

Efficacia e sicurezza a confronto: stimolazione LML Vs SDL

Prof. Matteo Bertini, MD, PhD

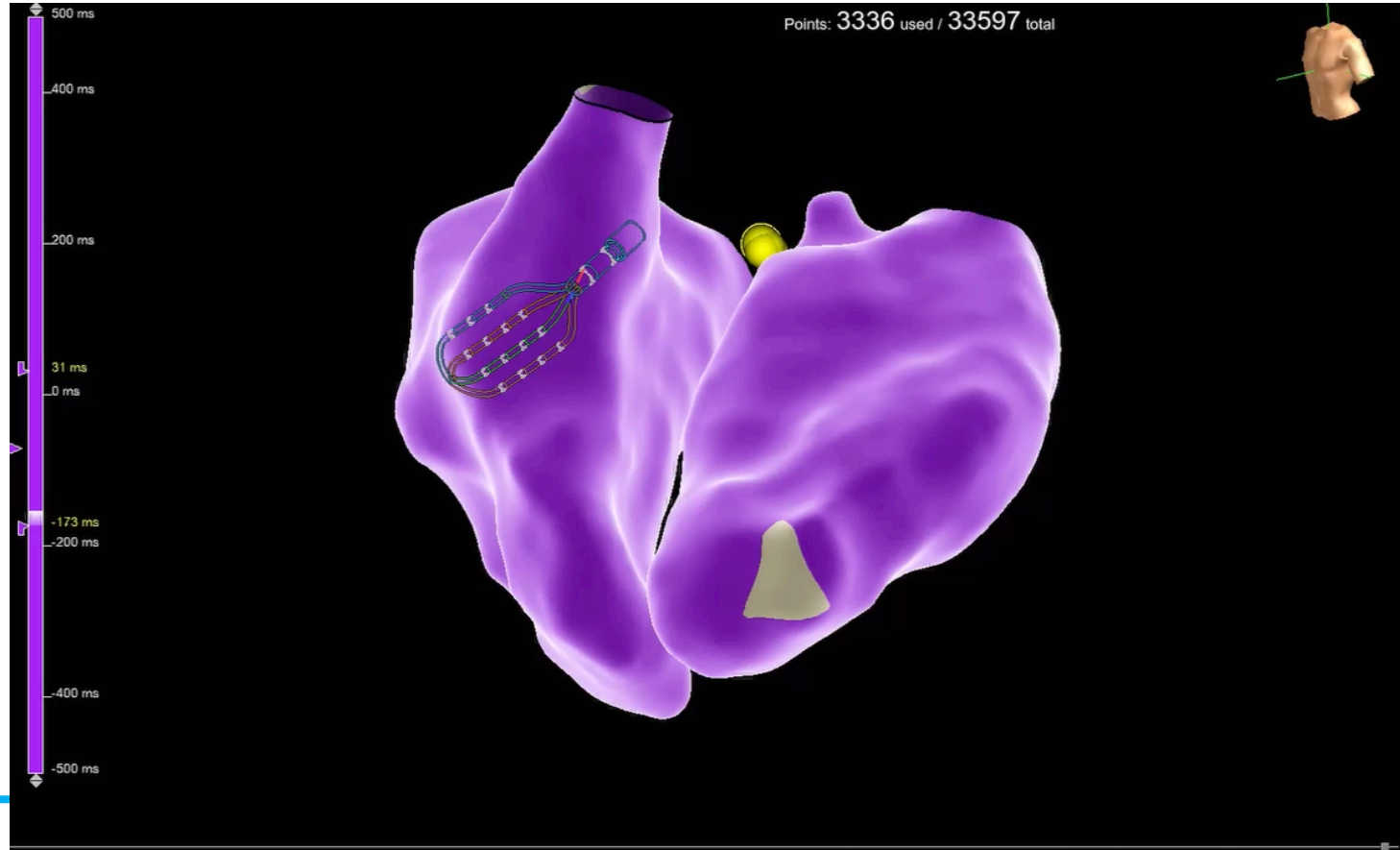


CENTROCARDIOLOGICO UNIVERSITARIO
Azienda Ospedaliero-Universitaria di Ferrara

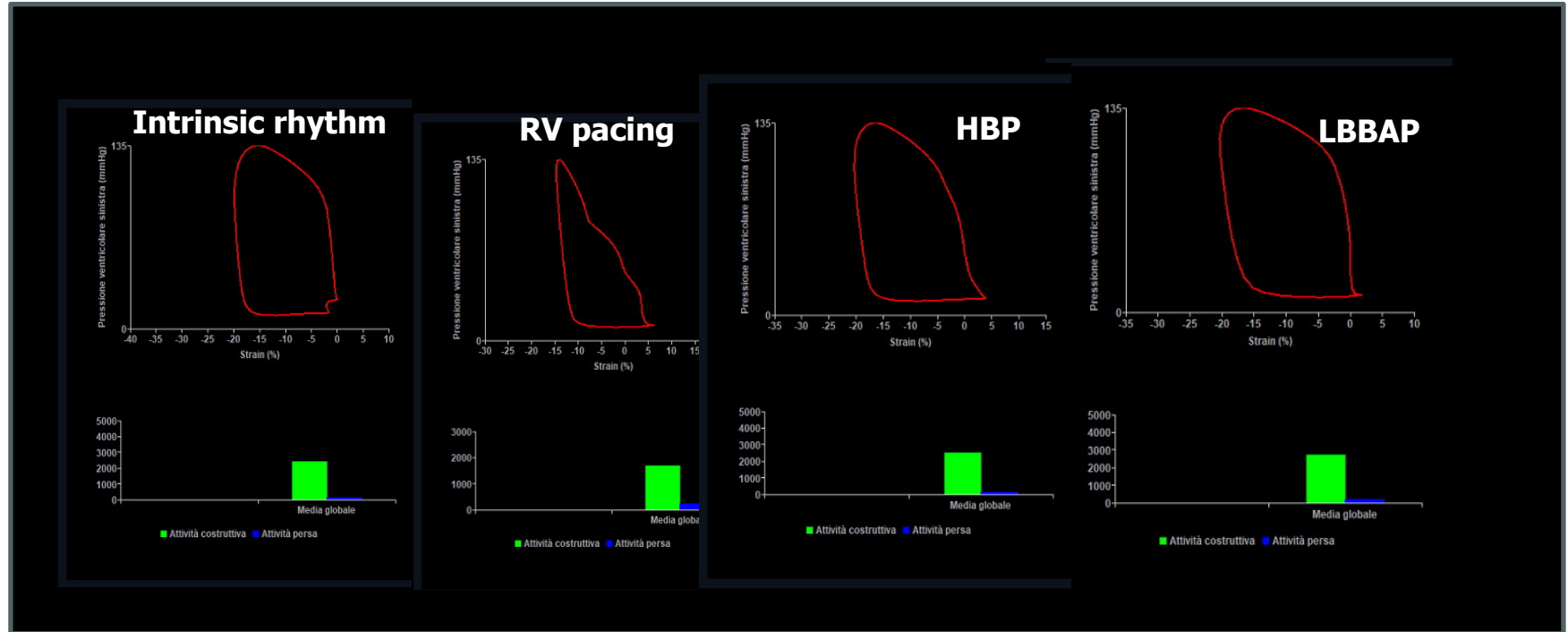


**Università
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di Ferrara**

NORMAL VENTRICULAR ACTIVATION



Azzolini G, Bianchi N, Vitali F, Malagù M, Balla C, De Raffe M, Bertini M.
A Comparative Assessment of Myocardial Work Performance during Spontaneous
Rhythm, His Bundle Pacing, and Left Bundle Branch Area Pacing: Insights from the
EMPATHY Study. **J Cardiovasc Dev Dis.** 2023 Oct 27;10(11):444



Conduction System Pacing

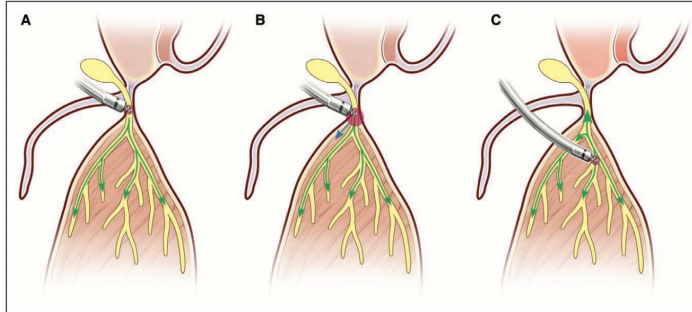
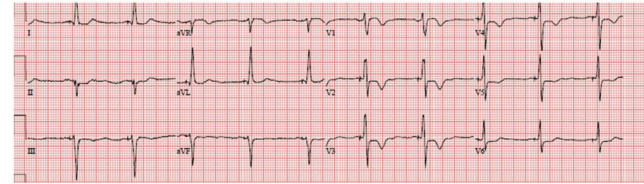
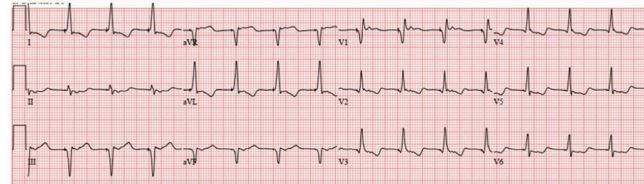


Figure 7. Anatomic illustrations of physiologic pacing techniques.
A, Selective His bundle pacing; (B) nonselective His bundle pacing; (C) left bundle branch area pacing.



- His Bundle Pacing

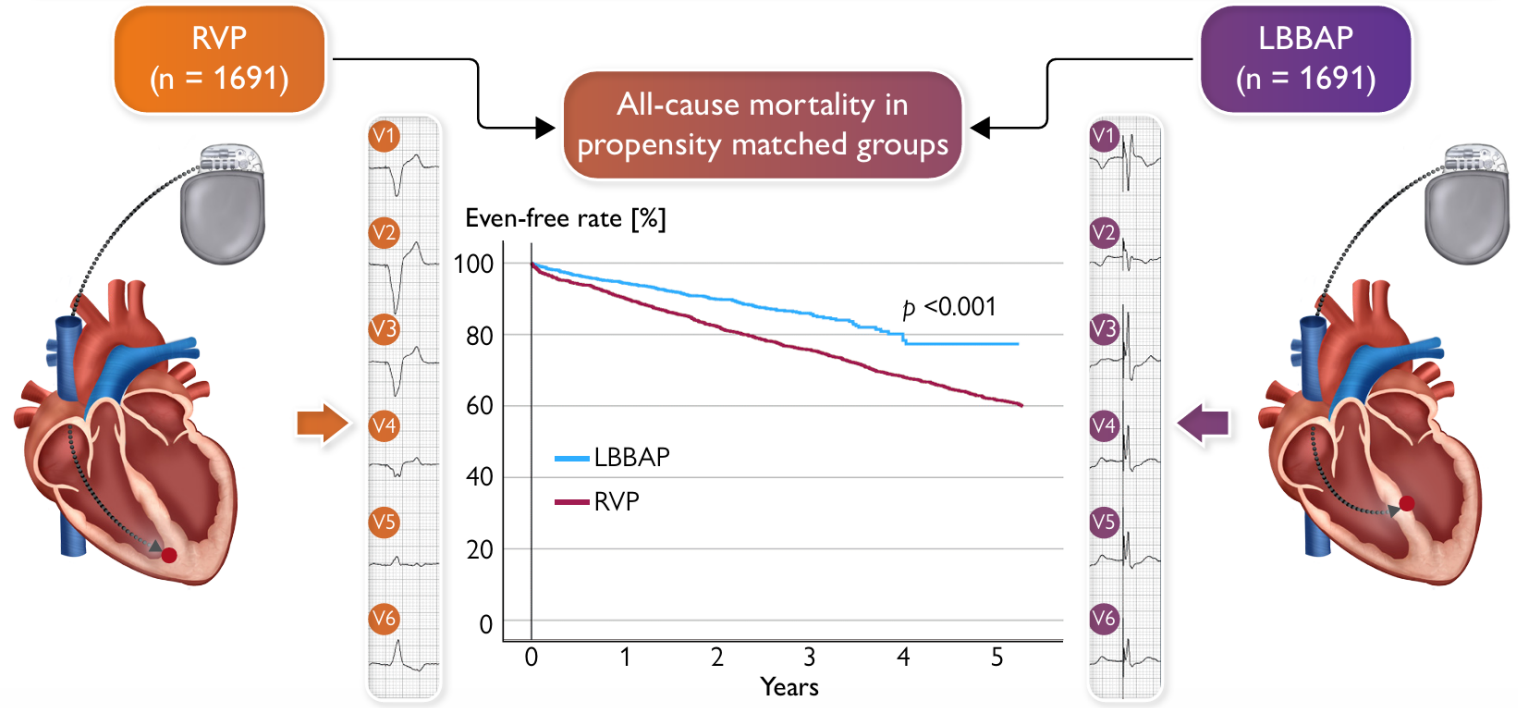
- Left Bundle Branch Area Pacing



MELOS RELOADED

Multicentre European Left bundle branch area pacing Outcomes Study REassessment of LOnG-term All-cause DEath rate in paceD patients

3382 European patients undergoing pacemaker implantation for treatment of atrioventricular block



Use of LBBAP instead of RVP in patients with atrioventricular block is associated with significantly lower long-term mortality

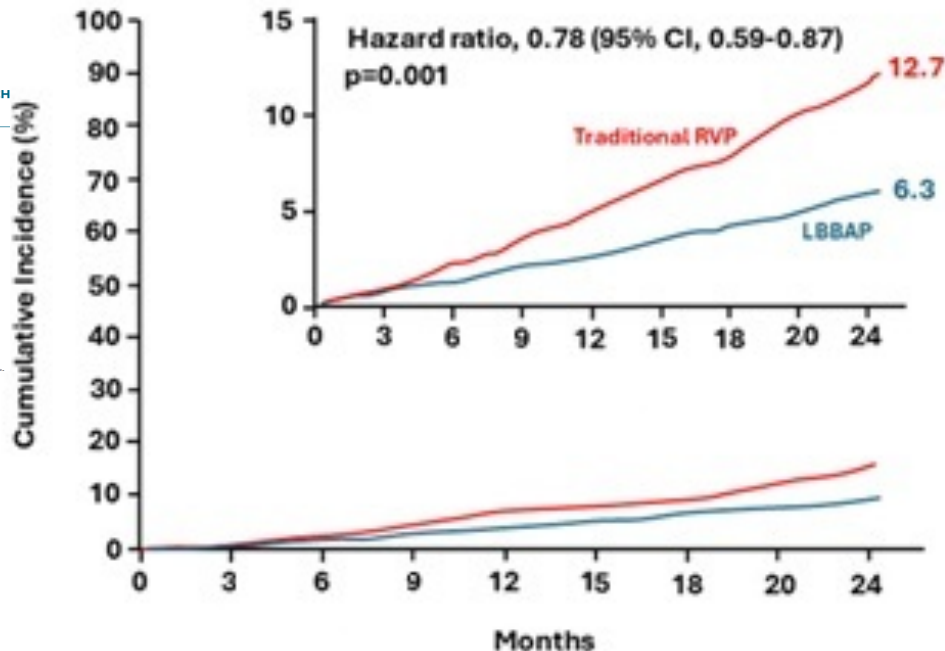
Primary composite outcome (young pts!)

A. Composite Outcome

Two-year outcomes of left bundle branch area pacing versus traditional right ventricular pacing in middle-aged adults: a registry-based trial

Matteo Bertini ^{1*}, Luca Canovi ¹, Francesco Vitali ¹, Lina Marcantoni ²,
Gianni Pastore ³, Mario Volpicelli ⁴, Orlando Munciguerra ⁵, Mauro Biffi ⁴,
Matteo Ziacchi ⁴, Luca Rossi ⁵, Valeria Carinci ⁶, Paolo Sirugo ⁶,
Paolo Pastori ⁷, Jacopo Francesco Imberti ⁸, Pier Luigi Pellegrino ⁹,
Erminia Guerriero ¹⁰, Biagio Sassone ¹¹, Enrico Bertagnin ¹¹,
Giuseppe Coppola ¹², Michele Malagù ¹, Cristina Balla ¹, Giorgia Azzolini ¹,
Gloria Zuccari ¹, Francesco Zanon ², Giuseppe Boriani ⁹, and Marco Zuin ¹

*Correspondence: Matteo Bertini, European Society of Cardiology, 30042, Via S. Maria di Piazza, 10000, 10000, Italy. E-mail: m.bertini@esca.org



No. At Risk

Traditional RVP	172	171	170	168	165	160	156	154	150
LBBAP	172	171	168	166	165	164	163	162	161

RRR=22%

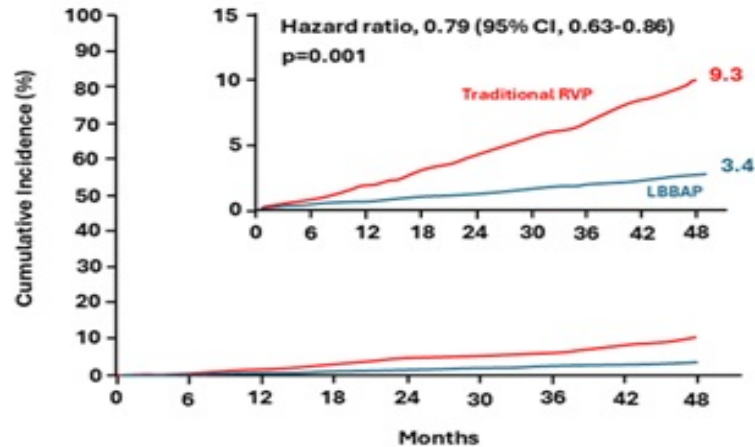
ARR=6.4%

NNT=15

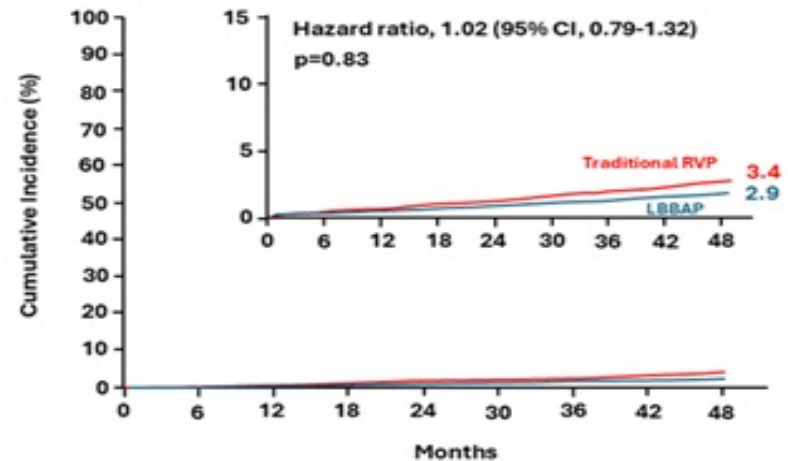
Secondary outcomes

HF Hospitalization

CV Mortality

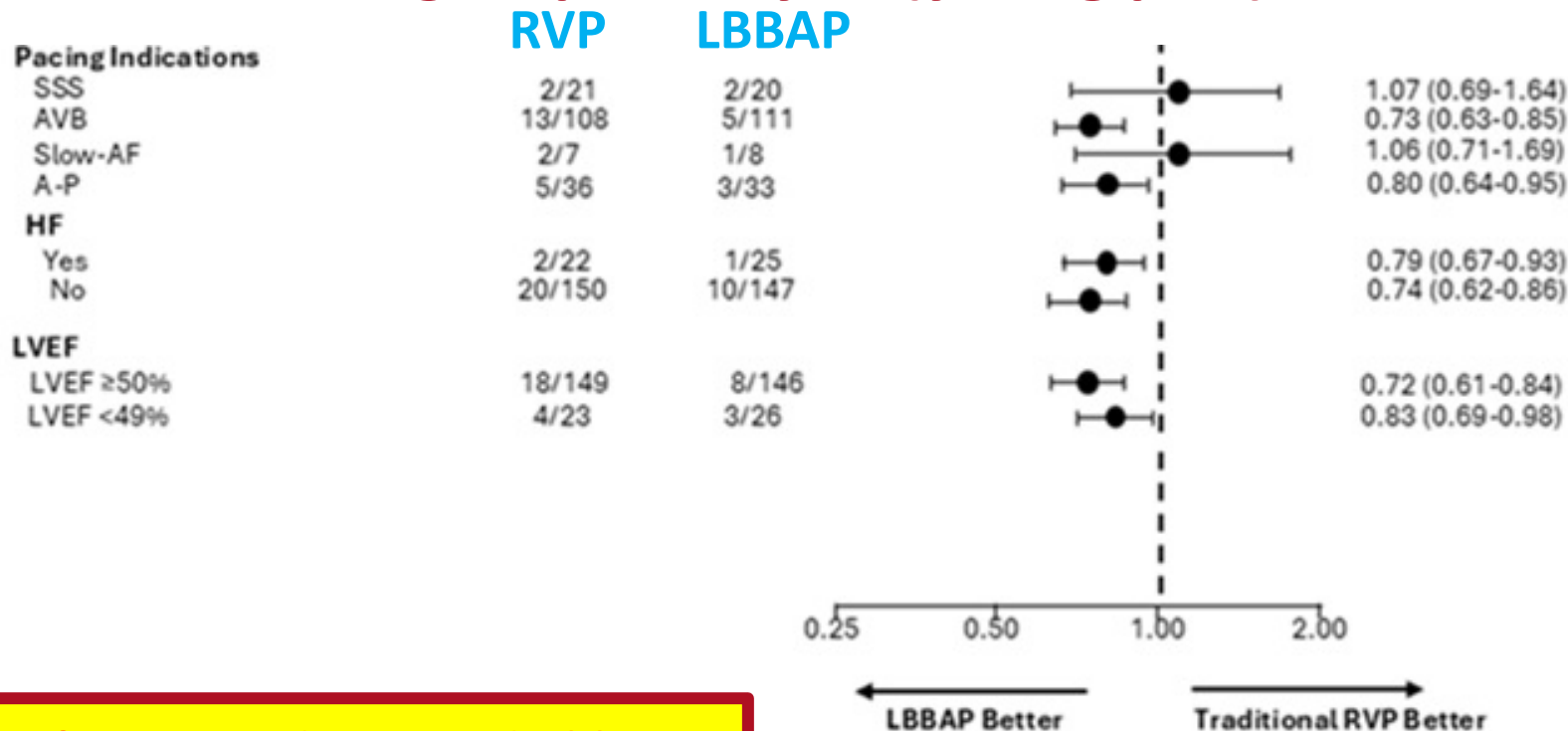


No. At Risk									
Traditional RVP	172	172	170	167	164	161	159	157	156
LBBAP	172	172	171	170	169	168	167	166	166

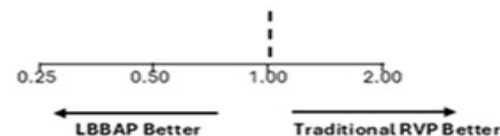


No. At Risk									
Traditional RVP	172	172	172	171	170	169	168	167	166
LBBAP	172	172	172	171	170	169	169	168	167

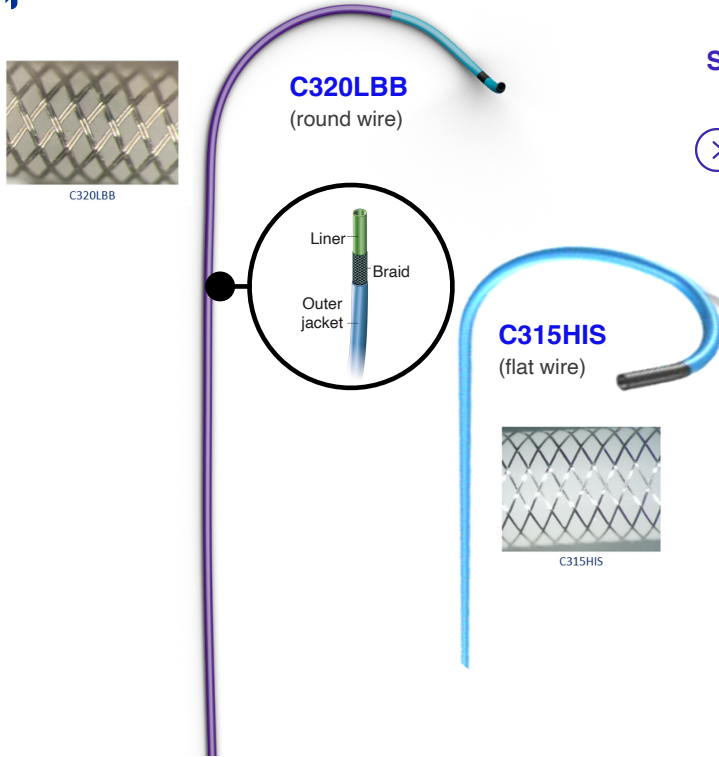
Predefined subgroups analysis (young pts!)



Maximal Benefit: AVB and Pace and Ablate!

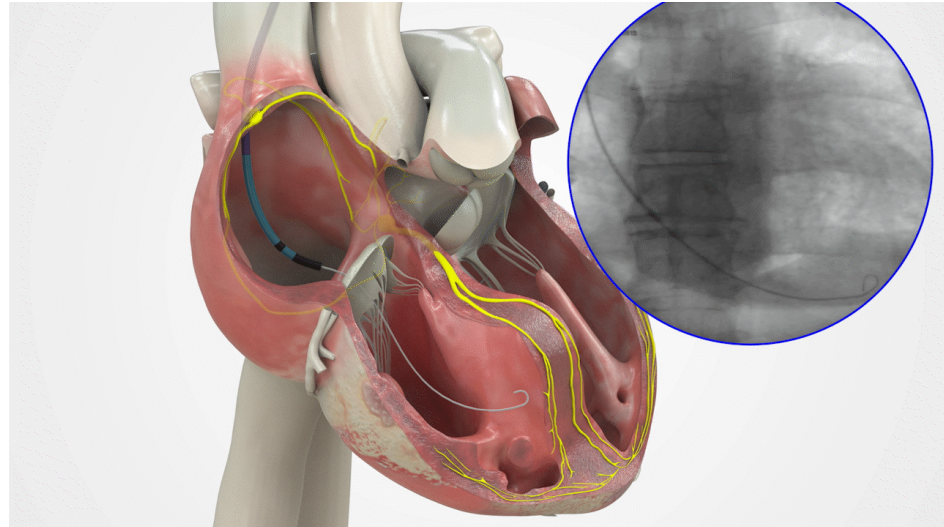


C320LBB delivery system – engineered for LBBAP



Stable - stiffer shaft that enables higher kink resistance and support

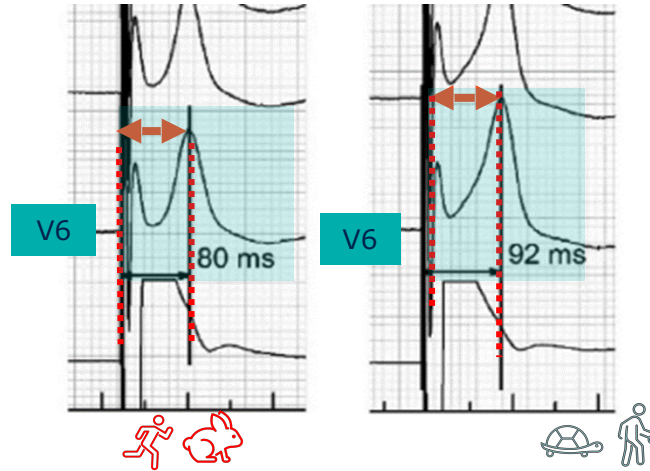
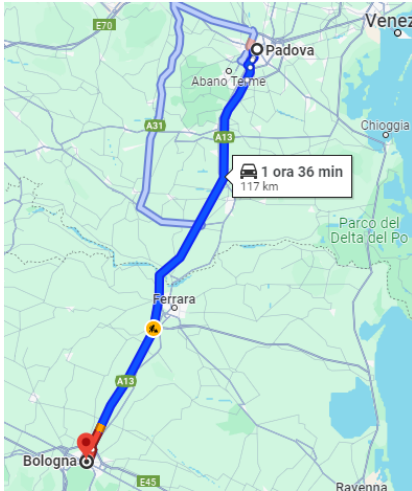
> The stiffer shaft, compared to C315HIS, is designed to provide additional mechanical support for lead fixation.



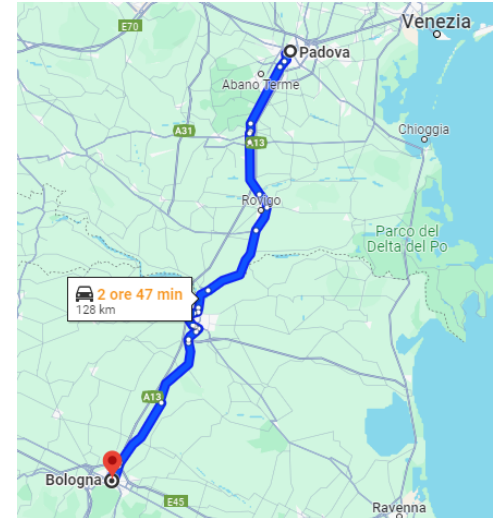


LBBAP

LBBP Very fast!



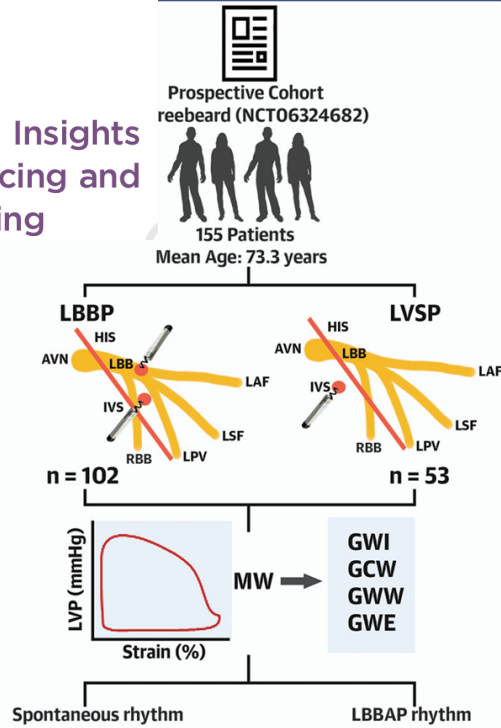
LVSP Slower but not so slow!



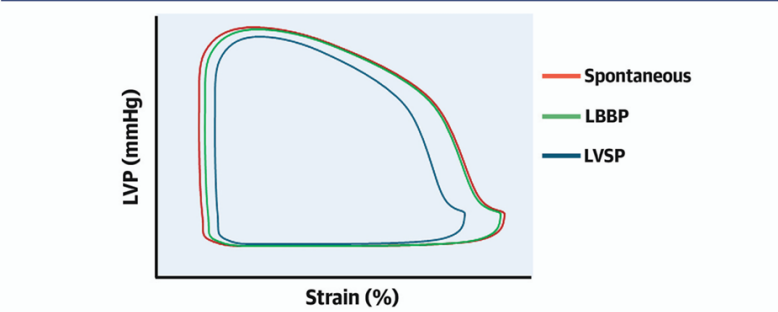
Left Ventricular Mechanical Insights
Into Left Bundle Branch Pacing and
Left Ventricular Septal Pacing

Bertini et al.
JACCEP Vol 11:8;2025

Methods



Results



Spontaneous vs Durng LBBAP				
	Global Work Index (GWI)	Global Constructive Work (GCW)	Global Waste Work (GWW)	Global Work Efficiency(GWE)
LBBP	✓	✓	✓	✓
LVSP	✓	✓	✗	✓

✗ No correlation ✓ Moderate correlation ✓ Strong correlation



**Non sel→
Sel**

**Non sel→
LVSP**

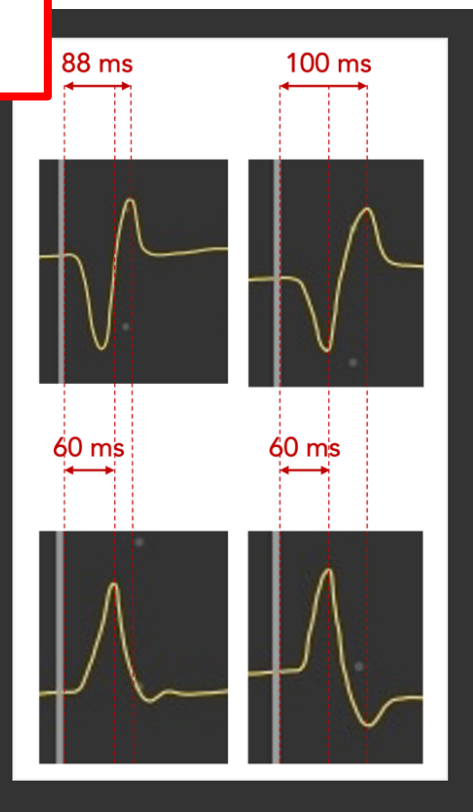
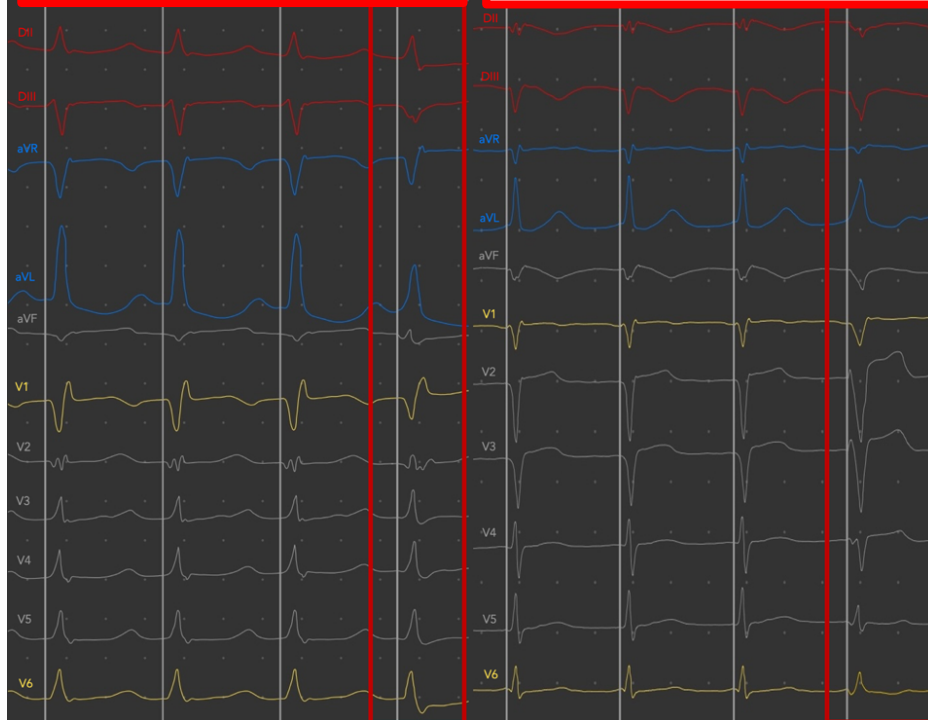
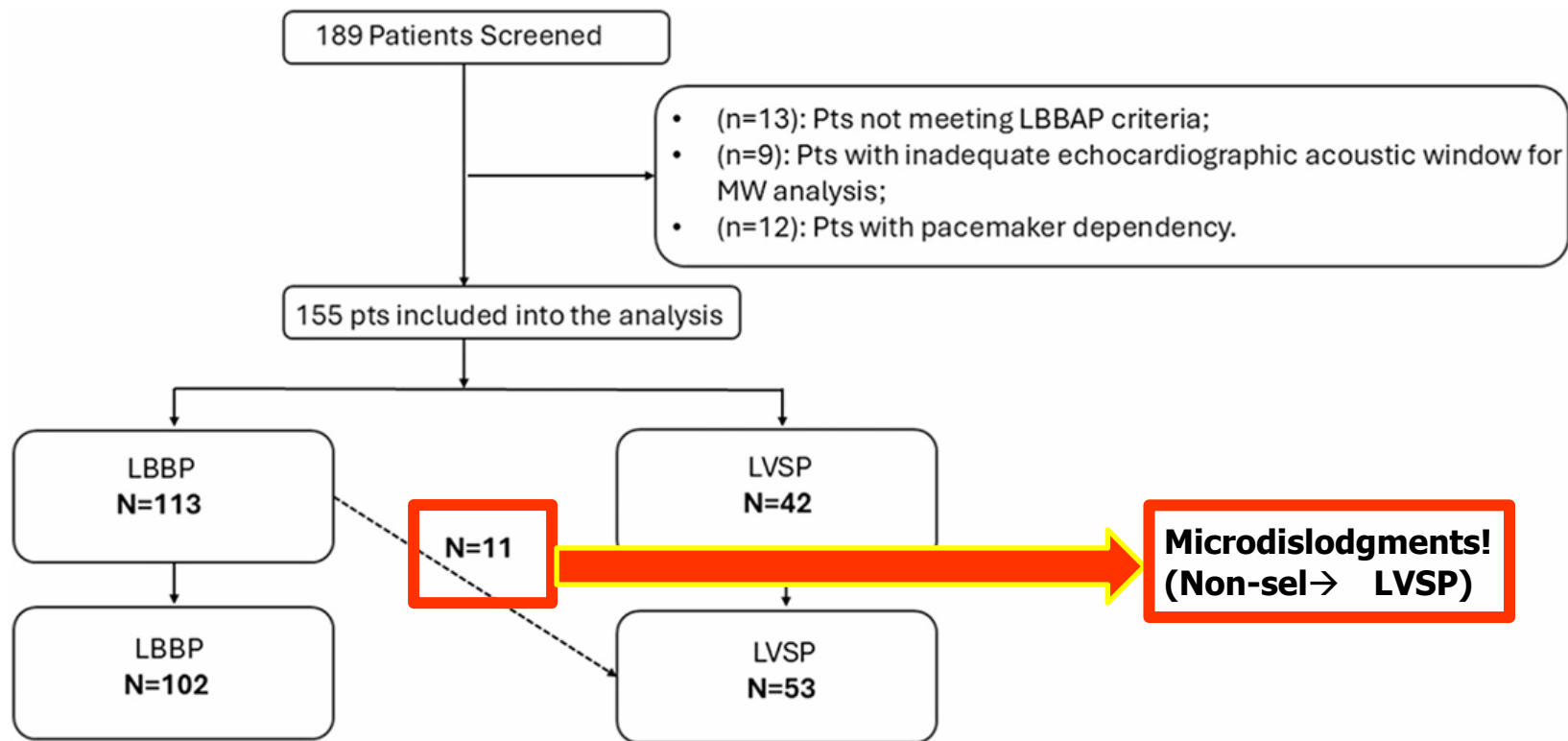


FIGURE 1 Study Flowchart



1. MW indices during spontaneous rhythm and LBBP did not significantly differ in the overall population or within either the LB or non-LB subgroups.
2. A strong correlation between spontaneous rhythm and LBBP was observed for all MW indices in the LB group, whereas in the non-LB group, strong correlations were limited to GWI and GCW, with GWE and GWW showing moderate and weak associations, respectively.

Impact of Left Bundle Branch Pacing on Left Ventricular Mechanical Efficiency

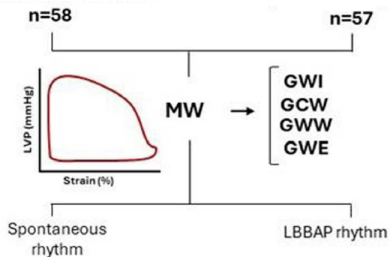
Luca Canovi^{1,2}  | Angelo Melpignano¹ | Michele Malagù¹  | Cristina Balla¹  | Ludovica Rita Vocale¹ | Laura Rotondo¹  | Elena Marchetti¹  | Davide Antonio Mei³  | Marco Zuin^{1,4,5}  | Matteo Bertini¹  | Francesco Vitali¹ 

Journal of Cardiovascular Electrophysiology

Methods

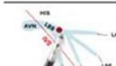

Prospective Cohort
TREEBEARD (NCT06324682)


115 Patients
Mean Age: 75.4 years

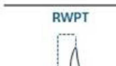


Results

Spontaneous vs During LBBP

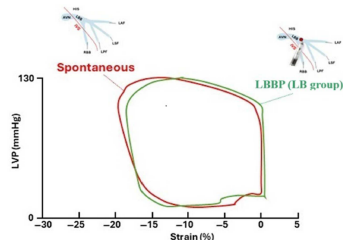
	GWI	GCW	GWW	GWE
				
				

During LBBP

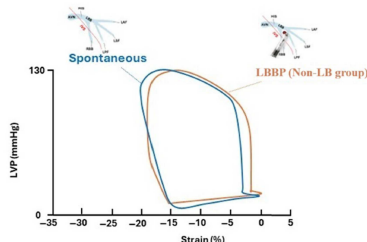
	GWI	GCW	GWW	GWE
				
				
				

 No correlation  Weak correlation  Moderate correlation  Strong correlation

A

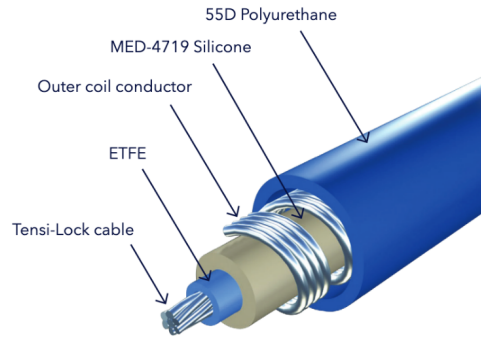


B

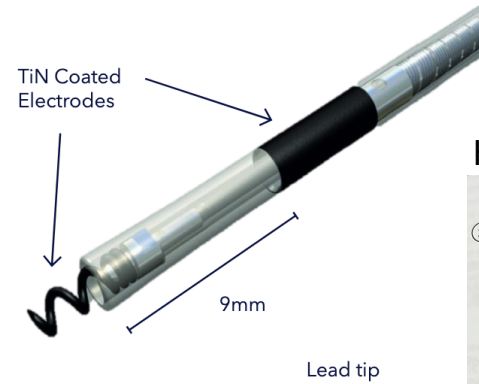


Lead name	SelectSecure 3830	Solia S	Ingevity	Tendril 2088TC	Ultipace
Manufacturer	Medtronic	Biotronik	Boston Scientific	Abbott	
Lead design	Lumen-less	Stylet-driven	Stylet-driven	Stylet-driven	
Lead length (cm)	59/69/74	45/53/60	45/52/59	46/52/58/65/85/100	
Lead body diameter (mm/Fr)	1.4 (4.1)	1.8 (5.6)	1.9 (5.7)	1.9 (5.8)	
Helix design	Fixed, non-retractable	Retractable	Retractable	Retractable	
Cathode design (Lead tip electrode)	Electrical active helix	Electrical active helix	Electrical active helix	Electrical active helix	
Tip electrode length (mm)	1.8	1.8	1.8	2.0	
Tip electrode surface area (mm ²)	3.6	4.5	4.5	6.9	
Tip to ring electrode spacing (mm)	9	10	10.7	10	
Anode ring electrode surface area (mm ²)	16.9	17.4	20	16	
Anode ring electrode width (mm)	Not specified	1.9 (5.9)	2.0 (6.0)	Not specified	
Outer isolation	Polyurethane	Polyurethane/Silicone	Polyurethane (55D)	Optim™	
Inner isolation	Silicone/ETE	Silicone	Silicone	Silicone	
Rotations to extend helix					
With straight stylet	NA	5–10	7	6–11	
With J- stylet	NA	5–10	8	9–14	
Maximal number of rotations	NA	17 (45 cm length) 21 (53 cm length) 23 (60 cm length)	30	No maximum specified	
Steroid eluting	Yes	Yes	Yes	Yes	
Steroid eluting	Beclomethasone Dipropionate	Dexamethasone Acetate	Dexacomethasone Acetate	Dexamethasone Sodium Phosphate	

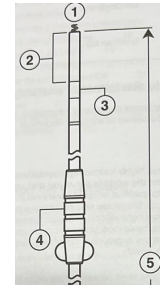
Lumenless (4F)



Cross-section showing lead body construction



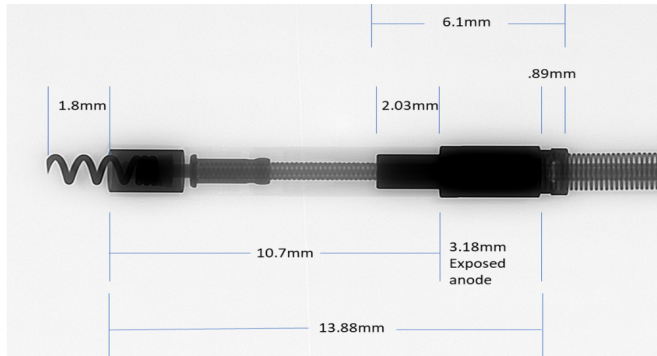
Helix 1.8 mm



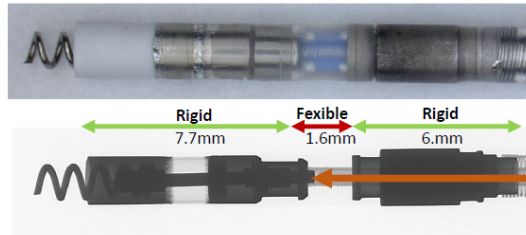
Tip helix-ring= 10.8 mm

Stylet Driven Lead (SDL)

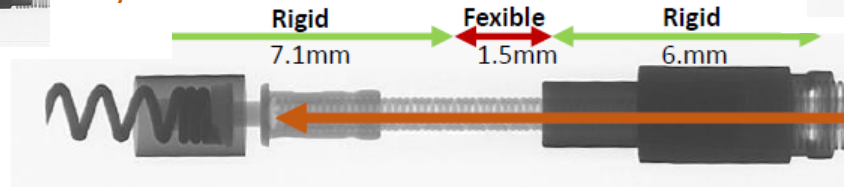
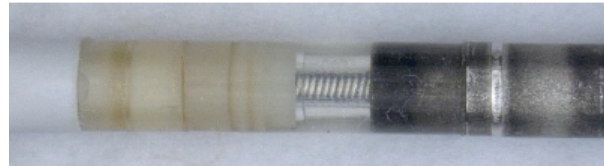
6F



SoliaS, Biotronik



Ingevity+, Boston Scientific



Tendril 2088, Abbott



Study Design (LIFE-LBBAP)

Multicenter registry: 17 centers



8,255 patients with successful LBBAP

Median follow up: 16.4 [6.4:28.8] months

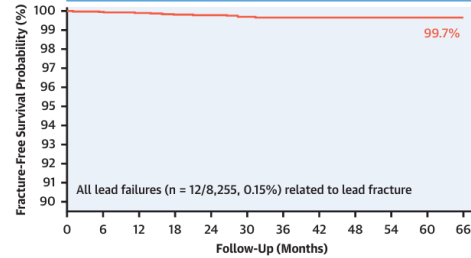
Endpoint

LBBAP lead failure (lead fracture or insulation defects)

Results

Lead Survival Probability

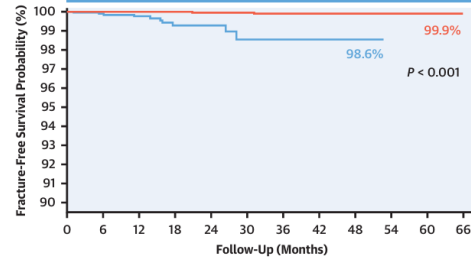
Overall Lead Survival Probability



No. at risk

8,255 6,278 5,151 3,786 2,746 1,928 1,152 672 362 155 40 1

Lead Survival Probability in SDL and LLL



No. at risk

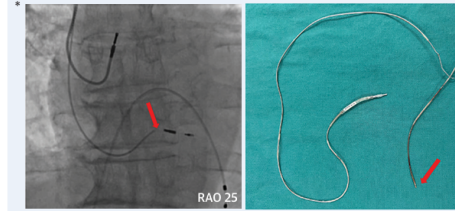
5,609 4,590 3,951 3,030 2,334 1,733 1,100 657 359 155 40 1

2,646 1,687 1,199 755 411 194 51 14 2 / / /

— LLL — SDL

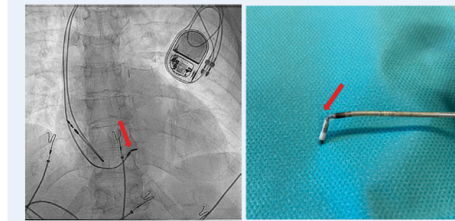
Lead Fracture Analysis

LBBAP LLL Fracture Location (n = 2/5,609, 0.04%):

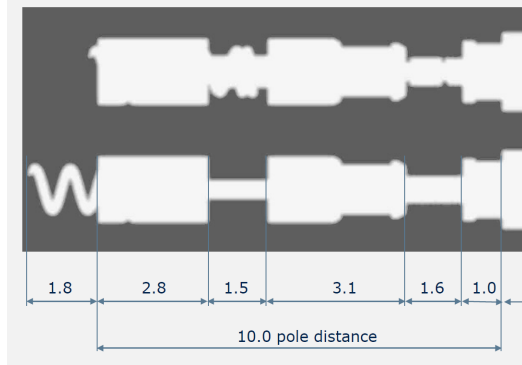


Fracture Occurs Proximal of Ring Electrode

LBBAP SDL Fracture Location (n = 10/2,646, 0.4%):



Fracture Occurs at Interelectrode Segment



5F



Stylet Driven Lead (SDL)

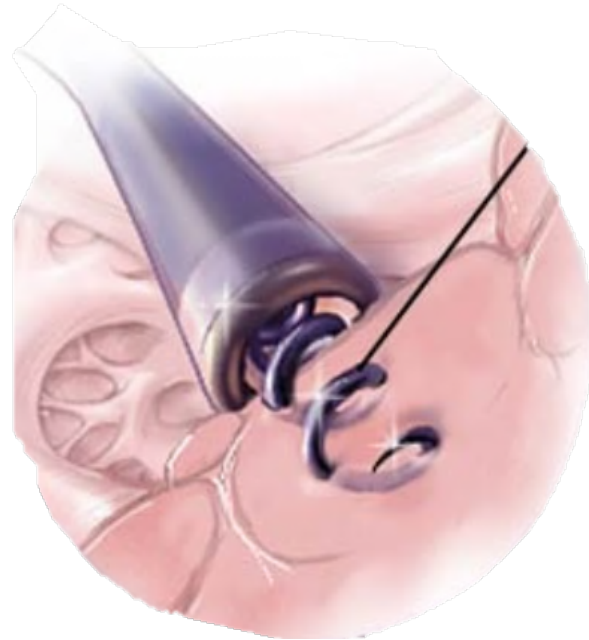
Tip helix-ring= 11.8 mm

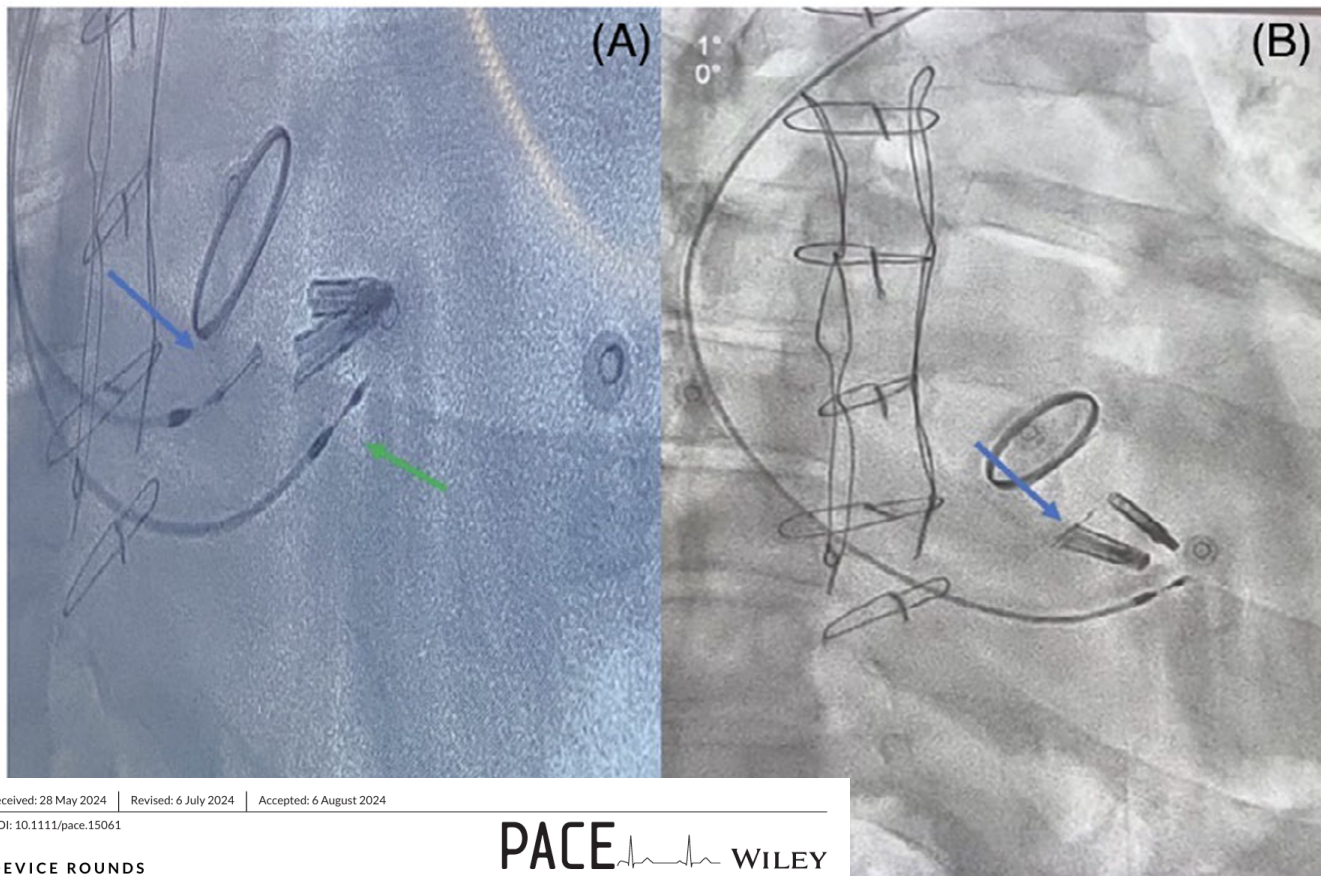


6F

SDL

- **STEP 1: firm stylet until the tip and screw when sheath is in good contact with the septum (overscrew!)**
- **STEP 2: check electrical parameters and stimulation, then 2-3 rapid rotation when the screw is exposed if needed**



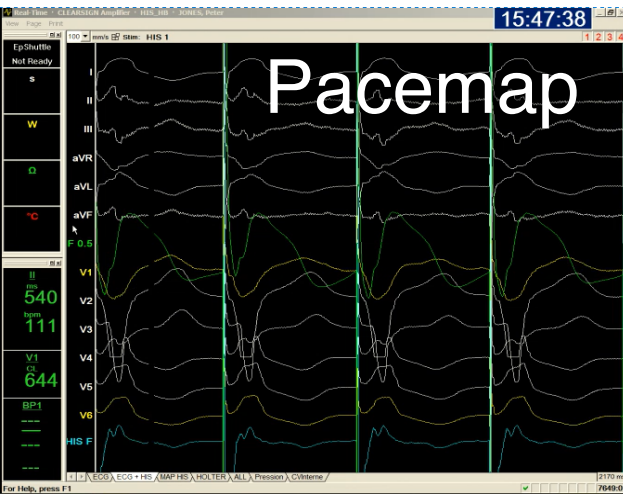
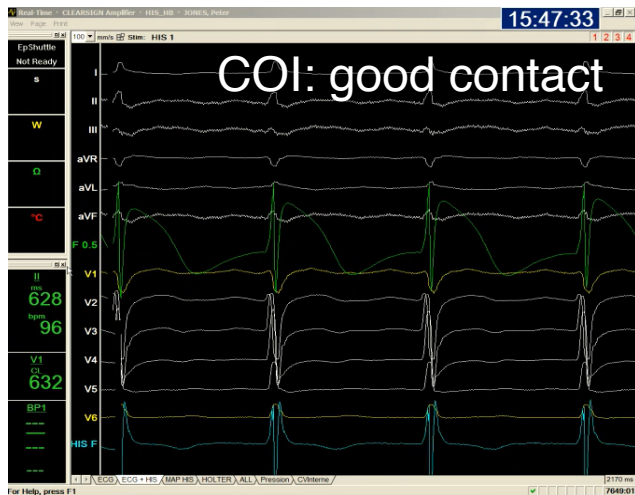
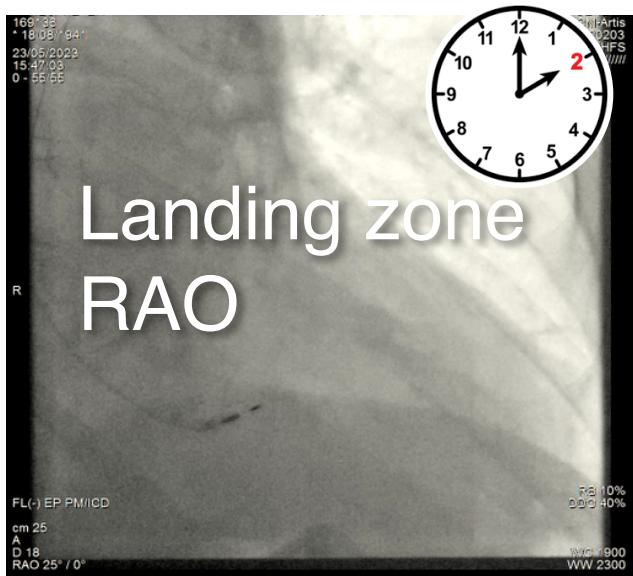


Helix breakage during left bundle pacing area implantation

Amato Santoro MD¹  | Simone Taddeucci MD²

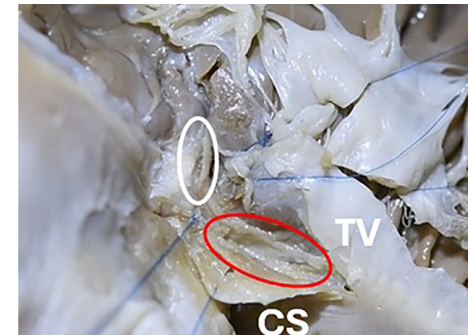
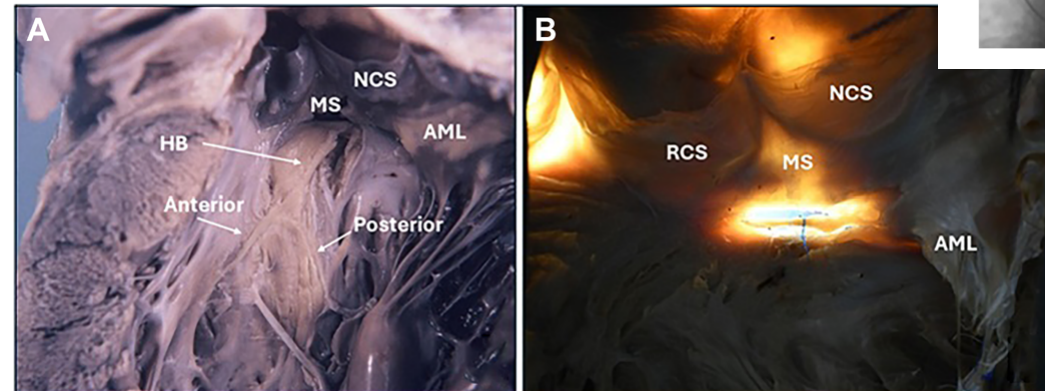
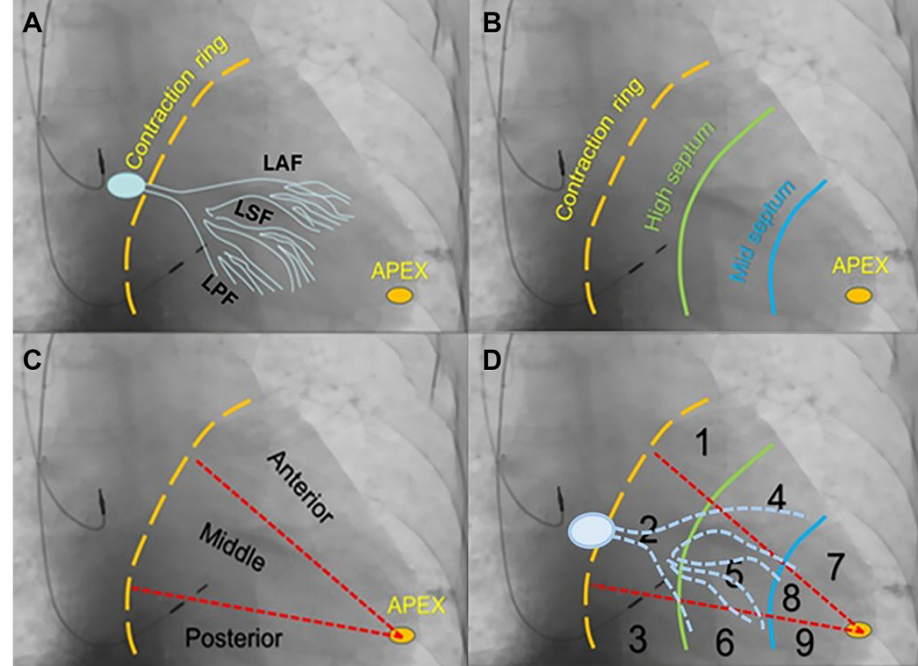


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Anatomical considerations for left bundle branch area pacing

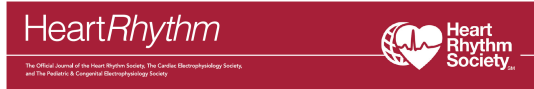
Marco Zuin, MD, MS,^{1,2,3} Pugazhendhi Vijayaraman, MD,⁴ Gustavo Abuin, MD,⁵
Francesco Vitali, MD, PhD,⁶ Luca Canovi, MD,^{6,7} Mauro Biffi, MD,⁸ Biagio Sassone, MD,⁹
Giuseppe Boriani, MD, PhD,¹⁰ José Angel Cabrera, MD,¹¹ Matteo Bertini, MD, PhD⁶



SDL only

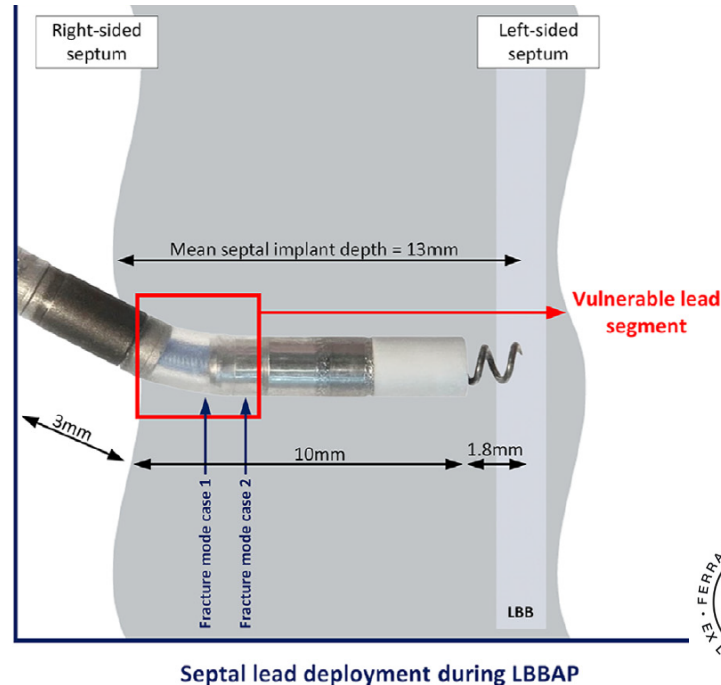
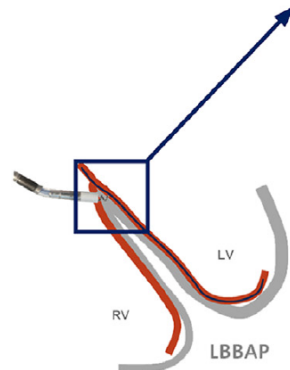
325 leads, 18 mths fup 0.6% complete fracture 1.3% high lead bending angulation

CONCLUSION The incidence of early conductor failure in LBBAP seems higher than with conventional RVo sites. The most vulnerable lead part seems to be the interelectrode space between the tip housing and ring electrode. Excessive angulation and preconditioning might contribute to early fatigue fracture.



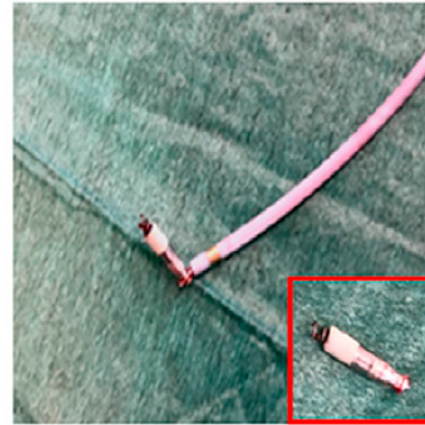
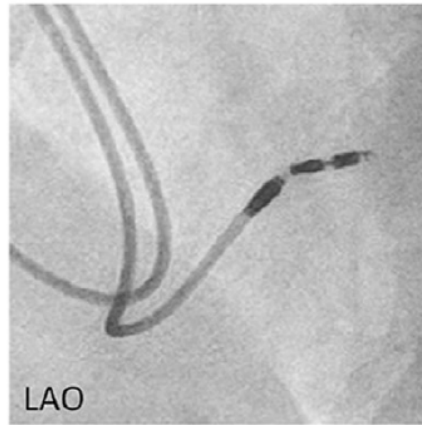
Lead performance of stylet-driven leads in left bundle branch area pacing: Results from a large single-center cohort and insights from *in vitro* bench testing

Emine Özpak, MD, Frederic Van Heuverswyn, MD, Frank Timmermans, MD, PhD, Jan De Pooter, MD, PhD

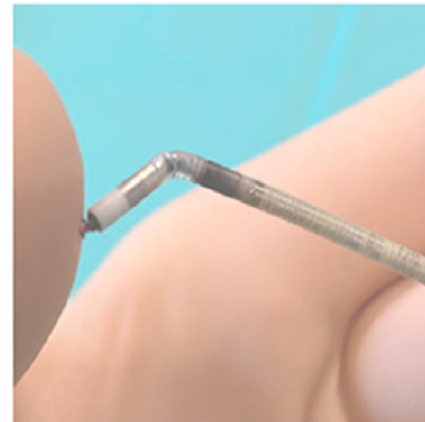
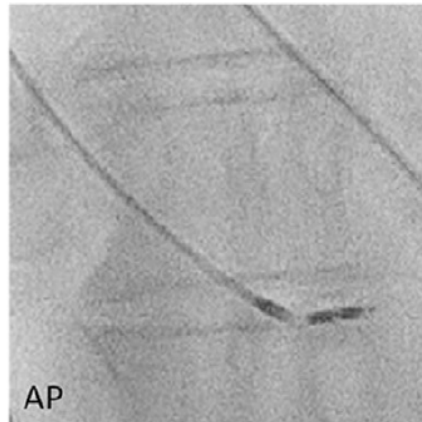


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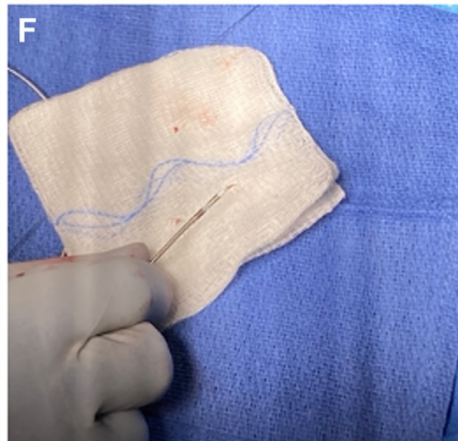
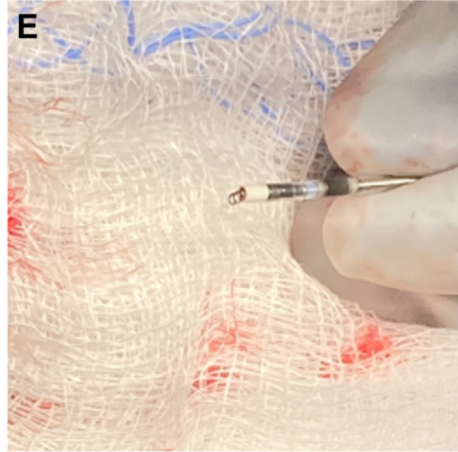
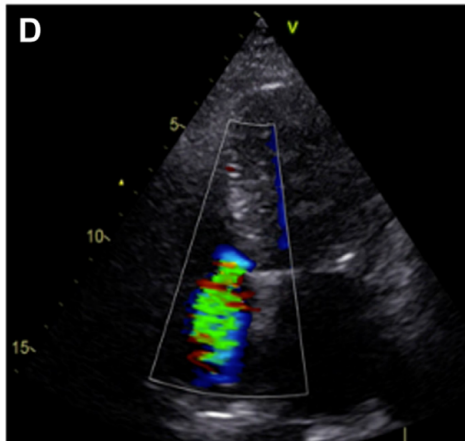
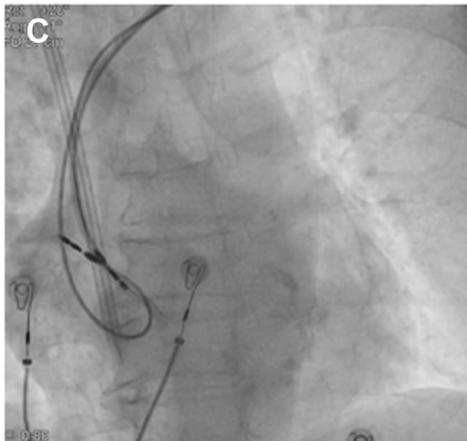
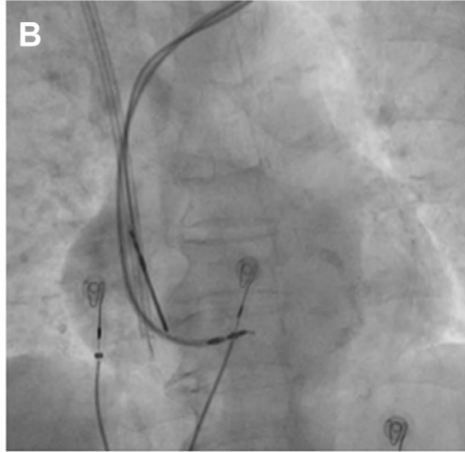
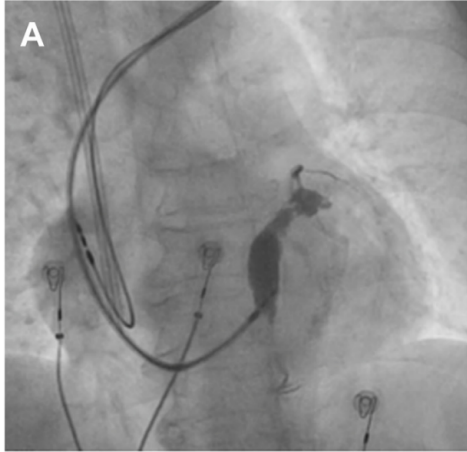
LBBAP lead fracture case 1



LBBAP lead fracture case 2



LLL vs SDL



Image

Late distal conductor fracture of the lumenless pacing lead after left bundle branch area pacing  

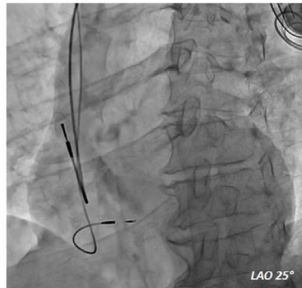
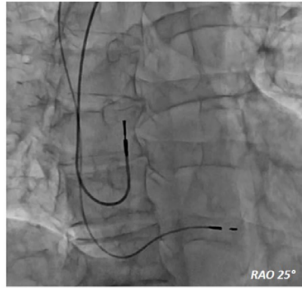
Vickram Vignesh Rangaswamy, MD, DM,¹ Shunmuga Sundaram Ponnusamy, MD, DM, CEPS²

KEYWORDS Left bundle branch area pacing; Lumenless pacing lead; Distal conductor fracture

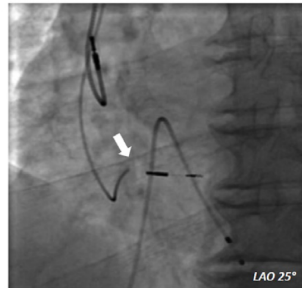
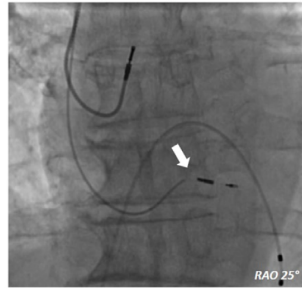
(Heart Rhythm 2024;21:490–491) © 2024 Heart Rhythm Society. All rights reserved.

A

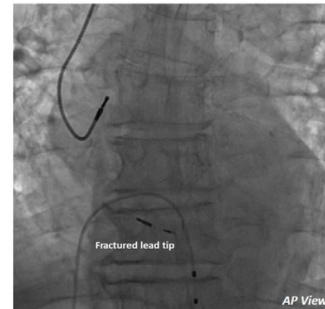
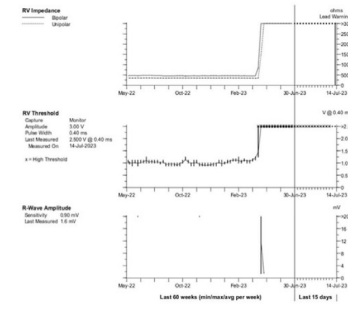
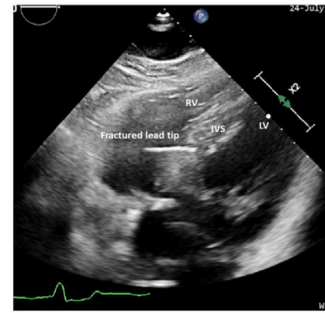
Post Implantation



After 2 years



B



Solia CSP S Lead

Design elements taken over from Solia S_

- Corpo dell'elettrocattetere isodiametrico 5.6F
- Elettrodo ad anello
- Alloggiamento della punta e collare steroideo
- Lume per l'impianto di elettrocatteteri guidato da stiletto
 - per un maggiore supporto
 - per una maggiore flessibilità
 - per misure di impedenza durante l'avvitamento



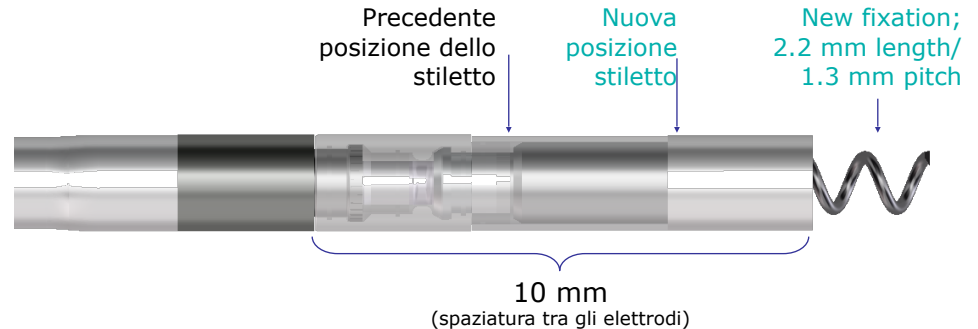
Modifiche al design del Solia CSP S

+ Vite fissa per una maggiore maneggevolezza

Elica più lunga, fissa e affilata di 2,2 mm con passo maggiore per una penetrazione controllata e regolare dei tessuti e un riposizionamento più atraumatico

Stiletto F più morbido all'interno della confezione

Inserimento più profondo dello stiletto per una migliore stabilità e manovrabilità



Take Home Messages



- **SDL old generation be sure to be as perpendicular as you can (RAO/LAO, COI)**
- **No more than 3 attempts with every leads**
- **Do not stress the leads**
- **Quality matters! LBBP is better than LVSP**

Thanks for your attention



CENTROCARDIOLOGICO UNIVERSITARIO
Azienda Ospedaliero-Universitaria di Ferrara



TREEBEARD

ConTempoRary Cardiac Stimulation in
Clinical practice: LEft, BiVentriculAr,
Right, and conduction System Pacing