



Conduction System Pacing
Summer Summit Berlin 2025

Physiological Atrial Pacing

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Disclosures

- Proctorship fees - Medtronic, Biotronik
- Travel grants - Medtronic, Biotronik, Abbott
- Speaker fees - Medtronic, Biotronik, Abbott

Background



His bundle pacing



Search

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Save

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Sort by: Most recent



Display options

RESULTS BY YEAR

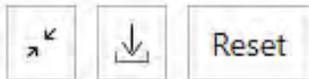
1,770 results



Page

1

of 177



Background

The image shows a screenshot of the PubMed search interface. At the top left is the PubMed logo. To its right is a search bar containing the text "left bundle branch pacing". Below the search bar are links for "Advanced", "Create alert", and "Create RSS". On the far right of the search bar area is a "Search" button and a "User Guide" link. Below the search bar is a row of buttons: "Save", "Email", and "Send to". To the right of these buttons is a "Sort by:" dropdown menu set to "Most recent", and a "Display options" button with a gear icon. Below this row is a section titled "RESULTS BY YEAR". On the left of this section are three buttons: a zoom-in icon, a download icon, and a "Reset" button. In the center of the "RESULTS BY YEAR" section, the text "2,615 results" is displayed and highlighted with a red rectangular box. To the right of this text is a pagination control showing "Page 1 of 262" with navigation arrows. Below the pagination is a bar chart showing the number of results per year from 2005 to 2025. The chart shows a steady increase in results over time, with a significant spike in the most recent years.

PublMed®

left bundle branch pacing

Advanced Create alert Create RSS

Search

User Guide

Save Email Send to

Sort by: Most recent

Display options

RESULTS BY YEAR

2,615 results

Page 1 of 262

2005 2025

Background

 × Search

[Advanced](#) [Create alert](#) [Create RSS](#) [User Guide](#)

Save Email Send to Sort by: Most recent ⌵ ⌵ Display options ⚙️

RESULTS BY YEAR

87 results

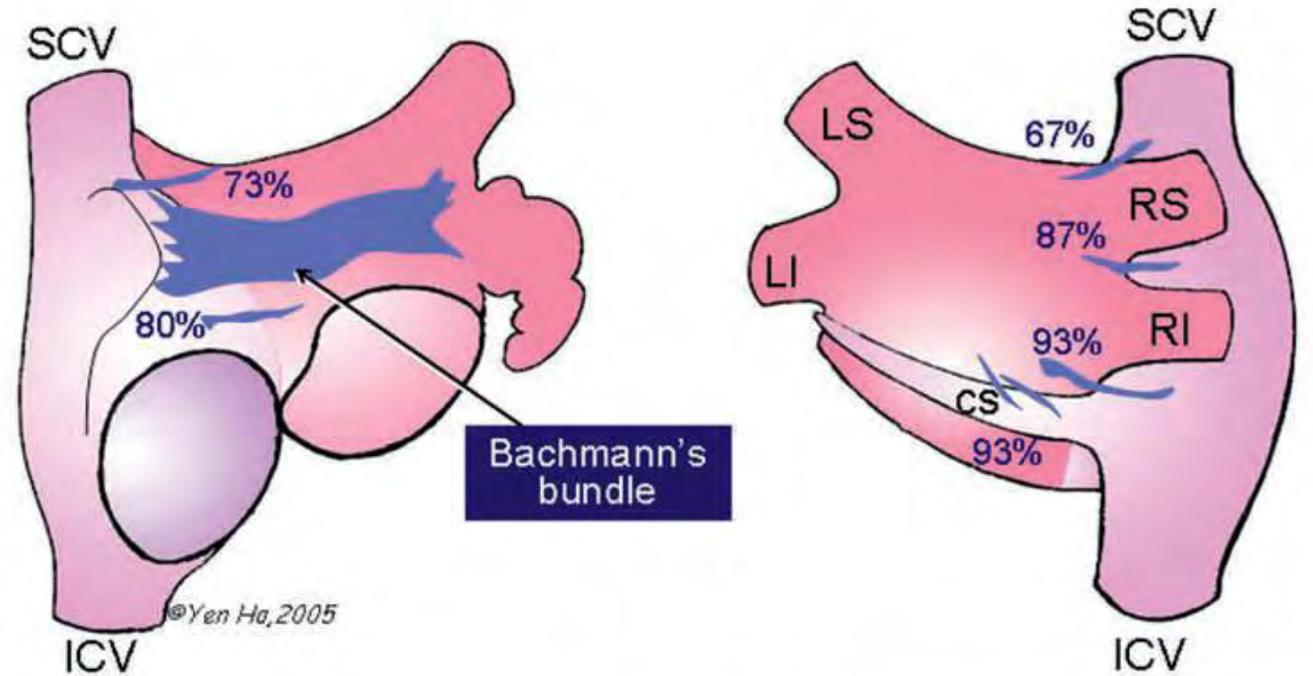
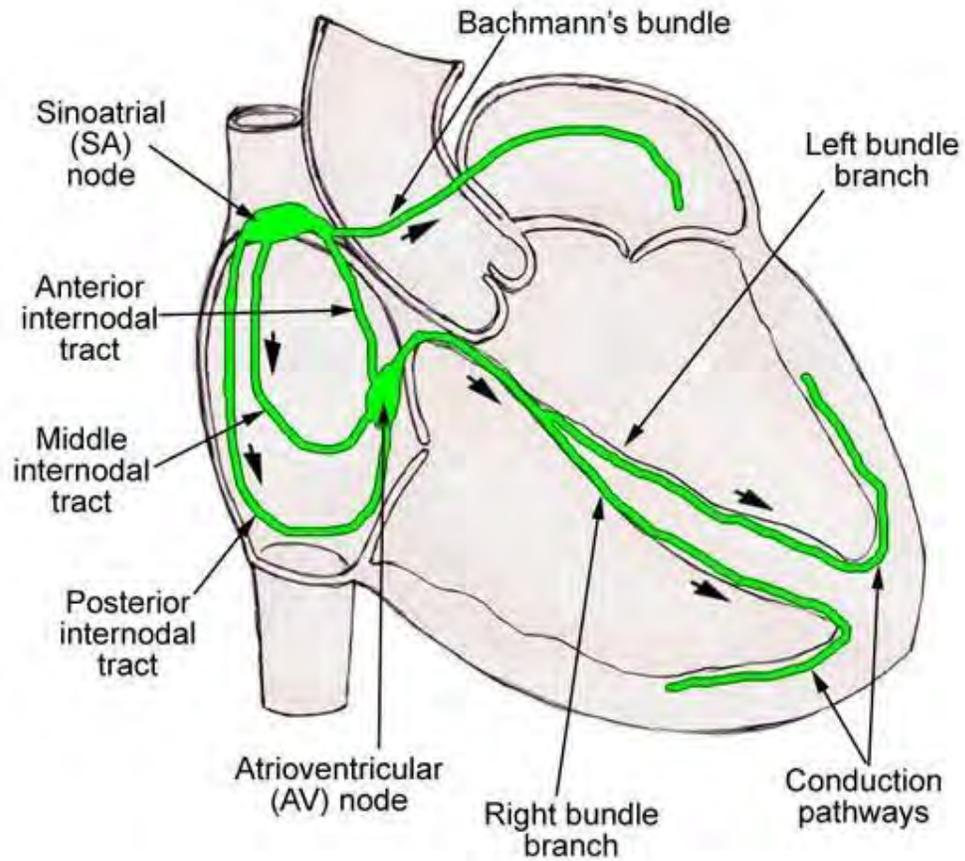
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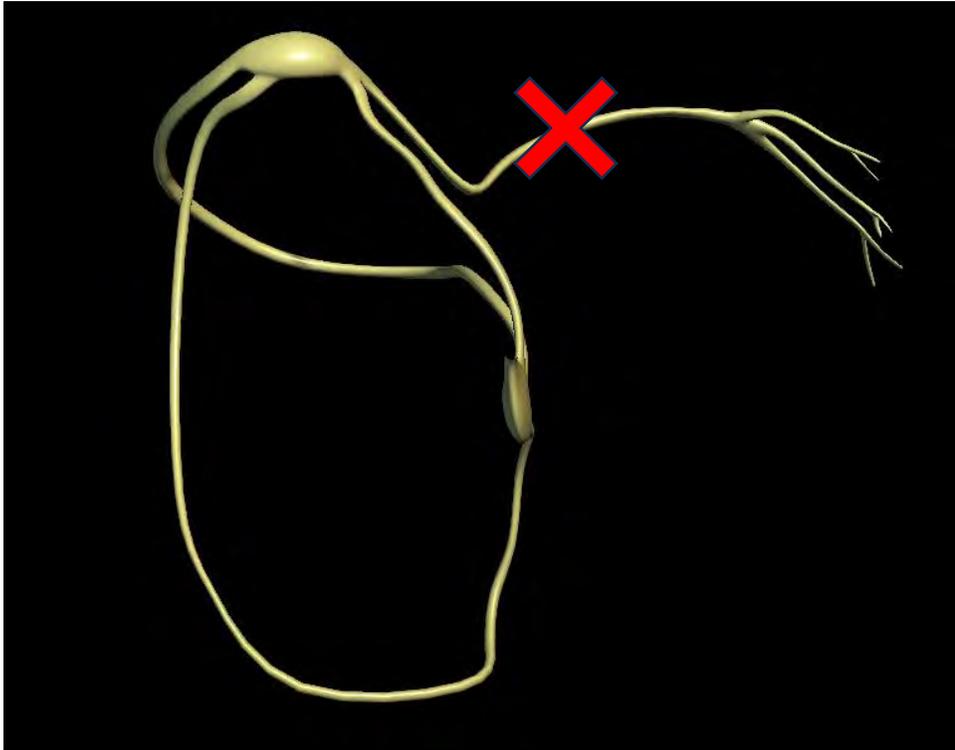
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But...the atria have their own conduction system

Electrical system of the heart





Problem

Intervention

Comparator

Outcome

Problem

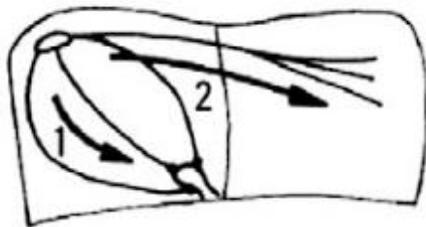
Interatrial conduction disorders

Scheme of atrial activation

P wave in FP

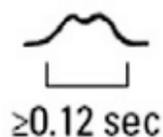
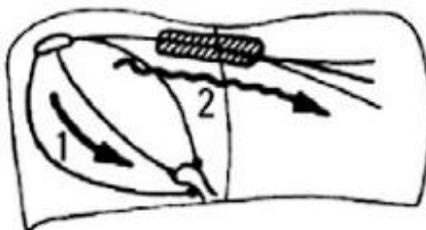
A

Normal atrial activation



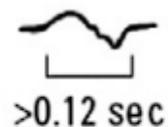
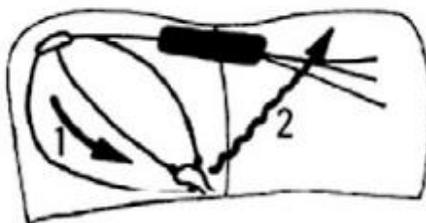
B

Partial interatrial block



C

Advanced interatrial block

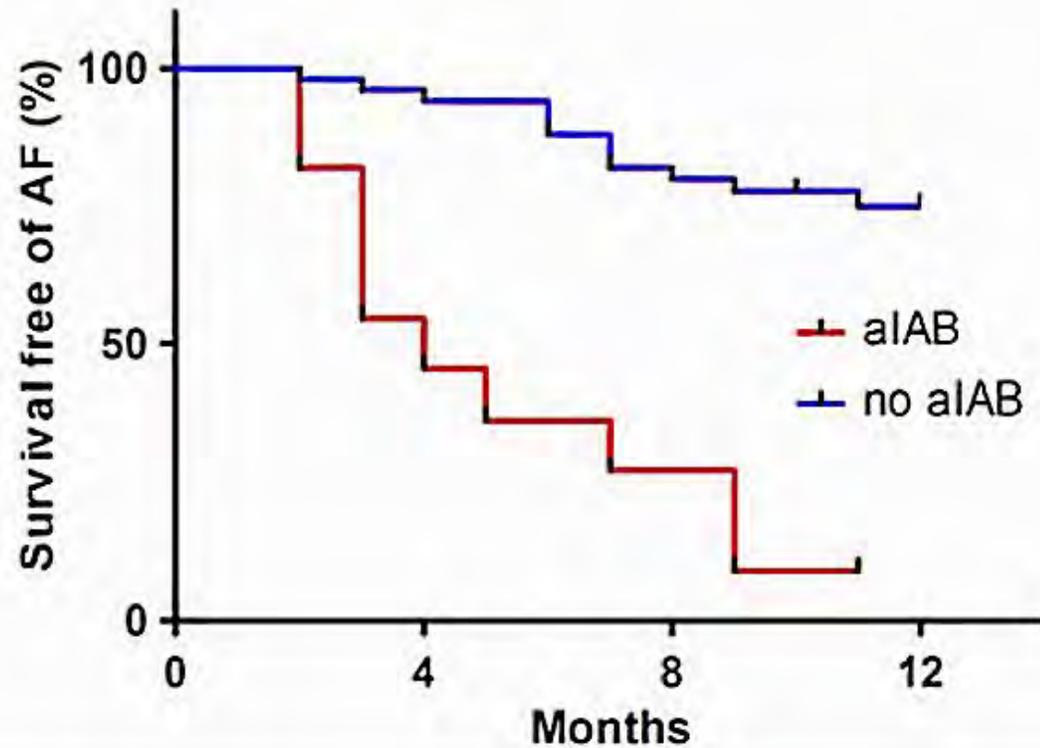


Classification of Interatrial Block (2012)

Simplified Classification	Degree of Block	Definition	Associated Findings
Partial IAB	First	P-wave duration ≥ 120 ms	Positive, usually bimodal configuration in leads I, II, III, and aVF and normal biphasic configuration in lead V ₁
Intermittent IAB	Second	Variable degree of block on the same ECG recording (alternating between first and third degree)	P-wave configuration changes may appear after a premature beat-induced pause
Advanced IAB	Third	P-wave duration ≥ 120 ms and biphasic configuration in the inferior leads (II, III, and aVF)	There are some atypical patterns: 1) by duration, P-wave < 120 ms; and 2) by configuration, P-wave is not biphasic in all 3 inferior leads

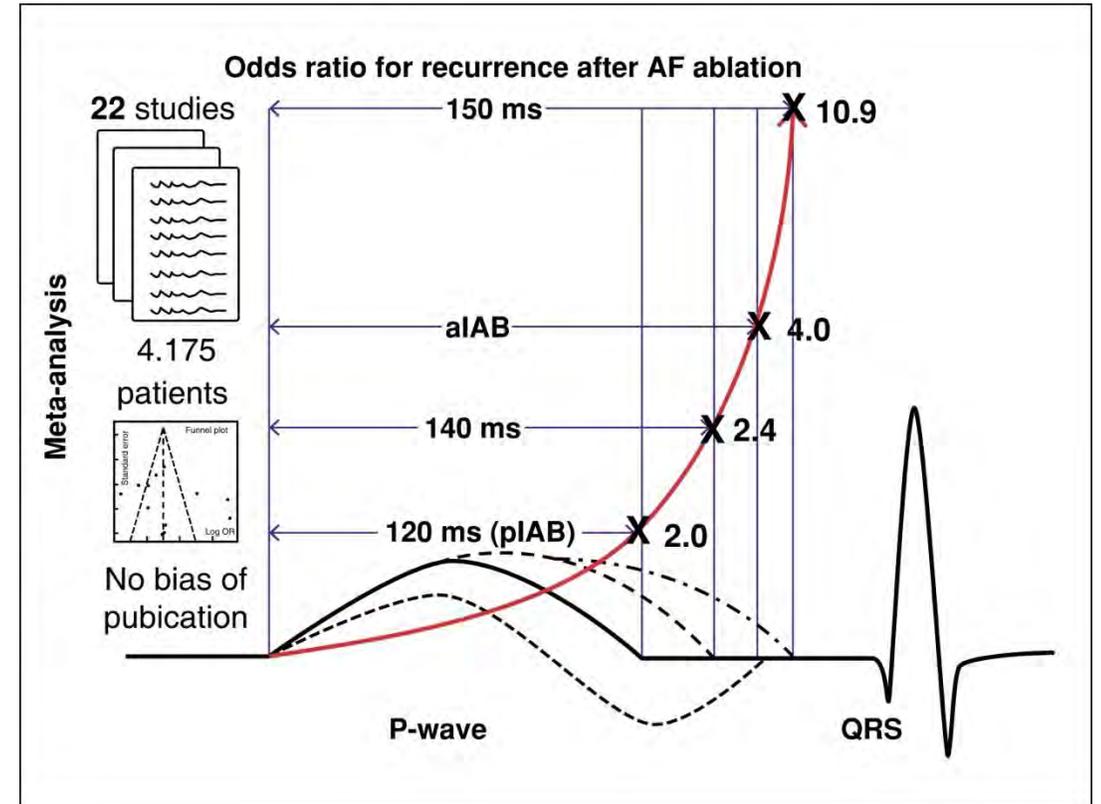
Consequences of interatrial block – Atrial fibrillation

PWD and recurrence post-pharmacological cardioversion



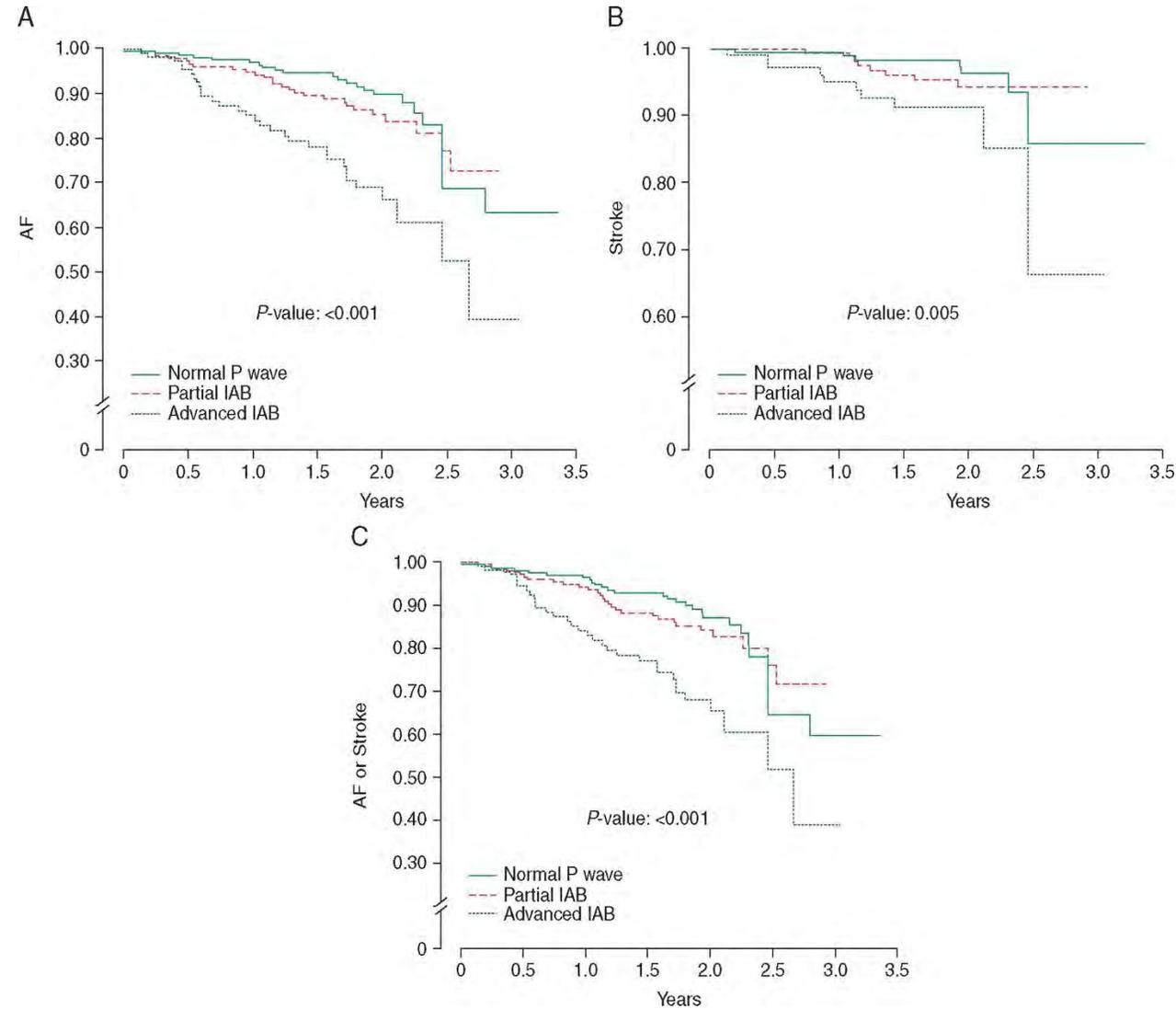
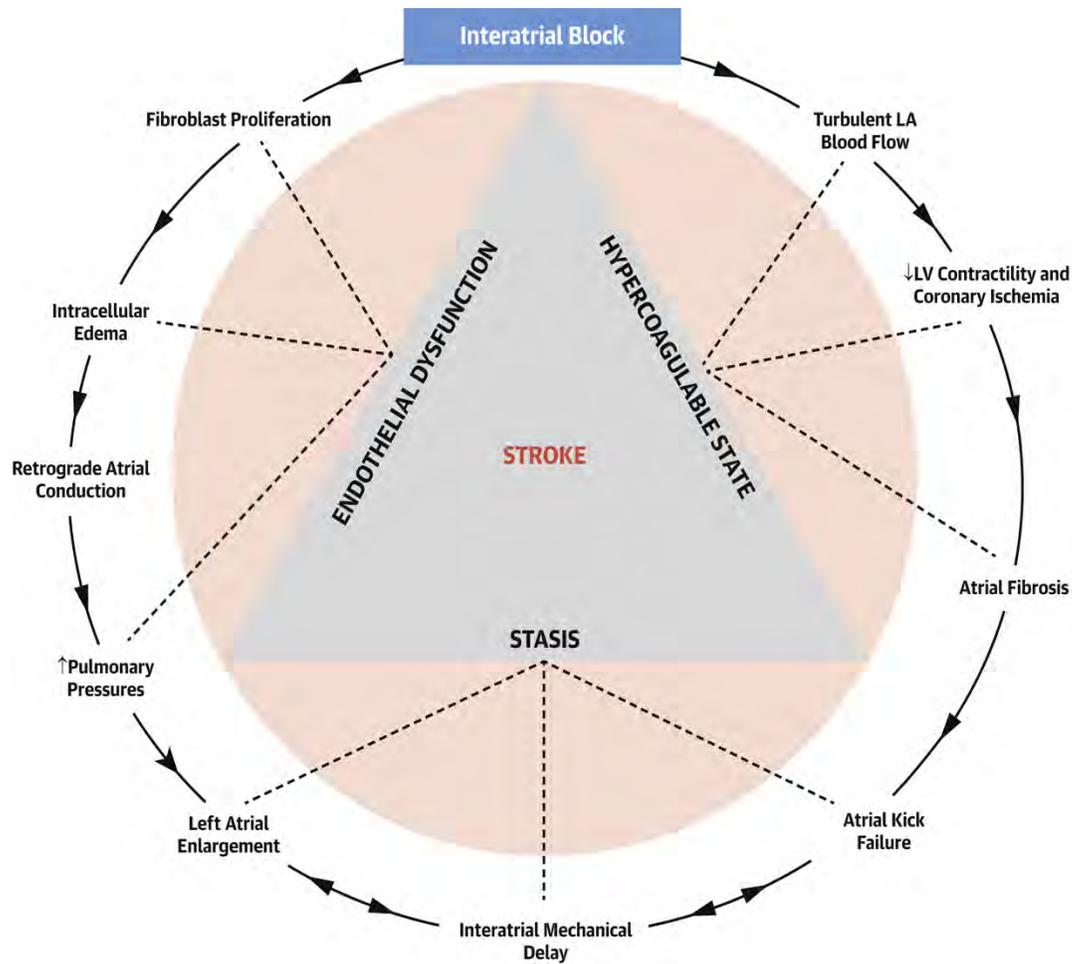
Enriquez A, et al. Advanced interatrial block is associated with recurrence of atrial fibrillation post pharmacological cardioversion. *Cardiovasc Ther.* 2014 Apr;32(2):52-6.

PWD and recurrence after AF ablation



Stergios Intzes, et al. P-wave duration and atrial fibrillation recurrence after catheter ablation: a systematic review and meta-analysis, *EP Europace*, Volume 25, Issue 2, February 2023, Pages 450–459

Consequences of interatrial block – Stroke

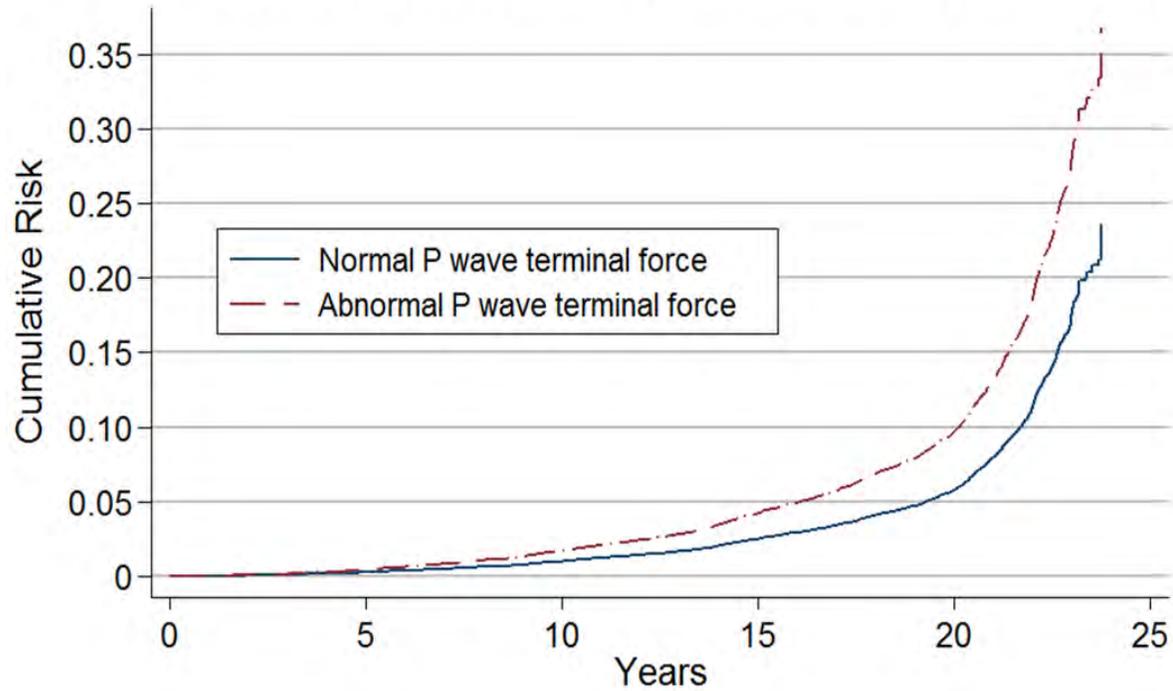


Power DA, et al. Cardiovascular Complications of Interatrial Conduction Block: JACC State-of-the-Art Review. J Am Coll Cardiol. 2022 Mar 29;79(12):1199-1211.

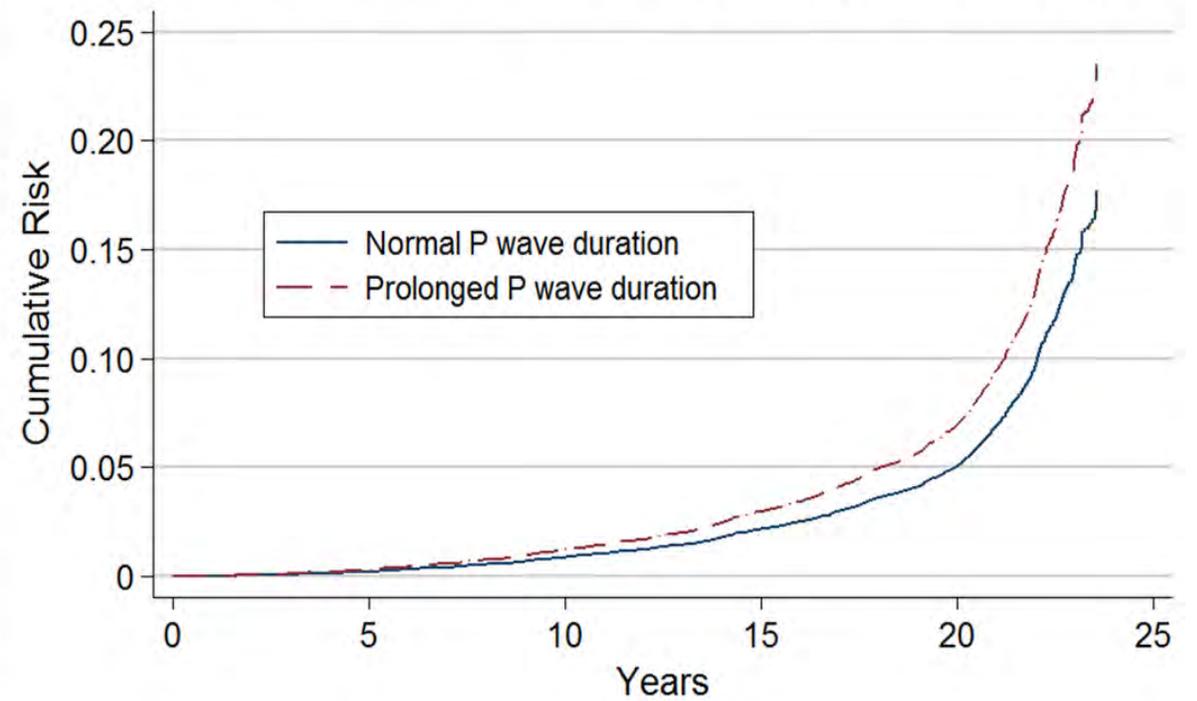
Manuel Martínez-Sellés, et al. Advanced interatrial block and P-wave duration are associated with atrial fibrillation and stroke in older adults with heart disease: the BAYES registry, EP Europace, Volume 22, Issue 7, July 2020, Pages 1001–1008.

Consequences of interatrial block – Cognitive decline

Panel **A** Cumulative Risk of Dementia by Abnormal P Wave Terminal Force

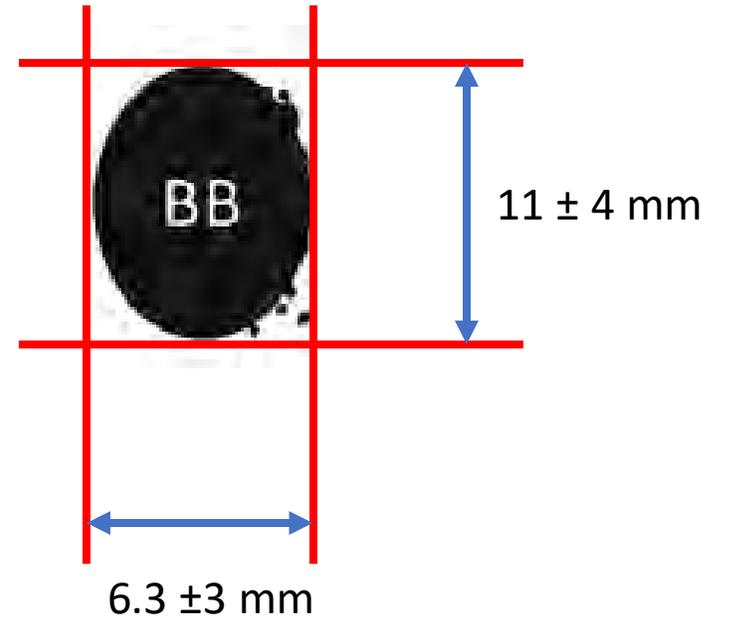
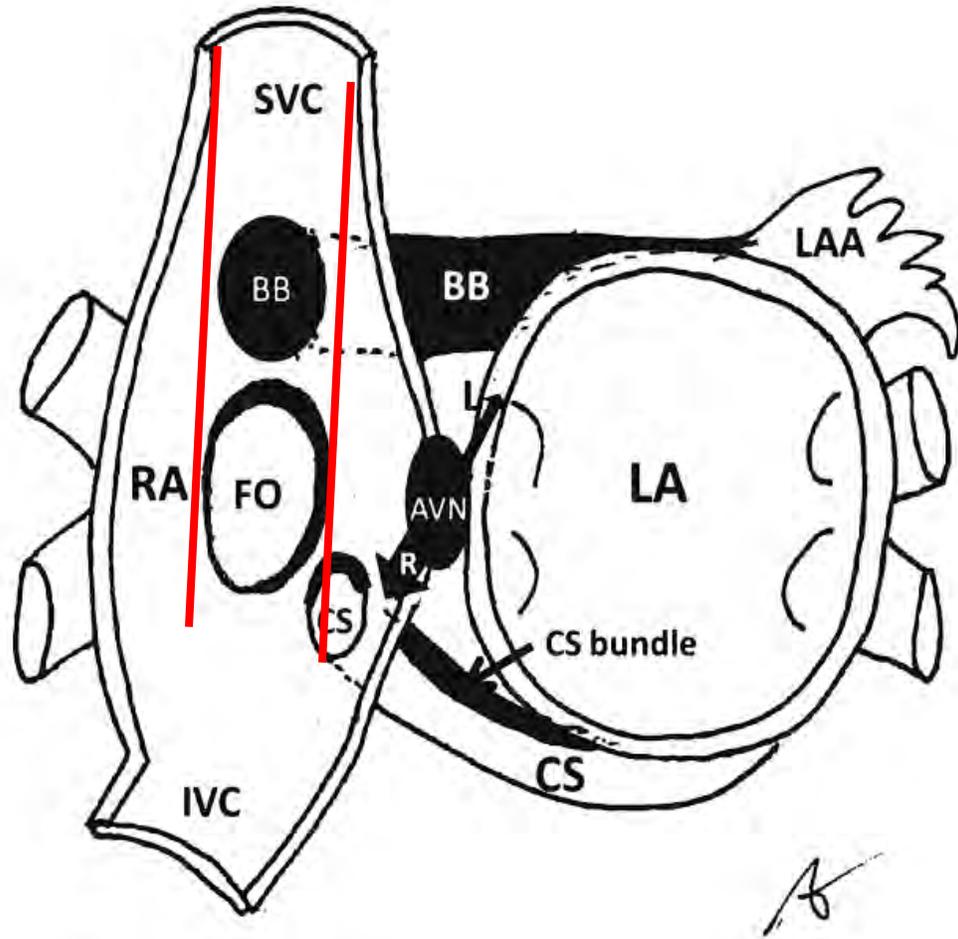


Panel **B** Cumulative Risk of Dementia by Prolonged P Wave Duration



Intervention

Bachmann bundle pacing – Pacing target

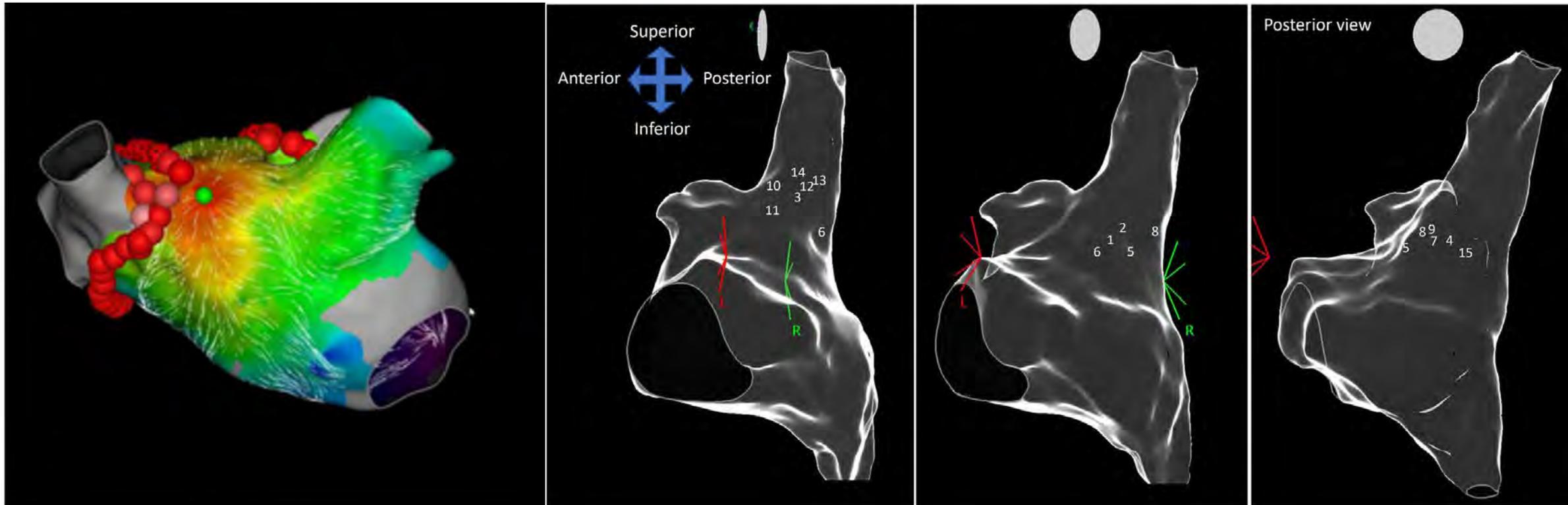


Bachmann bundle pacing – How to get there

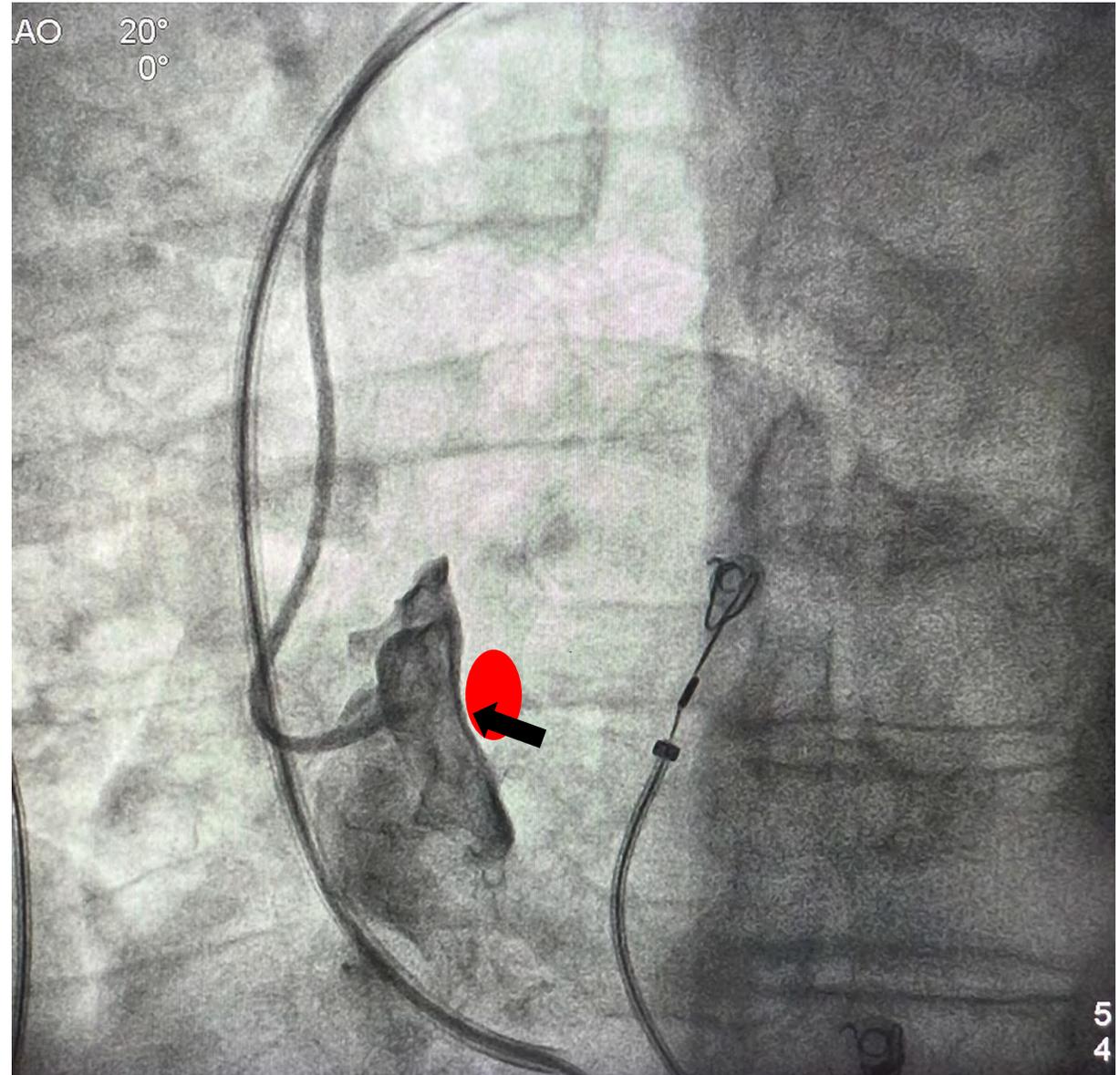
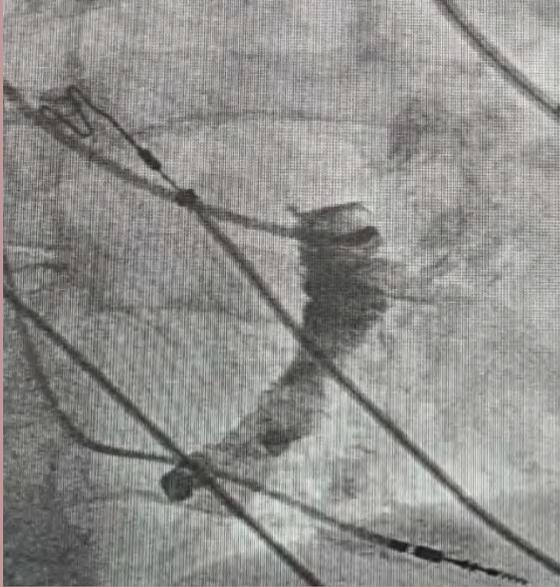


The Bachmann Bundle Pacing Target: Retrograde Mapping and Microstructural Correlation

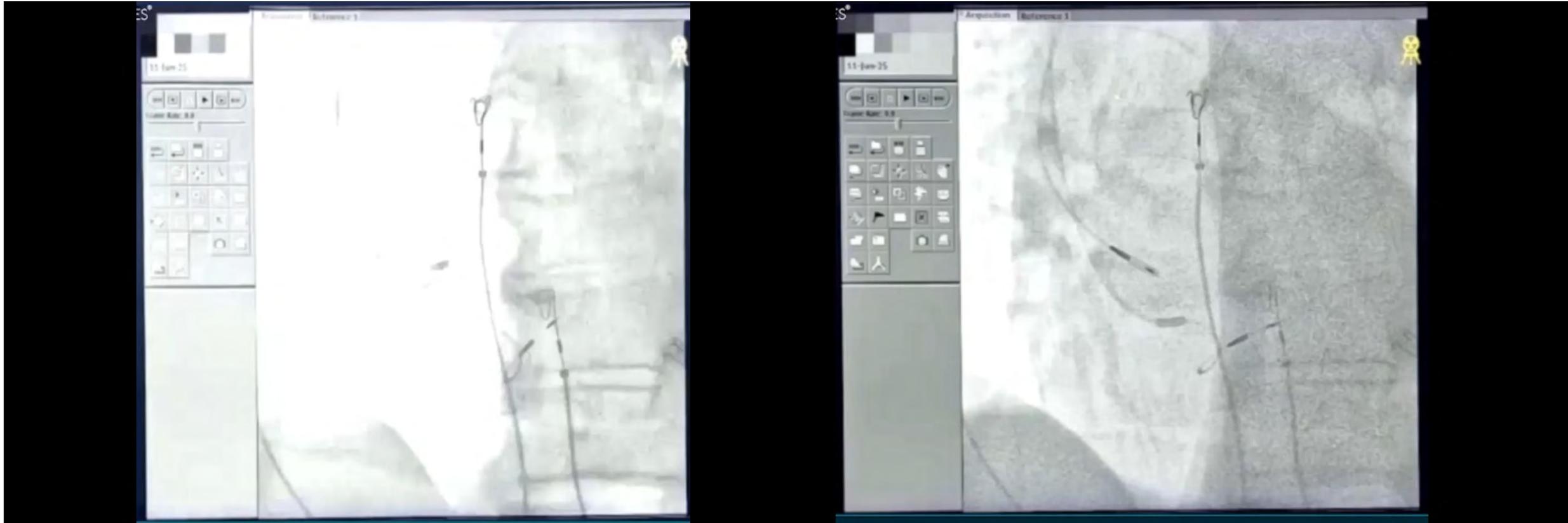
Daniel L. Lustgarten, MD, PhD, FHRS,¹ Nicole Habel, MD, PhD,¹ Margaret Infeld, MD, MS,²
Daniel Correa de Sa, MD,¹ Robert Lobel, MD,¹ Peter Spector, MD, FHRS,¹ Nathaniel Thompson, MD,¹
Joseph Winget, MD,¹ Neal Duong, BME,³ Bo Ye, MD, PhD,⁴ Paul A. Iaizzo, PhD,^{3,4}
Markus Meyer, MD, PhD⁴



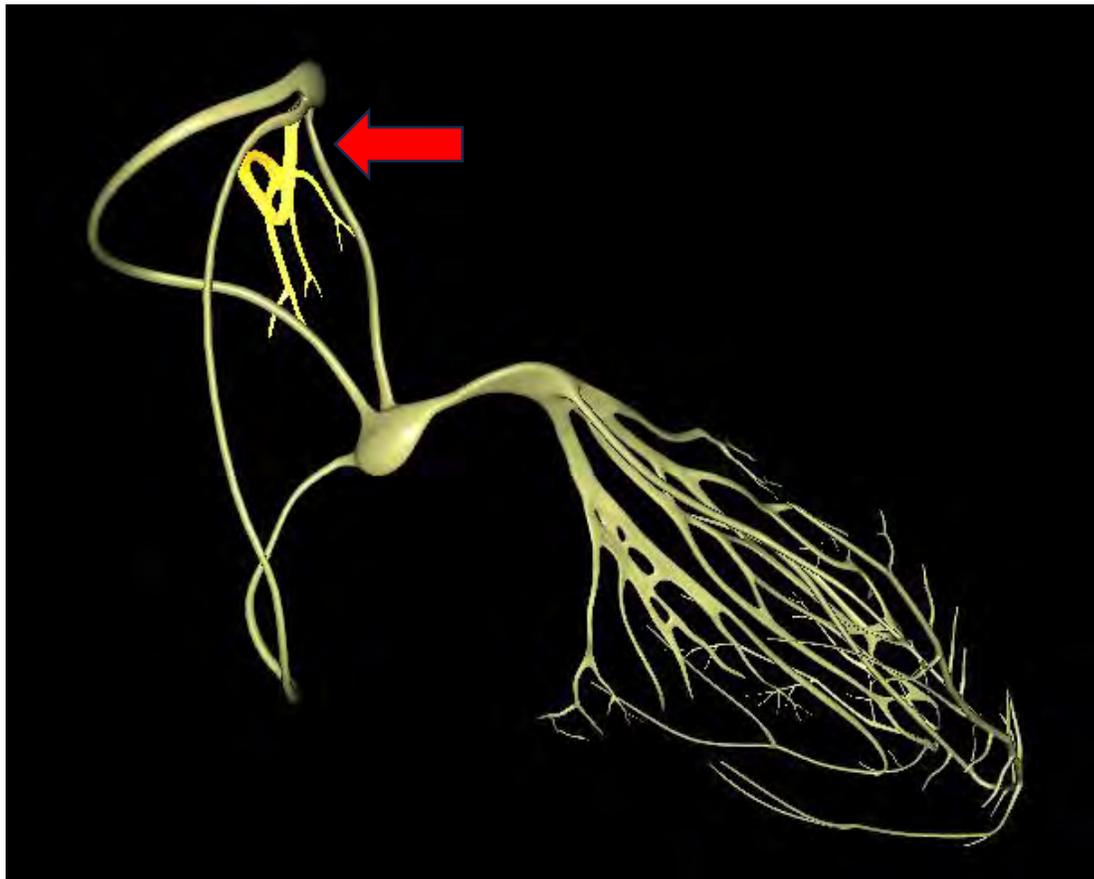
Bachmann bundle area – Fluoroscopic guidance



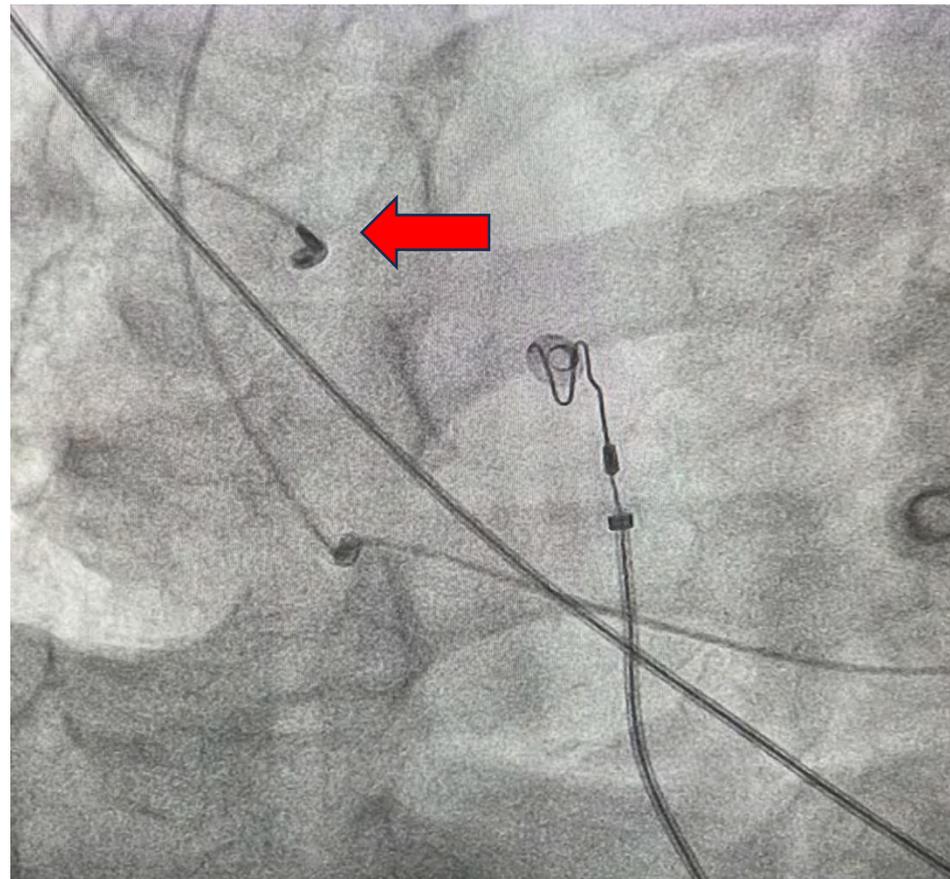
Bachmann bundle area – Fluoroscopic guidance



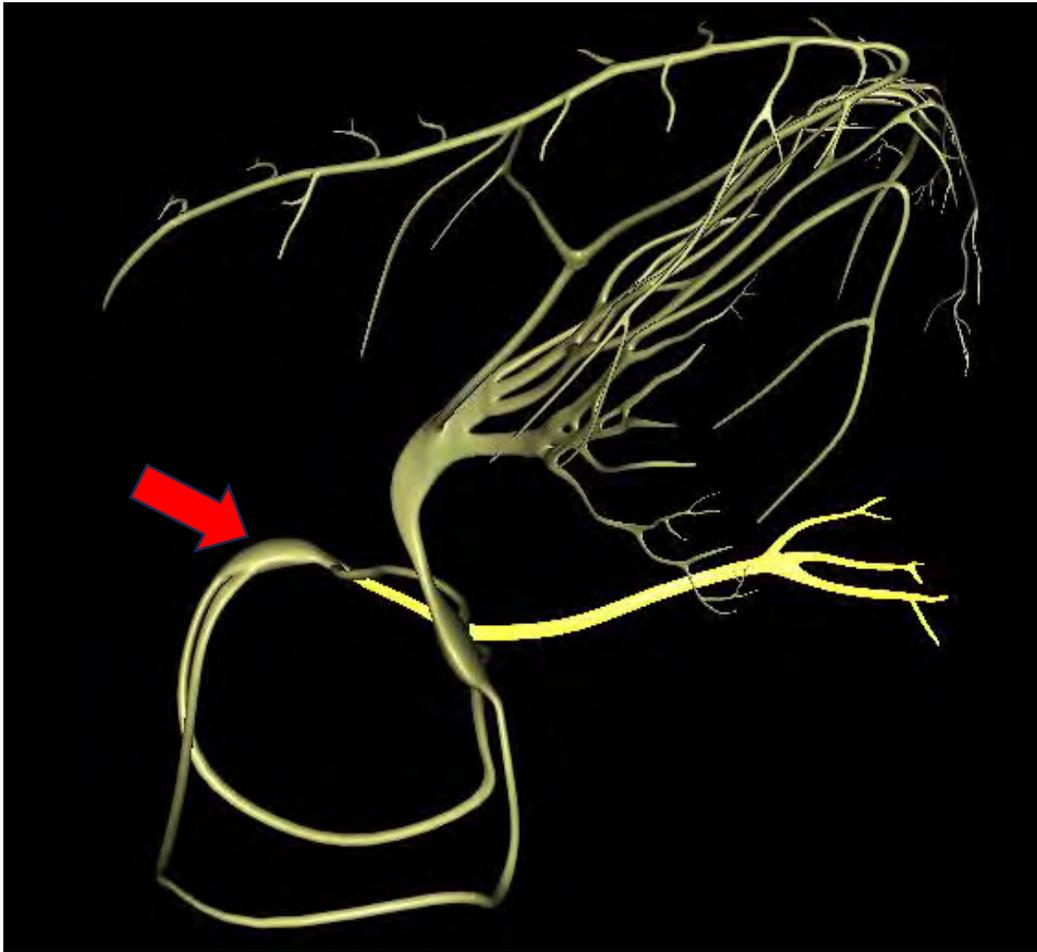
Bachmann bundle area – Fluoroscopic guidance



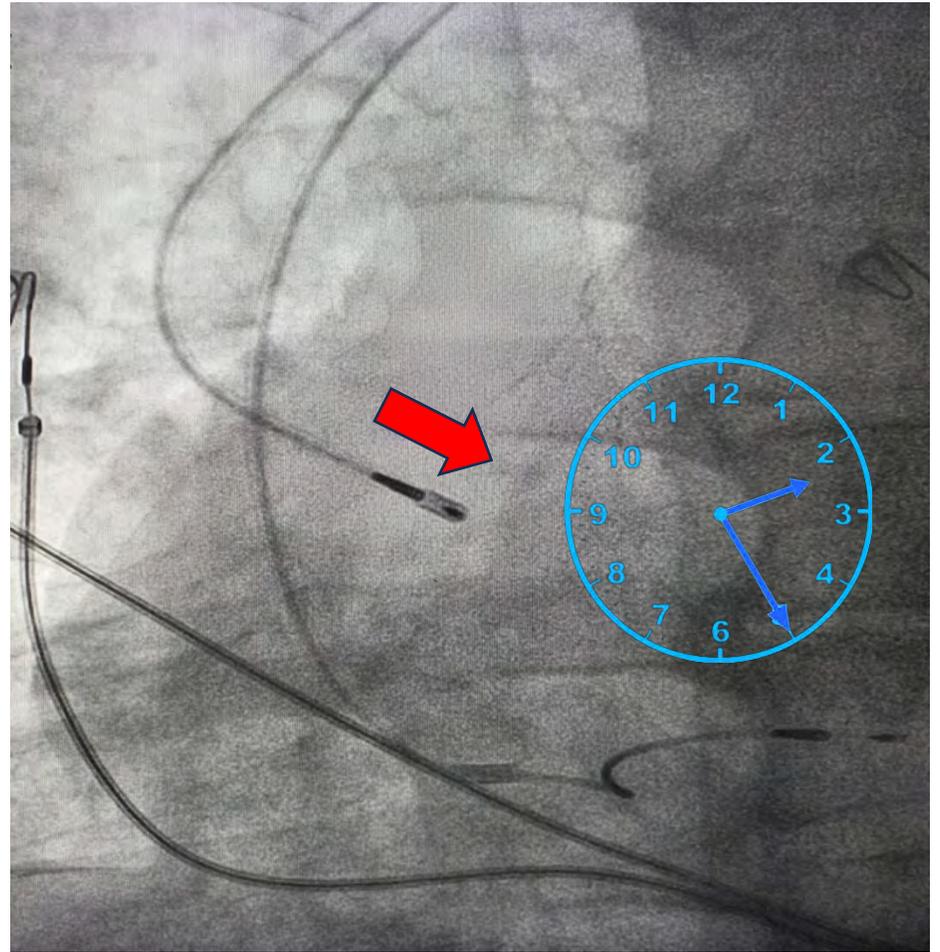
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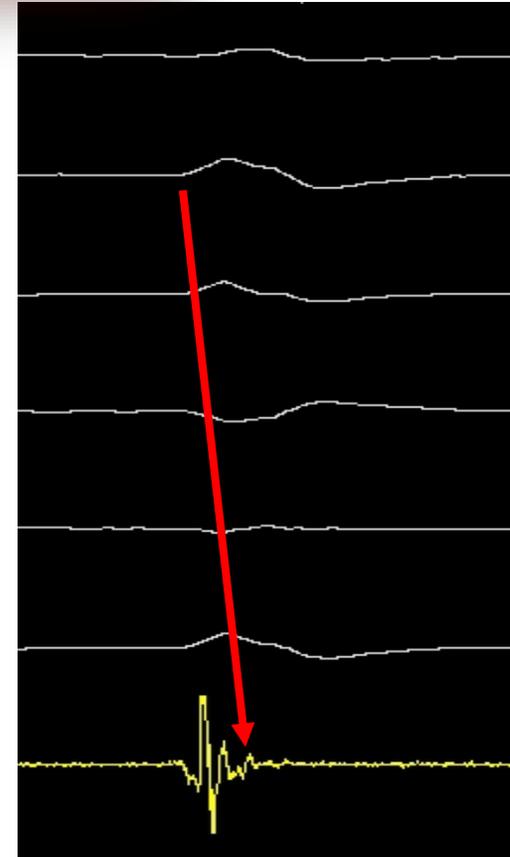
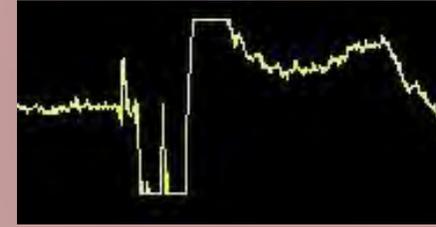
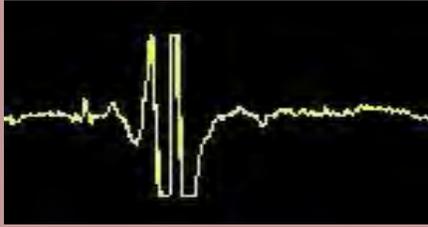
Bachmann bundle area – Fluoroscopic guidance



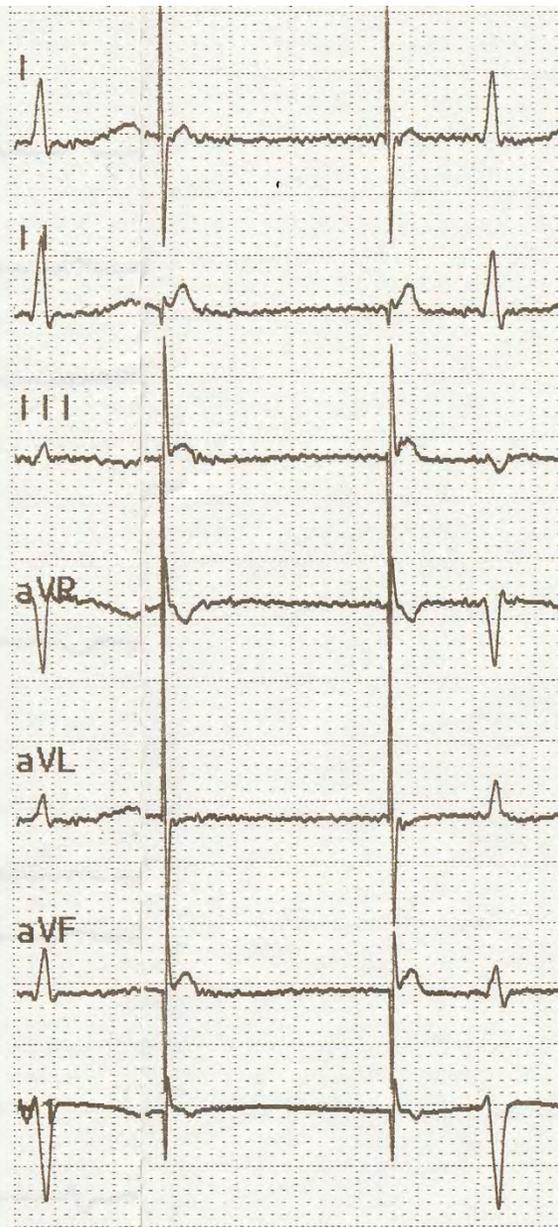
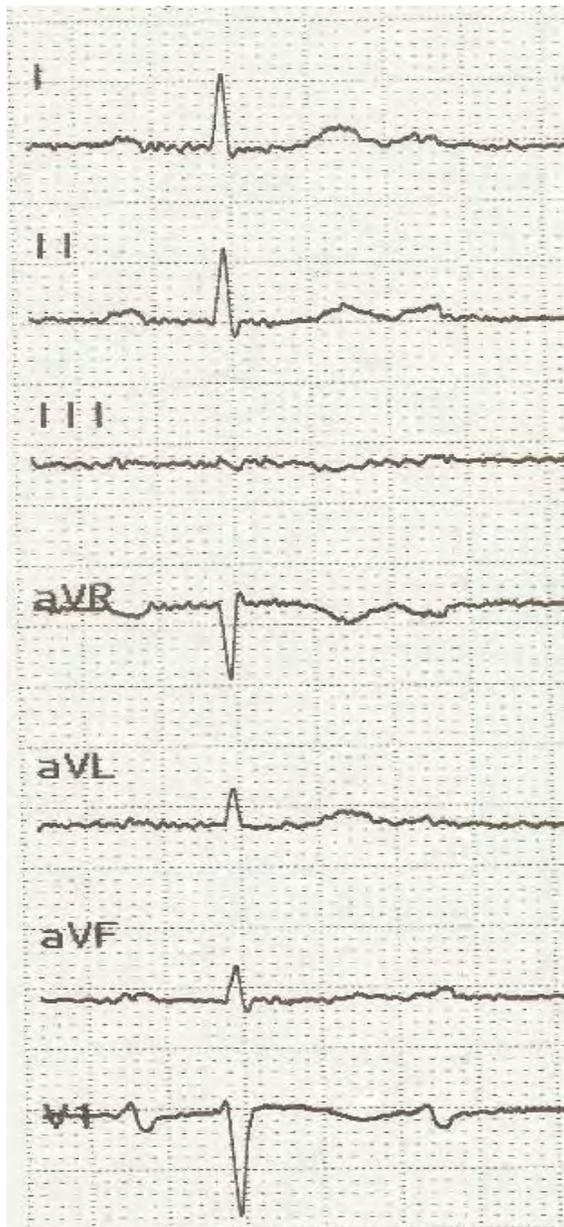
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Bachmann bundle area – Electrogram guidance



Bachmann bundle pacing – Pacemapping

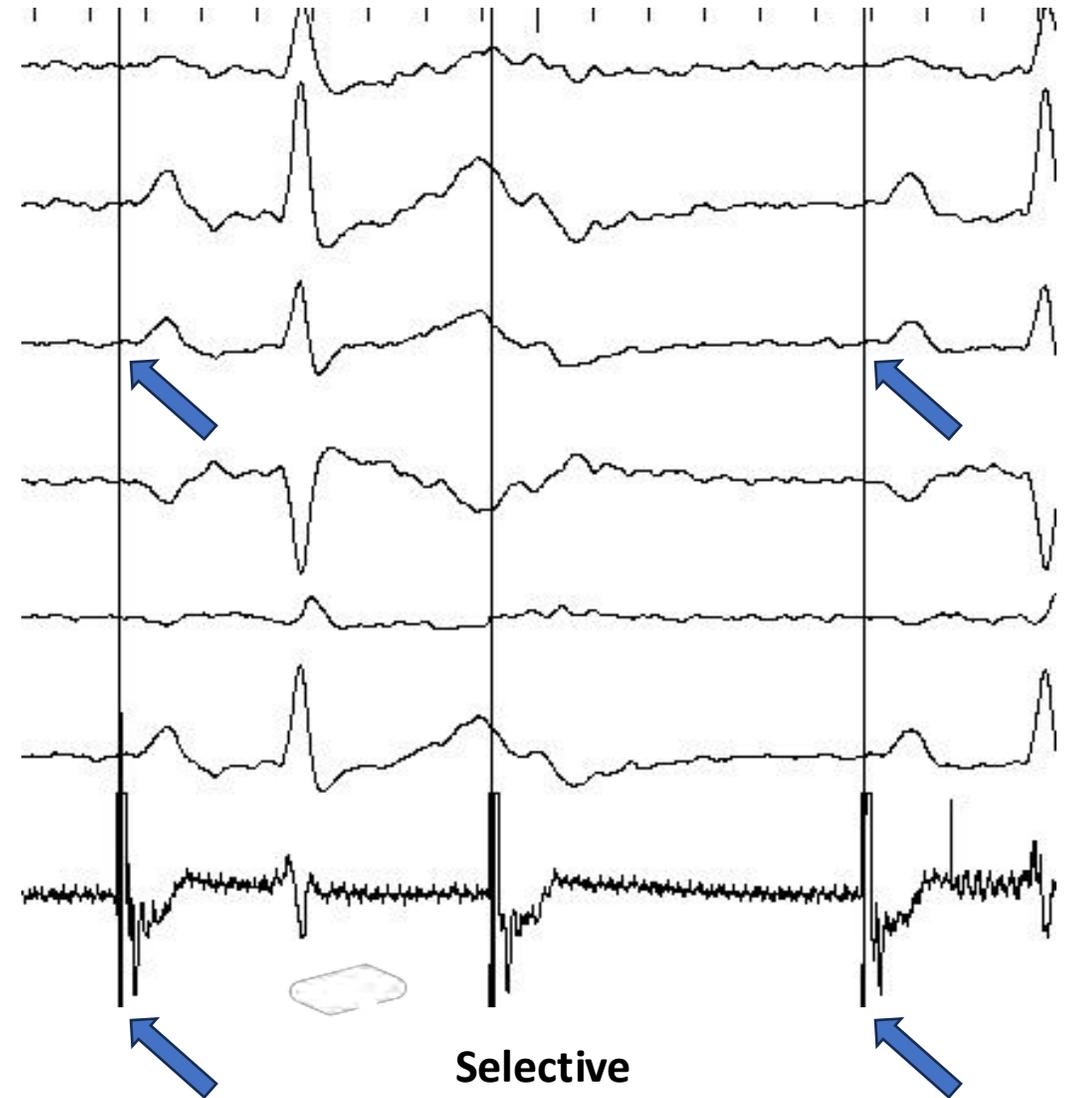


- P wave + in DI, DII, DIII, aVF, - or +/- in V1
- P wave taller and symmetric in inferior leads
- P wave narrower > 10 ms than sinus rhythm

Bachmann bundle pacing – Pacemapping

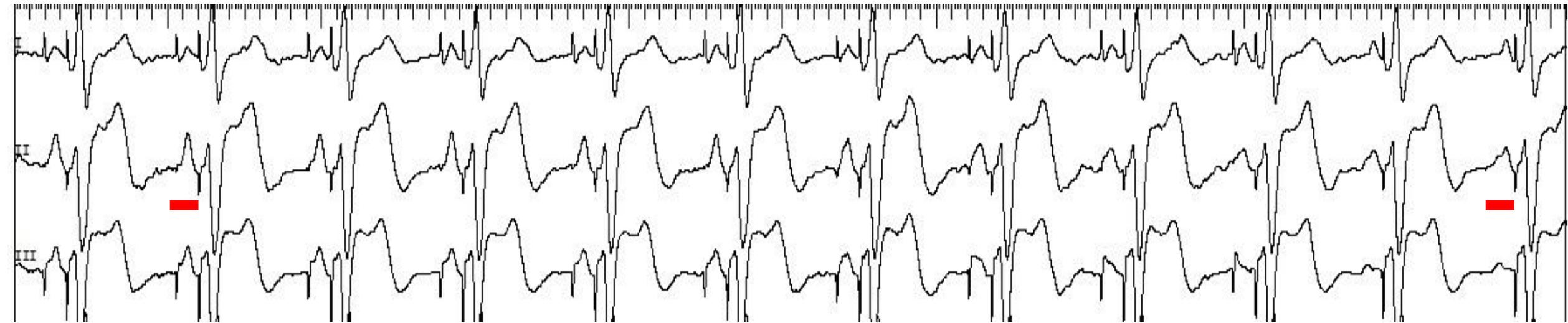


Non-selective

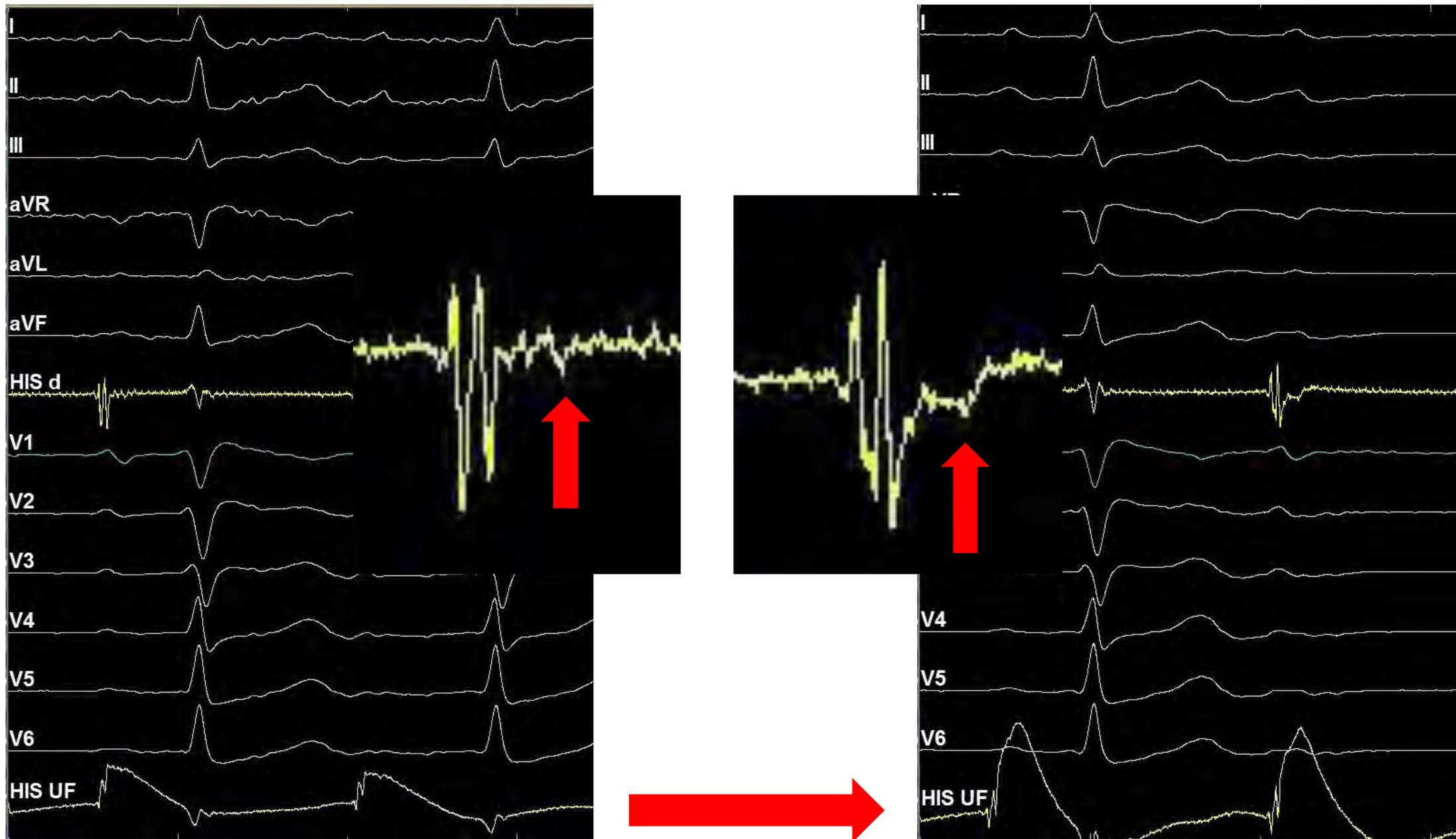


Selective

Bachmann bundle pacing – Final result



Bachmann bundle pacing – Current of injury



Comparator

Prevalence and Characterization of Asymptomatic Pacemaker and ICD Lead Perforation on CT

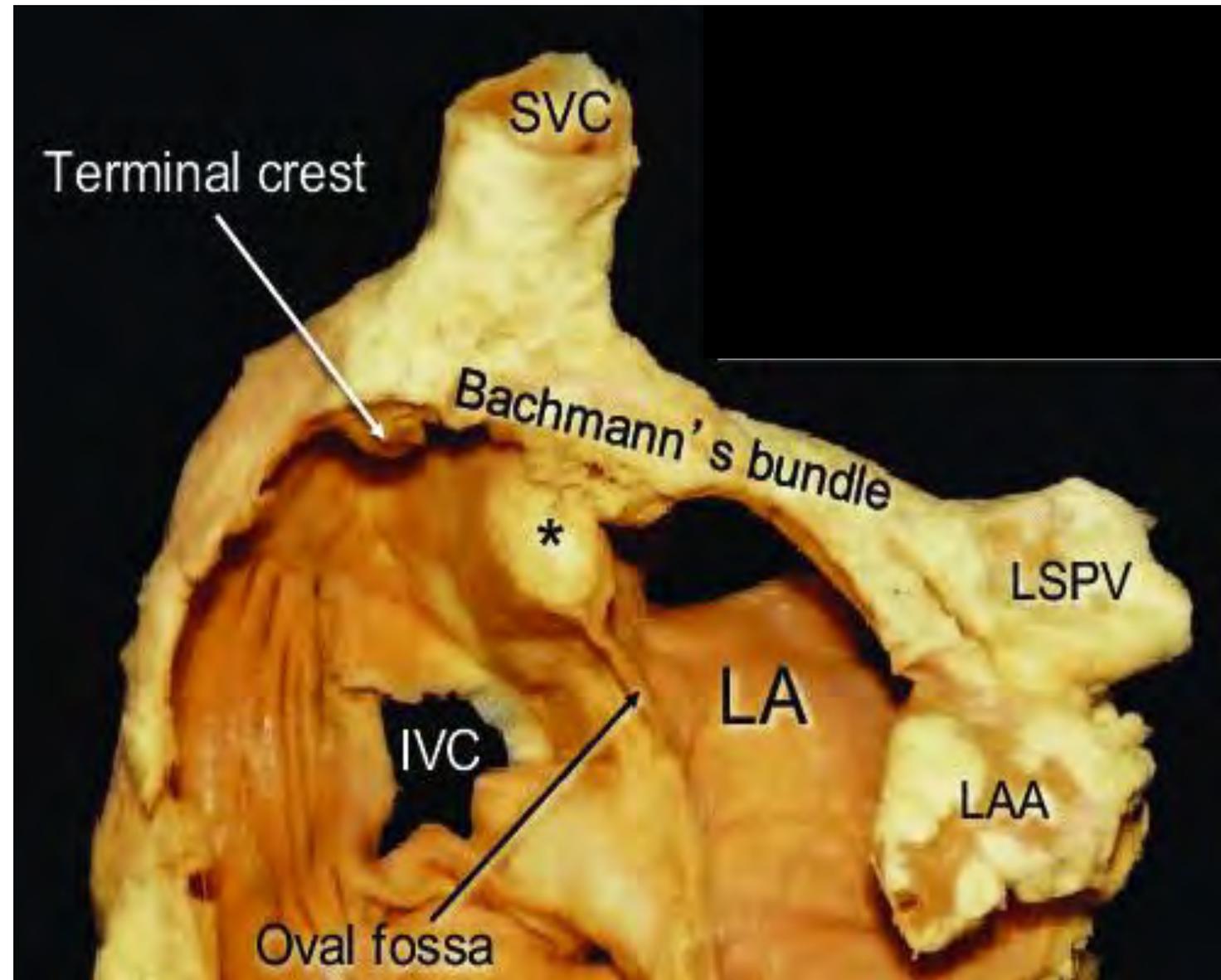
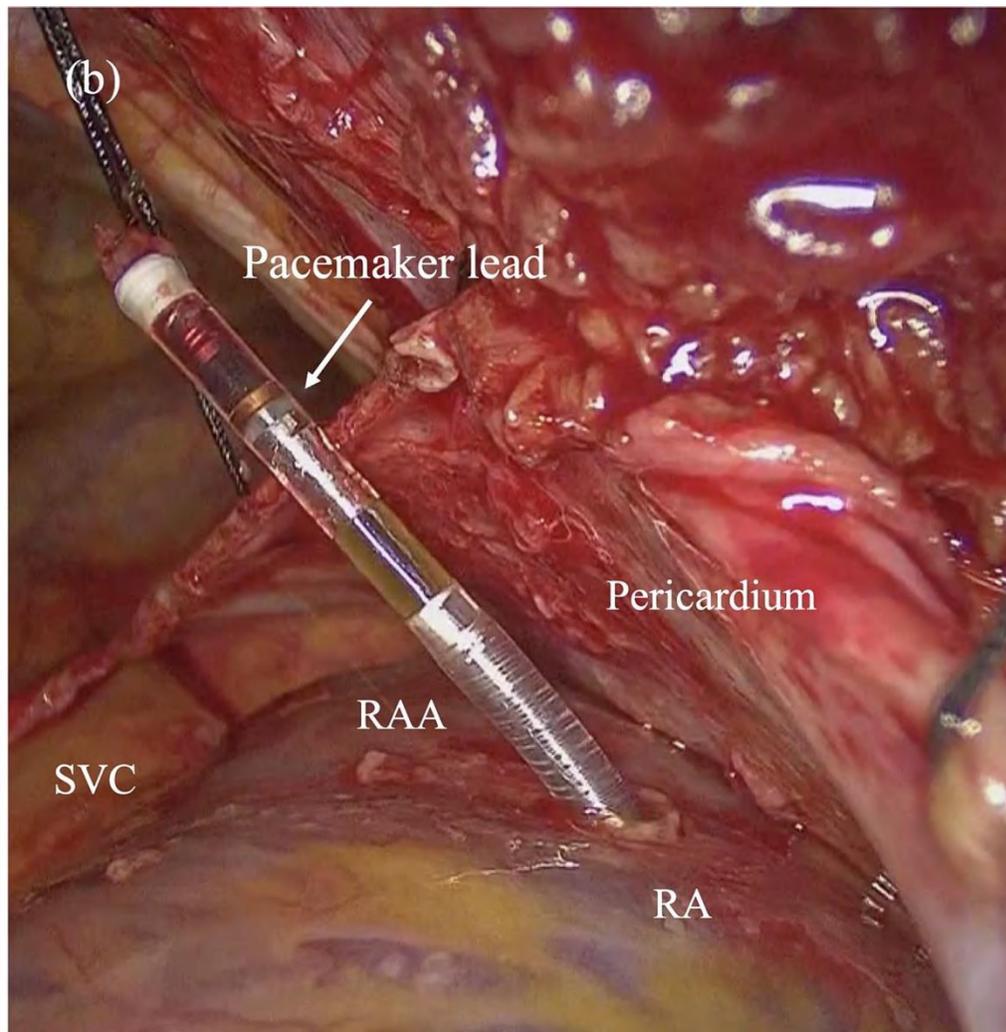
DAVID A. HIRSCHL, M.D.,* VINEET R. JAIN, M.D.,* HUGO SPINDOLA-FRANCO, M.D.,*
JAY N. GROSS, M.D.,† and LINDA B. HARAMATI, M.D.*

From the *Department of Radiology, and †Department of Internal Medicine, Division of Cardiology, Albert Einstein College of Medicine, Montefiore Medical Center, Bronx, New York

Perforation rates were 15% (9/61) for atrial and 6% (6/100) for ventricular leads (P < 0.05, chi-square).

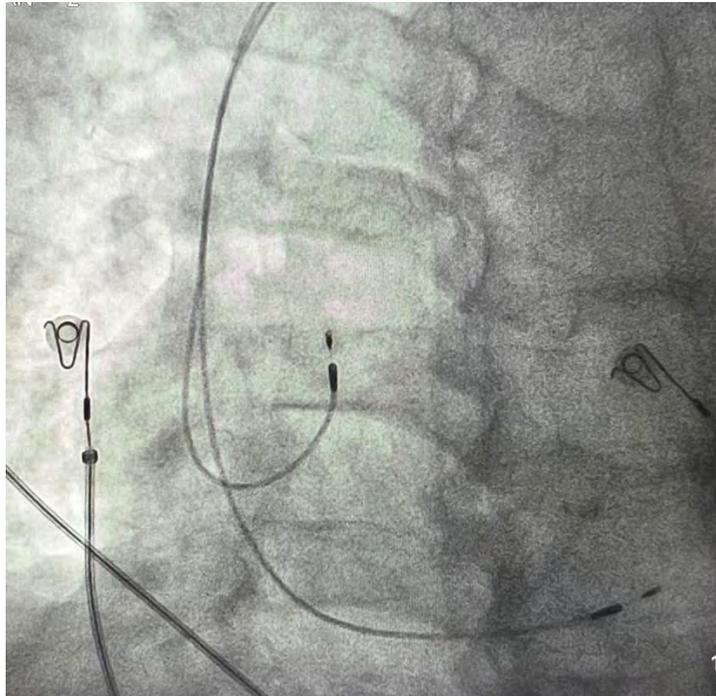
Hirschl DA, et al. Prevalence and characterization of asymptomatic pacemaker and ICD lead perforation on CT. *Pacing Clin Electrophysiol.* 2007 Jan;30(1):28-32. doi: 10.1111/j.1540-8159.2007.00575.x. PMID: 17241311.





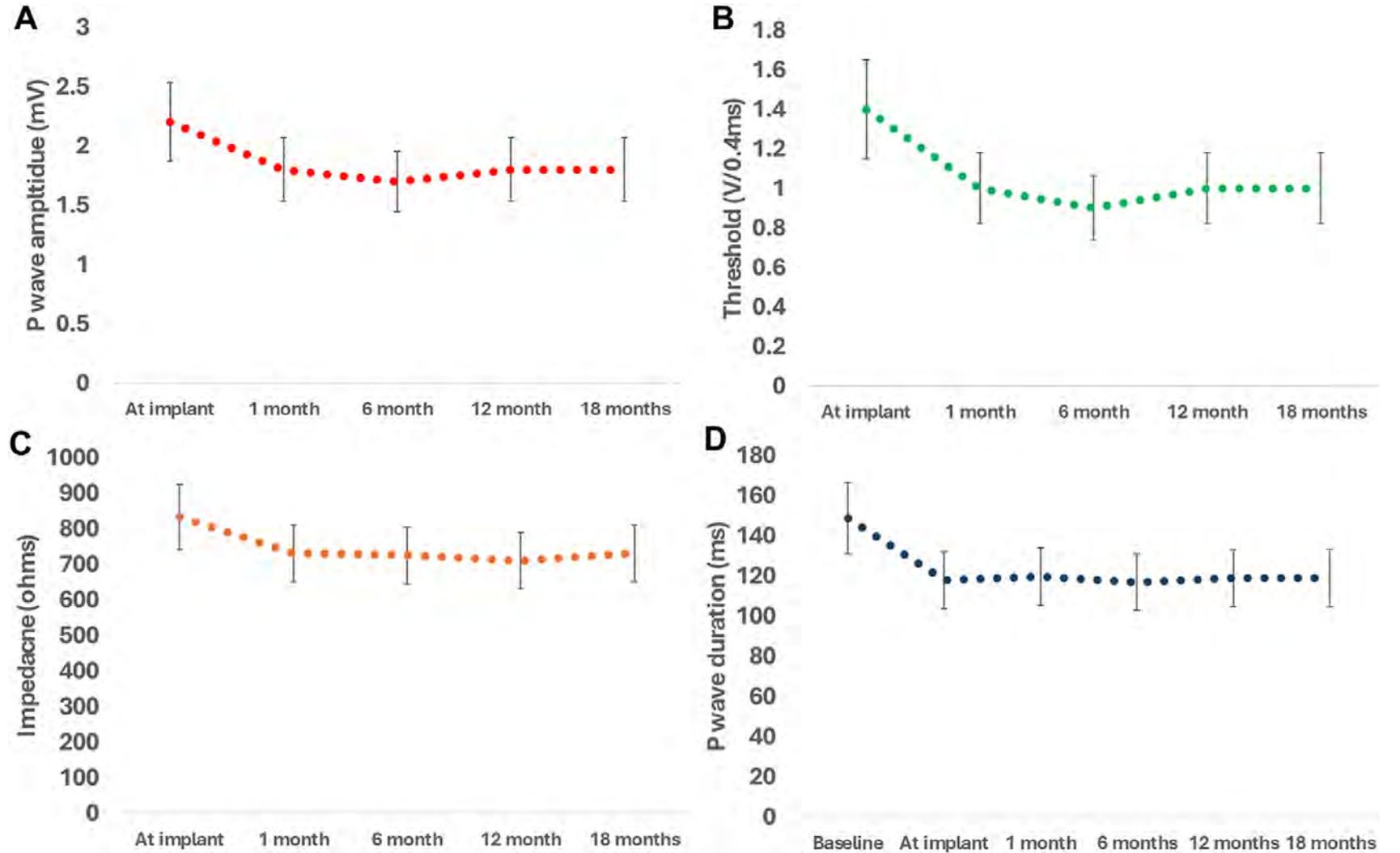
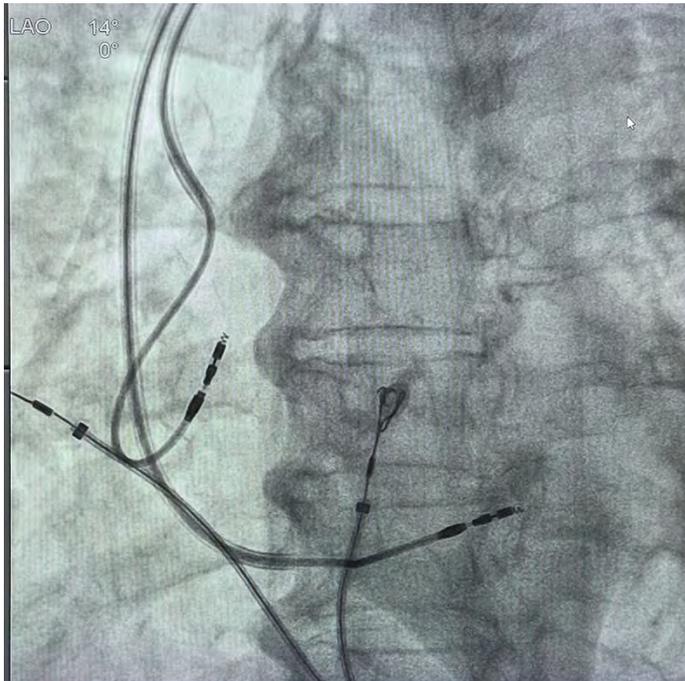
Shiomi S, et al. Complete atrial screw lead penetration and contralateral pneumothorax post-pacemaker implantation. *J Cardiol Cases*. 2024 Sep 23;31(1):1-4. doi: 10.1016/j.jccase.2024.09.002.

Procedural parameters – lumenless leads



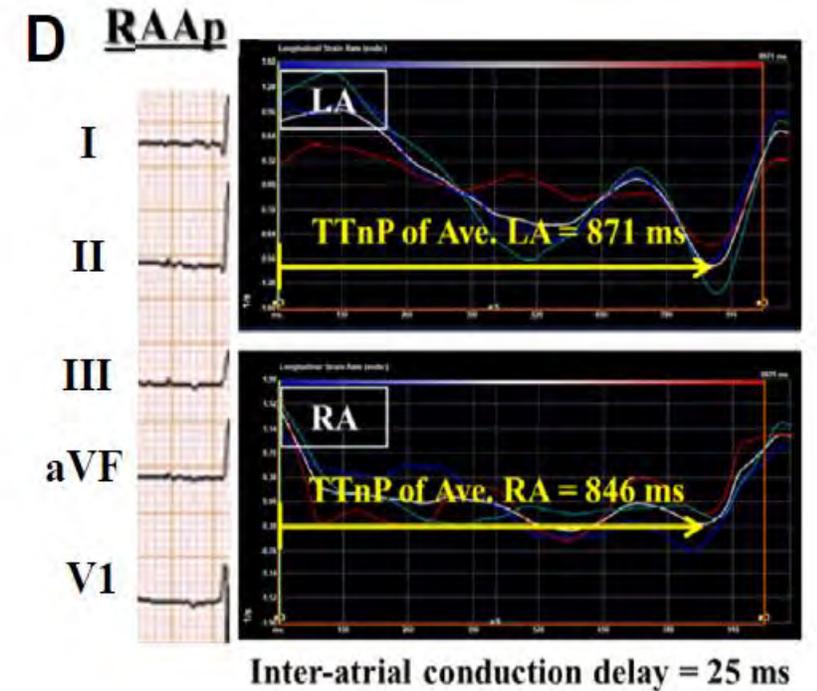
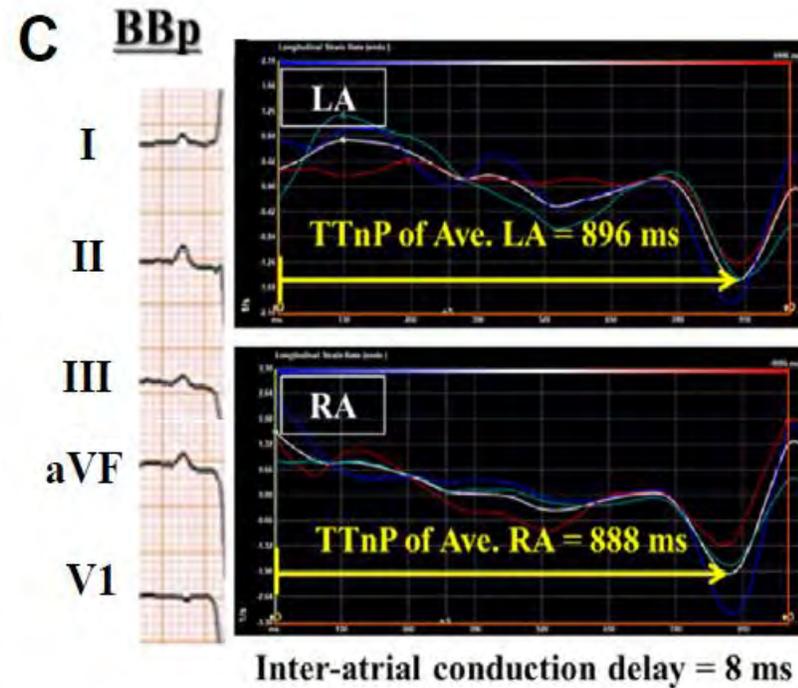
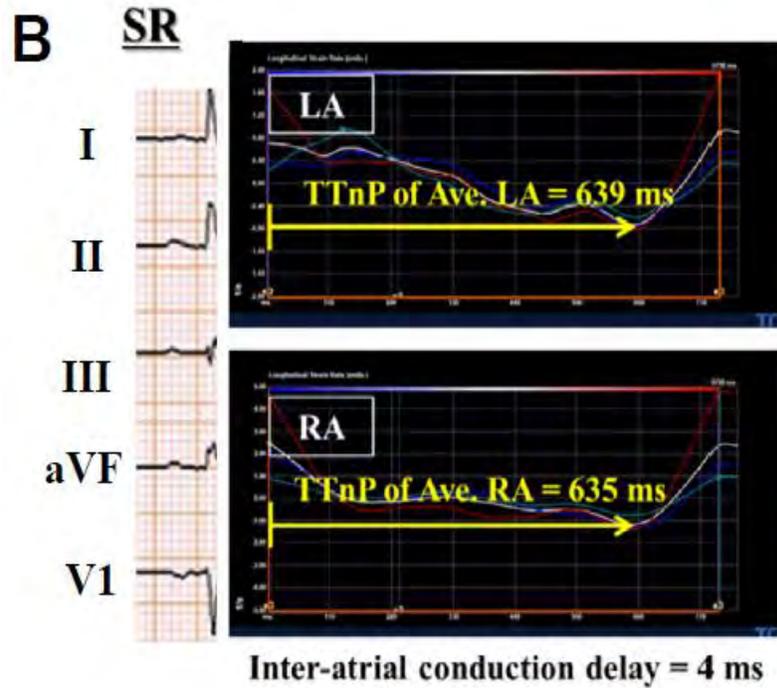
Category	BBp (n = 134)	RASp (n = 107)	RAAp (n = 108)	P-value
Atrial lead parameters at implant				
Threshold (V), mean ± SD ^a	0.78 ± 0.41	0.92 ± 0.48	0.89 ± 0.35	0.033
Pulse width (ms), mean ± SD	0.45 ± 0.16	0.46 ± 0.14	0.45 ± 0.14	0.747
P-wave sensing threshold (mV), mean ± SD ^b	2.23 ± 1.13	1.73 ± 0.88	2.68 ± 1.57	<0.001
Impedance (Ω), mean ± SD ^c	689.0 ± 186.2	692.4 ± 250.2	539.6 ± 130.6	<0.001
Atrial lead parameters at last follow-up				
Overall follow-up (months), mean ± SD	58 ± 36	65 ± 40	63 ± 38	0.154
Threshold (V), mean ± SD ^e	0.96 ± 0.39	0.94 ± 0.46	0.79 ± 0.38	0.004
Pulse width (ms), mean ± SD ^f	0.45 ± 0.16	0.44 ± 0.19	0.39 ± 0.10	0.006
P-wave sensing threshold (mV), mean ± SD ^g	2.11 ± 1.33	1.62 ± 1.22	2.21 ± 1.43	<0.001
Impedance (Ω), mean ± SD ^h	564.6 ± 109.7	524.6 ± 95.0	449.1 ± 95.0	<0.001
Atrial lead complications				
Atrial lead revisions, n (%)	2 (1.5)	3 (2.8)	3 (2.7)	0.491

Procedural parameters – stylet-driven leads



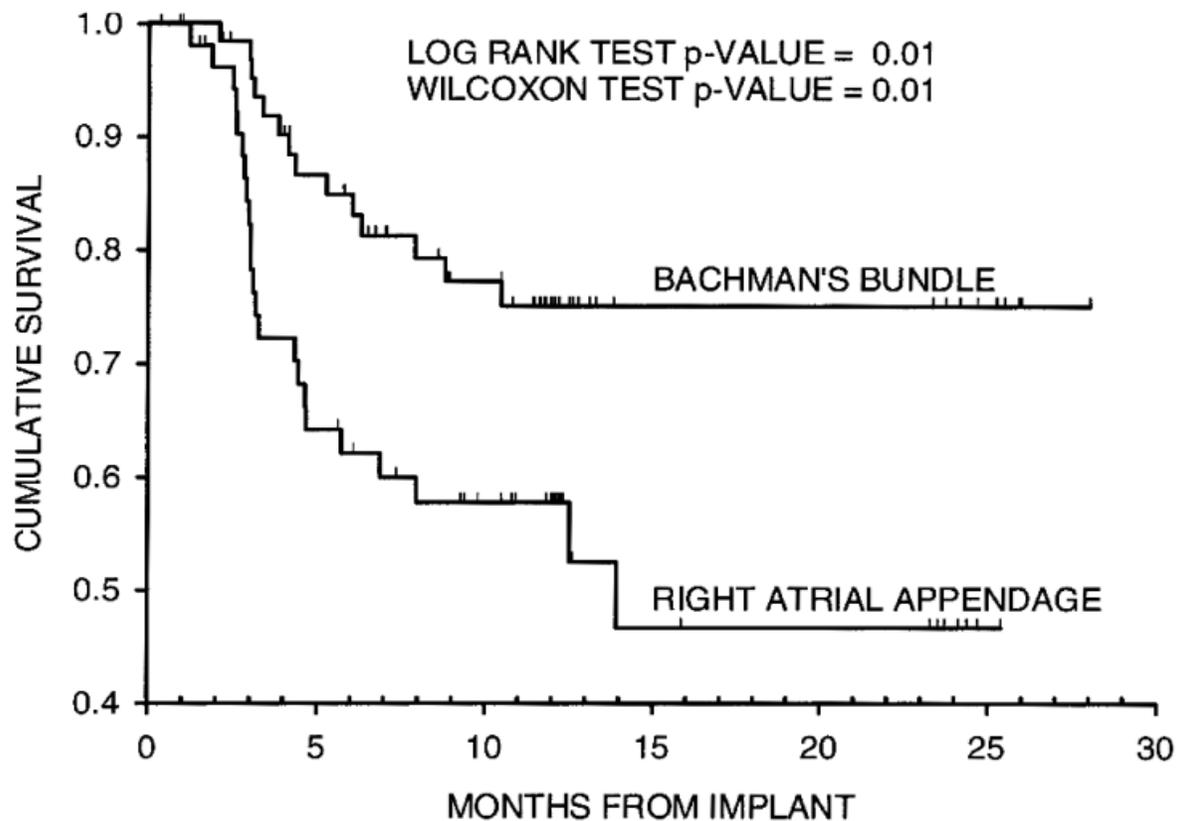
Outcome

Echocardiographic results

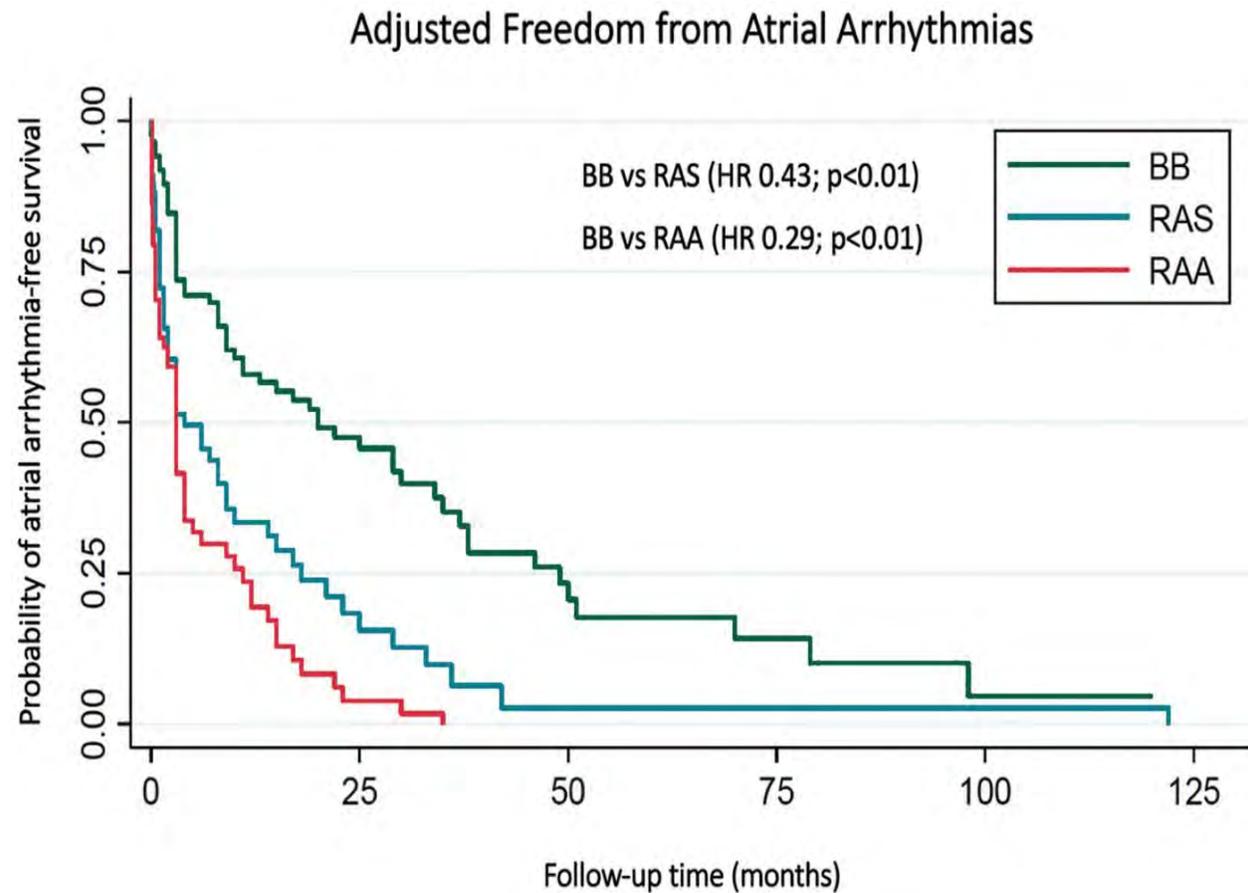


Yoshimoto D, et al. Comparative assessment of interatrial conduction delay during Bachmann's bundle pacing and right atrial appendage pacing using biatrial strain rate echocardiography. Heart Rhythm. 2024 Dec 15:S1547-5271(24)03661-0.

Clinical results



Bailin, S. J. et al (2001). Prevention of Chronic Atrial Fibrillation by Pacing in the Region of Bachmann's Bundle: Results of a Multicenter Randomized Trial. *Journal of Cardiovascular Electrophysiology*, 12(8), 912–917.



Infeld M, et al. Clinical impact of Bachmann's bundle pacing defined by electrocardiographic criteria on atrial arrhythmia outcomes, *EP Europace*, Volume 24, Issue 9, September 2022, Pages 1460–1468,

Conclusions

- Bachmann bundle pacing has a short learning curve (especially for those experienced with the dedicated delivery tools for CSP)
- The procedure is feasible with good and stable sensing and pacing parameters
- It has the pathogenetic arguments for clinical benefit (especially a reduction in AF occurrence), but larger prospective clinical trials will have to prove it.
- It minimizes the risk of atrial perforation

Recommendation	Class ^a	Level ^b
Bachmann Bundle Pacing?	I	C

THANK YOU FOR YOUR ATTENTION!