



KDY VYBRAT KTEROU METODU RESYNCHRONIZACE?

Alan Bulava

I. Interní klinika – kardiologická, FN Olomouc

LF UP Olomouc

ZSF JU v Českých Budějovicích



FAKULTNÍ NEMOCNICE®
OLOMOUC



Lékařská
fakulta
Univerzita Palackého
v Olomouci



KOMPLEXNÍ
KARDIOVASKULÁRNÍ CENTRUM
FAKULTNÍ NEMOCNICE OLOMOUC



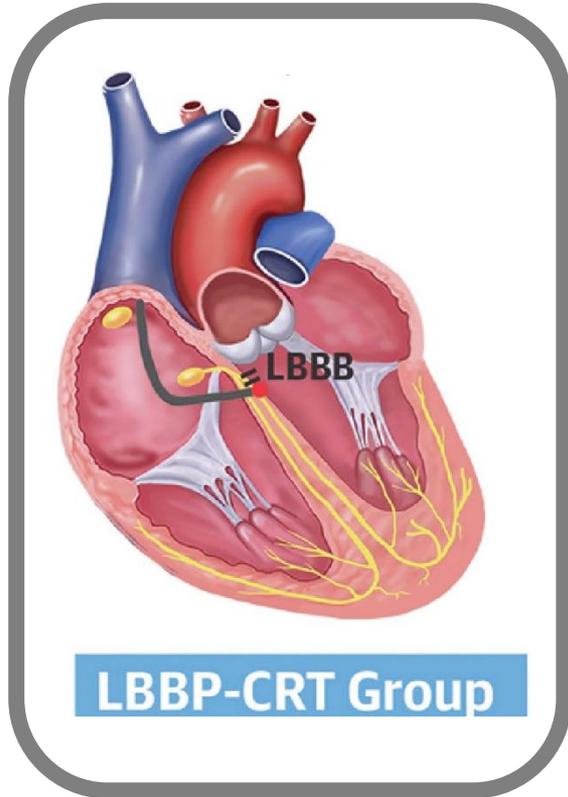
Zdravotně
sociální fakulta
Faculty of Health
and Social Sciences

Jihočeská univerzita
v Českých Budějovicích
University of South Bohemia
in České Budějovice

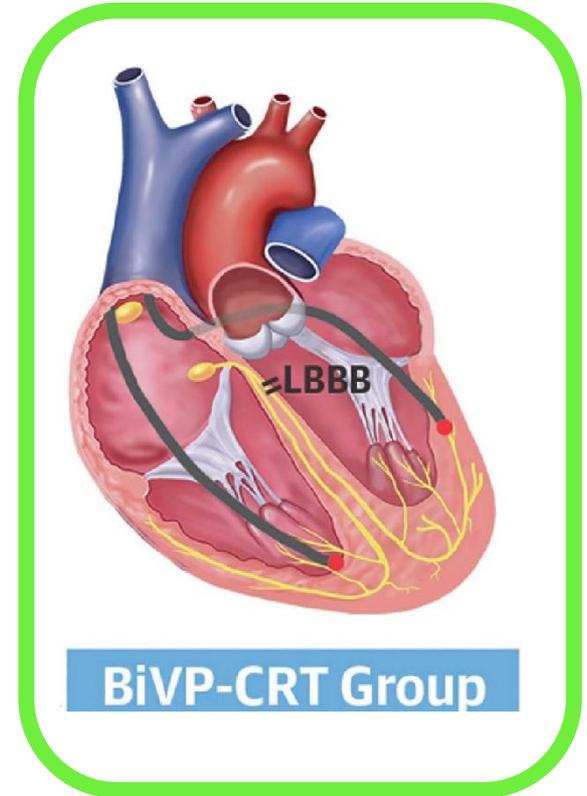
Změna nomenklatury

- CRT (SRL) \neq biventrikulární stimulace
- CRT = biv nebo LBBAP (korektivní stimulace)
- ?: Stupeň resynchronizace LKS u LBBB/IVCD při použití jednotlivých metod
- ?: Evidence technického úspěchu, klinického benefitu a bezpečnosti

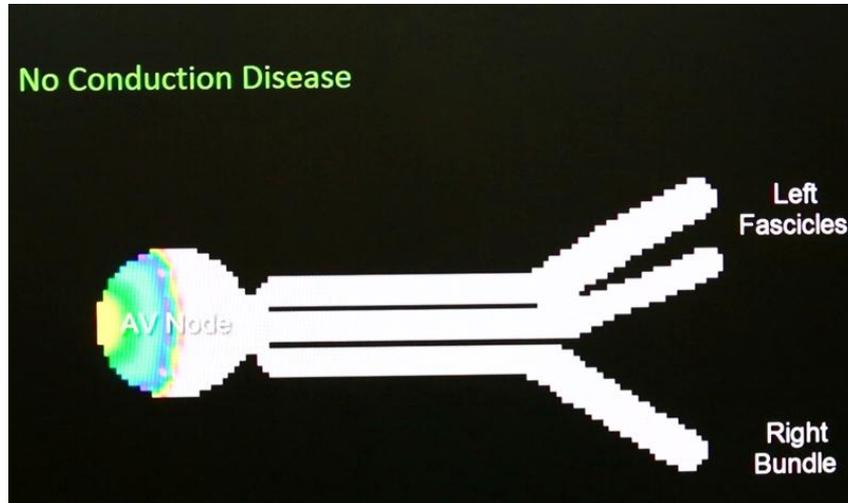
LBBAP vs. Biv?

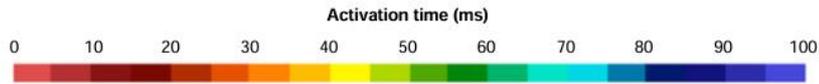


Class I, LoEA



Funkční longitudinální disociace





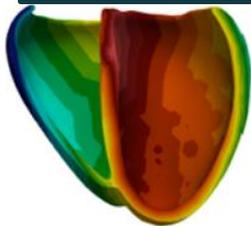
LBBB



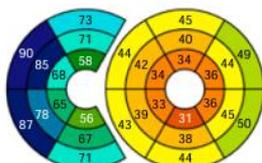
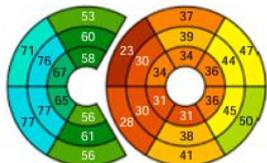
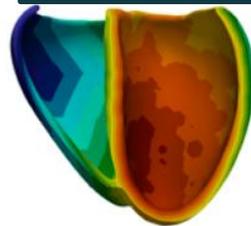
BiV



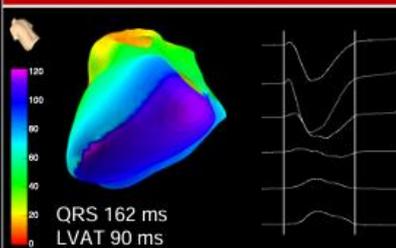
ns-LBBP



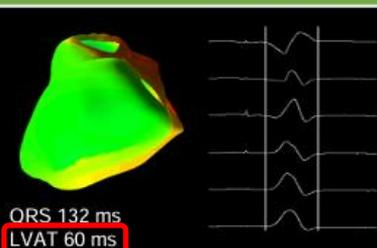
s-LBBP



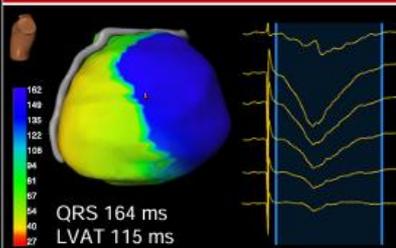
A Left bundle branch block



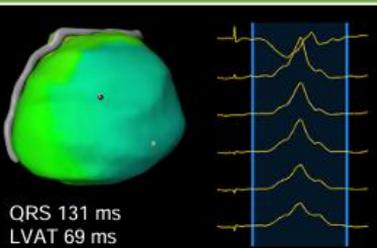
Left bundle branch pacing



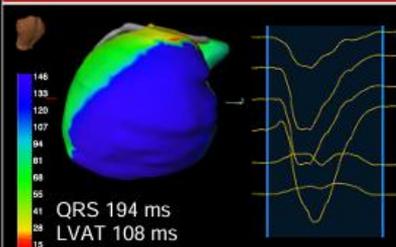
B Right ventricular pacing



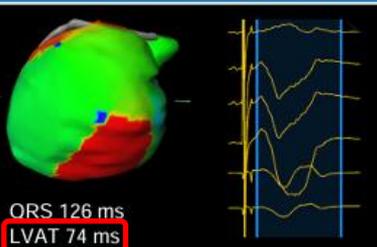
Left bundle branch pacing



C Left bundle branch block



Biventricular pacing



Cardiac resynchronization therapy

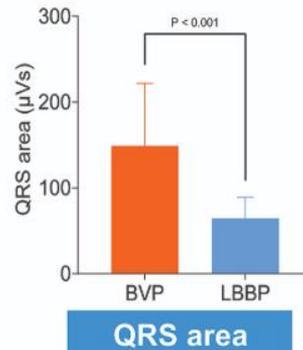
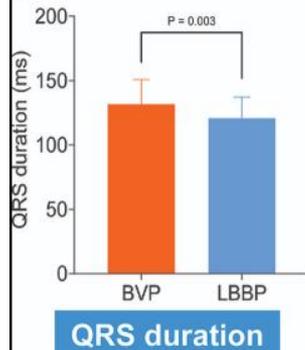


LBBP delivers greater acute electrical and mechanical resynchronization and hemodynamic improvement than BVP in predominantly nonischemic heart failure patients with LBBB

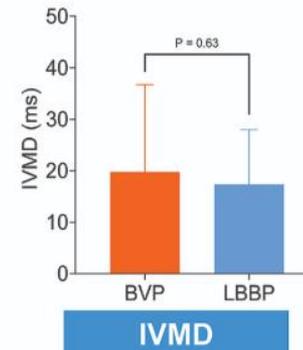
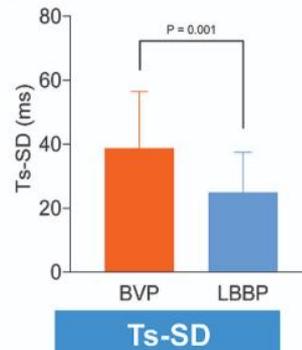
BVP

LBBP

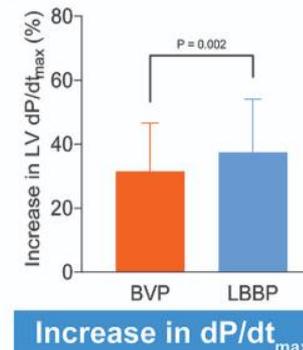
Electrical synchrony



Mechanical synchrony



Hemodynamics



N=25 s LBBB (neischemická etio) ale 1 neúsp. LBBP, 4 nedokončili měření...21 pacientů – cross-over design

Metaanalýza 12 studií

N = 3004 pacientů

Table 1 Study characteristics

First author, year	Study design	Country of origin	Total cohort	LBBAP	BiVP	Mean follow-up duration (mo)	CRT criteria used	NOS score
Guo et al, 2020 ⁶	Prospective	China	42	21	21	14.3	QRSd ≥150 ms, typical LBBB	8
Li et al, 2020 ⁷	Prospective	China	81	27	54	6	LBBB (QRSd N/A)	7
Wang et al, 2020 ⁸	Prospective	China	40	10	30	6	QRSd >140 ms (men) and >130 ms (women), typical LBBB	7
Wu et al, 2021 ⁹	Prospective	China	86	32	54	12	Typical LBBB (QRSd N/A)	8
Liu et al, 2021 ¹⁵	Prospective	China	62	27	35	6	QRSd ≥150 ms, typical LBBB	7
Chen et al, 2022 ¹⁰	Prospective	China	100	49	51	12	QRSd ≥150 ms, typical LBBB	8
Hua et al, 2022 ¹¹	Prospective	China	41	21	20	23.71	QRSd ≥150 ms, typical LBBB	8
Wang et al, 2022 ¹²	RCT	China	40	20	20	6	QRSd >140 ms (men) and >130 ms (women), typical LBBB	N/A
Liang et al, 2022 ¹³	Retrospective	China	491	154	337	31	QRSd ≥130 ms	8
Rademakers et al, 2023 ¹⁴	Prospective	The Netherlands	80	40	40	6	QRSd ≥150 ms, typical LBBB	7
Ezzeddine et al, 2023 ¹⁶	Retrospective	United States, Spain, Canada	169	50	119	8 (LBBAP) and 10 (BiVP)	QRSd ≥120 ms	8
Vijayaraman et al, 2023 ¹⁷	Retrospective	North America, Asia, Europe	1778	797	981	33	NYHA II-IV, LVEF ≤35%, and indication for CRT or expected V-pacing >40%	8

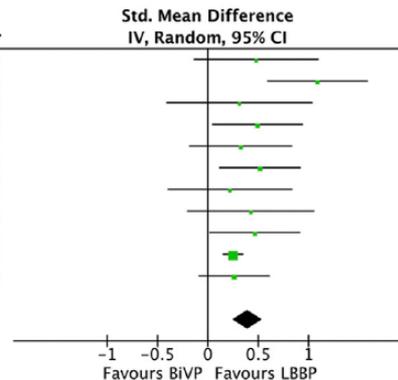
85%

BiVP = biventricular pacing; CRT = cardiac resynchronization therapy; LBBAP = left bundle branch area pacing; LBBB = left bundle branch block; LVEF = left ventricular ejection fraction; N/A = not available/not reported; NOS = Newcastle-Ottawa Scale; NYHA = New York Heart Association; QRSd = QRS duration; RCT = randomized controlled trial.

A Improvement in LVEF

Study or Subgroup	LBBP		BiVP		Total	Weight	Std. Mean Difference IV, Random, 95% CI	Year	
	Mean	SD	Mean	SD					
Guo et al, 2020	20.5	9.6	21	15.4	11.2	21	4.7%	0.48 [-0.13, 1.09]	2020
Li et al, 2020	15.5	6.6	27	7.8	7.2	54	6.8%	1.09 [0.60, 1.58]	2020
Wang et al, 2020	18.9	6.7	10	13	20.8	30	3.5%	0.31 [-0.41, 1.03]	2020
Wu et al, 2021	24	12.1	32	16.8	15.7	54	8.1%	0.49 [0.05, 0.94]	2020
Liu et al, 2021	17.2	9.3	27	13.7	11.5	35	6.5%	0.33 [-0.18, 0.83]	2021
Chen et al, 2022	20.9	11.8	49	15.2	10	51	9.5%	0.52 [0.12, 0.92]	2022
Hua et al, 2022	15.7	14.6	21	12.8	11.1	20	4.7%	0.22 [-0.40, 0.83]	2022
Wang et al, 2022	21.1	14.2	20	15.6	10.9	20	4.5%	0.43 [-0.20, 1.05]	2022
Rademakers et al, 2022	15.2	11.7	40	9.6	12.1	40	8.0%	0.47 [0.02, 0.91]	2022
Vijayaraman et al, 2023	13	12	797	10	12	981	32.1%	0.25 [0.16, 0.34]	2023
Ezzeddine et al, 2023	10	12.5	44	7.3	9.4	119	11.6%	0.26 [-0.09, 0.61]	2023
Total (95% CI)			1088			1425	100.0%	0.40 [0.25, 0.54]	

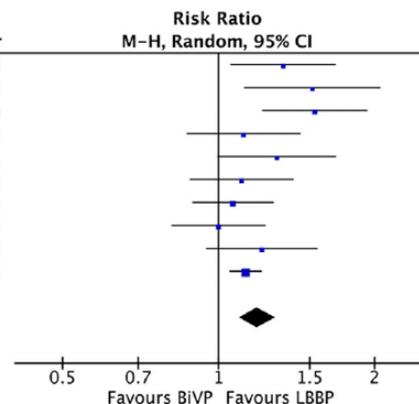
Heterogeneity: Tau² = 0.01; Chi² = 13.91, df = 10 (P = 0.18); I² = 28%
 Test for overall effect: Z = 5.44 (P < 0.00001)



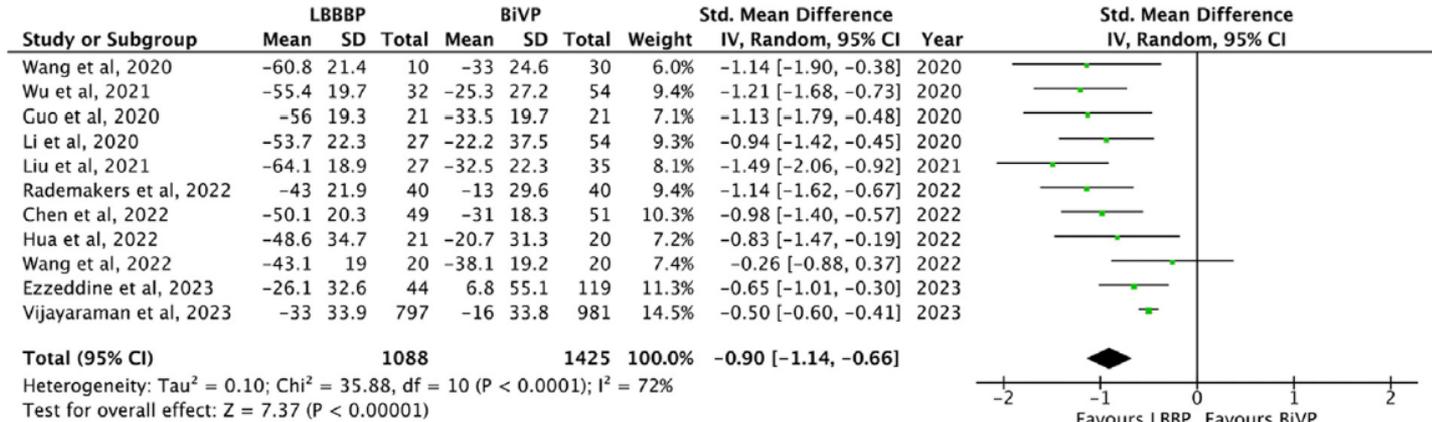
B Echocardiographic response rate

Study or Subgroup	LBBP		BiVP		Total	Weight	Risk Ratio M-H, Random, 95% CI	Year
	Events	Total	Events	Total				
Li et al, 2020	24	27	36	54	8.5%	1.33 [1.06, 1.68]	2020	
Wang et al, 2020	10	10	19	30	5.8%	1.52 [1.12, 2.05]	2020	
Wu et al, 2021	30	32	33	54	8.5%	1.53 [1.22, 1.93]	2020	
Guo et al, 2020	19	21	17	21	7.6%	1.12 [0.87, 1.43]	2020	
Liu et al, 2021	24	27	24	35	7.1%	1.30 [1.00, 1.68]	2021	
Rademakers et al, 2022	25	29	28	36	8.7%	1.11 [0.88, 1.39]	2022	
Chen et al, 2022	42	49	41	51	12.0%	1.07 [0.89, 1.27]	2022	
Wang et al, 2022	18	20	18	20	9.9%	1.00 [0.81, 1.23]	2022	
Ezzeddine et al, 2023	32	44	57	95	7.9%	1.21 [0.95, 1.55]	2023	
Vijayaraman et al, 2023	492	667	495	757	23.9%	1.13 [1.05, 1.21]	2023	
Total (95% CI)		926		1153	100.0%	1.19 [1.10, 1.29]		

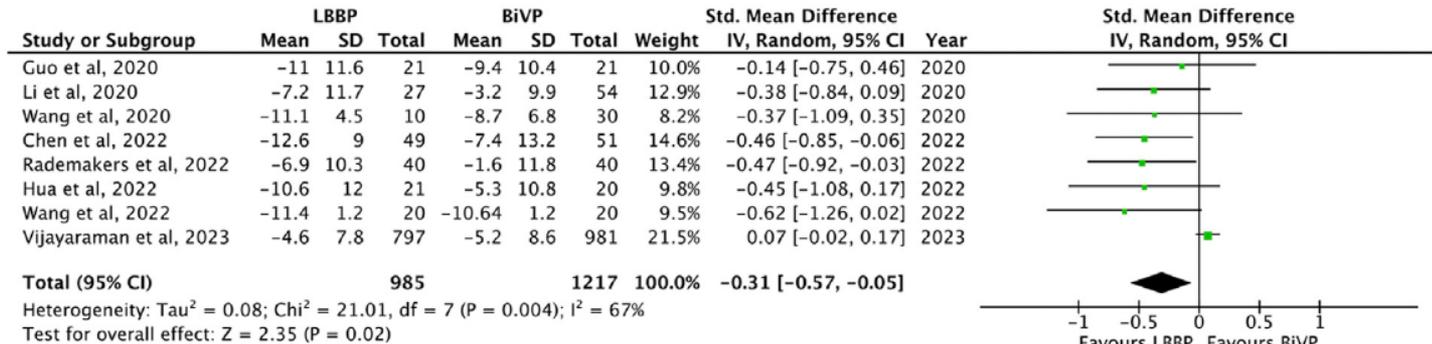
Total events: LBBP 716, BiVP 768
 Heterogeneity: Tau² = 0.01; Chi² = 14.67, df = 9 (P = 0.10); I² = 39%
 Test for overall effect: Z = 4.22 (P < 0.00001)



A Reduction in QRS duration

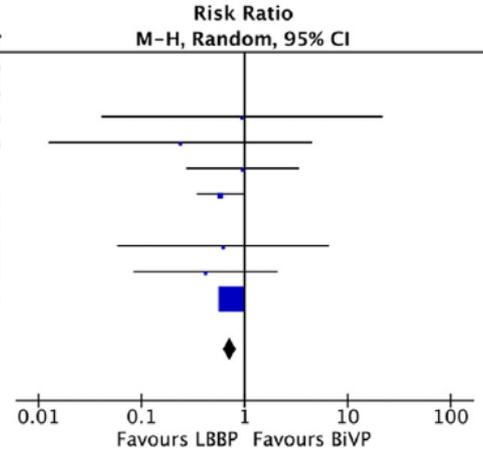


B Reduction in LVEDD



C Hospitalization for heart failure exacerbation

Study or Subgroup	LBBP		BiVP		Weight	Risk Ratio		Year
	Events	Total	Events	Total		M-H, Random, 95% CI		
Guo et al, 2020	0	21	0	21		Not estimable		2020
Li et al, 2020	0	27	0	54		Not estimable		2020
Wang et al, 2020	0	10	1	30	0.3%	0.94 [0.04, 21.40]		2020
Wu et al, 2021	0	32	3	54	0.3%	0.24 [0.01, 4.47]		2020
Hua et al, 2022	4	21	4	20	1.6%	0.95 [0.27, 3.30]		2022
Liang et al, 2022	16	154	60	337	9.2%	0.58 [0.35, 0.98]		2022
Wang et al, 2022	0	20	0	20		Not estimable		2022
Rademakers et al, 2022	1	29	2	36	0.4%	0.62 [0.06, 6.51]		2022
Chen et al, 2022	2	49	5	51	1.0%	0.42 [0.08, 2.05]		2022
Vijayaraman et al, 2023	166	797	275	981	87.2%	0.74 [0.63, 0.88]		2023
Total (95% CI)		1160		1604	100.0%	0.72 [0.62, 0.85]		
Total events	189		350					
Heterogeneity: Tau ² = 0.00; Chi ² = 2.02, df = 6 (P = 0.92); I ² = 0%								
Test for overall effect: Z = 4.04 (P < 0.0001)								



D All-cause mortality

Study or Subgroup	LBBP		BiVP		Weight	Risk Ratio		Year
	Events	Total	Events	Total		M-H, Random, 95% CI		
Wang et al, 2020	0	10	0	30		Not estimable		2020
Hua et al, 2022	1	21	1	20	0.7%	0.95 [0.06, 14.22]		2022
Rademakers et al, 2022	2	40	2	40	1.4%	1.00 [0.15, 6.76]		2022
Wang et al, 2022	0	20	0	20		Not estimable		2022
Chen et al, 2022	0	49	0	51		Not estimable		2022
Vijayaraman et al, 2023	99	797	168	981	97.9%	0.73 [0.58, 0.91]		2023
Total (95% CI)		937		1142	100.0%	0.73 [0.58, 0.92]		
Total events	102		171					
Heterogeneity: Tau ² = 0.00; Chi ² = 0.14, df = 2 (P = 0.93); I ² = 0%								
Test for overall effect: Z = 2.71 (P = 0.007)								

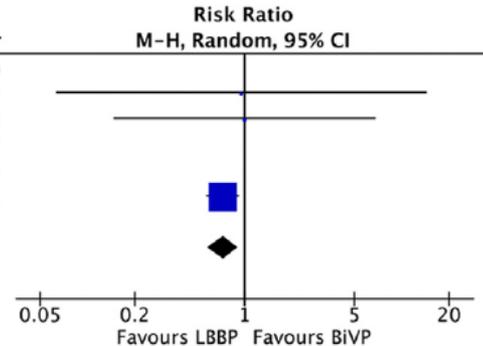


Table 2 Baseline patient and procedural characteristics

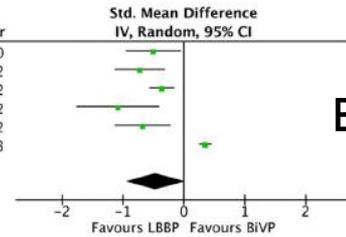
First Author, Year	Female (%)	Intervention	Age (y)	HTN	DM	AF	NICM	LVEF (%)	LVEDD (mm)	NYHA functional class	ACE inhibitor	BB	QRSd (ms)	Procedure time (min)	Fluoroscopy time (min)	Implant success	Reported Complications)
Guo et al, 2020 ⁶	24 (57)	LBBAP	66.1 ± 9.7	9 (43)	8 (38)	3 (14)	19 (90)	30.0 ± 5.0	64.9 ± 7.2	3.0 ± 0.7	19 (90)	20 (95)	167.7 ± 14.9	N/A	17.9 ± 7.1	21 (87)	Transient third-degree AVB 4 (19)
		BiVP	65.1 ± 7.5	7 (33)	1 (5)	1 (5)	19 (90)	29.8 ± 4.1	66.7 ± 5.4	3.0 ± 0.7	19 (90)	21 (100)	163.6 ± 13.8	N/A	37.8 ± 14.2	N/A	Transient third-degree AVB 1 (5)
Li et al, 2020 ⁷	34 (42)	LBBAP	57.5 ± 9.8	7 (28)	4 (16)	5 (20)	23 (85)	28.8 ± 4.5	66.5 ± 8.0	3.1 ± 0.7	27 (100)	25 (93)	178.2 ± 18.8	N/A	16.9 ± 6.4	30 (81)	N/A
		BiVP	58.5 ± 8.5	3 (25)	2 (17)	2 (17)	46 (87)	27.2 ± 4.9	69.4 ± 5.1	3.0 ± 0.7	54 (100)	53 (98)	180.9 ± 29.7	N/A	39.6 ± 9.2	N/A	N/A
Wang et al, 2020 ⁸	8 (20)	LBBAP	64.80 ± 7.25	N/A	N/A	N/A	9 (90)	26.80 ± 3.85	68.60 ± 7.15	2.90 ± 0.74	8 (80)	10 (100)	183.6 ± 19.27	N/A	N/A	N/A	N/A
		BiVP	62.93 ± 10.33	N/A	N/A	N/A	27 (90)	26.38 ± 5.27	70.37 ± 7.59	3.07 ± 0.74	26.1 (87)	27 (90)	174.6 ± 19.48	N/A	N/A	N/A	N/A
Wu et al, 2021 ⁹	43 (50)	LBBAP	67.2 ± 13	16 (50)	12 (37)	7 (22)	31 (97)	30.9 ± 7.3	N/A	2.8 ± 0.5	29 (91)	27 (84)	166.2 ± 16.2	98.4 ± 36.5	5.2 ± 4.1	N/A	N/A
		BiVP	68.3 ± 10	27 (50)	16 (30)	11 (20)	47 (87)	30.0 ± 6.2	N/A	2.8 ± 0.6	49 (91)	48 (89)	161.1 ± 18.2	122.7 ± 53.5	10.3 ± 4.4	N/A	N/A
Liu et al, 2021 ¹⁵	28 (45)	LBBAP	65.5 ± 8.8	11 (41)	9 (33)	3 (11)	20 (74)	29.9 ± 4.8	67.9 ± 6.6	3.0 ± 0.5	24 (89)	24 (89)	177.1 ± 16.7	N/A	N/A	27 (79)	N/A
		BiVP	64.3 ± 8.4	16 (46)	8 (23)	4 (11)	27 (87)	29.5 ± 4.9	N/A	2.8 ± 0.6	33 (94)	32 (91)	168.8 ± 16.8	N/A	N/A	N/A	N/A
Chen et al, 2022 ¹⁰	46 (46)	LBBAP	67.14 ± 8.88	14 (29)	12 (24)	N/A	36 (73)	29.05 ± 5.09	67.07 ± 6.67	N/A	48 (98)	48 (98)	180.12 ± 15.79	129.2 ± 31.7	11.9 ± 5.8	N/A	RBB injury 10 (20)
		BiVP	64.37 ± 8.74	16 (31)	10 (20)	N/A	41 (80)	28.36 ± 5.30	68.38 ± 7.81	N/A	50 (98)	51 (100)	175.70 ± 11.29	155.9 ± 40.7	18.7 ± 10.1	N/A	LV lead dislodgement 1 (2)
Hua et al, 2022 ¹¹	11 (27)	LBBAP	65.50 ± 6.91	6 (28.57)	7 (33.33)	5 (23.81)	20 (95.24)	30.05 ± 7.03	68.05 ± 10.30	3.00 ± 0.71	18 (85.71)	18 (86)	177.91 ± 14.67	104.2 ± 7.4	9.5 ± 2.0	N/A	N/A
		BiVP	67.50 ± 11.69	11 (55)	5 (25)	4 (20)	17 (85)	31.40 ± 9.30	66.60 ± 11.50	3.05 ± 0.89	18 (90)	17 (85)	177.50 ± 16.99	127.8 ± 24.7	13.8 ± 5.5	N/A	N/A
Wang et al, 2022 ¹²	20 (50)	LBBAP	62.3 ± 11.2	N/A	N/A	N/A	20 (100)	28.3 ± 5.3	66.4 ± 8.1	2.40 ± 0.50	18 (90)	19 (95)	174.6 ± 14.3	129.2 ± 31.7	11.9 ± 5.8	18 (90)	Lead dislodgement 1 (5)
		BiVP	65.3 ± 10.6	N/A	N/A	N/A	20 (100)	31.1 ± 5.6	66.4 ± 9.8	2.45 ± 0.51	19 (95)	19 (95)	174.7 ± 14.1	155.9 ± 40.1	18.7 ± 10.1	16 (80)	Pneumothorax 1 (5)
Liang et al, 2022 ¹³	160 (33)	LBBAP	67 (61-73)	67 (44)	34 (22)	46 (30)	126 (82)	32 (28-37)	66 (60-73)	N/A	142 (92)	120 (78)	160 (150-180)	110.5 ± 35.7	14.6 ± 6.8	141 (94)	N/A
		BiVP	63 (55-69)	130 (39)	79 (23)	70 (21)	304 (90)	30 (25-36)	68 (61-75)	N/A	293 (87)	258 (77)	160 (150-180)	123.5 ± 42.6	19.3 ± 16.5	N/A	N/A
Rademakers et al, 2023 ¹⁴	34 (42)	LBBAP	68 ± 13	34 (85)	8 (20)	9 (23)	29 (72)	28 ± 8	60 ± 10	2.8 ± 0.5	38 (95)	37 (93)	166 ± 15	109 ± 32	14 ± 10	31 (78)	None
		BiVP	71 ± 9	32 (80)	9 (23)	13 (33)	26 (65)	31 ± 6	61 ± 9	2.7 ± 0.6	37 (93)	38 (95)	159 ± 16	137 ± 48	15 ± 10	N/A	N/A
Ezzeddine et al, 2023 ¹⁶	66 (28)	LBBAP	N/A	N/A	N/A	N/A	N/A	31.4 ± 8.9	59.3 ± 7.9	N/A	N/A	N/A	150.5 ± 34	N/A	N/A	N/A	Lead revision 1 (2.1)
		BiVP	70.6 ± 11.9	89 (75)	46 (39)	58 (49)	87 (73)	34.6 ± 12	58.2 ± 8.8	N/A	64 (54)	94 (79)	150.5 ± 34	N/A	N/A	N/A	Lead revision 11 (9.2)
Vijayarman et al, 2023 ¹⁷	575 (32)	LBBAP	69 ± 12	529 (66)	317 (40)	286 (36)	479 (60)	27.5 ± 6.2	60 ± 9	2.8 ± 0.6	325 (41)	716 (90)	160 ± 28	142 ± 55	17 ± 15	N/A	Pericardial effusion 4 (0.5), pneumothorax 3 (0.4), lead dislodgement 13 (1.6), infection 6 (0.8)
		BiVP	68 ± 12	614 (63)	381 (39)	364 (37)	550 (56)	26.6 ± 6.4	63 ± 9	2.7 ± 0.6	412 (42)	871 (89)	160 ± 24	124 ± 48	16 ± 12	N/A	Pericardial effusion 10 (1), pneumothorax 5 (0.5), lead dislodgement 34 (3.5), infection 21 (2.1)

78-94% úspěšnost LBBAP (MELOS: 82-92%) vs. ≈95-98% biv.

A Procedural duration

Study or Subgroup	LBBP			BIVP			Weight	Std. Mean Difference IV, Random, 95% CI	Year
	Mean	SD	Total	Mean	SD	Total			
Wu et al, 2021	98.4	36.5	32	122.7	53.5	54	16.3%	-0.50 [-0.95, -0.06]	2020
Chen et al, 2022	129.2	31.7	49	155.9	40.7	51	16.7%	-0.72 [-1.13, -0.32]	2022
Liang et al, 2022	110.5	35.7	154	123.5	35.7	337	18.3%	-0.36 [-0.56, -0.17]	2022
Wang et al, 2022	104.2	17.3	20	127.8	24.7	20	13.9%	-1.08 [-1.75, -0.42]	2022
Rademakers et al, 2022	109	32	40	137	48	40	16.2%	-0.68 [-1.13, -0.23]	2022
Vijayaraman et al, 2023	142	55	797	124	48	981	18.7%	0.35 [0.26, 0.45]	2023
Total (95% CI)	1092			1483			100.0%	-0.46 [-0.95, 0.02]	

Heterogeneity: Tau² = 0.33; Chi² = 96.16, df = 5 (P < 0.00001); I² = 95%
Test for overall effect: Z = 1.87 (P = 0.06)

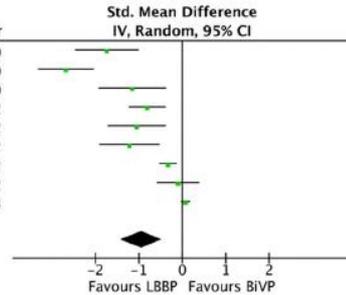


Biv v Číně více než 2H!!!

B Fluoroscopy time

Study or Subgroup	LBBP			BIVP			Weight	Std. Mean Difference IV, Random, 95% CI	Year
	Mean	SD	Total	Mean	SD	Total			
Guo et al, 2020	17.9	7.1	21	37.8	14.2	21	10.0%	-1.74 [-2.46, -1.02]	2020
Li et al, 2020	16.9	6.4	27	39.6	9.2	54	10.6%	-2.68 [-3.31, -2.06]	2020
Wu et al, 2021	5.2	4.1	10	10.3	4.4	30	9.7%	-1.15 [-1.92, -0.39]	2020
Chen et al, 2022	11.9	5.7	49	18.6	10.1	51	11.9%	-0.81 [-1.21, -0.40]	2022
Hua et al, 2022	9.5	1.9	21	13.8	5.4	20	10.4%	-1.05 [-1.71, -0.39]	2022
Wang et al, 2022	20.1	6	20	26.5	4.1	20	10.2%	-1.22 [-1.90, -0.54]	2022
Liang et al, 2022	14.6	6.8	154	19.3	16.5	337	12.7%	-0.33 [-0.52, -0.14]	2022
Rademakers et al, 2022	14	10	31	15	10	38	11.5%	-0.10 [-0.57, 0.38]	2022
Vijayaraman et al, 2023	17	15	797	16	12	981	13.0%	0.07 [-0.02, 0.17]	2023
Total (95% CI)	1130			1552			100.0%	-0.94 [-1.42, -0.47]	

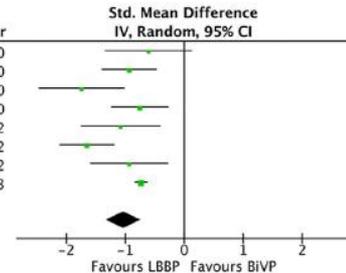
Heterogeneity: Tau² = 0.45; Chi² = 140.28, df = 8 (P < 0.00001); I² = 94%
Test for overall effect: Z = 3.92 (P < 0.0001)



C Pacing threshold at implantation

Study or Subgroup	LBBP			BIVP			Weight	Std. Mean Difference IV, Random, 95% CI	Year
	Mean	SD	Total	Mean	SD	Total			
Wang et al, 2020	0.69	0.26	10	0.92	0.4	30	9.0%	-0.61 [-1.34, 0.12]	2020
Wu et al, 2021	0.49	0.13	32	0.93	0.58	54	13.8%	-0.93 [-1.39, -0.47]	2020
Guo et al, 2020	0.48	0.22	21	1.12	0.46	21	9.2%	-1.74 [-2.46, -1.02]	2020
Li et al, 2020	0.81	0.31	27	1.22	0.62	54	13.4%	-0.75 [-1.23, -0.28]	2020
Wang et al, 2022	0.54	0.11	20	1	0.58	20	10.0%	-1.08 [-1.75, -0.41]	2022
Chen et al, 2022	0.92	0.22	49	1.45	0.39	51	13.8%	-1.65 [-2.11, -1.20]	2022
Hua et al, 2022	0.78	0.22	21	1.03	0.3	20	10.3%	-0.94 [-1.58, -0.29]	2022
Vijayaraman et al, 2023	0.72	0.4	797	1.15	0.7	981	20.5%	-0.73 [-0.83, -0.64]	2023
Total (95% CI)	977			1231			100.0%	-1.03 [-1.32, -0.74]	

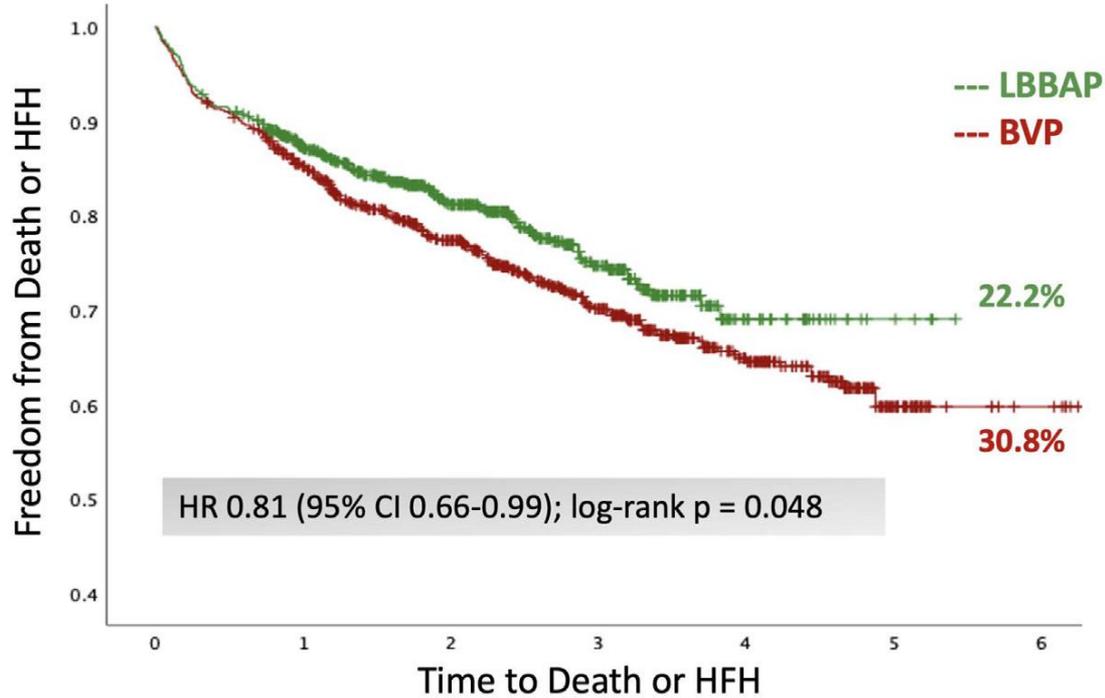
Heterogeneity: Tau² = 0.10; Chi² = 23.18, df = 7 (P = 0.002); I² = 70%
Test for overall effect: Z = 6.93 (P < 0.00001)



International Collaborative LBBAP Study (I-CLAS)

- Multicentrická retrospektivní observační studie
- 18 center (1/2018-6/2023)
- Celkem **2579** pts (BVP, 1118; LBBAP, 1461)
- Propensity match analysis (n=1560; 780 BVP a 780 LBBAP)
- Bez signifikantních rozdílů mezi BVP a LBBAP v:
 - Délka procedury (117 ± 42 min vs 113 ± 45 min; $P = 0,09$)
 - Skia čas ($15,4 \pm 11$ min vs $15,7 \pm 14$ min; $P = 0,59$)
- Akutní stimulační prahy byly nižší u LBBAP ve srovnání s LVp ($0,7 \pm 0,4$ V vs $1,1 \pm 0,6$ V; $P < 0,001$).
- Nižší počet komplikací u LBBAP než u BVP (3,5% vs 6,5%; $P = 0,004$)

Primary Outcome of Death or HFH (PSM, n=1560)

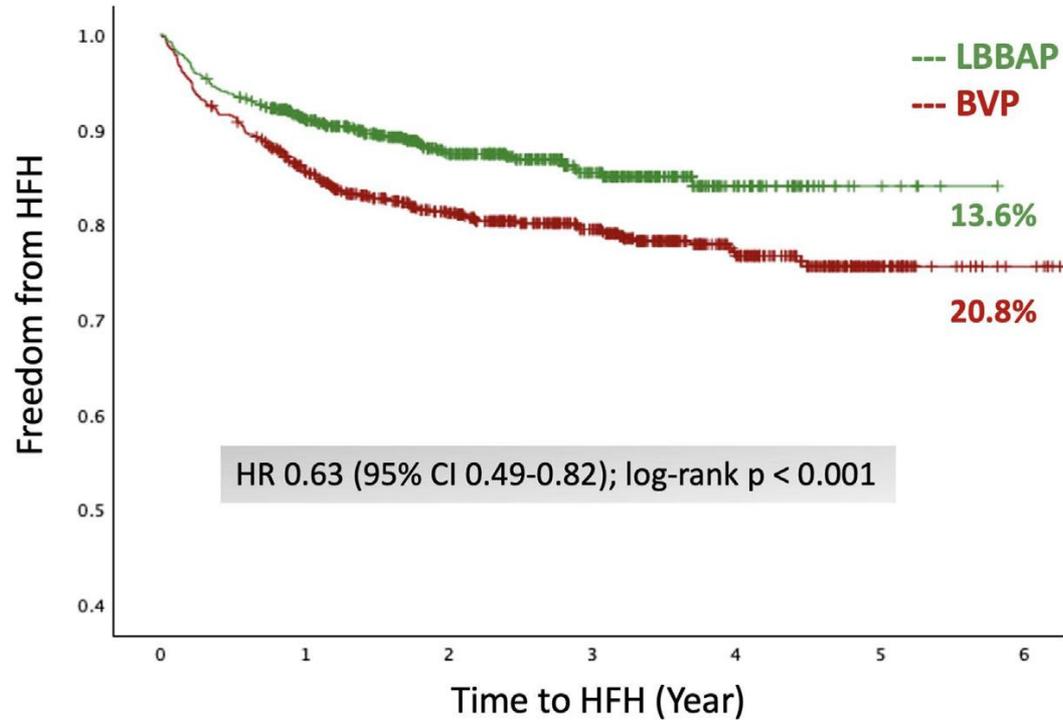


--- LBBAP

--- BVP

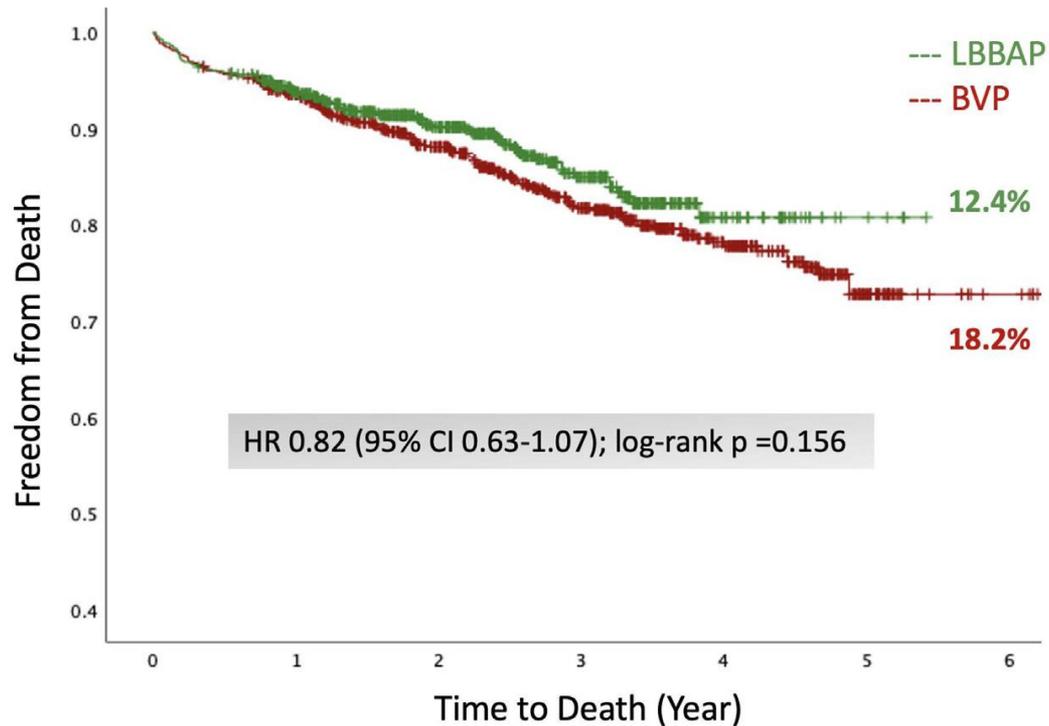
768	602	381	190	35	5	0
770	619	472	315	166	47	9

Heart Failure Hospitalization (PSM, n=1560)



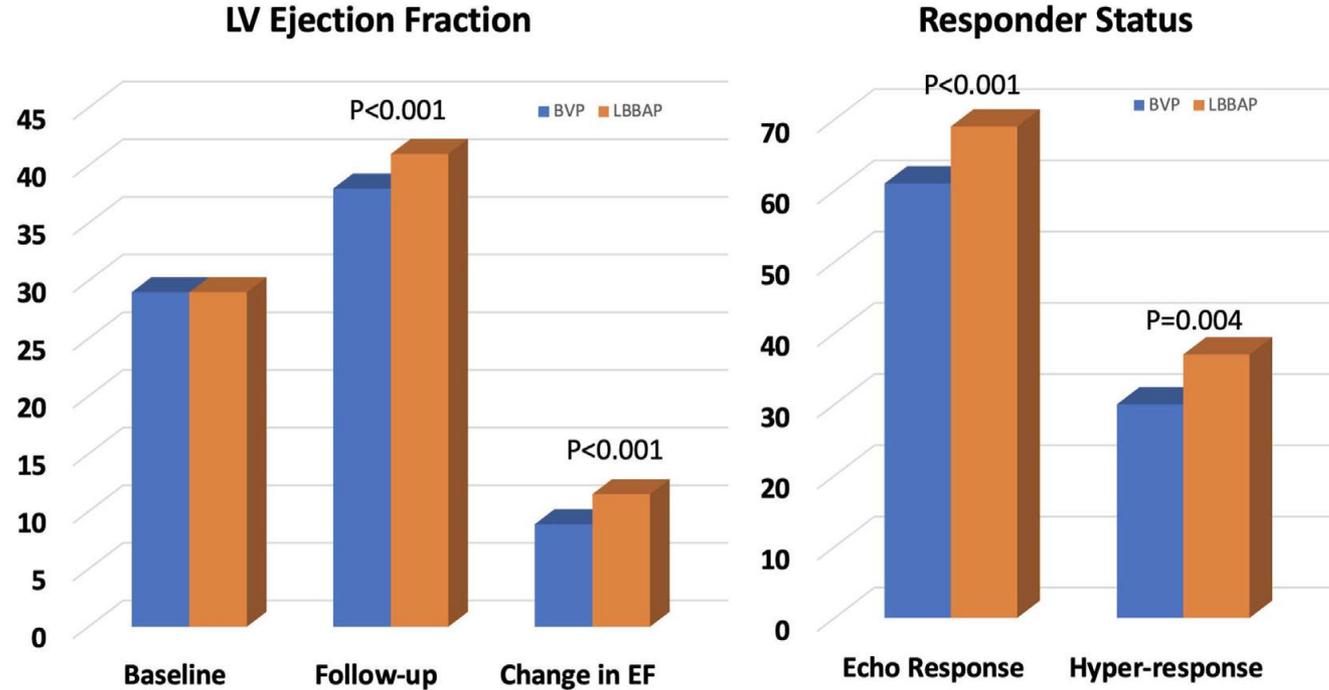
--- LBBAP	771	630	411	221	51	6	0
--- BVP	770	621	495	353	187	54	9

All-Cause Mortality (PSM, n=1560)

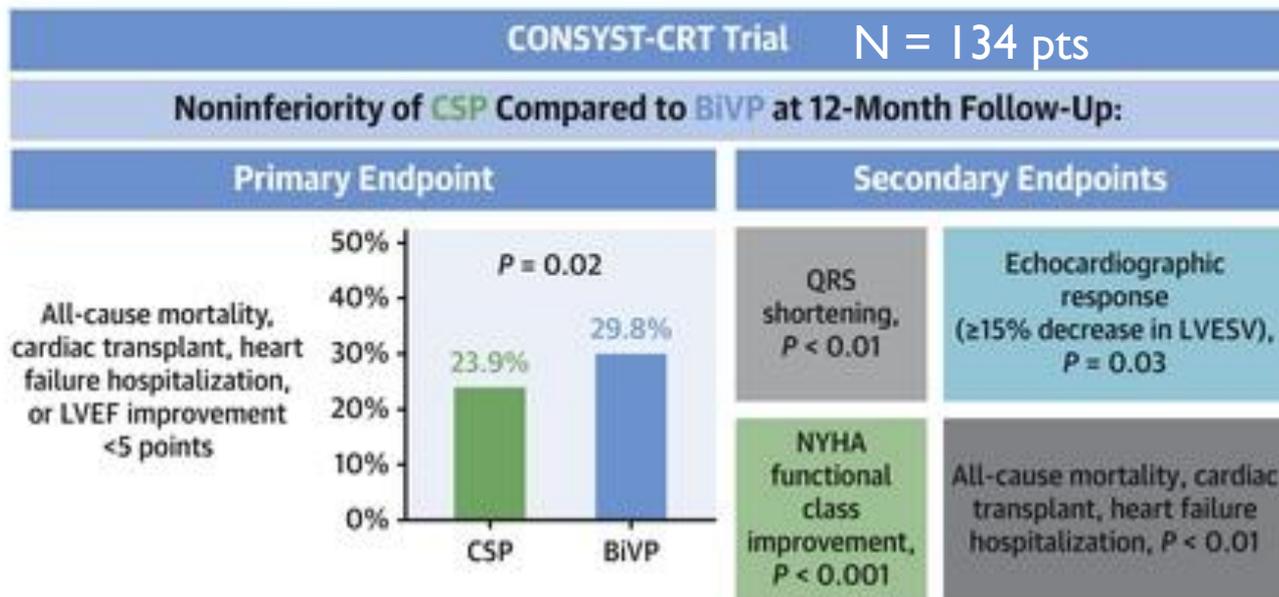


--- LBBAP	775	653	423	211	40	5	0
--- BVP	778	687	537	367	194	53	10

Echocardiographic Outcomes

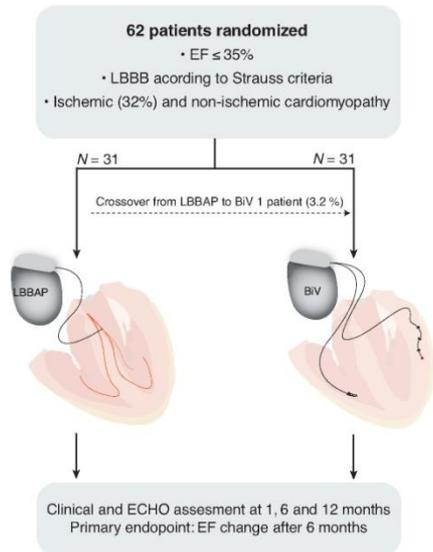


CENTRAL ILLUSTRATION: Primary and Secondary Endpoints of the CONSYST-CRT Trial (Intention-to-Treat)

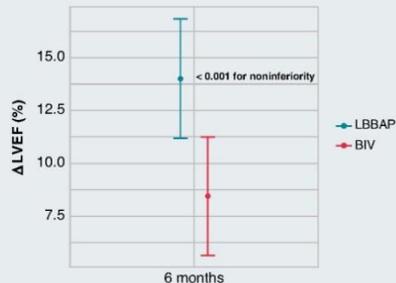


Pujol-López M, et al. JACC Clin Electrophysiol. 2025;11(8):1820-1831.

Conduction system pacing versus biventricular pacing for cardiac resynchronization: The CSP-SYNC randomized single center study



Change of EF after 6 months



Change of EF during 12 months



Table 2 Echocardiographic and electrocardiographic endpoints after 6 months with results of the longitudinal tests with non-inferiority *P*-values and superiority *P*-values. *P*-values are adjusted with Holm's method, and 95% confidence intervals are unadjusted.

	LBBAP Difference (95% CI)	BiV Difference (95% CI)	Mean difference between groups (95% CI)	P-value non-inferiority	P-value superiority
Primary					
Δ LVEF (%)	14.0 (11.2–16.8)	8.5 (5.6–11.2)	5.6 (1.6–9.5)	< 0.001	0.071
Secondary					
Δ LVESV (mL)	–64 (–78 to –50)	–40 (–54 to –25)	–24 (–44 to –4)	< 0.001	0.034
Δ QRS (ms)	–33 (–40 to –26)	–32 (–39 to –25)	–1 (–11 to 9)	0.028	1

LVEF, left ventricular ejection fraction; LVESV, left ventricular end-systolic volume.

HeartSync-LBBB Trial



Results

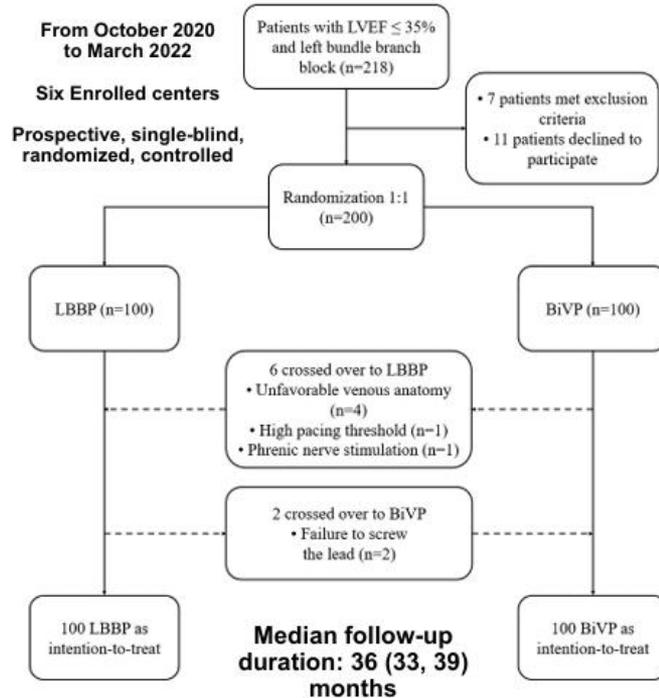


Table 1. Baseline Clinical and Demographic Characteristics of Patients who Underwent

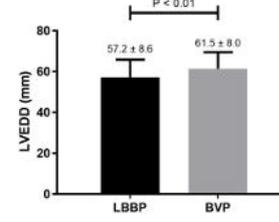
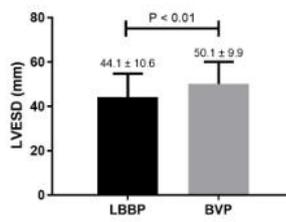
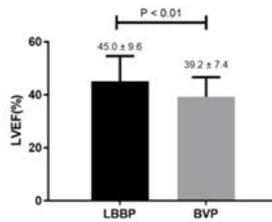
Randomization

	LBBP (n=100)	BiVP (n=100)
Demographics		
Age (years)	64.3 \pm 9.5	65.3 \pm 9.5
Male	67 (67.0%)	69 (69.0%)
Nonischemic cardiomyopathy	84 (84.0%)	81 (81.0%)
Comorbidities		
Hypertension	26 (26.0%)	28 (28.0%)
Diabetes mellitus	21 (21.0%)	23 (23.0%)
Baseline QRS duration (ms)	169.8 \pm 19.0	167.0 \pm 18.0
NYHA class	2.9 \pm 0.5	3.0 \pm 0.6
Echocardiography		
LVEF (%)	28.3 \pm 3.8	28.1 \pm 5.0
LVEDD (mm)	66.1 \pm 7.3	66.9 \pm 7.0
LVESD (mm)	56.6 \pm 8.3	56.9 \pm 8.1
Medications		
ACEI/ARB/ARNI	97 (97.0%)	98 (98.0%)
Beta-blockers	96 (96.0%)	95 (95.0%)
Spirolactone	94 (94.0%)	92 (92.0%)

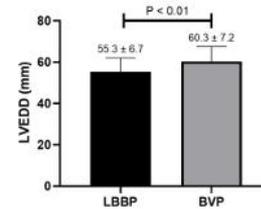
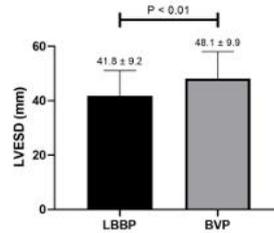
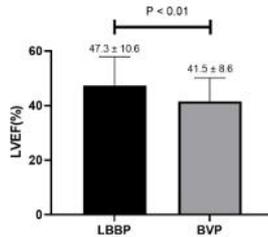
Results



- Echocardiographic measurements between groups at 6-month and last time follow-up.



- 6-month follow-up.

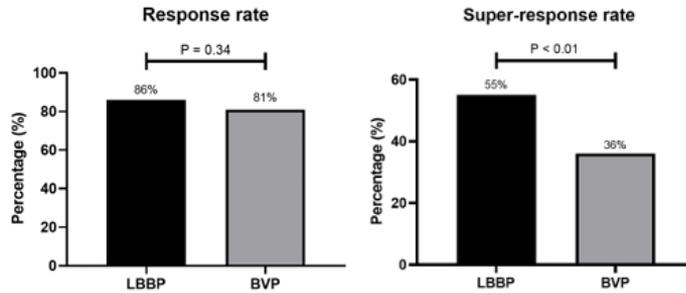


- Last time follow-up.

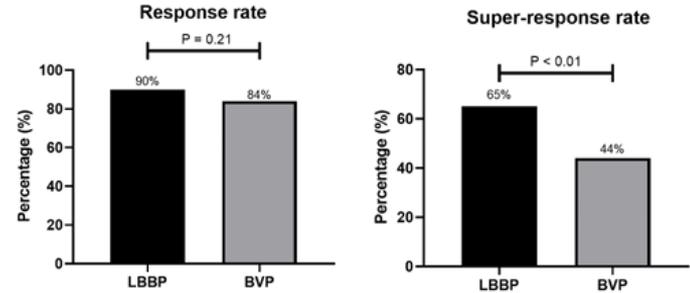
Results



- Response rate and super-response rate at 6-month and last time follow-up.



- 6-month follow-up.



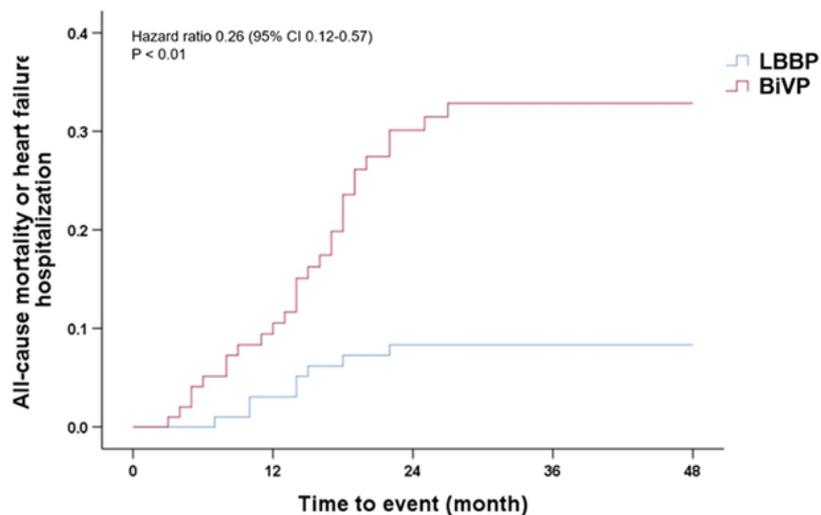
- Last time follow-up.

Primary endpoint



- Intention-to-treat analysis showed that the incidence of the primary endpoint (all-cause mortality and HFH) in LBBP was significantly lower than in BVP ($P < 0.01$).

Median follow-up duration: 36 (33, 39) months



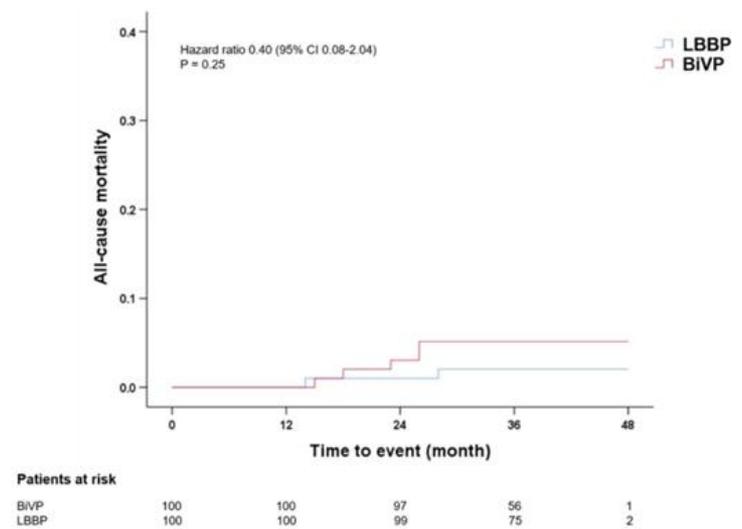
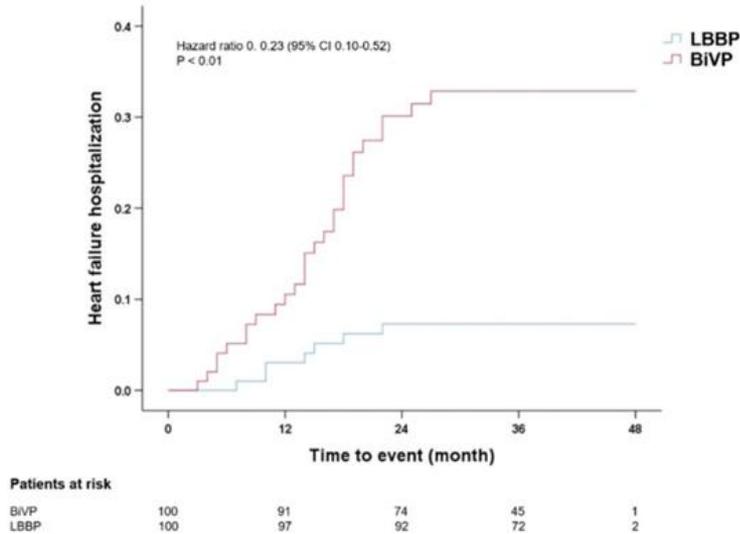
Patients at risk

BVP	100	91	74	45	1
LBBP	100	97	92	72	2

Secondary endpoint



- Individual outcomes of HFH ($p < 0.01$) and all-cause mortality ($P = 0.25$).



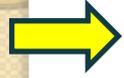
Dnešní realita

- Současná guidelines HRS/APHRS/LAHRs doporučují BiV ve **třídě I** u pacientů s LBBB, LVEF <35%, QRS ≥150 ms a CHSS na GDMT
 - CSP ve **třídě IIa**, pokud je výsledek BiV suboptimální/bail-out
 - Jinak má CSP v této indikaci **třídu IIb**
- Běží velká studie „Left vs Left“, n=2136 pts se CRT indikací, randomizace na CSP vs BVP (síla studie by měla být dostatečná k prokázání superiority (prim. cíl je celk. mortalita + HFH během 5 letého f-upu)
- Běží i menší studie (BATTLE, LeCaRT)

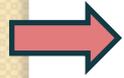
Co lze 11.10.2025 tvrdit prakticky s jistotou?



- LBBAP = non-inferior to BiV (bail-out)



- LBBAP = first among equals?



- LBBAP = preferred (as better) amongst others?

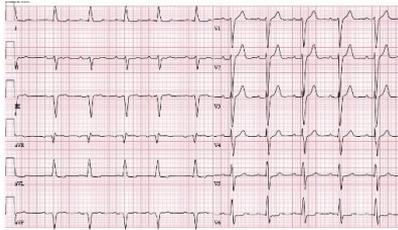
LETTER TO THE EDITOR

Left bundle branch p... cardiac resynchronization therapy vs
biventricular pacing car... zation therapy—time to write
a requiem for biventricular... resynchronization therapy

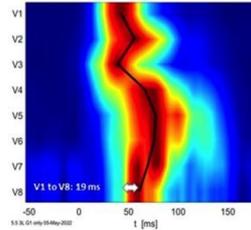
Akshyaya Pradhan, Daljeet Saggu, Monika Bhandari

One size fits all? – individualizovaný přístup

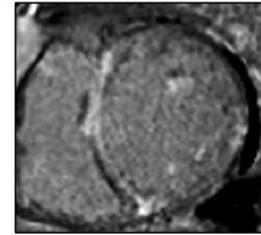
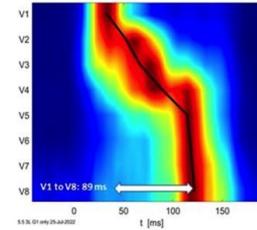
Pre-implantation considerations



Evaluate ECG for LBBB, IVCD or combination

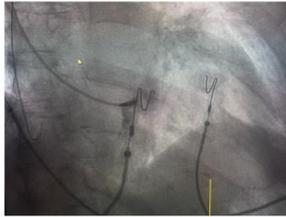


Consider advanced ECG analysis



Evaluate cardiac anatomy and scar

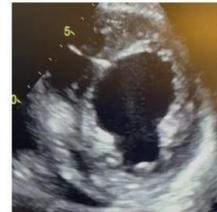
Intraprocedural considerations



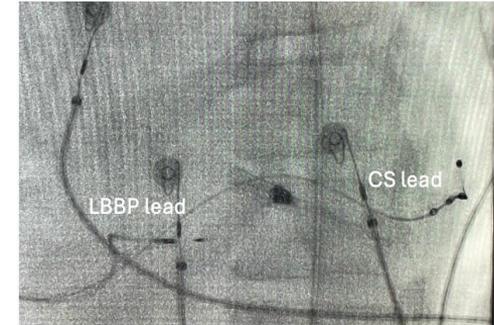
Anatomical orientation by tricuspid valve angiography



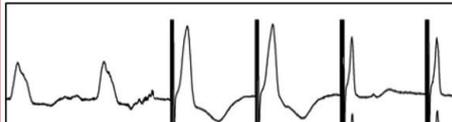
Consider functional DSP despite LBB capture



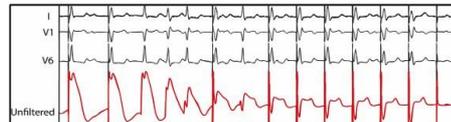
Confirm position of lead tip



Consider adding a CS lead to LBBP (LOT-CRT) when incomplete resynchronization is suspected



LBBB correction with temporary HBP: Patient is eligible for HBP-CRT or LBBP-CRT



Current-of-injury monitoring during lead penetration

DĚKUJI ZA POZORNOST



Email: alan.bulava@fnol.cz