Transvenous endocardial pacemaker implantation is contraindicated in patients after prosthetic tricuspid valve replacement. A 65-year-old woman underwent both replacement of the mitral and tricuspid valves and pacemaker implantation with epicardial lead for bradycardia with chronic atrial fibrillation. At 2 years after this operation, the pacemaker’s battery became low, and she was admitted for a battery exchange. To avoid frequent battery exchanges because of high stimulation thresholds, a left ventricular pacing lead was implanted via a coronary vein. There were no complications and the stimulation thresholds were stable. Coronary vein leads enable a minimally invasive approach, improve safety, and give effective stimulation for patients with a prosthetic tricuspid valve. This is the first case report in Japan of left ventricular pacing in such a patient. (Circ J 2008; 72: 335–336)

**Key Words:** Arrhythmia; Pacemaker; Valves

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**Case Report**

A 65-year-old woman underwent mitral valve replacement with a bioprosthetic valve, as well as tricuspid valve repair using the De-Vega method. Four years later, she underwent pacemaker implantation with a transvenous endocardial lead because of bradycardia with chronic atrial fibrillation. A further 5 years later, the mitral and tricuspid valves had to be replaced, because of degeneration of the mitral bioprosthetic valve and recurrent grade IV tricuspid valve regurgitation. She underwent mitral and tricuspid valve replacements and removal of the endocardial lead of the right ventricle (RV), and implantation of a new pacemaker with a LV epicardial lead.

At 2 years after this operation, the pacemaker’s battery became low, and she was admitted for a battery exchange. To avoid frequent battery exchanges because of high stimulation thresholds, we implanted a LV pacing lead via a coronary vein. After accessing the left subclavian vein, a guiding catheter (Attain 6215, Medtronic Inc, Minneapolis, MN, USA) was introduced and placed into the ostium of the CS, then venography of the coronary veins was performed to establish their anatomy for occlusion with a Berman catheter (Fig 1).

The unipolar steroid-eluting endocardial pacing lead (Attain 4194, Medtronic) was implanted into the great cardiac vein (Fig 2). Measurements at implantation were: threshold 2.0 V at 0.4 ms; R wave 8.0 mV, impedance 850 ohms at 4.8 mA. The lead was secured and connected to a rate-adaptive pacemaker (InSync III 8042, Medtronic) that was placed in a left subfascial prepectoral pocket and programmed to ventricular demand rate-responsive at 70 ppm. Three days after implantation, a roentgenogram

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**Fig 1.** Coronary sinus venogram in the right anterior oblique view showing the great cardiac vein. MV, mitral valve; TV, tricuspid valve.
showed no lead dislodgement. After 1 month, we checked the pacemaker and it had a low threshold (1.0 V, 0.4 ms), good R-wave sensing (8 mV), and stable impedance (812 ohms, 4.8 mA).

**Discussion**

Today, nearly all ventricular pacemaker leads are implanted via the transvenous route. However, transvenous RV endocardial pacing lead is contraindicated in patients with a prosthetic tricuspid valve and in such cases, the epicardial pacing leads need to be located by a surgical technique. Recently, some authors have reported epicardial LV pacing lead placement by minimal invasive technique using a robotic assistant, revealing good results and a lower rate of lead-related complications compared with a CS lead. However, their failure rates and lead-related complications of the CS lead or epicardial pacing lead were approximately 10–20% and comparatively high. Furthermore, surgical epicardial pacing lead implantation has some disadvantages, such as the requirement of general anesthesia and surgical incision. In particular, after cardiac surgery the tissue around the ventricle is adherent and ventricular injury during dissection or exposing of the LV surface (especially after mitral valve replacement) may be fatal.

Bai et al first reported the use of LV pacing via the great cardiac vein after prosthetic TVR and this method has some advantages, such as the minimally invasive approach and improvement of cardiac function. Auricchio et al demonstrated that LV pacing increased peak oxygen consumption, the anaerobic threshold, distance walked in 6 min, and the quality-of-life score in patient with congestive heart failure. Unfortunately, there is still no report that has examined which coronary vein is better in terms of cardiac function after LV pacing implantation.

The most common complications of LV pacing through a coronary vein are diaphragmatic stimulation, CS dissection, and lead dislodgement. In the present case, we encountered a high stimulation threshold in the anterolateral vein and diaphragmatic stimulation in the posterolateral vein and had to place the lead in the great cardiac vein.

Hansky et al reported excellent results, with a success rate of 99%, and they demonstrated optimal lead choice and implantation technique in 579 patients who have been treated by biventricular pacing. Furthermore, in our experience, at least 1 coronary vein exists, so it is possible to implant a pacing lead in the anterior, lateral or posterior coronary vein. The development of leads specifically designed for LV stimulation by way of the CS may solve the problem of lead dislodgement. Good results for LV pacing in patients with mechanical tricuspid valves have been shown. During the follow-up period (3–18 months, mean 9 months), all patients were functioning without complications and the stimulation thresholds were stable (below 2.0 V).

The use of LV pacing through a coronary vein lead in patients with prosthetic tricuspid valves provides a minimally invasive approach, effective stimulation of the ventricle and improvement of cardiac function. LV pacing with these leads should be the first choice for patients with prosthetic tricuspid valves who require permanent ventricular pacing.

**References**