# Two Cases of Long-term Coronary Sinus Pacing by Medtronic Model 6992 Lead

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**NAKAZATO and NAKATA**: ***Two Cases of Long-term Coronary Sinus Pacing by Medtronic Model 6992 Lead.*** *In late '70s, coronary sinus (CS) pacing was clinically performed by using several specifically designed lead systems. However, there is scant long-term follow-up data covering periods more than 15 years. We report two patients with sick sinus syndrome in whom CS pacing with Medtronic model 6992 lead system was successfully applied for 17 and 21 years, respectively. (J HK Coll Cardiol 2004;12:3-6)*

*Left atrial pacing, pacing lead, prognosis, sick sinus syndrome*

**摘要**

七十年代的晚期，冠狀竇起搏器在配以特殊設計的導線系統下已經在臨床上得以運用。然而缺乏超過15年的長期隨訪資料。我們在此報道二例病竇綜合征的病人，接受了冠狀竇起搏器配以美敦力6992型號導線系統，分別運用了17年和21年。

關鍵詞：左房起搏器　起搏導線　預後　病竇綜合征

## Introduction

Coronary sinus (CS) is an optional site for atrial pacing if an optimal site cannot be found in the right atrium. Although lead dislodgement and/or threshold rise were observed in limited cases, the long-term feasibility of the CS pacing method by standard or specifically designed lead systems has been reported.[1,2] However, no follow-up data over 15 years using Medtronic model 6992 CS lead has been reported. We have experienced two patients with sick sinus syndrome (SSS) in whom CS pacing by this system was successfully implanted at late '70 and applied for 17 and 21 years, respectively.

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## Case Reports

### Case 1

The patient was a 77-year-old male with SSS. At the age of 55, he was implanted with an AAI mode pacemaker using a Medtronic model 6992 CS lead (Figures 1a & 1b). Unipolar pacing was performed because of better thresholds than bipolar pacing. The voltage (V) and current (mA) thresholds measured with a pulse width of 0.6 msec were 2.4 V and 7.9 mA respectively at the time of implantation. P-wave amplitude was 2.1 mV and pacing impedance was 304 ohms. Although two generator changes were performed at 8 and 12 years following initial implant,

these parameters remained stable (Table 1). Thereafter, CS pacing was successfully performed for 17 years until lead fracture was found at the vicinity of puncture site. We abandoned the CS lead and implanted a new pacing system from the opposite site. ECG during CS pacing has not changed and no progression to atrioventricular block was noted (Figure 1c).

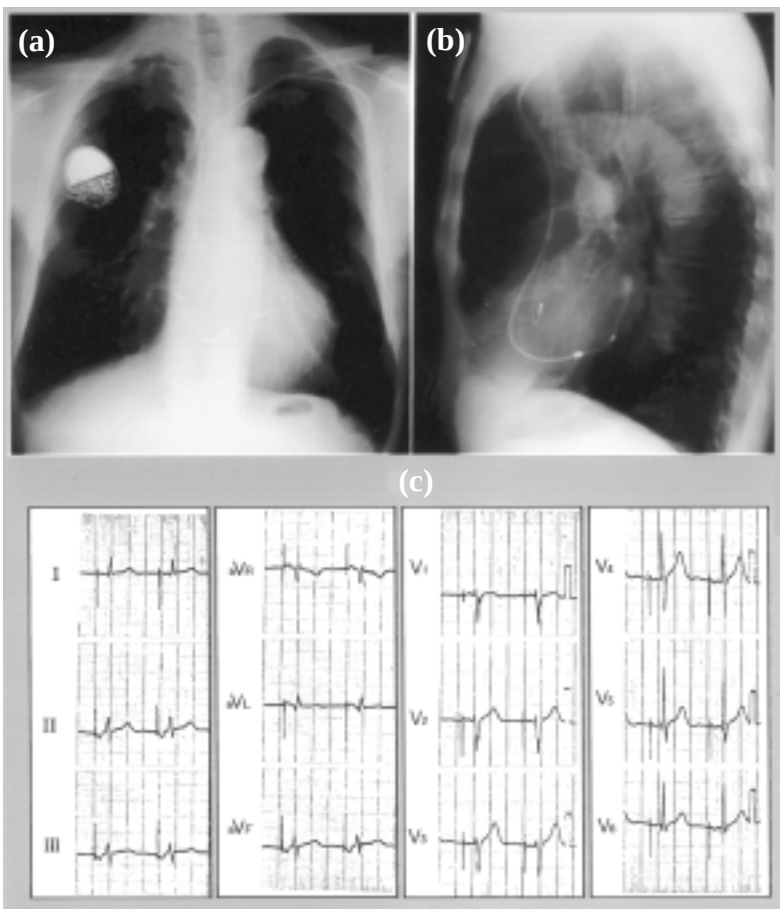


**Figure 1.** *Chest X-ray and ECG in Case 1. (a & b) CS lead is clearly recognizable in the Postero-anterior and lateral projections. (c) ECG showed stable atrial pacing. New pacing system implanted after CS lead fracture is seen at opposite site.*

**Table 1. Change of measurements at the time of initial implantation and replacement in Case 1**

| | Initial implant | Replacement | | |
|---|---|---|---|---|
| | | 1st | 2nd | 3rd |
| | ('78) | ('85) | ('90) | ('95) |
| Voltage* (V) | 2.4 | 3.2 | 2.2 | fracture |
| Current* (mA) | 7.9 | 9.6 | 5.6 | |
| P-wave (mV) | 2.1 | 1.8 | 2.4 | 0.3 |
| Impedance (Ω) | 304 | 315 | 379 | 740 |

*Measured at pulse width of 0.6 ms

### Case 2

The patient was a 68-year-old female with SSS. At the age of 48, she had recurrent syncope due to sinus arrest and CS pacing with a Medtronic 6992 lead was performed (Figures 2a & 2b). At the time of initial implantation, the voltage and current thresholds measured at a pulse width of 0.6 msec were 1.2 V and 2.8 mA respectively, and P-wave amplitude was 3.7 mV all in the unipolar configuration. Subsequently, the lead remained functional after one generator change with the last measured thresholds of 1.3 V and 2.9 mA at 0.6 ms, a P-wave amplitude of 2.6 mV and lead impedance of 540Ω. Stable CS pacing has been maintained for 21 years since the initial implantation. Voltage threshold during the follow-up period has ranged from 1.8 V to 2.2 V with a pulse width of 0.5 msec. The ECG has indicated constant AAI pacing and no progression to atrioventricular block is noted during the follow-up period (Figure 2b).

## Discussion

Recent advances in pacing lead technology have made stable atrial pacing possible. The prevalent lead fixation sites are the right atrial free wall by screw-in leads or the right atrial appendage by J-shaped leads. CS is another optional site for atrial pacing and several specially designed CS leads were used before the development of above two lead systems.[1,2] However, the CS lead has the concern of lead dislodgement and/or threshold rise and their clinical application was very limited.[1-3]

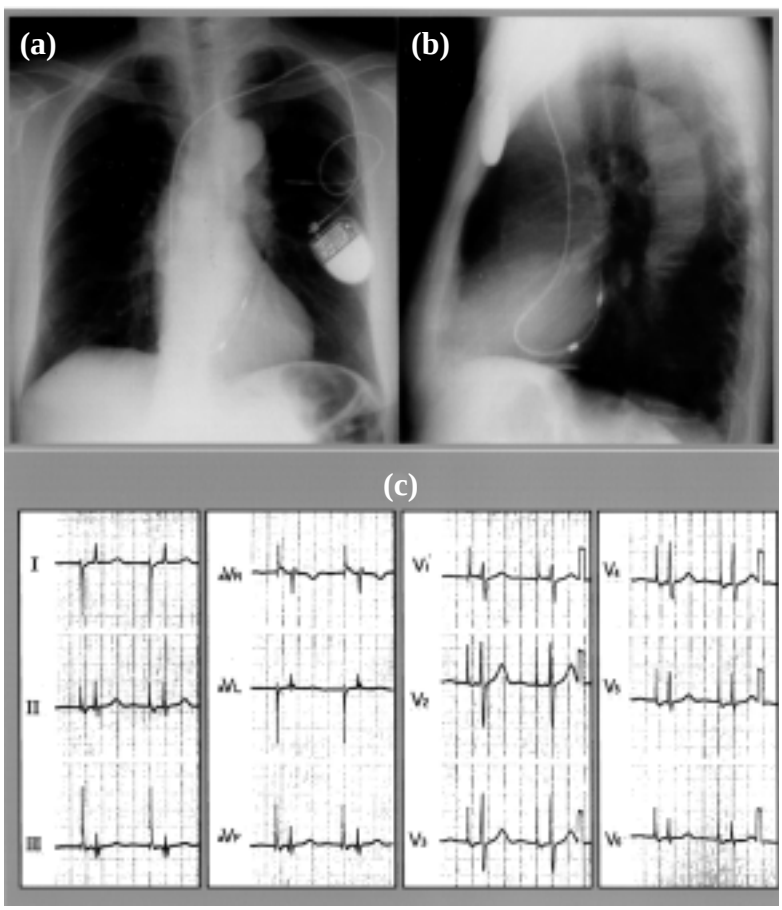


**Figure 2.** *Chest X-ray and ECG in Case 2. (a & b) CS lead is clearly recognizable in the Postero-anterior and lateral projection. (c) ECG showed stable atrial pacing.*

Moss and Rivers[2] reported ten-year experience in 50 patients with CS pacing by Medtronic model 5818 and 6904 bipolar pacing lead. They had 11 electrode related malpacing events, or a rate of 10% in the first pacing month, 1.1% per paced month during the next six months, and 0.25% per paced month thereafter. Within 7 months, they observed lead dislodgement and high thresholds as major problems. Effective atrial pacing was achieved in 76% of the patients during a follow-up of more than five years. They concluded that long term atrial pacing from the CS was safe and effective.

Greenberg et al[1] reported 66 patients with CS pacing by specifically designed leads. During an average follow-up of 14 months the failure rate was 14% and they reported 4 cases of lead dislodgement and 4 cases of threshold rise.

In the present cases, we had a chance to use Medtronic 6992 leads for CS pacing. Until then, we had no means of atrial pacing for sic sinus syndrome. This lead has a straight tapered tip with bipolar electrodes for obtaining stable fixation. However, unipolar use with distal electrode provides superior thresholds as compared to bipolar use. This could be explained by the fact that proximal electrode more mobile and could not maintain good contact with surrounded CS tissues. Ideally, it had been better to fix the lead in optimal position for good thresholds. However, if this CS lead was once fixed, it could not be changed the position for preventing dislodgement. If the thresholds were not acceptable at this position, we might have abondoned it and obliged to chose ventricular pacing. In our 2nd case, voltage and current thresholds were 1.3 V and 2.9 mA respectively. These were similar to Greenberg et al's[1] and Moss and Rivers's[2] reports which stated an overall average threshold by unipolar and bipolar CS pacing as 2.3 mA in both series. Relatively high thresholds were obtained in our 1st case, but they were mostly stable. Thus, the thresholds during long-term follow-up periods were acceptable and lead dislodgement was not observed in either cases.

Recently, the indication of biatrial pacing is emphasized for the prevention of refractory atrial tachyarrhythmias.[4] In such cases, CS pacing is a necessary site for left atrial pacing. Therefore, the long-term prognosis of CS leads is major concern. Rosenthal and Cook reported that significant adhesions to the coronary veins were found 12 years after placing a pacing lead in the posterolateral coronary vein.[5] The results of their observation and the presented cases support that the long-term CS pacing is feasible with safety. It may encourage selecting the CS as a site for multisite pacing if it is needed.

## References

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