARVC/D is an inherited disease of the heart muscle that leads to ventricular arrhythmias because of electrical instability and to ventricular tachycardia and fibrillation that can cause SCD, particularly during sports activity. Furthermore, patients with ARVC often present with cardiac arrest or advanced heart failure, and early detection might help patients receive primary prevention and treatment for heart failure.

Early work by Prof Vranic included the observation and discovery of the V sign (formed by the confluence of the ductus arteriosus and aortic isthmus) on echocardiography as a characteristic specific to ARVC/D and the development of the ability to identify the Tau point on echocardiography. The Tau point is the specific location in the heart with the strongest influence of orthogonally opposed forces during the cardiac cycle and the location of early-induced apoptosis. Radionuclide ventriculography was used to verify the presence of ARVC/D in the silent phase; these patients had very low regional and global ejection fractions in the right ventricle compared with the left ventricle.

The novel software, called VCG Sophie, incorporates these findings and was evaluated in patients in an ARVC/D database established by Prof Vranic in Serbia. Vectorcardiography was discovered by the presence of the V sign and T sign, stated Prof Vranic. Data from 36 patients who had ongoing monitoring with echocardiography that measured subtle changes with 2D vector loops were analyzed with 3D vector analysis.

The VCG Sophie software has proven to be a powerful tool with a 90% sensitivity and 100% specificity to diagnose ARVC/D. Notably, this software can be used in any medical office in the world, stated Prof Vranic, and will be especially useful in those that do not have echocardiography and other technology. This software will allow for earlier diagnosis of ARVC/D and the prevention of SCD because of earlier treatment, concluded Prof Vranic.