



PLATFORM OF LABORATORIES FOR ADVANCES IN CARDIAC EXPERIENCE

**ROMA**

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**30 Settembre  
1 Ottobre  
2022**

**Aritmologia per il cardiologo clinico**

**STIMOLAZIONE DEL SISTEMA DI  
CONDUZIONE FISIOLOGICA**

**Domenico Grieco, MD, PhD**

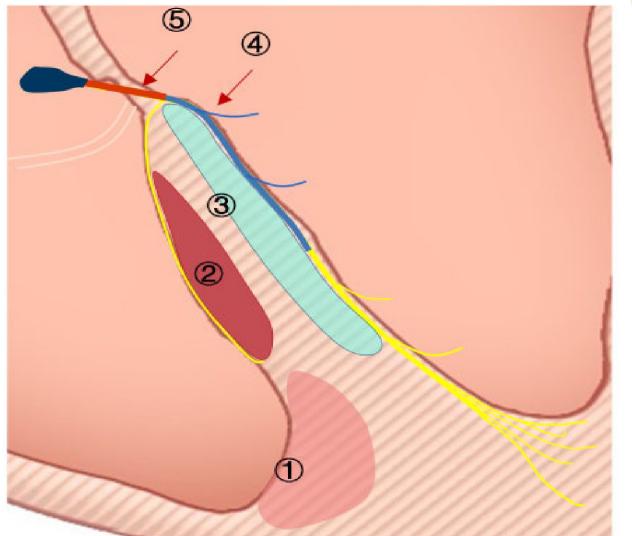


No disclosures regarding this presentation

# Physiological Pacing

Pacing technique that preserves or restores physiological sequence of heart activation.

RV is the standard location for implantation of pacing lead (easy access, stable position and parameters).

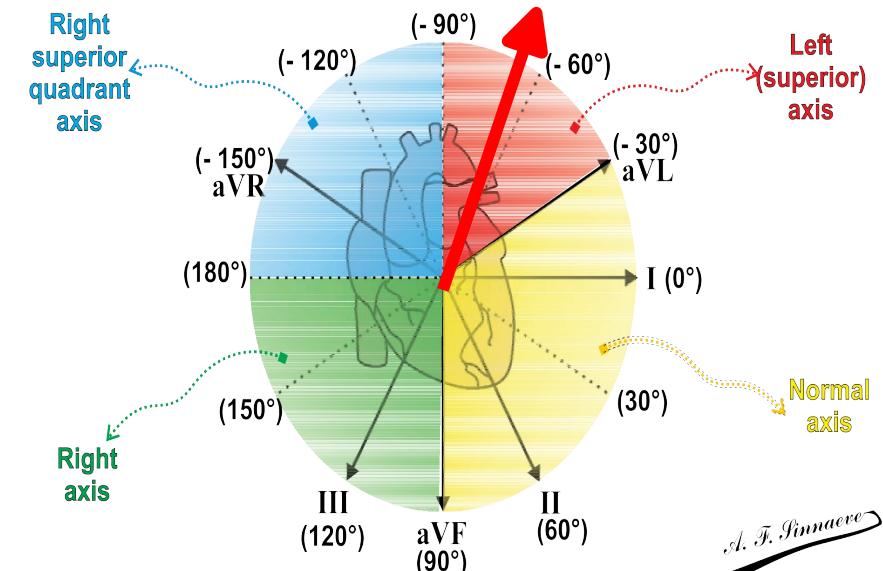


(1): RV apex                          (4): proximal LBB  
(2): RV septum                          (5): His bundle  
(3): Deep LV septum  
LBBAP means LBBP or LVSP

Heart activation is completely distorted!



Induced dyssynchrony and dysfunction!



# RVP is harmful!

# No matter where!

## DAVID Trial

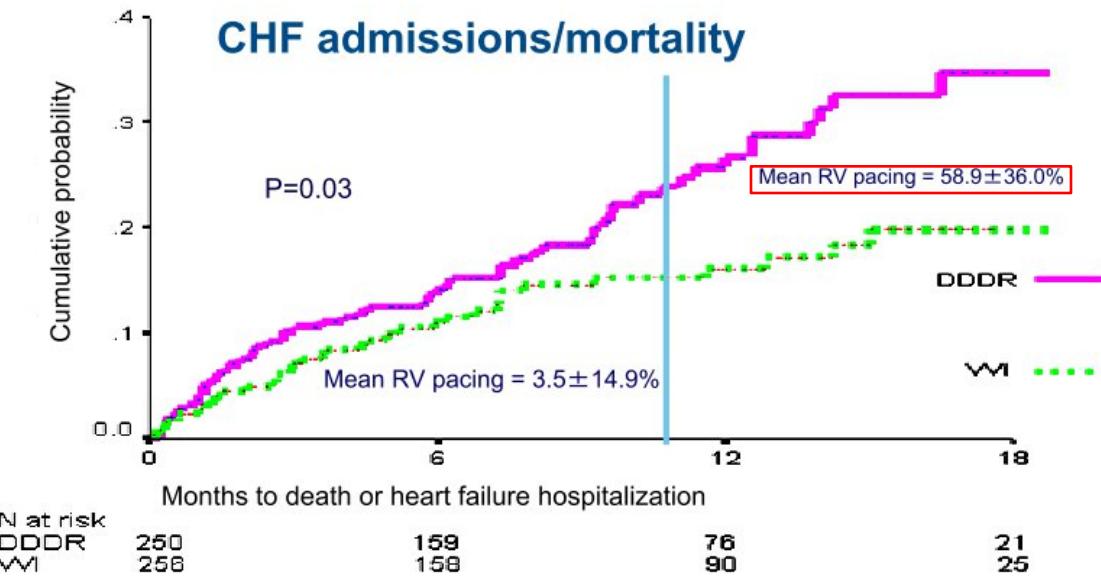


Table 2 Comparison of QRS axis, QRS duration and dyssynchrony indices with pacing site. Values given in terms of mean ± standard deviation

	RV apex	Mid-septum	RVOT	Others
pQRSd (msec)	149.3 ± 18.1	140.7 ± 21.1	137.9 ± 13.8	145.9 ± 10.0
QRS axis (degrees)	-66.3 ± 48.2	25.5 ± 8.0	80.7 ± 31.8	-5.9 ± 83.0
Aortopulmonary ejection delay (msec)	32.4 ± 23.3	24.8 ± 16.2	24.3 ± 31.2	17 ± 10.9
Septal-posterior wall activation delay (msec)	54.9 ± 41.7	52.3 ± 33.5	48.4 ± 38.8	45.3 ± 21.9

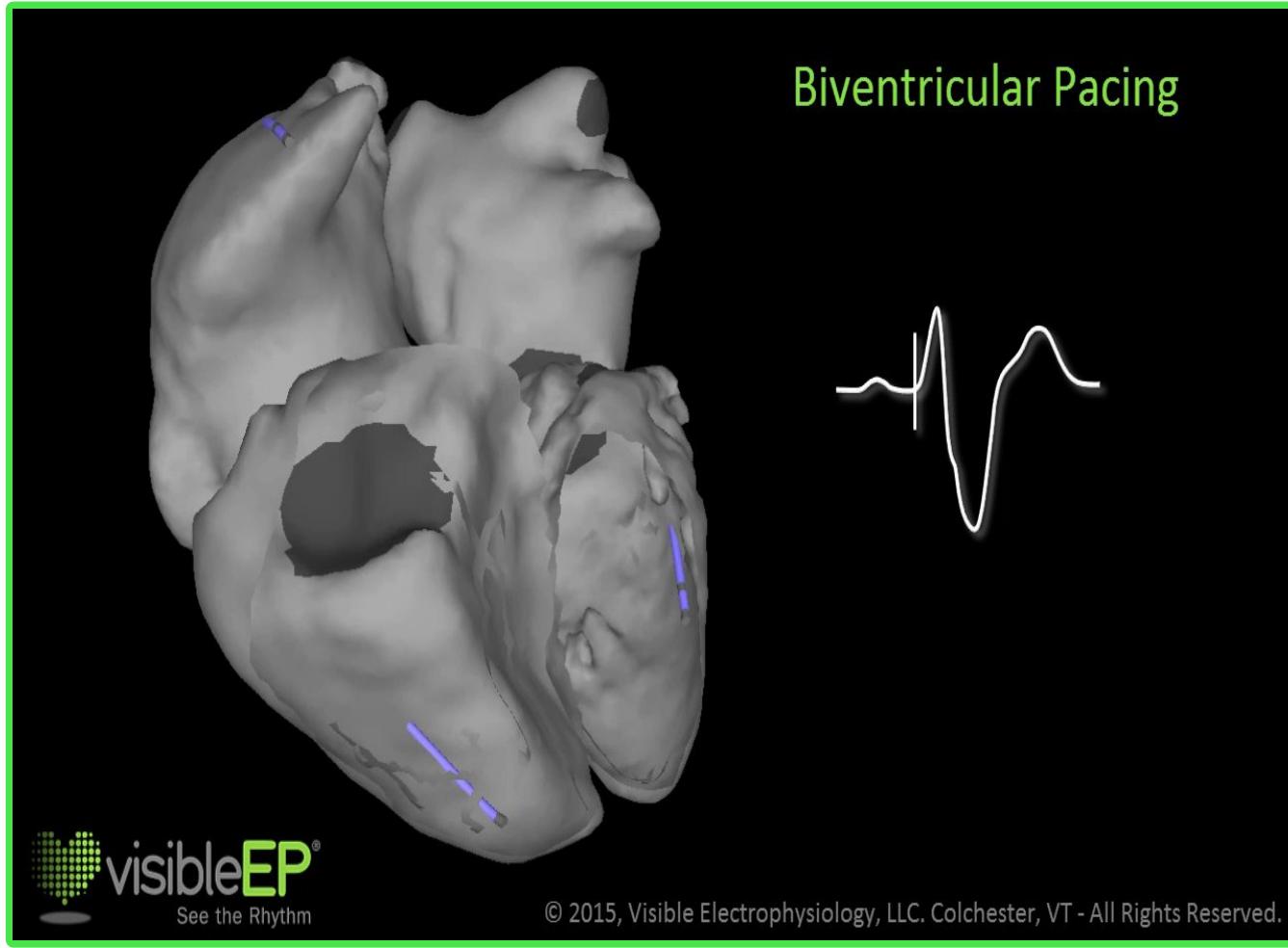
**PICM (↓ EF 10%) in 13.8% at 14.5 m**

**Predictors:**

- VP > 60%
- IV dyssynchrony

**No effect of RV pacing site (apical vs non-apical) on incidence of PICM!**

# Attempts to prevent desynchronization



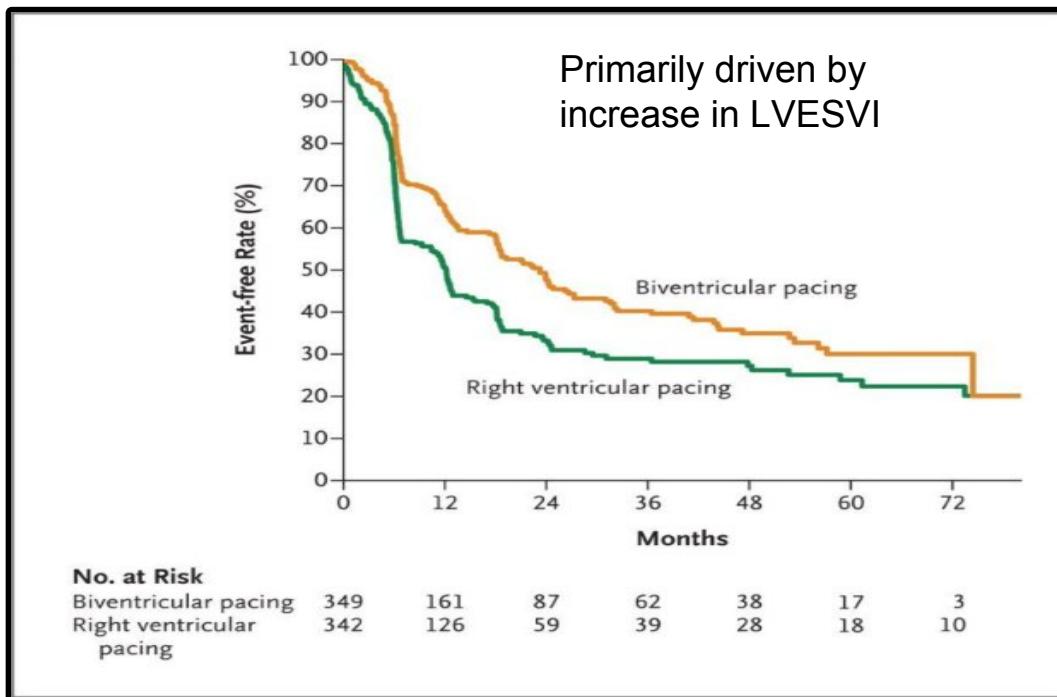
Requires 2 leads to pace the myocardium in a **nonphysiological** way that does not incorporate heart's normal, rapid conduction through the His-Purkinje system.

**It's Epi & Endo!!!**

# Attempts to prevent desynchronization

## BLOCK-HF

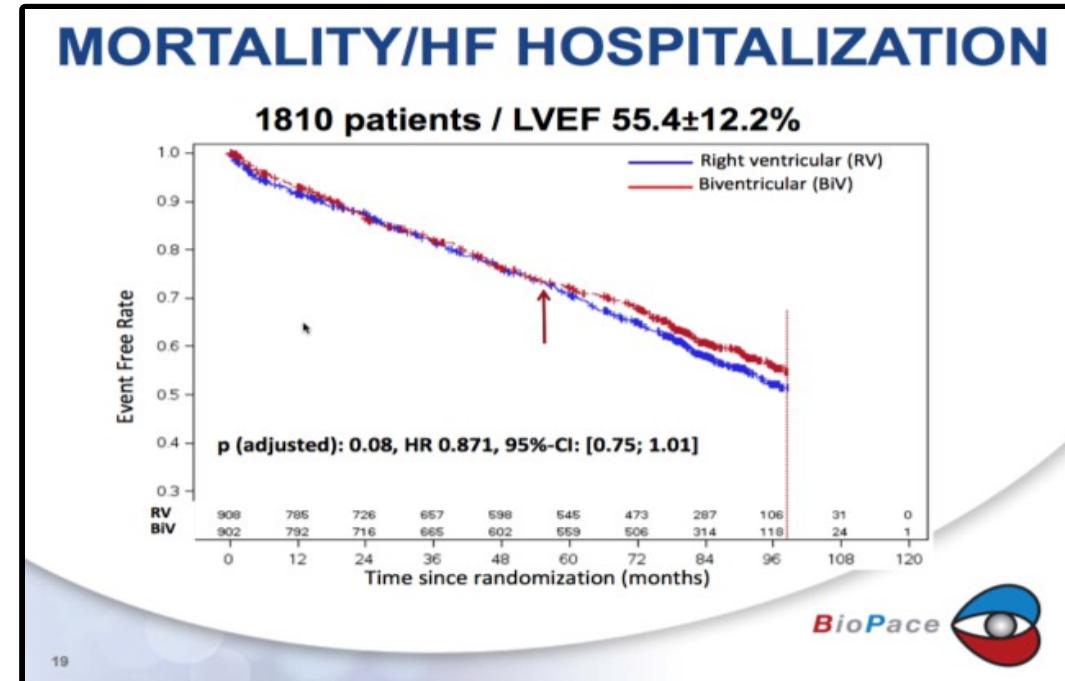
(Biventricular Pacing for Atrioventricular Block and Systolic Dysfunction)  
Heart Block, NYHA class I-III, EF < 50%



Curtis et al., NEJM 2013;368:1585-93

## BIOPACE

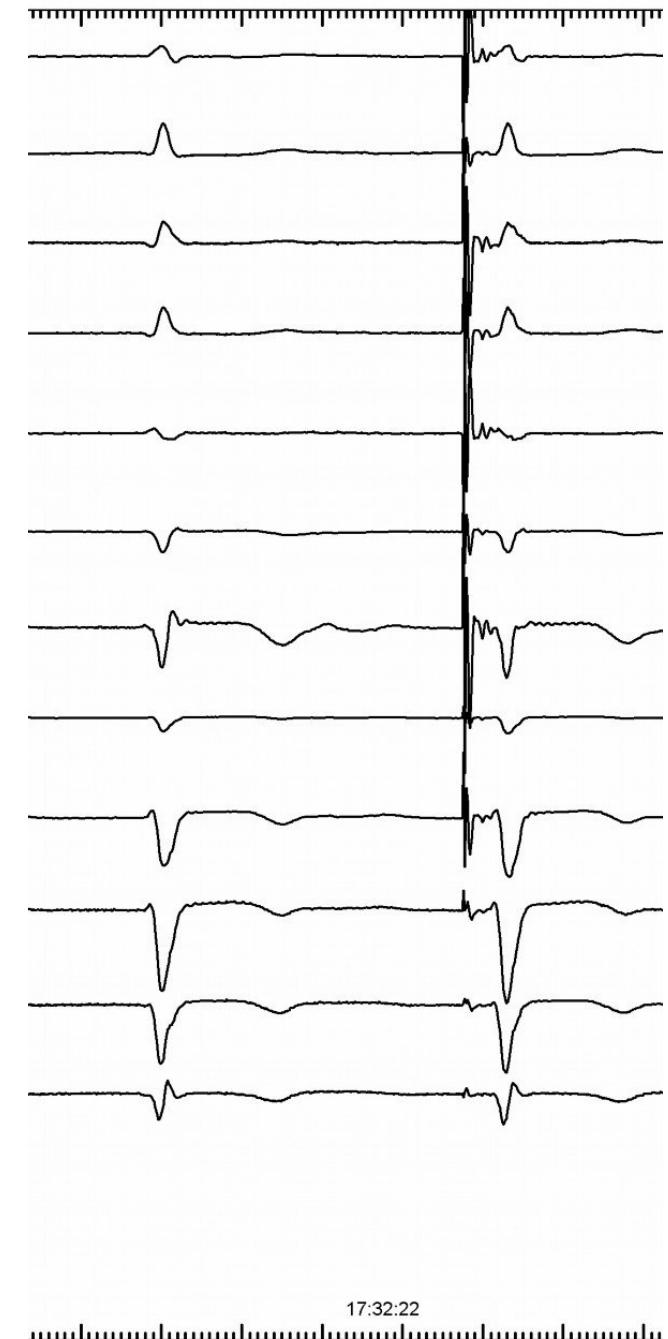
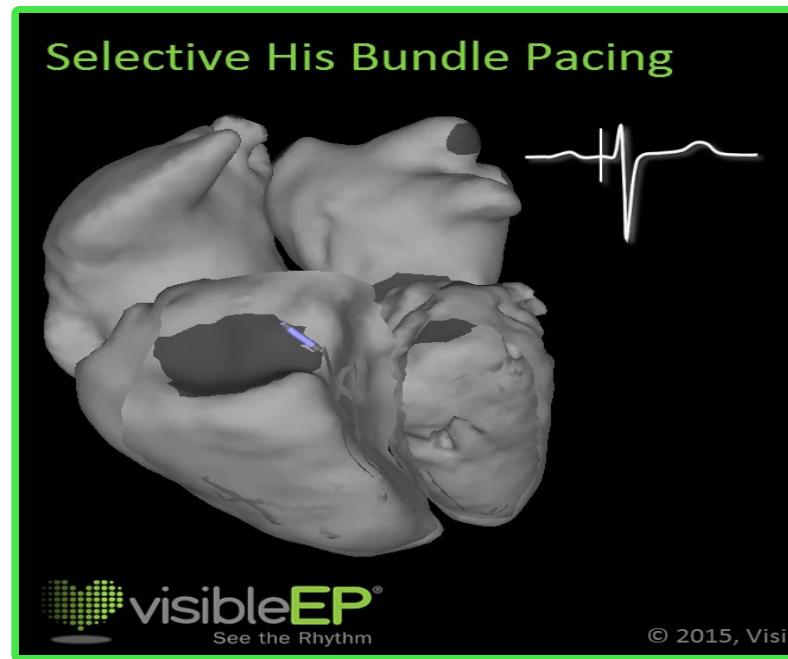
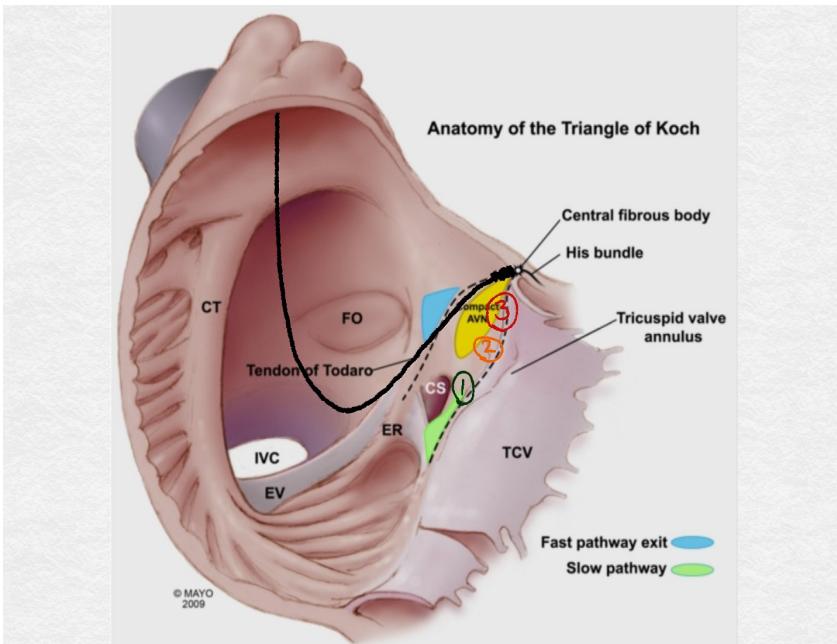
(Bi-V Pacing for AV Block to Prevent Cardiac Desynchronization)  
Indications for V pacing, any EF (PR >220 ms)



Funck et al. Europace. 2006;8(8):629-35.

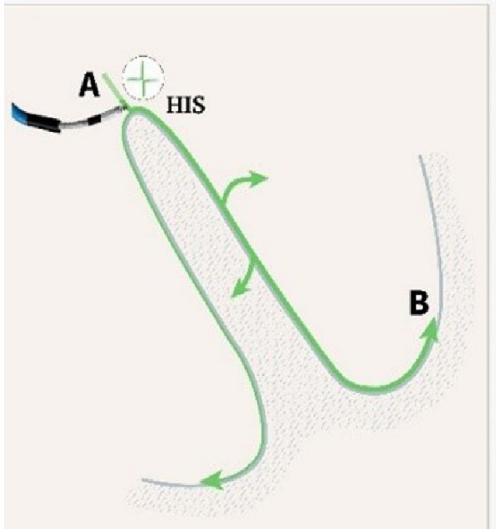
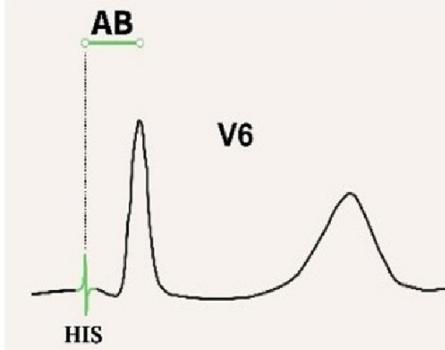
# HBP (the most physiological)

Replicates human physiology (evolution has selected HPS as the most efficient way to activate the ventricles)

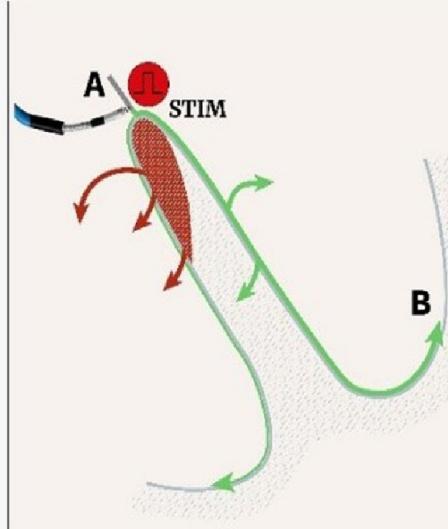
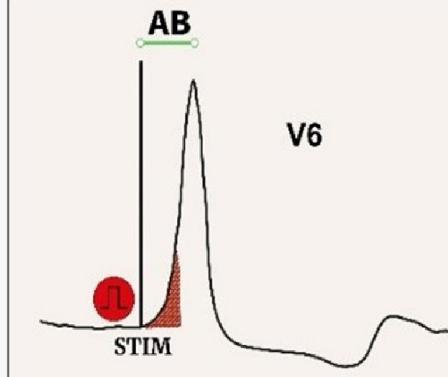


# Spontaneous V6-RWPT as reference for HB capture

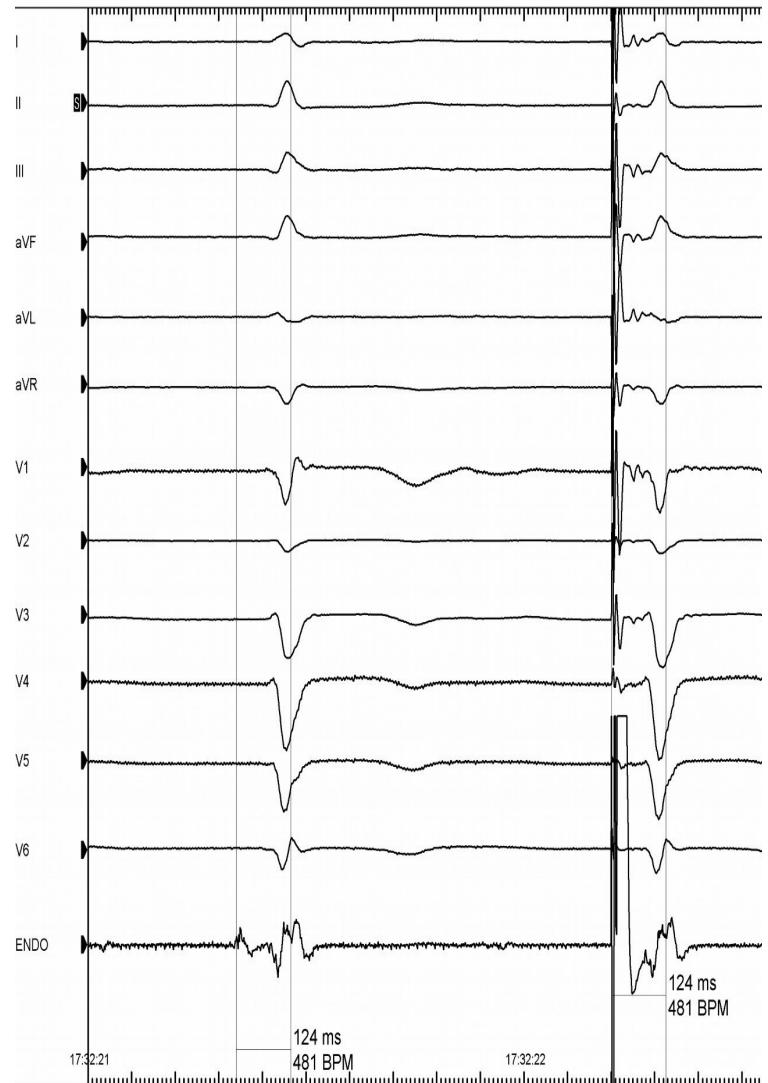
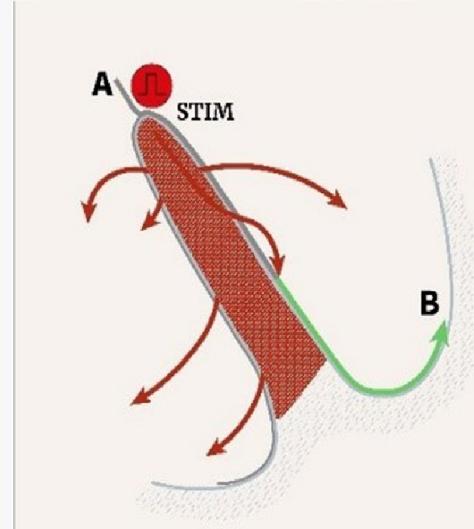
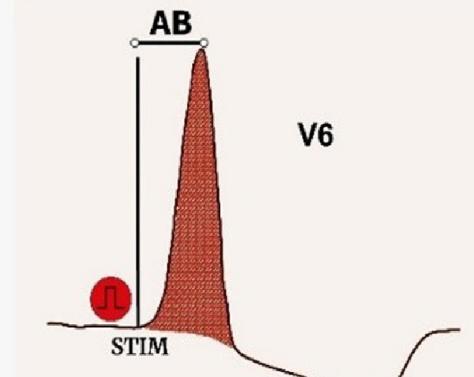
Selective = Spontaneous



Non Selective

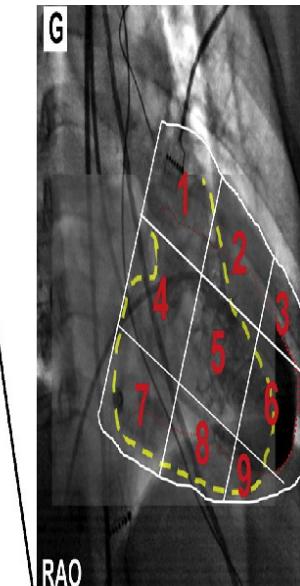
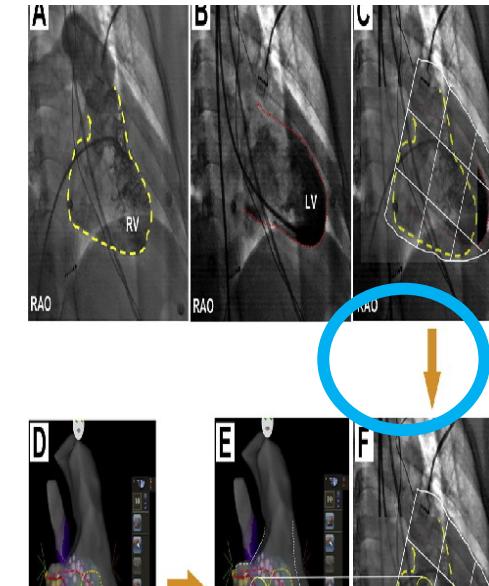
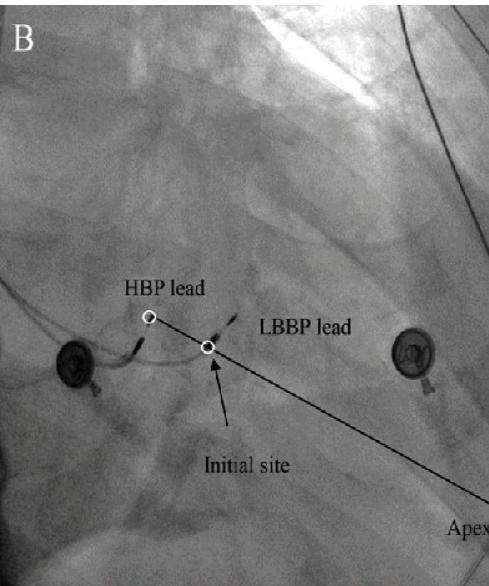
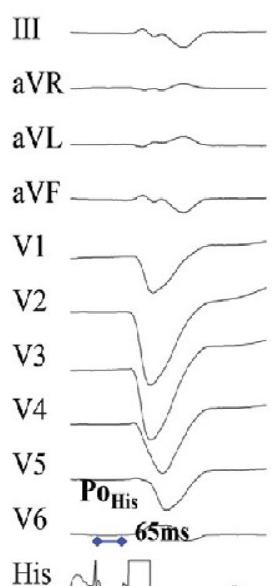
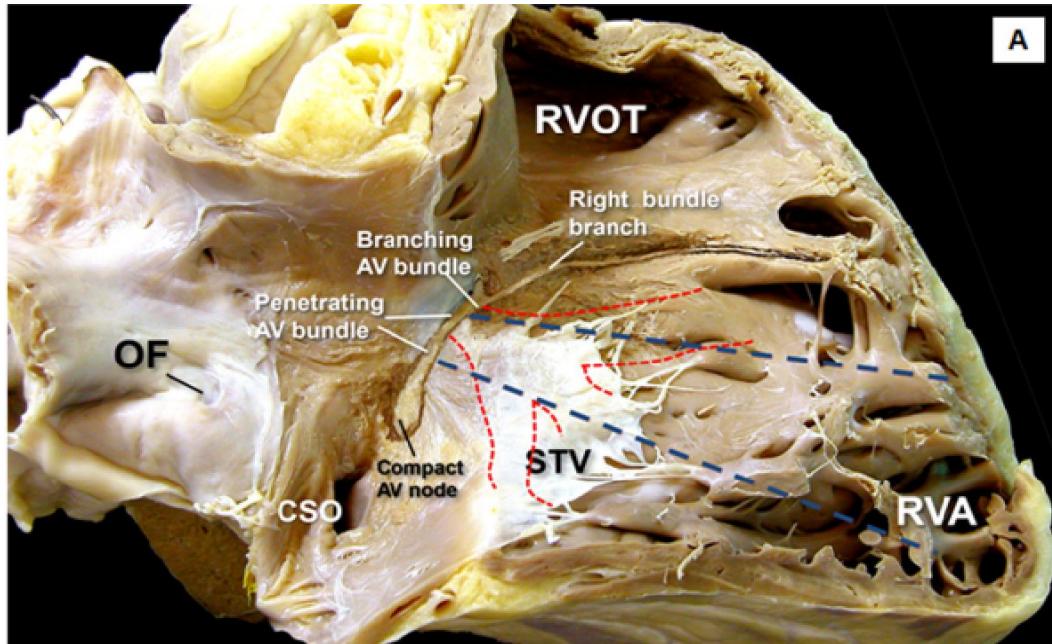


RV septum



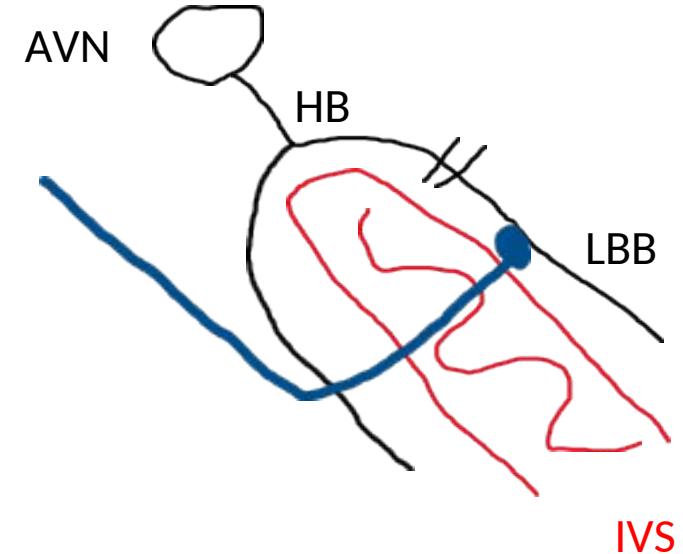
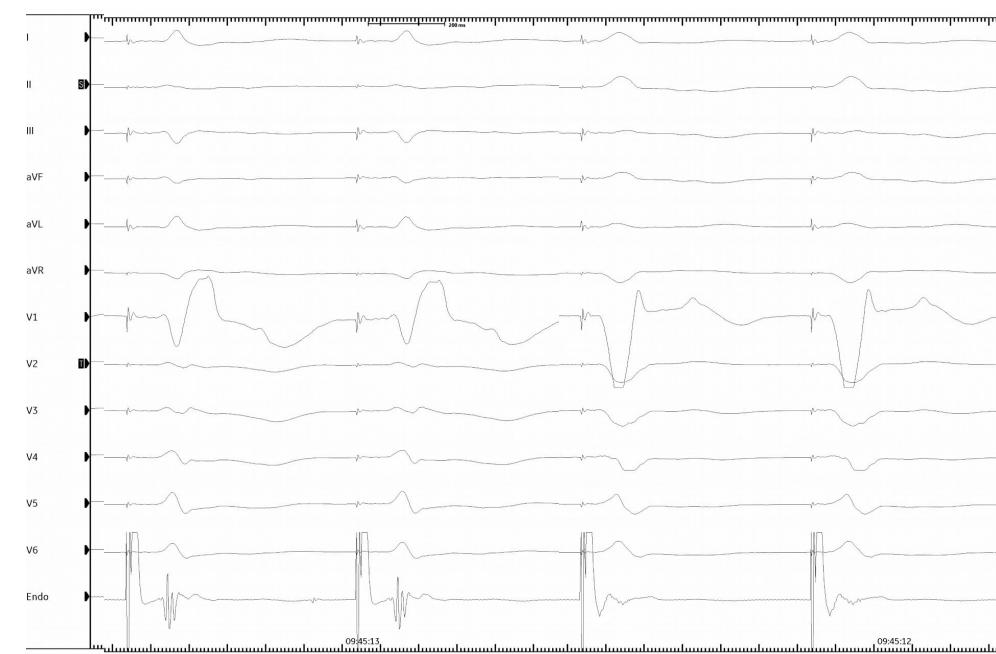
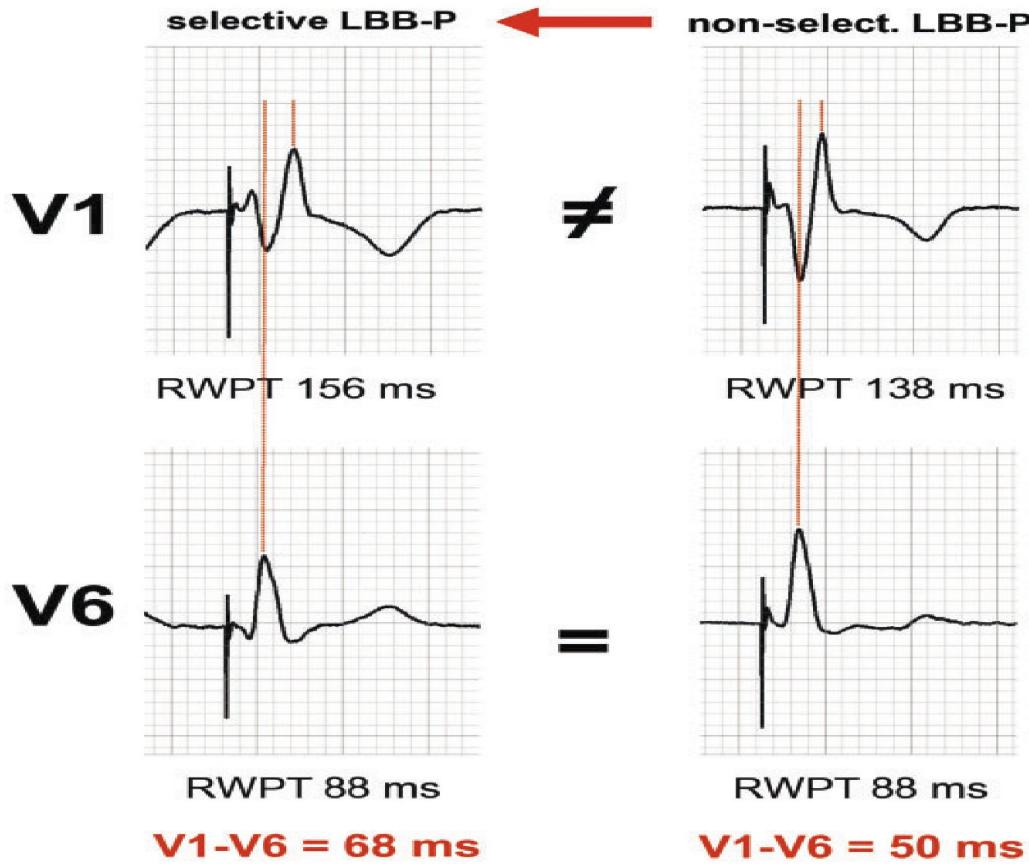
# From HBP to LBBAP

- Easier procedure (less procedure and X-Ray time)
- Less Failure to implant (80-85% vs > 90%)
- Less Threshold rise (10% vs as myocardial)
- Less Ventricular undersensing
- Less Atrial oversensing
- Less Atrial capture
- Less battery depletion



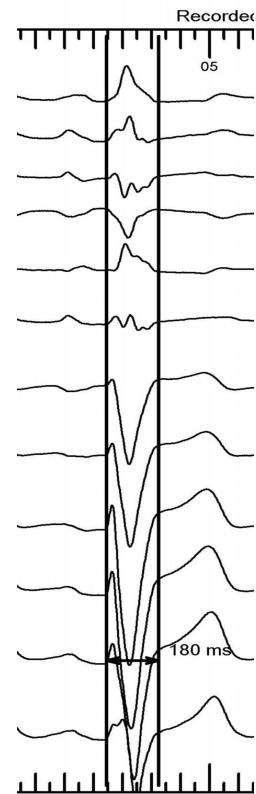
# LBBP

Physiology is the result of the right combination between  
Non-Selectivity and AV delay optimization.

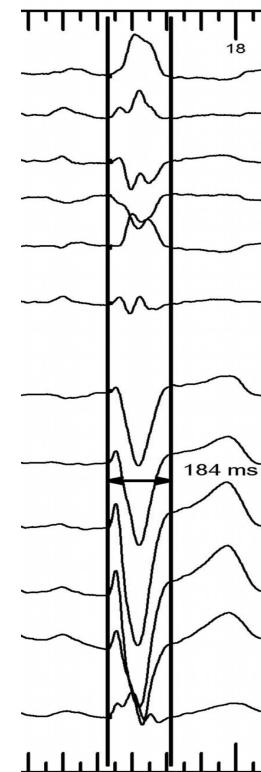


# LBBP

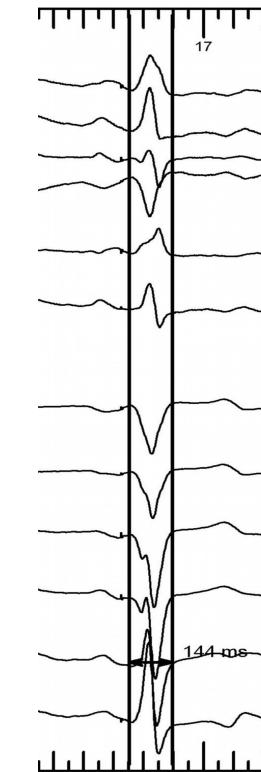
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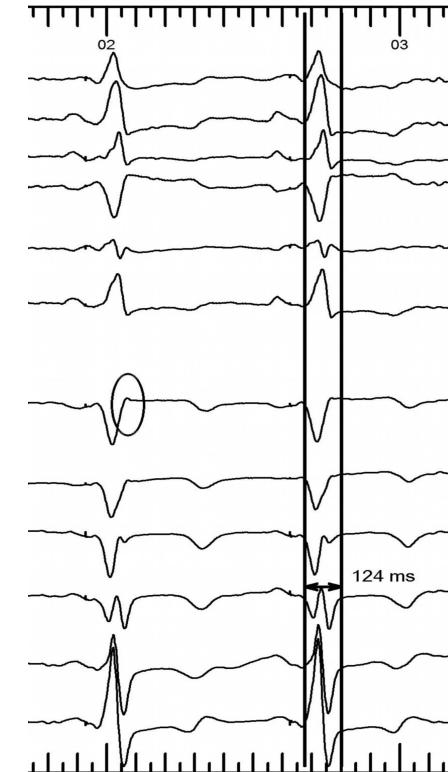
spont



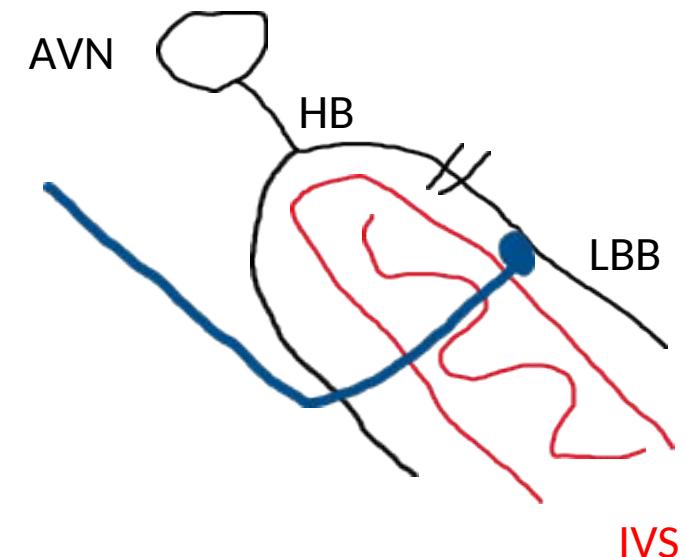
AVD 220 ms



AVD 160 ms



AVD 100 ms



Id:

Marcuccio, Sebastiano

Sconosciuto --- (--) Sconosciuto

Altezza:-- cm Peso:-- kg PA: 0/0 mmHg

20/05/2021 11:52:51

FC: 66 bpm (899ms)

R<sub>v5-6</sub>/S<sub>v1</sub>: 0.89/--- mV

\*REPORT NON CONFERMATO\*

PR: --- ms

Sok-Lyon: 0.89 mV

QRS: 76 ms

Assi: ---/-15/153 °

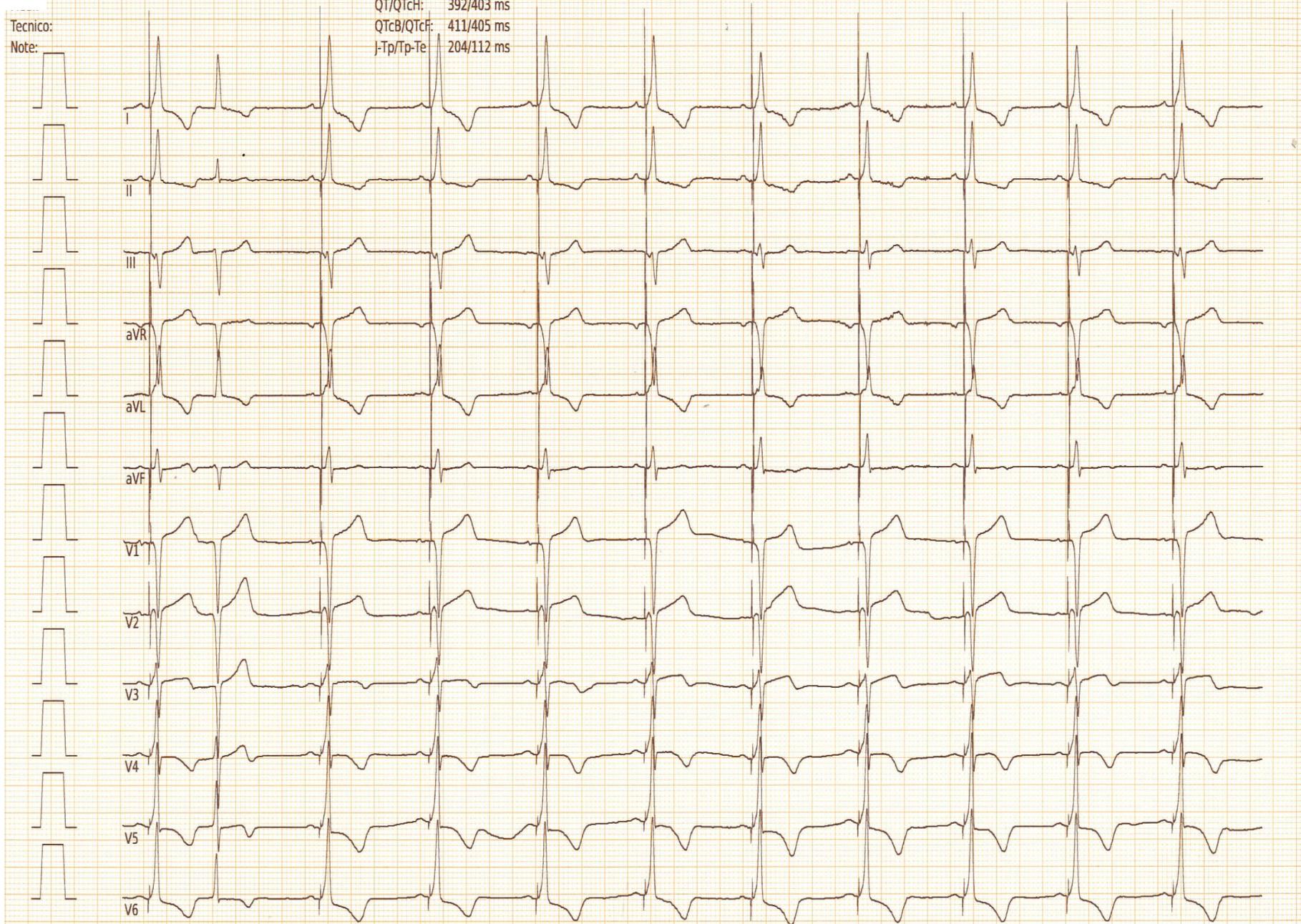
QT/QTcH: 392/403 ms

QTcB/QTcf: 411/405 ms

J-Tp/Tp-Te 204/112 ms

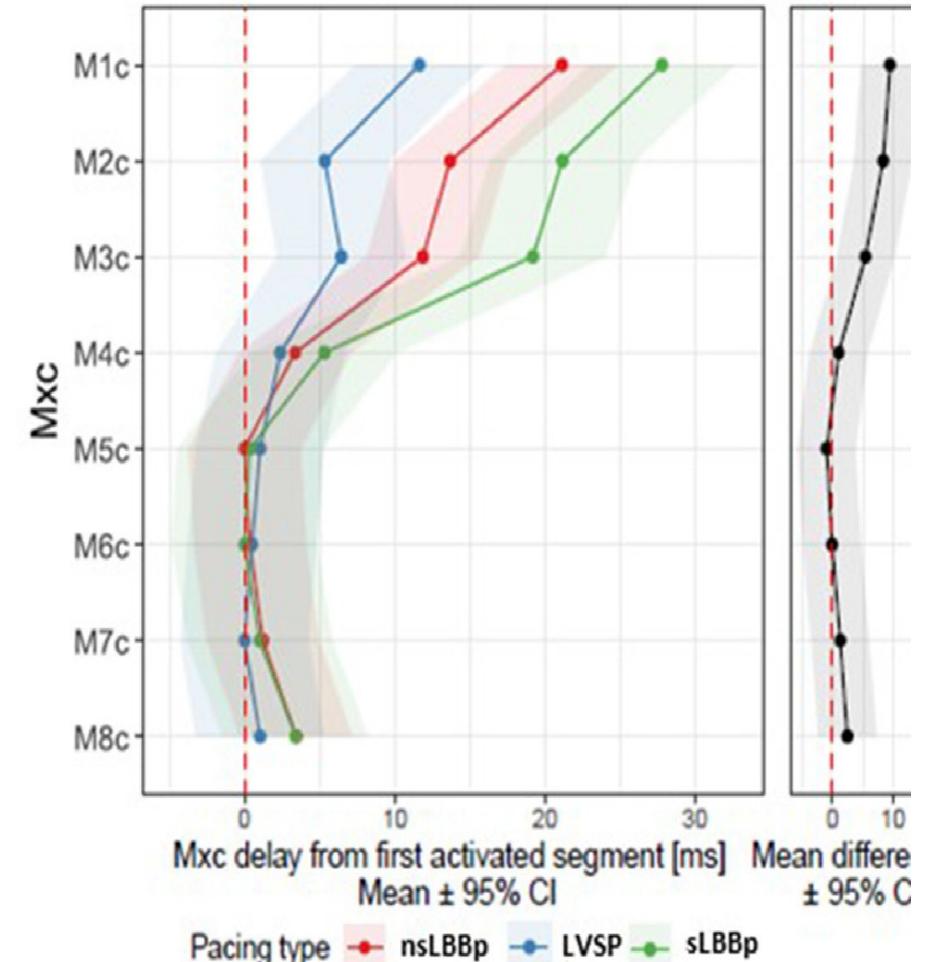
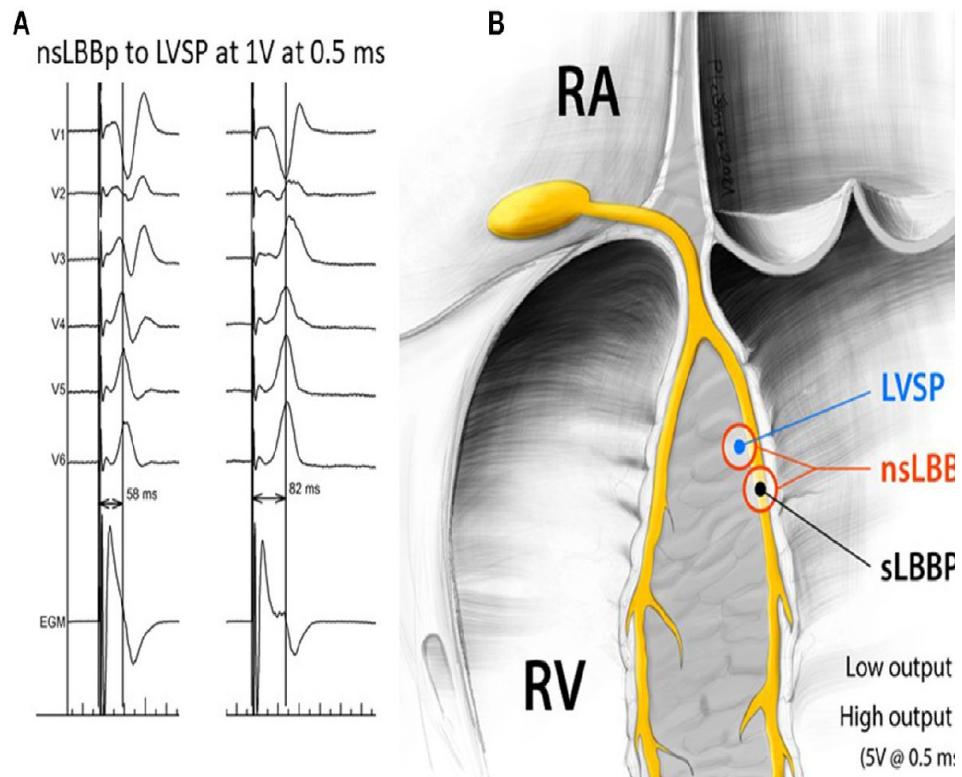
Tecnico:

Note:



# LVSP

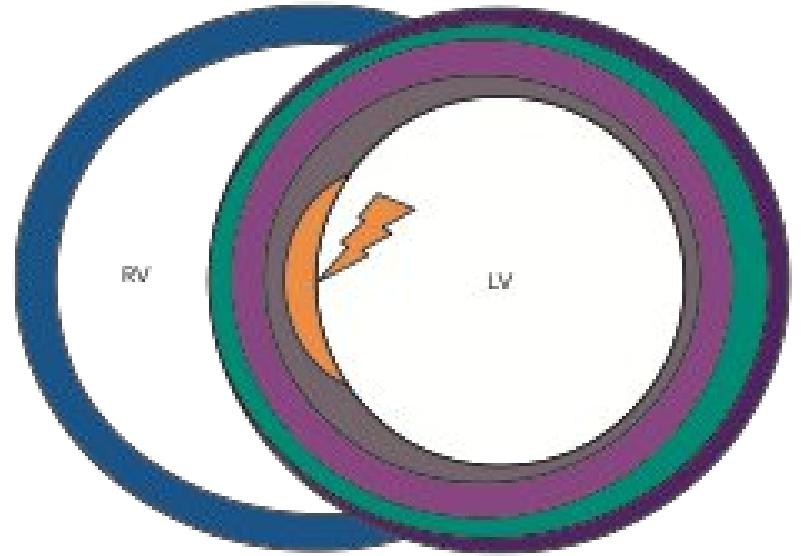
LVSP in close proximity to LBB results in better interventricular synchrony than nsLBBp and sLBBp and did not significantly prolong depolarization of the left ventricular lateral wall.



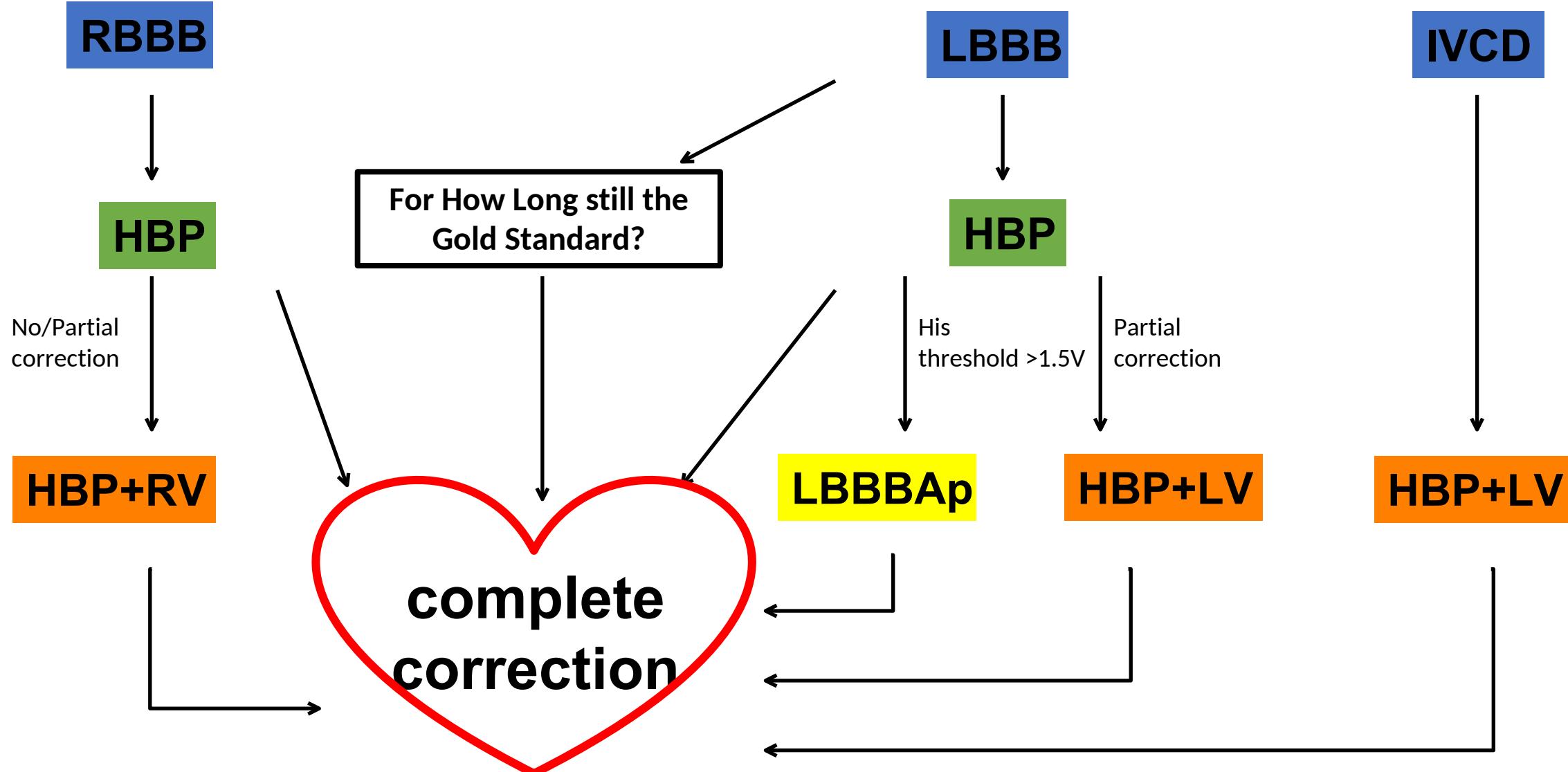
# LVSP

## Benefits of LVSP:

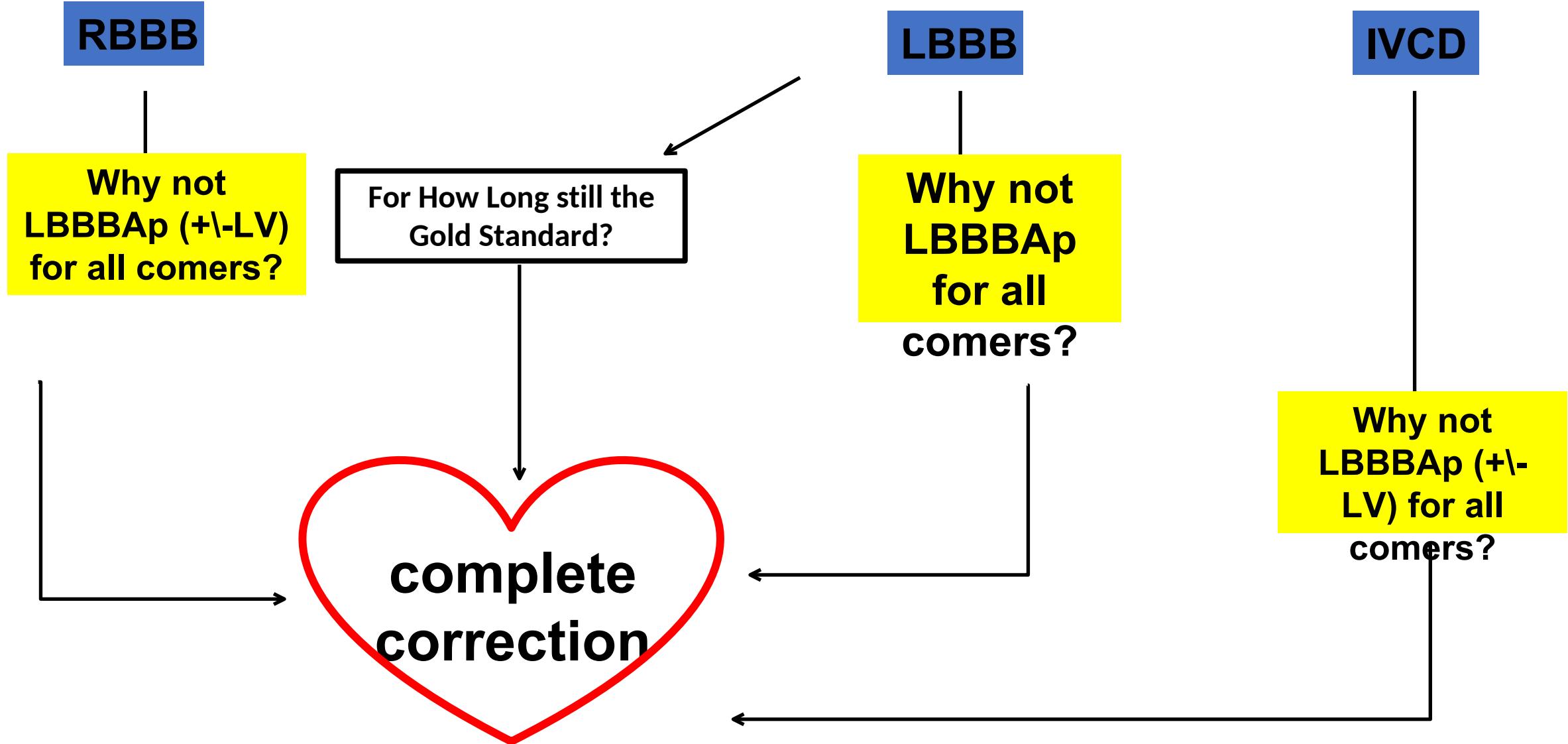
- Compensation of slow trans-septal conduction
- Short path-length of conduction
- Fast Endocardial conduction (fast non-Purkinje fibers)
- Faster Endo-to-Epicardial conduction than viceversa
- Avoiding phrenic nerve stimulation, CS catheterization, PL wall scar



# EVOLUTION OF CRT



# EVOLUTION OF CRT



# 2021 ESC Guidelines on cardiac pacing and cardiac resynchronization therapy

## Recommendations for using His bundle pacing

Recommendations	Class <sup>a</sup>	Level <sup>b</sup>
In patients treated with HBP, device programming tailored to specific requirements of HBP is recommended. <sup>430,431</sup>	I	C
In CRT candidates in whom coronary sinus lead implantation is unsuccessful, HBP should be considered as a treatment option along with other techniques such as surgical epicardial lead. <sup>318,424,440,443</sup>	IIa	B
In patients treated with HBP, implantation of an RV lead used as ‘backup’ for pacing should be considered in specific situations (e.g. pacemaker dependency, high-grade AVB, infranodal block, high pacing threshold, planned AVJ ablation) or for sensing in the case of issues with detection (e.g. risk of ventricular undersensing or oversensing of atrial/His potentials). <sup>423,426,444</sup>	IIa	C
HBP with a ventricular backup lead may be considered in patients in whom a ‘pace-and-ablate’ strategy for rapidly conducted supraventricular arrhythmia is indicated, particularly when the intrinsic QRS is narrow. <sup>197,199,200,318</sup>	IIb	C

Only HBP is contemplated in current European GL as alternative to traditional (RV and BIV) pacing

BUT

- None of RCTs states BIVp – rather CRT!!!
- Believing that BIVp, Epicardial, Non-Physiological pacing is better than «pacing» chosen by nature is impertinence not EBM!!!
- Evolution is the largest RCT!!!

Recommendations for using left bundle branch area pacing cannot therefore be formulated at this stage. However, conduction system pacing (which includes HBP and left bundle branch area pacing) is very likely to play a growing role in the future, and the current recommendations will probably need to be revised once more solid evidence of safety and efficacy (from randomized trials) is published. A comparison of RV pacing, HBP, and left bundle branch area pacing is provided in *Supplementary Table 12*.