

ELECTRA

4-5 DÉCEMBRE 2021

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MARSEILLE | FRANCE

1^Èmes journées françaises
pratiques de rythmologie
& de stimulation cardiaque

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ELECTRA 

4-5 DÉCEMBRE 2025

VILLA M. - MARSEILLE | FRANCE

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

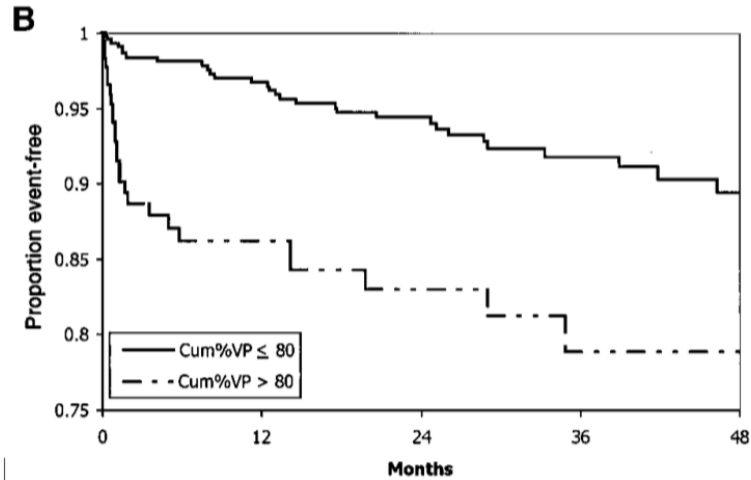
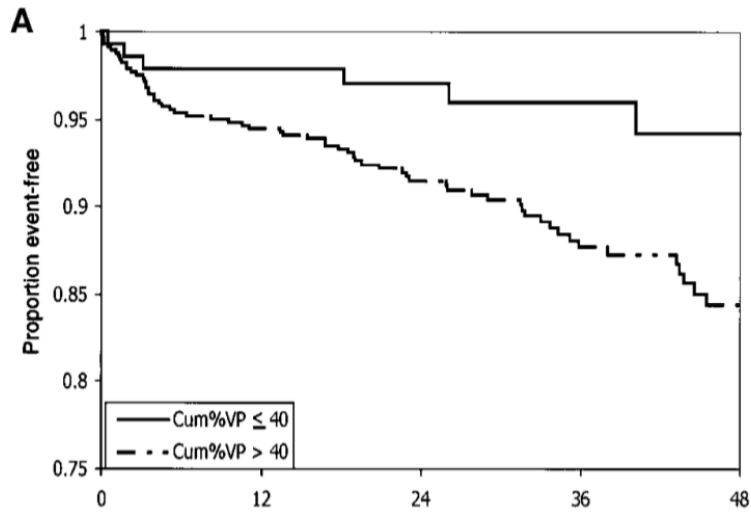
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STIMULATION DE L'AIRE DE LA BRANCHE GAUCHE :

STIMULATION CONVENTIONNELLE, C'EST FINI ?

HF

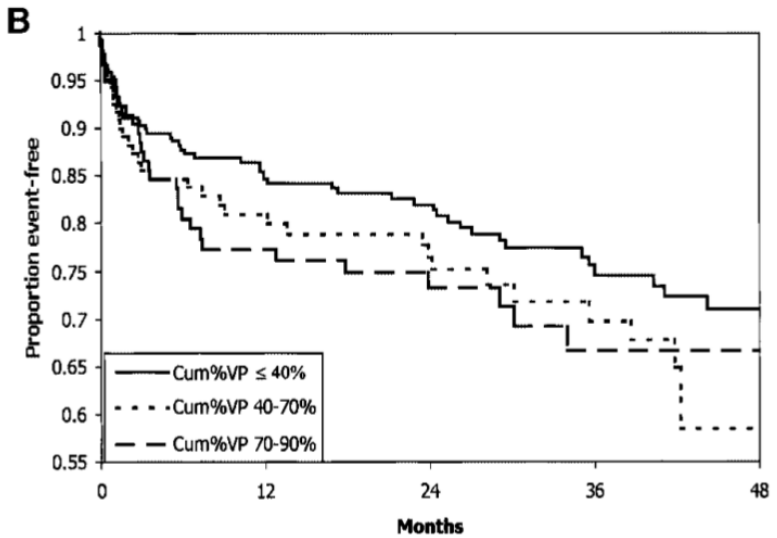
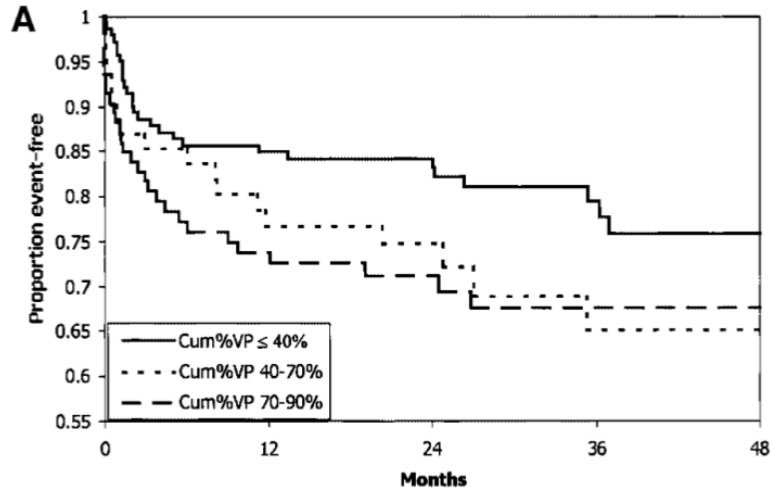
DDDR



VVIR

AF

DDDR



VVIR

Adverse Effect of Ventricular Pacing on Heart Failure and Atrial Fibrillation Among Patients With Normal Baseline QRS Duration in a Clinical Trial of Pacemaker Therapy for Sinus Node Dysfunction

Michael O. Sweeney, MD; Anne S. Hellkamp, MS; Kenneth A. Ellenbogen, MD;
 Arnold J. Greenspon, MD; Roger A. Freedman, MD; Kerry L. Lee, PhD; Gervasio A. Lamas, MD;
 for the MODE Selection Trial (MOST) Investigators

Arrhythmia/electrophysiology

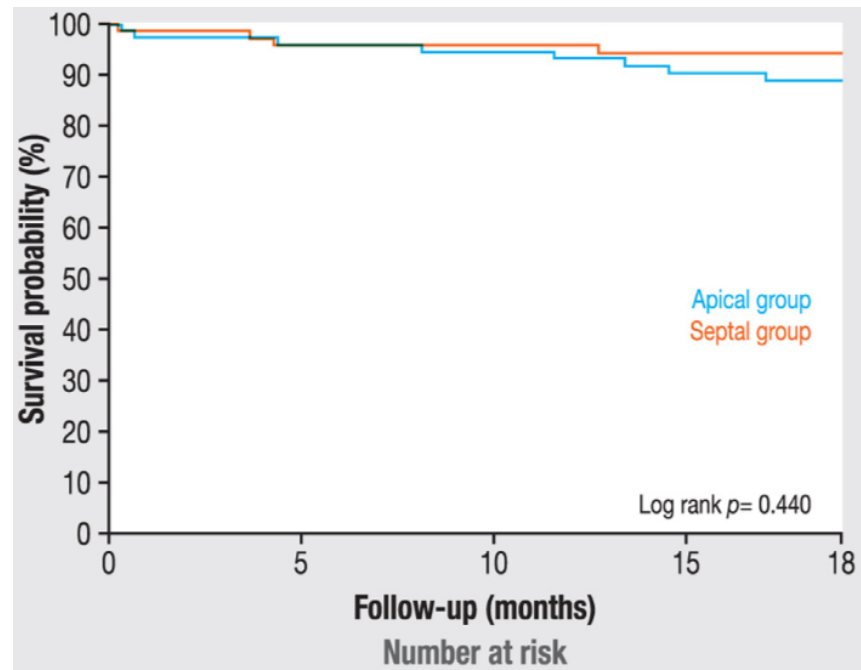
Effect of right ventricular pacing lead site on left ventricular function in patients with high-grade atrioventricular block: results of the Protect-Pace study

Gerald C. Kaye¹*, Nicholas J. Linker², Thomas H. Marwick³, Lucy Pollock⁴, Laura Graham⁴, Erika Poulriot⁵, Jan Poloniecki⁶, and Michael Gammage⁷, on behalf of the Protect-Pace trial investigators

Conclusion

In patients with a high-grade AV block and preserved LV function requiring a high percentage of ventricular pacing, RVHS pacing does not provide a protective effect on left ventricular function over RVA pacing in the first 2 years.

Septal versus apical pacing sites in permanent right ventricular pacing: The multicentre prospective SEPTAL-PM study[☆]



FEVG à 18 mois : $56.7 \pm 12.5\%$ vs. $57.7 \pm 12.9\%$;
 $P = 0.65$

Pacing-induced cardiomyopathy: A systematic review and meta-analysis of definition, prevalence, risk factors, and management



Vincenzo Somma, MD,* Francis J. Ha, MBBS(Hons), BMedSc(Hons),*
 Sonny Palmer, MBBS, DMedSci,* Uwais Mohamed, MBBS,* Sharad Agarwal, MD†

Heart Rhythm. 2023 Feb;20(2):282-290.

PREVALENCE : 12% (11-14%)

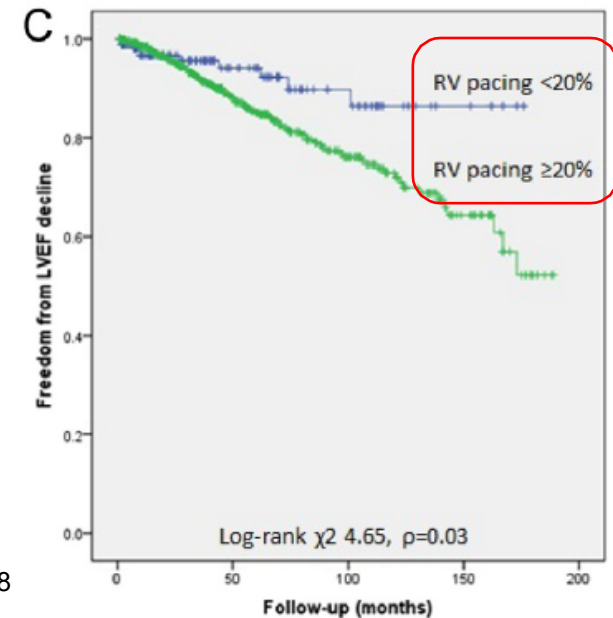
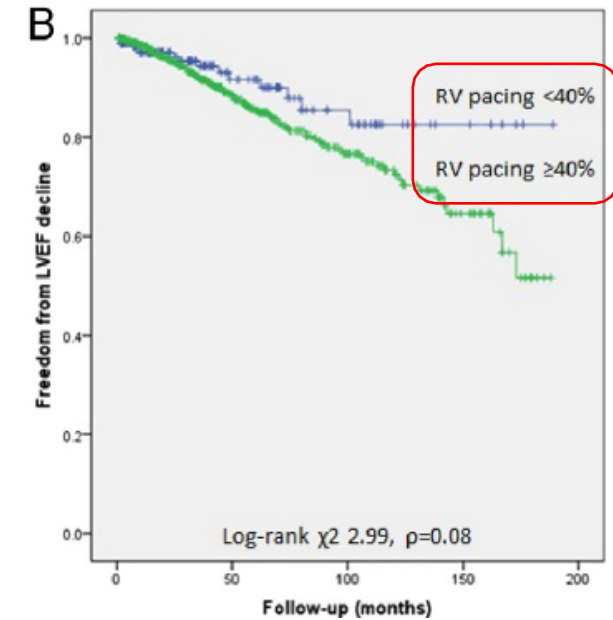
Table 1 Meta-analysis of potential risk factors for PiCM

| Variable | Number of included studies | Total patients | Overall OR (95% CI) | P | Heterogeneity, I ² (%) |
|--|----------------------------|----------------|---------------------|-------|-----------------------------------|
| Age | 7 | 2,762 | 1.01 (0.99–1.02) | .09 | 61 |
| Male sex | 9 | 3,129 | 1.23 (1.12–1.35) | <.001 | 36 |
| History of MI | 3 | 28,525 | 1.81 (1.54–2.12) | <.001 | 0 |
| T2DM | 3 | 28,301 | 0.86 (0.69–1.06) | .14 | 0 |
| CKD | 2 | 28,322 | 1.66 (1.32–2.01) | <.001 | 0 |
| AF | 2 | 2,847 | 1.32 (1.23–1.42) | <.001 | 0 |
| Baseline LVEF (per 1% increase) | 7 | 21,405 | 0.95 (0.93–0.97) | <.001 | 61 |
| Native QRS duration (per ms increase) | 3 | 1,005 | 1.02 (1.01–1.03) | <.01 | 36 |
| RV pacing percentage (per 1% increase) | 6 | 1,983 | 1.02 (1.01–1.02) | <.001 | 95 |
| Paced QRS duration (per ms increase) | 10 | 3,858 | 1.02 (1.01–1.03) | <.001 | 97 |

Forest plot of meta-analysis for each variable is included in the Online Supplement.

AF = atrial fibrillation; CI = confidence interval; CKD = chronic kidney disease; LVEF = left ventricular ejection fraction; MI = myocardial Infarction; OR = odds ratio; PiCM = pacing-induced cardiomyopathy; RV = right ventricular; T2DM = type 2 diabetes mellitus.

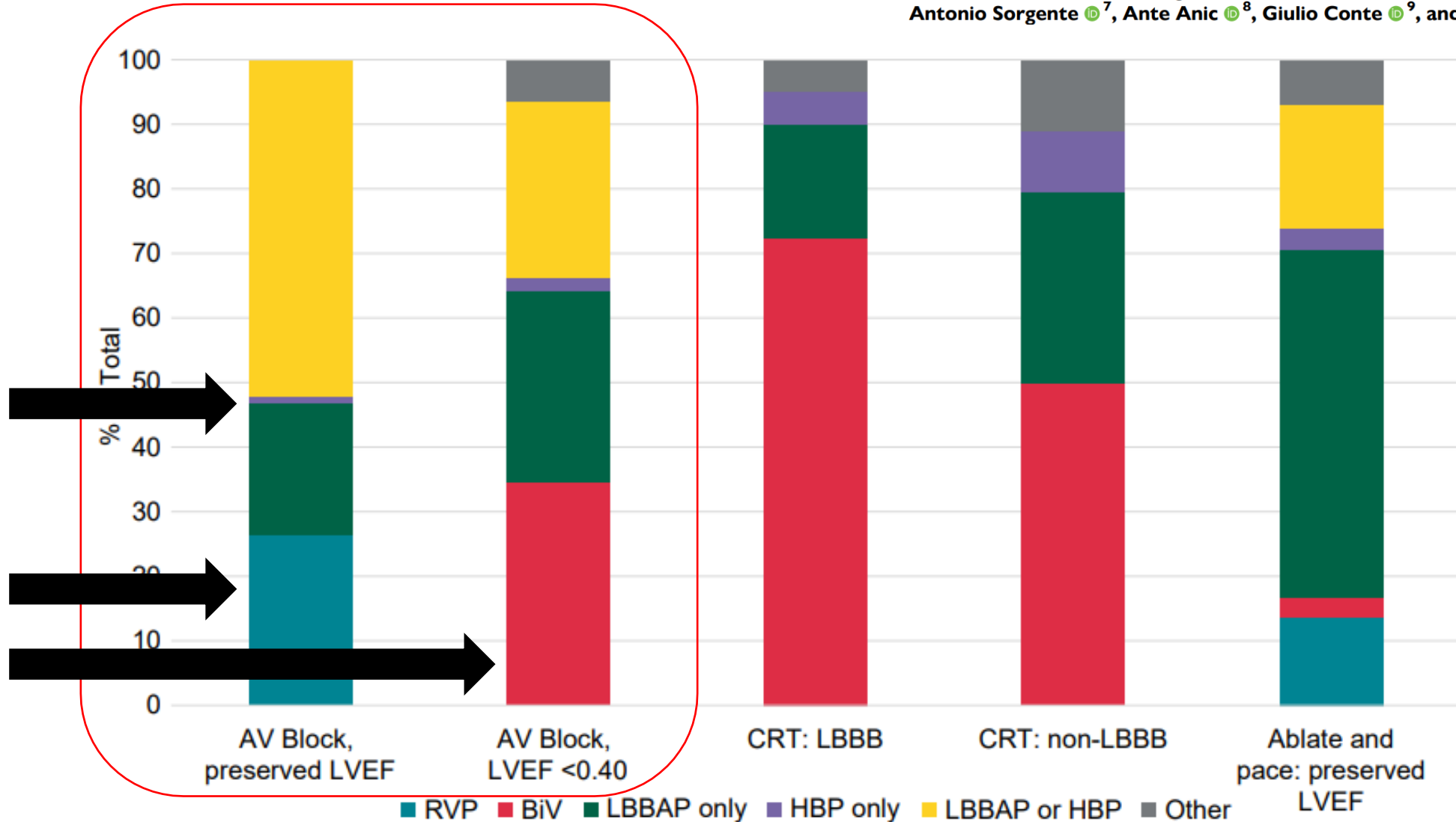
Incidence and predictors of right ventricular pacing-induced cardiomyopathy in patients with complete atrioventricular block and preserved left ventricular systolic function



Et la LBBP est arrivée ...

Conduction system pacing in everyday clinical practice: EHRA physician survey

Bratislav Kircanski ^{1,2}, Serge Boveda ^{3,4,5}, Frits Prinzen ⁶,
Antonio Sorgente ⁷, Ante Anic ⁸, Giulio Conte ⁹, and Haran Burri ^{10*}



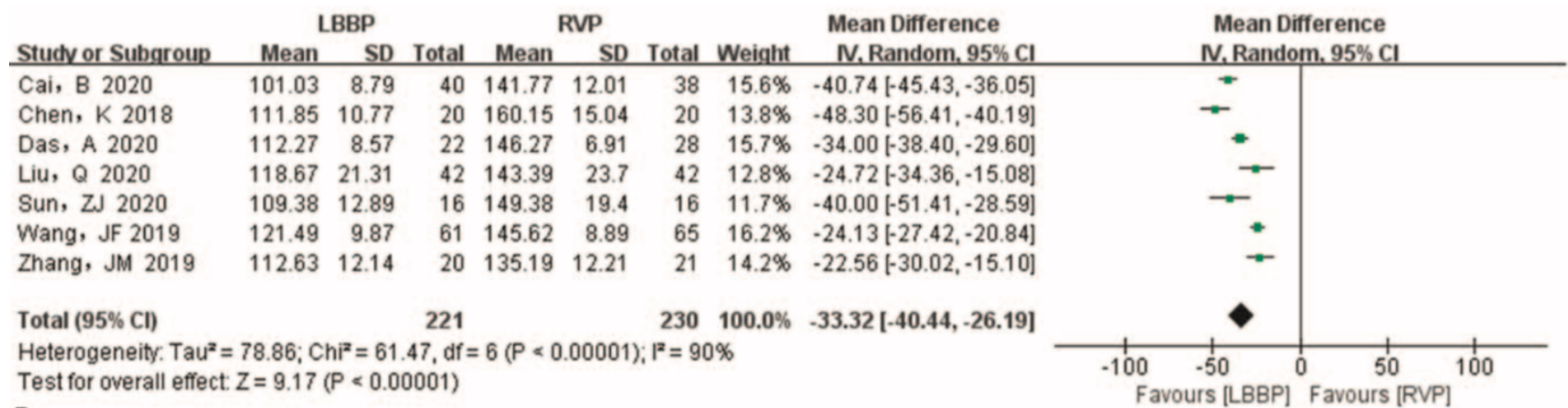
Safety and efficacy of left bundle branch pacing in comparison with conventional right ventricular pacing

Medicine (Baltimore). 2021 Jul 9;100(27):e26560.

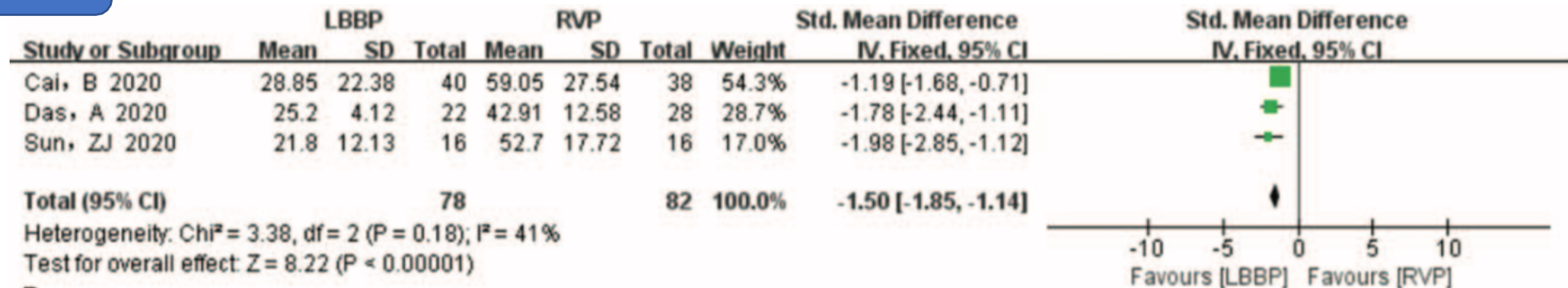
A systematic review and meta-analysis

Xing Liu, MS¹, Wenbin Li, MS, Lei Wang, MD, Shaohua Tian, MS, Xiaolin Zhou, MS, Mingxing Wu, MS*

Largueurs QRS



Synchronisation VD/VG



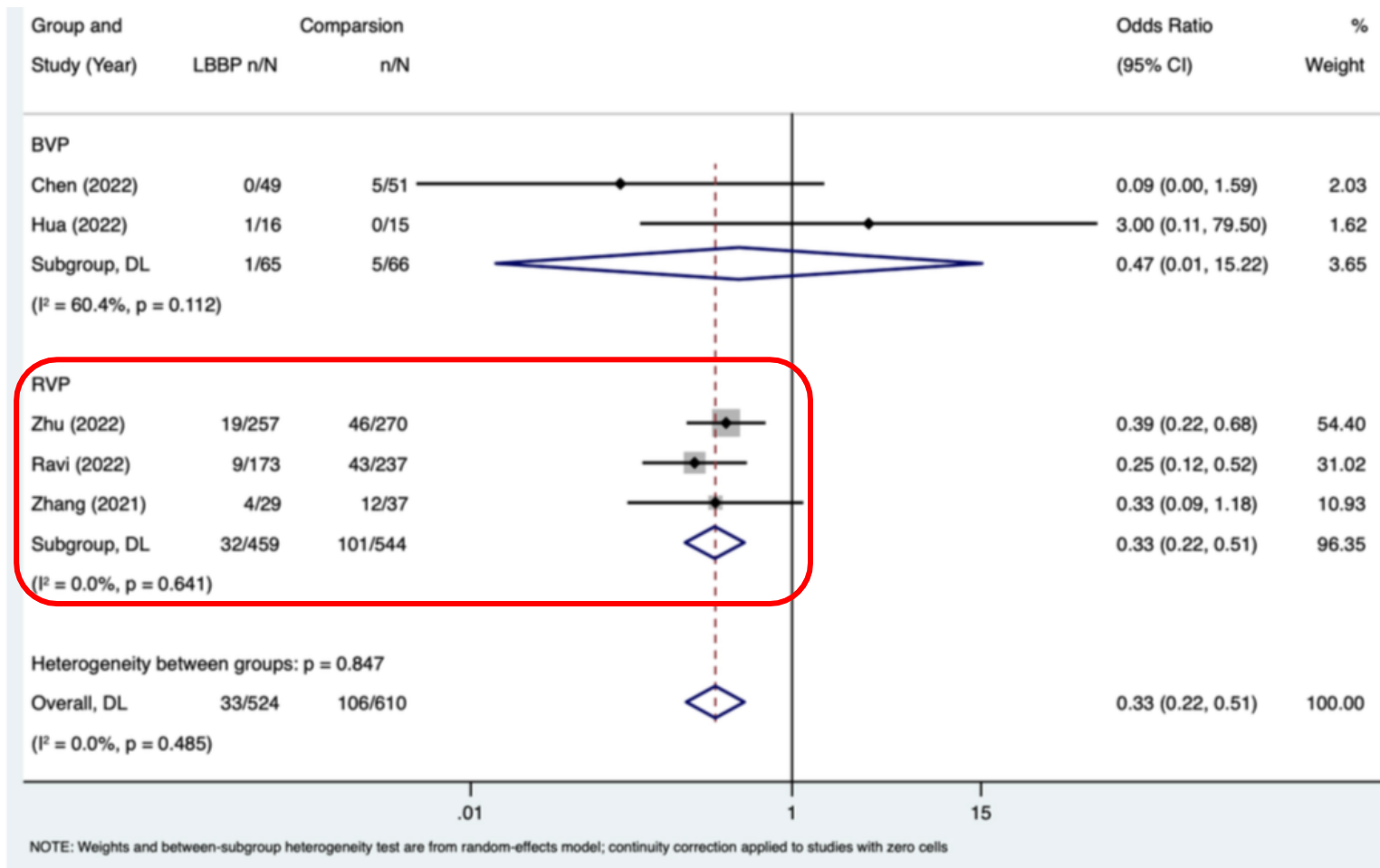


Fig. 4. Risk of AF in LBBP compared with other pacing strategies. Abbreviations: AF, atrial fibrillation; LBBP, left bundle

Clinical outcomes of left bundle branch pacing compared to right ventricular apical pacing in patients with atrioventricular block

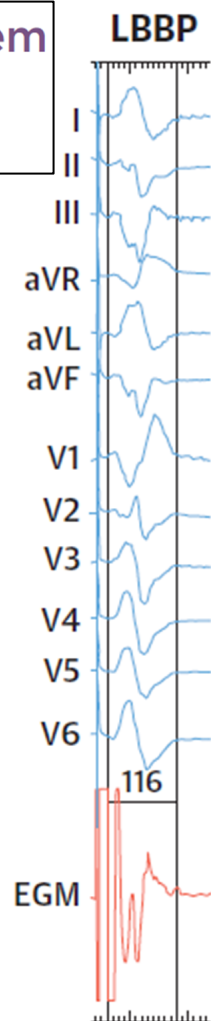
Zhang S, Guo J, Tao A, Zhang B, Bao Z, Zhang G. Clin Cardiol. 2021 Apr;44(4):481-487

TABLE 2 Pacing, QRS duration, and echocardiographic characteristics

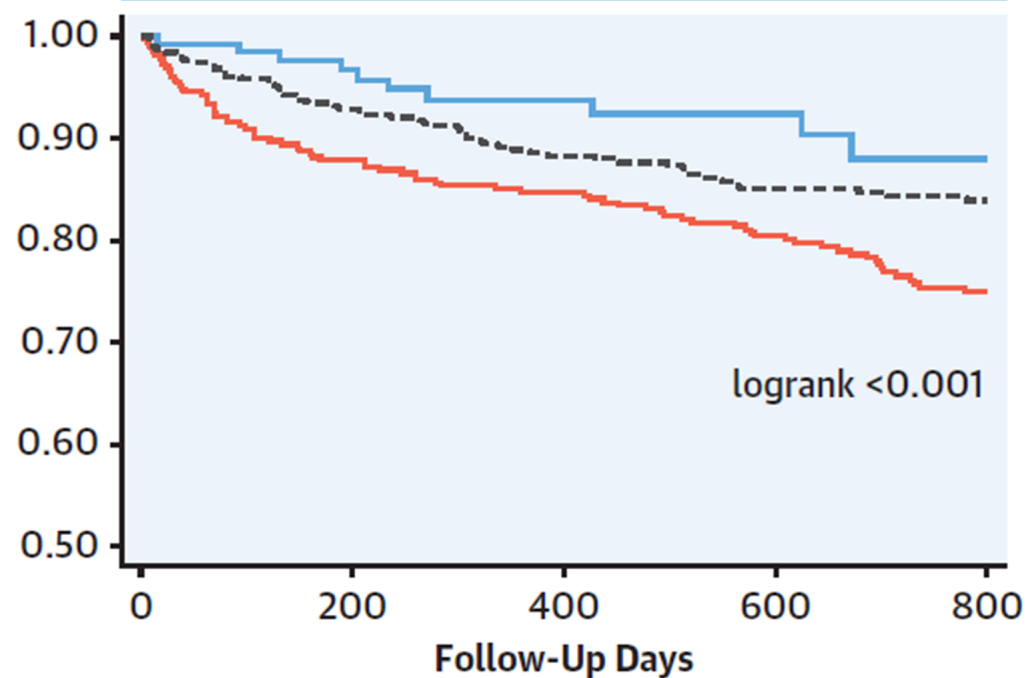
| | | LBBP group (N = 29) | RVAP group (N = 37) | p-value |
|--------------------------------|--|---------------------|---------------------|---------|
| Measurements at implantation | Paced QRS duration (ms), mean (SD) | 110.75 ± 6.77 | 154.29 ± 6.96 | .000 |
| | Capture threshold (V @0.4 ms), mean (SD) | 0.68 ± 0.22 | 0.73 ± 0.23 | .620 |
| | R wave amplitude (mV), mean (SD) | 9.42 ± 2.05 | 9.82 ± 2.01 | .617 |
| | Ventricular impedance (Ohms), mean (SD) | 818.83 ± 165.73 | 844.29 ± 182.95 | .715 |
| Measurements at last follow-up | Paced QRS duration (ms), mean (SD) | 111.83 ± 6.89 | 155.36 ± 5.94 | .000 |
| | Capture threshold (V@0.4 ms), mean (SD) | 0.65 ± 0.22 | 0.71 ± 0.21 | .511 |
| | R wave amplitude (mV), mean (SD) | 10.25 ± 1.95 | 10.36 ± 1.80 | .886 |
| | Ventricular impedance (Ohms), mean (SD) | 826.67 ± 164.45 | 856.71 ± 160.73 | .643 |
| | LVEF%, mean (SD) | 54.17 ± 4.34 | 50.14 ± 2.14 | .005 |
| | LVDD (mm), mean (SD) | 47.58 ± 3.29 | 49.79 ± 1.85 | .042 |
| | Cum% VP | 95.47% ± 1.22% | 94.86% ± 1.56% | .768 |

| | LBBP group (N = 29) | | | RVAP group (N = 37) | | |
|--|---------------------|-------------------|---------|---------------------|-------------------|---------|
| | At implantation | At last follow-up | p-value | At implantation | At last follow-up | p-value |
| Paced QRS duration(ms), mean(SD) | 110.75 ± 6.77 | 111.83 ± 6.89 | .684 | 154.29 ± 6.96 | 155.36 ± 5.94 | .704 |
| Capture threshold(V @0.4 ms), mean(SD) | 0.68 ± 0.22 | 0.65 ± 0.22 | .786 | 0.73 ± 0.23 | 0.71 ± 0.21 | .837 |
| R wave amplitude(mV), mean(SD) | 9.42 ± 2.05 | 10.25 ± 1.95 | .412 | 9.82 ± 2.01 | 10.36 ± 1.80 | .440 |
| Ventricular impedance(Ohms), mean(SD) | 818.83 ± 165.73 | 826.67 ± 164.45 | .772 | 844.29 ± 182.95 | 856.71 ± 160.73 | .832 |
| LVEF%, mean(SD) | 55.08 ± 4.32 | 54.17 ± 4.34 | .609 | 56.29 ± 5.40 | 50.14 ± 2.14 | .005 |
| LVDD(mm), mean(SD) | 48.71 ± 3.27 | 47.58 ± 3.29 | .700 | 46.92 ± 4.93 | 49.79 ± 1.85 | .046 |

Clinical Outcomes in Conduction System Pacing Compared to Right Ventricular Pacing in Bradycardia



Primary Outcome of HF-Hospitalization, BiVP Upgrade or All Cause-Mortality



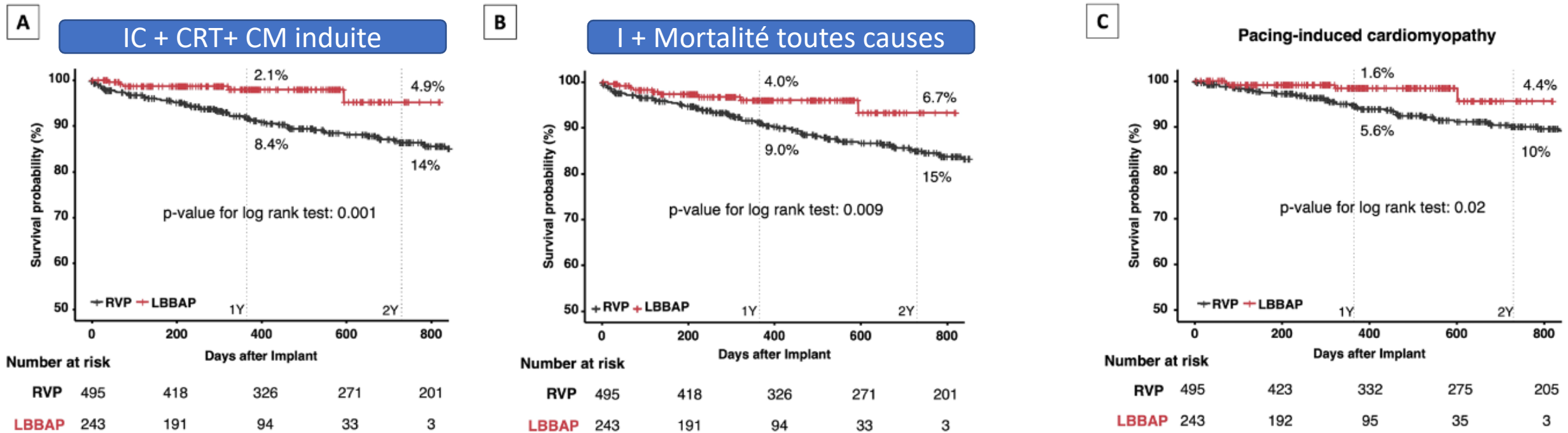
| Number at risk | | 0 | 200 | 400 | 600 | 800 |
|----------------|--------------|-----|-----|-----|-----|-----|
| — | RVP, Vp >20% | 330 | 281 | 264 | 235 | 200 |
| — | CSP, Vp >20% | 132 | 103 | 71 | 46 | 30 |
| - - - | Vp ≤20% | 386 | 334 | 292 | 246 | 210 |

Tan ESJ., et al. J Am Coll Cardiol EP. 2022;■(■):■-■.

CSP provides more physiological pacing with greater electrical synchrony with improved clinical outcomes compared with RVP when Vp is >20%. BiVP = biventricular pacing; CSP = conduction system pacing; EGM = electrogram; HBP = His-bundle pacing; HF = heart failure; LBBP = left bundle branch pacing; RVP = right ventricular pacing; Vp = ventricular pacing burden.

Comparison of Clinical Outcomes Between Left Bundle Branch Area Pacing With a Stylet-Driven Lead and Conventional Right Ventricular Pacing

Lee KY, et al. J Cardiovasc Electrophysiol. 2025 Jun;36(6):1253-1263.



| LBBAP capture threshold at implant [V] | |
|--|-----------------|
| LBBP | 0.6 (0.5–0.9) |
| LBFP (LPFP + LAFP + LSFP) | 0.6 (0.5–0.9) |
| LVSP | 0.7 (0.5–1.0) |
| LBBAP sensing at implant [mV] | |
| LBBP | 10 (6.8–15) |
| LBFP (LPFP + LAFP + LSFP) | 10 (7–13.9) |
| LVSP | 10 (6.7–13) |
| LBBAP lead impedance at implant [Ohm] | 652.1 (± 234.5) |

Supplemental Table 1. Comparison of Pacing Characteristics and Clinical Outcomes Between HBP and LBBP

| | HBP | LBBP | P value |
|-------------------------------|---------|----------|------------------|
| Pacing characteristics | | | |
| QRSd baseline, ms | 105±26 | 104±29 | 0.48 |
| QRSd after implant, ms | 113±22 | 106±18 | 0.01 |
| Threshold at implant, V | 1.3±0.7 | 0.7±0.3 | <0.001 |
| Threshold at follow-up, V | 1.7±1.3 | 0.8±0.3 | <0.001 |
| R-wave at implant, mV | 4.7±3.1 | 12.2±4.9 | <0.001 |
| R-wave at follow-up, mV | 4.6±2.8 | 14.8±5.1 | <0.001 |
| Impedance at implant, ohm | 545±124 | 819±209 | <0.001 |

Original Article

Comparison of the left ventricular dyssynchrony between stylet-driven and lumen-less lead technique in left bundle branch area pacing using myocardial perfusion scintigraphy

Keisuke Miyajima¹*, Tsuyoshi Urushida², Yuichiro Tomida¹, Takumi Tamura¹, Sakito Masuda¹, Ayako Okazaki¹, Yoshitaka Kawaguchi¹, Yasushi Wakabayashi¹, Yuichiro Maekawa²

Quant Imaging Med Surg 2023;13(10):6840-6853

Tan ESJ., et al. *J Am Coll Cardiol EP.* 2022

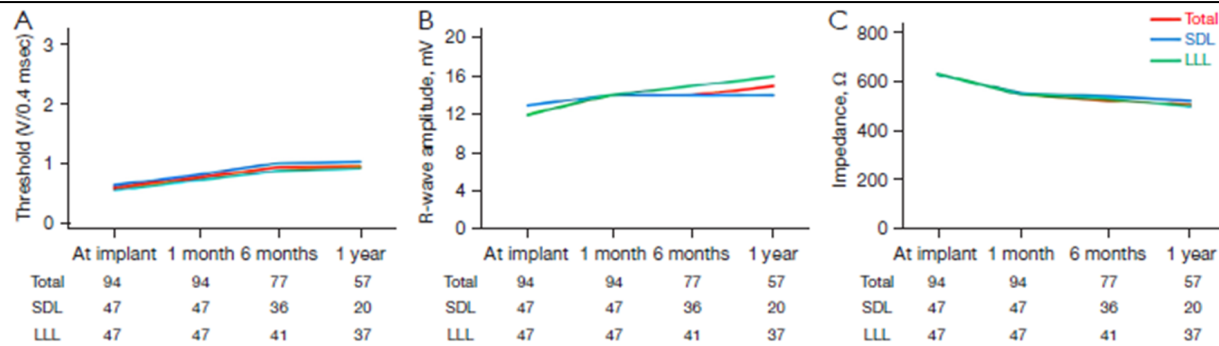
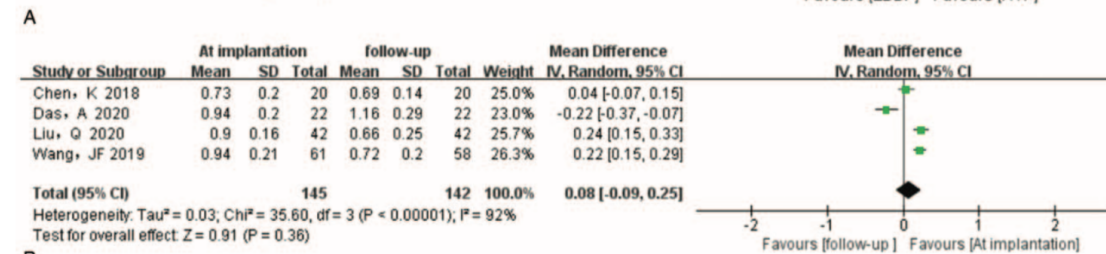
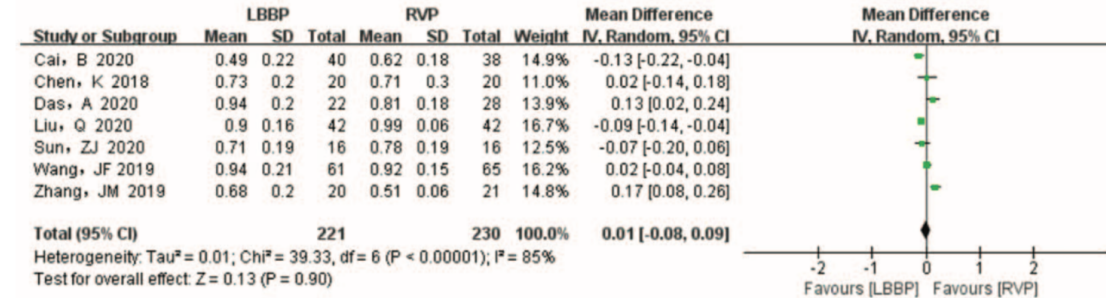


Figure 3 Serial changes of ventricular lead parameters. (A) Capture threshold; (B) R-wave amplitude; (C) impedance at implantation and during the follow-up period. SDL, stylet-driven lead; LLL, lumen-less pacing lead.



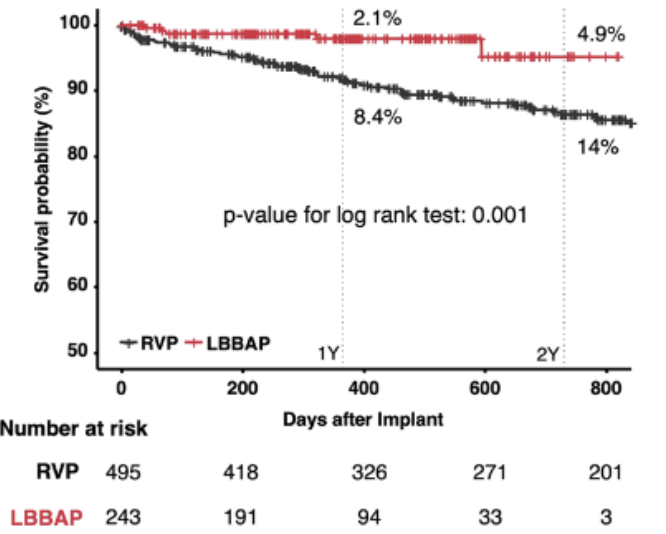
LA MESSE EST-ELLE DITE ?

Comparison of Clinical Outcomes Between Left Bundle Branch Area Pacing With a Stylet-Driven Lead and Conventional Right Ventricular Pacing

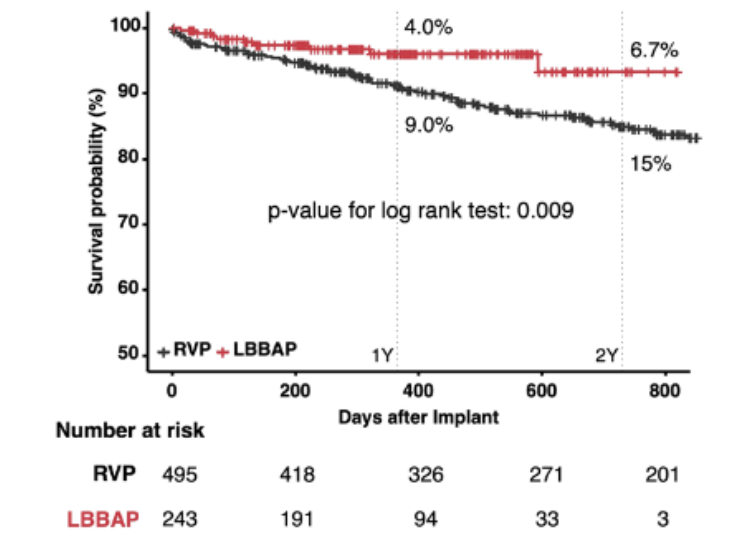
Lee KY, et al. J Cardiovasc Electrophysiol. 2025 Jun;36(6):1253-1263.

VP : 96% vs. 86%, $p < 0.001$

A IC + CRT+ CM induite



B I + Mortalité toutes causes



C Pacing-induced cardiomyopathy

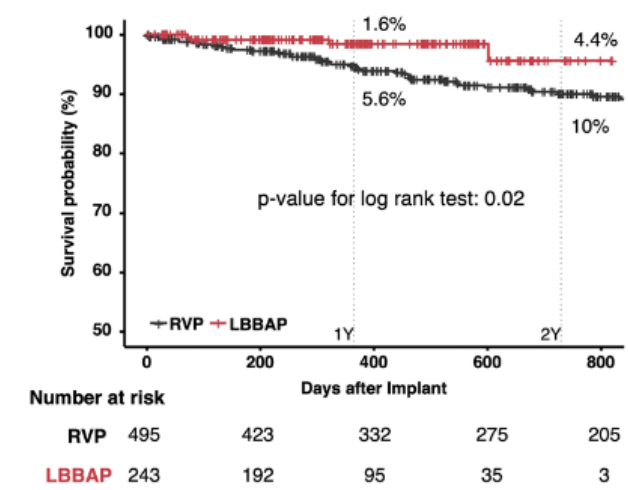


TABLE 1 | Baseline characteristics for left bundle branch area pacing and right ventricular apex groups.

| | Total (n = 738) | RVP (n = 495) | LBBAP (n = 243) | p-value |
|--------------------------------|-----------------|---------------|-----------------|---------|
| Age, year | 72.1 ± 12.3 | 72.5 ± 11.6 | 71.5 ± 13.4 | 0.312 |
| Sex, male | 381 (51.6) | 251 (50.7) | 130 (53.5) | 0.526 |
| Indication | | | | < 0.001 |
| Atrioventricular block | 557 (75.5) | 343 (69.3) | 214 (88.1) | |
| Sick sinus syndrome | 135 (18.3) | 118 (23.8) | 17 (7.0) | |
| AF SVR | 46 (6.2) | 34 (6.9) | 12 (4.9) | |
| Chamber | | | | < 0.001 |
| Single chamber | 149 (20.2) | 128 (25.9) | 21 (8.6) | |
| Dual chamber | 589 (79.8) | 367 (74.1) | 222 (91.4) | |
| Comorbidities | | | | |
| Hypertension | 377 (51.1) | 259 (52.3) | 118 (48.6) | 0.377 |
| Diabetes mellitus | 183 (24.8) | 112 (22.6) | 71 (29.2) | 0.063 |
| Chronic kidney disease | 209 (28.3) | 133 (26.9) | 76 (31.3) | 0.245 |
| Heart failure | 64 (8.7) | 44 (8.9) | 20 (8.2) | 0.873 |
| Structural heart disease | 152 (20.6) | 105 (21.2) | 47 (19.3) | 0.622 |
| Ischemic heart disease | 120 (16.3) | 78 (15.8) | 42 (17.3) | 0.673 |
| Valvular heart disease | | | | 0.013 |
| Moderate to severe grade | 153 (20.7) | 91 (18.4) | 62 (25.5) | |
| Repaired valve | 79 (10.7) | 62 (12.5) | 17 (7.0) | |
| AF | | | | < 0.001 |
| None | 515 (69.8) | 320 (64.6) | 195 (80.2) | |
| Paroxysmal AF | 123 (16.7) | 99 (20.0) | 24 (9.9) | |
| Persistent AF | 100 (13.6) | 76 (15.4) | 24 (9.9) | |
| Medication | | | | |
| Antiarrhythmic drug | 43 (5.8) | 38 (7.7) | 5 (2.1) | 0.004 |
| Beta-blocker | 107 (14.5) | 66 (13.3) | 41 (16.9) | 0.241 |
| RAS blocker | 212 (28.7) | 151 (30.5) | 61 (25.1) | 0.151 |
| Diuretics | 153 (20.7) | 116 (23.4) | 37 (15.2) | 0.013 |
| Baseline QRS duration, ms | 116.4 ± 30.2 | 114.0 ± 28.8 | 121.1 ± 32.4 | 0.004 |
| Underlying bundle branch block | | | | < 0.001 |

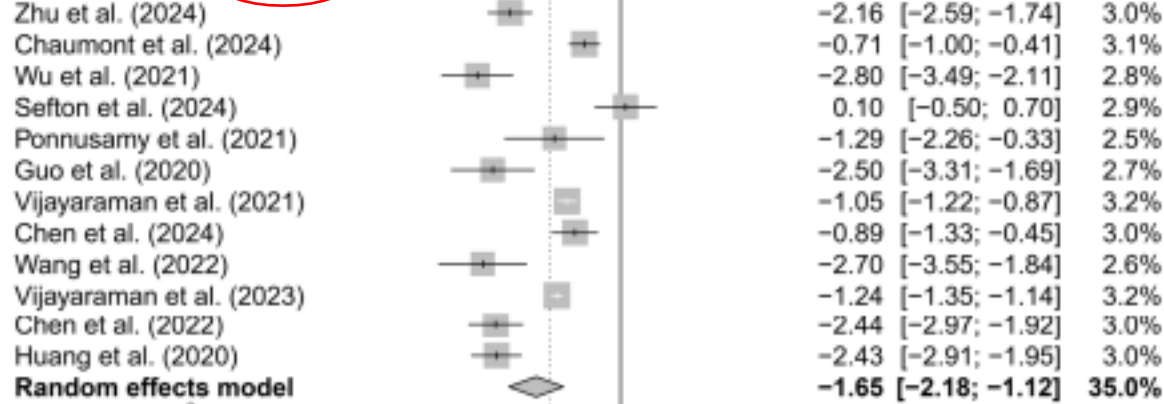
A Meta-Analysis of Clinical and Echocardiographic Outcomes of Physiological Versus Conventional Pacing

Biomedicines. 2025 May 31;13(6):1359.

Patrycja Paluszkiewicz ^{1,*}, Adrian Martuszewski ², Jacek Smereka ¹ and Jacek Gajek ³

FEVG

Type_of_pacing = LBBAP



Type_of_pacing = RVP

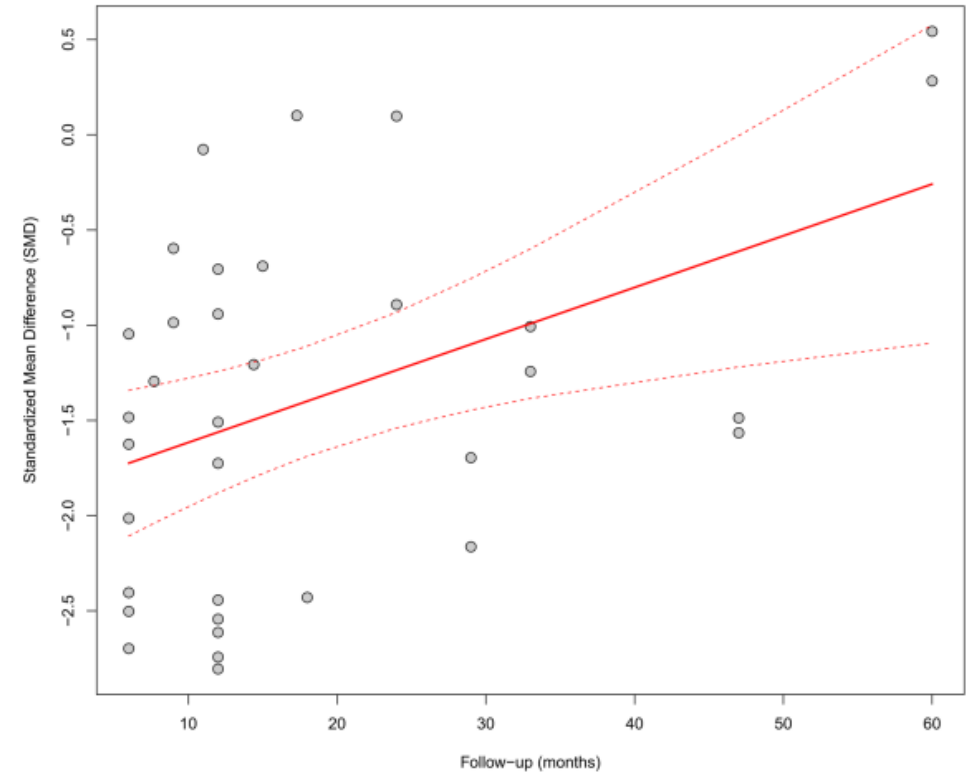
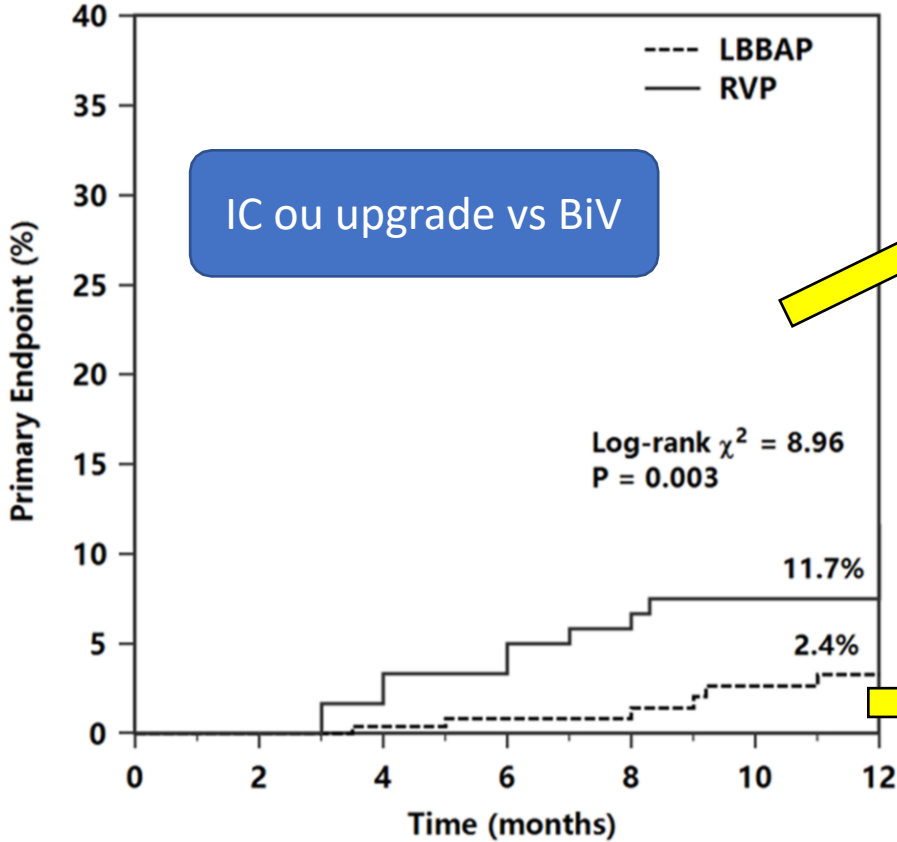


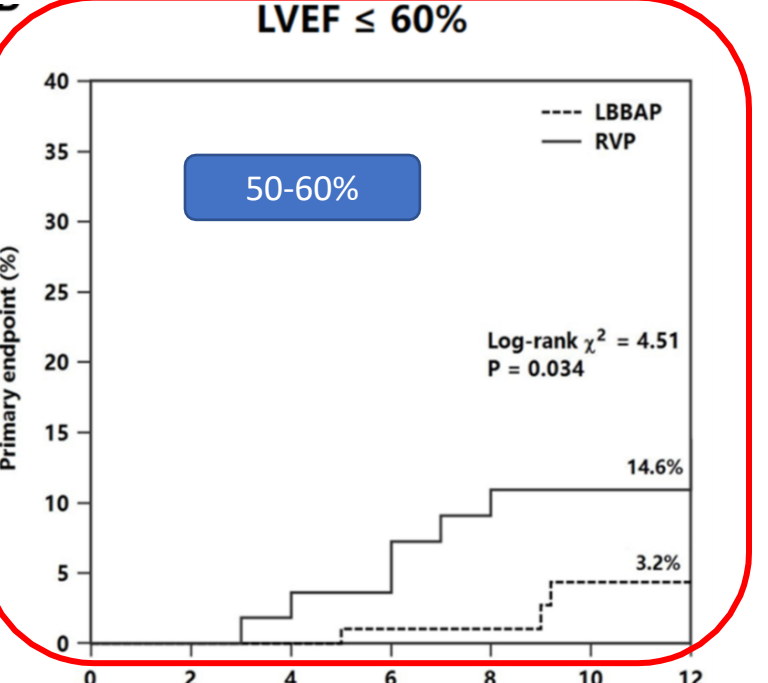
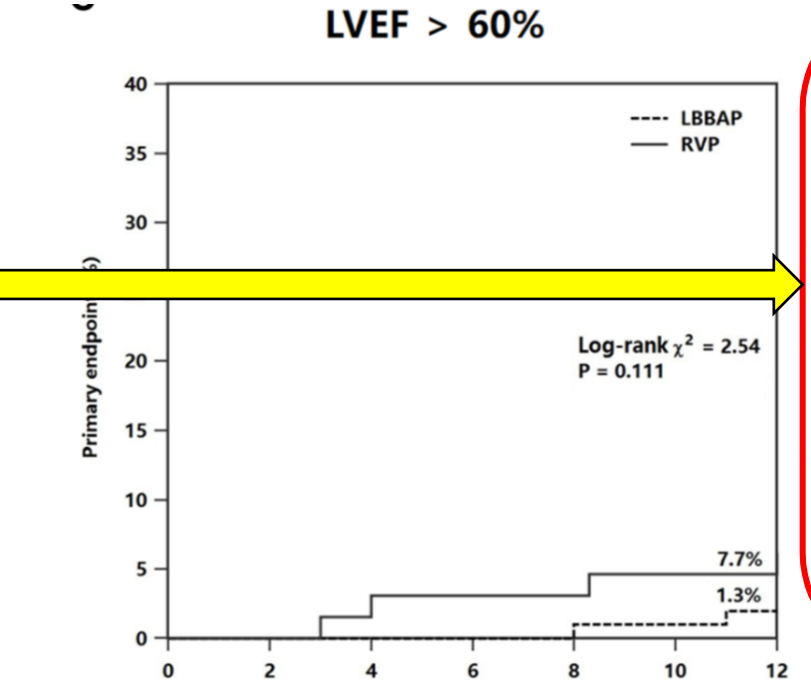
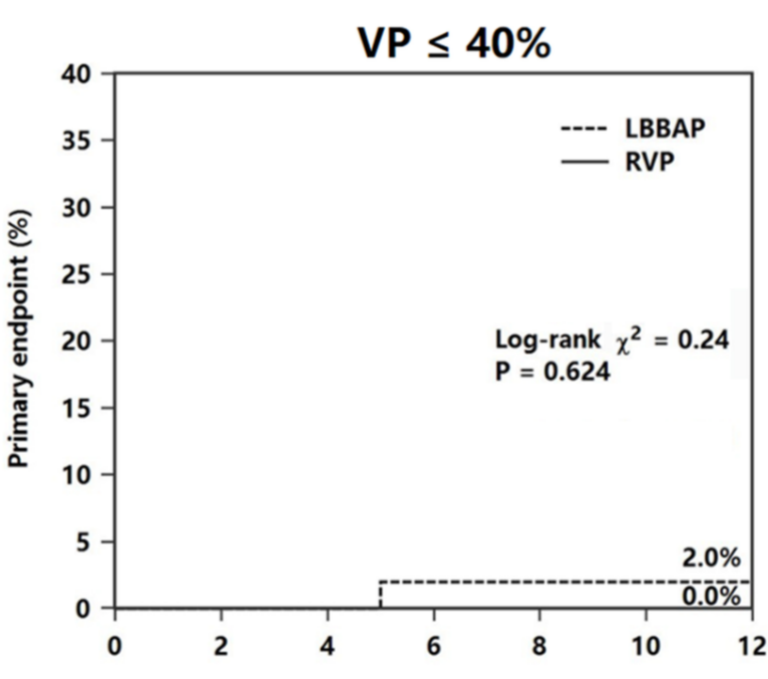
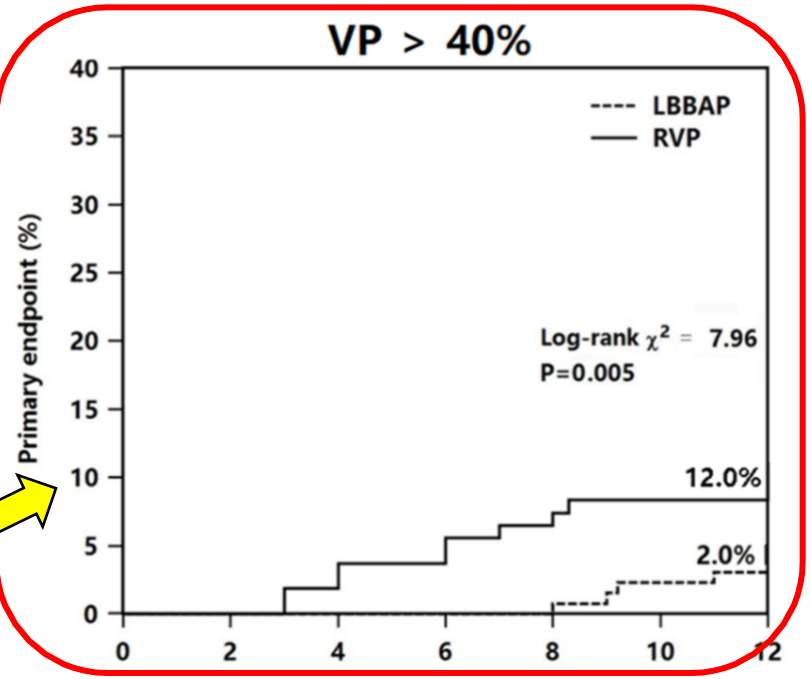
Figure 4. Meta-regression (bubble plot) of the relationship between follow-up duration (in months) and the SMD in LVEF. A significant impact of follow-up time on the observed improvement was found; longer follow-up was associated with a greater increase in LVEF ($\beta = +0.027$; $p = 0.0055$), and the model explained 18.3% of the total heterogeneity [21,30–32,34–39,41,43–45,48–51,53,55].

| Endpoint | Comparisons/Patients | Pooled Effect (SMD [95% CI]) | Certainty of Evidence (GRADE) | Downgrading Factors |
|------------------------------------|----------------------|------------------------------|-------------------------------|---|
| LVEF (benefit SMD < 0) | 34/6102 | -1.38 [-1.69; -1.06] | ●●○○ low | observational studies, $I^2 > 90\%$ |
| NYHA (benefit SMD > 0) | 19/3418 | 1.94 [1.59; 2.29] | ●●○○ low | observational studies, $I^2 > 90\%$ |
| NT-proBNP (benefit SMD > 0) | 5/811 | 0.91 [0.63; 1.19] | ●●○○ low | a limited number of studies, observational studies |
| LVESV (benefit SMD > 0) | 13/2047 | 1.14 [0.81; 1.47] | ●●○○ low | heterogeneity, lack of Randomized Controlled Trials |
| Pacing threshold (benefit SMD < 0) | 17/2682 | -0.14 [-0.36; 0.08] | ●●○○ low | non-significant effect, $I^2 = 81\%$ |

Li X, Zhang J, et al. Clinical Outcomes in Patients With Left Bundle Branch Area Pacing vs. Right Ventricular Pacing for Atrioventricular Block. Front Cardiovasc Med. 2021 Jul 8;8:685253

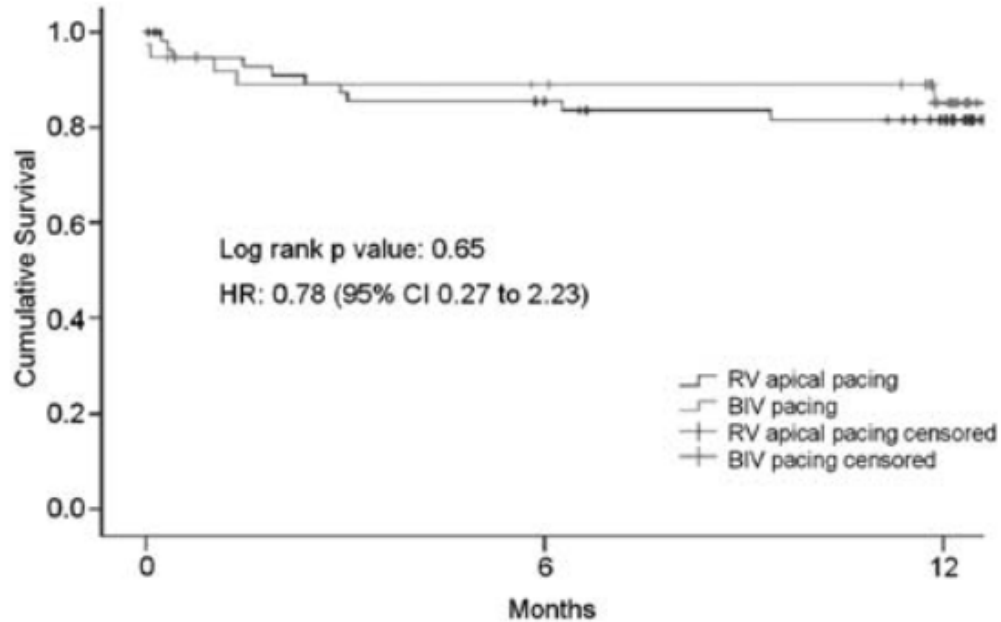


| Number at risk | | 0 | 2 | 4 | 6 | 8 | 10 | 12 |
|----------------|--|-----|-----|-----|-----|-----|-----|----|
| LBBAP | | 246 | 246 | 245 | 161 | 160 | 158 | 0 |
| RVP | | 120 | 120 | 116 | 114 | 112 | 111 | 0 |



Preventing ventricular dysfunction in pacemaker patients without advanced heart failure: results from a multicentre international randomized trial (PREVENT-HF)

VP >80%

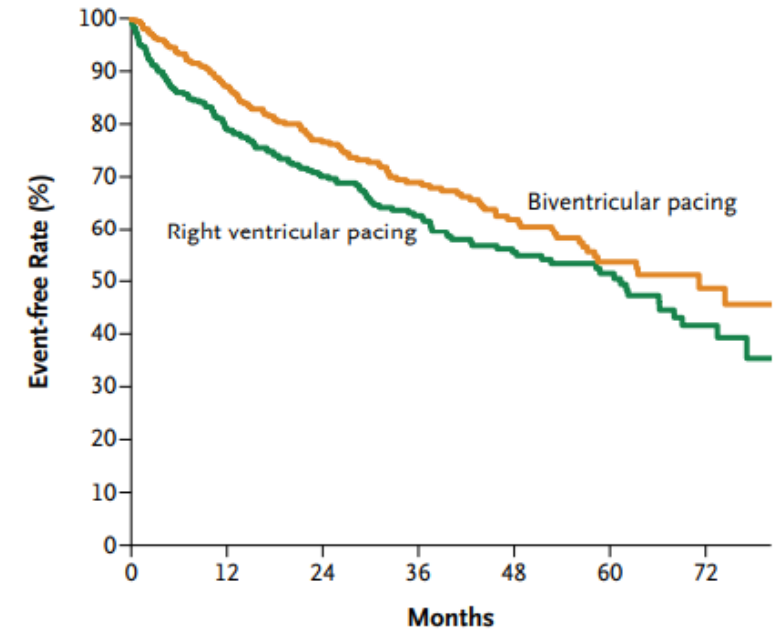


FEVG 42.9%

Biventricular Pacing for Atrioventricular Block and Systolic Dysfunction

Anne B. Curtis, M.D., Seth J. Worley, M.D., Philip B. Adamson, M.D., Eugene S. Chung, M.D., Imran Niazi, M.D., Lou Sherfese, Ph.D., Timothy Shinn, M.D., and Martin St. John Sutton, M.D., for the Biventricular versus Right Ventricular Pacing in Heart Failure Patients with Atrioventricular Block (BLOCK HF) Trial Investigators

N Engl J Med. 2013 Apr 25;368(17):1585-93.



No. at Risk

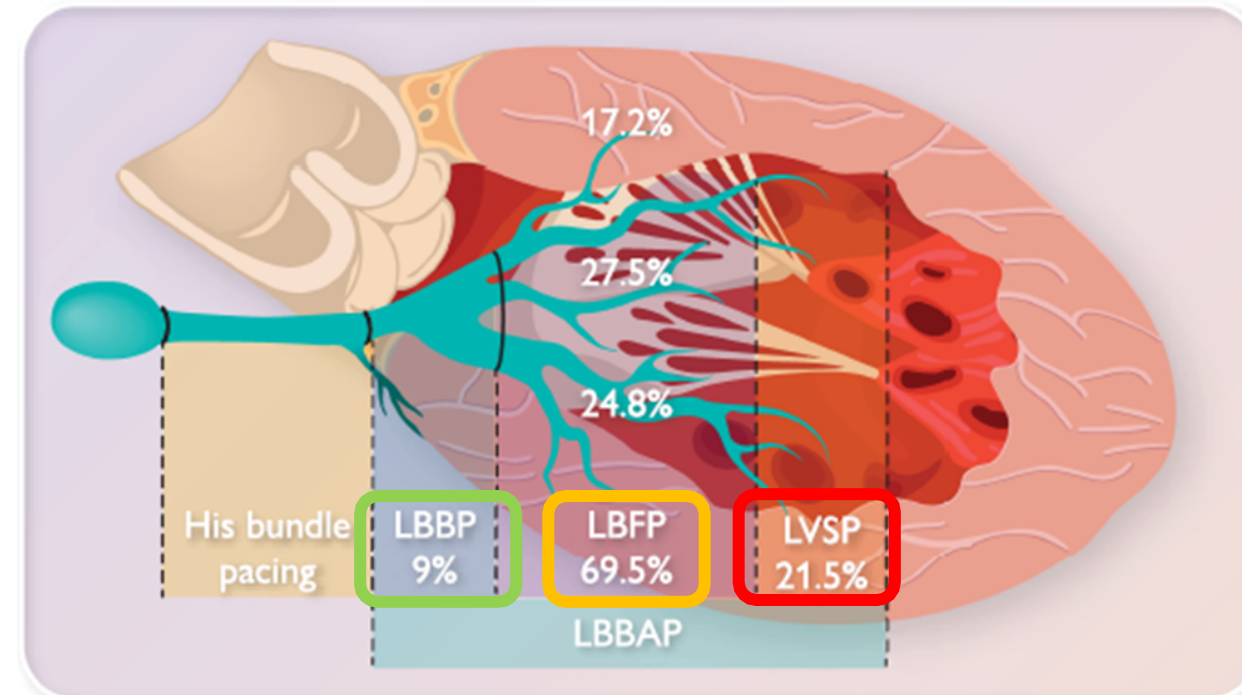
| | | | | | | | |
|--------------------------|-----|-----|-----|-----|----|----|----|
| Biventricular pacing | 349 | 271 | 195 | 134 | 91 | 52 | 17 |
| Right ventricular pacing | 342 | 248 | 180 | 121 | 88 | 54 | 22 |

Figure 3. Freedom from the Clinical Components of the Primary Outcome.

The clinical components of the primary outcome included death from any cause or an urgent care visit for heart failure. There was a significant difference in favor of biventricular pacing over right ventricular pacing (hazard ratio, 0.73; 95% credible interval, 0.57 to 0.92).

LBBP PAR TOUT LE MONDE ?

LBBAP implantation success
 Bradycardia indication success **92.4%**
 Heart failure indication success **82.2%**



Jastrzębski M, et al. Left bundle branch area pacing outcomes: the multicentre European MELOS study. Eur Heart J. 2022 Oct 21;43(40):4161-4173.

Paced V₆RWPT per obtained capture type [ms]

| | | | |
|---------------------------|---------------|-----------|---------------------|
| LBBP | 79.0 (± 12.0) | 76.9–81.2 | <0.001 ^d |
| LBFP (LPFP + LAFP + LSFP) | 74.8 (± 12.3) | 74.0–75.6 | — |
| LVSP | 94.3 (± 11.6) | 93.3–95.4 | — |

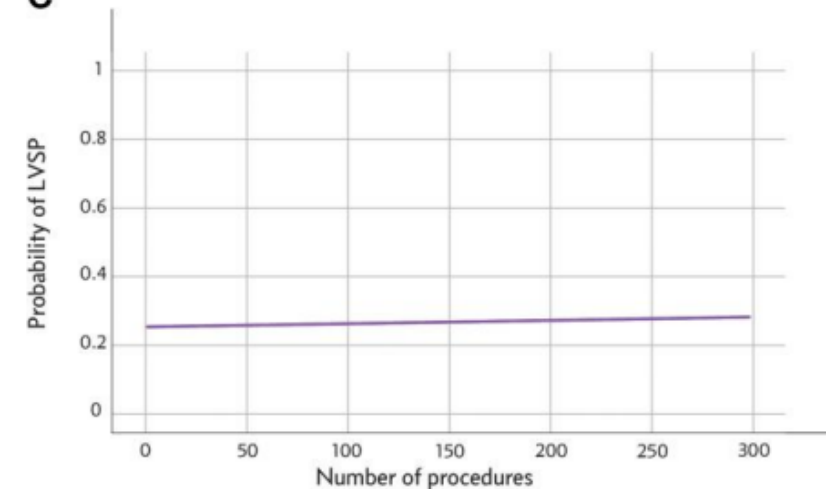
Paced QRS duration per baseline QRS type [ms]

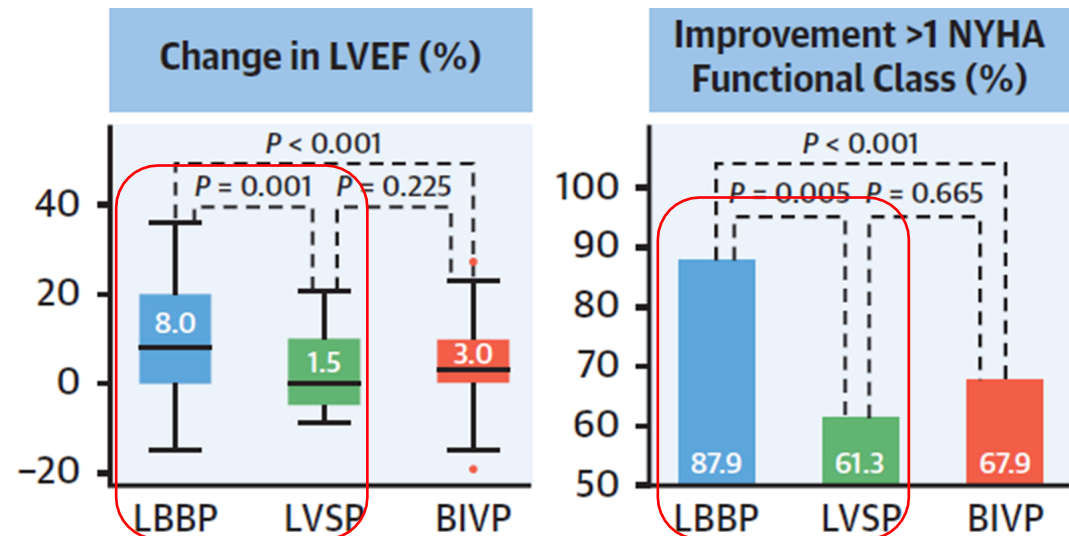
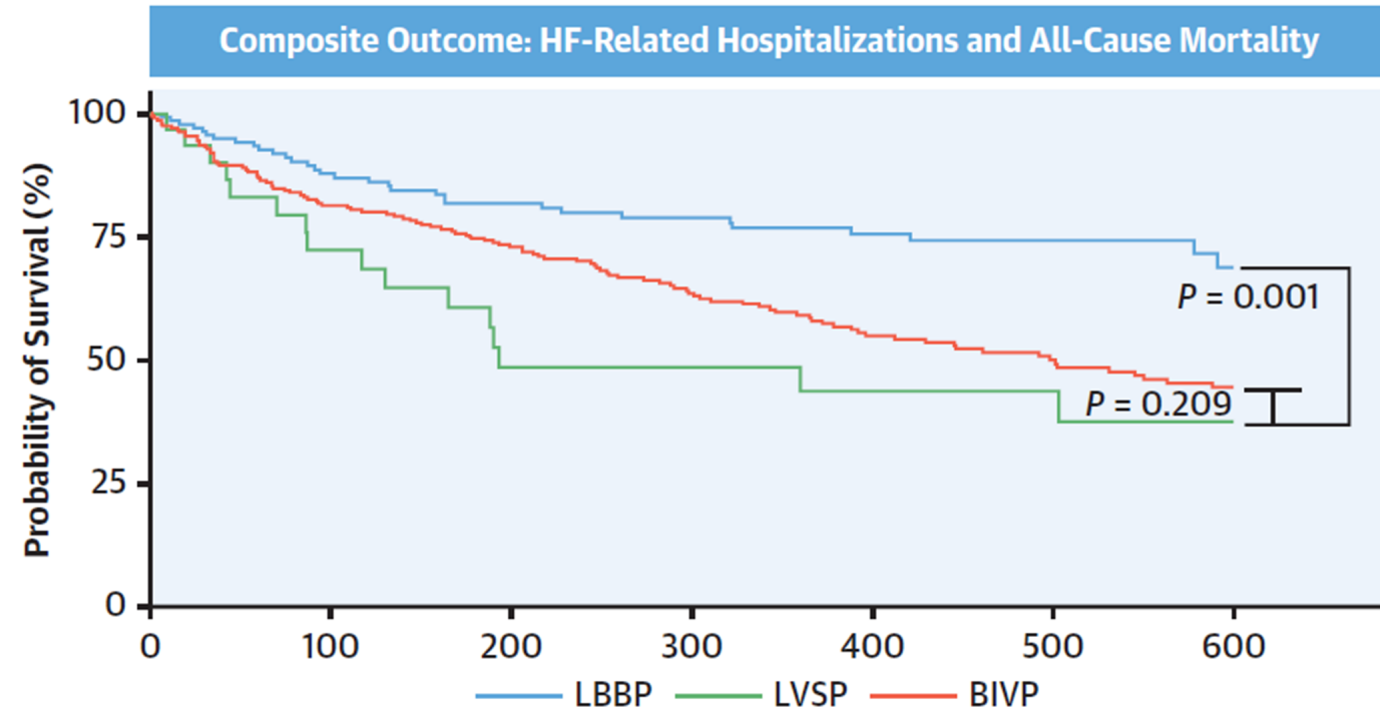
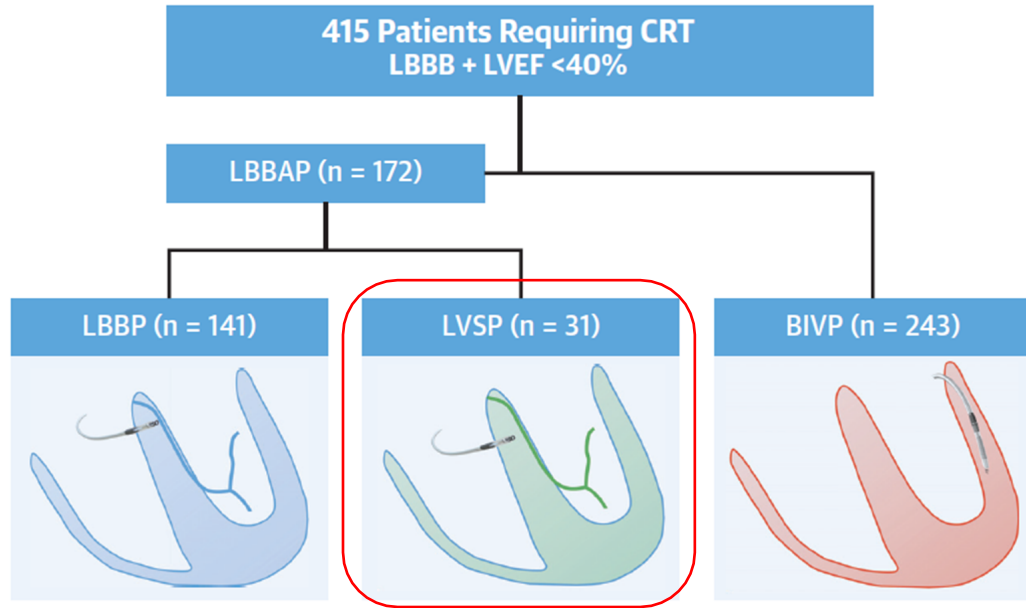
| | | | |
|--------------------------|----------------|-------------|--------|
| Narrow QRS/isolated RBBB | 137.5 (± 19.3) | 136.4–138.7 | <0.001 |
| LBBB/NIVCD/RBBB(+) | 145.3 (± 22.5) | 144.0–146.6 | — |

Paced QRS duration per obtained capture type [ms]

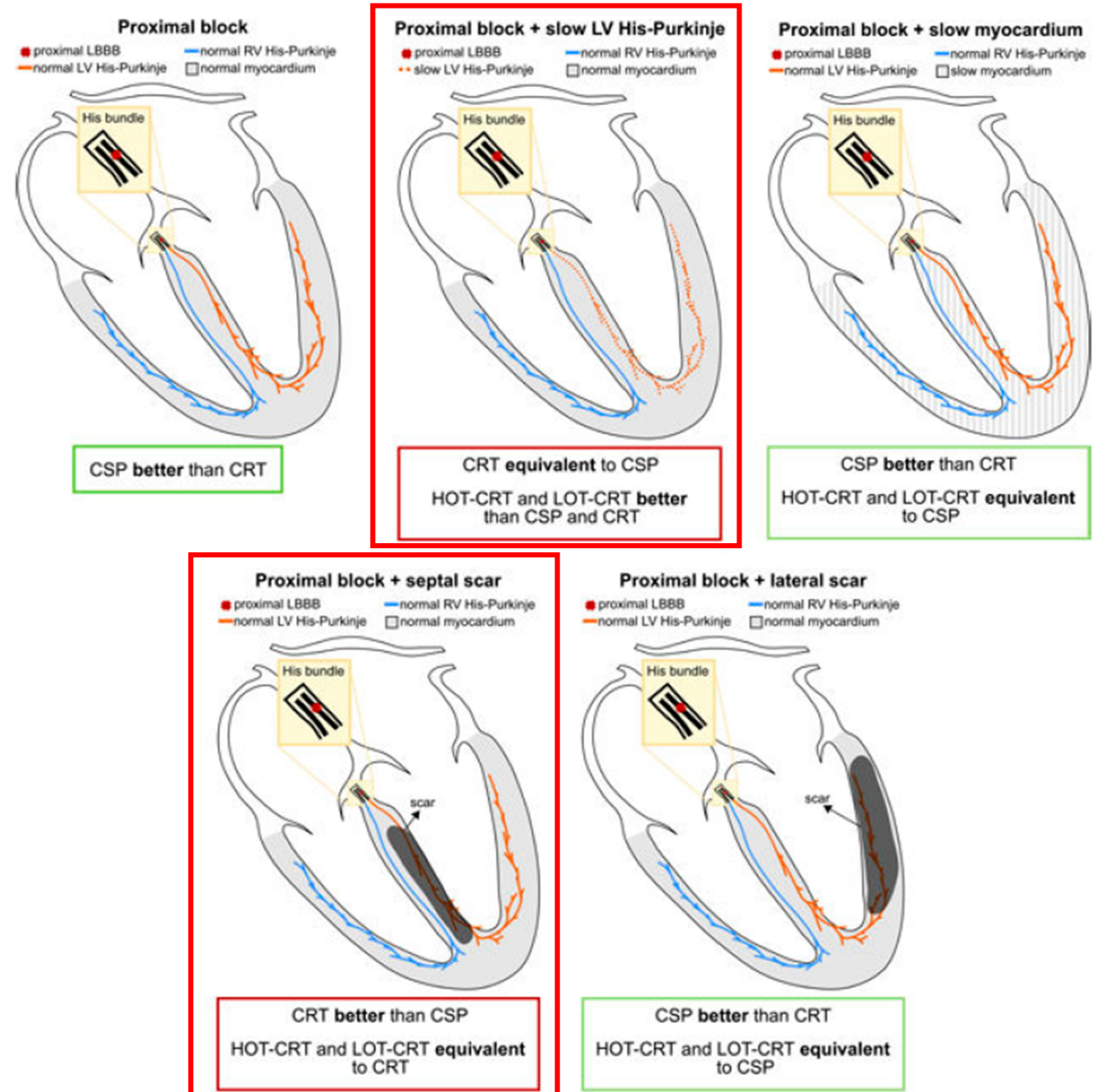
| | | | |
|---------------------------|----------------|-------------|---------------------|
| LBBP | 141.4 (± 16.9) | 138.4–144.4 | <0.001 ^e |
| LBFP (LPFP + LAFP + LSFP) | 139.0 (± 19.0) | 137.8–140.2 | — |
| LVSP | 150.3 (± 22.3) | 148.3–152.3 | — |

C



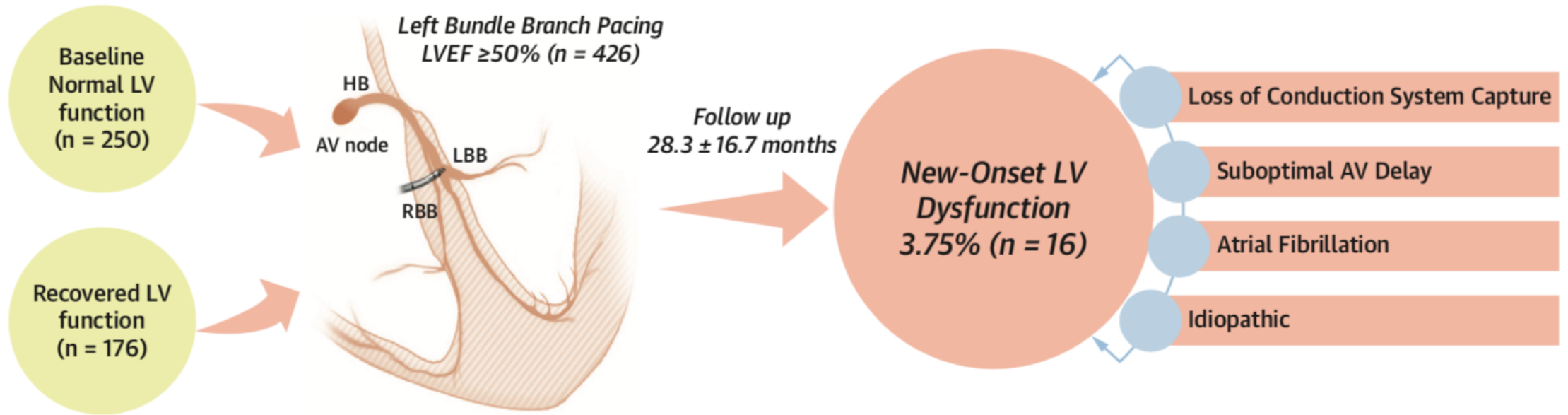


LBBP **POUR** TOUT LE MONDE ?



LBBP POUR La VIE ?

CENTRAL ILLUSTRATION New-Onset LV Dysfunction After Left Bundle Branch Pacing



Ponnusamy SS, et al. JACC Clin Electrophysiol. 2024;10(11):2494-2502.

STIMULATION SANS SONDE

AVEIR™ AR2 Atrial Leadless Pacemaker

As the exclusive provider of atrial leadless pacemakers (LPs), Abbott offers a second-generation atrial device, **AVEIR AR2 Leadless Pacemaker**, with enhanced battery life in the same size, long-term retrievability, and the option to upgrade to dual chamber pacing.^{1,2}

AVEIR™ VR Ventricular Leadless Pacemaker

The **AVEIR VR leadless pacemaker** is the next evolution in ventricular leadless technology that has been designed for long-term retrieval¹, an extended battery life^{4,5}, electrical mapping prior to fixation for optimal device location^{4,6}, and provides an upgradeable platform to later support dual chamber pacing when the patient therapy need evolves.

Medtronic

Leadless pacemakers

Micra™ AV2

and

Micra™ VR2



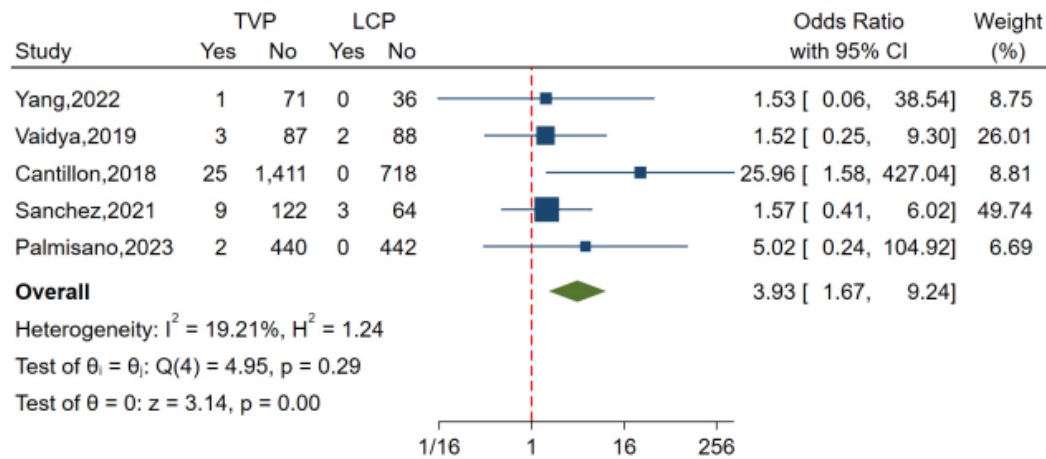
PM CONVENTIONNEL VS. SANS SONDE

Systematic Review

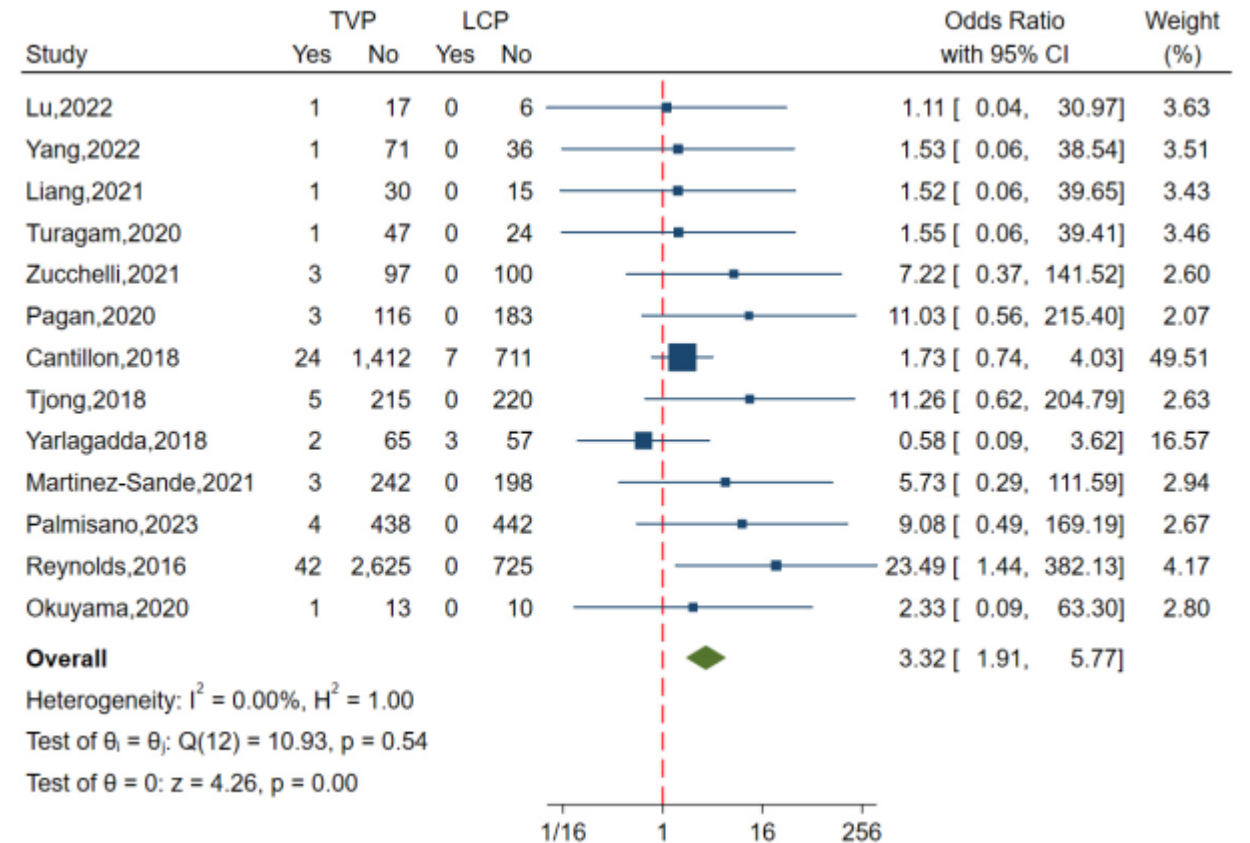
Comparison of Postoperative Outcomes between Leadless and Conventional Transvenous Pacemakers Implantation: An Up-to-Date Meta-analysis

Huimiao Dai^{1,2,†}, Hao Liu^{1,†}, Chuncheng Gao^{1,†}, Jing Han¹, Jun Meng³, Pengyun Liu¹, Mingming Zhang¹, Dongdong Li^{1,*}, Wangang Guo^{1,*}

INFECTIONS



DEPLACEMENT DISPOSITIF/SONDES



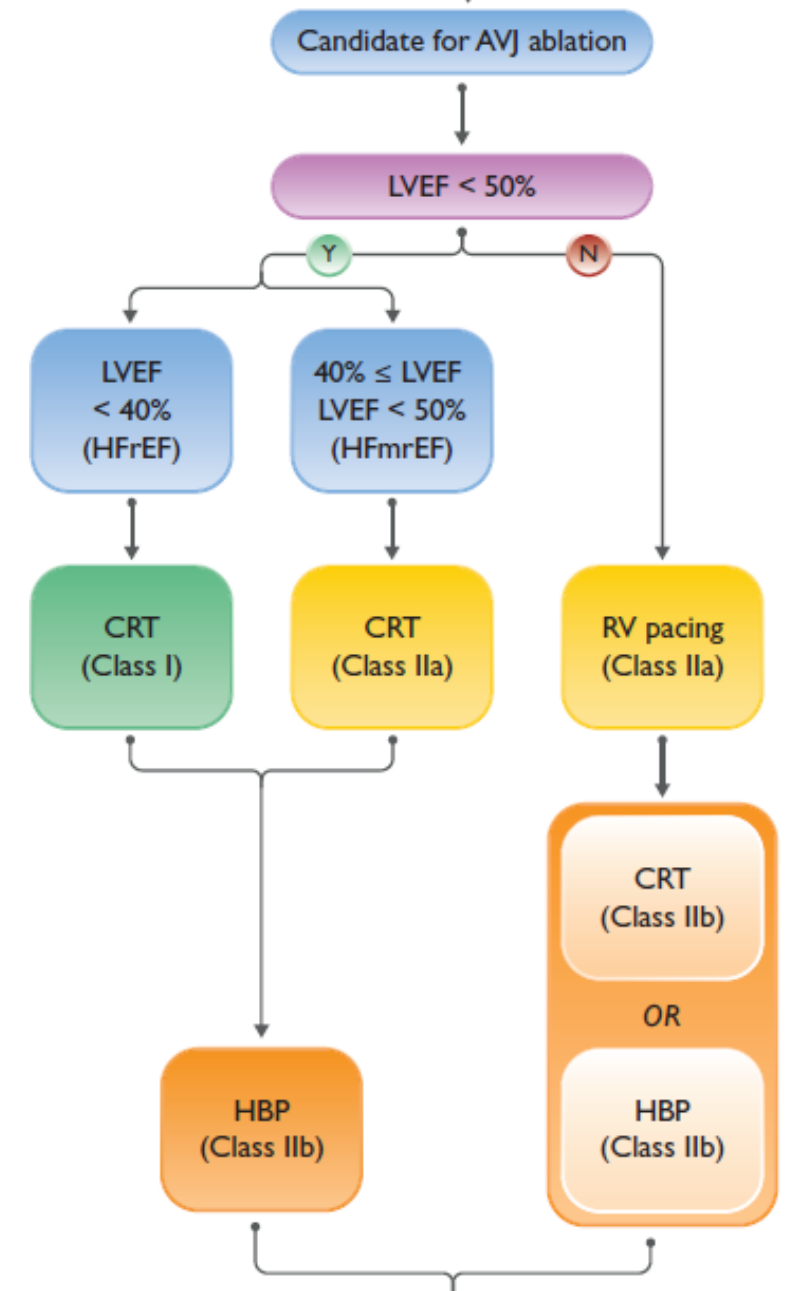
Fixed-effects Mantel-Haenszel model

2021 ESC Guidelines on cardiac pacing and cardiac resynchronization therapy

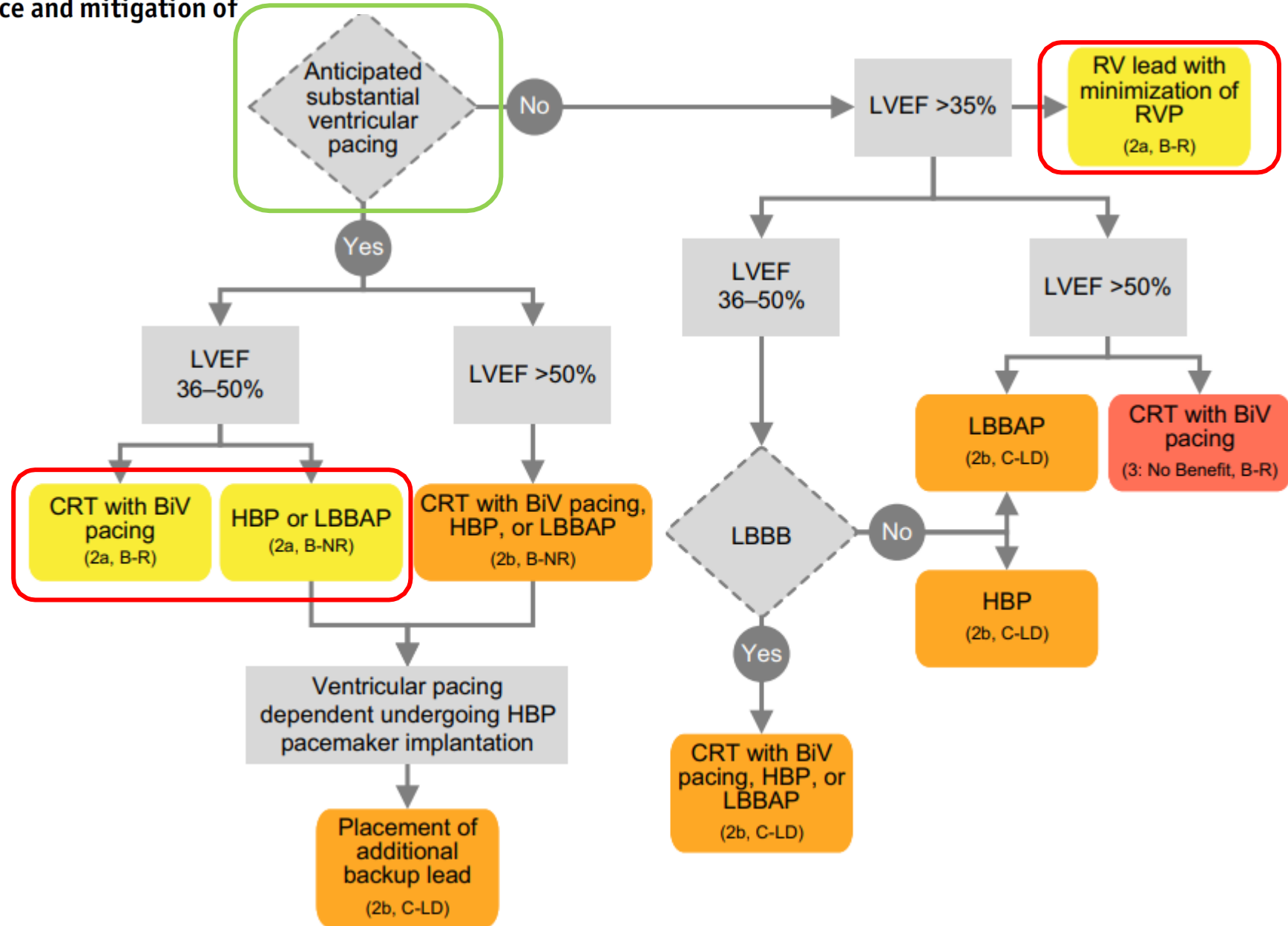
Recommendation for patients with heart failure and atrioventricular block

| Recommendation | Class ^a | Level ^b |
|---|--------------------|--------------------|
| CRT rather than RV pacing is recommended for patients with HFrEF (<40%) regardless of NYHA class who have an indication for ventricular pacing and high-degree AVB in order to reduce morbidity. This includes patients with AF. ^{183,190,196,268,313,323,357–359,361,362} | I | A |
| HBP may be considered as an alternative to RV pacing in patients with AVB and LVEF >40%, who are anticipated to have >20% ventricular pacing. ^{42,433} | IIb | C |

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2023 HRS/APHRS/LAHRs guideline on cardiac physiologic pacing for the avoidance and mitigation of heart failure



CONCLUSION

La stimulation conventionnelle VD a encore de beaux jours ...