Conduction System Pacing with a dual chamber implantable cardioverter-defibrillator

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COI Disclosure

Su Yeong,Park

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Disclosure

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- Consulting Fees:
- Other:

Conduction system pacing (CSP)

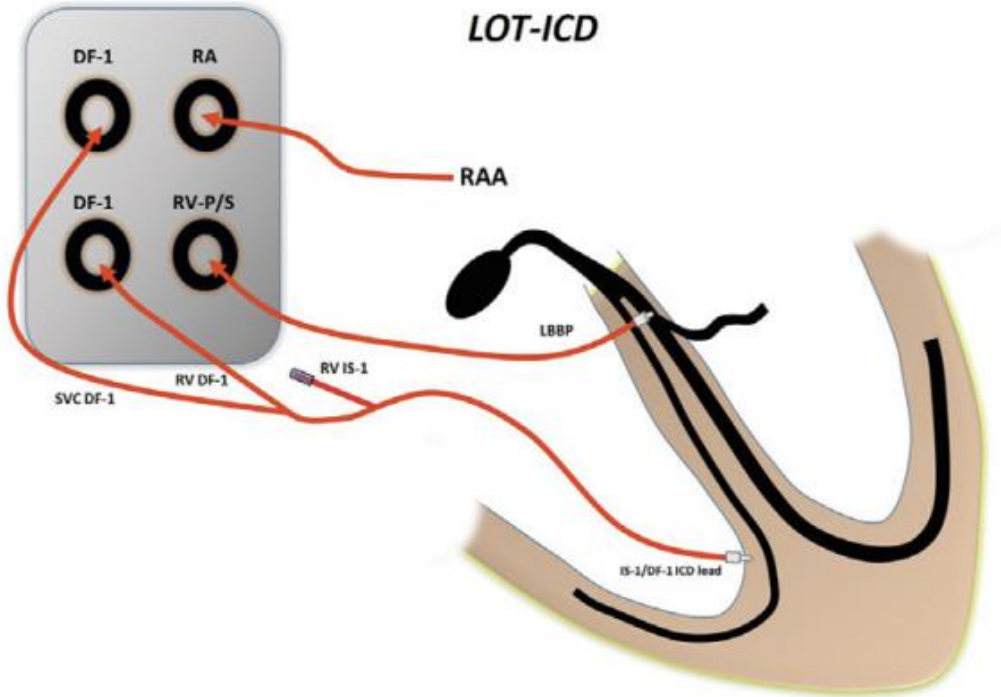
2022 AHA/ACC/HFSA Guideline for the Management of Heart Failure
His bundle and left bundle pacing are attractive because they use the intrinsic conduction system.

2021 ESC guidelines on cardiac pacing and cardiac resynchronization therapy
Left bundle area pacing is very promising data on the modality are still scarce, Therefore, recommendations for LBBAP cannot be formulated at this stage.

Conduction system pacing is considered to be beneficial include...

- **Fail to place LV lead in CS**
- **High ventricular pacing burden**
- **AVN ablation or AF with SVR**

Left bundle branch pacing–optimized implantable cardioverter-defibrillator (LOT-ICD) for cardiac resynchronization therapy: A pilot study

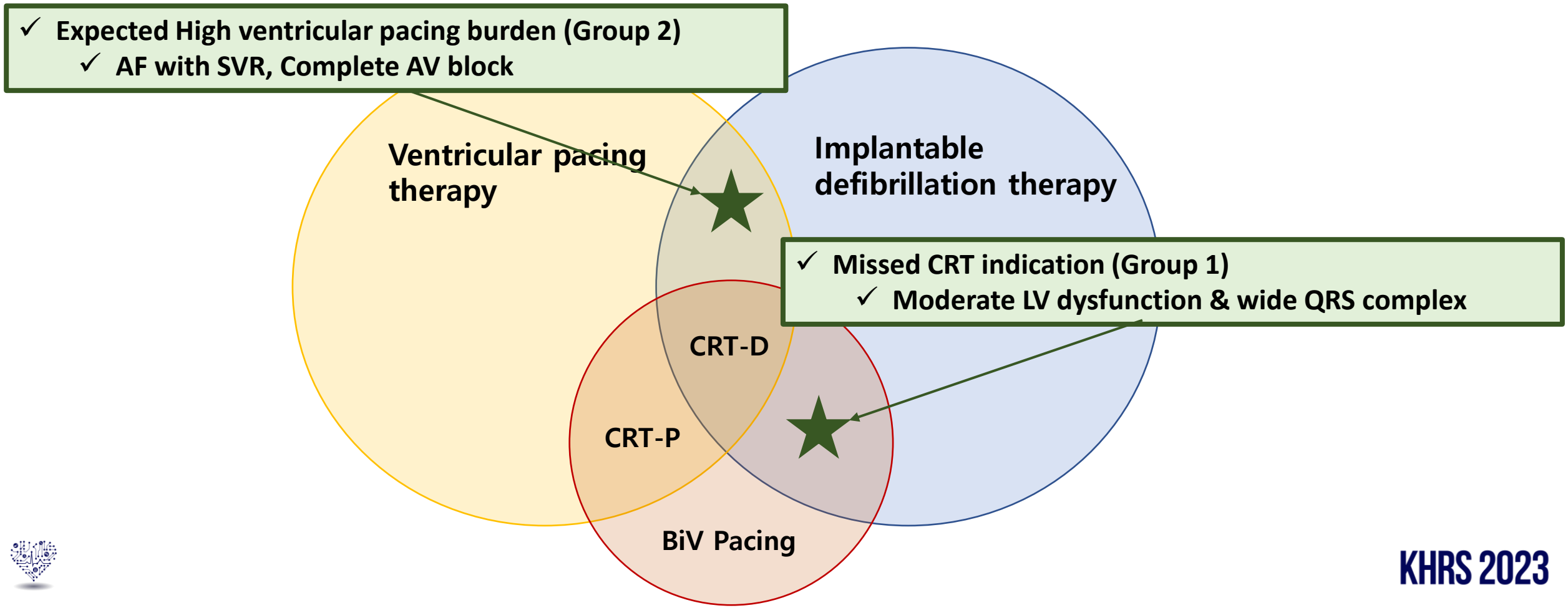


- ✓ **LOT-ICD could provide cost-effective cardiac resynchronization therapy without CRT device**
- ✓ LBBP was successful in 11 of 19 CRT-D–eligible patients (57.9%)
- ✓ Pacing parameters remained stable during mean follow-up of 13.9 months

Ponnusamy, Shunmuga Sundaram et al. *Heart rhythm O2* vol. 3,6Part B 723-727. 16 Dec. 2022,

Background

There is an unmet need for conduction system pacing (CSP) in patients with indication for implantable cardioverter-defibrillator (ICD).



Hypothesis

- ✓ Additional CSP with dual chamber ICD would be helpful in selected patients at high risk of pacing induced cardiomyopathy or moderate LV dysfunction with intra-ventricular conduction delay.

Objectives

- ✓ Investigate the feasibility and acute outcome of CSP with a dual chamber ICD.

Methods – Study design

- **Single center retrospective study**
- **From May-2022 to Mar-2023**

CSP-ICD was done in patients

- Standard indication for ICD
- Either of the two conditions
  I. Intra-ventricular conduction delay, manifested as Wide QRS complex (n=4)
     I. LVEF > 35% and Wide QRS complex ≥ 130ms with LBBB (n=2)
     II. LVEF > 35% and Wide QRS complex > 150ms with non-LBBB (n=2)
  II. Expected High ventricular pacing burden (n=5)
     I. Complete AV block (n=2)
     II. AF with slow ventricular rate or Tachy-brady syndrome (n=3)

Methods – Study design

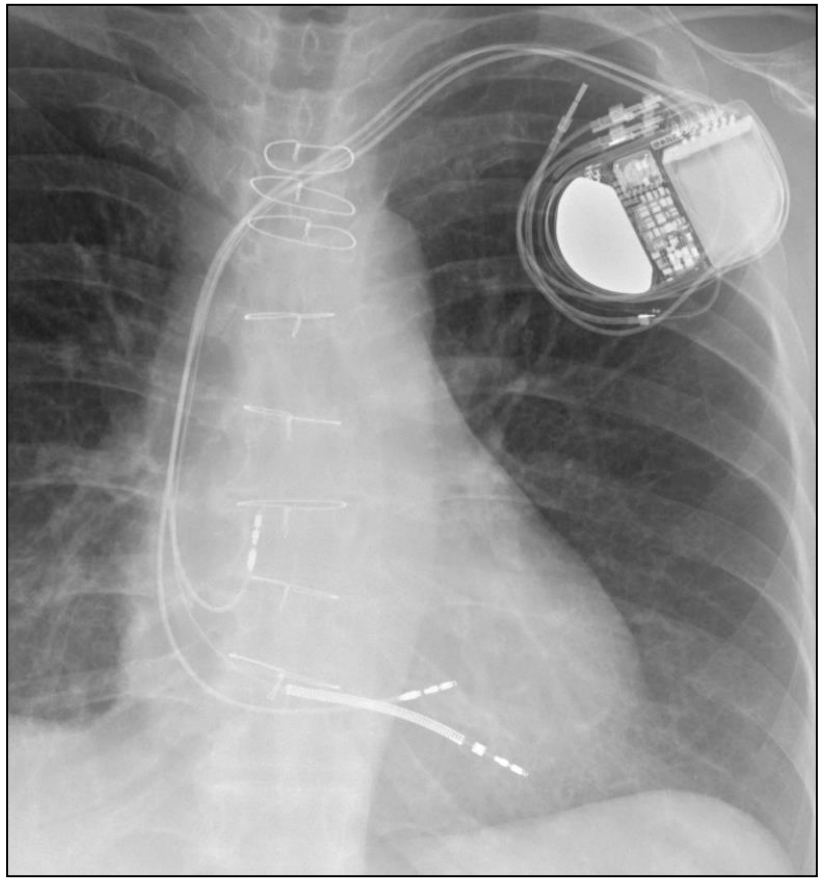
Procedure

- CSP was performed with stylet-driven lead delivered through a specific designed introducer
- A single coil DF-1 lead was placed in RV apex

Outcomes

- electronic database
- procedural outcome and complications

CSP-ICD



Result – Baseline characteristics

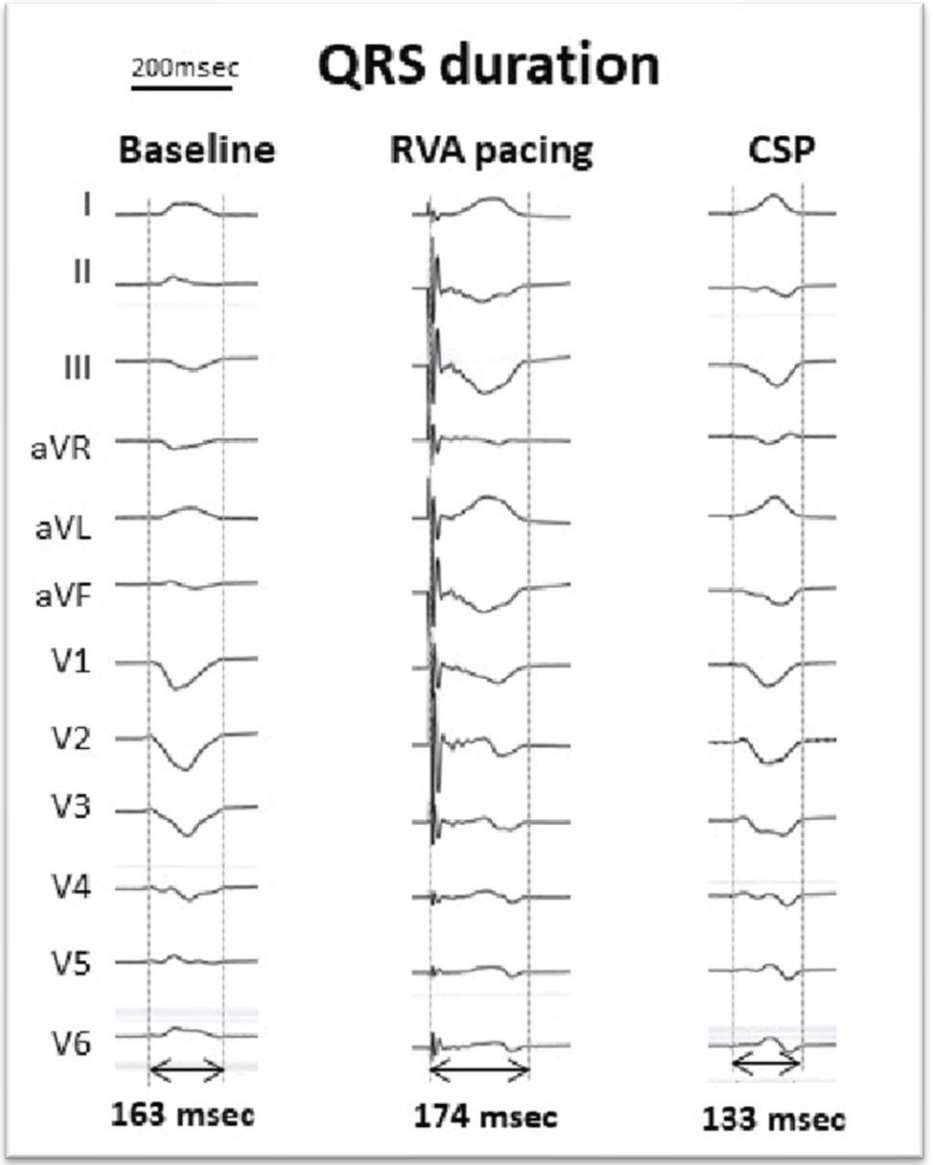
	Total (n=9)
Age	64.2 ± 13.2
Male, n (%)	7 (77.8%)
Hypertension, n (%)	3 (33.3%)
Diabetes mellitus, n (%)	3 (33.3%)
Peripheral artery disease, n (%)	0 (0%)
Stroke, n (%)	0 (0%)
Coronary artery disease, n (%)	1 (11.1%)
Valvular heart disease, n (%)	3 (33.3%)
Chronic kidney disease, n (%)	3 (33.3%)
Atrial fibrillation, n (%)	
Paroxysmal	4 (44.4%)
Persistent	3 (33.3%)
Ventricular tachycardia, n (%)	9 (100%)
LVEF, %	46.8 ± 10.5
Cardiomyopathy, n (%)	
Dilated cardiomyopathy	2 (22.2%)
Ischemic cardiomyopathy	1 (11.1%)
Hypertrophic cardiomyopathy	3 (33.3%)
Infiltrative cardiomyopathy (Fabry, Sarcoidosis)	3 (33.3%)

Result – Procedural outcome

Procedural characteristics	
Procedure time, min	100.8 ± 19.8
Fluoroscopy time, min (n=10)	15.9 ± 8.2
Radiation dose, mcgy/m2 (n=10)	1570. ± 954.8
Complication, n (%)	
Cardiac perforation and tamponage	0 (%)
Pocket hematoma	1 (11.1%)
Lead dislodgment	1 (11.1%)
Infection	0 (%)

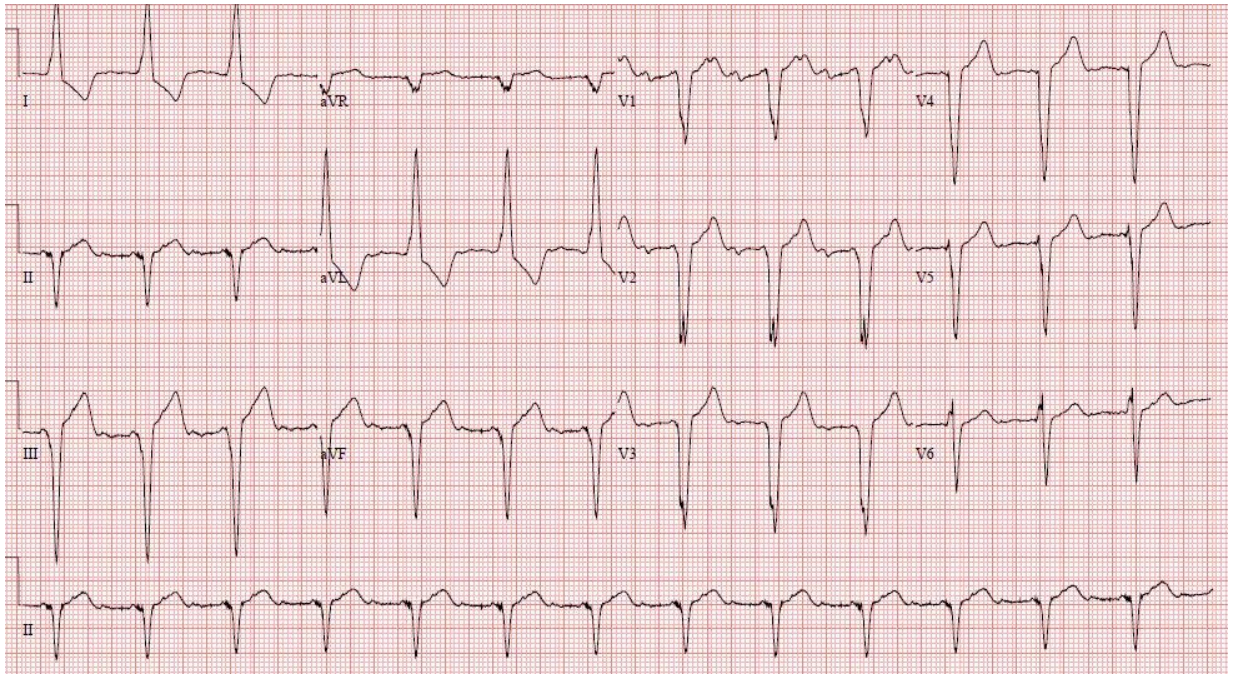
Result – Procedural outcome

Electrogram (intra-cardiac)	Intraventricular con duction delay (n=4)	Ventricular pacing dependent (n=5)
Baseline QRS width, ms	170.7 ± 22.2	125.8 ± 15.1
RVA pacing QRS width, ms	168.3 ± 12.5	216.7 ± 52.3
CSP QRS width, ms	148.5 ± 15.1	182.0 ± 74.0
V pacing, %	77.7 ± 42.5	98.7 ± 1.3

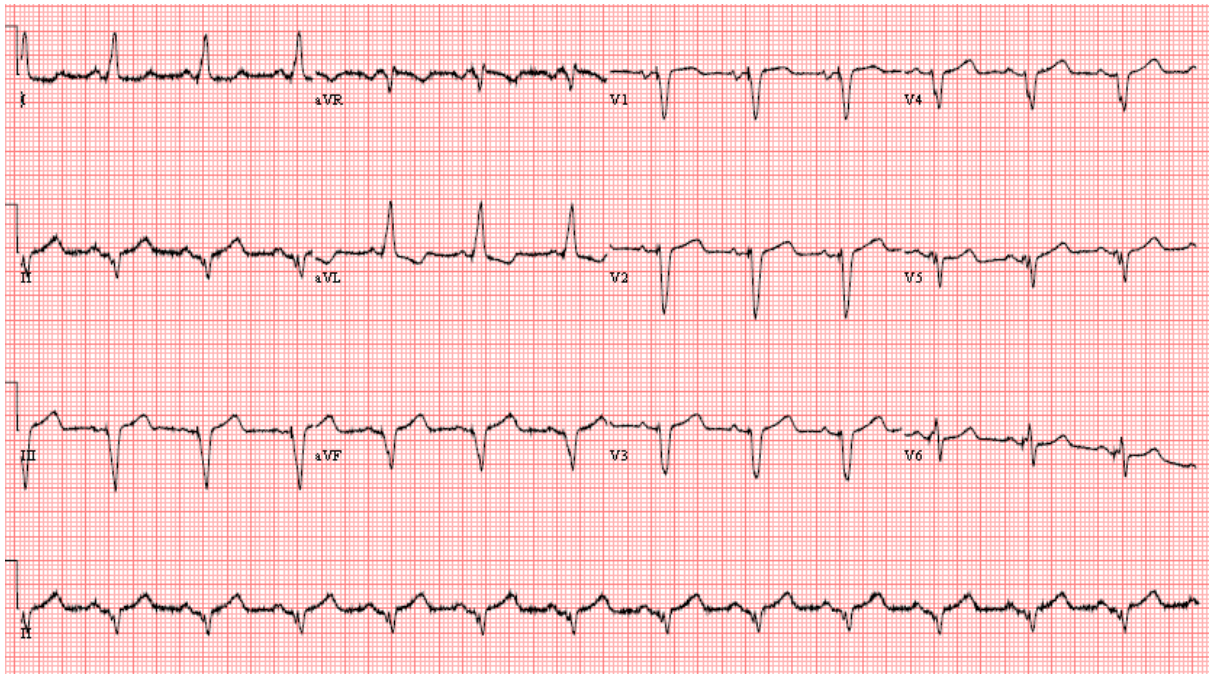


Result – 12 lead Electrocardiogram

Pre-procedure



Post-procedure 1 day



52/F
HCMP s/p septal myectomy, Non sustained VT (ICD indication)
LBBB pattern with wide QRS, LVEF 51%

Result – Electronic database outcomes

	Total (n=9)	Intraventricular conduction delay (n=4)	Ventricular pacing dependent (n=5)
Measurement at 1 day follow-up			
Paced QRS duration, ms	161.7 ± 20.1 (n=8)	150.7 ± 21.2 (n=3)	168.4 ± 18.4 (n=5)
Sensing voltage, mV	14.7 ± 7.8 (n=6)	19.3 ± 3.0 (n=3)	10.0 ± 8.8 (n=3)
Threshold, V @ ms	0.84 ± 0.33	0.68 ± 0.13	0.98 ± 0.40
Impedance, Ohms	764.3 ± 178.9	683.2 ± 218.5	829.2 ± 128.0
Measurement at 1 month follow-up			
Paced QRS duration, ms	146.2 ± 18.3	147.0 ± 21.3	145.5 ± 18.1 (n=4)
Sensing voltage, mV	14.1 ± 8.4 (n=8)	18.2 ± 10.4 (n=3)	11.7 ± 7.1
Threshold, V @ ms	0.72 ± 0.22	0.74 ± 0.34	0.70 ± 0.10
Impedance, Ohms	676.8 ± 119.9	696.2 ± 171.1	661.2 ± 78.2

QRS duration measured on surface 12 lead electrogram

Conclusion

- ✓ CSP-ICD is a feasible and may be an alternative strategy in patients, who plan to implant ICD and have moderate left ventricular dysfunction with wide QRS complex or high risk of pacing-induced cardiomyopathy.

- ✓ Further large-scale randomized trials are necessary.