

## LEFT BUNDLE BRANCH PACING AND MECHANICAL DESYNCHRONY: A REAL-WORLD PERSPECTIVE

**Margarida de Castro**, Luísa Pinheiro, Mariana Tinoco, Emídio Mata, Bárbara Lage, Cláudia Mendes, Assunção Alves, Bernardete Rodrigues, Rita Andrade, Vera, Olga Azevedo, Lucy Calvo, Sílvia Ribeiro, João Português, Victor Sanfins, António Lourenço

### BACKGROUND AND PURPOSE

**Left Bundle Branch (LBB) Area Pacing (LBBAP)** is a physiological pacing technique designed to mitigate the adverse effects of right ventricular pacing. It is believed to preserve inter- and intraventricular synchrony and reduce QRS duration.

**Aims:** To evaluate the performance and success rate of LBBAP in a real-world population. To compare the results of LBBAP under unipolar and bipolar polarity configuration. To assess the effect of LBBAP on mechanical dyssynchrony (MD) in the subset of patients with intraventricular conduction disturbances.

### METHODS

**Retrospective study** of patients undergoing LBBAP (intention-to-treat) for bradycardia indication. The performance, success rate and complications of LBBAP are described.

In patients with **baseline QRS >110ms**, QRS duration after LBBAP was measured and compared under **unipolar and bipolar** configuration.

**In the subset of patients with intraventricular conduction disorders**, **echocardiographic evaluation of MD** was performed offline by **two independent observers** in three scenarios: **baseline rhythm** and under **unipolar and bipolar** configuration of LBBAP.

MD was defined using septal flash and interventricular mechanical delay (IVMD) >40ms.

### CONCLUSIONS

LBBAP demonstrated **high success rates, stable parameters and reduced QRS duration**, with minimal complications.

**Polarity configuration** of LBBAP showed **no significant differences in ECG parameters**. Given that the unipolar configuration leads to greater battery drain, the polarity must be defined case by case in order to guarantee greater optimization of mechanical synchrony.

MD improved in patients with intraventricular conduction disorders, so LBBAP may be preferable to minimize the risk of LV dysfunction mediated by dyssynchrony in these patients. Further research with larger samples and extended FU is needed to better understand the impact of LBBAP on MD.

### RESULTS

	N = 68
Immediate Success n (%)	59 (86.8)
Complications n (%)	
None	62 (91.2)
Lead displacement	1 (1.5)
Hematoma	2 (2.9)
Electrode disfunction	1 (1.5)
Hydropneumothorax	1 (1.5)
Pericarditis	1 (1.5)
Median left ventricular activation time (LVAT)	72.05±1.65ms
Success loss in FU n (%)	2 (2.9)
Success rate at FU n (%)	57 (83.8)
Follow-up time, months Mean ± SD	11.85 ± 0.86
Pacing percentage at FU, % Mdn (IQR)	48.5 (91.43)

	Procedure	Follow-up
Capture threshold, V at 0,4ms	0.50	0.60
Mnd (IQR)	(0.85)	(0.25)
Pacing impedance, ohms	589.00 (195.50)	399.00 (104.50)
Mnd (IQR)		
R wave amplitude, mV	9.20	14.80 (10.35)
Mnd (IQR)	(3.55)	

	Total (N)	Baseline	Post-procedure	Follow-up	p-value
QRS, ms Mnd (IQR)	31	134.00 (28.00)	120.00 (4.00)	122.00 (28.00)	.002

No significant difference was observed between bipolar and unipolar modes (**p=1.000**).

### INTERVENTRICULAR DESYNCHRONY

A subset of **14 patients with intraventricular conduction disorders (3 with right bundle branch block (RBBB) and 11 with LBBB)** underwent **echocardiographic analysis of MD**.

At baseline without *pacing*, QRS duration was 155.50ms (IQR 24.25) and left ventricular ejection fraction (LVEF) was 56.7%±2.19. **With LBBAP, LVEF remained stable.**

**A significant reduction in IVMD was shown (p=.003)** with both polarities (**42±52ms vs 18±31ms in unipolar; vs 10±15ms in bipolar**, with a **greater number of patients losing IVMD MD criteria with bipolar configuration (p=.004)**).

At baseline, 7 patients had MD (using IVMD>40ms as a criterion). With unipolar pacing, 4 patients no longer had MD and all 7 lost MD with bipolar pacing (p=.004) configuration.



	Total (N)	Baseline own rhythm	Unipolar Pacing	Bipolar Pacing	p-value
IVMD > 40ms	13	7 (53.8%)	3 (23.1%)	0 (0%)	.005

	Total (N)	Baseline own rhythm Mnd (IQR)	Unipolar Pacing Mnd (IQR)	Bipolar Pacing Mnd (IQR)	p-value
SEPTAL FLASH	12	9 (75.0%)	3 (23.1%)	5 (38.5%)	.030