Fractured Guidewire during Left Ventricular Lead Insertion: A First Case Report

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We report on a 77-year-old man who had been diagnosed with diabetes and hypertension. He had also been diagnosed with cardiomyopathy, although details were unclear. He was referred from local clinics after becoming aware of shortness of breath on exertion. Electrocardiogram showed a 2:1 atrioventricular block with a wide QRS beat. Echocardiography and cardiac MRI showed very poor left ventricular contraction with chamber dilatation. Echocardiography showed left bundle branch block with dyssynchrony. On the electrophysiological testing, ventricular tachycardia and ventricular fibrillation were not induced, and no significant findings on coronary angiography had revealed at that time. He had shortness of breath on exertion with bradycardia-tachycardia syndrome and low cardiac function, and his electrophysiological examination was negative. Therefore we decided to implant cardiac resynchronization therapy pacemaker (CRT-P). During a guide-wire insertion for placement of the left ventricular lead into the coronary venous branch, the tip of the guide-wire suddenly broke off. We attempted to recover the fragment using a snare catheter, but were unsuccessful. Since then the patient has been under observation, with no clinical manifestations seen.

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Key words: Cardiomyopathy, Cardiac resynchronization therapy pacemaker, 2:1 Atrio-ventricular block

Introduction

There is increasing enthusiasm for the therapeutic potential of Cardiac Resynchronization Therapy (CRT) in patients with heart failure and left ventricular (LV) systolic dysfunction. CRT implantation requires a special technique to insert a lead into the coronary veins. With physicians becoming more experienced due to an increasing number of cases CRT implantation has become relatively safe. However, in rare cases, complications may occur during LV lead insertion. Here we report our experience of an extremely rare event in which a guidewire was fractured and dislodged during LV lead insertion.

Case Report

A 77-year-old man visited to our hospital upon referral from local clinics because of the shortness
of breath on exertion. He had been diagnosed with hypertension, diabetes mellitus and was being treated with an antihypertensive agent (Candesartan 8 mg/day) and a diuretic (Spironolactone 25 mg/day). In addition, although details were unclear, cardiomyopathy had been suspected from several years before.

The patient was given several tests at our hospital. Chest X-ray showed cardiomegaly with mild congestion. Cardio-thoracic rate was about 60%. Electrocardiogram showed 2:1 atrio-ventricular block with prolonged QRS width. The QRS type of capture rhythm was left bundle branch block, QRS width was 164 ms (Figure 1), and HR was 32 bpm. The late potential was negative. (filtered QRS: 183 ms, RMS26: 32 μV, HFLA26: 25 ms) Echocardiogram showed severely reduced LV contraction with LV dilatation (ejection fraction 33%, LV diastolic dimension 67 mm). Estimation of dyssynchrony by TDI (tissue Doppler imaging) revealed a significant time lag in the left ventricular septum and lateral wall of 142 ms. Cardiac MRI also showed very poor LV contraction with chamber dilatation. In addition, blood tests revealed a slightly elevated NT-pro BNP and an elevated HbA1c. NT-pro BNP was 333.5 pg/ml (5.0–200.0) and HbA1c was 6.3% (4.3–5.8). Further studies included coronary angiogram (CAG) and electrophysiological study (EPS). We examined 3 continuous extra stimuli to the right ventricular apex (RVA) (600–300–260–240 ms) and the right ventricular outflow tract (RVOT) (600–280–240–200 ms). In addition Isoprenaline hydrochloride (5 μg/kg/min) was prescribed with continuation stimulus conditions carried out 2 times of after medicine load at 400–260–220 ms and 400–240–240 ms, but no arrhythmia was induced. Furthermore, a burst stimulus was added at 220 bpm. However Ventricular tachycardia (VT) and ventricular fibrillation (VF) was not induced on EPS, and no significant findings on CAG was revealed. Current tests results revealed shortness of breath on exertion because of bradycardia and severely impaired cardiac function. Electrophysiological test was negative. Considering these findings, we determined that aggressive CRT-D implantation therapy was not indicated. However, we planned cardiac resynchronization therapy pacemaker (CRT-P) implantation and the patient underwent CRT-P implantation. We considered that the adverse effects on cardiac function were due to bradycardia. The QRS width on an electrocardiogram were also extended and showed dyssynchrony with severe poor LV contraction. After the insertion of a right ventricular lead, we performed a left ventricular lead insertion. A Boston Scientific insertion system was used for the left ventricular lead. The guiding catheter (RAPID Guiding Catheter™) was inserted into the coronary vein. We performed coronary venography and which showed two possible insertion locations for the coronary venous lead. A guidewire (WHISPER ES™) was inserted into the distal lateral coronary vein, over which an LV lead (EASYTRACK 2™) was inserted. After inserting the left ventricular lead, during the removal of the guidewire, the guidewire tip broke suddenly and was dislodged in the coronary vein. This happened only slightly after the left ventricular lead insertion. We tried to recover the guidewire tip with a snare catheter,

![Figure 1](image-url)

**Figure 1**
Electrocardiogram shows 2:1 atrio-ventricular block with wide QRS capture beats. The QRS type was left bundle branch block and the width was 164 ms. Heart rate was 32 bpm.
but it was impossible. Eventually, an LV lead was inserted into the proximal lateral coronary vein (Figure 2). The guidewire tip was left in the coronary vein. The patient has been under strict observation, with no adverse events occurring. After CRT implantation, the patient’s clinical findings improved dramatically (Figure 3). After the operation, the patient has been under strict observation using echocardiography, but no liquid pooling has been seen in the pericardium. No clinical problems or complications have been observed thereafter and the dislodged guidewire tip was visualized by chest X-ray.

Discussion

CRT improves quality of life and functional status (eg, NYHA class, exercise capacity), reduces heart failure-related hospitalizations, and prolongs survival.1–3) The magnitude of these benefits are similar to those reported for angiotensin converting enzyme inhibitors or β-blockers and are additive to the benefit of such medical therapy. With an increase in the number of implantations, the safety and reliability of the implantation procedure has improved. The periprocedural risks of CRT appear modest and are similar to the frequency reported for patients.

Figure 2
Coronary venography shows two lateral branches. First, we entered the distal lateral coronary vein using a guidewire (WHISPER ES™), and then the LV lead (EASYTRACK 2™) was inserted over the guidewire. After inserting the left ventricular lead, during the removal of the guidewire, the guidewire tip suddenly broke off and the fragment remained in the coronary vein (arrow). We attempted to recover the catheter tip with a snare catheter, but without success. LV lead was inserted into the proximal lateral coronary vein.

Figure 3
The first examination at our hospital, a chest X-ray shows cardiomegaly and mild congestion (left). After CRT implantation, cardiomegaly and the patient’s symptoms improved dramatically (center & right). The guidewire tip that remained in the coronary vein is visible (arrow).
undergoing implantation of conventional dual-chamber pacemakers. However, in a few cases, complications are seen during CRT implantation. Recent reports indicate, complications observed during CRT implantation include coronary venous dissection, lead dislodgement, and stimulation of the phrenic nerve. The complication we experienced, wire fracture and disconnection, appears to be an extremely rare event. We attempted to find a report of such an event, and discovered that ours is the first case report. In percutaneous coronary intervention (PCI) which has a longer history as an established procedure, a relatively large number of reports of are found of complications resulting from fractured guidewires. Complications of PCI are likely to have a direct effect on the patient’s life. Many reports have discussed the surgical treatment and guidewire recovery. The guidewire used for left ventricular lead insertion and that used for PCI actually have a similar structure. Therefore, the cause of the broken guidewire can be considered to be the same. The guidewire structure consists of a core wire wrapped around a thin wire with the two wires bonded to each other. Presumably, the cause of fracture is a continuous load during the procedure, which causes metal fatigue. With operation performed in our hospital, insertion and operation of guidewire are performed by making a tip into the shape of a loop as much as possible in order to avoid coronary vein perforation by a guidewire tip. Actually, the observation of cross-sectional pictures taken by our laboratory showed that the guidewire probably became unscrewed (Figure 4). This kind of event could occur with any guidewire having this type of structure. The current LV lead insertion system including guidewire reliability have improved, making the system safer than before. In our case an attempt was made to recover the fragment left in the coronary vein using a snare catheter, but without success. Therefore, we were forced to place the patient under observation. Unlike the arterial system, perhaps in the venous system is considered less likely for adverse events to occur. Although there was also a possibility that movement of the guidewire fragment within the vessel might cause perforation of the vessel, no such events have occurred under our observation.

**Conclusion**

In this case, we report an extremely rare event we experienced involving fracture and disconnection of the guidewire during LV lead insertion. This is the first such case report. While inserting a guide wire and left ventricular lead in coronary venous branch, the tip of the guidewire suddenly broke off and remained in the vessel. We tried to recover the fragment using a snare catheter without success. The patient has remained under observation since, and no clinical problems have occurred.

**References**

4) Ellenbogen KA, Hellkamp AS, Wilff BL, et al:


