His-Bundle Pacing VS CRT for Patients with LV Dysfunction and LBBB

His-Bundle Pacing is a Reasonable Alternative to CRT

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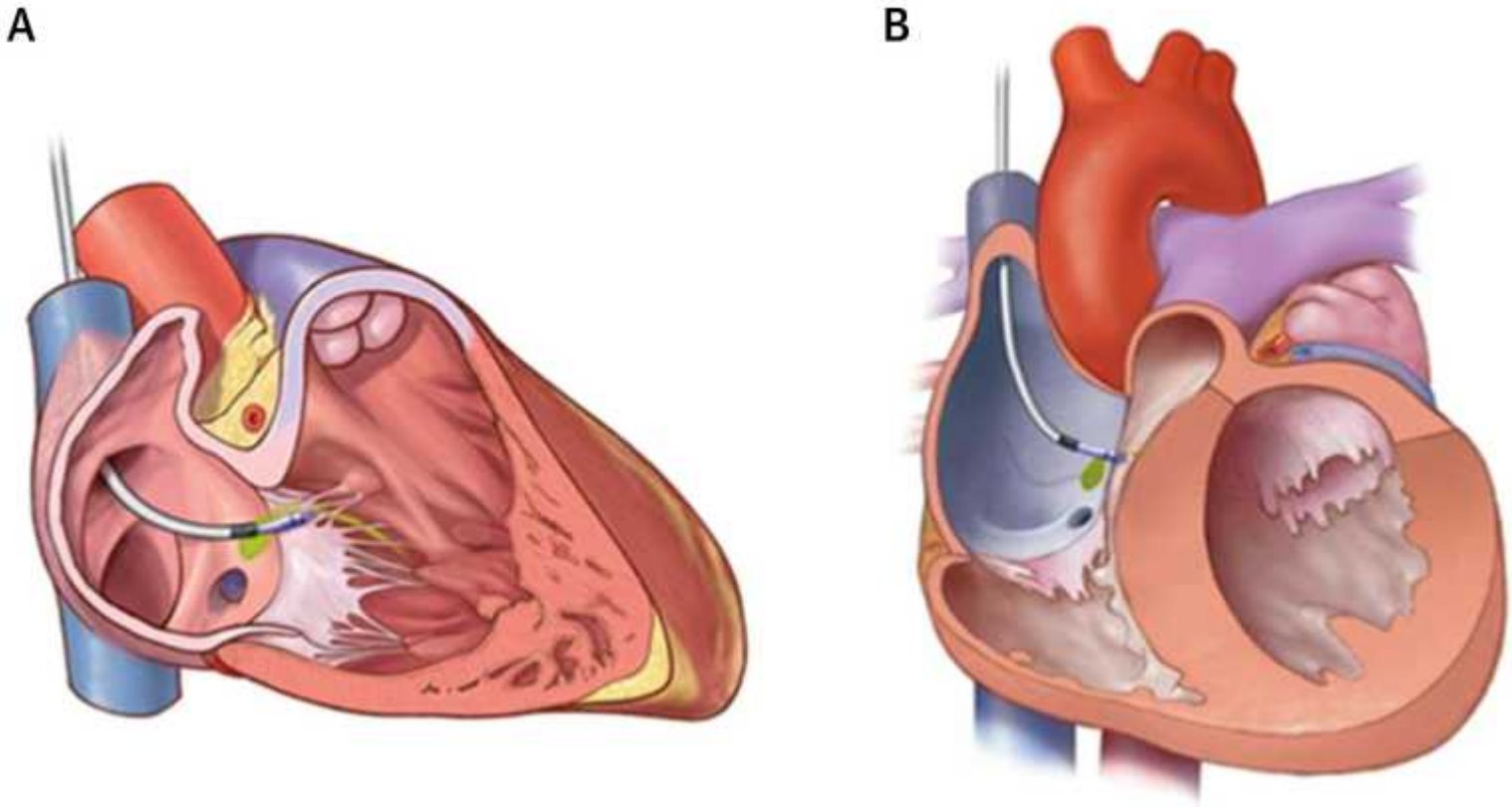
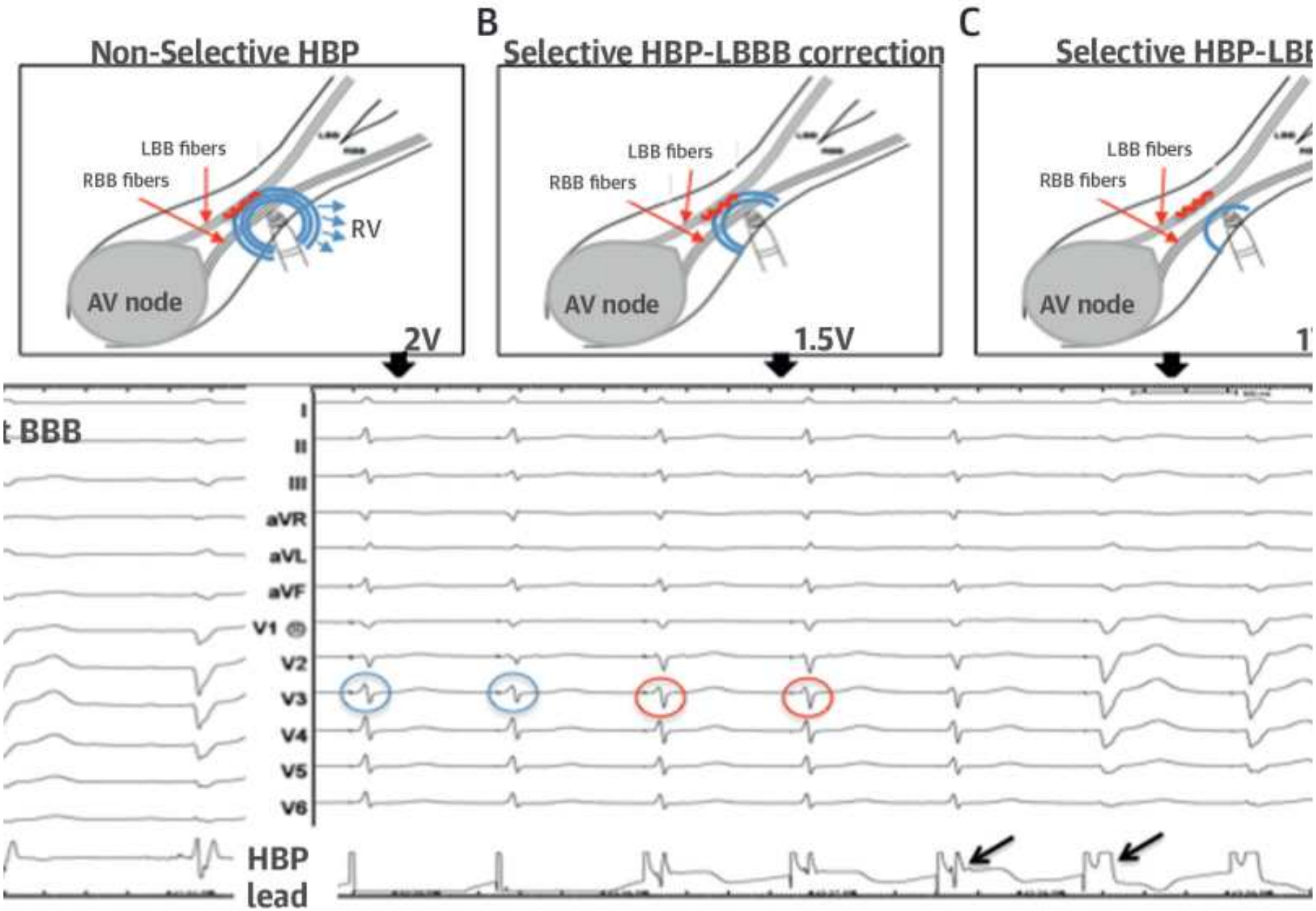
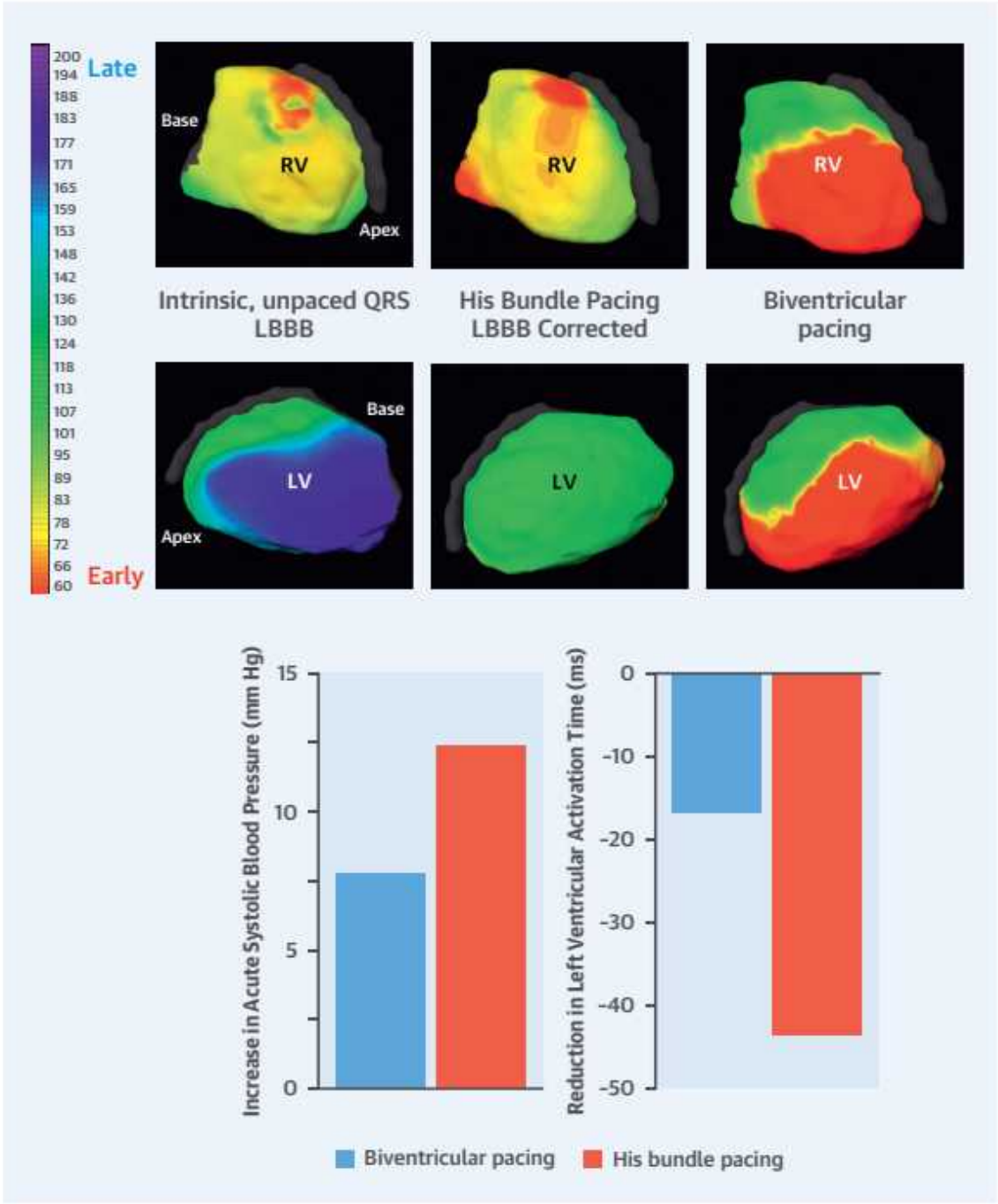
His Bundle pacing




B
Non-Selective HBP
Selective HBP-LBBB correction
C
Selective HBP-LBB
LBB fibers
RBB fibers
RV
AV node
2V
1.5V
t BBB
I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
HBP
lead

Optimal Pacing Site

- RV apex – worsening ventricular contractile function
- RV septum, RVOT, LV – no consistent result
- Bi-V pacing- improved HF outcomes and reduced mortality in patients with LBBB and severe LV systolic dysfunction, its role in patients with preserved LV systolic function remains unresolved.



Arnold, A.D. et al. J Am Coll Cardiol. 2018;72(24):3112-22.

BiV pacing:
adding dyssynchrony to dyssynchrony, causing what some have termed “iatrogenic electropathy”

His Bundle pacing for CRT candidate

TABLE 3 His Bundle Pacing for CRT Indication

First Author (Ref. #)	Year	N	Indication	HBP Lead	Implant Success (%)	Major Findings
Barba-Pichardo et al. (46)	2013	16	CRT implant failure	Tendril 1488T, 1788TC, 1888TC	56	QRS narrowing achieved in 13 of 16 patients with HBP, of whom 9 underwent implant. During mean follow-up of 31.3 ± 21.5 months, NYHA functional class improved III→II and LVEF improved from 29%→36% (<0.05)
Lustgarten et al. (47)	2015	29	Crossover study of HBP and conventional CRT	Select-Secure 3830	59	QRS narrowing achieved in 21 of 29 patients with HBP, of whom 17 patients underwent implant and 12 completed follow-up. Both groups demonstrated significant improvement in NYHA functional class, 6-min walk, QOL, and LVEF compared with baseline.
Su et al. (50)	2015	16	CRT implant failure	Select-Secure 3830	100	Specific degree of QRS narrowing not reported, but correction achieved for all patients. They found that His bundle tip-RV coil configuration demonstrated better capture thresholds than bipolar configuration
Ajijola et al. (48)	2017	21	Primary HBP	Select-Secure 3830	76	QRS narrowing achieved in all 16 patients with implant success (180 ± 23 ms to 129 ± 13 ms; $p < 0.0001$). NYHA functional class III→II ($p < 0.001$), and LVEF improved from 27 ± 10% to 41 ± 13% ($p < 0.001$)
Sharma et al. (49)	2017	106	CRT implant failure (Group I) and primary HBP (Group II)	Select-Secure 3830	90	QRS narrowing achieved across all patients with implant success (157 ± 33 ms to 117 ± 18 ms; $p = 0.0001$). Underlying BBB was present in 48 patients and implant success was 92% in this group (33 of 36 LBBB and 11 of 12 non-LBBB). Among all patients NYHA functional class 2.8 ± 0.5→1.8 ± 0.6 ($p = 0.0001$) and LVEF improved from 30 ± 10% to 43 ± 13% ($p = 0.0001$).

BBB = bundle branch block; CRT = cardiac resynchronization therapy; LBBB = left bundle branch block; LVEF = left ventricular ejection fraction; NYHA = New York Heart Association; QOL = quality of life; RV = right ventricle.

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His Resynchronization Versus Biventricular Pacing in Patients With Heart Failure and Left Bundle Branch Block

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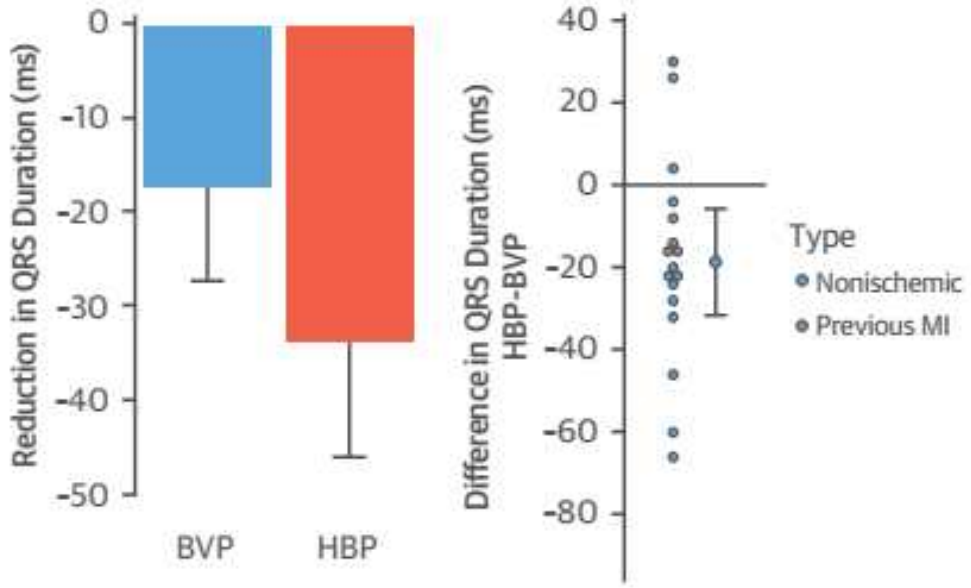
ECG QRS response

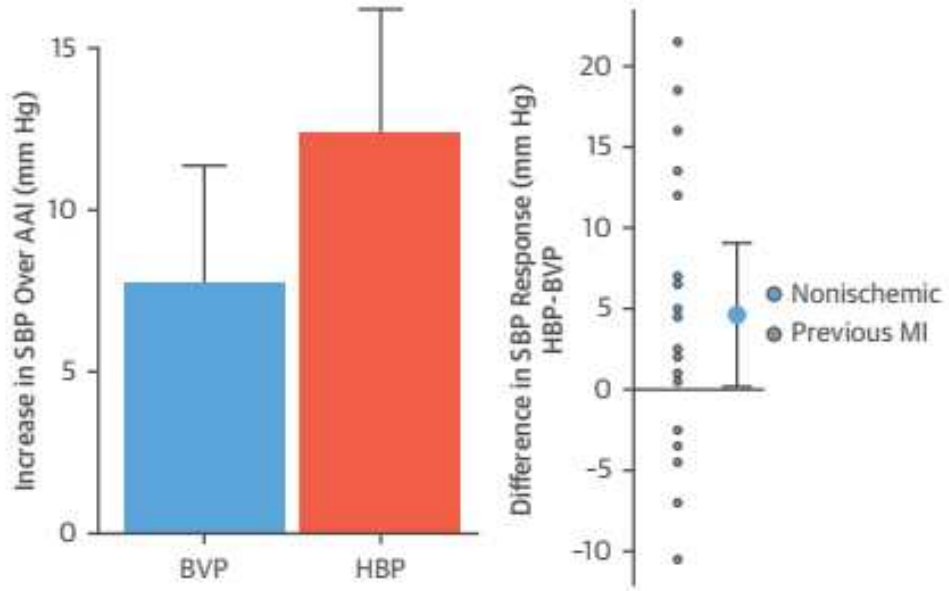
FIGURE 2 12-Lead Surface ECG QRS Responses



Change in QRS duration with BVP and HBP **(left)** and within-patient incremental QRS duration reduction with HBP over BVP **(right)**. The 95% confidence intervals are displayed. MI = myocardial infarction; other abbreviations as in Figure 1.

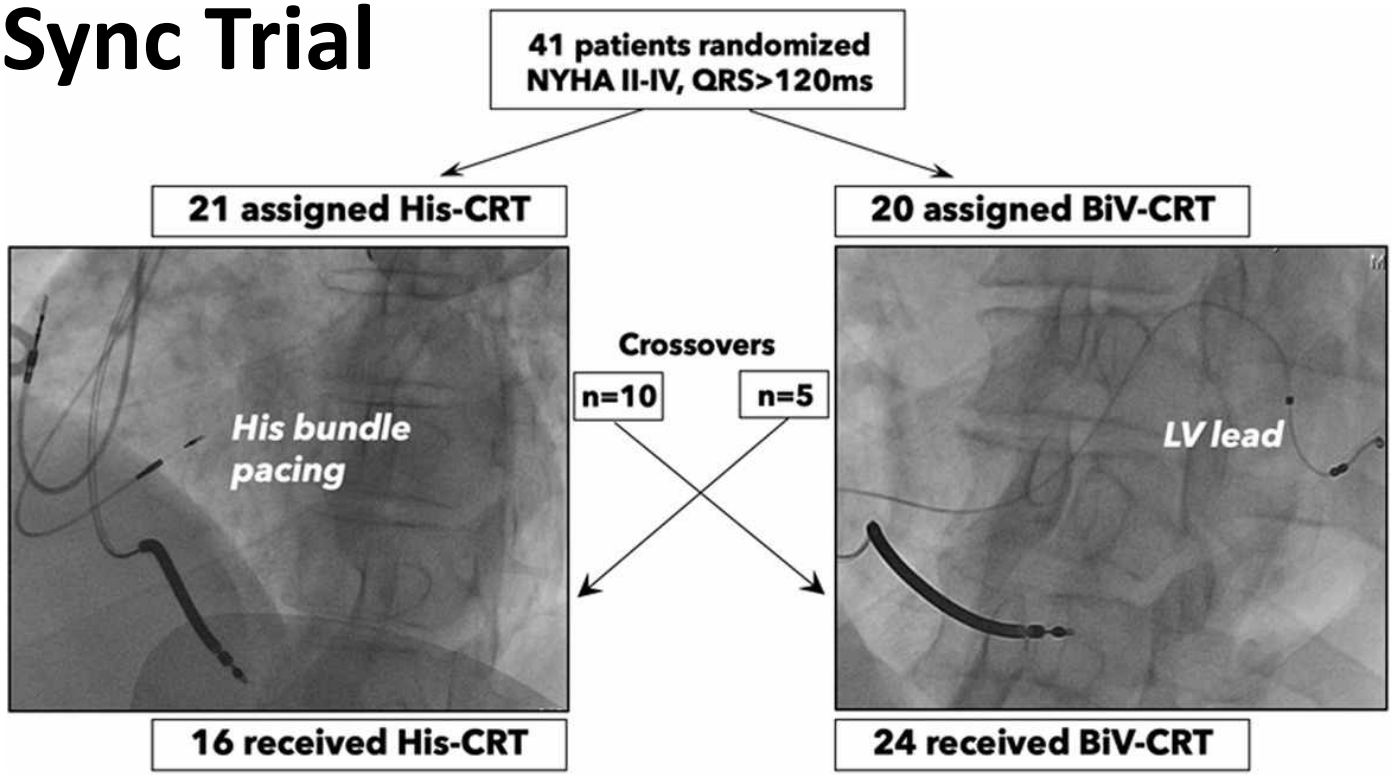
Hemodynamic Response

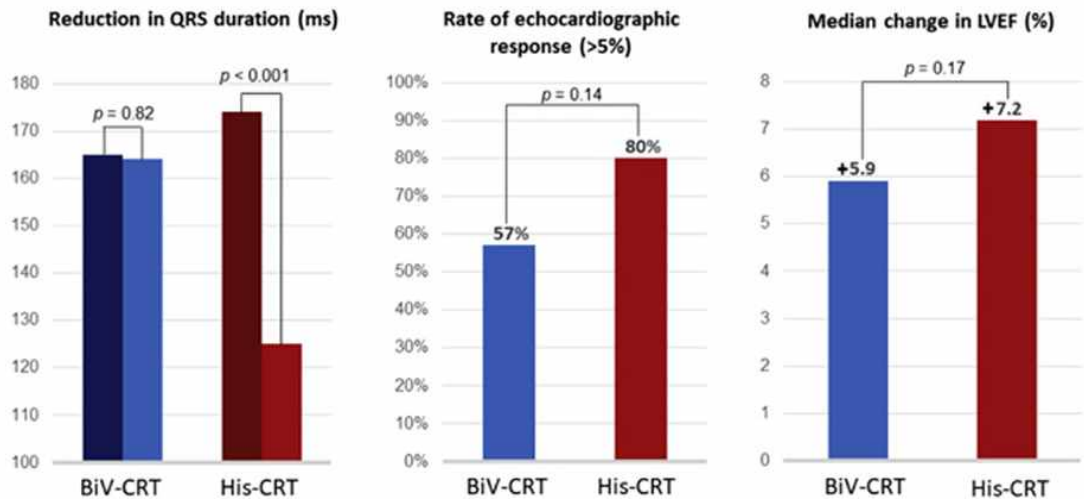
FIGURE 6 Hemodynamic Responses



Acute improvement in systolic blood pressure is observed with both BVP and HBP **(left)**. His bundle pacing delivered significantly greater within-patient improvements in acute systolic blood pressure **(right)**. The 95% confidence intervals are displayed. Abbreviations as in Figures 1 and 2.

His-Sync Trial





(Heart Rhythm 2019;-:1–11)

His Bundle Pacing is better than CRT

- Using normal His-Purkinje system
- Physiological ventricular resynchronization
- Better acute hemodynamic improvement
- Similar or better long term outcome (limited data)
- Fewer leads
- Longer battery longevity
- Lower cost
- Lower complication

Conclusion

- HBP is an attractive mode of physiological pacing with significant promise for future applications in patients who are traditional candidates for RV pacing as well as CRT.

- Widespread adaptation of this technique is dependent on the improvement of tools and further validation of its efficacy in large randomized clinical trials.