LBBB Cardiomyopathy and His-Bundle Pacing

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SCHOOL OF **MEDICINE**

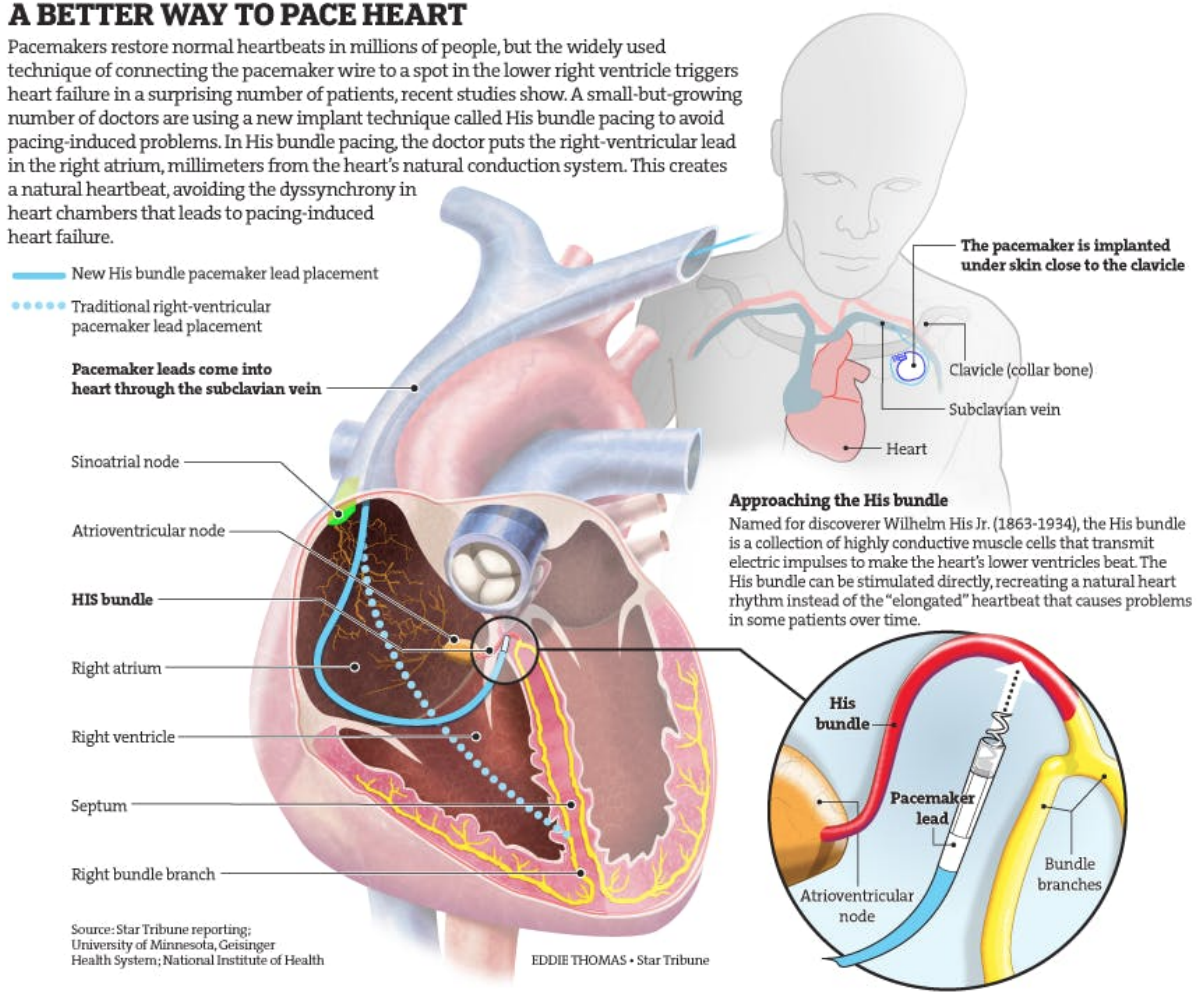
Disclosures

- No relevant disclosures

Goals of this Presentation

- I. Background: Introduce the audience to the concept of LBBB Cardiomyopathy
- II. IU Experience with His Bundle Pacing and Left Bundle Branch Cardiomyopathy
- III. Novel Concepts and Future Work

Background: His Bundle Pacing



Carlson, Joe. "Making pacemakers easier on the heart may come down to connections." *Star Tribune*. May 27, 2017.

Background: LBBB Cardiomyopathy

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Conduction Defects and Heart Failure

Resolution of Left Bundle Branch Block–Induced Cardiomyopathy by Cardiac Resynchronization Therapy

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Rennes, France

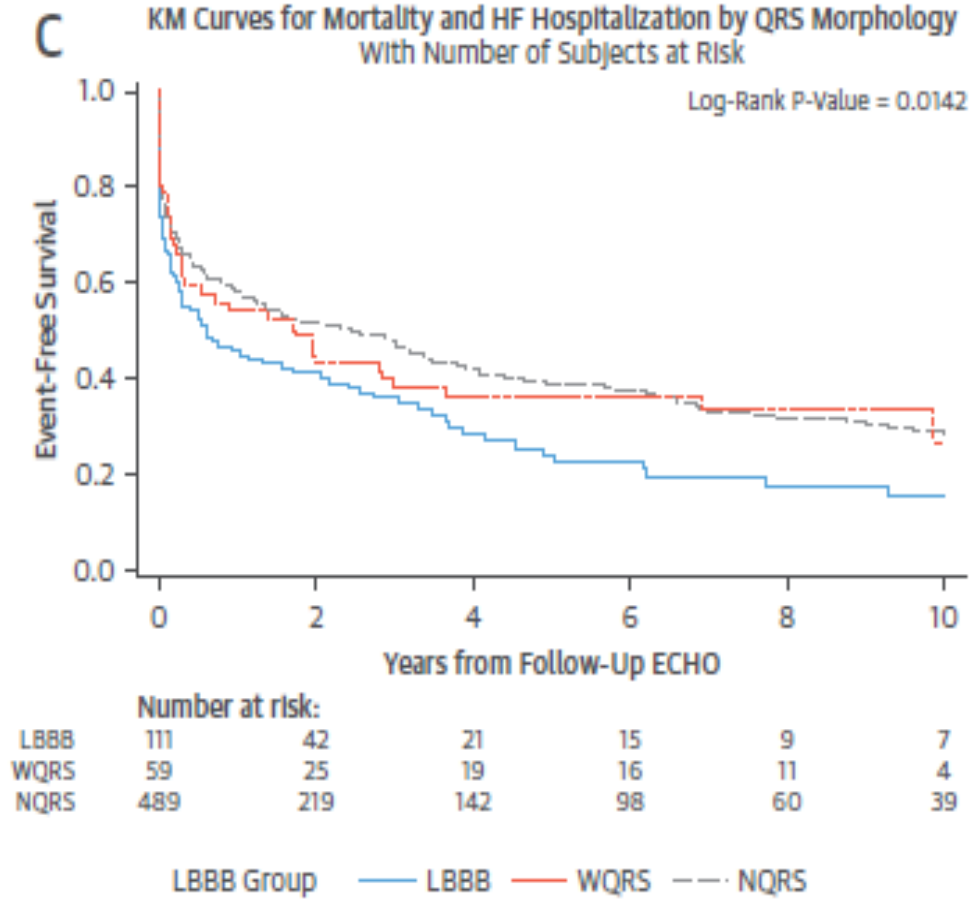
First proposed in 2013; based on JACC article which retrospectively analyzed 375 patients form 2007-2010

Six Patients were identified that fit pre-existing criteria which included

1) History of typical LBBB > 5 years
2) LVEF > 50%
3) Decrease LVEF < 40% and development of HF to NYHA II-IV
4) Major mechanical dyssychrony
4) Idiopathic etiology of cardiomyopathy

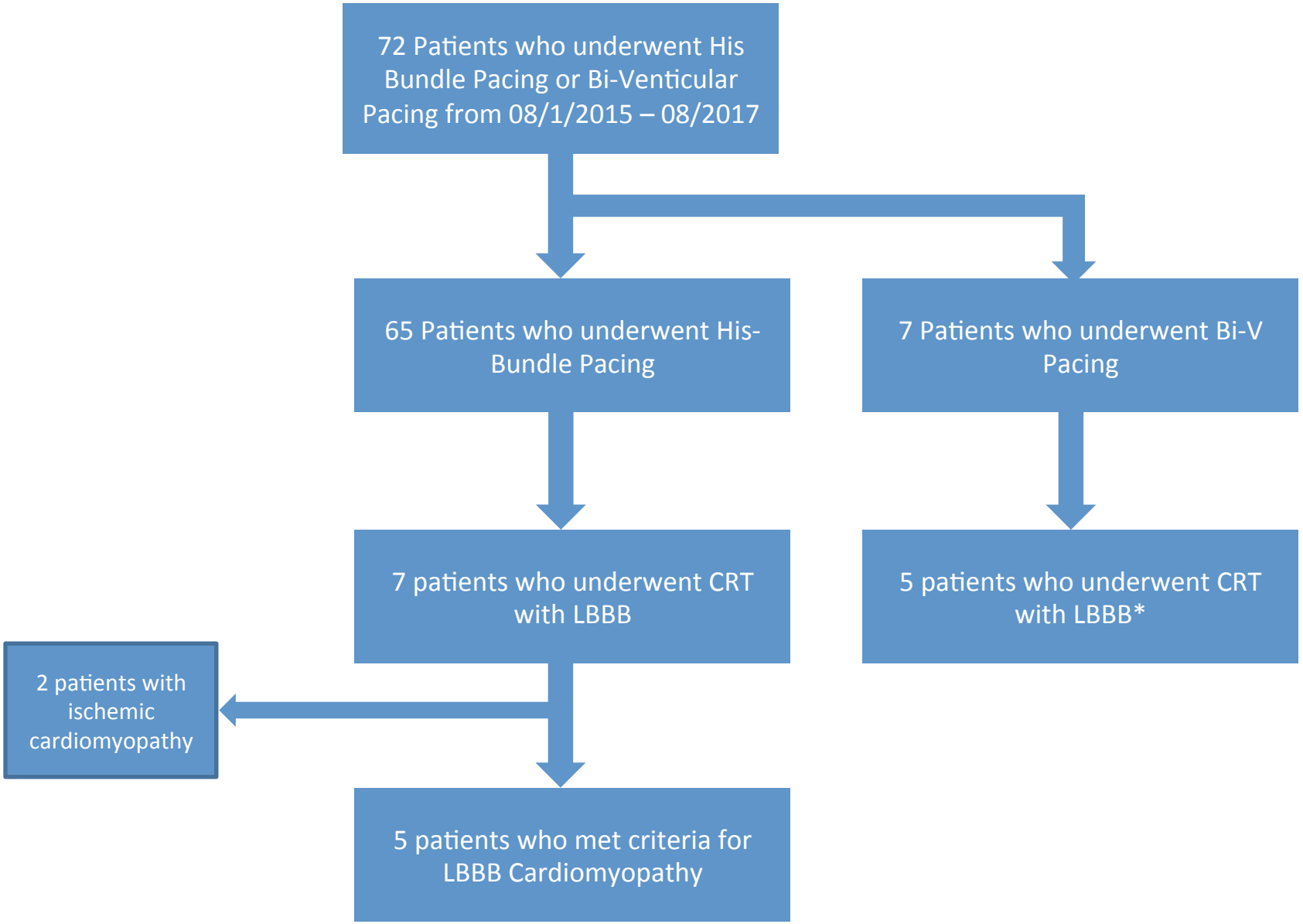
Vaillant, Caroline, et al. "Resolution of left bundle branch block–induced cardiomyopathy by cardiac resynchronization therapy." *Journal of the American College of Cardiology* 61.10 (2013): 1089-1095.

Background: LBBB HFREF Does Not Respond to Conventional Treatment

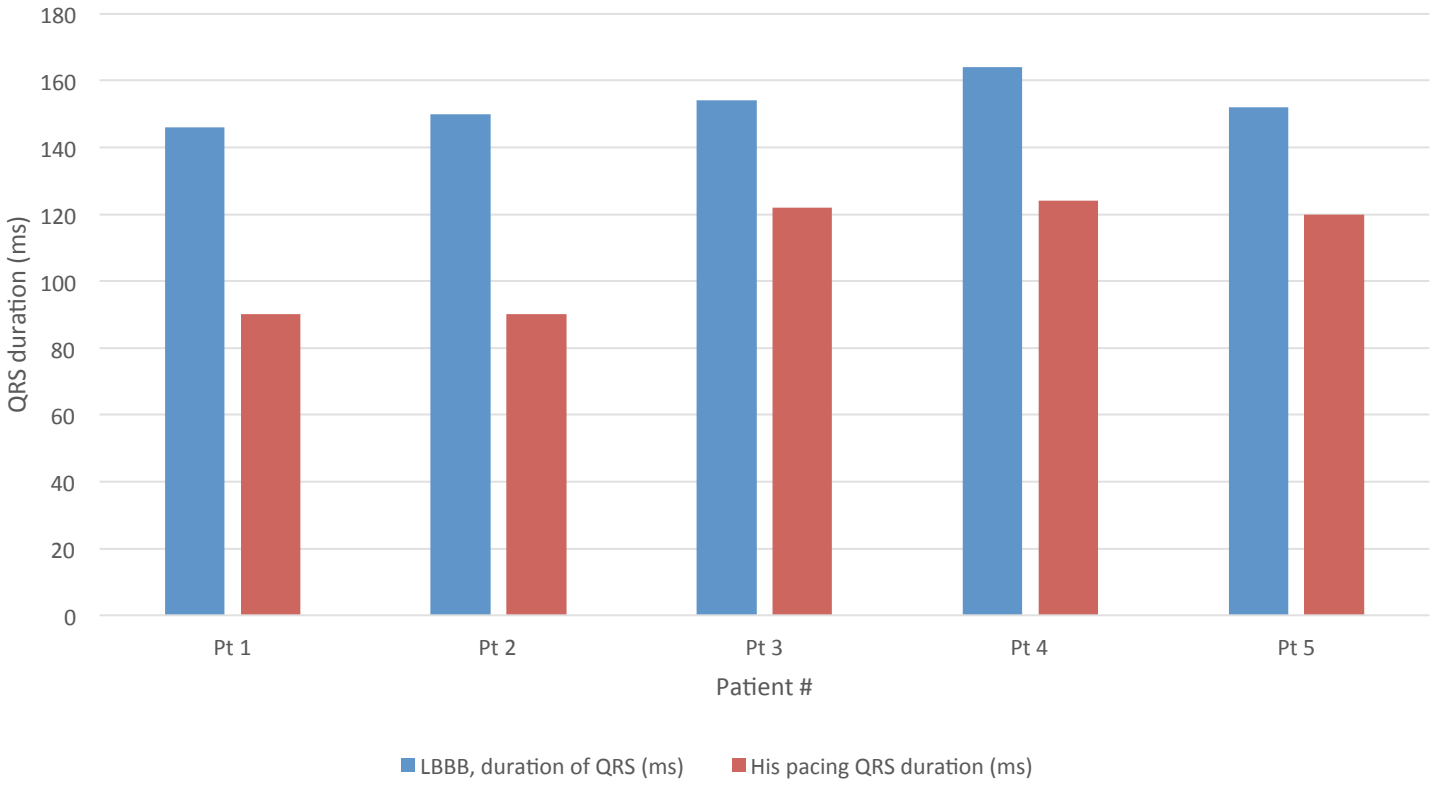


- January 2018 Duke study; QRS duration, EF, and OMT studied on 659 patients
- Highest HF hospitalization, mortality for LBBB, worst response to OMT (3.5% improvement in EF vs 10%)

Sze, Edward, et al. "Impaired recovery of left ventricular function in patients with cardiomyopathy and left bundle branch block." *Journal of the American College of Cardiology*71.3 (2018): 306-317.

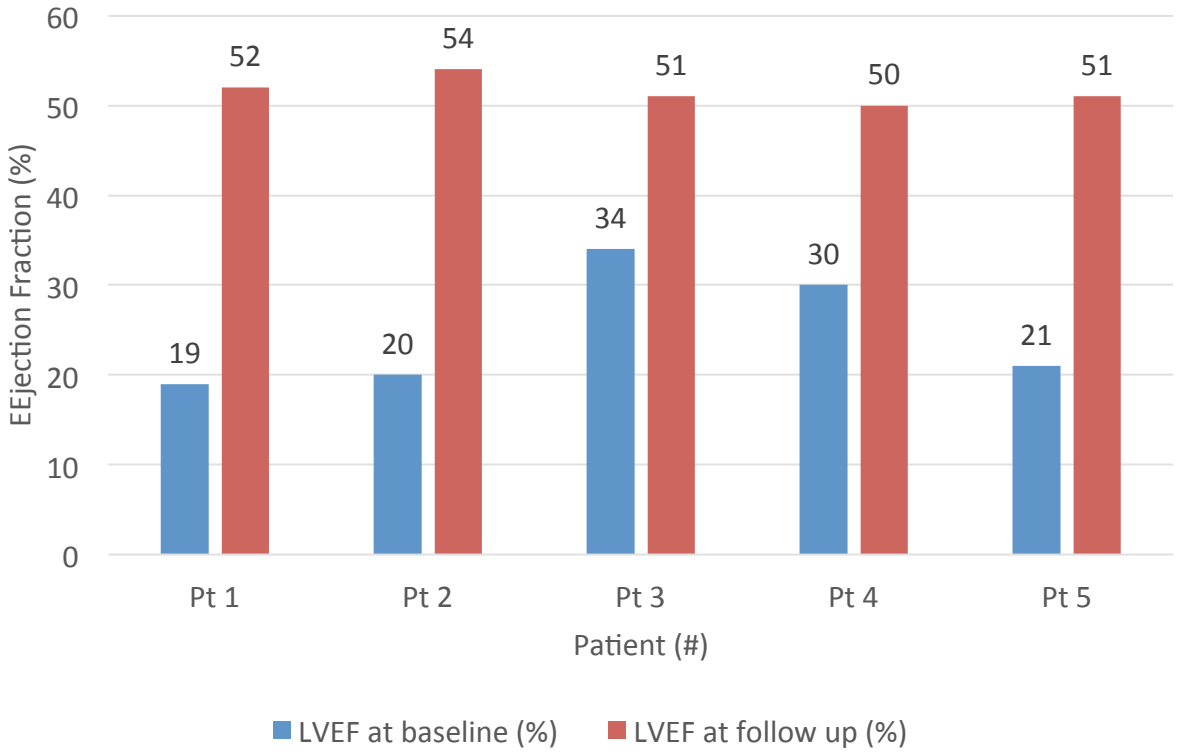

72 Patients who underwent His Bundle Pacing or Bi-Venticular Pacing from 08/1/2015 – 08/2017
65 Patients who underwent His-Bundle Pacing
7 Patients who underwent Bi-V Pacing
7 patients who underwent CRT with LBBB
5 patients who underwent CRT with LBBB*
2 patients with ischemic cardiomyopathy
5 patients who met criteria for LBBB Cardiomyopathy

QRS Duration Decrease



- 28% decrease in QRS duration from 153 ms → 110 ms

EF Improvement



- Average improvement in EF by 52% from 24% → 52%
- 100% patients were hyper-responders (EF> 50%)

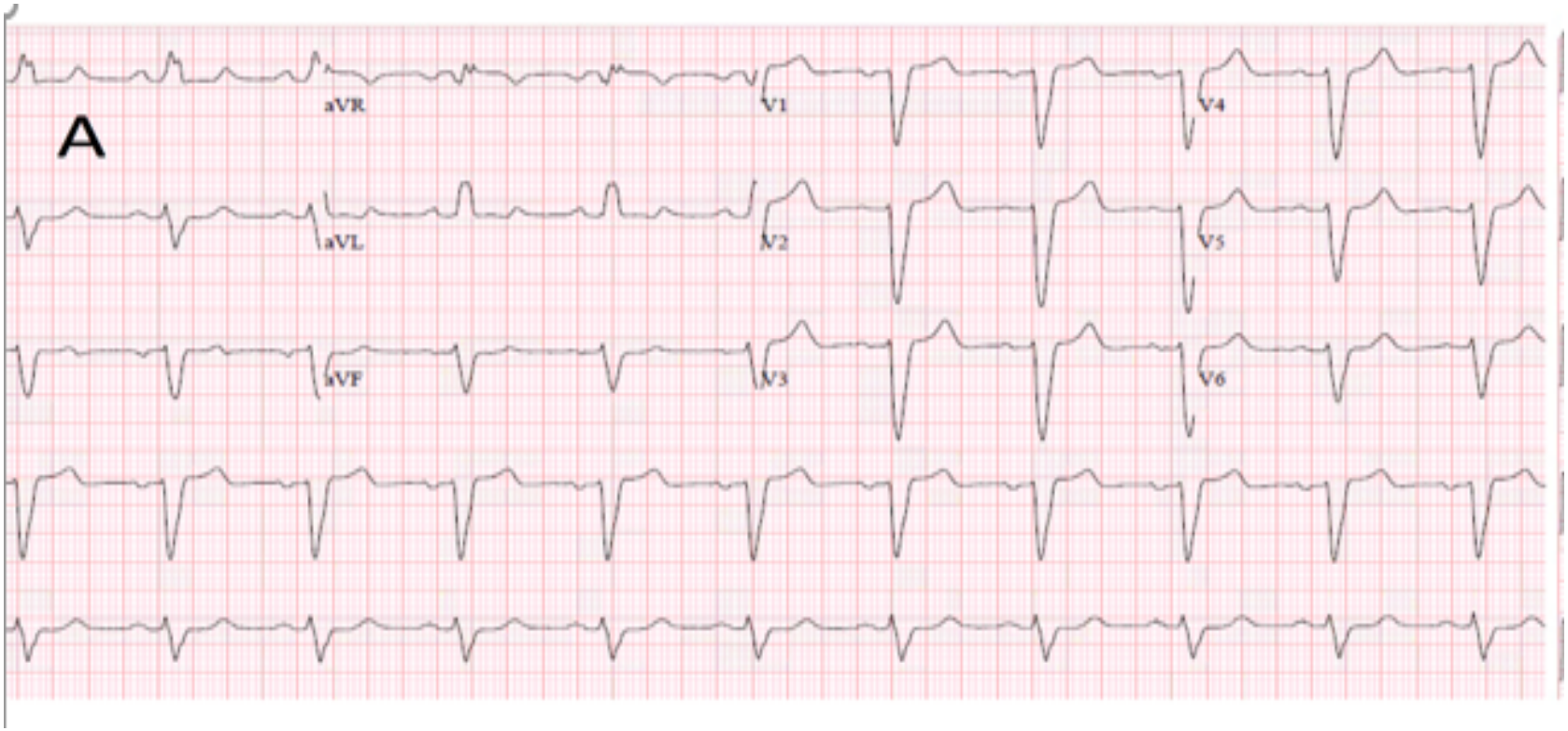
Patient Characteristics

	Pt 1	Pt 2	Pt 3	Pt 4	Pt 5
Age/Gender	59/F	51/F	71/F	61/F	50/M
LBBB, duration (months)	16	36	6	72	24
LVEDD at baseline (mm)	52	53	59	58	64
LVEDD at follow up (mm)	40	45	42	50	54
Hyper-response noted on follow up duration (months)	13	3	5	5	3
Nature of His bundle pacing	S	S	NS	NS	S

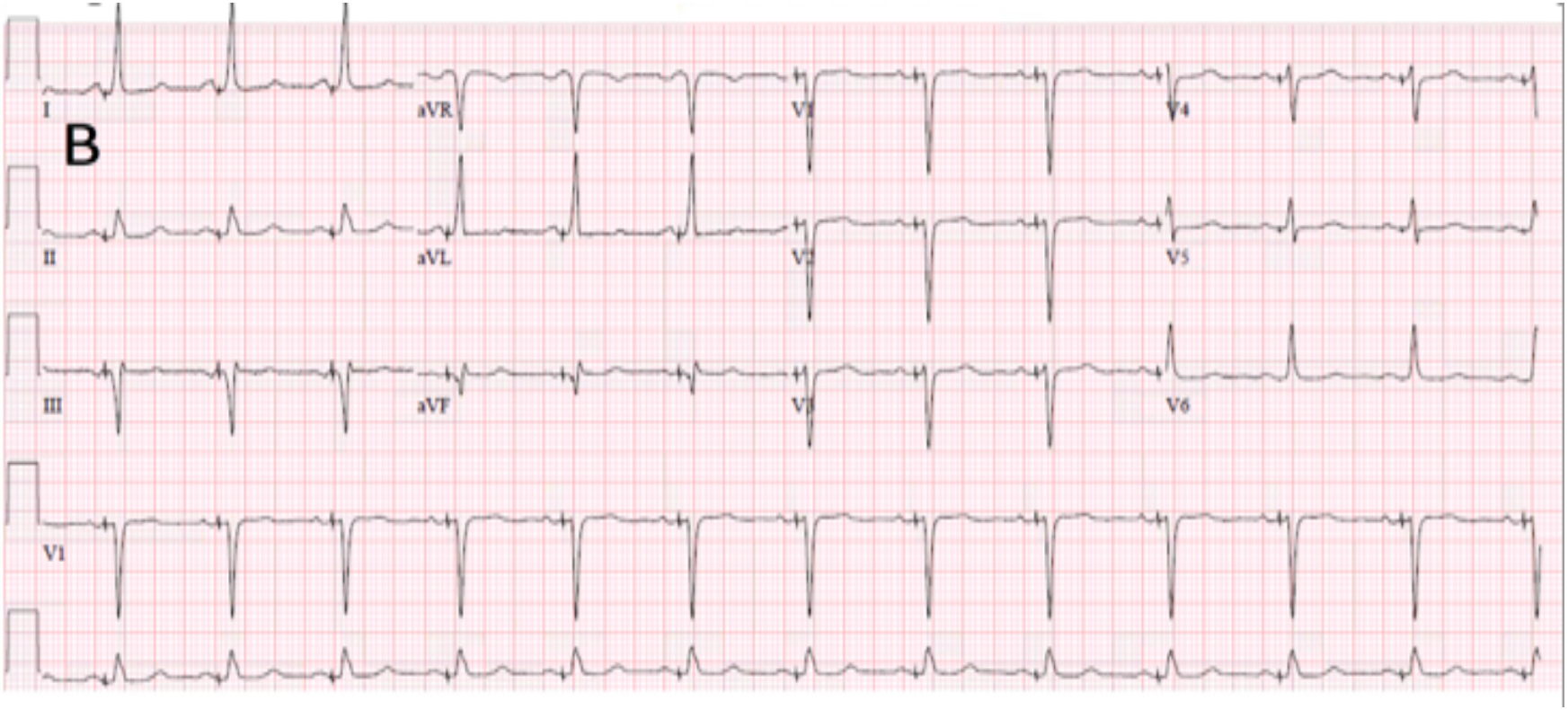
Electrical Remodeling via HBP?

- One patient with resolution of LBBB on follow-up

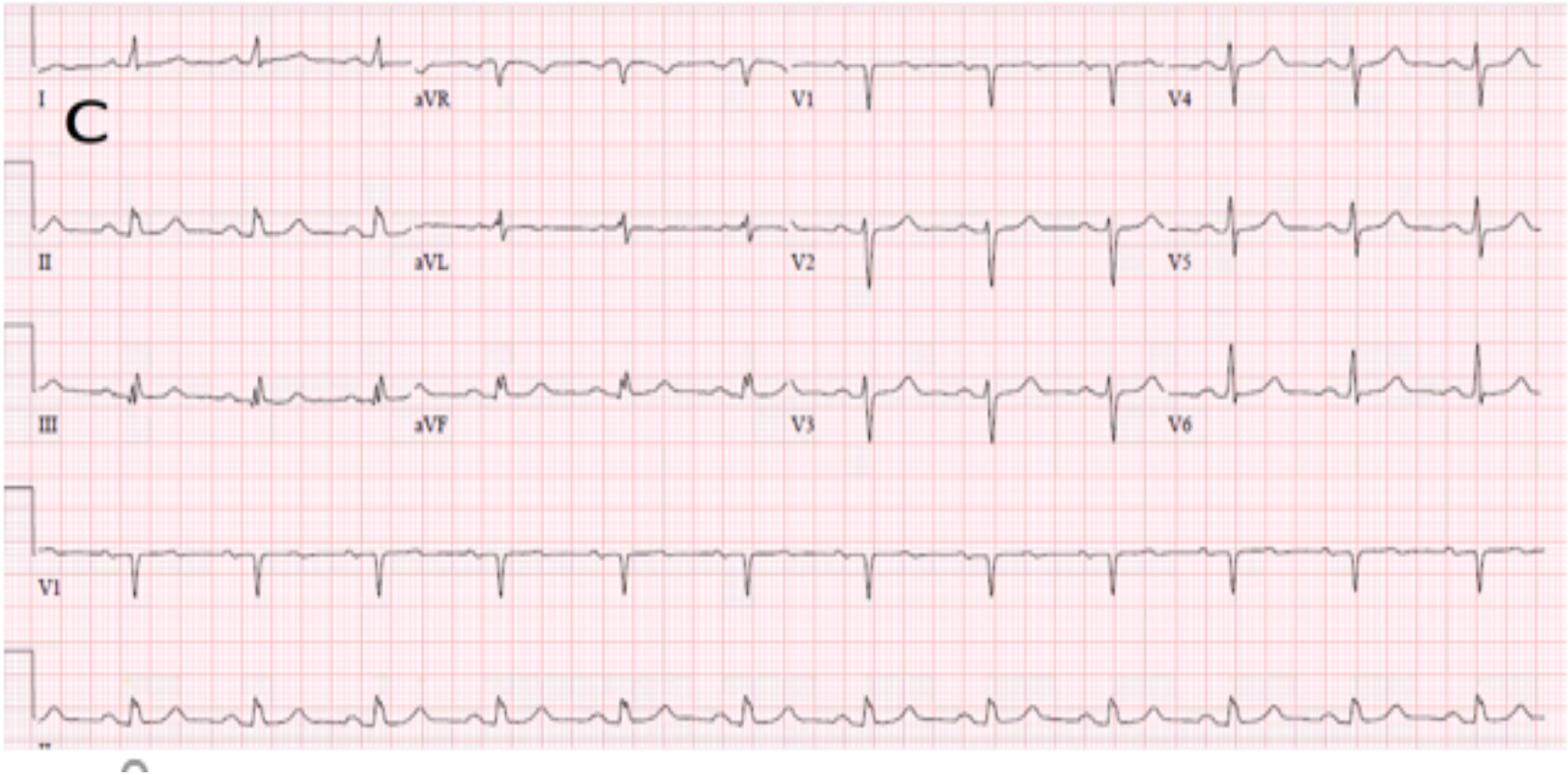
Baseline ECG with LBBB



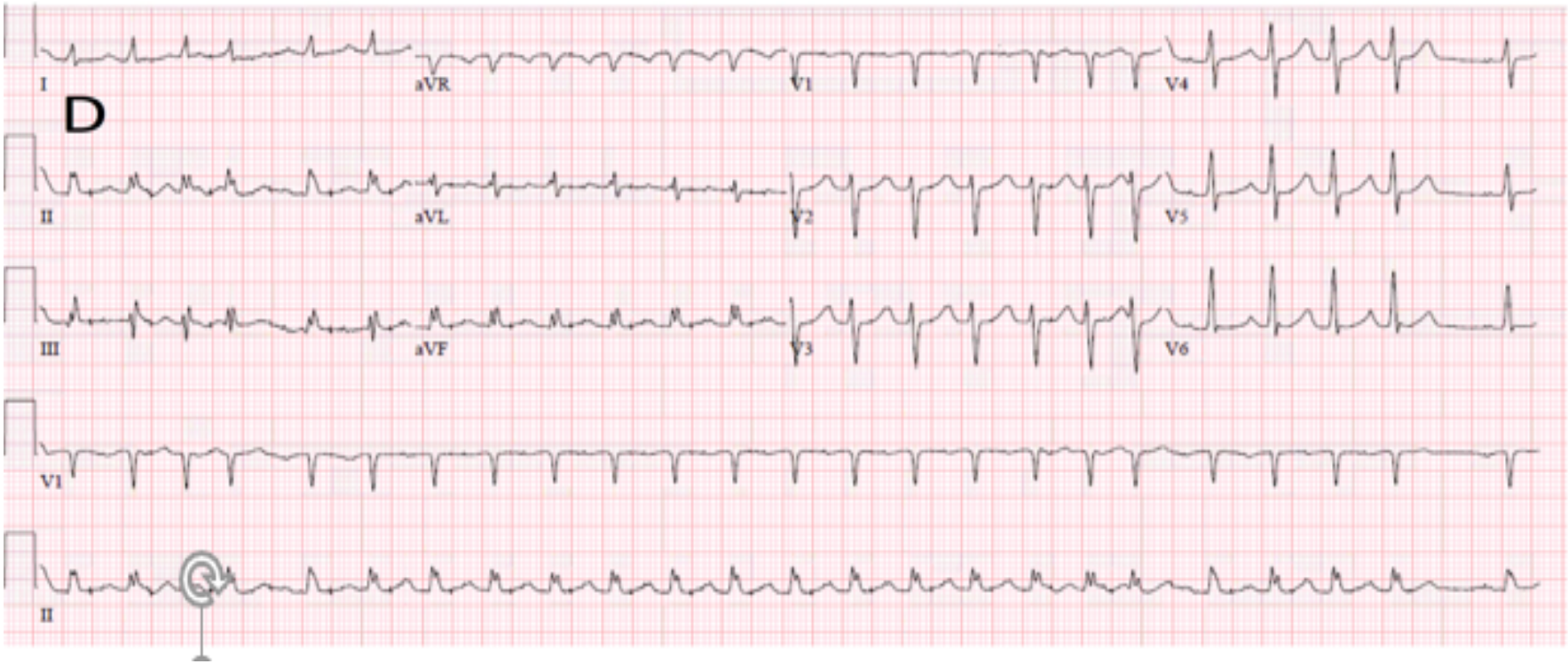
His bundle pacing with recruitment of LBB fibers



Sinus rhythm with LBB reverse remodeling after 3 months

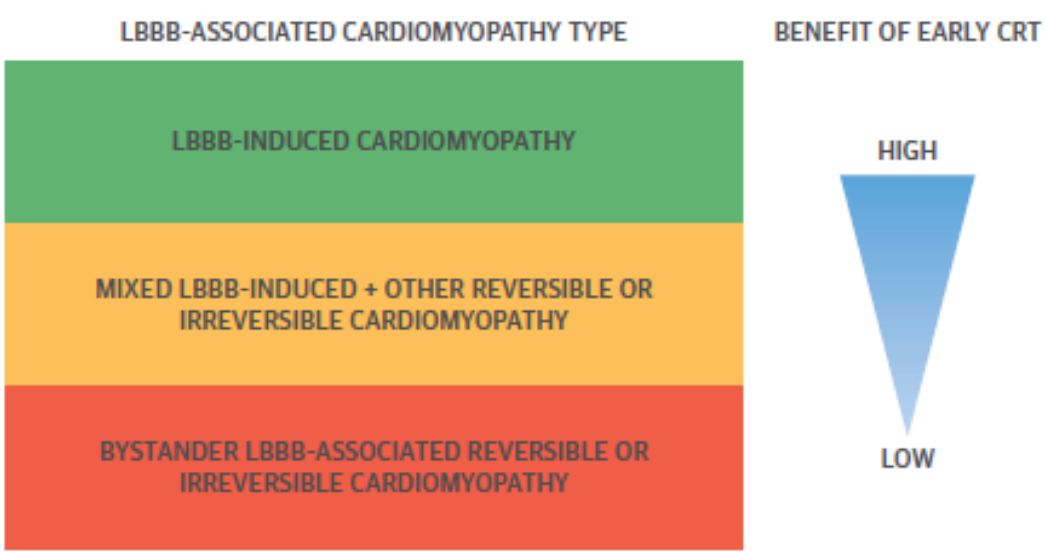


Atrial pacing with faster ventricular rates and no evidence of LBBB



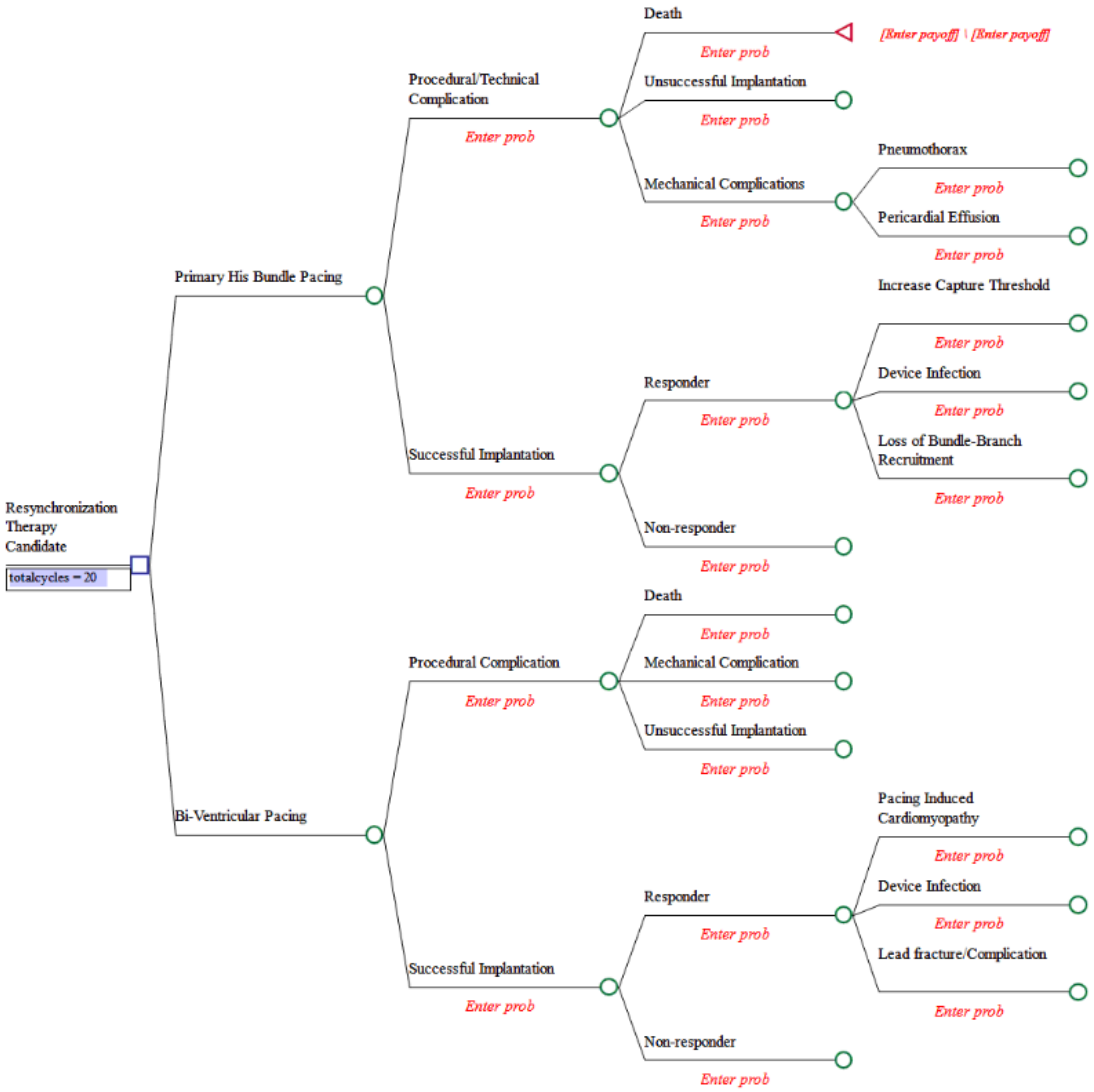
LBBB Cardiomyopathy: A New Paradigm?

FIGURE 1 Theoretical Model of the Anticipated Benefit of Early CRT in LBBB-Associated Cardiomyopathy



A tiered approach for early cardiac resynchronization therapy (CRT) should be based on the perceived relative causal contributions of left bundle branch block (LBBB) toward the overall cardiomyopathy.

Wang, Norman C., et al. "Left Bundle Branch Block–Associated Cardiomyopathies and Early Cardiac Resynchronization Therapy: Conceptualizing a Tailored Approach." *Journal of the American College of Cardiology*71.17 (2018): 1943-1944.



- Markov Model: Cost Effectiveness/Value Based Care
- Improved response with HBP vs BiV CRT
- No PIM with HBP vs RVP
- Higher thresholds lead to decreased generator longevity

Conclusions

- LBBB NICM does not respond to GDMT in same manner as other cardiomyopathies. Why should it be treated as such?

- PHBP appears to be a viable strategy in treating LBBB-induced cardiomyopathy, addressing the underlying physiology rather than mechanical manifestations of LBBB

- Our case demonstrates electrical reverse remodeling of chronic and persistent LBBB with HBP.

Future Work

- Future randomized trials: HIS-SYNC II: 8000 pt randomizing CRT to HBP

- LBBB Cardiomyopathy group undergoing strain and dysynchrony analysis for a more complete LV systolic function assessment rather than just Ejection Fraction

Questions and Thanks

- Special thanks: Dr. Dandamudi; Dr. Devahaktuni, Dr. Simon, Dr. Ezzedine

LBBB Recruitment by HBP

- 1) Longitudinal disassociation of His Bundle (some fibers in His bundle are pre-destined to go into left bundle or right bundle)
- 2) VEP: Virtual Electrode Polarization: Electrical stimulation can decrease threshold
- 3) Source-sink: Overcoming diseased tissue through higher output
- 4) Bypassing block through distal pacing

Recruitment