



ELECTRA



4-5 DÉCEMBRE 2025

VILLA M. - MARSEILLE | FRANCE

19^{èmes} journées françaises
pratiques de rythmologie
& de stimulation cardiaque

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Stimulation de branche gauche Consensus EHRA 2025

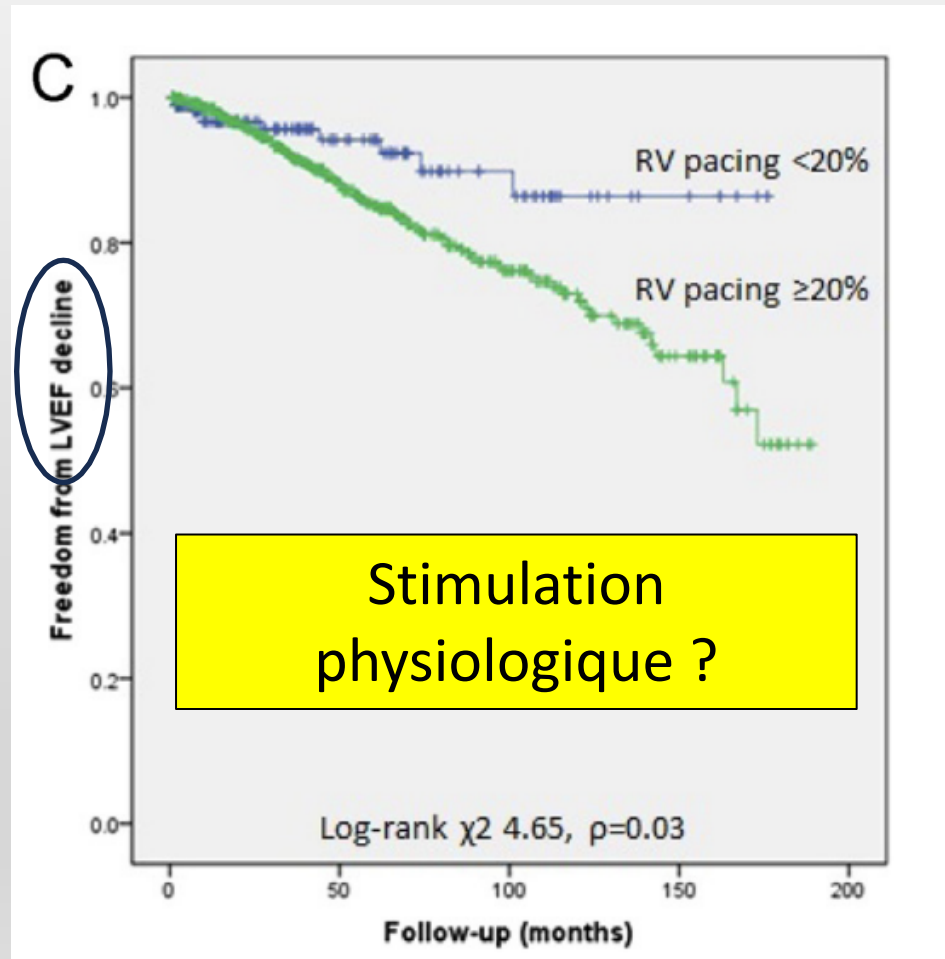
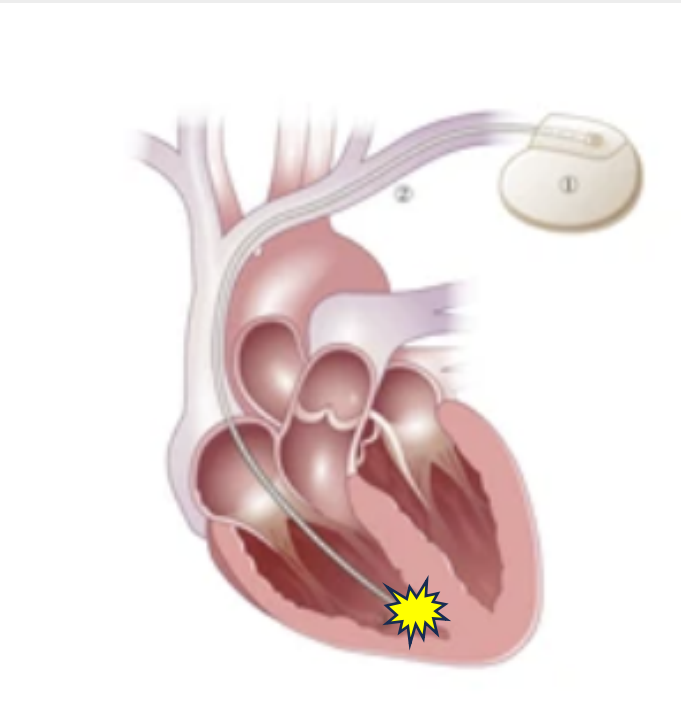
Jérôme Taieb



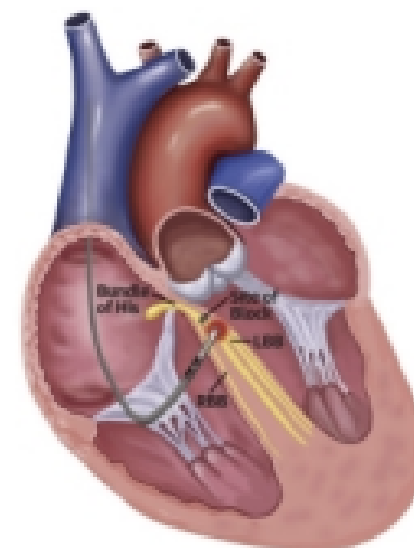
Liens d'intérêt

- Aucun

Cardiomyopathie induite par la stimulation VD à 15 ans



First case of LBBP



Canadian Journal of Cardiology 33 (2017) 1736.e1–1736.e3 www.onlinecjc.ca

Case Report

A Novel Pacing Strategy With Low and Stable Output: Pacing the Left Bundle Branch Immediately Beyond the Conduction Block

Wei Jian Huang, MD, FHRS,^a Lan Su, MD,^a Shengjie Wu, MD,^a Lei Xu, MD,^a Fangyi Xiao, MD,^a
Xiaohong Zhou, MD,^b and Kenneth A. Ellenbogen, MD, FHRS^c

^a Department of Cardiology, First Affiliated Hospital of Wenzhou Medical University, Key Lab of Cardiovascular Disease of Wenzhou, Wenzhou, China

^b CRHF Division, Medtronic PLC, Mounds View, Minnesota, USA

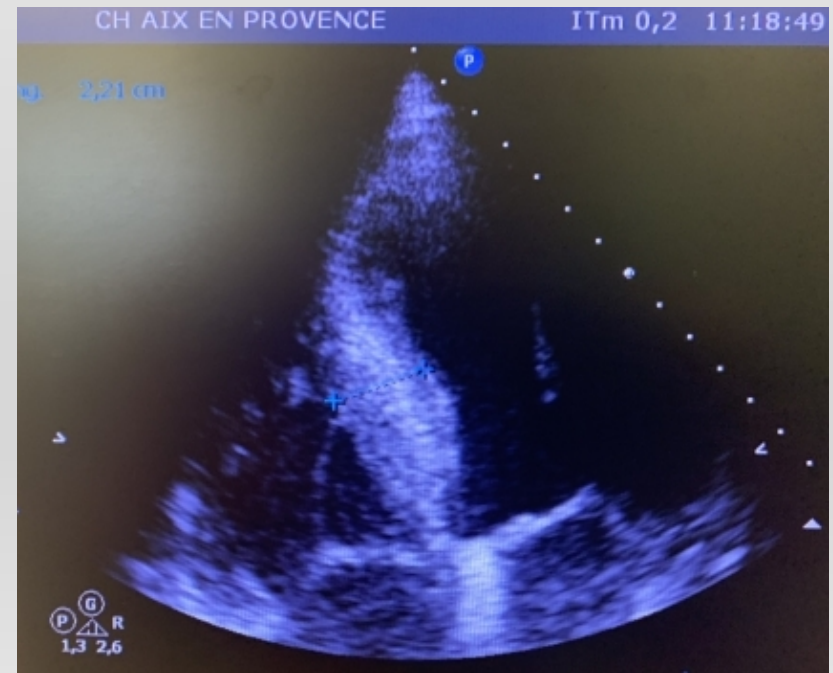
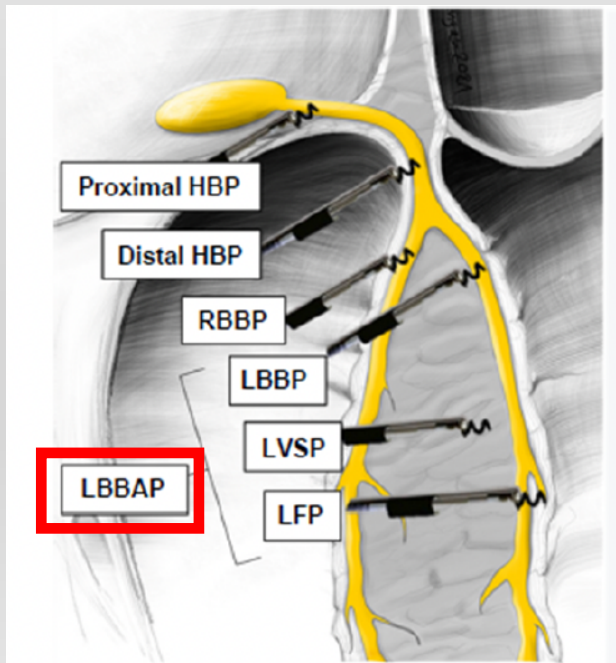
^c Department of Cardiology, Virginia Commonwealth University Health System, Richmond, Virginia, USA

Stimulation Physique: Nosologie

- **Stimulation des Voies de conduction : Conduction System Pacing (CSP)**

- His

- Branche gauche = **Left Bundle Branch Pacing**



MELOS — MULTICENTER EUROPEAN LEFT BUNDLE BRANCH AREA PACING OUTCOMES STUDY



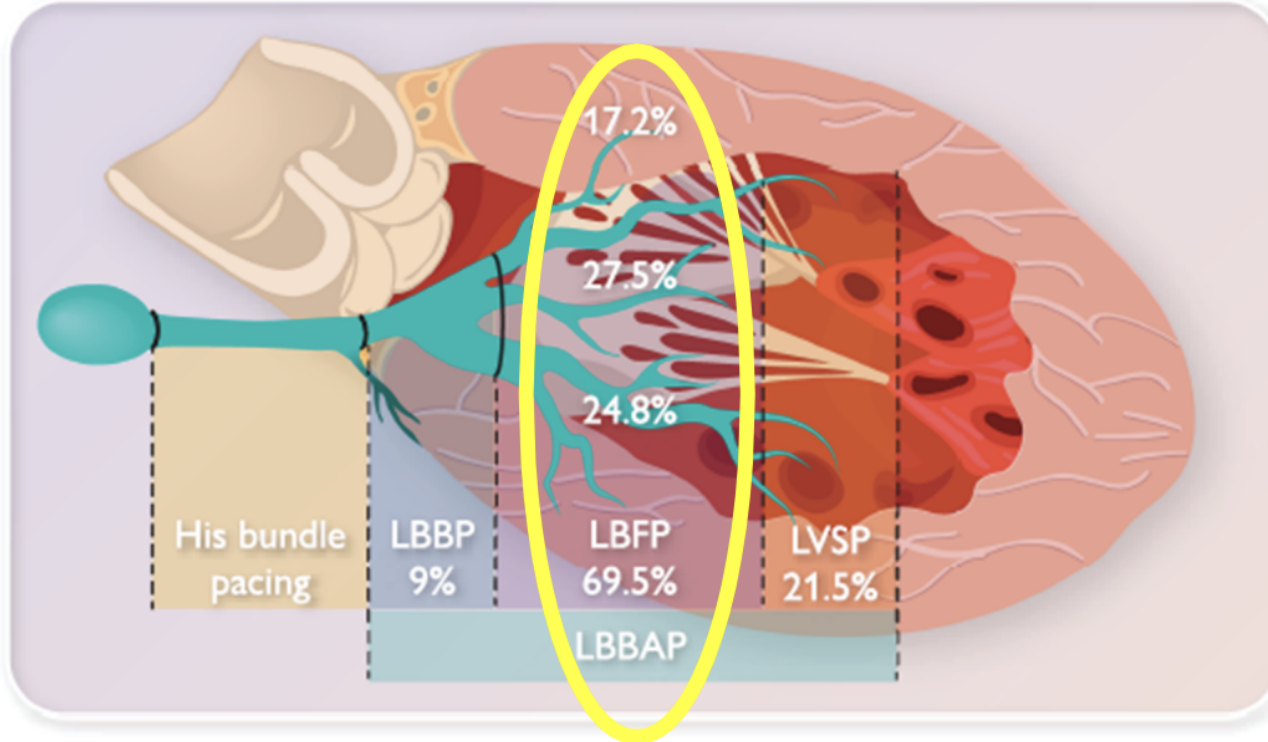
Prospective, multicenter,
registry-based observational study



2533
Participants



14
European centres



Independent predictors of LBBAP lead implantation failure

Heart failure indication	OR 1.49, 95% CI 1.01–2.21
Baseline QRS duration, per 10 ms	OR 1.08, 95% CI 1.03–1.14
LVEDD, per 10 mm increase	OR 1.53, 95% CI 1.26–1.86

LBBAP implantation success

Bradycardia indication success

92.4%

Heart failure indication success

82.2%

LBBAP lead complications

8.3%

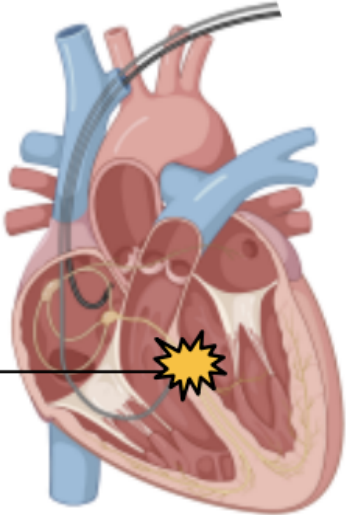
- Acute perforation to LV 3.7%
- Lead dislodgement 1.5%
- Acute chest pain 1.0%
- Capture threshold rise 0.7%
- Acute coronary syndrome 0.4%
- Trapped/damaged helix 0.4%
- Delayed perforation to LV 0.1%
- Other 0.7%

Consensus EHRA 04/2025

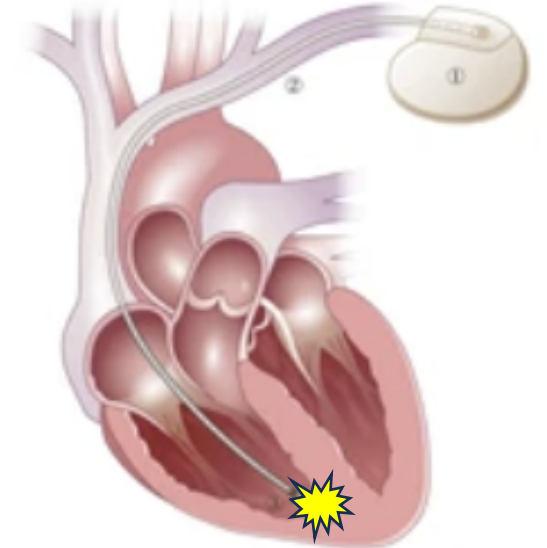
European Society of Cardiology (ESC) clinical consensus statement on indications for conduction system pacing, with special contribution of the European Heart Rhythm Association of the ESC and endorsed by the Asia Pacific Heart Rhythm Society, the Canadian Heart Rhythm Society, the Heart Rhythm Society, and the Latin American Heart Rhythm Society 

Conduction system

Conduction system lead

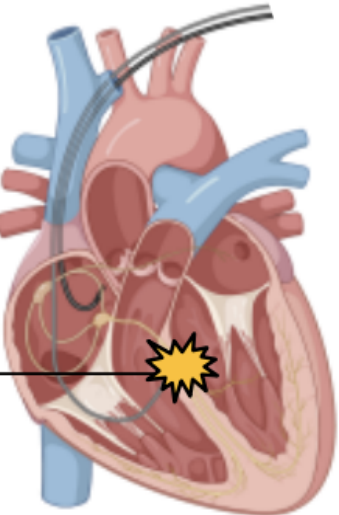


CSP vs stim VD



Conduction system

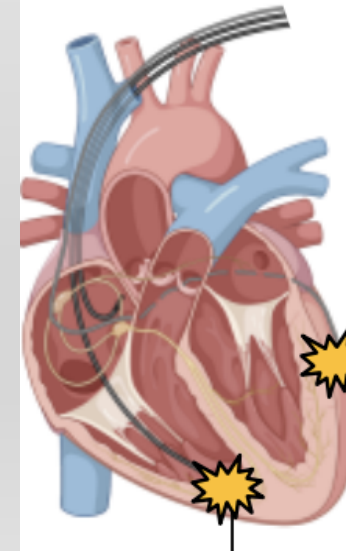
Conduction system lead



CSP vs CRT

Biventricular

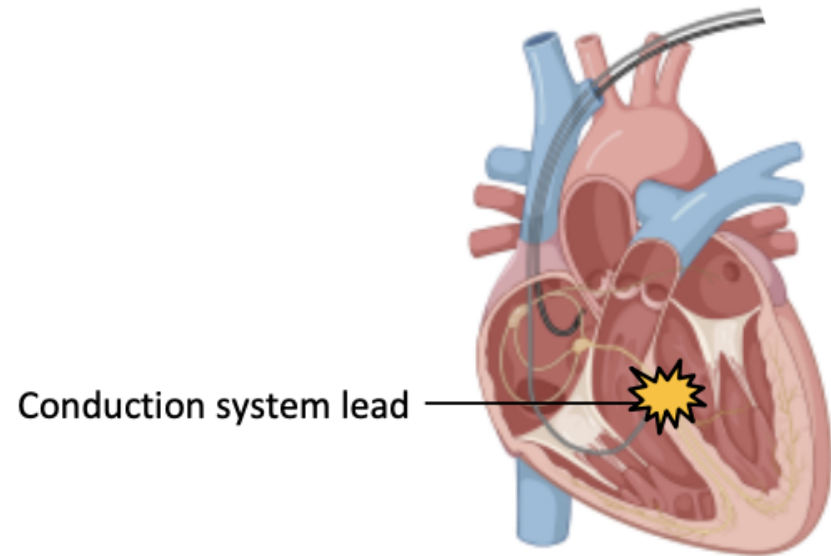
Left ventricular lead



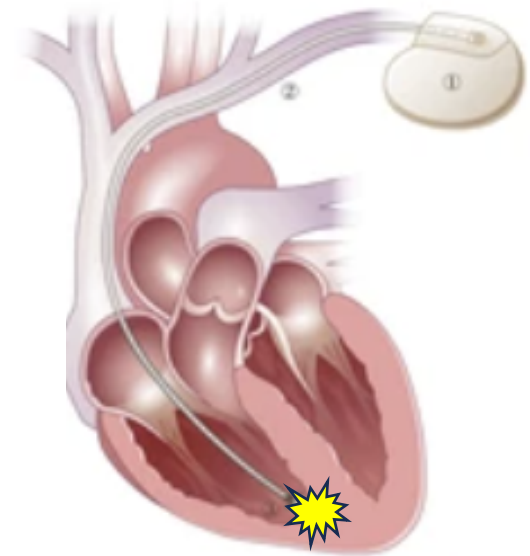
Right ventricular lead

CSP vs stim VD

Conduction system



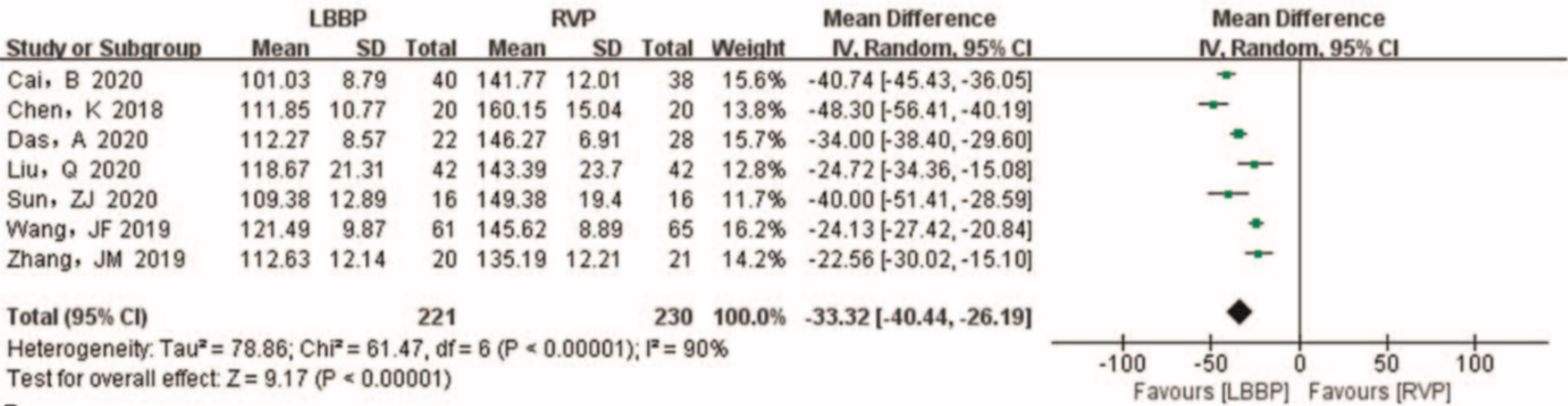
Stim VD



Safety and efficacy of left bundle branch pacing in comparison with conventional right ventricular pacing

A systematic review and meta-analysis

Xing Liu, MS , Wenbin Li, MS, Lei Wang, MD, Shaohua Tian, MS, Xiaolin Zhou, MS, Mingxing Wu, MS*



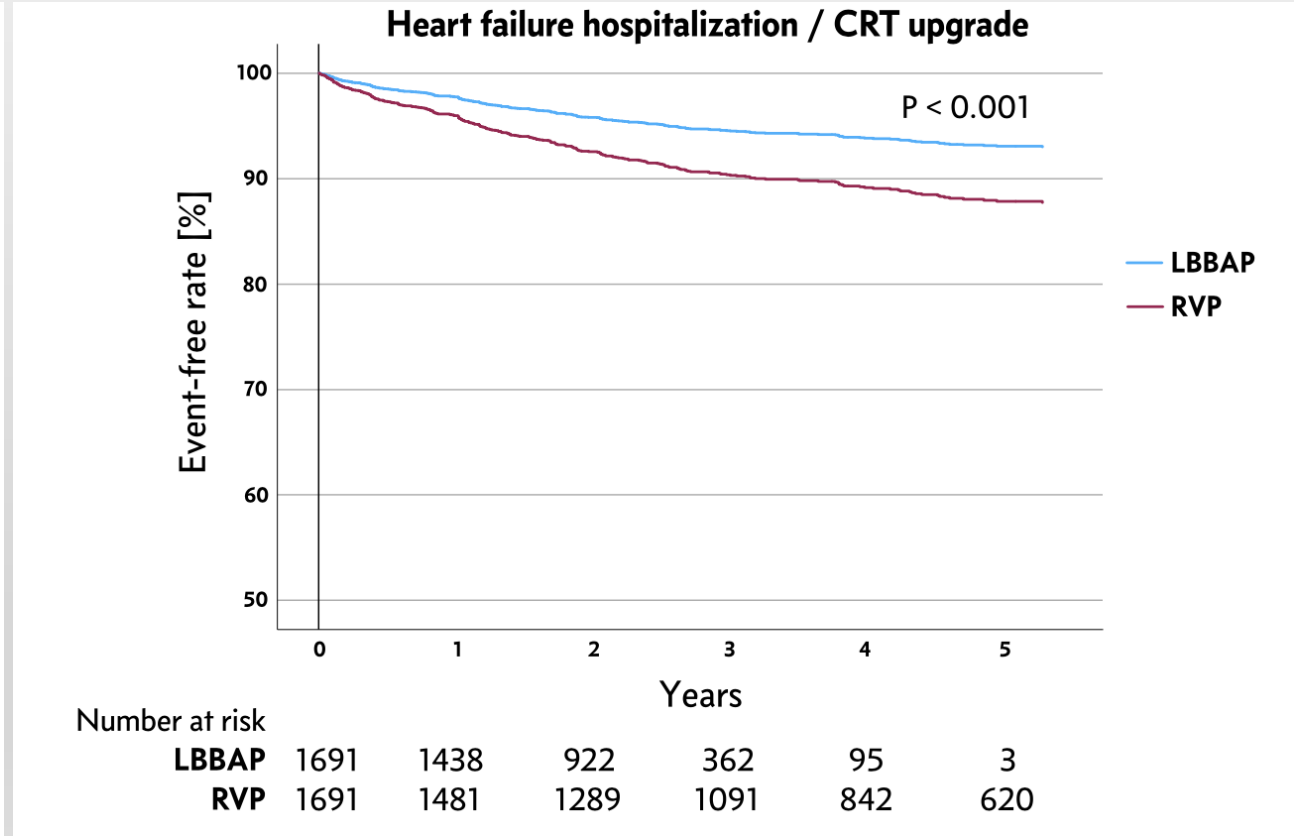
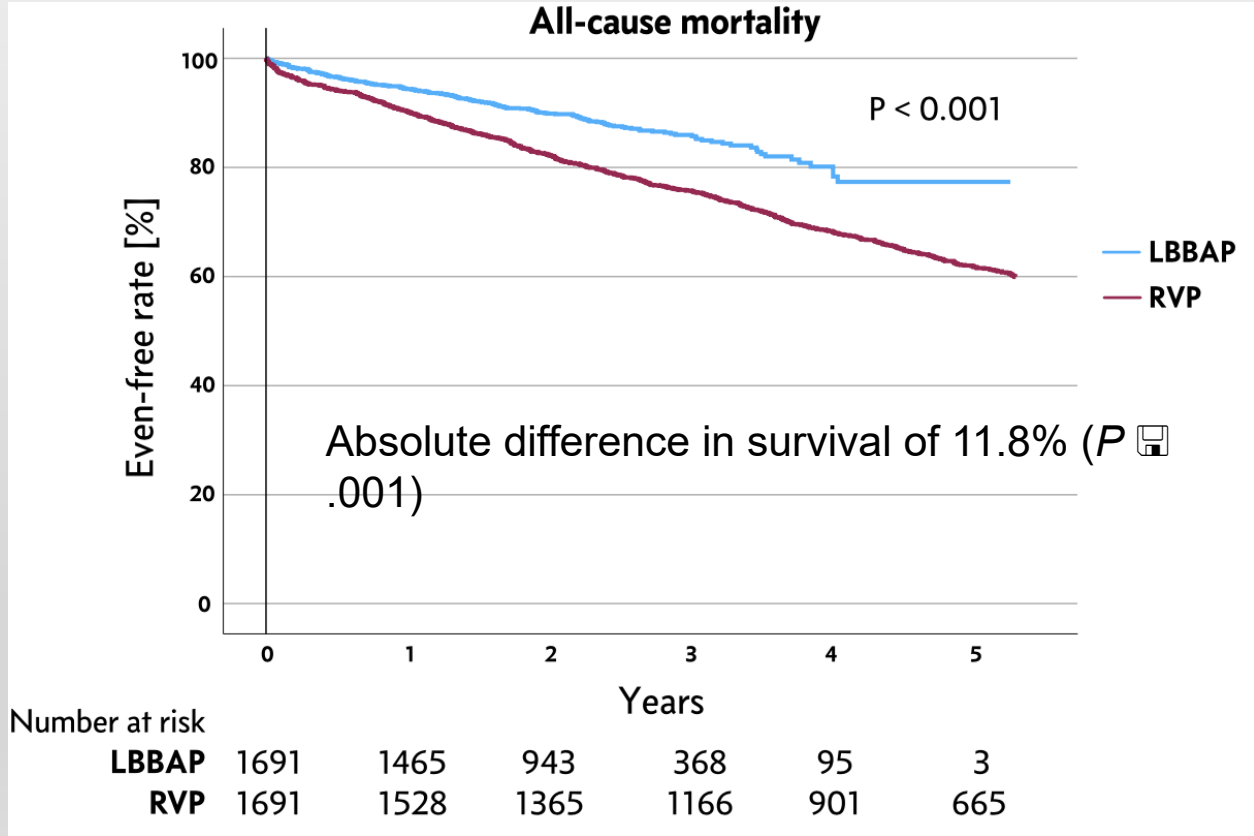
Non randomisées
Faible effectif
Critères electriques, remodelage.
Suivi court

MELOS RELOADED study

FE > 40% VP > 20%

NON RANDOMISE

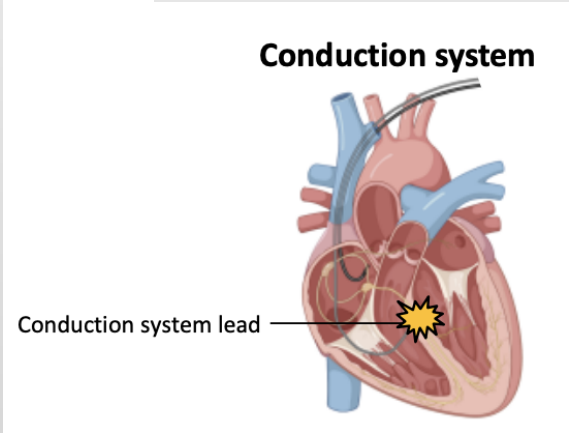
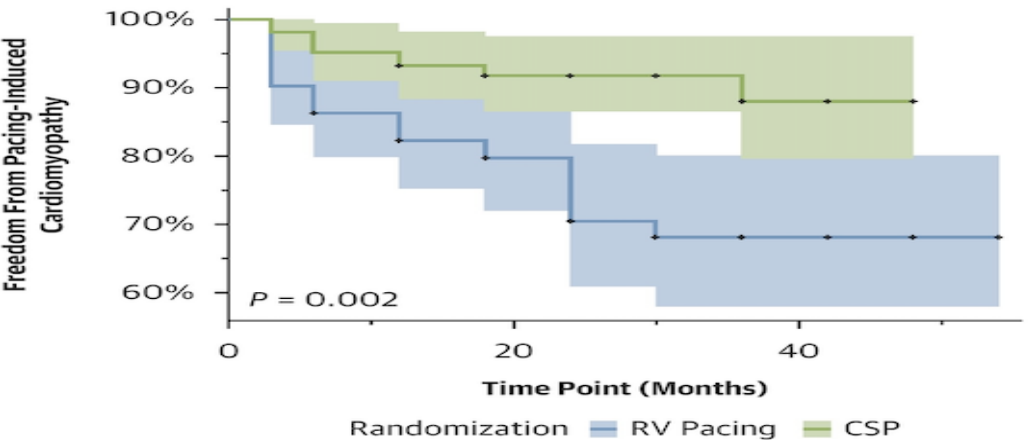
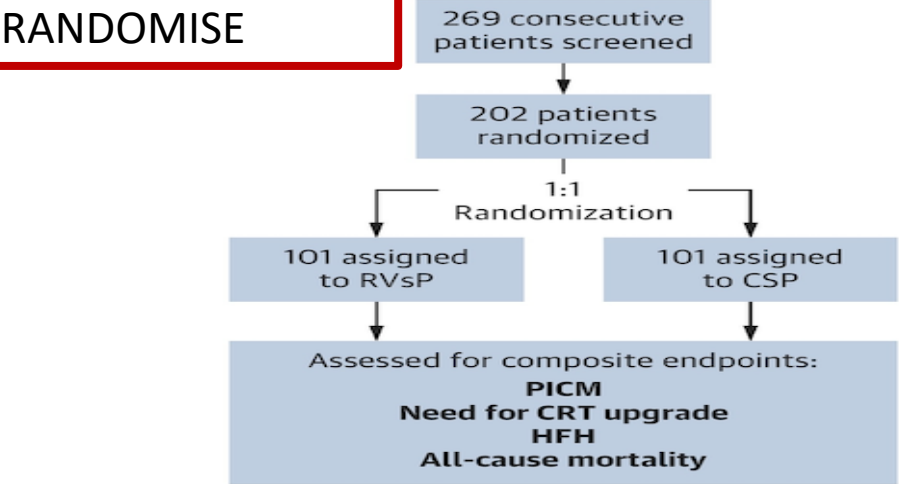
European Registry Propensity score matching
3382 patients receiving LBBAP or RVP
matched. 4-year follow-up



Cardiomyopathie induite à 2 ans: RCT CSPACE trial

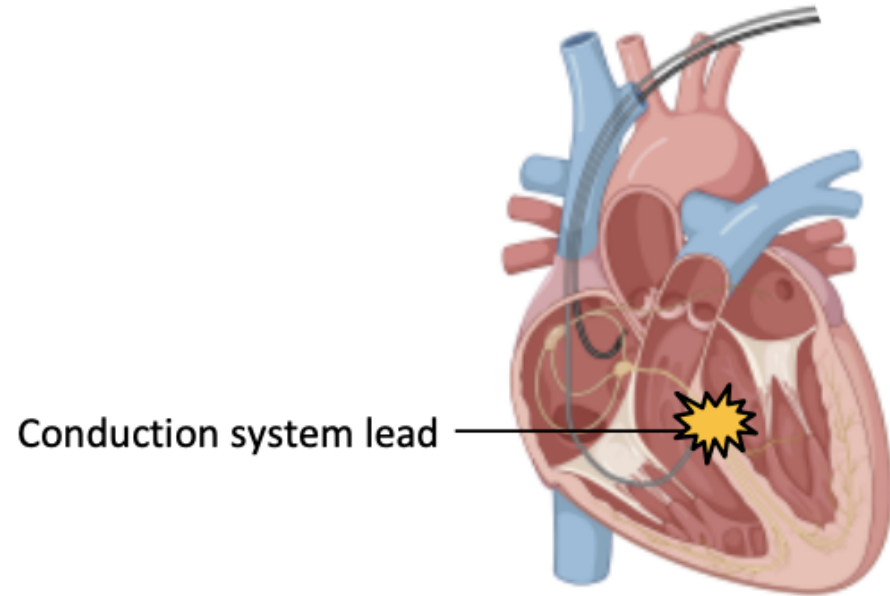
BAV sans indication de resynchronisation

RANDOMISE

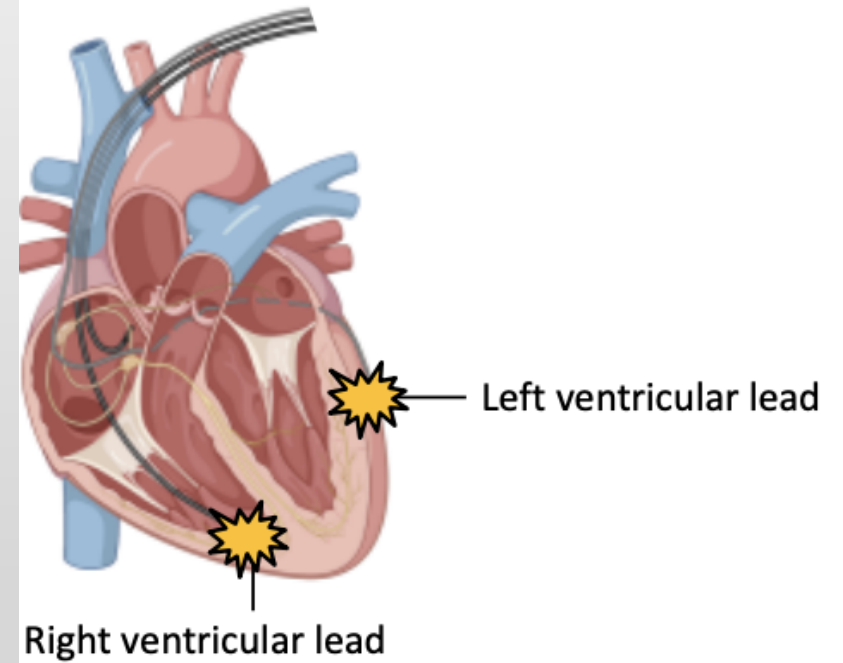


CSP vs CRT

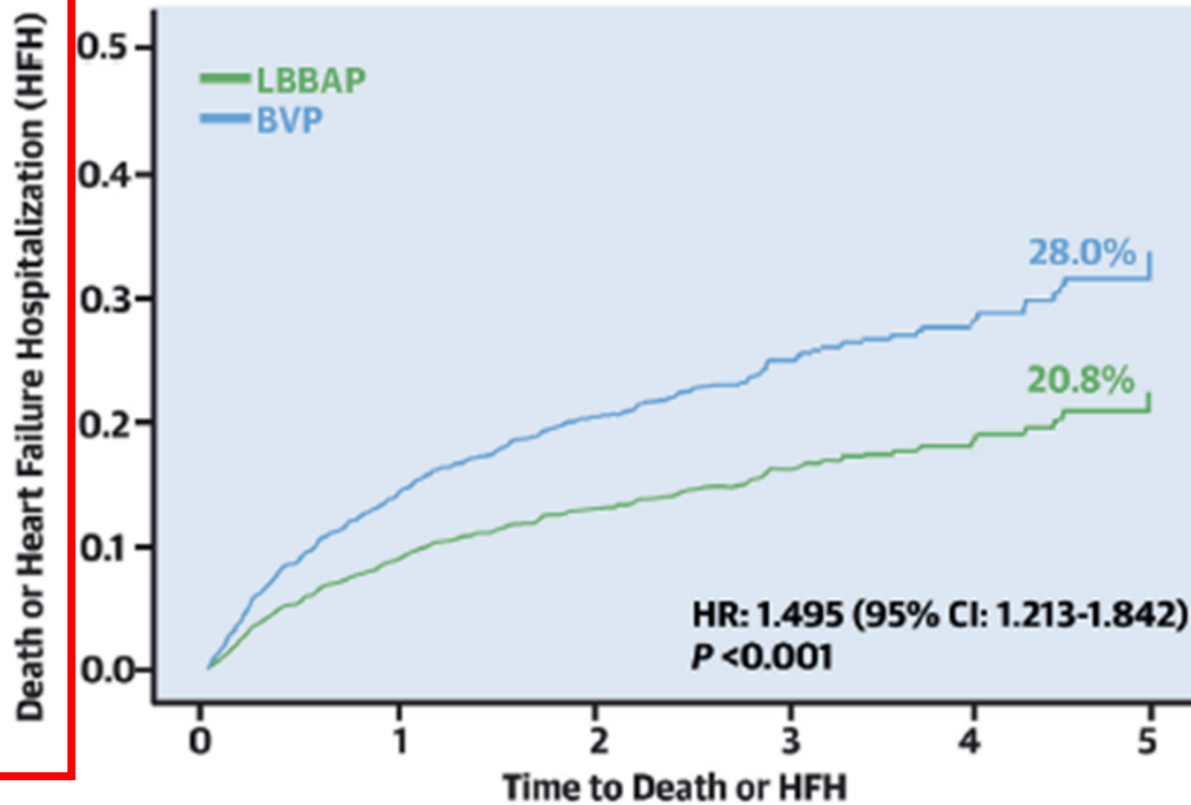
Conduction system



Biventricular



Time to Death or Heart Failure Hospitalization All Patients (n = 1,778)



BVP	981	728	546	352	166	18
LBBAP	797	574	342	152	18	0

TABLE 2 Procedural Characteristics

	All Patients (N = 1,778)		P Value
	BVP (n = 981)	LBBAP (n = 797)	
Procedural duration, min	124 ± 48	142 ± 55	<0.001
Fluoroscopy duration, min	16 ± 12	17 ± 15	0.63
Type of device			
Pacemaker	149 (15.0)	267 (33.0)	<0.001
ICD	832 (85.0)	530 (67.0)	<0.001
Dual chamber	-	237 (30.0)	<0.001
CRT	981 (100.0)	537 (67.0)	<0.001
Pacing threshold (LV-CS/LBBAP)			
Implant, V	1.15 ± 0.7	0.72 ± 0.4	<0.001
Follow-up, V	1.31 ± 0.7	0.74 ± 0.3	<0.001
Threshold increase ≥1 V	72 (7.3)	13 (1.6)	<0.001
Baseline QRS duration, ms	160 ± 25	161 ± 28	0.63
Paced QRS duration, ms	144 ± 23	128 ± 19	<0.001
Ventricular pacing	96.0	95.2	0.17
Lead revision	48 (4.9)	29 (3.6)	0.20
Procedural complications	74 (7.5)	30 (3.8)	<0.001
Pericardial effusion	10 (1.0)	4 (0.5)	
Pneumothorax	5 (0.5)	3 (0.4)	
Acute lead dislodgement	34 (3.5)	13 (1.6)	
Infection	21 (2.1)	6 (0.8)	
Other	4 (0.4)	4 (0.5)	

CRT vs CSP

NON RANDOMISE

415 Patients Requiring CRT
LBBB + LVEF <40%

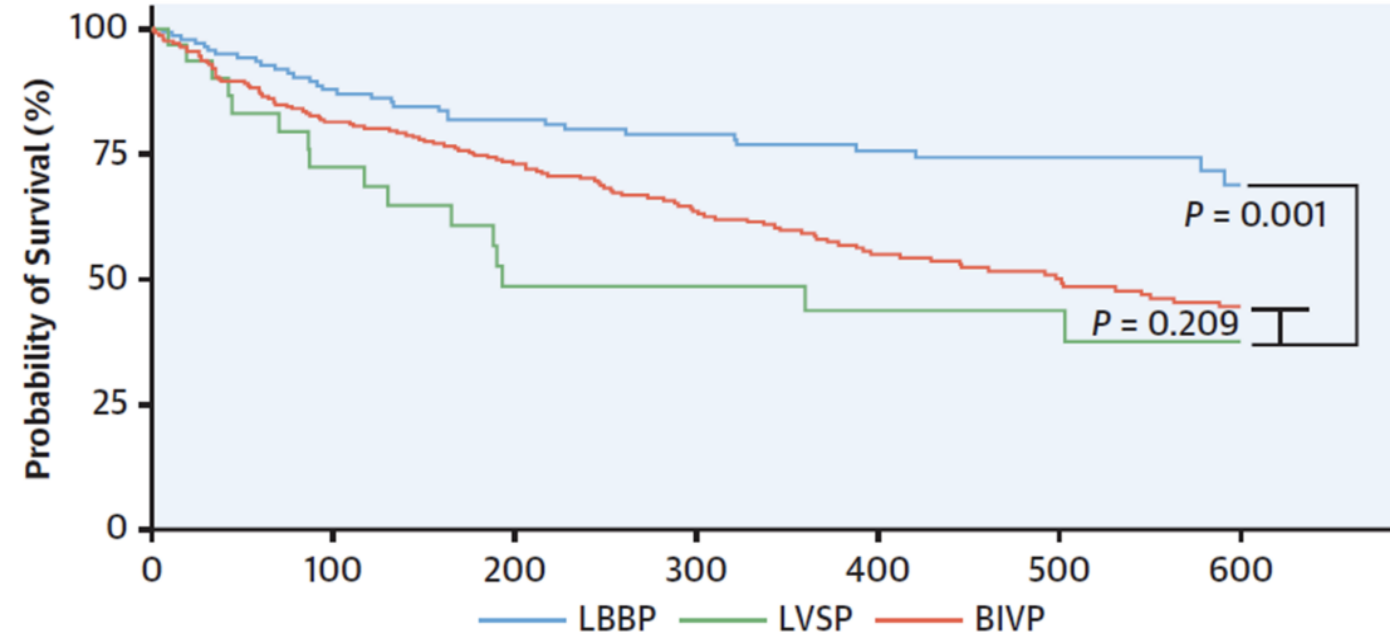
LBBAP (n = 172)

LBBP (n = 141)

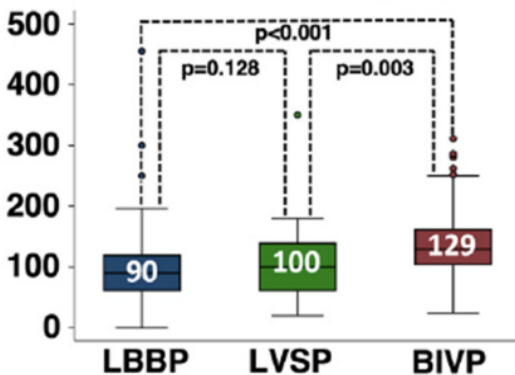
LVSP (n = 31)

BIVP (n = 243)

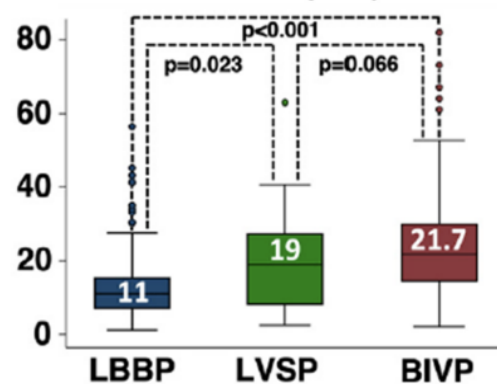
Composite Outcome: HF-Related Hospitalizations and All-Cause Mortality



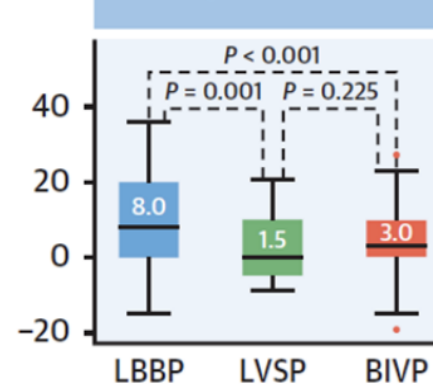
Procedural Time (min)



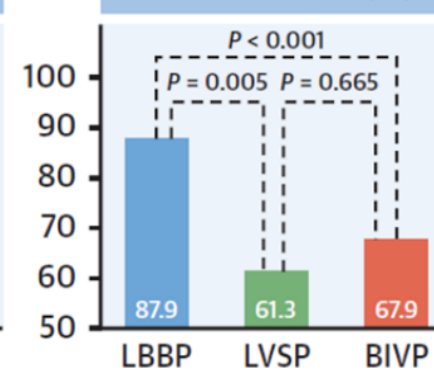
Fluoro Time (min)



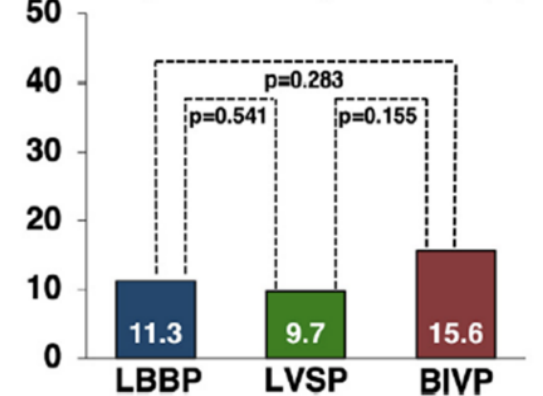
Change in LVEF (%)



Improvement >1 NYHA Functional Class (%)

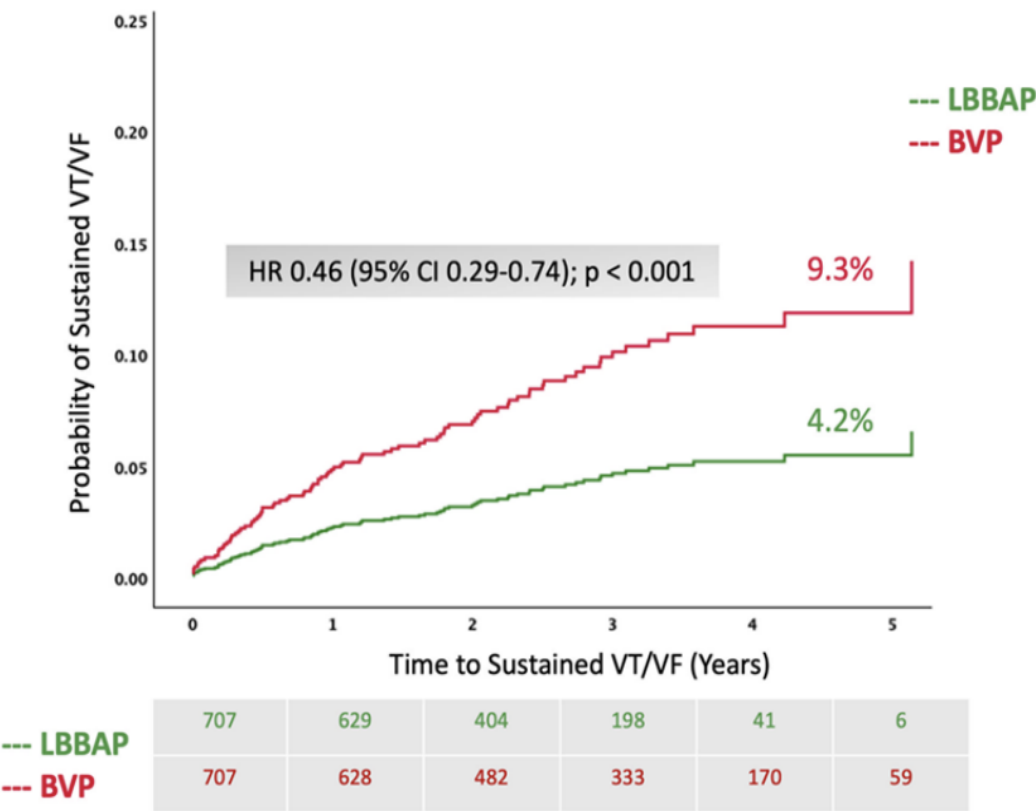


Long-term Complications (%)

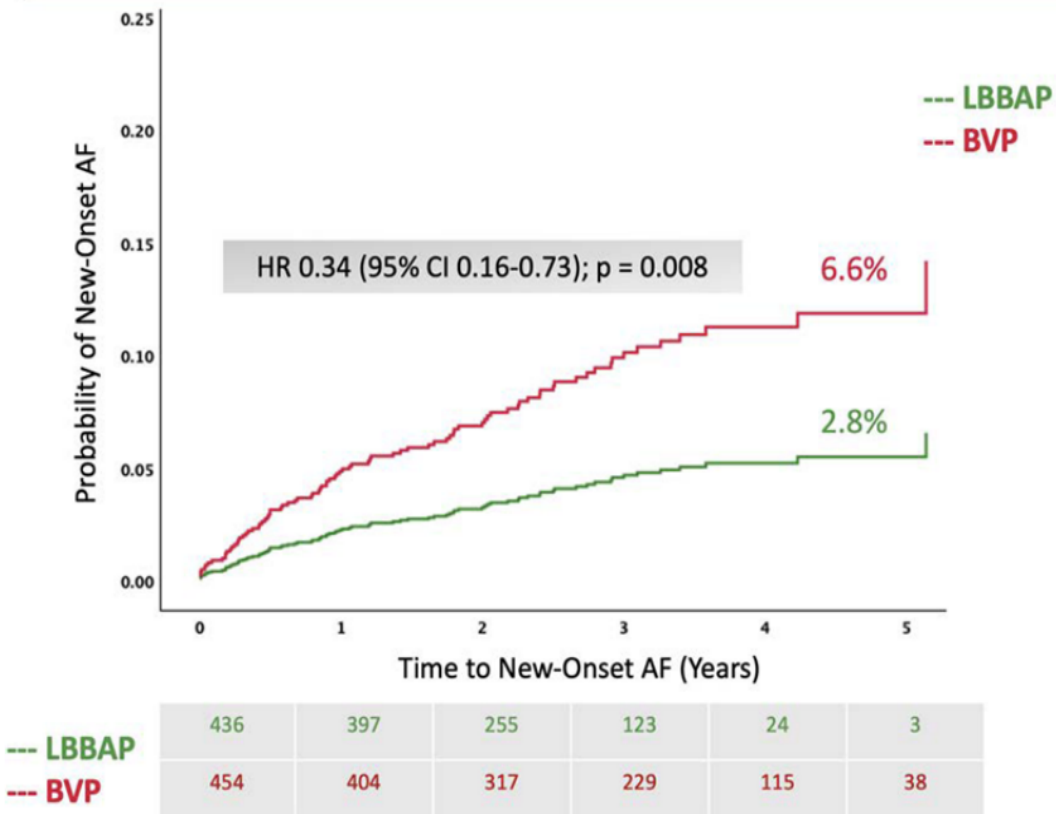


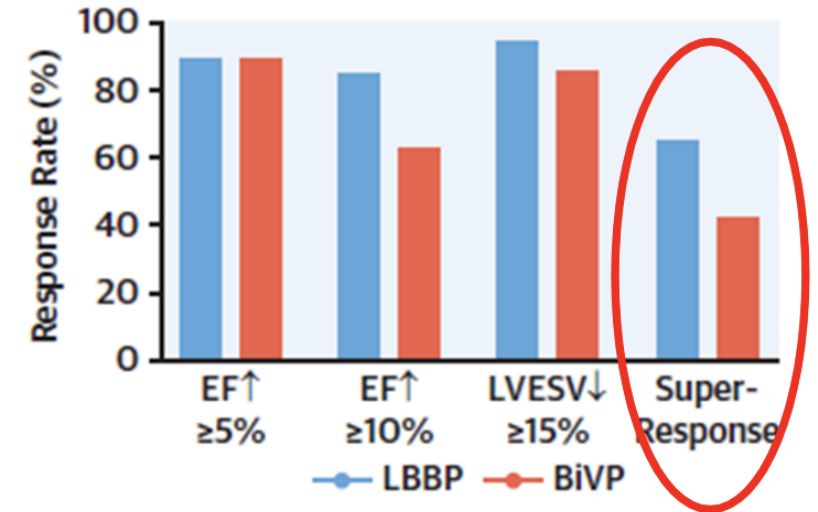
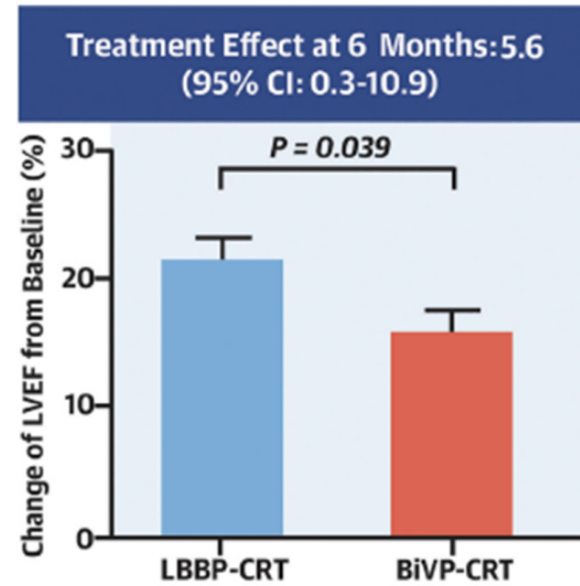
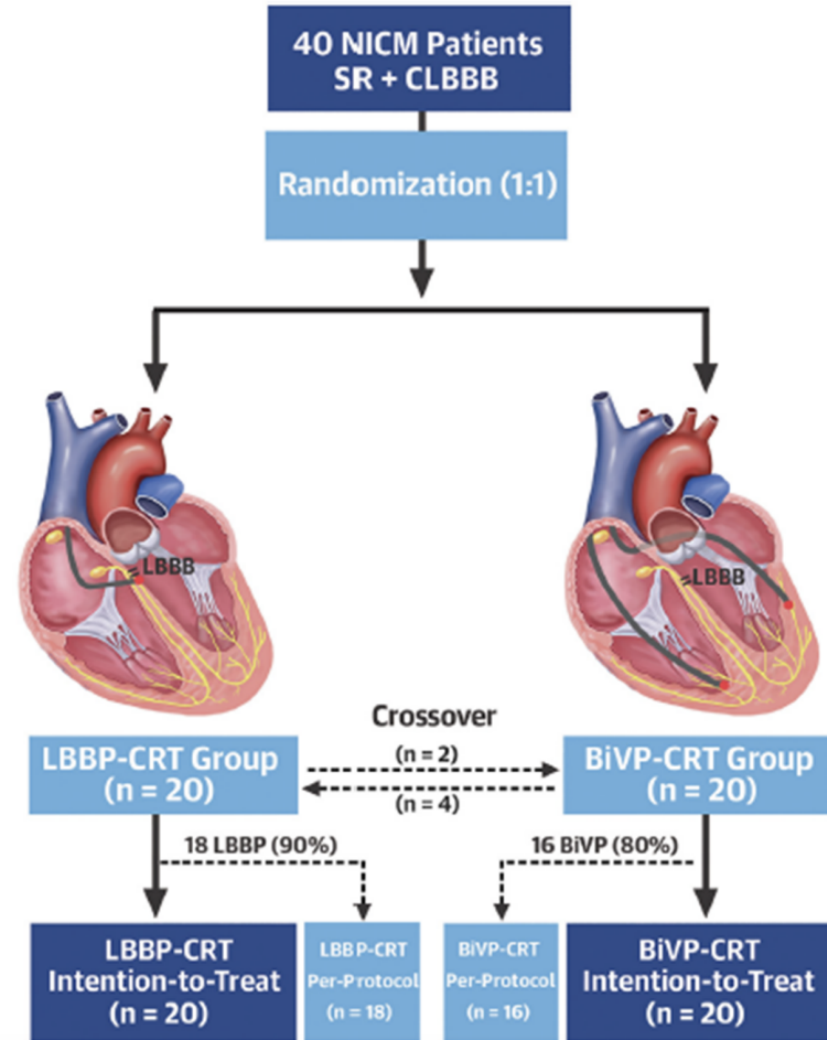
NON RANDOMISE

Time to sustained ventricular tachycardia / ventricular fibrillation among all patients (N=1414)



Time to new new-onset atrial fibrillation in patients without prior history of atrial fibrillation (N=890)





Consensus

European Society of Cardiology (ESC) clinical consensus statement on indications for conduction system pacing, with special contribution of the European Heart Rhythm Association of the ESC and endorsed by the Asia Pacific Heart Rhythm Society, the Canadian Heart Rhythm Society, the Heart Rhythm Society, and the Latin American Heart Rhythm Society 

Stimulation branche gauche

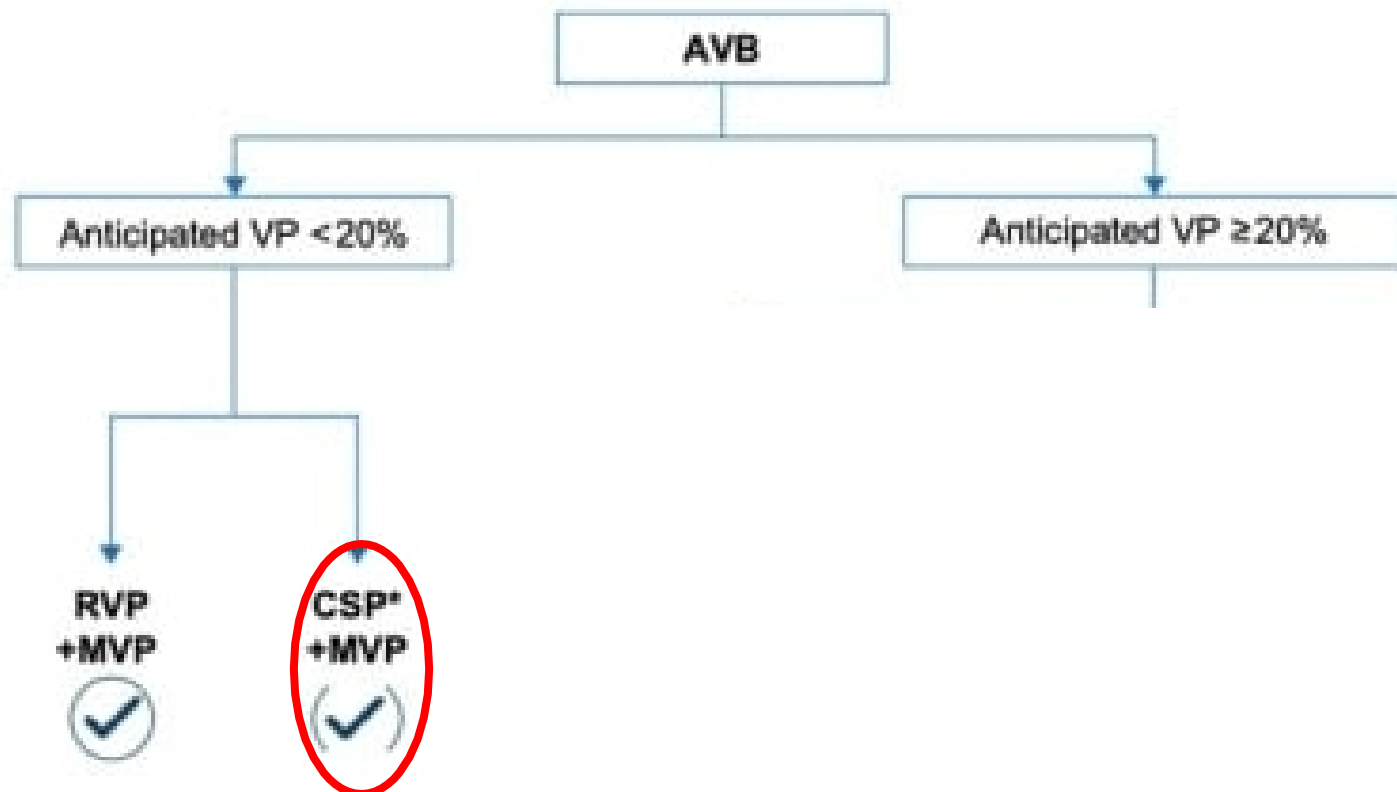
STIMULATION VD

- BAV stimulation V >20%
 - FE <40%
 - FE > 40%
- BAV ablation NAV (st V 100%)

RESYNCHRONISATION

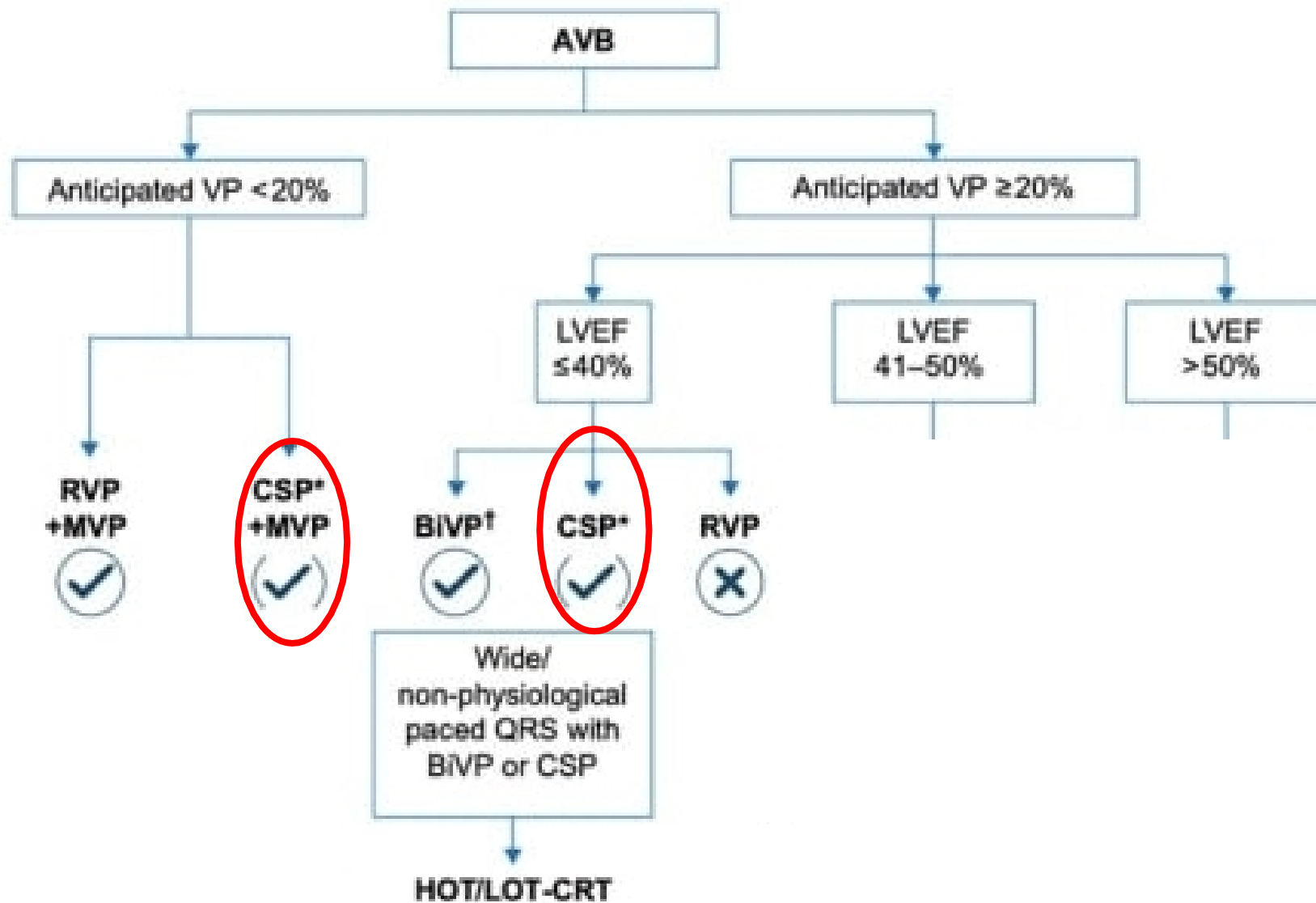
- Vs CRT
- LOT

Figure 1 EHRA 2025



✓ Advice TO DO; (✓) May be appropriate TO DO; (✗) Advice NOT TO DO

Figure 1 EHRA 2025

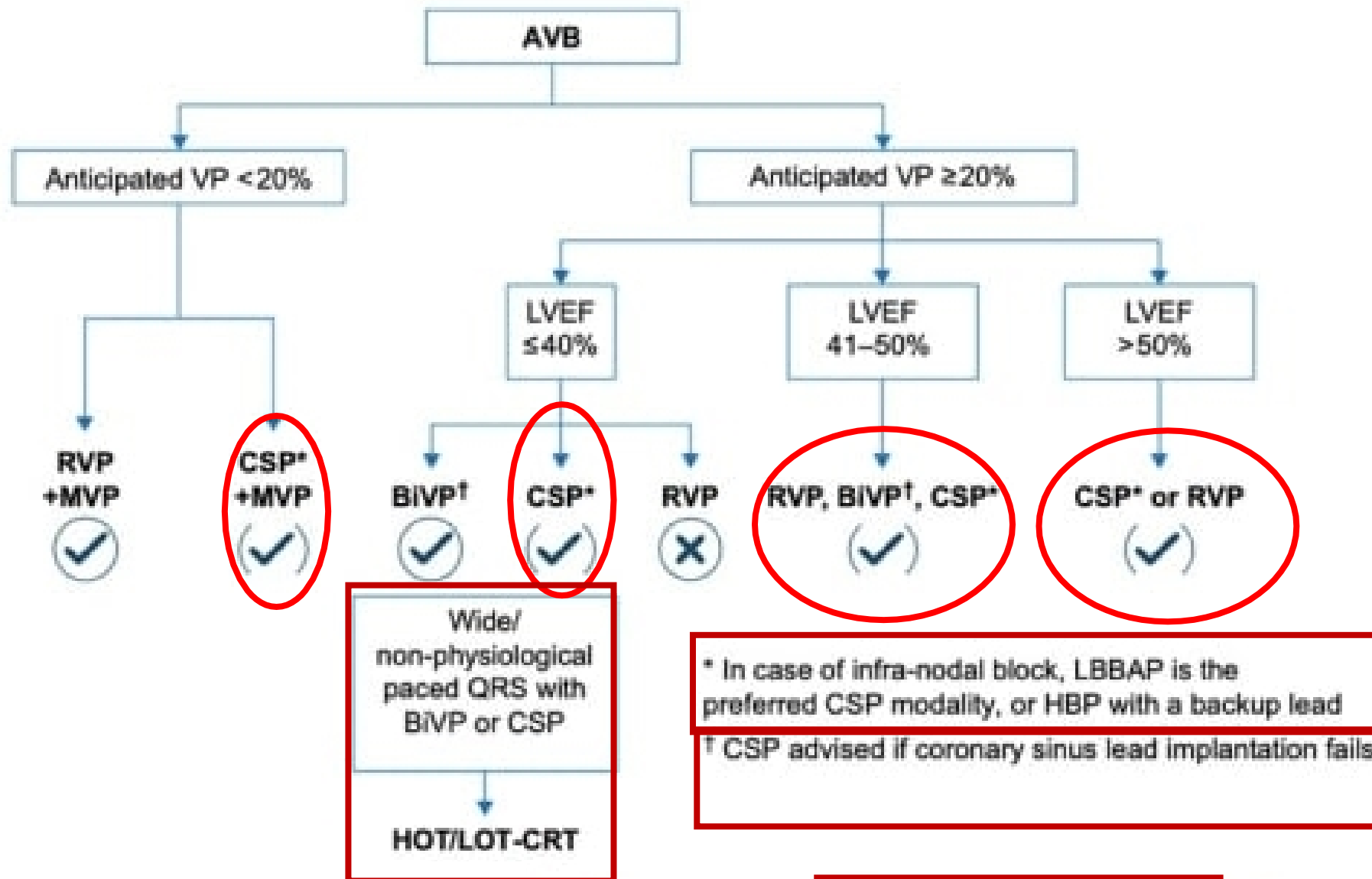


✓ Advice TO DO

(✓) May be appropriate TO DO

✗ Advice NOT TO DO

Figure 1 EHRA 2025



Ablation NAV et FEVG intermediaire: **CSP** vs BiV

Change in LVEF - CSP vs.
BVP

LBBAP

Palmisano, Ziacchi <i>et al.</i> 2023	42	5.8	16.4	263	5.92	2.3		-0.12 (-2.20, 1.96)	20.33
Ivanovski <i>et al.</i> 2022	10	8.7	11.1	13	0	13		8.70 (-1.38, 18.78)	6.42
Vijayaraman <i>et al.</i> 2022	46	3.2	19.9	56	7.1	18.7		-3.90 (-11.41, 3.61)	9.42
Heterogeneity: $\tau^2 = 0.00$, $I^2 = 0.00\%$, $H^2 = 1.00$								-0.04 (-2.01, 1.93)	
Test of $\theta_i = \theta_j$: $Q(2) = 3.91$ $P = 0.14$									
Test of $\theta = 0$: $Z = -0.04$, $P = 0.97$									

Favours BVP

Favours CSP

Figure 2 EHRA 2025

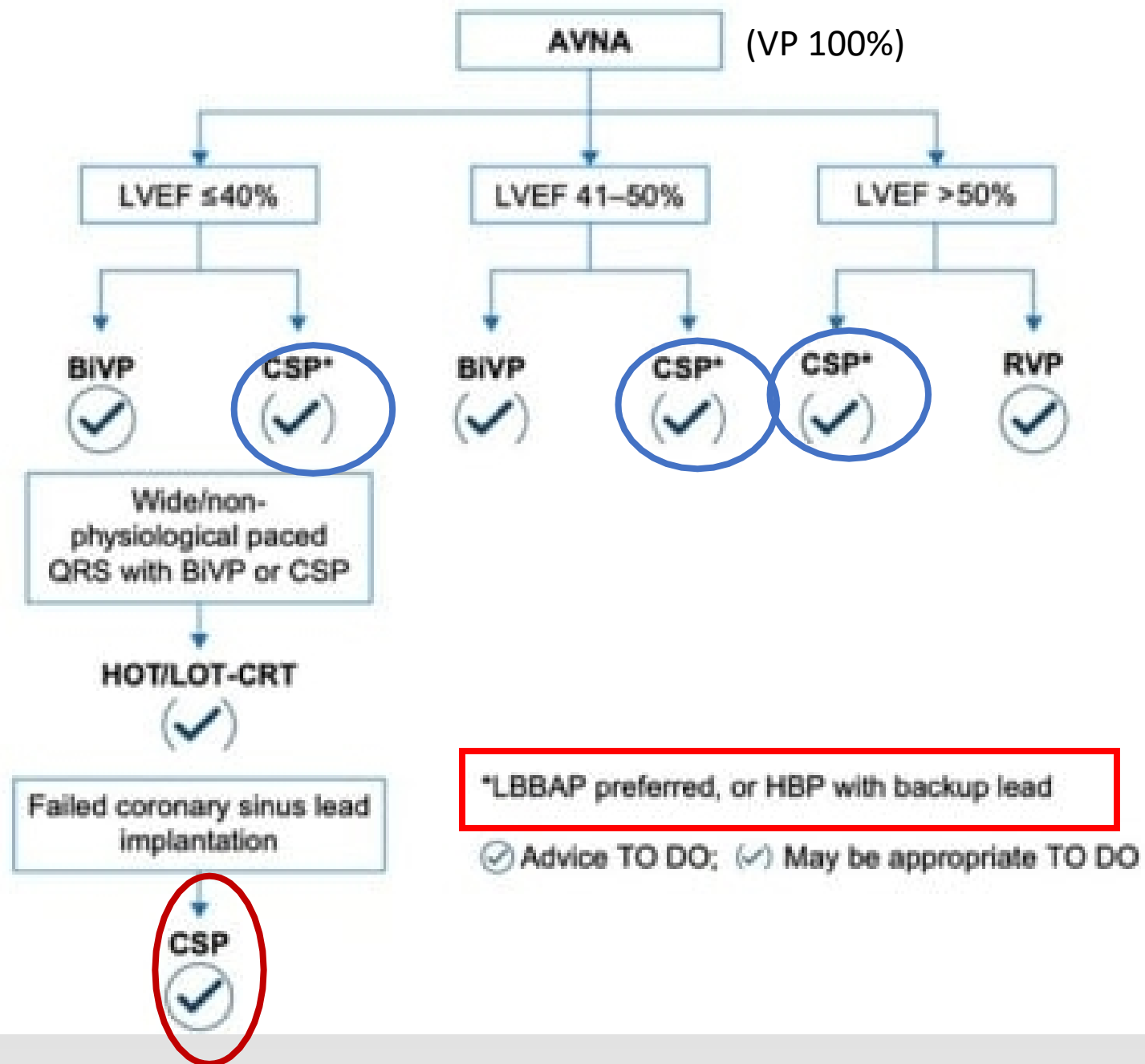
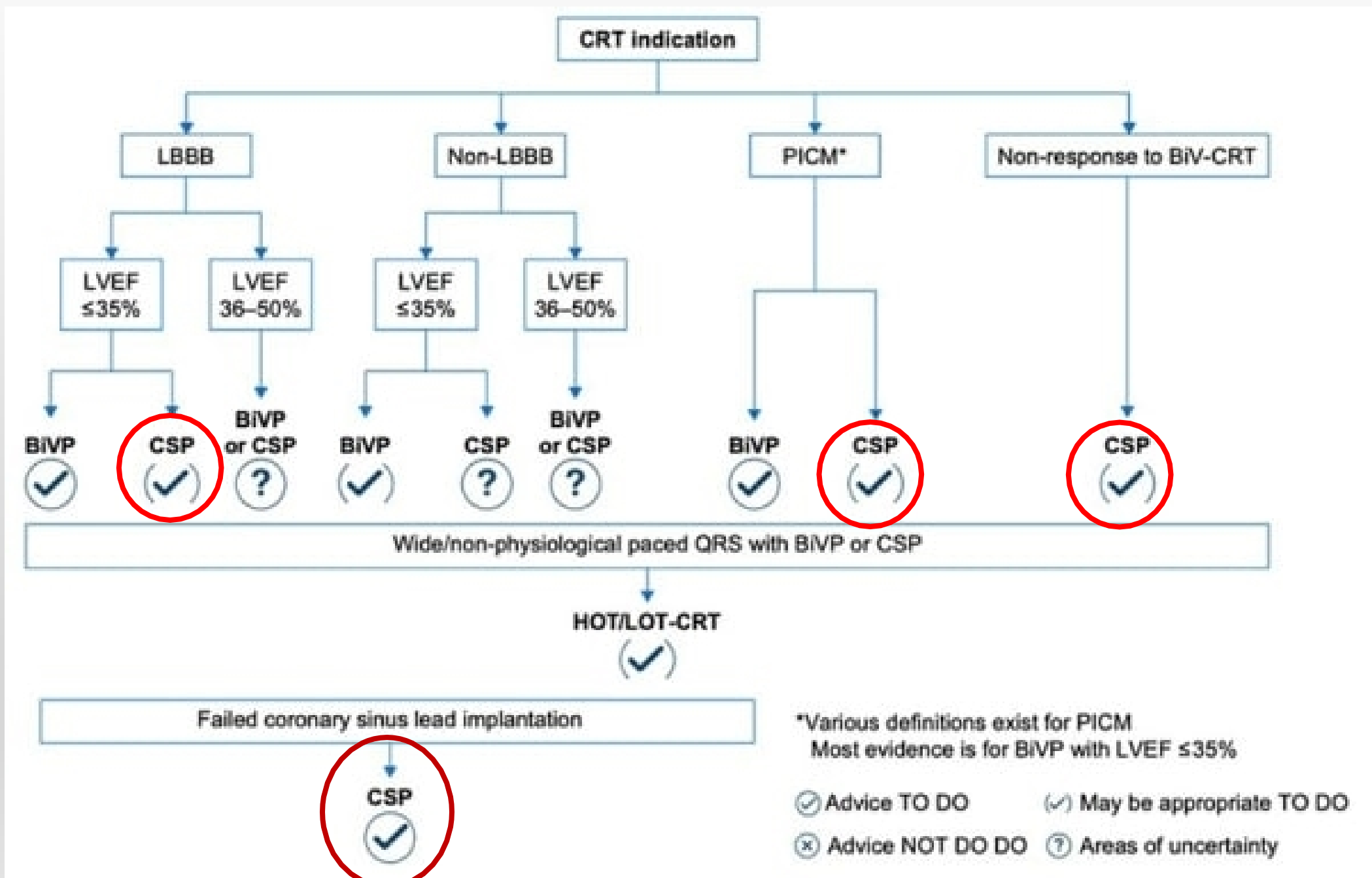


Figure 3 EHRA 2025



ESC 09/2025

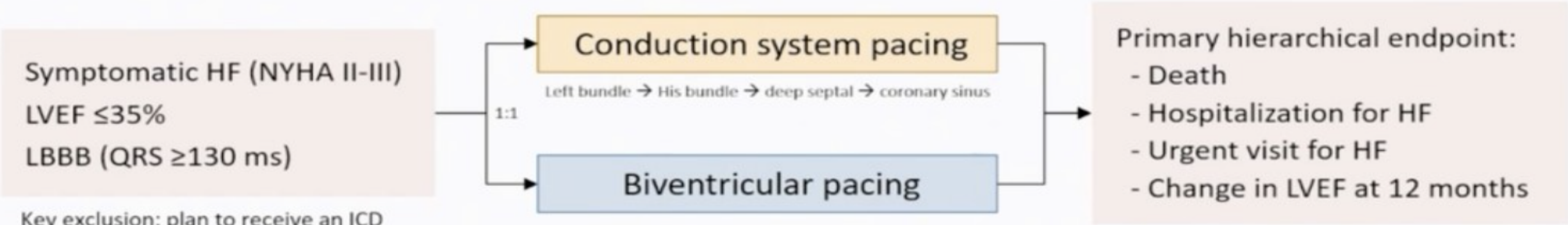
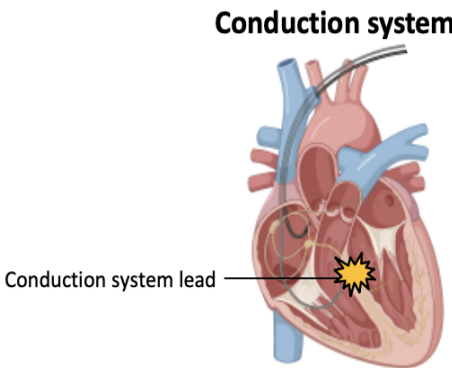
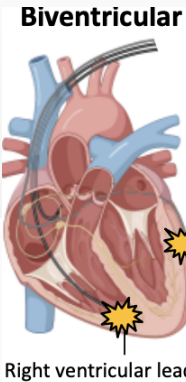
PHYSIOSYNC-HF

RANDOMISE

Trial design

Clinicaltrials.gov: NCT05572736

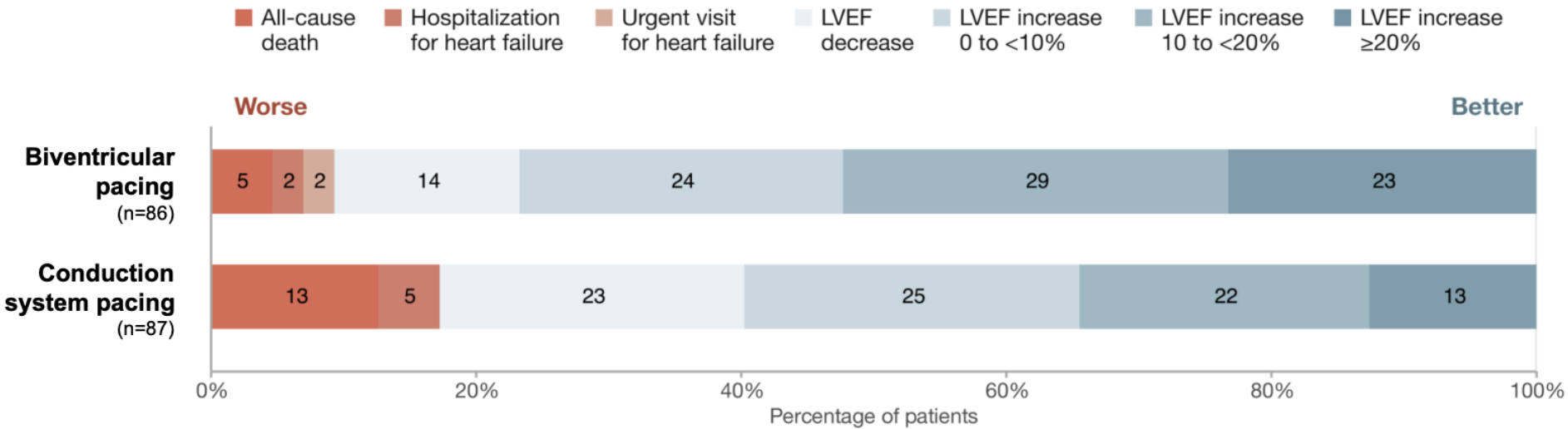
CRT vs LBBAP
173 patients
BBG typique QTS 180 ms
2/3 CMD FE 26%
66% LBBP succès
0 sortie 0 perdu de vue
Comité adjudication



Treatment assignment was blinded to patients and non-electrophysiology personnel.
Endpoints were independently adjudicated by blinded committees.



Primary endpoint



Odds ratio, 2.36 (95% CI 1.37–4.06)

p=0.99 for non-inferiority of conduction system pacing
p=0.002 for between-group difference favoring biventricular pacing

Assessed at 12 months.

Futur

Etudes randomisées en cours LBBAP vs CRT

Trial name	Design	Interventions arm	Unique identifier	<i>n</i>	Primary endpoint
LeCaRt trial	RCT	LBBP-CRT <i>vs</i> BiVP-CRT	NCT05365568	170	Composite of death, HF hospitalization or worsening HF
LEFT-BUNDLE-CRT trial	RCT	LBBP-CRT <i>vs</i> BiVP-CRT	NCT05434962	176	Positive CRT response: improved clinical composite score or > 15% reduction in LVESV
RAFT-P & A trial	RCT	AV nodal ablation + LBBP-CRT <i>vs</i> AV nodal ablation + BiVP-CRT	NCT05428787	284	Change in NT-ProBNP at 6 months follow-up
Left <i>vs</i> left trial	RCT	HBP/LBBP-CRT <i>vs</i> BiVP-CRT	NCT05650658	2136	All-cause mortality and HF hospitalization at 5.5 yr

Sondes dédiées 2 eme génération pourraient augmenter les taux de succès

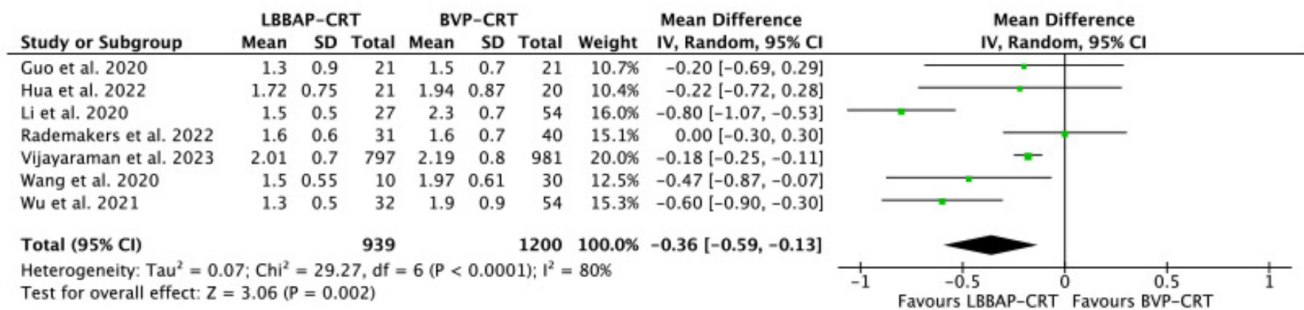
Conclusion

- LBBAP (stimulation aïre branche gauche) futur gold standard BAV et CRT?
- LBBAP consensus prudent
 - Possible si BAV FE <40% et taux stim >20% ... 100% Ablation NAV
 - CRT en cas d'échec . Possible en première intention.
- Etudes randomisée et Progrès technologiques en cours

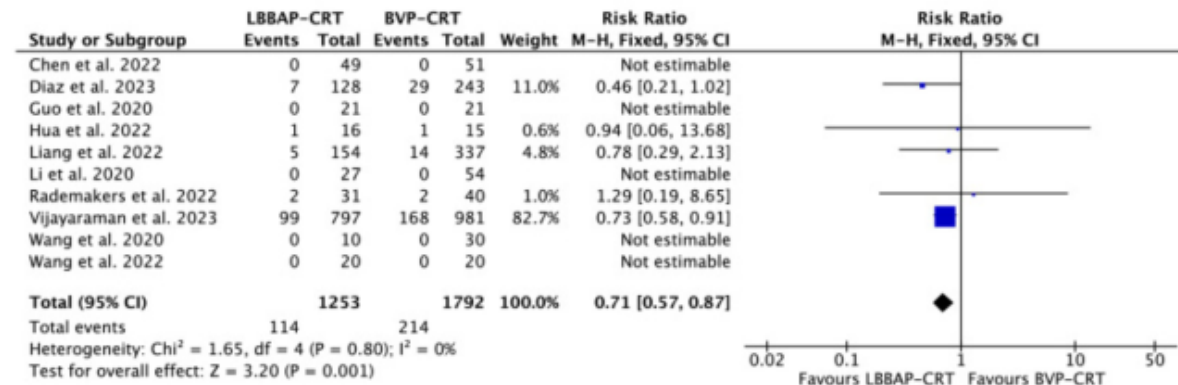
FEVG <40% : LBBAP vs CRT

3141 pts
10 observationnal, 1
RCT

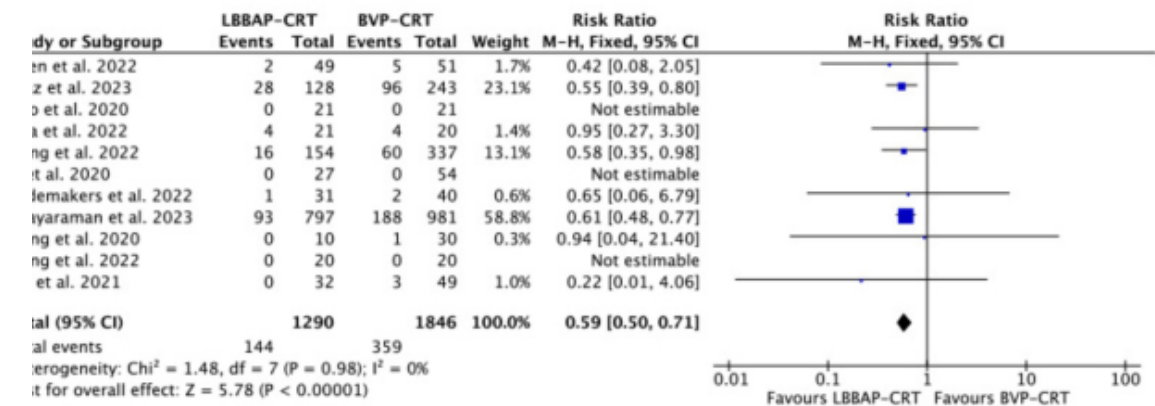
C. NYHA class



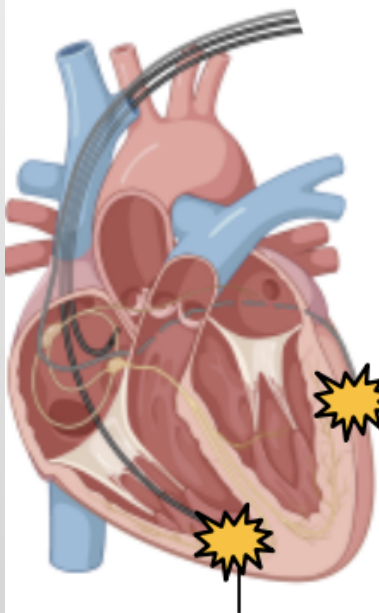
A. All-cause mortality



B. Heart failure hospitalizations



Biventricular



Left ventricular lead

Right ventricular lead

Advice: CSP for AV block

Advice TO DO

In patients with AV block in whom BiVP is desired, it is advised to implant CSP^a as a rescue strategy if coronary sinus lead implantation fails¹³⁹

May be appropriate TO DO

It may be appropriate to implant CSP^a in patients with LVEF >40% with an anticipated ventricular pacing burden >20%.^{4,26,51,102–106,108,114–116}

It may be appropriate to implant CSP^a in lieu of BiVP in patients with AV block and LVEF <40% with an anticipated ventricular pacing burden >20%.^{130,132}

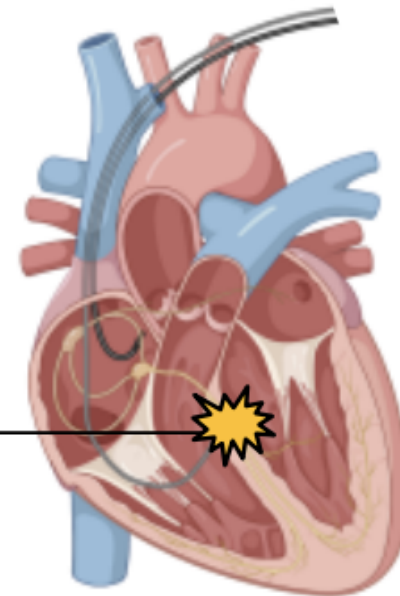
In patients with AV block and infrequent (<20%) anticipated ventricular pacing, it may be appropriate to implant CSP^a in combination with minimized ventricular pacing strategies, in order to provide physiological ventricular pacing in case the conduction disorder progresses

It may be appropriate to choose CSP^a as opposed to BiVP as a primary strategy, taking into account operator experience, in the presence of specific patient populations where a simpler device is desired (e.g. frail patients, patients with limited life expectancy, or those requiring a smaller device)

Advice NOT TO DO

It is advised to avoid RV pacing in patients with AV block, LVEF <40%, and frequent (>20%) anticipated ventricular pacing^{119–121}

Conduction system



Conduction system lead