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Comparative analysis of His-bundle pacing and left bundle branch area pacing: acute and short-term results

Estudio comparativo entre la estimulación hisiana y la estimulación en la zona de la rama izquierda: resultados agudos y a corto plazo

To the Editor,

Selective and nonselective His-bundle pacing (HBP) has proven to have morbidity and mortality outcomes comparable or superior to those of conventional endocardial right-ventricular pacing and cardiac resynchronization therapy (CRT).[1]

Left bundle branch area pacing (LBBAP) is a feasible and safe alternative option in candidates for antibradycardia therapy or CRT and has also obtained similar outcomes to conventional pacing.[2] The objective of this study was to compare electrocardiographic and pacing parameter outcomes between HBP and LBBAP at implantation and at 3 months.

A retrospective review was conducted of a prospectively studied cohort of consecutive patients scheduled for antibradycardia therapy and CRT who underwent cardiac device implantation by the same electrophysiologist and with the same learning curve in each group. HBP alone was performed during the first study period (January through December 2018) and LBBAP alone during the second study period (January through December 2019).

HBP was performed as described in the literature.[3] For the LBBAP procedure, we based our criteria on those of Huang et al.[4]: left bundle pacing was defined as the presence of qR or rsR'

Table 1
Patients' baseline characteristics and success criteria

Success criteria *		HBP group	LBBAP group
bQRS < 120ms		< 120 ms	≤ 130 ms
bQRS ≥ 120ms		Narrowing ≥ 20% or paced QRS < 130 ms	Narrowing ≥ 20% or paced QRS < 130 ms
ABT	51 (58.6)	29 (64.4)	22 (52.4)
CRT	36 (41.4)	16 (35.6)	20 (47.6)

Variable	Total group (n = 87)	HBP group (n = 45)	LBBAP group (n = 42)	P
Age, y	76 (64-81)	75.5 (62.5-82.5)	76 (64.2-81)	.7
Sex male, %	53 (60.9)	28 (62.2)	25 (59.5)	.8
HT	67 (77)	40 (89)	27 (64.3)	< .01
DM	37 (42.5)	21 (46.7)	16 (38.1)	.42
Heart disease	46 (53)	18 (40)	28 (66.7)	< .05
LVEF, %	60 (35-60)	60 (34.5-60)	52.5 (34.7-60)	.47
Depressed LVEF	38 (43.7)	17 (37.8)	21 (50)	.25
Dilated RA	39 (44.8)	21 (46.7)	18 (42.9)	.72
Dilated LA	67 (77.3)	34 (75.6)	33 (78.6)	.74
Previous device	13 (15)	8 (17.8)	5 (11.9)	.44
Sinus atrial rhythm	69 (79.3)	32 (71.1)	37 (88.1)	.051
PR interval, ms	196 (178-234)	192 (160-220)	200 (180-238)	.28
BBB	49 (56)	25 (55.5)	24 (57.1)	.91
QRS complex, ms	145.5 ± 44	148.3 ± 48	142.5 ± 38	.54
Wide QRS complex	55 (63.2)	28 (62.2)	27 (64.3)	.84
Therapy indication				.25

ABT, antibradycardia therapy; BBB, bundle branch block; bQRS, baseline QRS; CRT, cardiac resynchronization therapy; DM, diabetes mellitus; HBP, His-bundle pacing; HT, hypertension (high blood pressure); LA, left atrium; LBBAP; left bundle branch area pacing; LVEF, left ventricle ejection fraction; RA, right atrium.
The data are presented as No. (%), mean ± standard deviation, of median [interquartile range].
* Accepted pacing parameters: threshold ≤ 3.5 V, R-wave amplitude ≥ 0.8 mV, pulse with of 1 ms with HBP and 0.5 ms with LBBAP. An increased in threshold of > 1 V was defined as significant.

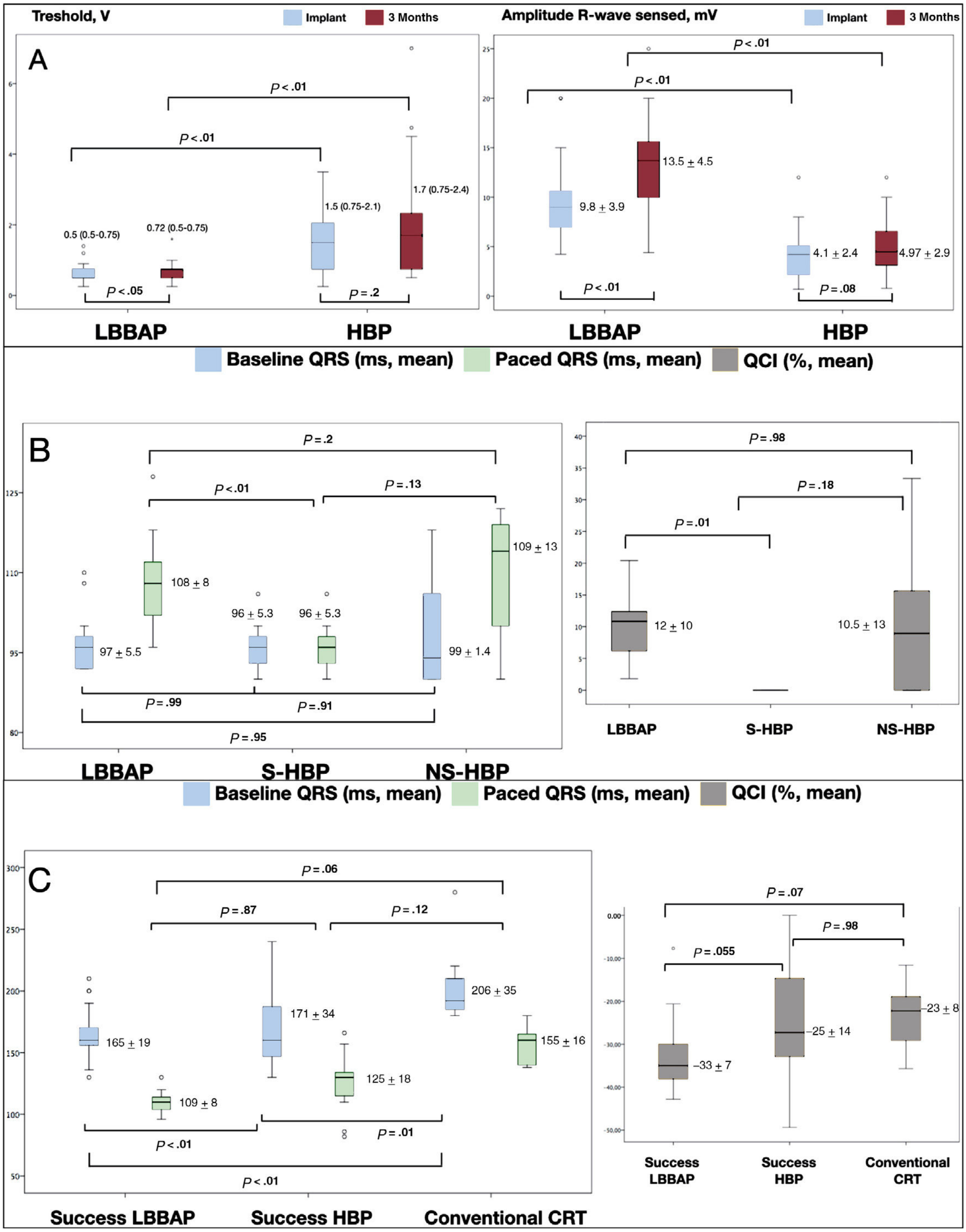

Figure 1. A: progress of pacing parameters. Left: pacing threshold in volts. Right: sensed R-wave amplitude in milivolts. At implantation and at 3 months. B: QRS width analysis in baseline QRS < 120 ms cases. Baseline QRS (blue box), paced QRS and QCI. C: QRS width analysis in baseline QRS ≥ 130 ms cases. Baseline QRS, paced QRS and QCI. CRT, cardiac resynchronization therapy; HBP, His-bundle pacing; LBBAP; left bundle branch area pacing; NS-HBP: nonselective His bundle pacing; S-HBP: selective His bundle pacing.

morphology in V_1 and deep septal pacing as the presence of qs in V_1.[5]

The QRS complex was recorded before and after implantation by another operator using a digital recording system at a speed of 100 mm/s. Table 1 shows the success criteria for each technique.

Ninety procedures were performed (46 underwent HBP and 44 LBBAP) in 87 patients. Left bundle branch pacing was performed in 18 patients (40.9%) in the LBBAP group, and deep septal pacing in 26 (59.1%). Table 1 shows the patients' baseline characteristics.

A successful outcome was obtained in 85% (77/90) of the implantations: 80.4% (n = 37) in the HBP group and 90.9% (n = 40) in the LBBAP group (P = .23). Among the 13 failures, 4 were in the LBBAP group and 9 were in the HBP group. Fluoroscopy time was shorter for LBBAP than for HBP (10 vs 17 min, $P < .001$).

Similar complication rates were recorded at the 3-month follow-up between the HBP group (13%, n = 6) and the LBBAP group (6.8%, n = 3) (P = .48). Lead-related complications were observed in 5 (10.6%) in the HBP group (loss of capture in 2, macrodisplacement in 1, and a significant increase in pacing threshold in 2) vs 1 (2.3%) in the LBBAP group (macrodisplacement, P = .2).

Nonselective HBP was obtained in 28 (75.7%) of the 37 patients and selective HBP in 9 (24.3%). The pacing threshold was lower and the sensed R-wave amplitude was higher in the LBBAP group at implantation and after 3 months. Threshold and amplitude were increased in both groups at 3 months vs baseline. The difference was statistically significance in the LBBAP group (figure 1A).

In the 29 successful cases with a baseline QRS of < 120 ms (14 in HBP and 15 in LBBAP), the paced QRS was significantly increased (97.3 ± 7.1 vs 105.5 ± 10.3 ms; $P < .001$) and the mean QCI was 8.7 ± 10.5%, with a slightly lower increase in the HBP group (5.2 ± 10.2% vs 12 ± 10%; P = .08). Better results were obtained with selective HBP than with nonselective HBP or LBBAP (figure 1B).

In the 48 successful cases with a baseline QRS of ≥ 130 ms (25 in LBBAP and 23 in HBP), 23 had right bundle branch block, 19 had left bundle branch block, and 6 had QRS paced by a previously implanted device. There was a trend (P = .055) toward a greater reduction of QCI with LBBAP vs HBP and an even greater reduction vs conventional CRT in failed cases (figure 1C).

Among the patients with left bundle branch block (12 in HBP and 11 in LBBAP), the success rate was 100% in the LBBAP group vs 66.7% in the HBP group (P = .09). Among successful cases, the paced QRS width was lower in the LBBAP group (112 ± 9 vs 127 ± 26 ms; P = .16), although this difference was not statistically significant (figure 1). Among the patients with right bundle branch block (14 in HBP and 13 in LBBAP), the success rate did not differ between the HBP (85.7%) and LBBAP (84.6%) groups (P = 1), but paced QRS was lower (106 ± 7 vs 122 ± 16 ms; $P < .01$).

The main findings of this study were that narrower QRS complexes and better pacing outcomes were obtained at implantation and at 3 months with LBBAP than with HBP. Yiran Hu et al.[6] described a similar success rate between LBBAP and HBP, although our population also included CRT indication. The radiological exposure time was shorter with the LBBAP technique because it does not require a search for the His-bundle electrogram (essential in HBP).

In conclusion, LBBAP achieves a narrower paced QRS, lower threshold, improved R-wave detection, and shorter fluoroscopy time with a similar complication rate compared with HBP.

CONFLICTO DE INTERESES

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Usefulness of myocardial T_1 and T_2 mapping with magnetic resonance in transfusion-dependent patients with low-risk myelodysplastic syndrome

Utilidad del mapeo miocárdico T_1 y T_2 mediante resonancia magnética cardiaca en pacientes transfundidos con síndrome mielodisplásico de bajo riesgo

To the Editor,

Iron overload cardiomyopathy is common in low-risk myelodysplastic syndrome (MDS) patients requiring repeat red blood cell (RBC) transfusions. Early diagnosis is essential to establish an effective treatment with iron chelators and improve their survival,[1] and the detection of myocardial iron overload (MIO) modifies its strategy by intensifying the therapy.

T_2* by cardiac magnetic resonance (cMR) is the gold standard for MIO diagnosis. Recently, small studies carried out in thalassemia mayor (TM) suggest the usefulness of new imaging techniques such as T_1 mapping being reduced in individuals with MIO.[2,3]

We performed a prospective observational study to analyze the usefulness of T_1 and T_2 mapping in the assessment of transfusion-dependent low-risk MDS patients (including very low, low and intermediate risk groups from the Revised-International Prognostic Scoring System classification [IPSS-R]), older than 18 years, who provided their authorization by signing informed consent. Exclusion criteria were those patients belonging to very high or high-risk MDS groups according to IPSS-R classification and those who had never received transfusions. The study was approved by the local ethics committee.

Thirty-one low-risk MDS patients were recruited between January 2016 and February 2017 (table 1). Patients underwent a 1.5-Tesla cMR (Philips Healthcare, Netherlands) including cardiac morphology and function assessment, late gadolinium enhancement, myocardial and hepatic T_2* mapping (multiecho-gradient sequences including 15 echo times from 1-16 milliseconds), native T_1 (modified