

HN TM Miền Trung mở rộng lần thứ X 07-2019

Cập nhật trong Tạo nhịp tái đồng bộ tim (CRT)

TS.BS. Trần Song Giang
Viện Tim mạch Việt nam

NỘI DUNG

1. Chỉ định cấy CRT
2. Các tiến bộ trong tối ưu hóa CRT

Hiệu quả cấy CRT

Ở BN suy tim, EF giảm, có mất đồng bộ

So với điều trị Nội khoa, CRT với hiệu quả:

- Lâm sàng: Cải thiện mức độ NYHA, Test đi bộ (6 MWT results) và chất lượng cuộc sống¹
- Siêu âm tim: LVESV, LVEDV, LVEF...
- Giảm tỷ lệ tái nhập viện do suy tim, giảm tỷ lệ tử vong²

1. Abraham WT, et al. Cardiac resynchronization in chronic heart failure. N Engl J Med. 2002 Jun;346(24):1845-53.

2. Anand IS, et al. Cardiac resynchronization therapy reduces the risk of hospitalizations in patients with advanced heart failure: results from the Comparison of Medical Therapy, Pacing and Defibrillation In Heart Failure (COMPANION) trial. Circulation. 2009 Feb 24;119(7):969-77.

Chỉ định cấy CRT

1. Nhịp xoang

- Bloc nhánh trái

. QRS: $\geq 150\text{ms}$

. QRS: 130-149ms

. QRS: 120-129ms

- **COMPANION**

- **CARE-HF**

**2004-
2005**

- Không có bloc nhánh trái

. QRS: $\geq 150\text{ms}$

. QRS: 130-149ms

. QRS: 120-129ms

ECHO-CRT

BLOCK-HF

**2013-
2018**

2. Rung nhĩ

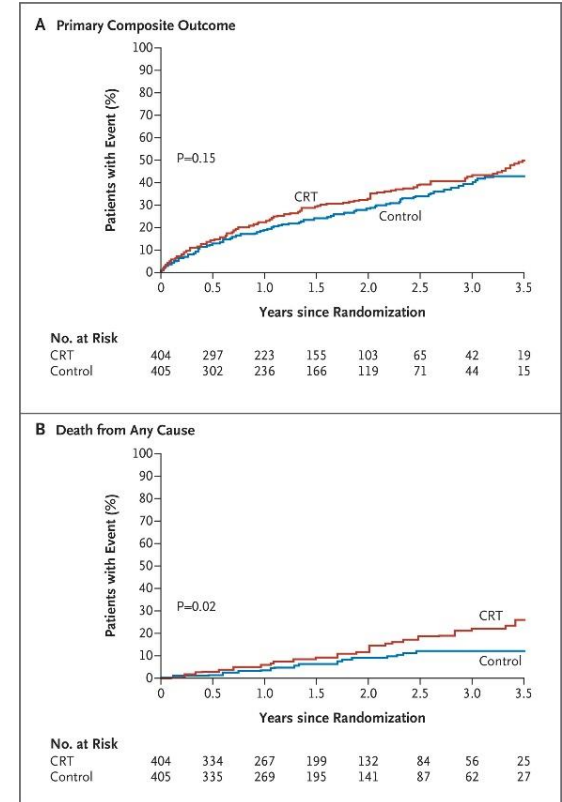


Chỉ định cấy CRT: nhóm có bloc nhánh trái (LBBB)

Guideline (Year)	QRS ≥ 150 ms		QRS 130-149 ms		QRS 120-129 ms	
	NYHA Functional Class III/IV	NYHA Functional Class II	NYHA Functional Class III/IV	NYHA Functional Class II	NYHA Functional Class III/IV	NYHA Functional Class II
ESC HFA (2016)*	I, A	I, A	I, B	I, B	III, A	III, A
ESC EHRA (2013)	I, A	I, A	I, B	I, B	I, B	I, B
ACC/AHA/HRS (2013)	I, A	I, B	Ila, B	Ila, B	Ila, B	Ila, B
CCS (2017)	I, High	I, High	I, High	I, High	III, Moderate	III, Moderate
Australian Guidelines (2011)	A		A		A	
NICE (2014)	CRT-P or CRT-D†	CRT-D	CRT-P or CRT-D†	CRT-D	CRT-P or CRT-D†	CRT-D

Echo- CRT study

- 809 BN (>18t, NYHA III-IV, đtrị nội tối ưu, $EF \leq 35\%$, LVDd 55mm, Echo: có mất đồng bộ, QRS <130ms)
- Chia 2 nhóm:
 - 404: CRT on
 - 405: CRT off
- Theo dõi trung bình: 19,4 tháng
- Primary endpoint: tử vong do mọi nguyên nhân và nhập viện do suy tim nặng hơn



Chỉ định cấy CRT: nhóm không có bloc nhánh trái (Non- LBBB)

Guidelines (Year)	QRS ≥ 150 ms		QRS 130-149 ms		QRS 120-129 ms	
	NYHA Functional Class III/IV	NYHA Functional Class II	NYHA Functional Class III/IV	NYHA Functional Class II	NYHA Functional Class III/IV	NYHA Functional Class II
ESC HFA (2016)*	IIa, B	IIa, B	IIb, B	IIb, B	III, A	III, A
ESC EHRA (2013)	IIa, B	IIa, B	IIb, B	IIb, B	IIb, B	IIb, B
ACC/AHA/HRS (2013)	IIa, A	IIb, B	IIb, B	III, B	IIb, B	III, B
CCS (2017)	IIb, Low	IIb, Low			III, Moderate	III, Moderate
Australian Guidelines (2011)	A		A		A	
NICE (2014)	CRT-P or CRT-D†	CRT-D	CRT-P‡		CRT-P‡	

Values are Class of Recommendation, Level of Evidence, unless otherwise indicated. Australian guidelines provide only grade of recommendation (A), not evidence level for these recommendations. NICE guidelines provide guidance on type of device rather than recommendation or evidence level. *The ESC HFA guidelines do not specify NYHA class, rather they state that the guidelines refer to symptomatic patients with heart failure. †Not for NYHA functional class IV. ‡Only for NYHA functional class IV.

Abbreviations as in [Table 1 and 2](#).

BN nhịp chậm có CĐ cấy máy tạo nhịp, kèm suy tim trái

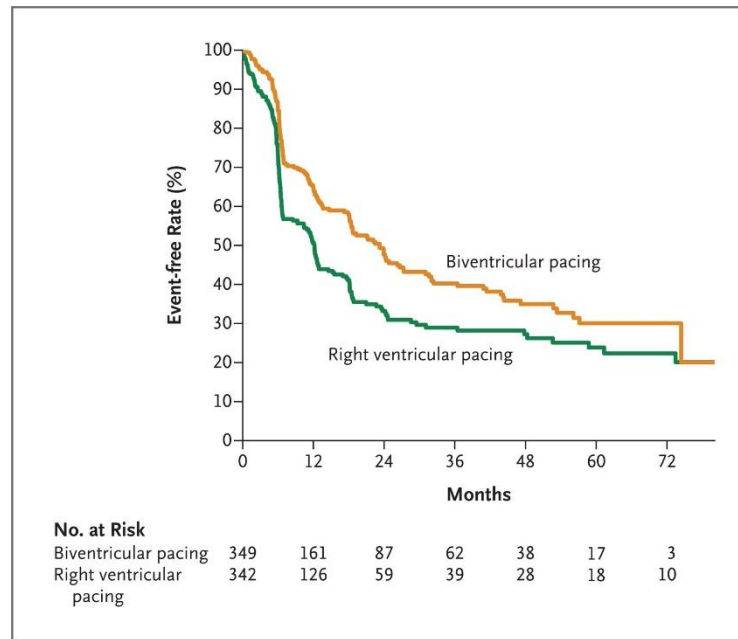
N/c BLOCK-HF (BiVentricular versus Right Ventricular Pacing in Heart Failure patients with AV Block)

918 BN cấy CRT hoặc ICD:

- Bloc NT độ cao, 3 có chỉ định cấy PM
- NYHA I, II, III
- EF $\leq 50\%$

Primary endpoint:

- Tử vong do mọi NN
- Nhập viện vì suy tim
- LVEDV tăng $\geq 15\%$



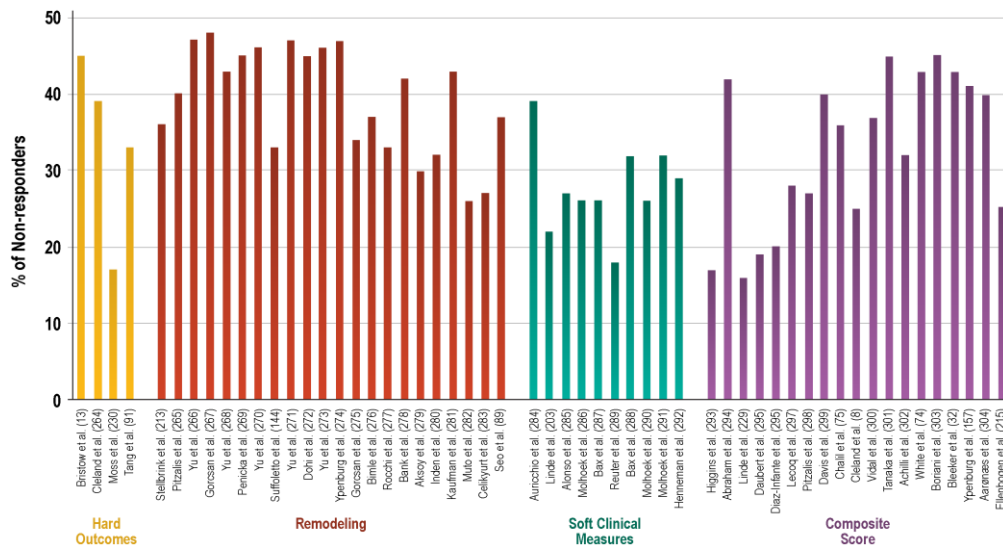
Curtis AB, Worley SJ, Adamson PB, et al. Biventricular pacing for atrioventricular block and systolic dysfunction. N Engl J Med 2013;368: 1585–93.

Chỉ định cấy CRT

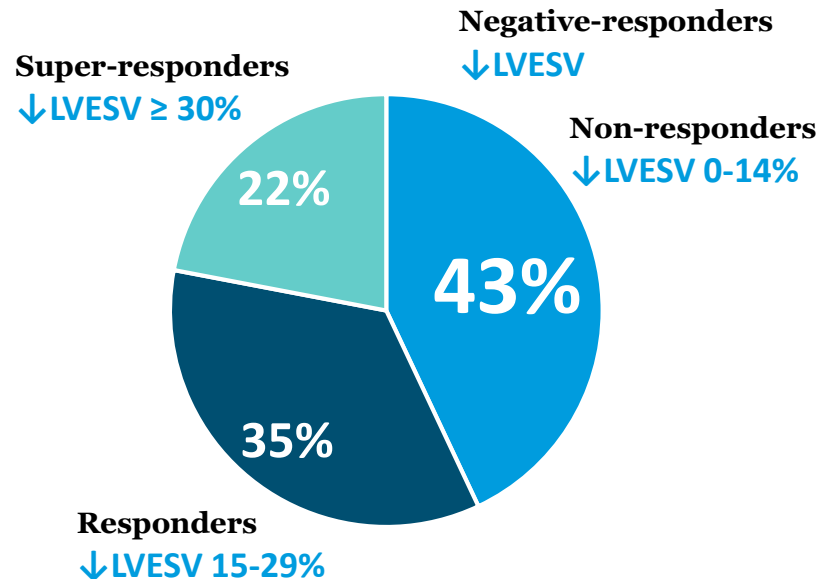
Guidelines (Year)	Atrial Fibrillation and HF	Expected High % of Ventricular Pacing With Reduced LVEF and Symptomatic HF
ESC HFA (2016)	IIa, B	I, A
ESC EHRA (2013)	IIa, B	IIa, B
ACC/AHA/HRS (2013)	IIa, B	IIa, C
CCS (2017)	IIb, Low	IIb, Moderate

Thách thức vẫn còn khi cấy CRT

RESPONSE TO CRT IS INADEQUATE AND UNPREDICTABLE¹



REPRESENTATIVE EXPERIENCE²



43% of CRT patients classified as non-responders or negative-responders by LVEFV after 6 months (N = 303)

1. Daubert, J.C., Saxon, L., Adamson, P.B., Auricchio, A., Berger, ... Torp-Pedersen, C.T. (2012). 2012 EHRA/HRS expert consensus statement on cardiac resynchronization therapy in heart failure: implant and follow-up recommendations and management. Europace, 14(9):1236-86.

2. Ypenburg, C., Bommel, R. J., Borleffs, C. J., Bleeker, G. B., Boersma, E., Schalij, M. J., & Bax, J. J. (2009). Long-Term Prognosis After Cardiac Resynchronization Therapy Is Related to the Extent of Left Ventricular Reverse Remodeling at Midterm Follow-Up. Journal of the American College of Cardiology, 53(6), 483-490. doi:10.1016/j.jacc.2008.10.032.

Các nguyên nhân của Non response CRT

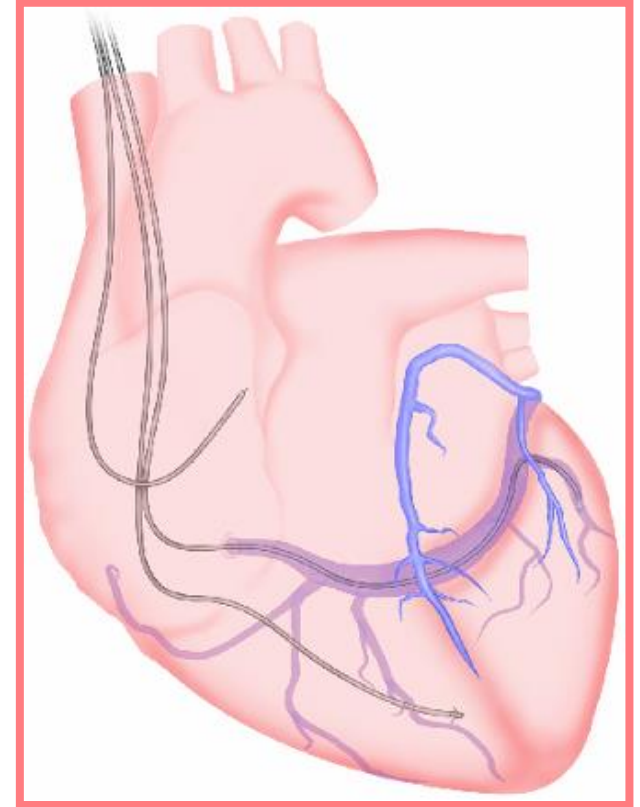
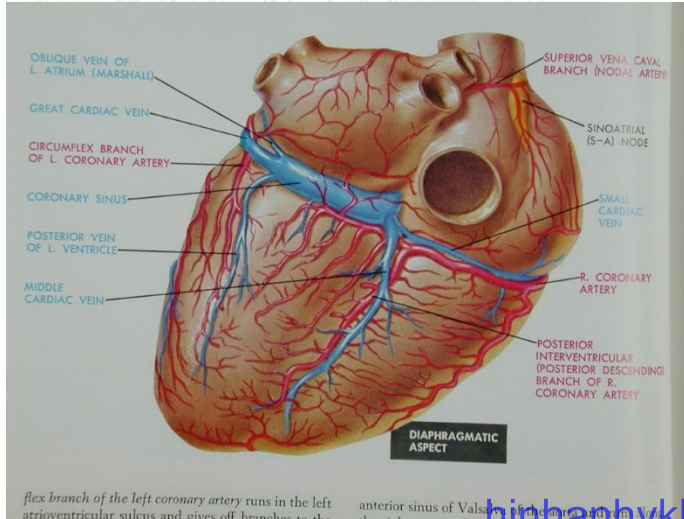
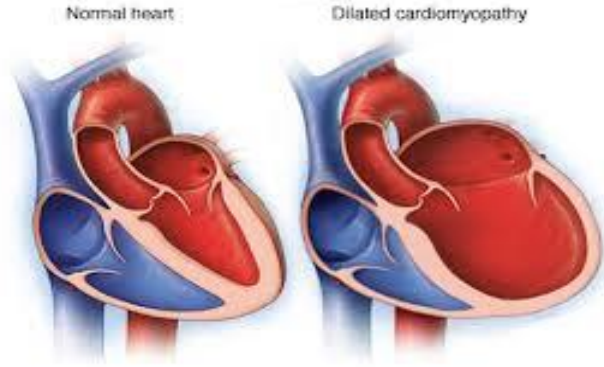
Các yếu tố liên quan đến BN:

- Suy tim do BTTMCB
- Giới tính: nam
- Độ rộng QRS: <120ms
- Hình dạng QRS: bloc nhánh phải, RLDT trong thất
- Thể tích thất trái cuối tâm trương quá to: LVEDD >240ml
- Sẹo cơ tim
- Kèm theo giãn, RLCN tâm thu thất phải
- Mắc các bệnh lý nội khoa khác: bệnh phổi mạn, thiếu máu...

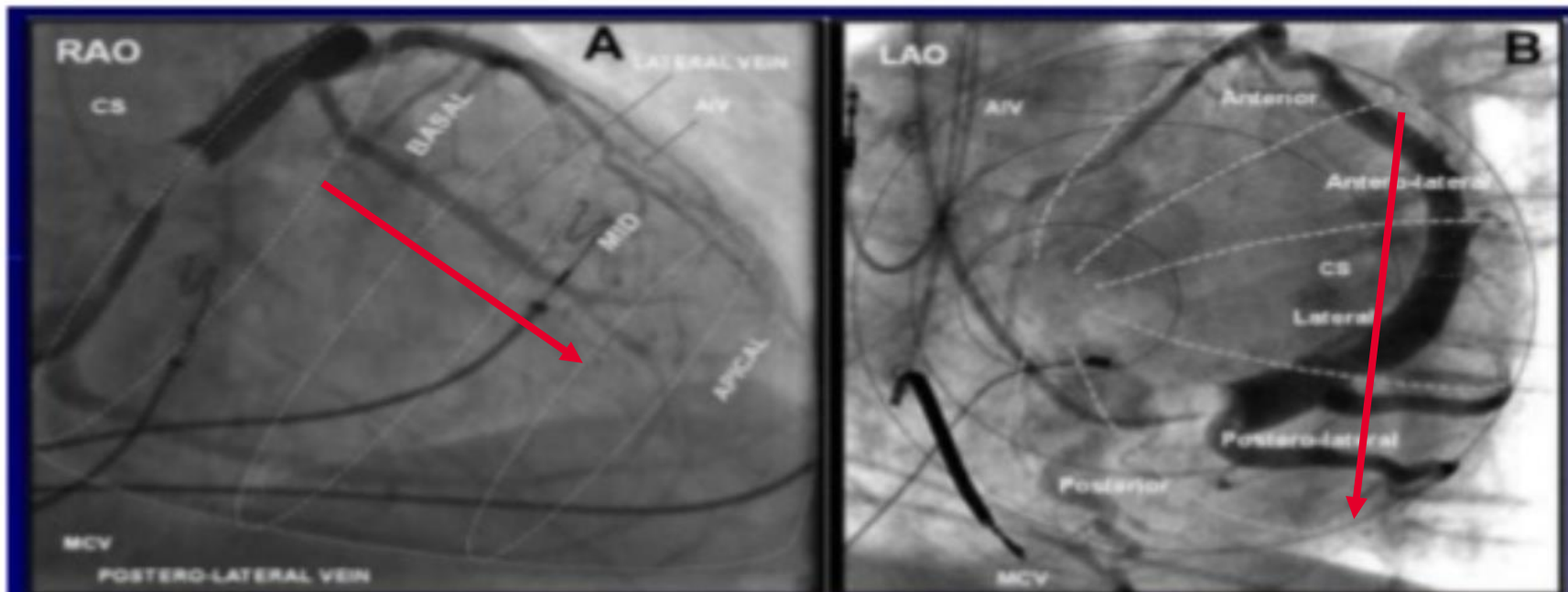
Các yếu tố liên quan đến hệ thống máy và dây:

- **Dây thất trái:** không hiệu quả
- Tỷ lệ tạo nhịp 2 thất (BiV pacing) không cao
- Đồng bộ giữa AV, VV không tối ưu
- Bị các RLNT: rung nhĩ, NTT/T...

Vị trí đặt dây điện cực thất trái



Vị trí đặt dây điện cực thất trái



Vị trí tối ưu: thành bên, vùng đáy và giữa của thất trái (Lateral, Base-Mid LV)

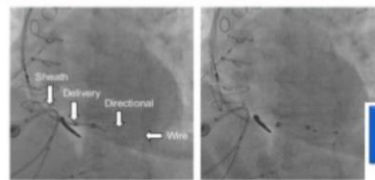
Dây thất trái không hiệu quả

- Do giải phẫu TM vành
- Mất đồng bộ từng vùng cơ tim
- Đặc điểm của vùng cơ tim: sẹo...
- Đáp ứng của cơ tim

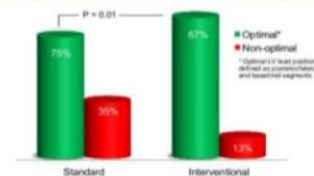
Vị trí dây thất trái không tối ưu: khắc phục

- Đặt lại dây thứ 2: CT scan
- Multiple LV leads
- Đặt dây điện cực thượng tâm mạc (phẫu thuật)
- Hệ thống Lead telescoping
- *Tạo nhịp đa điểm (MPP)*
- *Tạo nhịp His*
- *Tạo nhịp thất trái ở vùng vách*
- *Leadless*

The Telescoping System – Directional and Delivery Catheters to Improve Implant



Optimal* LV Lead Placement Improved with Telescoping Approach



TẠO NHỊP ĐA ĐIỂM



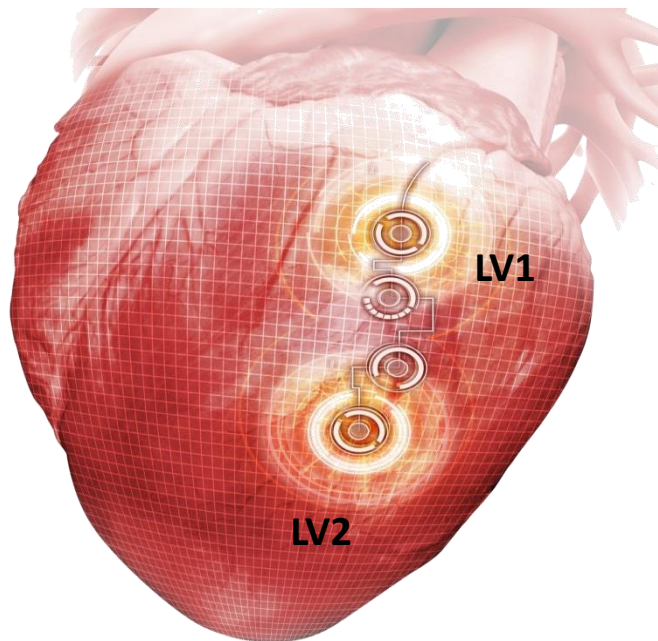
Tạo nhịp đa điểm kích thích tại 2 điểm gần nhau trên điện cực thất trái, giúp tạo nhịp tốt hơn.



1. Niazi I, et al. Safety and efficacy of multipoint pacing in cardiac resynchronization therapy—the multipoint pacing trial. JACC. 2017;3(11):1519-1522. <http://dx.doi.org/10.1016/j.jacep.2017.06.022>. Accessed July 31, 2018.

MultiPoint™ Pacing từ một nhánh CS

**ABILITY TO PACE FROM TWO LV SITES WITH
INDEPENDENT IMPULSES AND PROGRAMMABLE DELAYS**



Any 2 vectors
using different
cathodes can be
selected

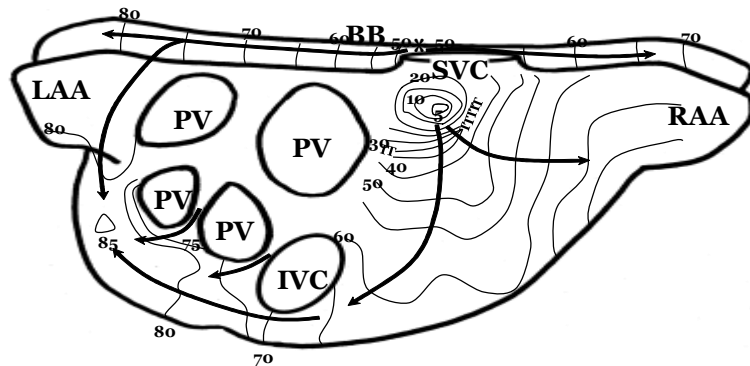
**10 CRT-D or 14 CRT-P
VectSelect Quartet™ Vectors**

VECTOR	CATHODE TO ANODE
1	D1 → M2
2	D1 → P4
3	D1 → RV Coil
4	M2 → P4
5	M2 → RV Coil
6	M3 → M2
7	M3 → P4
8	M3 → RV Coil
9	P4 → M2
10	P4 → RV Coil
11	D1 → Can
12	M2 → Can
13	M3 → Can
14	P4 → Can

Thực nghiệm trên động vật¹

IMPROVED ACTIVATION PROPAGATION AND MINIMIZED FUNCTIONAL BLOCK(S)

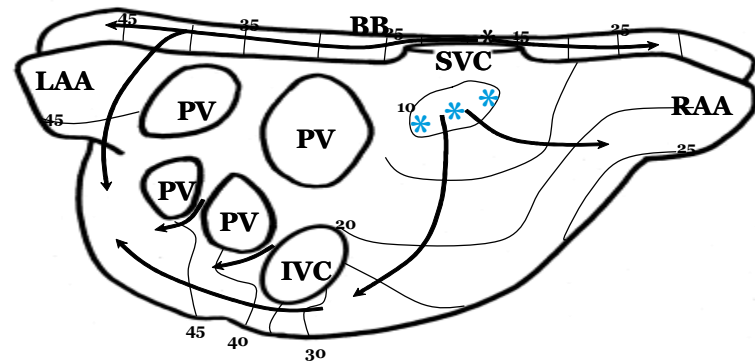
HIGH-DENSITY (380 SITES) EPICARDIAL MAPPING OF A PERICARDITIS DOG –
200 MS PACING CL EPISODES



SINGLE SITE PACING

RA AT: 65 ms (51 ± 11.8 ms, 8 dogs)

Bi-atrial AT: 87 ms



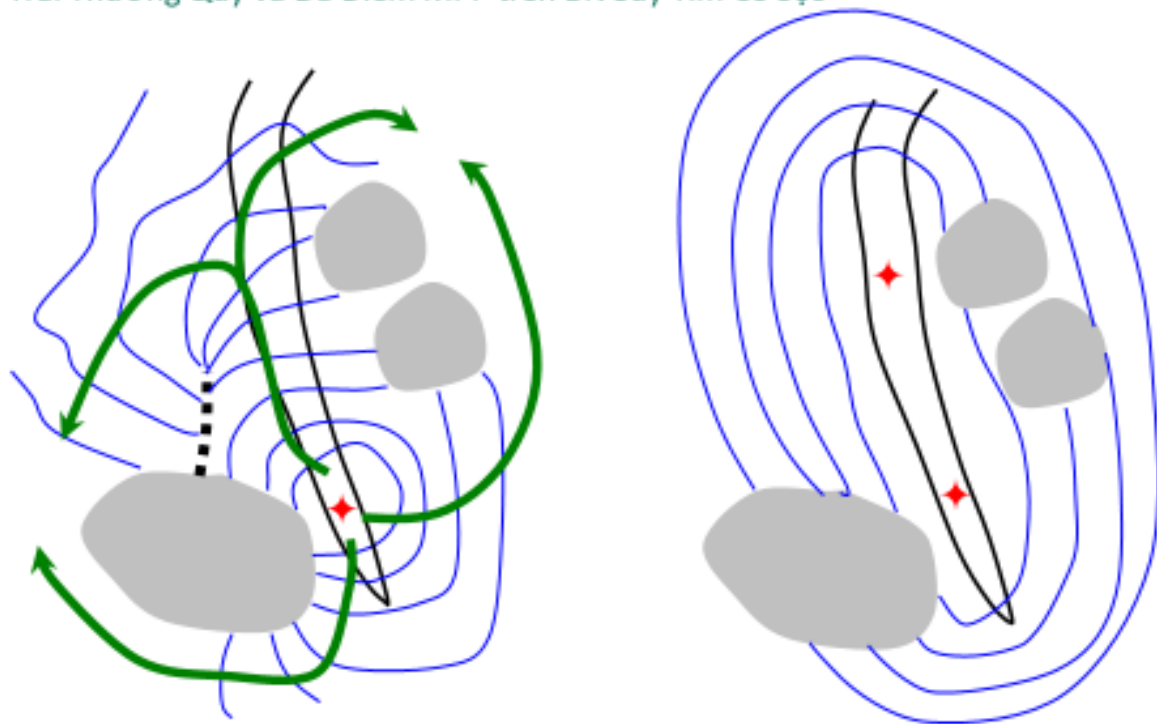
TRIPLE SITE PACING

RA AT: 30 ms (35 ± 4.9 ms, 8 dogs)

Bi-atrial AT: 50 ms

1. Ryu, K. (2005). Comparative effects of single- and linear triple-site rapid bipolar pacing on atrial activation in canine models. AJP: Heart and Circulatory Physiology, 289(1). doi:10.1152/ajpheart.01265.2004

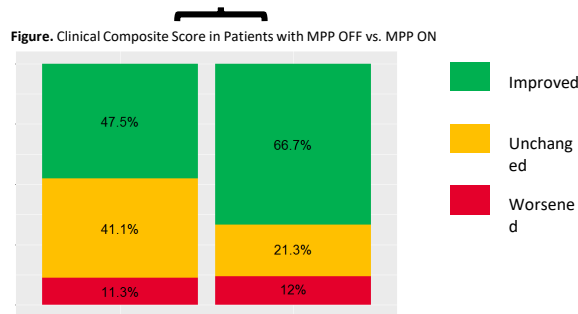
Hình Dạng Khả Năng Sóng Xung Kích (shockwave) Lan Truyền Giữa Tọa Nhịp Thất
Trái Thường Quy và Đa Điểm MPP trên BN Suy Tim Có Sẹo



IRON-MPP Clinical Data

Long-Term Analysis of the IRON-MPP Study Shows Improvement in NYHA Class and Clinical Composite Score

P = 0.010



	MPP OFF	MPP ON	p
N	141	75	
Patients with HF Hospitalizations	11 (7.8%)	8 (10.7%)	0.65
Patients with HF Death	1 (0.7%)	0 (0.0%)	1.00
Patients with Each CCS Classification			0.010
Improved	67 (47.5%)	50 (66.7%)	
Unchanged	58 (41.1%)	16 (21.3%)	
Worsened	16 (11.3%)	9 (12%)	

1. Zanon F, De Ruvo G, Calabrese V, et al. Impact of MultiPoint Pacing on Clinical Status: Long-Term Analysis of the IRON-MPP Study. Poster presented at EHRA 2019.

SJM-xxx-xxx | Item Approved for U.S. and OUS use

METHODS

- IRON-MPP (Italian Registry on Multipoint Left Ventricular Pacing), multi-center Italian registry involving 20 sites
- MPP™ Pacing activation and programming at implanting physician discretion
- Clinical composite score (CCS) incorporated HF hospitalizations, HF death, and NYHA Class
- Fisher exact test used to compare proportions of patients with worsened, improved, and unchanged NYHA Class and CCS scores

RESULTS

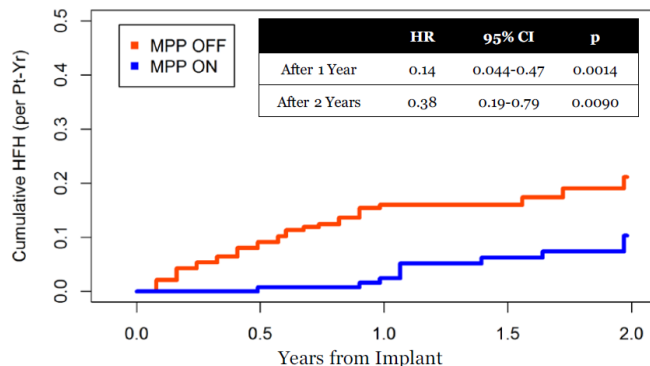
- 216 patients included (141 MPP-OFF, 75 MPP-ON) had long term NYHA data available
- No differences in baseline characteristics other than NYHA class
- At long-term follow-up more MPP ON patients experienced improvement in NYHA class and clinical composite score and
- In patients with baseline NYHA class II/IV more MPP-ON patients improved by 2 classes, similar number improved by 1 class

CONCLUSION

Activation of the MPP feature was associated with a larger long-term improvement in NYHA class and clinical composite score compared to single-site ventricular pacing²⁰

MPP Reduce Hospitalization and Cost

MPP reduces HF Hospitalizations and Associated Costs: an analysis of the IRON-MPP study



	0	0.5	1	1.5	2
MPP OFF	Events	0	17	29	32
	At Risk	190	185	164	84
MPP ON	Events	0	1	3	7
	At Risk	128	128	119	92

METHODS

- Prospective multi-center registry of patients implanted with MPP-capable device
- MPP activation and programming at implanting physician discretion
- HFH rates and compared between MPP (MPP-ON) and single-site pacing (MPP-OFF)
- National Italian reimbursement rates used to estimate cost of each HFH

RESULTS

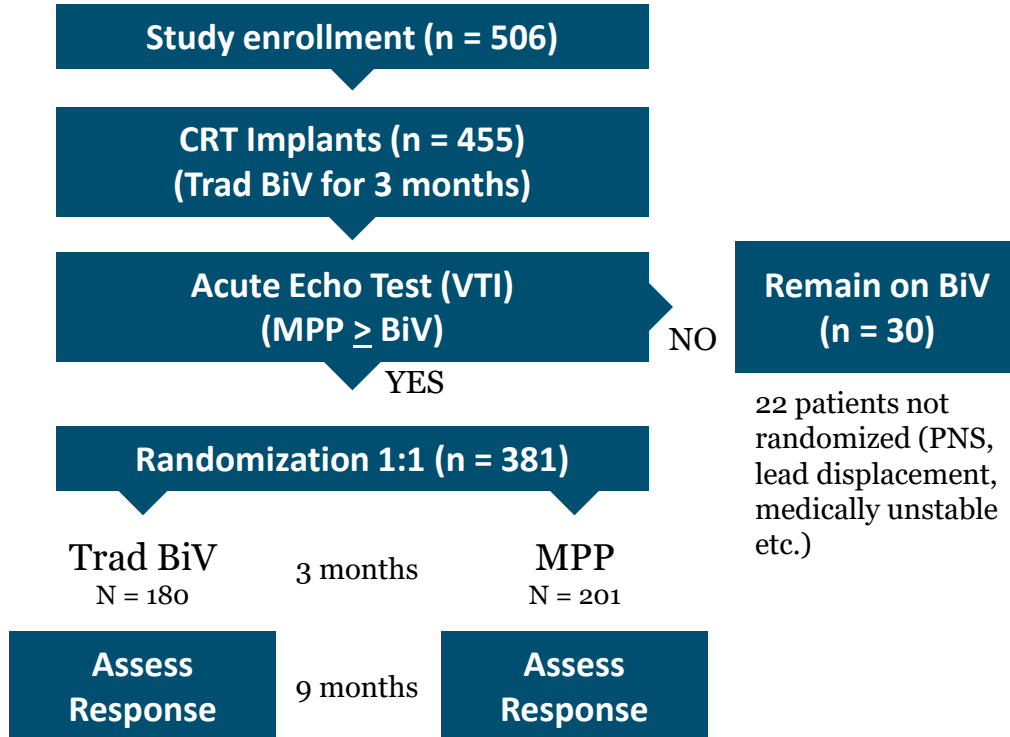
- 318 patients (190 MPP-OFF, 128 MPP-ON)
- At 1 and 2 years patients in the MPP-ON group were associated with lower cumulative rates of HFH and significantly lower per patient costs compared to MPP-OFF

CONCLUSION

This study showed that activation of the MPP feature was associated with a significant reduction in cumulative HF hospitalizations and cost savings

1. Zanon F, Forleo G, Calo L, et al. Multipoint Pacing Reduces Heart Failure Hospitalizations and Associated Costs: an analysis of the IRON-MPP study. Poster presented at EHRA 2019.

Thiết kế N/c IDE



STUDY DETAIL¹

OBJECTIVE:

- Đánh giá hiệu quả và độ an toàn của MPP™ ở BN suy tim có CD cấy CRT-D

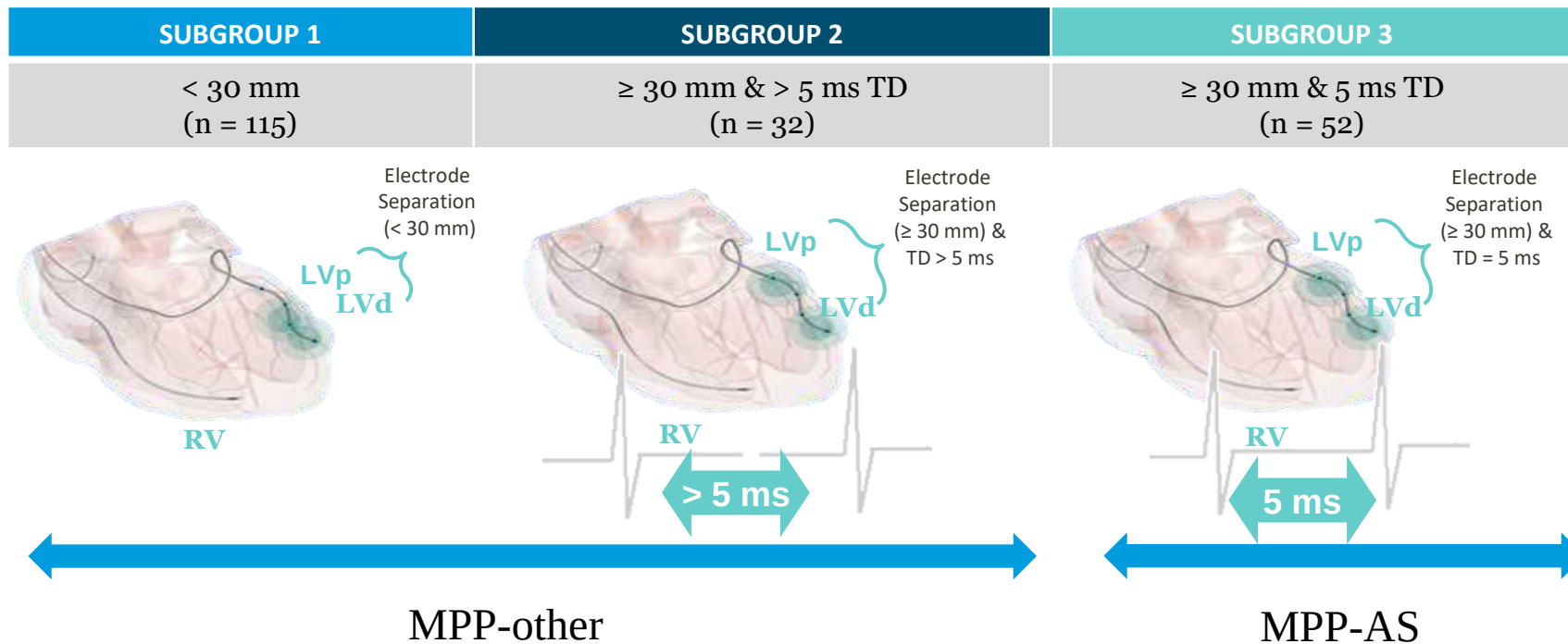
DESIGN:

- Prospective, multi-center, randomized, double-blinded non-inferiority trial
- 506 patients, 49 centers
- Responder status assessed at 3 & 9 months using Clinical Composite Score (CCS)
- CCS includes:
 - NYHA
 - Patient Global Assessment (PGA)
 - HF events
 - Cardiovascular death

1. Tomassoni, G., Baker II, J., Corbisiero, R., Love, C., Martin, D., Sheppard, R., Worley, S., Varma, N., Niazi, I. (2016). Safety and efficacy of multipoint pacing in cardiac resynchronization therapy: The MultiPoint Pacing (MPP) IDE Study. 2016 Heart Rhythm Society, LBCT 01-03.

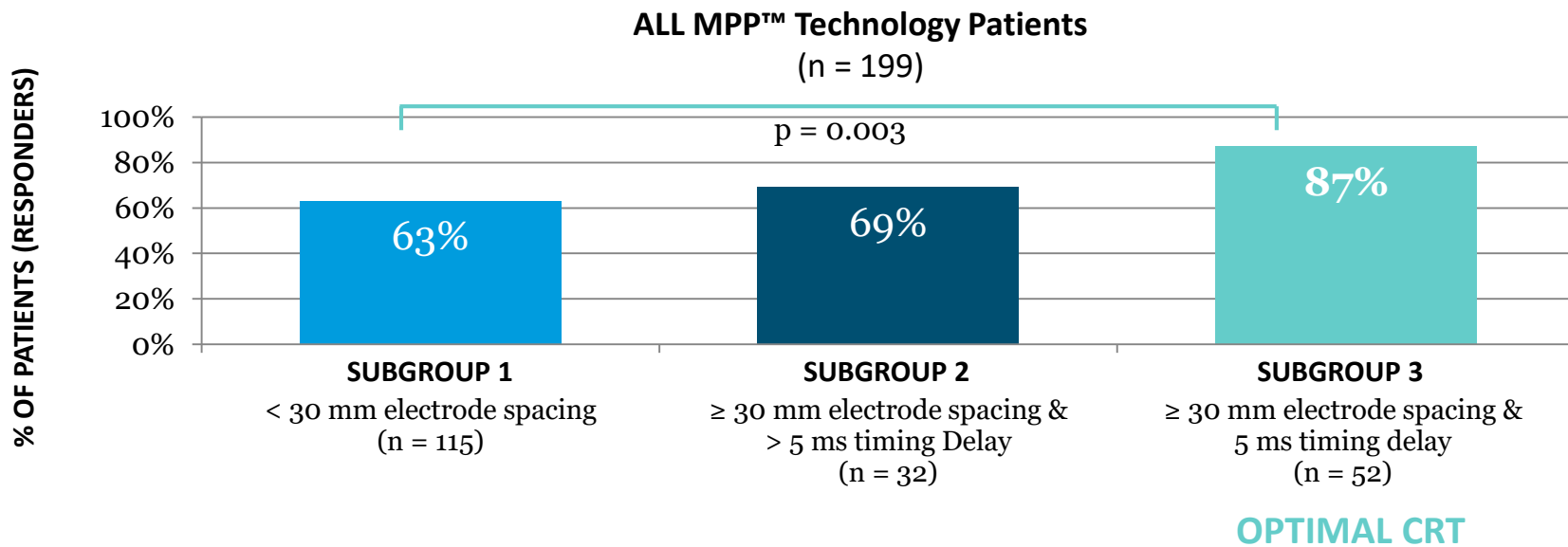
Kết quả: Vai trò của MPP™

POST-HOC SUB-ANALYSES WERE CONDUCTED TO DETERMINE THE INFLUENCE OF MPP™ PROGRAMMING ON CRT RESPONSE (199 PTS*):



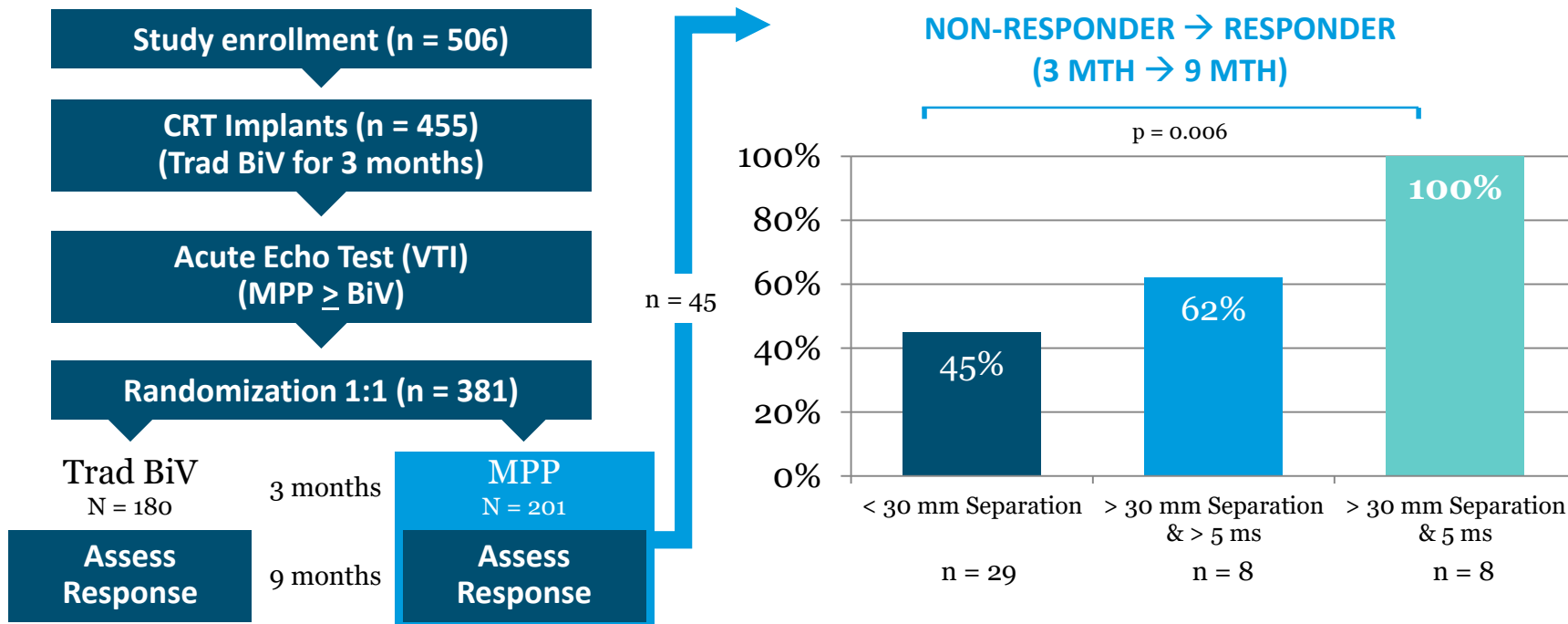
Đáp ứng với CRT sau 9 tháng – Optimal MPP™

The non-responder rates at 9 months between subgroup 3 (“Optimal MPP” CRT), and other subgroup programming was clinically and statistically significant.



Tiến triển từ không đáp ứng sang đáp ứng

- 8 of 8 patients who were non-responders at randomization were converted to responders when programmed to “Optimal MPP”
- 65% of non-responders randomized to continued BiV pacing became responders



Tạo nhịp bó His (His bundle pacing)

A BETTER WAY TO PACE HEART

Pacemakers restore normal heartbeats in millions of people, but the widely used technique of connecting the pacemaker wire to a spot in the lower right ventricle triggers heart failure in a surprising number of patients, recent studies show. A small-but-growing number of doctors are using a new implant technique called His bundle pacing to avoid pacing-induced problems. In His bundle pacing, the doctor puts the right-ventricular lead in the right atrium, millimeters from the heart's natural conduction system. This creates a natural heartbeat, avoiding the dyssynchrony in heart chambers that leads to pacing-induced heart failure.

— New His bundle pacemaker lead placement

..... Traditional right-ventricular pacemaker lead placement

Pacemaker leads come into heart through the subclavian vein

Sinoatrial node

Atrioventricular node

HIS bundle

Right atrium

Right ventricle

Septum

Right bundle branch

Source: Star Tribune reporting;
University of Minnesota, Geisinger
Health System; National Institute of Health

EDDIE THOMAS • Star Tribune

The pacemaker is implanted under skin close to the clavicle

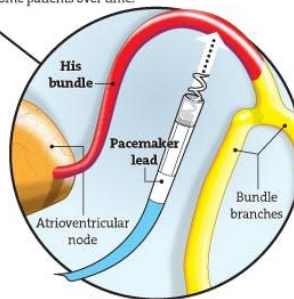
Clavicle (collar bone)

Subclavian vein

Heart

Approaching the His bundle

Named for discoverer Wilhelm His Jr. (1863-1934), the His bundle is a collection of highly conductive muscle cells that transmit electric impulses to make the heart's lower ventricles beat. The His bundle can be stimulated directly, recreating a natural heart rhythm instead of the "elongated" heartbeat that causes problems in some patients over time.



HIS BUNDLE PACING VERSUS BIVENTRICULAR PACING IN CARDIAC RESYNCHRONIZATION THERAPY ACUTE HEMODYNAMIC AND ELECTROPHYSIOLOGICAL EFFECTS

Floor C.W.M. Salden, Justin G. Luermans, Sjoerd W. Westra, Richard N. Cornelusse, Subham Ghosh, Frits W. Prinzen, and Kevin Vernoooy

Objective

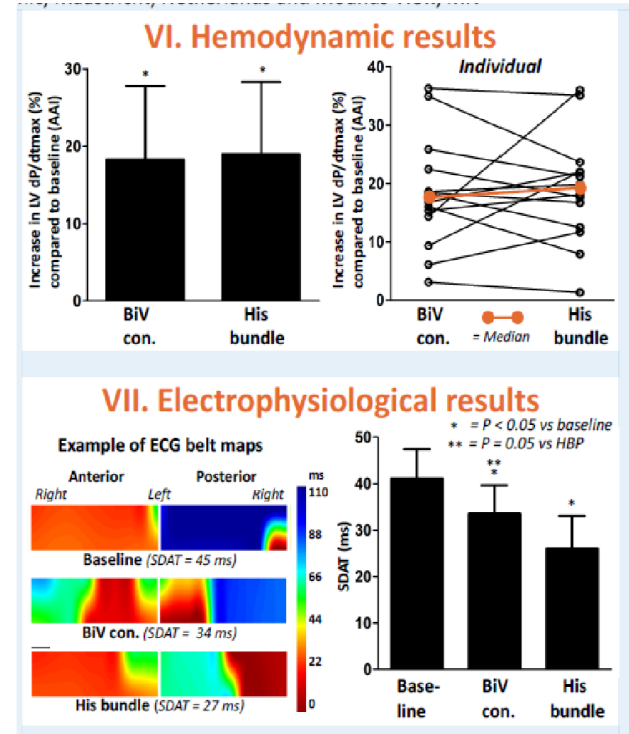
- To compare the acute hemodynamic (left ventricular dP/dtmax) and electrophysiological (standard deviation of activation times) effects of HBP and conventional BiV pacing in heart failure patients with LBBB (21.6%)

Methods

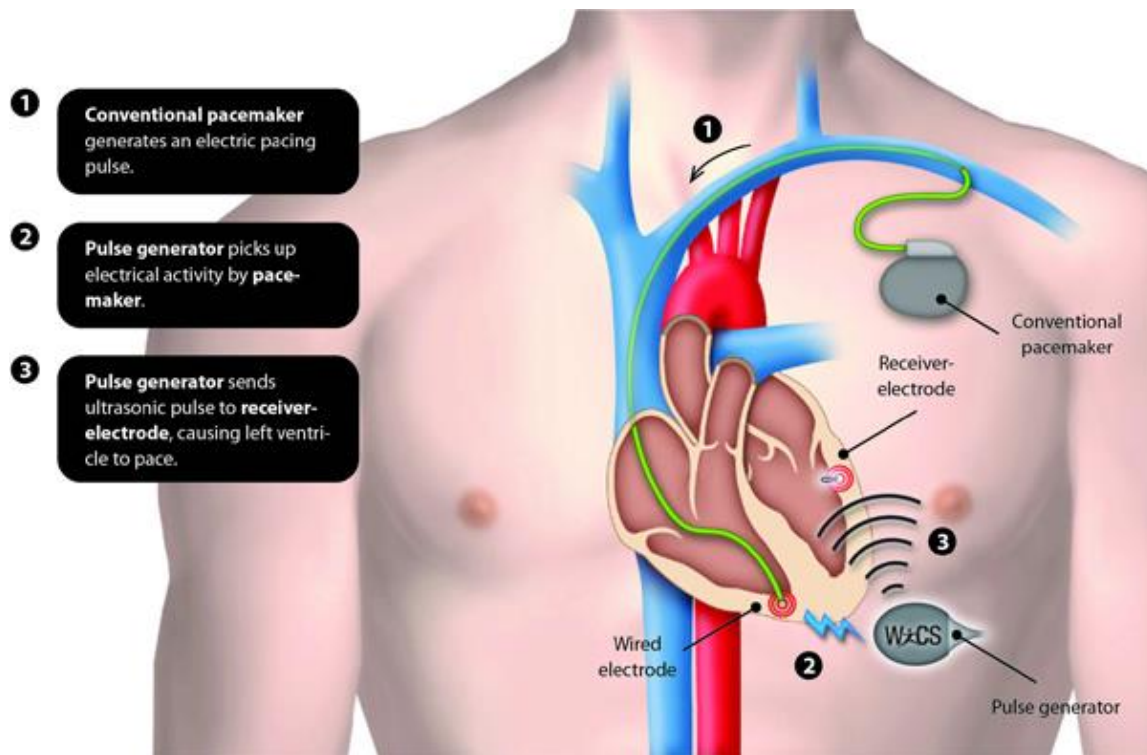
- RV apical and BiV pacing, using the implanted leads, and temporary HBP, using an electrophysiology catheter, was performed in 14 patients

Conclusions:

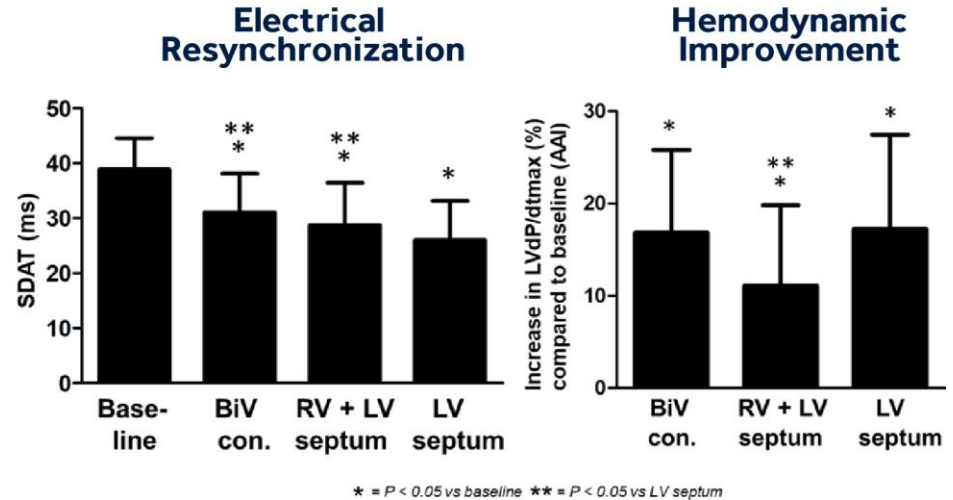
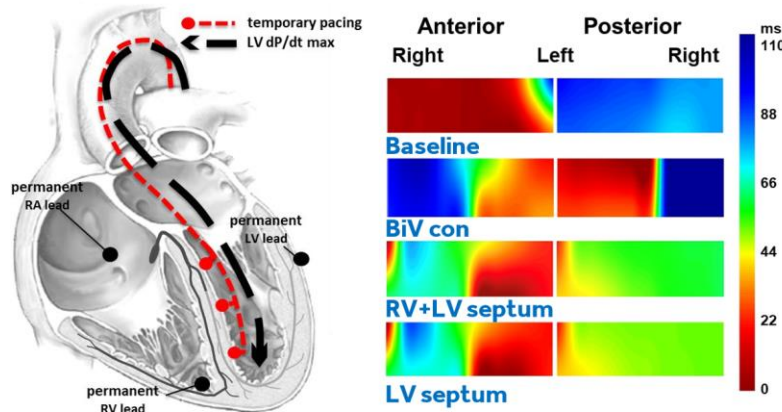
- Acute His bundle pacing results in hemodynamic improvement and electrical resynchronization that is as good as conventional BiV pacing.
- His bundle pacing may serve as an alternative for conventional BiV pacing in LBBB patients, however prospective studies are needed to prove chronic outcomes.



Tạo nhịp thất trái không dây



Tạo nhịp thất trái ở vùng vách liên thất



Conclusions:

LV septal pacing results in acute hemodynamic improvement and electrical resynchronization that is at least as good as BiV pacing. Suggesting that LV septal pacing may serve as a single ventricular lead alternative to conventional BiV pacing for cardiac resynchronization.

Accepted scientific abstracts at EHRA and HRS with clinical collaborators (Maastricht Univ Medical Center)

**XIN TRÂN TRỌNG CẢM ƠN SỰ CHÚ Ý THEO DÕI
CỦA QUÝ VỊ ĐẠI BIỂU**

Các khuyến cáo về CRT gần đây

Society	Guideline (Ref. #)	Year
ESC Heart Failure Association	Guidelines for the diagnosis and treatment of acute and chronic HF (15)	2016
ESC European Heart Rhythm Association	Guidelines on cardiac pacing and CRT (14)	2013
American College of Cardiology Foundation/ American Heart Association	Guidelines for the management of HF (37)	2013
Canadian Cardiovascular Society	Comprehensive update of the Canadian Cardiovascular Society Guidelines for the Management of HF (16)	2017
National Heart Foundation of Australia and Cardiac Society of Australia and New Zealand	Update to guidelines for the prevention, detection and management of chronic HF in Australia, 2006 (20)	2011
National Institute of Health and Care Excellence	ICD and CRT for arrhythmia and HF (38)	2014
CRT = cardiac resynchronization therapy; ESC = European Society of Cardiology; HF = heart failure; ICD = implantable cardioverter-defibrillator.		