

Septal pacing using an inner guiding catheter without an outer sheath: A case series



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Introduction

Selectra 3D (Biotronik, Berlin, Germany) is a recently developed catheter-based lead delivery system with 2 perpendicular curves. Owing to its 3-dimensional (3D) shape, it is an effective sheath that allows a lead to easily be directed toward the ventricular septum. The Selectra 3D has 2 perpendicular curves and is also available in 3 curves—65 mm, 55 mm, and 40 mm—to accommodate different patient anatomies (Figure 1A and 1B). However, Selectra 3D has a diameter of 7.3F and thus requires an outer sheath of 9F. As compared to a standard pacemaker implantation, using Selectra 3D is problematic in that the delivery system is increased by one sheath and the size is also larger, leading to increased costs and increased risk of bleeding.

The use of septal pacing has been reported to reduce chronic cardiac dysfunction as compared with apical pacing.¹ However, it has been reported that 8% of fluoroscopy-guided right ventricular (RV) lead placements in the ventricular septum are unexpectedly placed at the free wall instead.² This means that even if septal pacing is performed with fluoroscopic guidance, it is not definite because of the variable cardiac long-axis orientation.³

Considering the effort and cost of using an outer sheath, we wondered if it would be possible to perform septal pacing without using an outer sheath. Herein, we report a case series of implantation using a Selectra 3D system without an outer sheath.

KEYWORDS Septal pacing; Apical pacing; Selectra; Inner guiding catheter; Pacemaker implantation
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KEY TEACHING POINTS

- Selectra 3D (Biotronik, Berlin, Germany) is a recently developed catheter-based lead delivery system with 2 perpendicular curves. Owing to its 3-dimensional (3D) shape, it is an effective sheath that allows a lead to easily be directed toward the ventricular septum.
- The use of Selectra 3D alone without an outer sheath during pacemaker implantation resulted in adequate electrical parameters without increasing procedure-related complications.
- Septal pacing was confirmed by computed tomography in all cases. Selectra 3D can be useful device for septal pacing.

Case report

Between August and September of 2021, 10 consecutive patients were scheduled for elective dual-chamber pacemaker implantation (Evity 8 DR-T; Biotronik, Berlin, Germany) at Sapporo Cardio Vascular Clinic. They were performed by a single young implanter and included in this study. Informed consent was obtained from all patients. Standard steps for pacemaker implantation were followed. First, a venogram was performed from the left upper extremity to check for any anatomical problems. Second, the pacemaker pocket was created in the left thoracic cavity and then 2 guidewires were inserted by extrathoracic puncture. Subsequently, the Selectra 3D was inserted without an outer sheath (Figure 1C). The Selectra 3D was inserted into the RV outflow tract and pulled counterclockwise toward the inter-ventricular septum. Then, an RV lead with a straight stylet was inserted into the Selectra 3D. Contrast was performed in both the right anterior oblique position and the left anterior oblique position via Selectra 3D, and it was confirmed that

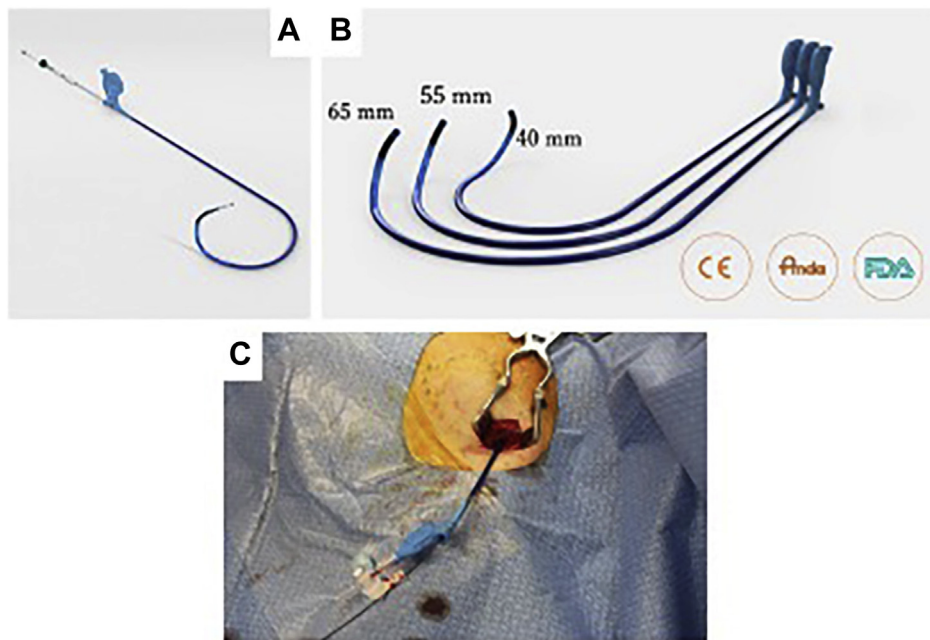


Figure 1 The shape and insertion of the Selectra 3D (Biotronik, Berlin, Germany) sheath. **A:** The Selectra 3D has 2 perpendicular curves. **B:** The Selectra 3D sheath is also available in 3 curves (65 mm, 55 mm, and 40 mm) to accommodate different patient anatomies. **C:** The Selectra 3D sheath is inserted via the subclavian vein without an outer sheath.

the Selectra 3D was facing toward the septum. After confirmation that the electrical parameters were adequate, the sheath was cut using a slit. The atrial lead was screwed into the right atrial appendage through a 7F peel-away sheath. We closed the pocket by suturing in 3 layers and the procedure was completed.

The RV lead placement time is the time from insertion of the Selectra 3D to implantation of the RV lead and sheath slitting. Electrocardiography-synchronized cardiac computed tomography (CT) was performed in all patients during hospitalization to confirm the position of the leads.

Baseline characteristics and procedural outcomes are shown in [Table 1](#). The mean age was 84 ± 6 years, and 20% of the patients were male. The procedure's success

rate was 100%, and the RV lead could be implanted with Selectra 3D without an outer sheath in all cases. The mean RV lead placement time was 9.1 ± 5.6 minutes. The sensed R-wave amplitude was 8.4 ± 3.1 mV, the pacing threshold was 0.6 ± 0.2 V, and the impedance was $641 \pm 80 \Omega$. Post-operative CT confirmed that the RV lead tip was located at the septum in all cases ([Figure 2](#)). No procedure-related complications such as bleeding or lead dislodgement were observed during hospitalization.

Discussion

This case series demonstrated that a pacemaker could be implanted using Selectra 3D alone without using an outer

Table 1 Patients' background and procedure outcomes

Case	Age	Sex	Arrhythmias	LVDD	LAD	Success	Procedure					
							Size of Selectra 3D	Time to RV lead implantation (min)	R-wave amplitude (mV)	Threshold (V)	Impedance (Ω)	Septal pacing via CT
1	86	Male	SSS	50	43	Yes	65-L	24	5.7	0.4	604	Yes
2	80	Female	SSS	50	32	Yes	65-L	7	9.1	0.7	585	Yes
3	74	Female	SSS	43	35	Yes	65-L	3	10.1	0.9	702	Yes
4	93	Female	CAVB	42	39	Yes	65-L	14	5.9	0.5	487	Yes
5	77	Male	CAVB	49	28	Yes	40-S	8	6.2	0.7	607	Yes
6	86	Female	CAVB	40	38	Yes	55-M	8	14.9	0.5	663	Yes
7	81	Female	SSS	48	37	Yes	65-L	6	12.5	0.8	781	Yes
8	84	Female	SSS	47	49	Yes	55-M	8	8	0.7	585	Yes
9	95	Female	CAVB	45	46	Yes	55-M	8	6	0.7	721	Yes
10	85	Female	AVB	42	33	Yes	65-L	5	5.1	0.4	682	Yes

AVB = atrioventricular block; CAVB = complete atrioventricular block; CT = computed tomography; LAD = left atrial diameter; LVDD = left ventricular end-diastolic diameter; RV = right ventricular; SSS = sick sinus syndrome.

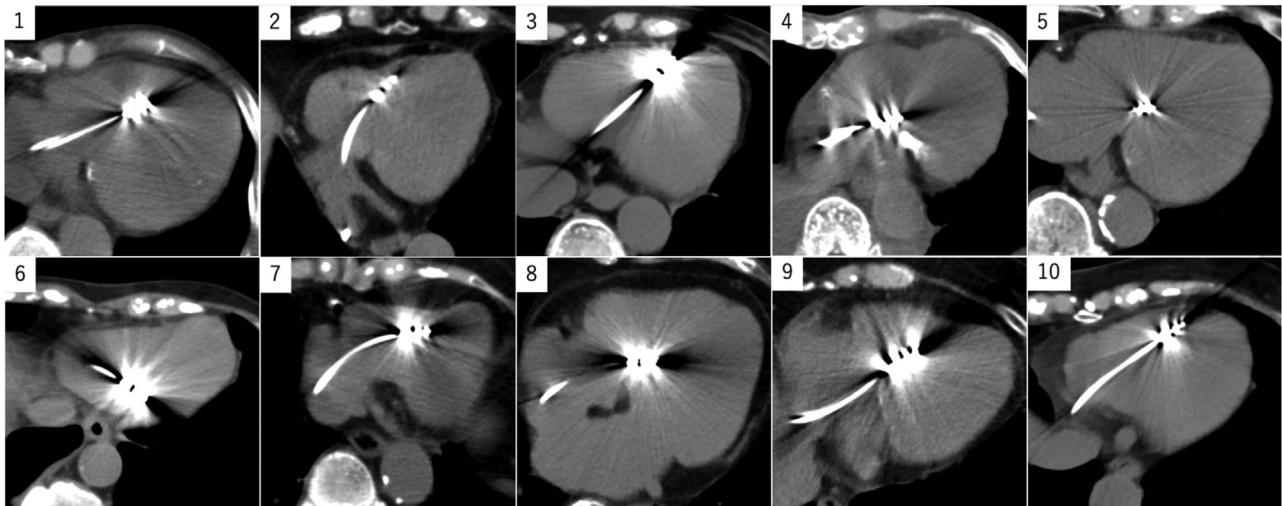


Figure 2 Postoperative computed tomography (CT). The CT confirmed that the right ventricular lead tip was located at the septum in all cases.

sheath. The use of the Selectra 3D without the outer sheath resulted in good electrical parameters and all patients confirmed septal pacing via CT. Furthermore, no procedure-related complications such as bleeding or lead dislodgement were observed.

Selectra 3D has a diameter of 7.3F and is traditionally inserted into a 9F outer sheath. The use of Selectra 3D alone has several advantages. First, using only 1 sheath simplifies the procedure. Second, this configuration is easier to insert even in cases of subclavian vein stenosis. Third, bleeding complications from the puncture site are expected to be reduced with the use of Selectra 3D. In addition, eliminating an outer sheath leads to cost reduction. Even if the lead is dislocated after the Selectra 3D is slitted, it can be replaced using stylet-driven leads.

The main problem during septal lead placement is unexpectedly attaching the lead to the RV free wall. Furthermore, patients with RV free-wall pacing have an increased rate of cardiac death and heart failure–related hospitalization compared to those with septal pacing.² To prevent RV free-wall pacing, fluoroscopic and electrocardiographic criteria for the documentation of pacing lead positioning have been described, but these are inaccurate.⁴

Selectra 3D is a preshaped sheath with 2 perpendicular curves. Owing to these 3D curves, the lead can be easily directed toward the septum without shaping the stylet. Furthermore, even with the RV lead inserted, contrast can be obtained from the sheath to ensure that the lead is facing the septum.

This study has several limitations. This was a relatively small case series with no control arm. Second, these procedures were performed by a single implanter. However, it is notable that even a young implanter with limited experience in implantation techniques was able to perform septal pacing in all cases. Finally, there were no clear criteria to determine which size of Selectra 3D to use. Further research is needed to determine whether it is possible to use different sizes depending on atrial diameter and vascular anatomy.

In conclusion, the use of Selectra 3D alone without an outer sheath resulted in adequate electrical parameters without increasing procedure-related complications. In addition, septal pacing was used in all cases, showing that Selectra 3D has the potential to be an effective device for septal pacing.

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