Indikation und Durchführung der epikardialen Ablation

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Helios

Conflict of Interests

NONE

Recommendation for training requirements and competencies for catheter ablation of VA

COR	LOE	Recommendation
I	C-EO	1. For clinical cardiac electrophysiologists who perform catheter ablation of VAs, appropriate advanced training and continued lifelong learning is recommended.

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Indications:

Based on the available data, the relative contribution of first-line epicardial ablation to a patient's outcome remains unclear. For a large number of patients, accessible epicardial ablation target sites cannot be identified, and these patients are exposed to additional procedural risks and discomfort. Considering the higher risk for procedural complications with an epicardial approach (S9.5.5.57), careful patient selection is warranted. Further study is required to determine whether preprocedural imaging can help to identify post-MI patients who will benefit from an epicardial approach (S9.5.5.58,S9.5.5.59).

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Use of Imaging:

Recommendations for preprocedural imaging for VA catheter ablation

COR	LOE	Recommendations	References
IIa	B-NR	2. In patients with NICM or ICM undergoing catheter ablation of VT, preprocedural CMR can be useful to reduce VT recurrence.	S5.4.7–S5.4.9
IIa	B-NR	3. In patients with NICM or ICM undergoing catheter ablation of VA, preprocedural imaging can be useful for procedural planning.	S5.4.10–S5.4.26
IIa	C-EO	4. In patients with NICM, CMR can be useful prior to ICD implantation to allow imaging without device-related artifact for diagnostic purposes and identification of potential arrhythmogenic substrate.	

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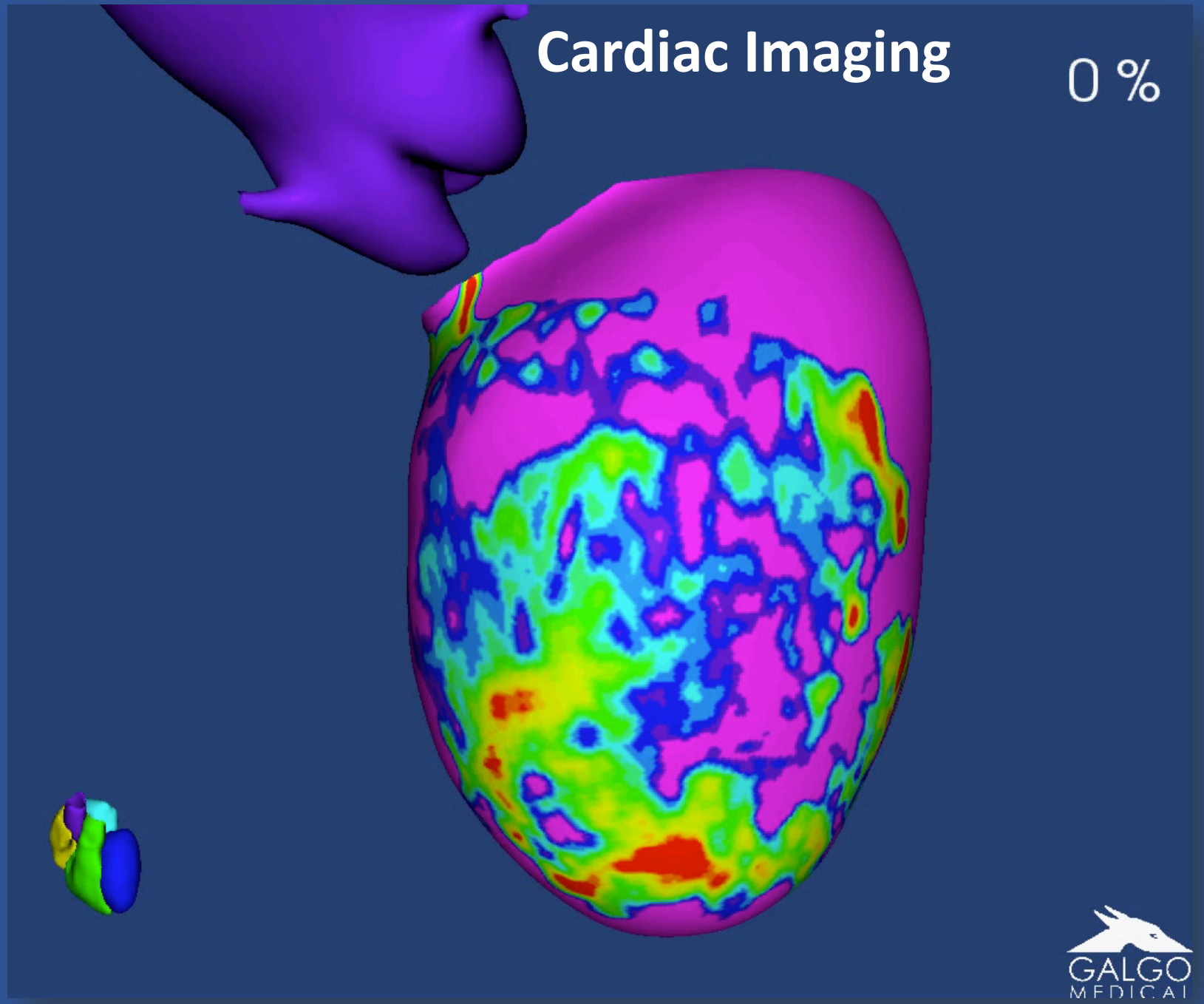
Cardiac Imaging



Recommendations for epicardial access for catheter ablation

COR	LOE	Recommendations
I	C-EO	1. In patients undergoing epicardial VT ablation, imaging of the epicardial coronary arteries by coronary arteriography or coronary CT angiogram prior to ablation is recommended to reduce the risk of arterial injury.
I	C-EO	2. In patients undergoing epicardial VT ablation via a percutaneous approach, provision for immediate echocardiography, blood transfusion, and onsite cardiothoracic surgical backup is recommended.
I	C-EO	3. In patients with prior cardiac surgery or pericardial adhesions for whom epicardial VT ablation via a percutaneous approach is considered, careful assessment of the risk/benefit ratio and alternative therapies such as surgical dissection are recommended.
I	C-EO	4. In patients undergoing epicardial VT ablation, pacing with high stimulus intensity from the ablation electrode to rule out diaphragmatic stimulation is recommended to avoid phrenic nerve injury.

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Recommendations for institutional requirements for catheter ablation of VT

COR	LOE	Recommendations
I	C-EO	2. Onsite interventional cardiology expertise is recommended for electrophysiology procedures requiring coronary imaging to delineate coronary anatomy for epicardial ablation, aortography to delineate coronary ostia for SV VT ablation, and need for placement of HS devices.
I	C-EO	3. Onsite cardiothoracic surgical backup is recommended for electrophysiology procedures requiring pericardial access due to the potential need for emergent sternotomy and cardiopulmonary bypass.
I	C-EO	4. Availability of anesthesia personnel is recommended for all patients undergoing catheter ablation of VAs.

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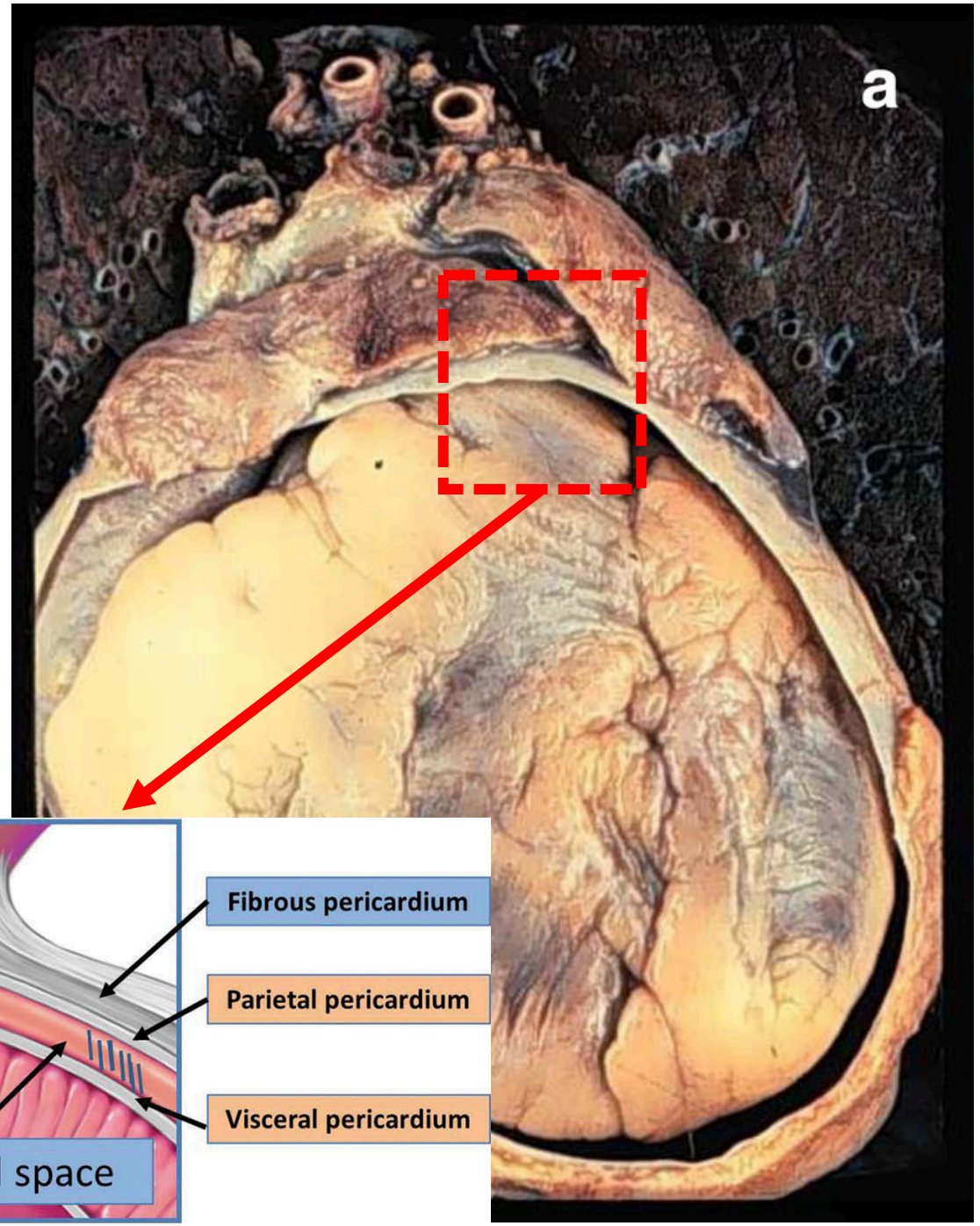
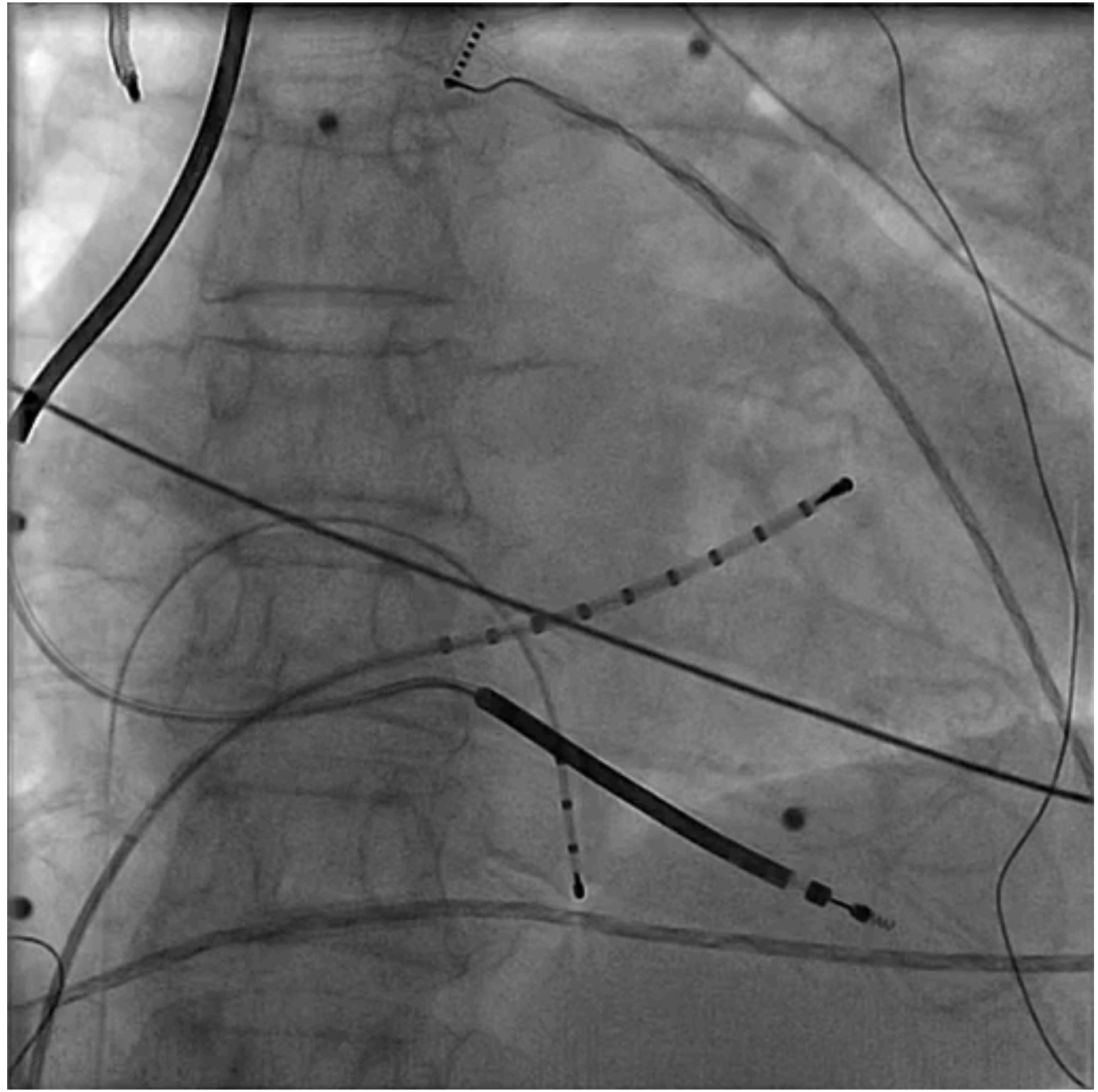
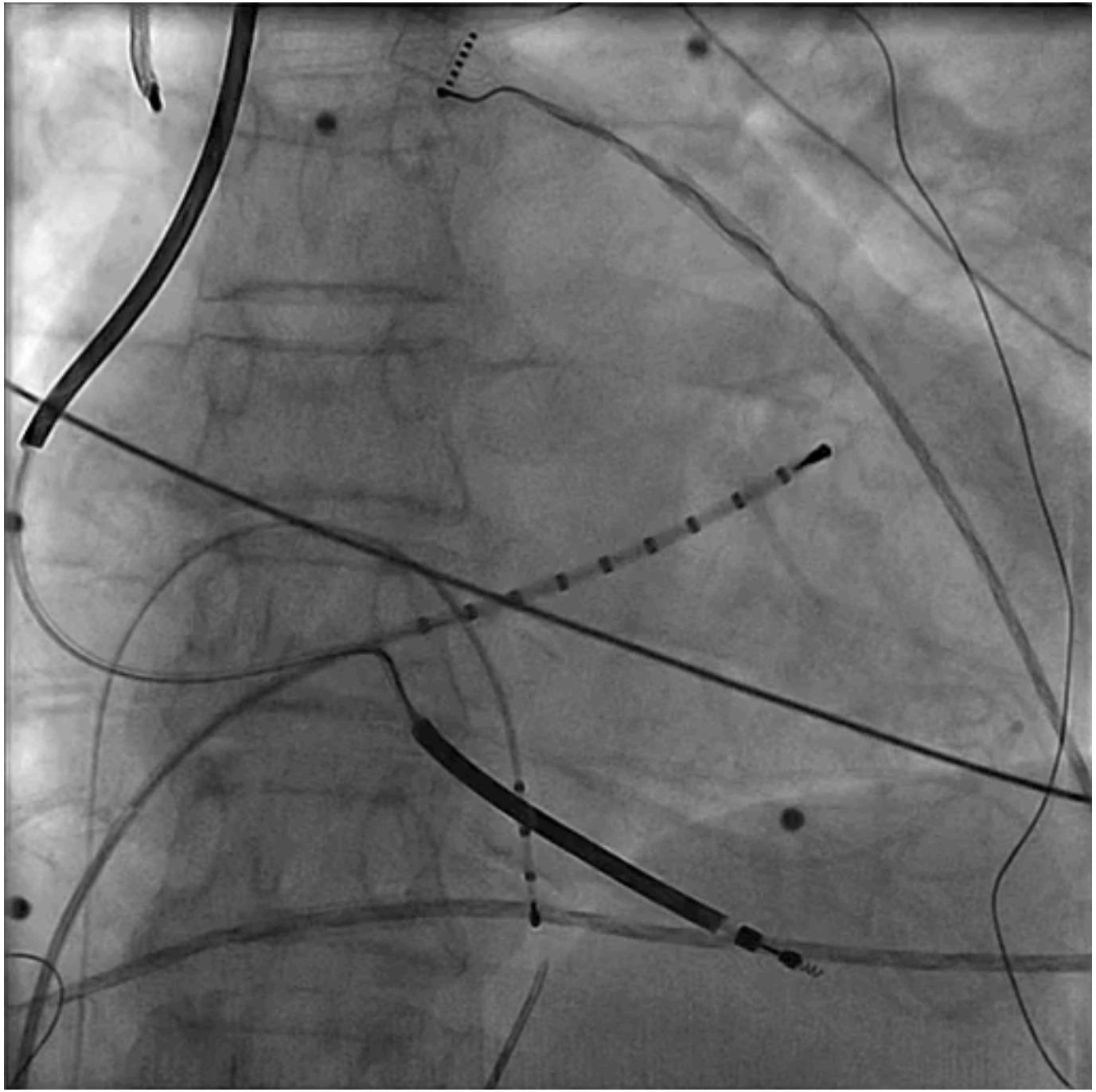
Overview

- Introduction
- Challenges in epicardial access:
  - Adhesions
  - Bypass Grafts
  - Others:
    - Anticoagulation
    - Fat tissue
    - Coronary arteries
    - Phrenic Nerve
    - Deep substrate

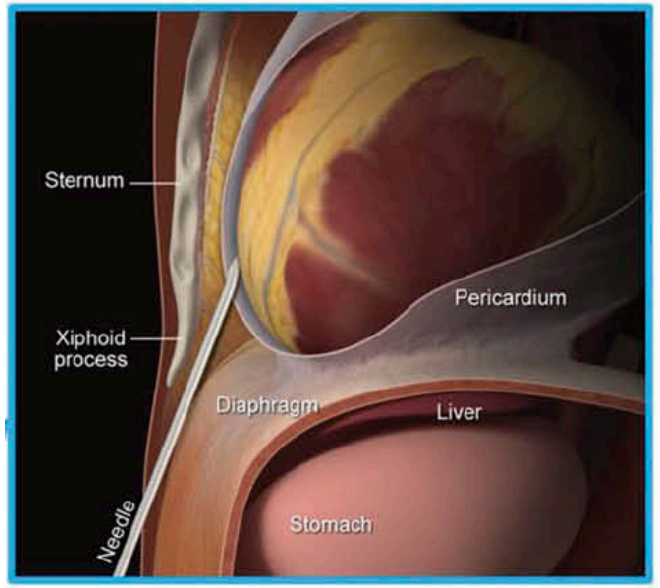


EXPERT REVIEW OF CARDIOVASCULAR THERAPY
2019, VOL. 17, NO. 2, 143–150

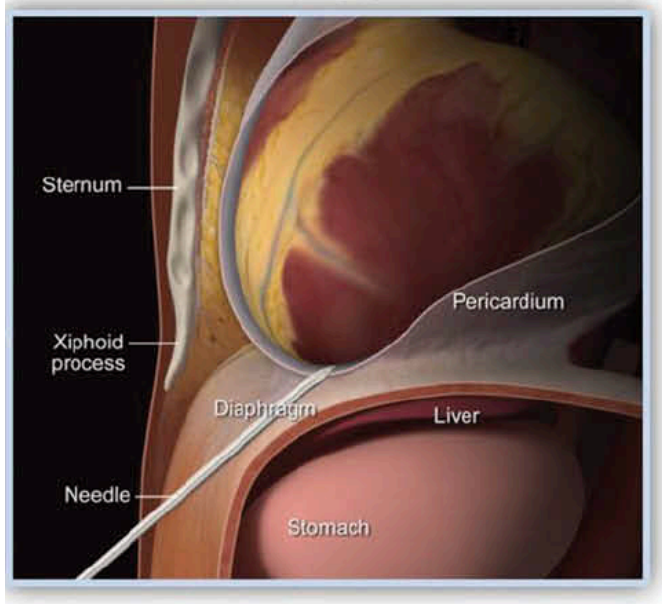




Anterior approach



Inferior approach



Adhesions

Is the procedure indicated? Does the patient have a considerable likelihood of **epicardial substrate**, and is epicardial mapping/ablation likely to lead to **improvement in outcomes**.

Are there alternatives that may be more appropriate? This may include ablation within the coronary sinus, trans-coronary alcohol ablation and needle ablation or hybrid procedures with surgical access via a lateral thoracotomy or sub-xiphoid window.

Are there patient characteristics that may preclude or complicate pericardial access? In addition to **prior cardiac surgery** and whether or not the pericardium was closed or reconstructed with a pericardial substitute, this may include **body habitus** (e.g. significant obesity and pectus excavatum chest deformity), **anticoagulation** requirements and **intra-abdominal anatomy** (hepatomegaly or sub-diaphragmatic bowel at the site of puncture.

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2019, VOL. 17, NO. 2, 143–150

Incidence and significance of adhesions encountered during epicardial mapping and ablation of ventricular tachycardia in patients with no history of prior cardiac surgery or pericarditis

Anthony Li, MBBS, BSc, MD, Eric Buch, MD, FHRS, Noel G. Boyle, MD, PhD, FHRS, Kalyanam Shivkumar, MD, PhD, FHRS, Jason S. Bradfield, MD, FHRS

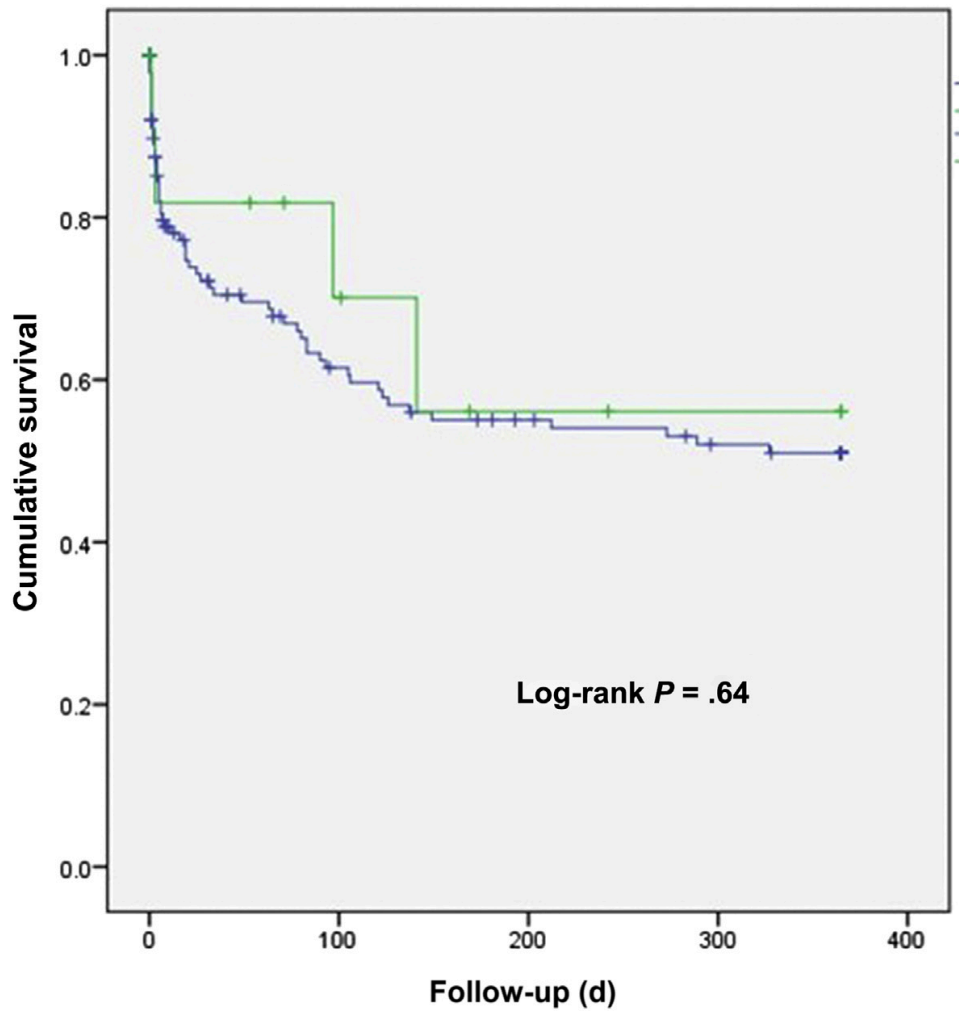
Heart Rhythm 2018;15:65–74

Between 2004 and 2016, successful epicardial entry was achieved in 188 of 192 attempts (98%).

In 155 **first-time** epicardial access attempts, pericardial adhesions were diagnosed in **13 (8%)**.

Adhesions tended to occur more frequently with severe **renal impairment** (2% of patients without adhesions vs 15% of patients with adhesions.

Adhesions were associated with limited epicardial mapping (3% of patients without adhesions vs 85% of patients with adhesions, P<0.001) and lower short-term procedural success (68% of patients without adhesions vs 46% of patients with adhesions, P=0.02), but **complication rates were similar**.



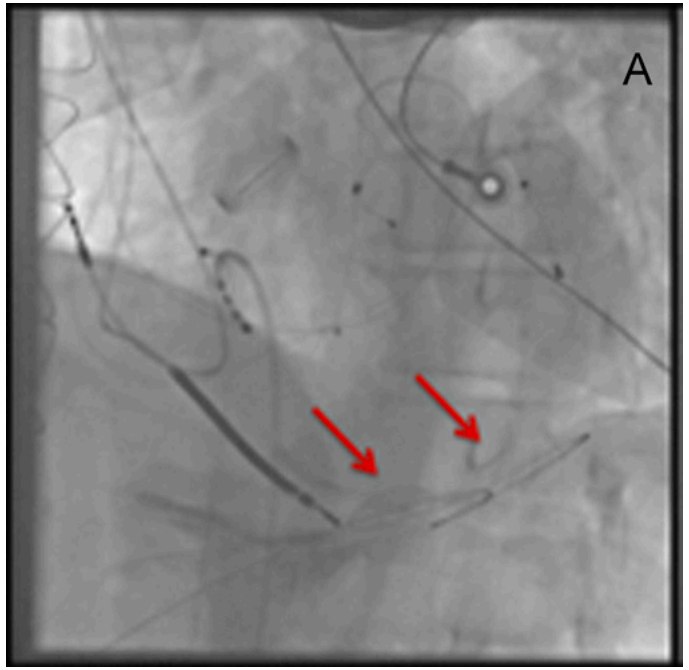
Percutaneous epicardial ventricular tachycardia ablation after noncoronary cardiac surgery or pericarditis

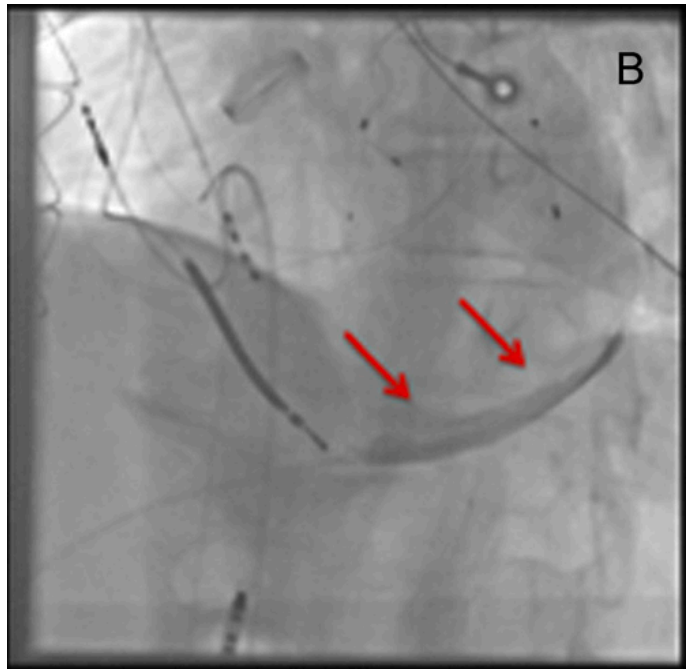
Cory M. Tschabrunn, CEPS, Haris M. Haqqani, MBBS, PhD, Joshua M. Cooper, MD, Sanjay Dixit, MD, FHRS, Fermin C. Garcia, MD, Edward P. Gerstenfeld, MD, FHRS, David J. Callans, MD, FHRS, Erica S. Zado, PA-C, FHRS, Francis E. Marchlinski, MD, FHRS

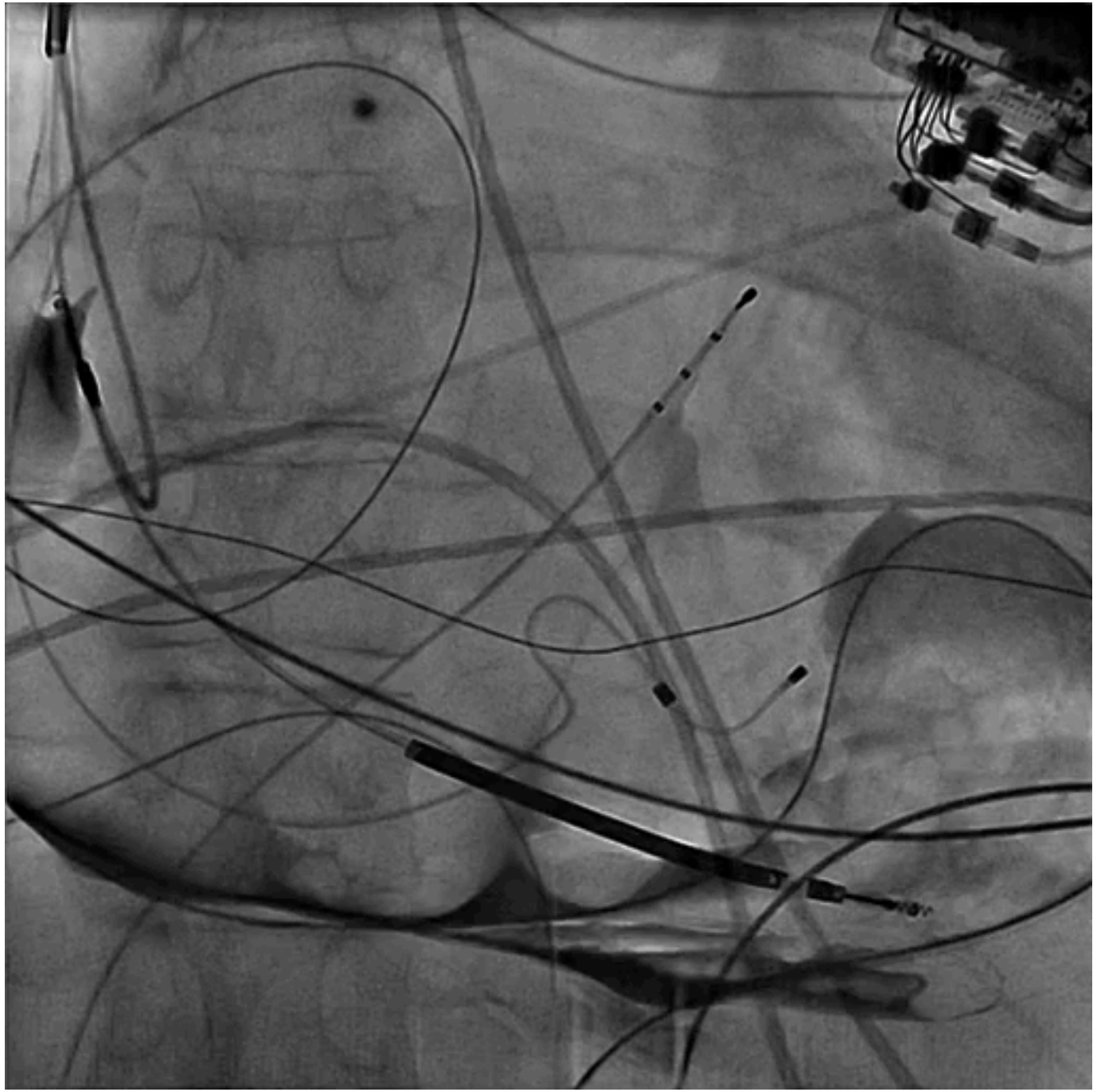
Heart Rhythm 2013;10:165–169

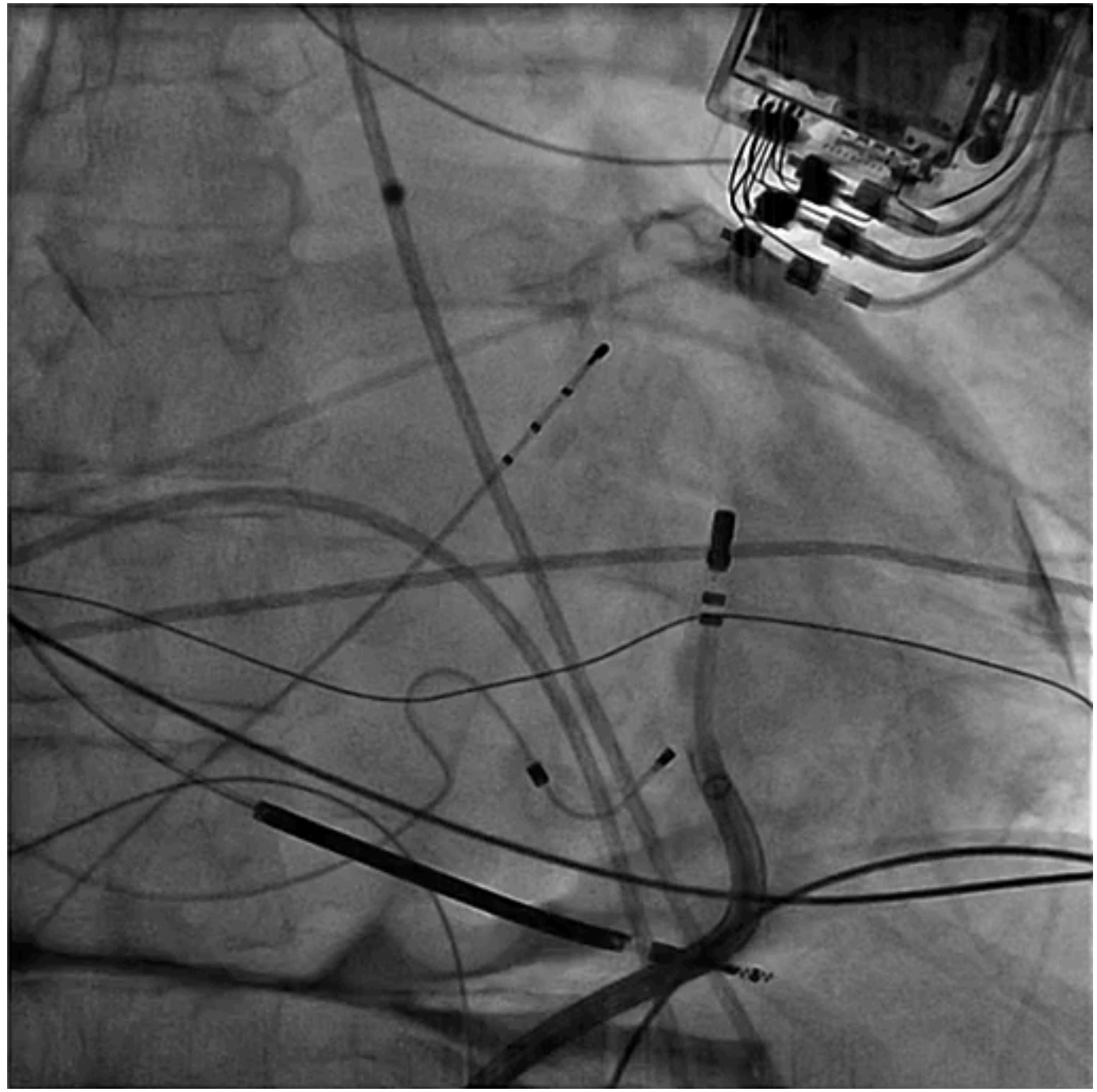
10 consecutive patients with prior non-coronary cardiac surgery (8 patients) or prior pericarditis (2 patients) who required epicardial access for VT ablation.

Using blunt dissection with a deflected ablation catheter, adhesions were divided over the course of 19–125 minutes. This dissection allowed for sufficient epicardial mapping in 9 of 10 (90%) patients.







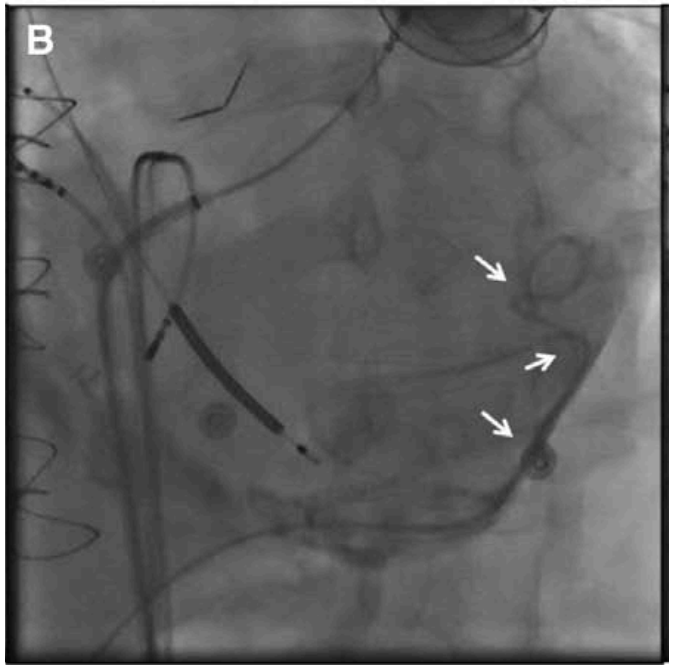


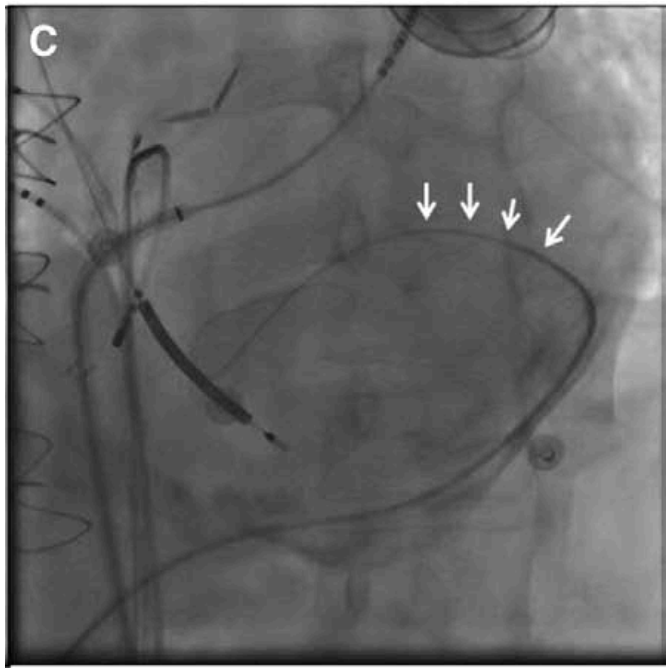
Percutaneous Epicardial Access for Mapping and Ablation Is Feasible in Patients With Prior Cardiac Surgery, Including Coronary Bypass Surgery

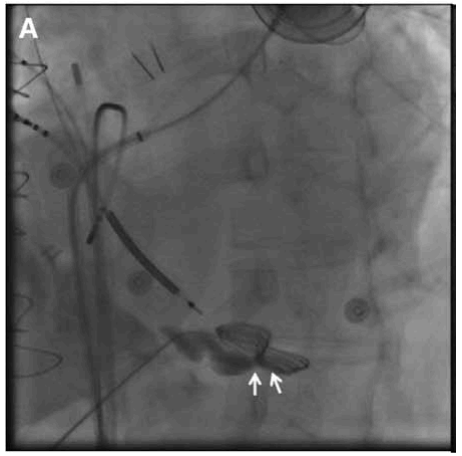
Ammar M. Killu, MBBS; Elisa Ebrille, MD; Samuel J. Asirvatham, MD; Thomas M. Munger, MD; Christopher J. McLeod, MD; Douglas L. Packer, MD; Paul A. Friedman, MD; Siva K. Mulpuru, MD

Circ Arrhythm Electrophysiol. 2015;8:94-101.

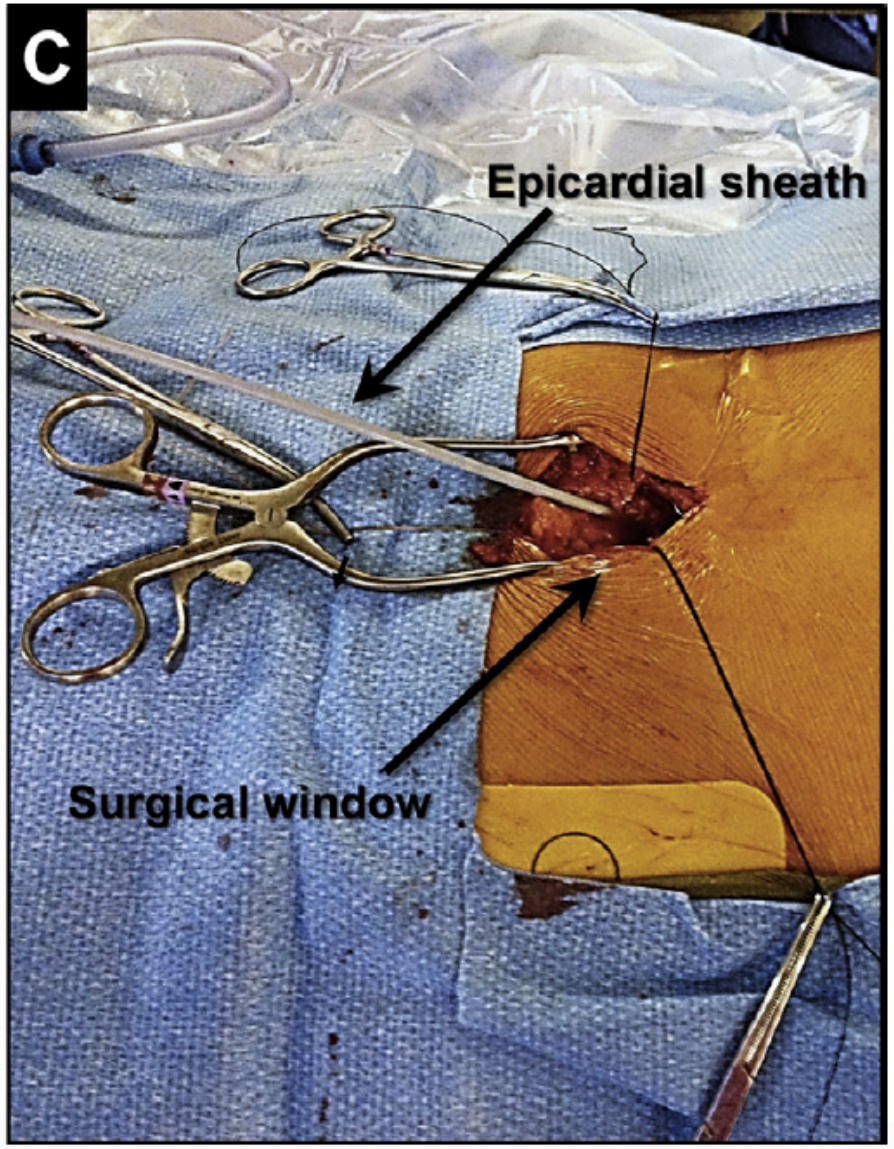
Of 162 patients who underwent epicardial access, 18 had **prior cardiac surgery**. **Access was successful in 12 of 18**; the inferior approach was used in 78%. Successful access was achieved in **6 of 10 patients with prior coronary artery bypass grafts.** Adhesion lysis was required in 10 patients with the **sheath, access wire, and pigtail or ablation catheter**.

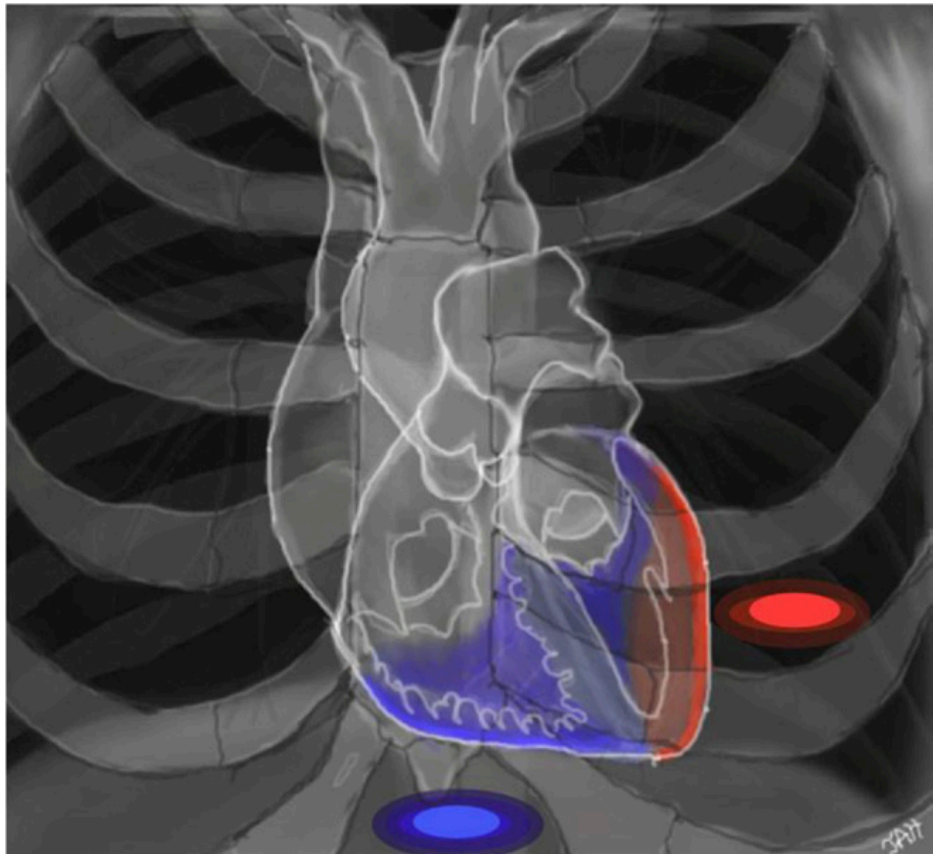






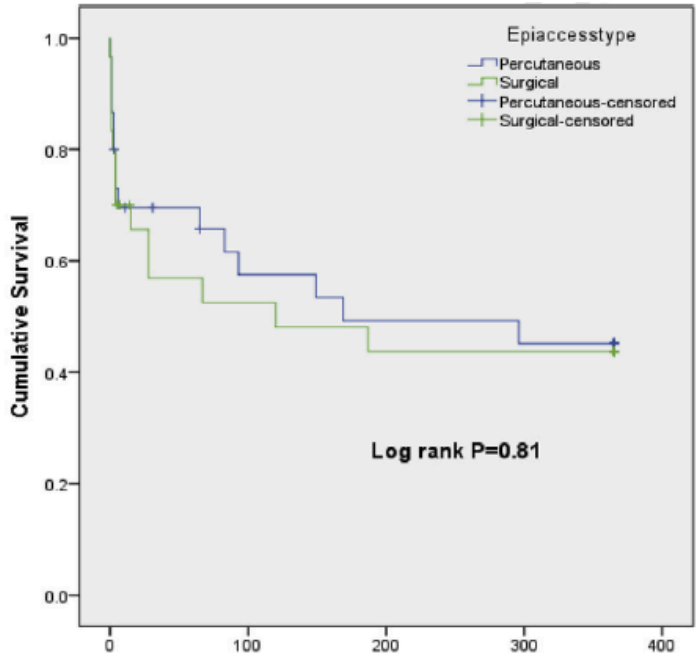
Surgical Access





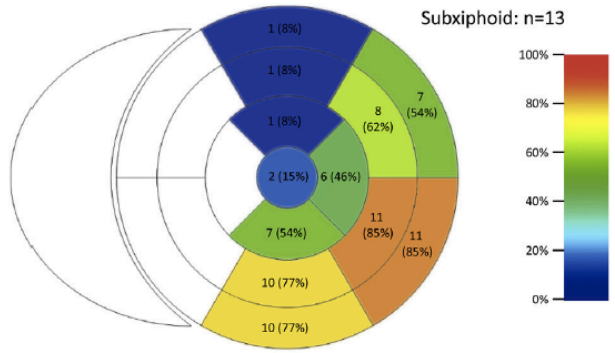
Hybrid surgical vs percutaneous access epicardial ventricular tachycardia ablation

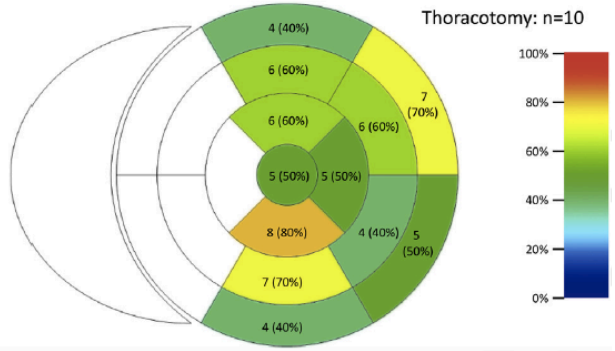
Heart Rhythm. 2018 Apr;15(4):512-519.

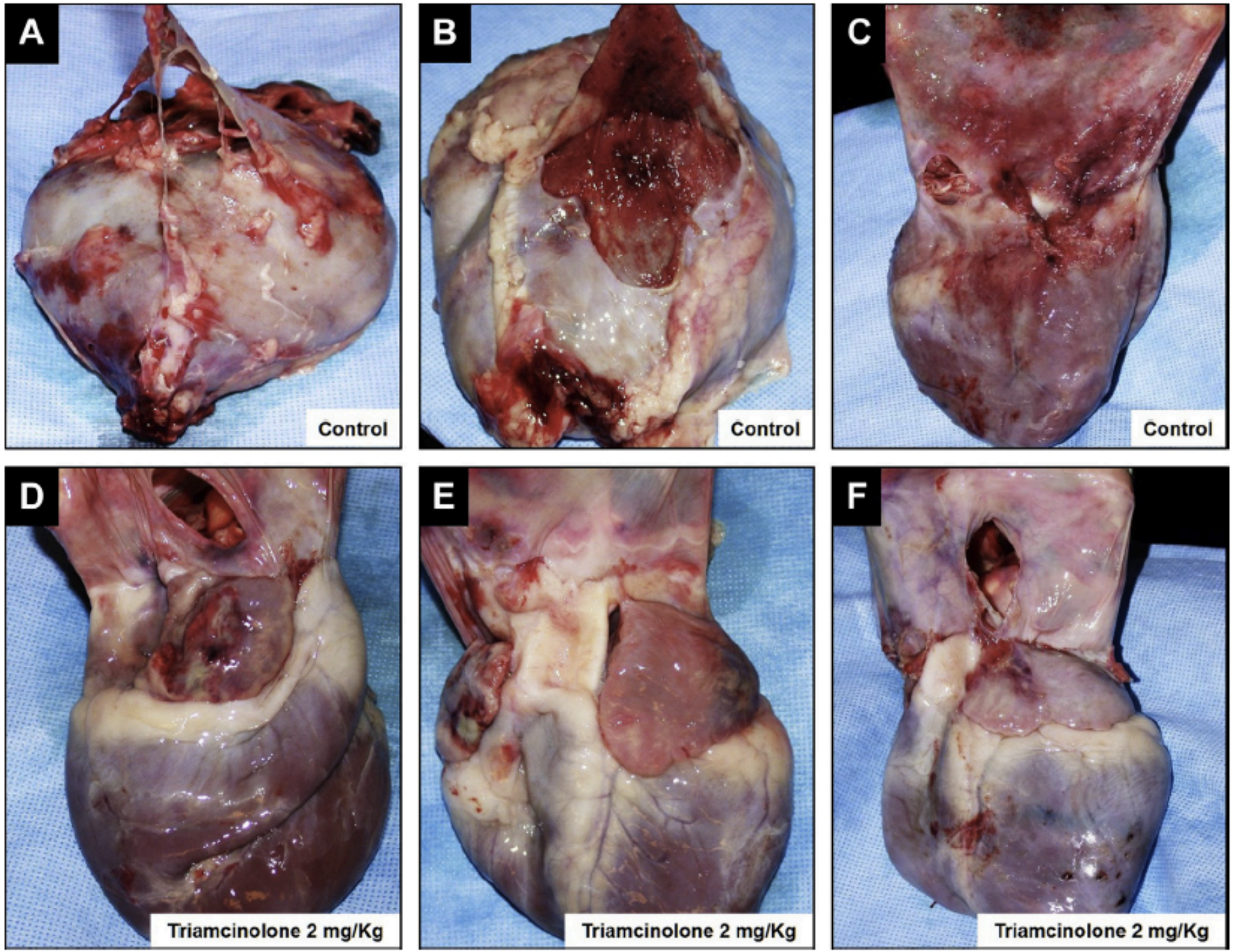


Number at Risk

Percutaneous	30	14	12	11
Surgical	30	12	10	10






A
Control
B
Control
C
Control
D
Triamcinolone 2 mg/Kg
E
Triamcinolone 2 mg/Kg
F
Triamcinolone 2 mg/Kg

Recommendations for management of epicardial access sites after catheter ablation of VA

COR	LOE	Recommendations	References
I	C-EO	1. If pericardial bleeding or cardiac tamponade has occurred during epicardial VT ablation, a pericardial drain should be left in place until bleeding has resolved.	
IIa	B-NR	2. The instillation of intrapericardial corticosteroids can be effective in reducing pericarditic chest pain after epicardial VT mapping or ablation.	S10.1.2.14, S10.1.2.15
IIa	B-NR	3. To reduce pericardial pain after epicardial VT ablation, unless pericardial bleeding or cardiac tamponade has occurred, it is reasonable to remove all pericardial access sheaths at the end of the procedure.	S10.1.2.14, S10.1.2.15
IIb	C-EO	4. Leaving a pericardial drain in place might be reasonable in patients at high risk for late bleeding or cardiac tamponade after epicardial VT ablation.	

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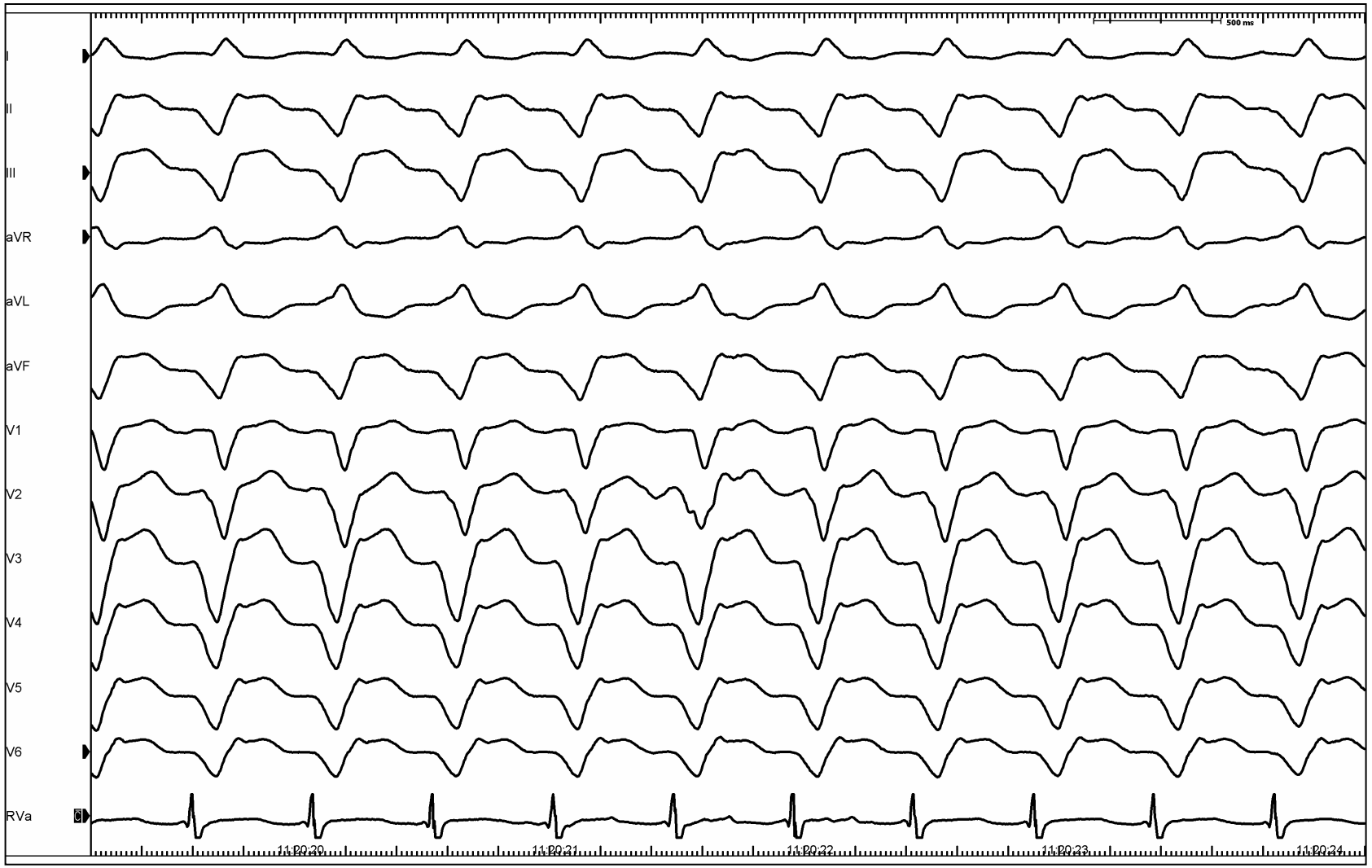
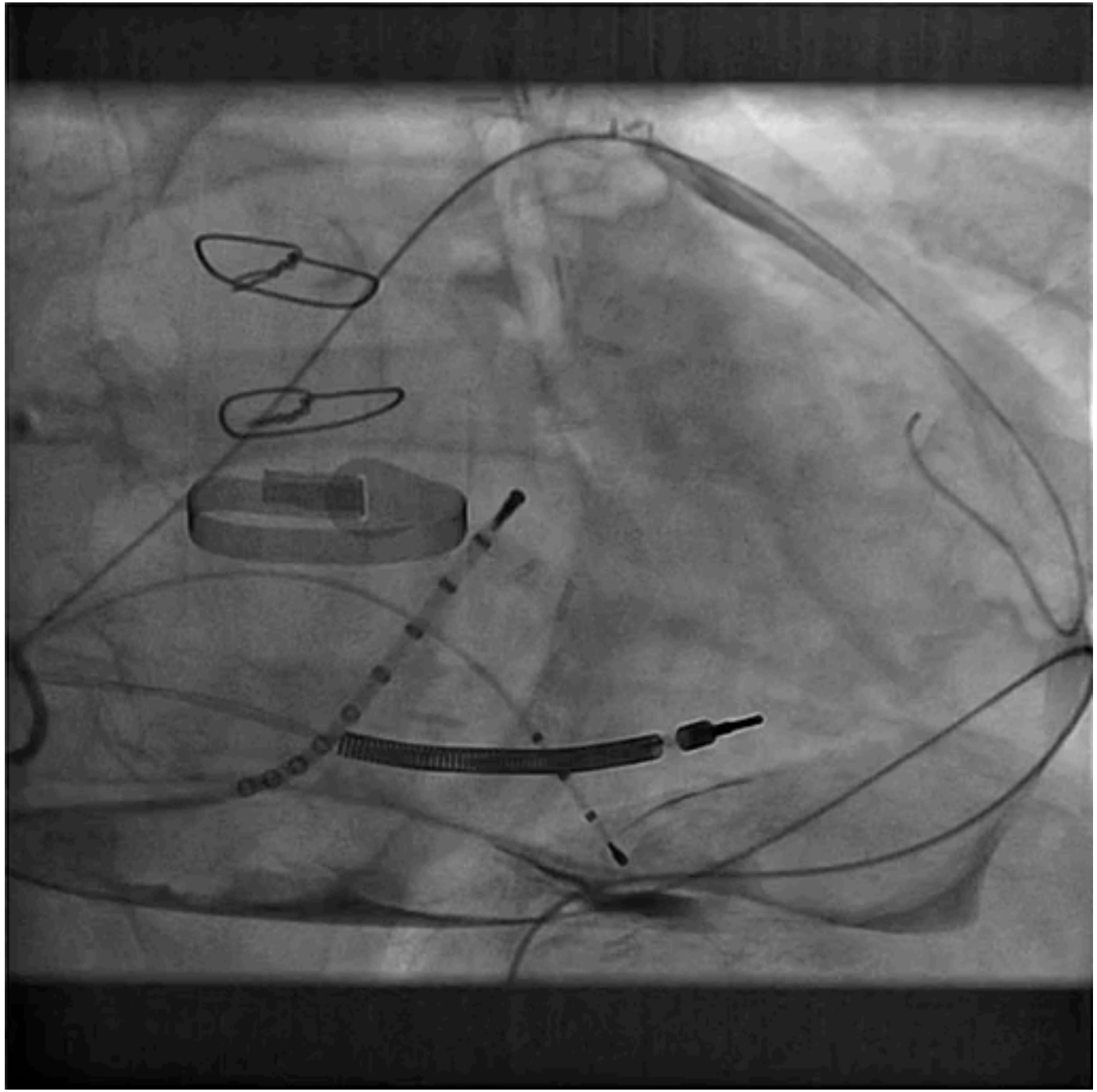
Bypass Grafts

Prior unsuccessful endocardial Ablation

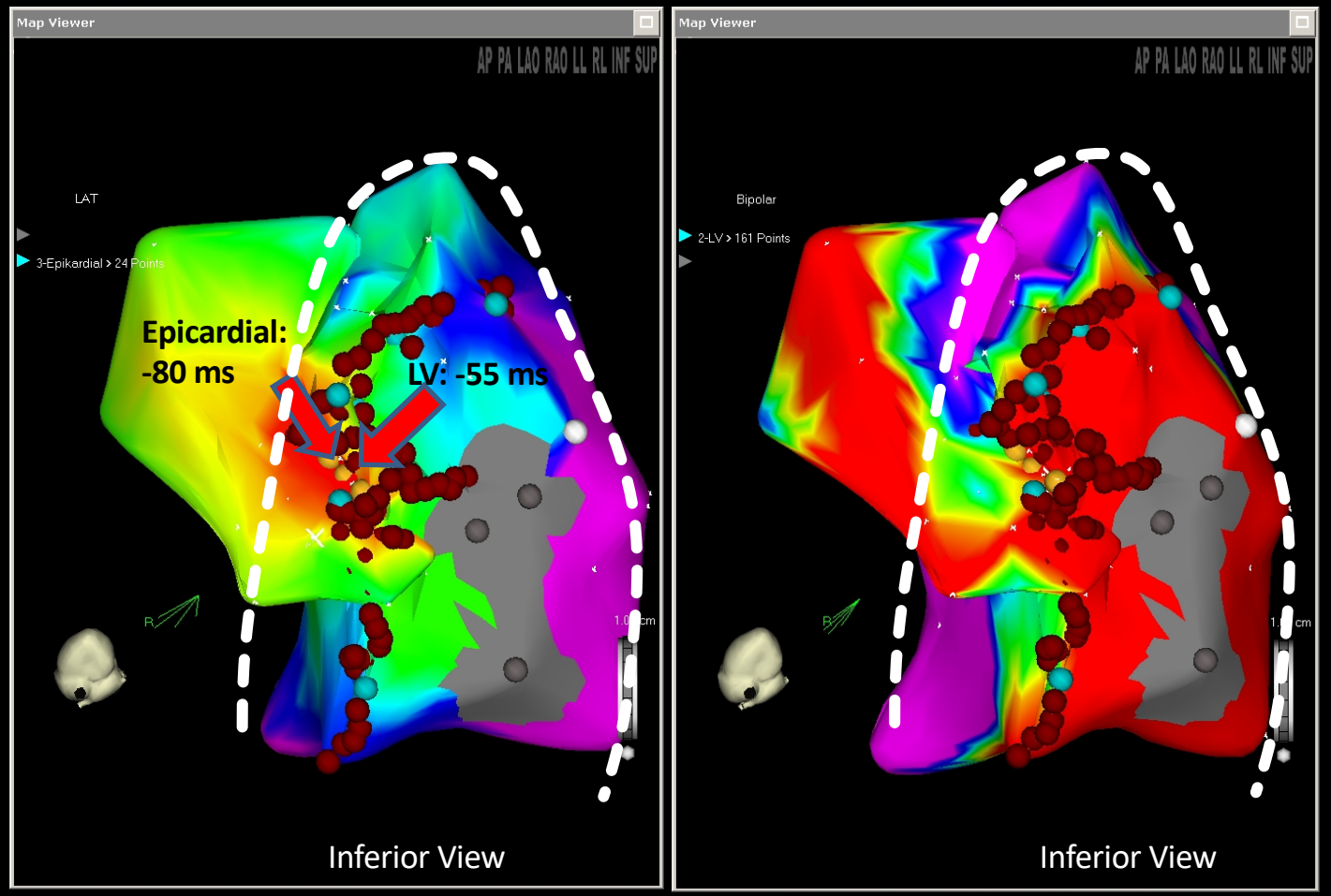




ATTENTION

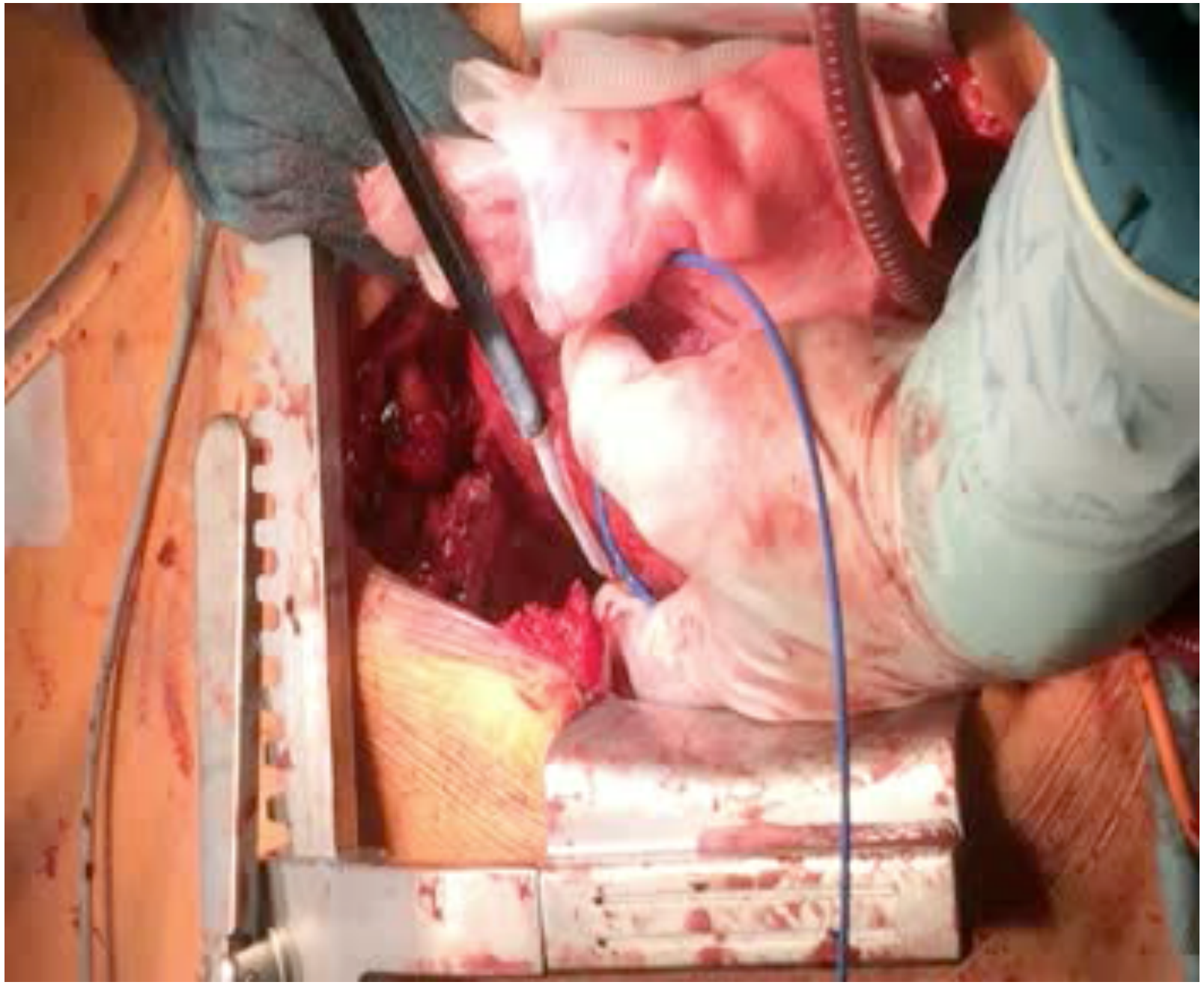
Even in the absence of coronary grafts, care is needed during epicardial mapping in individuals with coronary artery disease. This is owed to the presence of **bridging veins that traverse, via the visceral pericardium, from parietal pericardium to the myocardium**
(especially in non-revascularized CAD).

Catheter manipulation and adhesiolysis risk **disruption of these natural bypasses**.



Activation Map

Substrate Map



Others

Near-field impedance accurately distinguishes among pericardial, intracavitary, and anterior mediastinal position

David A. Burkland MD[1,2] | Anand V. Ganapathy M.ENG[1,2] | Mathews John M.ENG[1] | Brian D. Greet MD[1,2] | Mohammad Saeed MD[1,2] | Abdi Rasekh MD[1,2] | Mehdi Razavi MD[1,2]

J Cardiovasc Electrophysiol. 2017;28:1492–1499.

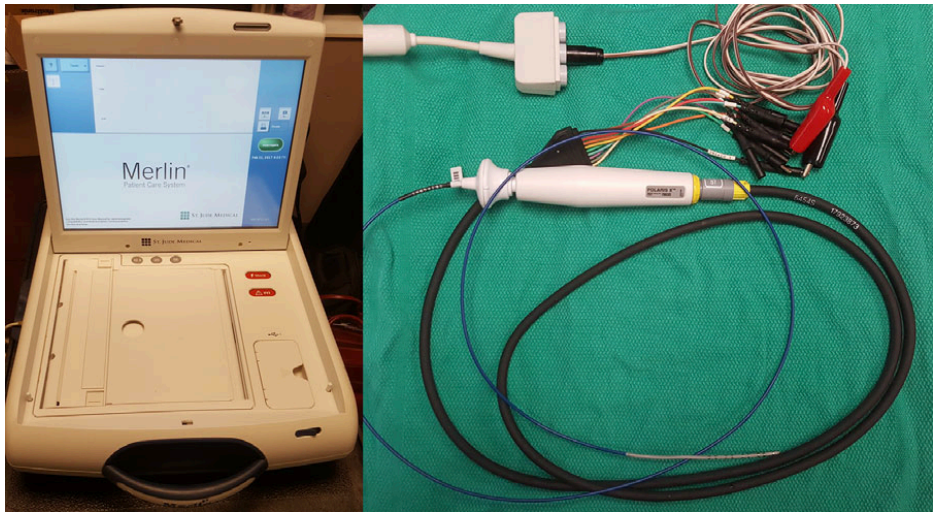
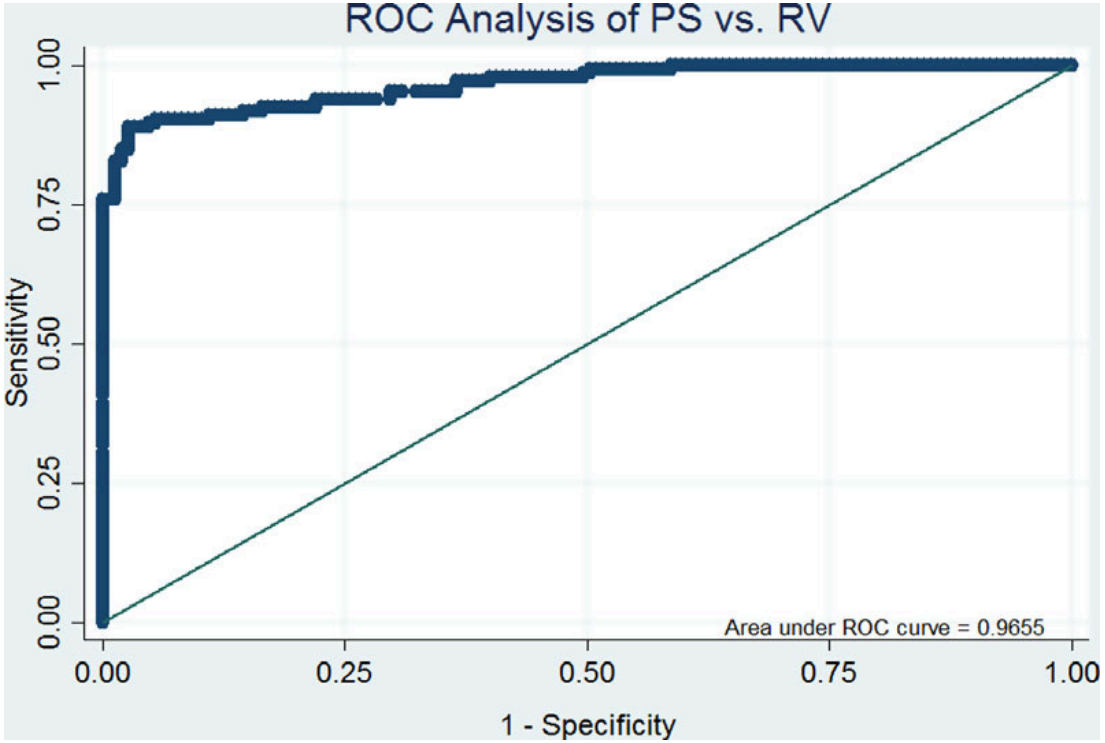


TABLE 2 Comparison of normalized impedance values between the pericardial space and right ventricle by electrode pair

Electrode Pair	Pericardial Space	Right Ventricle	P
1&2	1.890 ± 0.501	1.065 ± 0.269	0.0001
1&3	1.818 ± 0.467	1.059 ± 0.198	0.0001
1&4	1.709 ± 0.311	1.009 ± 0.248	0.0001
1&5	1.736 ± 0.220	1.001 ± 0.168	0.0001
1&10	1.622 ± 0.370	0.980 ± 0.092	0.0001
All	1.760 ± 0.370	1.024 ± 0.207	0.0001

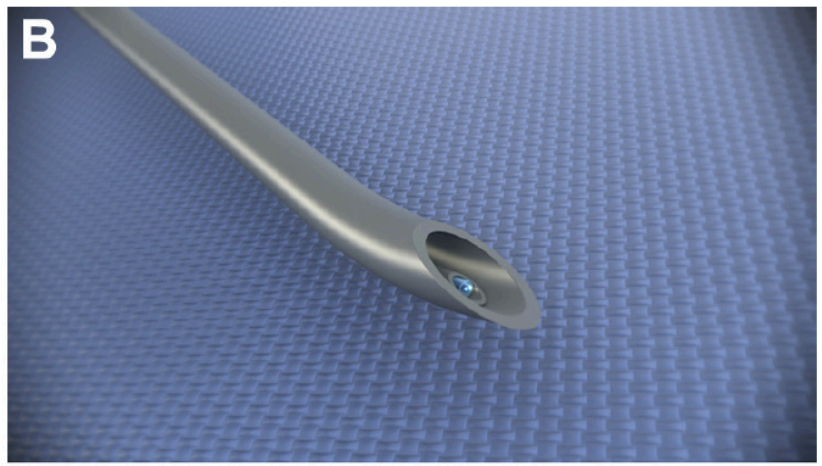


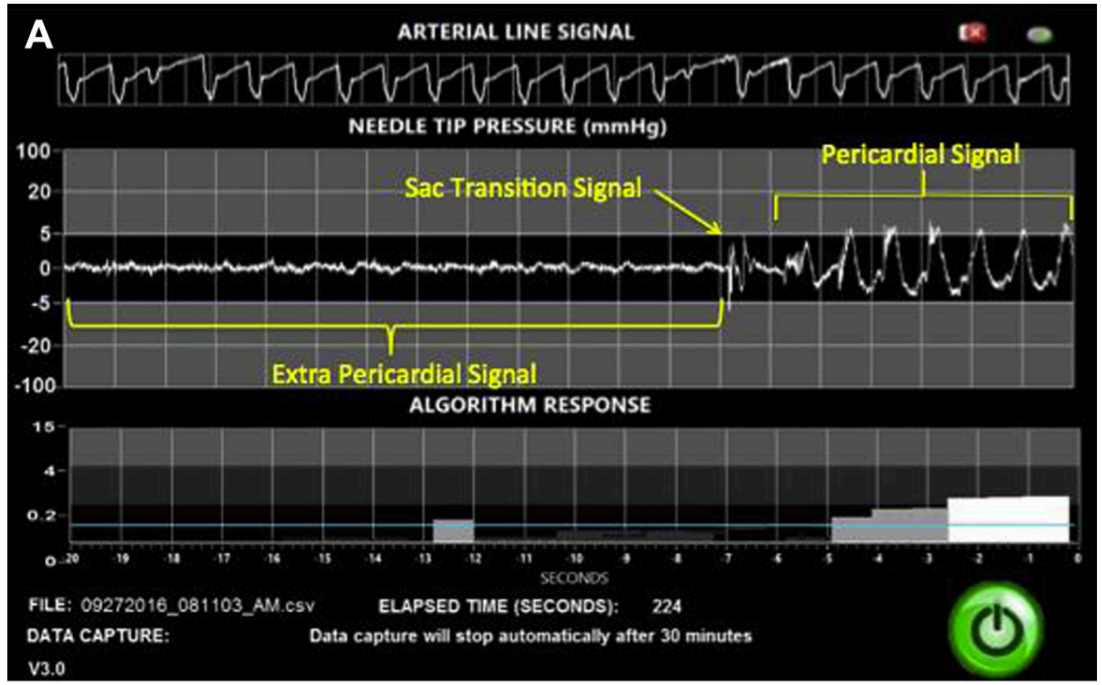
Initial international multicenter human experience with a novel epicardial access needle embedded with a real-time pressure/frequency monitoring to facilitate epicardial access: Feasibility and safety

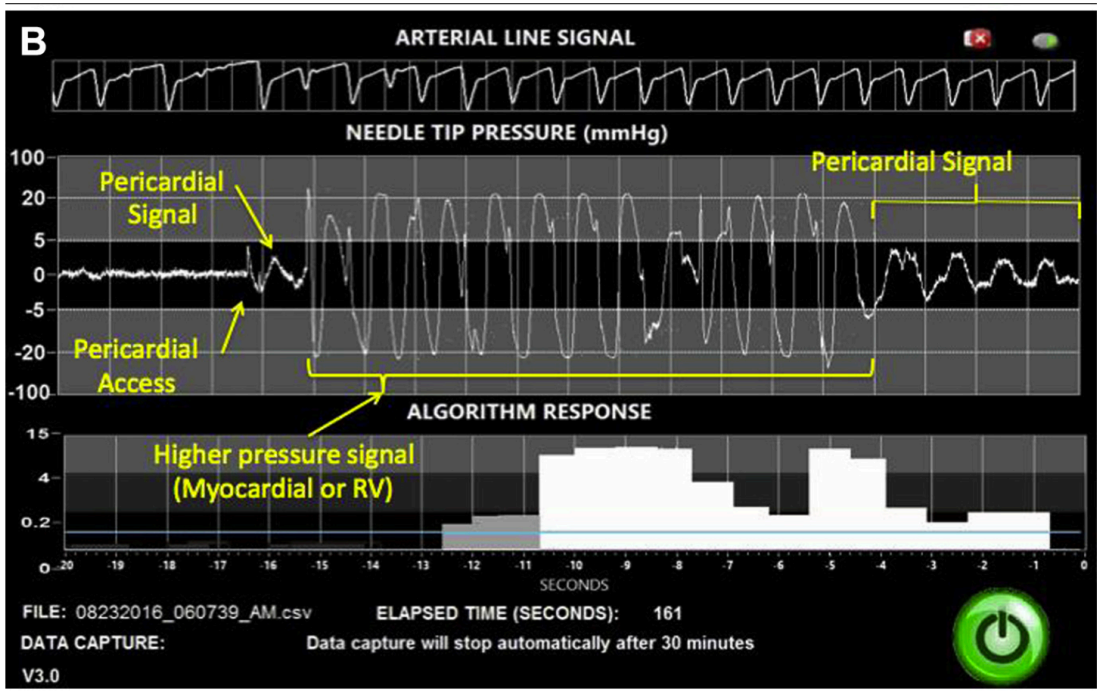
Luigi Di Biase, MD, PhD, FHRS,*†‡§ J. David Burkhardt, MD, FHRS,† Vivek Reddy, MD,‖ Jorge Romero, MD,* Petr Neuzil, MD,¶ Jan Petru, MD,¶ Lucie Sadiva, MD,¶ Jan Skoda, MD,¶ Miguel Ventura, MD,# Corrado Carbucicchio, MD,** Antonio Dello Russo, MD,** Zoltan Csanadi, MD,†† Michela Casella, MD,** Gaetano M. Fassini, MD,** Claudio Tondo, MD,** Frederic Sacher, MD,‡‡ Mike Theran, BSME,§§ Srinivas Dukkipati, MD,‖ Jacob Koruth, MD,‖ Pierre Jais, MD,‡‡ Andrea Natale, MD, FACC, FHRS, FESC†‡‖‖¶¶##***†††

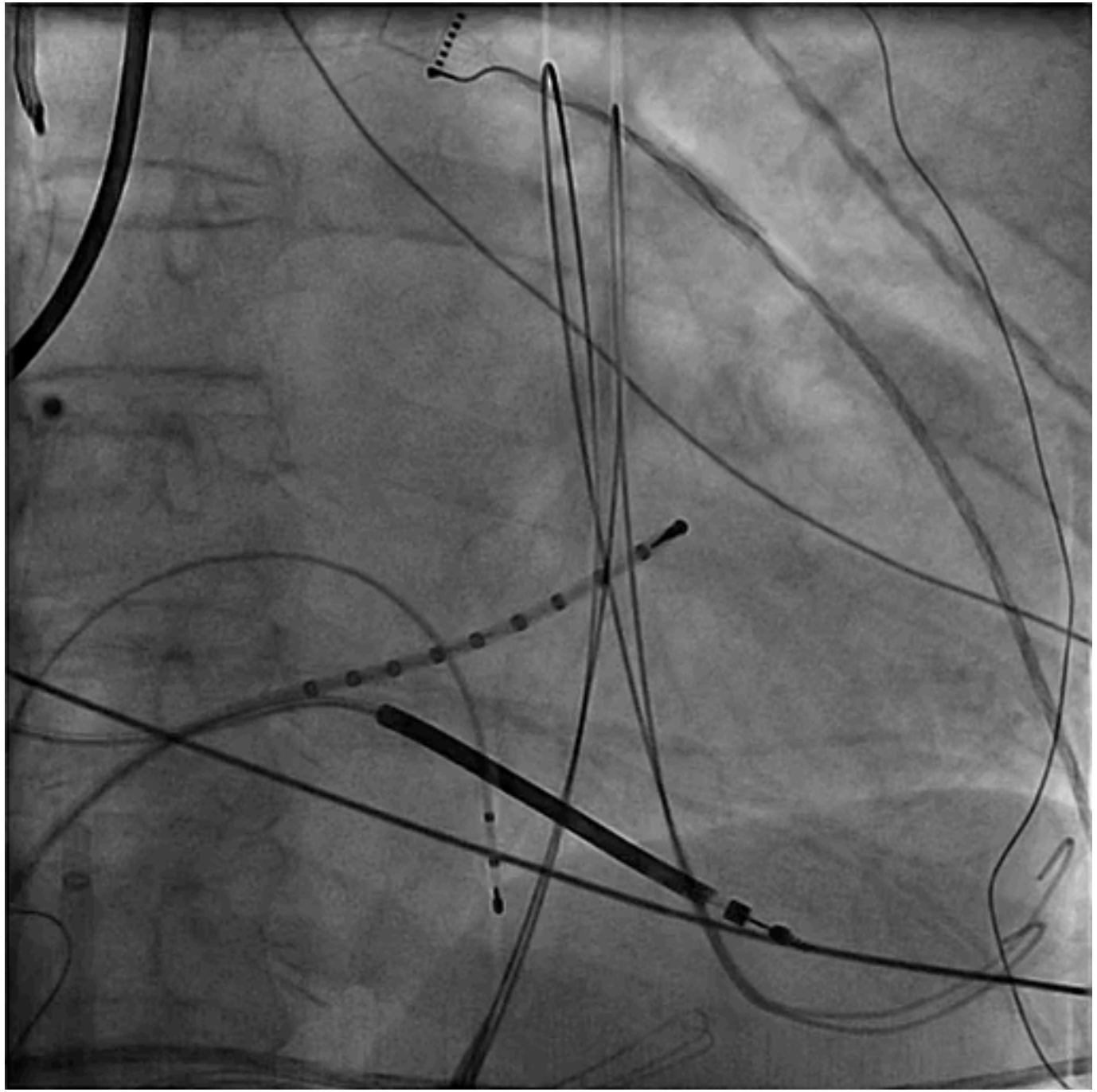
Twenty-five patients with a clinical need for epicardial access were enrolled.

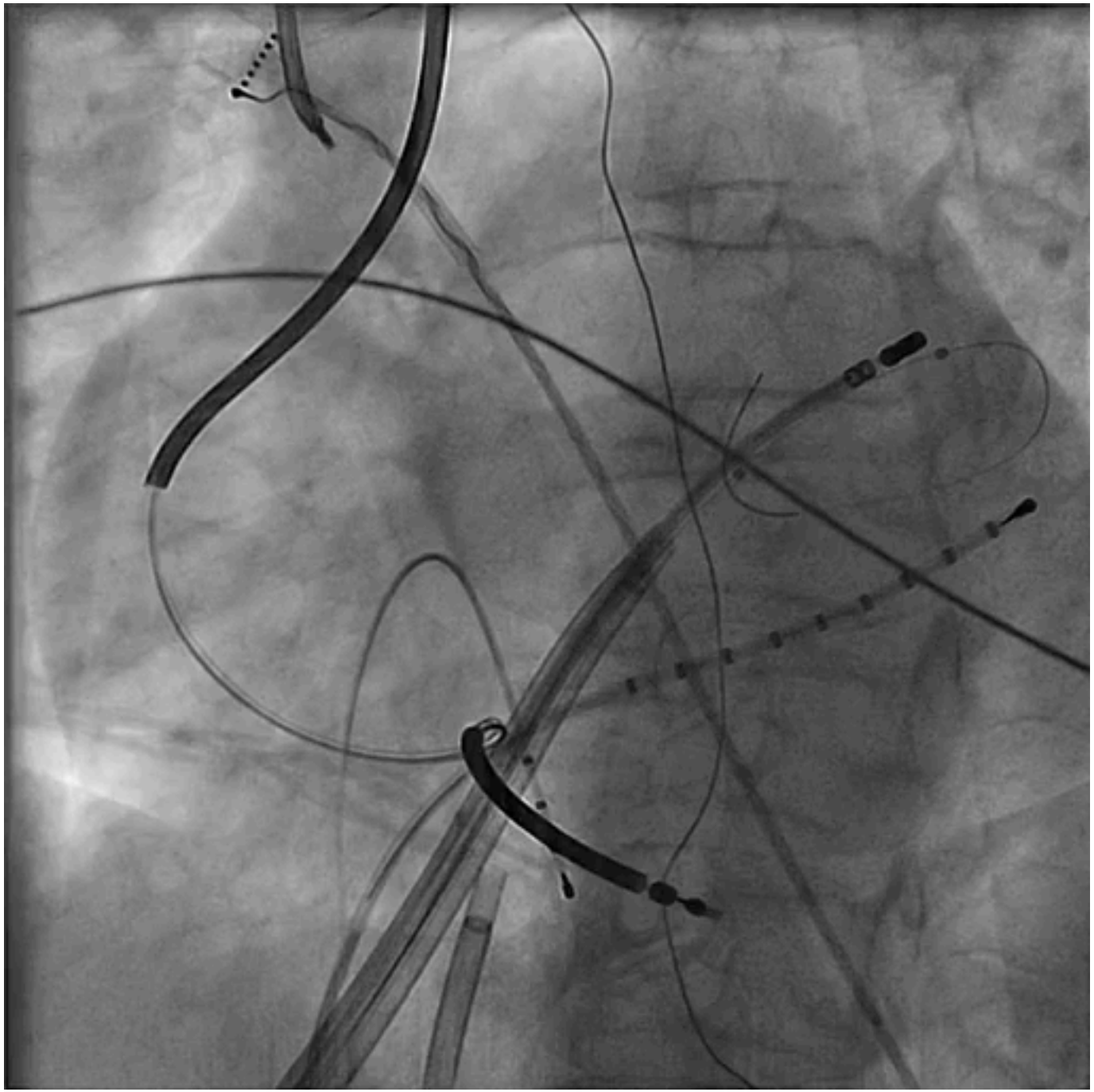
The EpiAccess needle and EpiAccess System were used for epicardial access in each case.

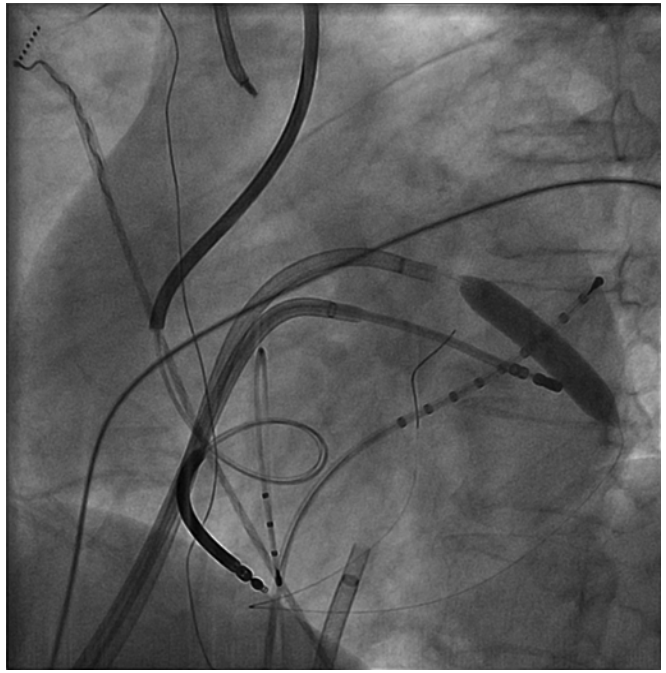


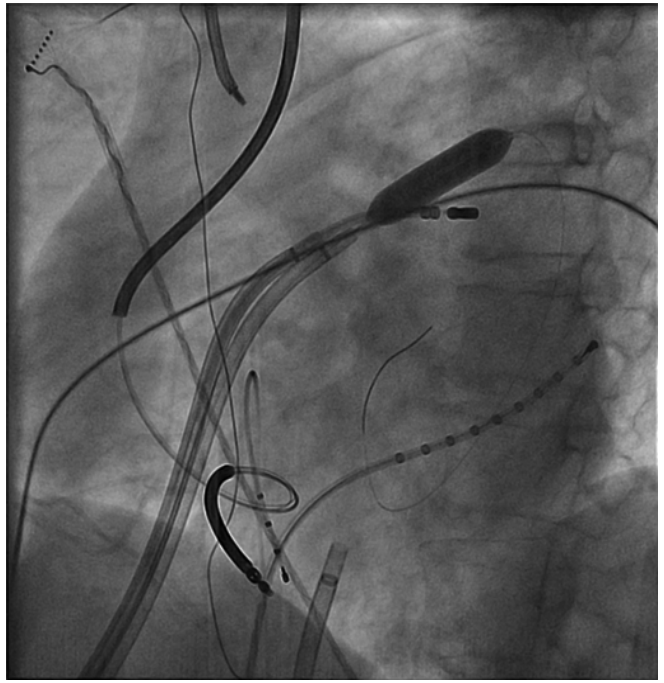












Impact of sedation vs. general anaesthesia on percutaneous epicardial access safety and procedural outcomes

Ammar M. Killu[1,2*], Alan Sugrue[1], Thomas M. Munger[1,2], David O. Hodge[3], Siva K. Mulpuru[1,2], Christopher J. McLeod[1,2], Douglas L. Packer[1,2], Samuel J. Asirvatham[1,2,4], and Paul A. Friedman[1,2]

Europace (2018) 20, 329–336

170 patients, GA was used in 69 (40.6%). There was no difference in route of access (more often anterior, 53.0%) or the rate of **successful access** (96% overall) between groups.

Similarly, the site of ablation (endocardial vs. epicardial vs. combined endocardial/epicardial) was similar between groups.

Complications were equally seen between groups—the most frequent event/complication was **pericardial effusion, occurring in 10.6% of patients**. Finally, **procedural and clinical success rates** between GA and sedation groups were **comparable** (93 vs. 91% and 44 vs. 51%, respectively, P >0.05).

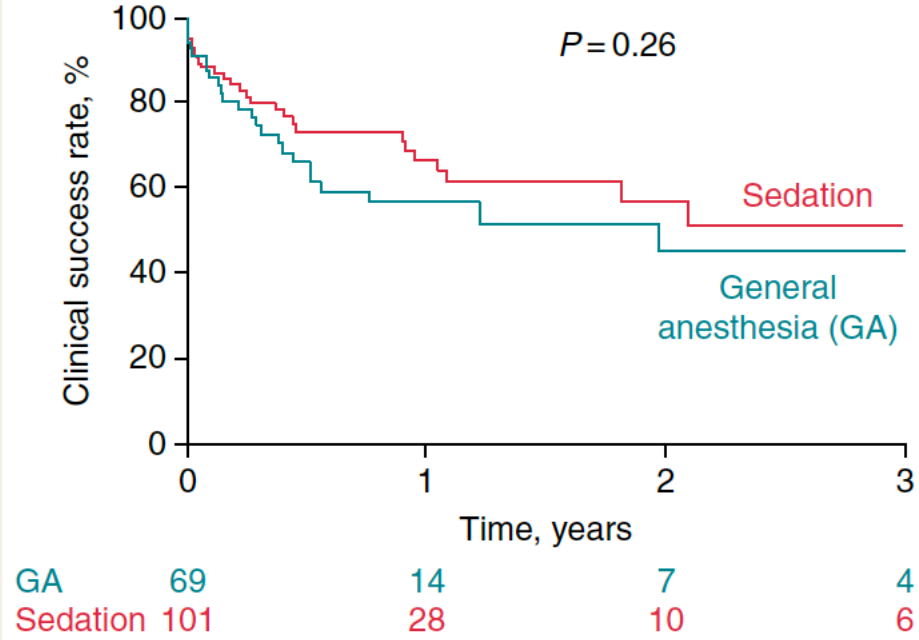


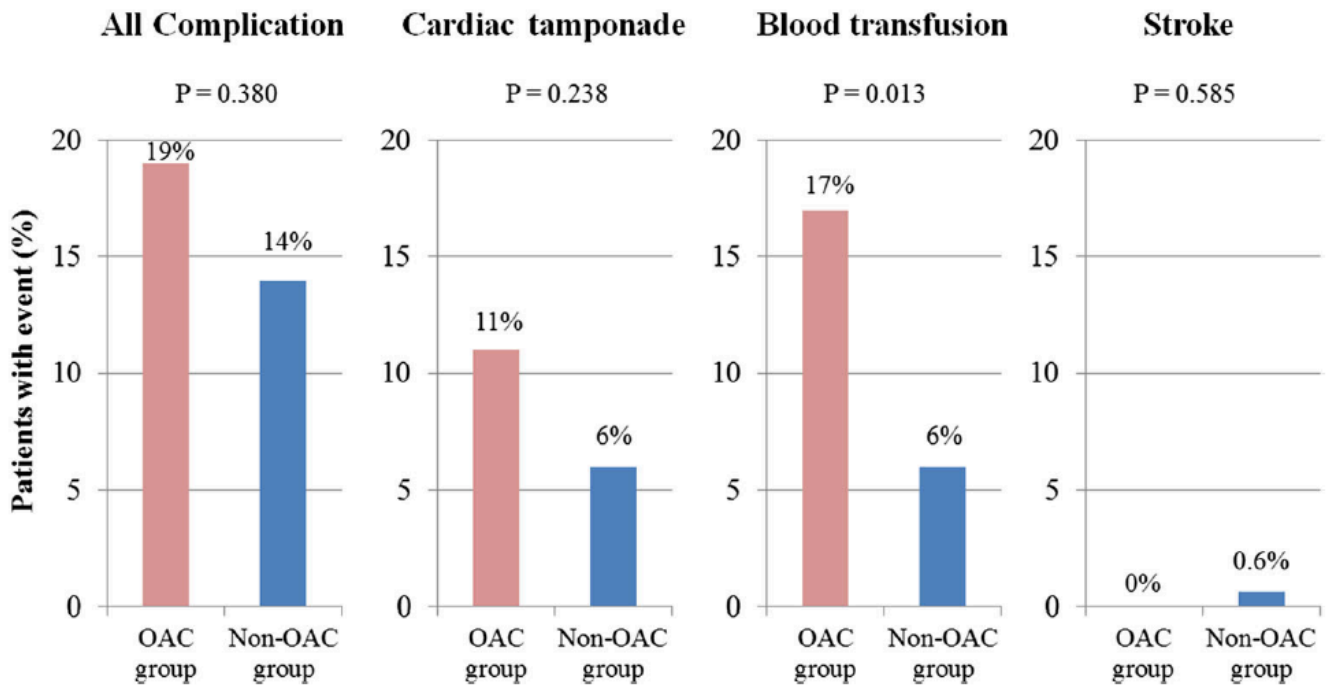
Figure 1 Kaplan–Meier curve comparing the rate of clinical success between patients undergoing EpiAcc under sedation or GA.

Feasibility and safety of percutaneous epicardial access for mapping and ablation for ventricular arrhythmias in patients on oral anticoagulants

Koji Miyamoto[1] · Ammar M. Killu[1] · Danesh K. Kella[1] · David O. Hodge[2] · Suraj Kapa[1] · Siva K. Mulpuru[1] · Abhishek J. Deshmukh[1] · Douglas L. Packer[1] · Samuel J. Asirvatham[1] · Thomas M. Munger[1] · Paul A. Friedman[1]

JICE online published 19th September 2018

205 patients (53 ± 16 years, 155 males) undergoing percutaneous Epi-Access as part of an RFA for VAs, and compared the outcome between patients chronically on OACs with warfarin (OAC group) and those without (non-OAC group).



Ablation and Intrapericardial Fluid

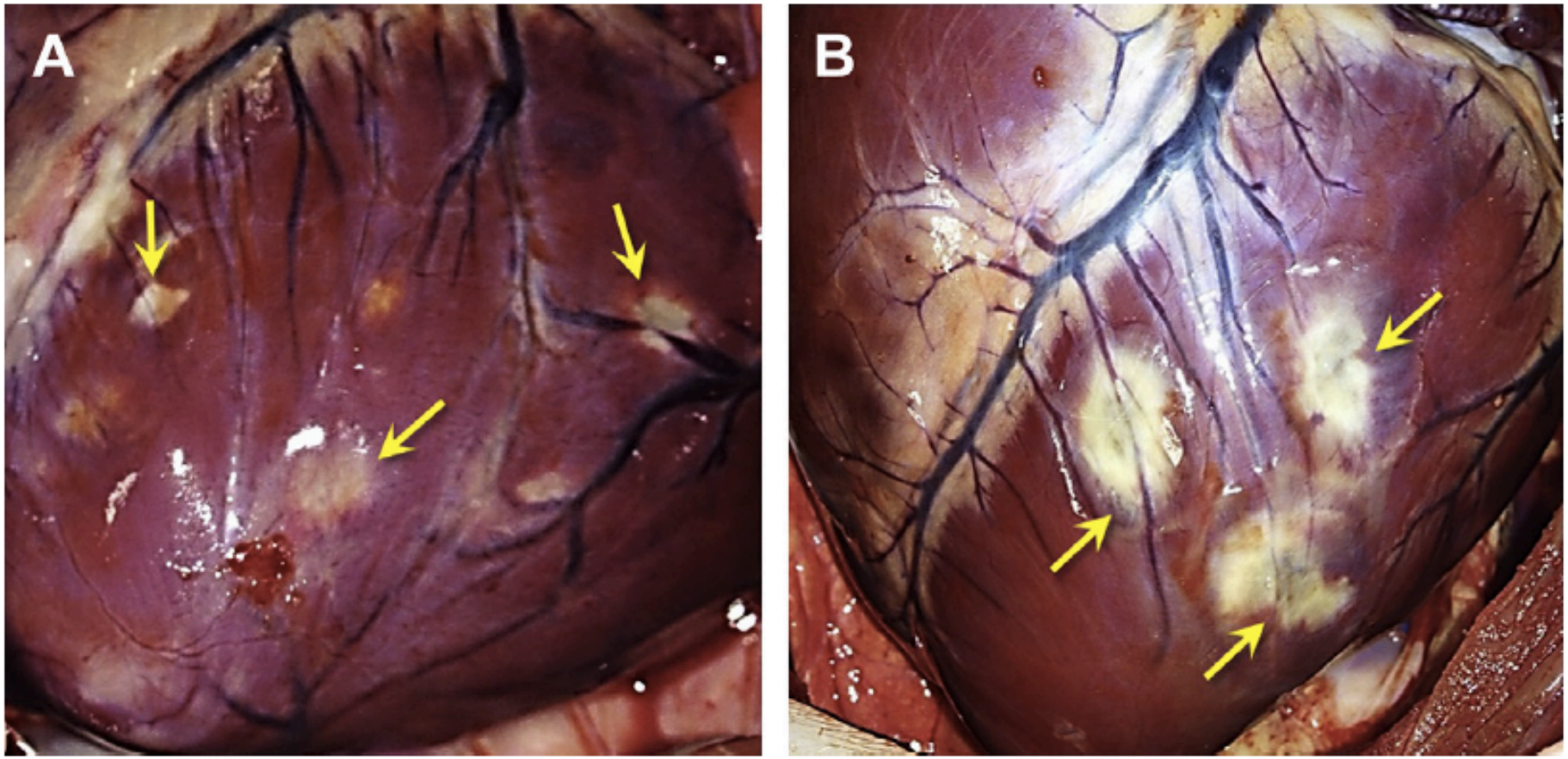
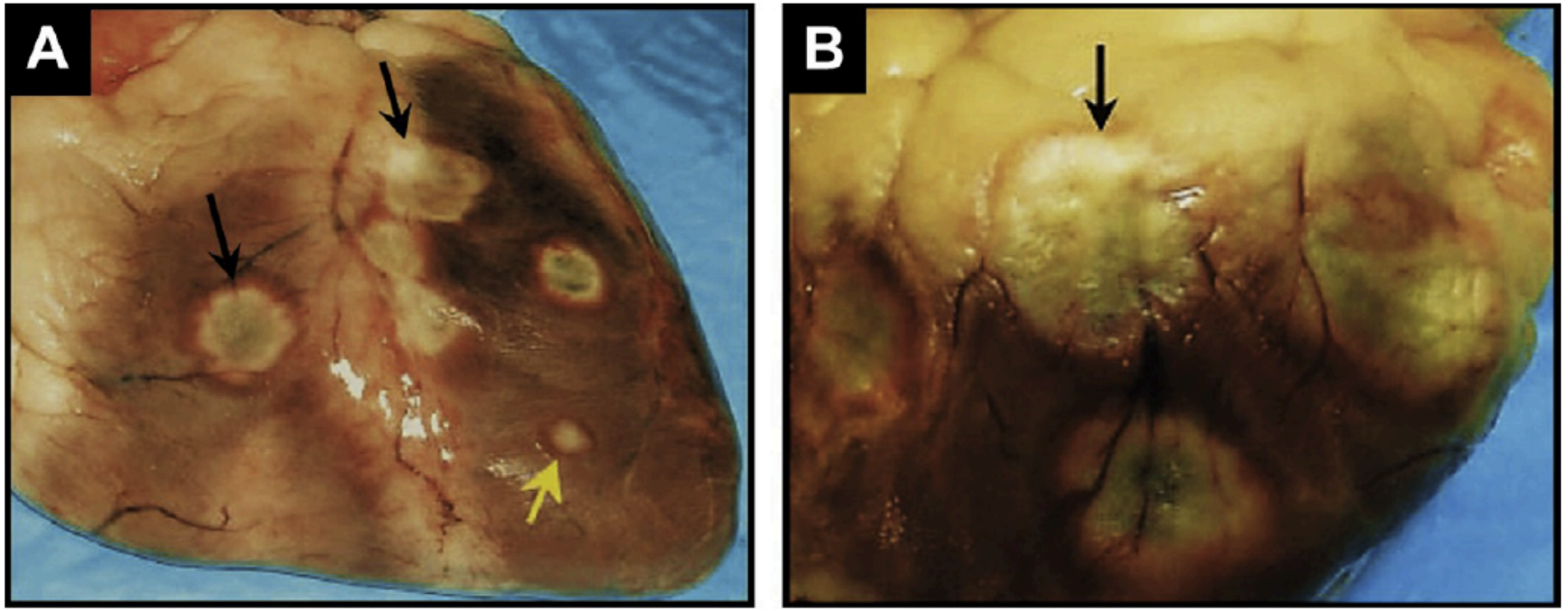


Fig. 5. Gross analysis of in vivo epicardial radiofrequency (RF) lesions. Shown are epicardial RF lesions (*yellow arrows*) created in presence (*A*) and absence (*B*) of intrapericardial fluid using fixed irrigation flow (5 mL/min), contact force (10 gm), at fixed power (40 Watts) and duration (60 s). As seen, the lesions generated in the absence of pericardial fluid (*B*) are significantly larger than those in presence of intrapericardial fluid (*A*).

Aryana A et al. Card Electrophysiol Clin. 2017 Mar;9(1):119-131.

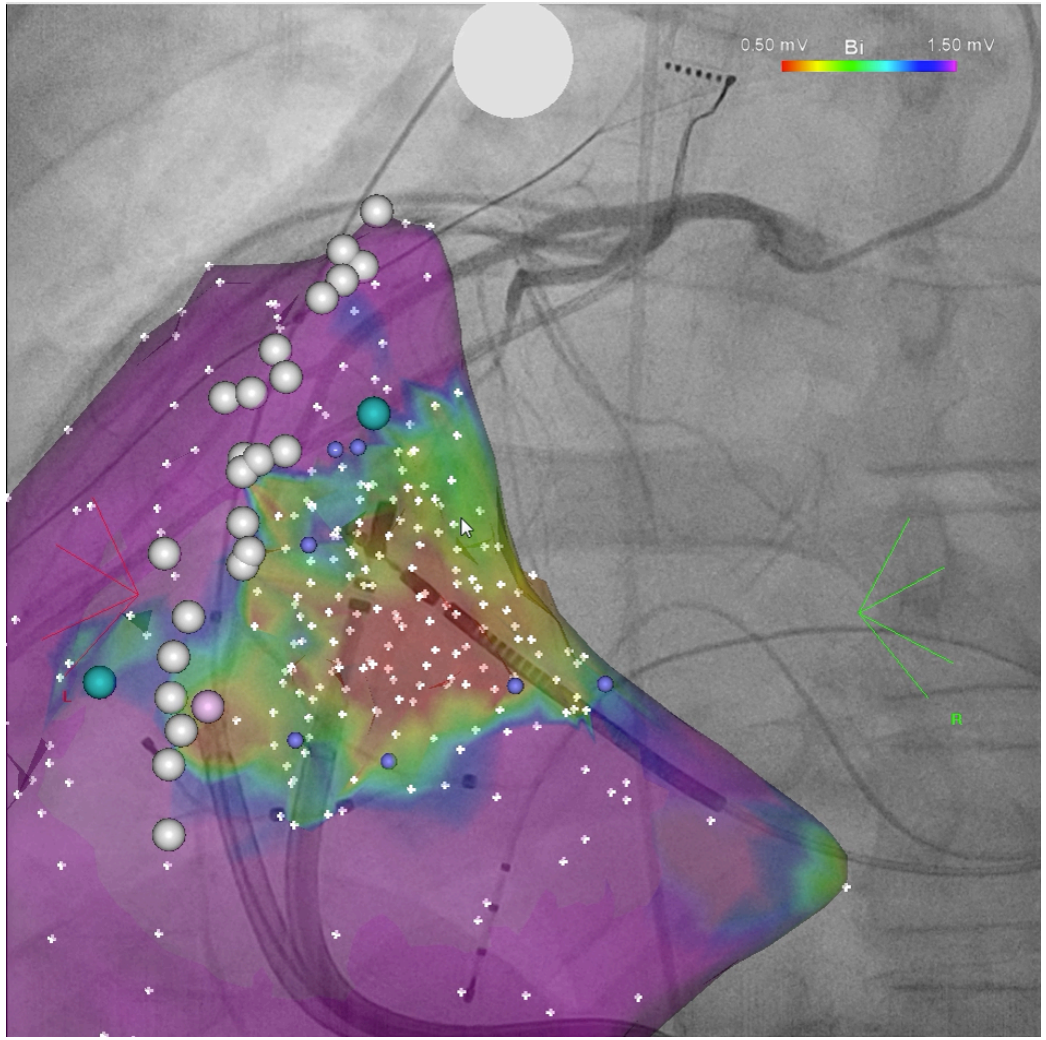
Epicardial Fat

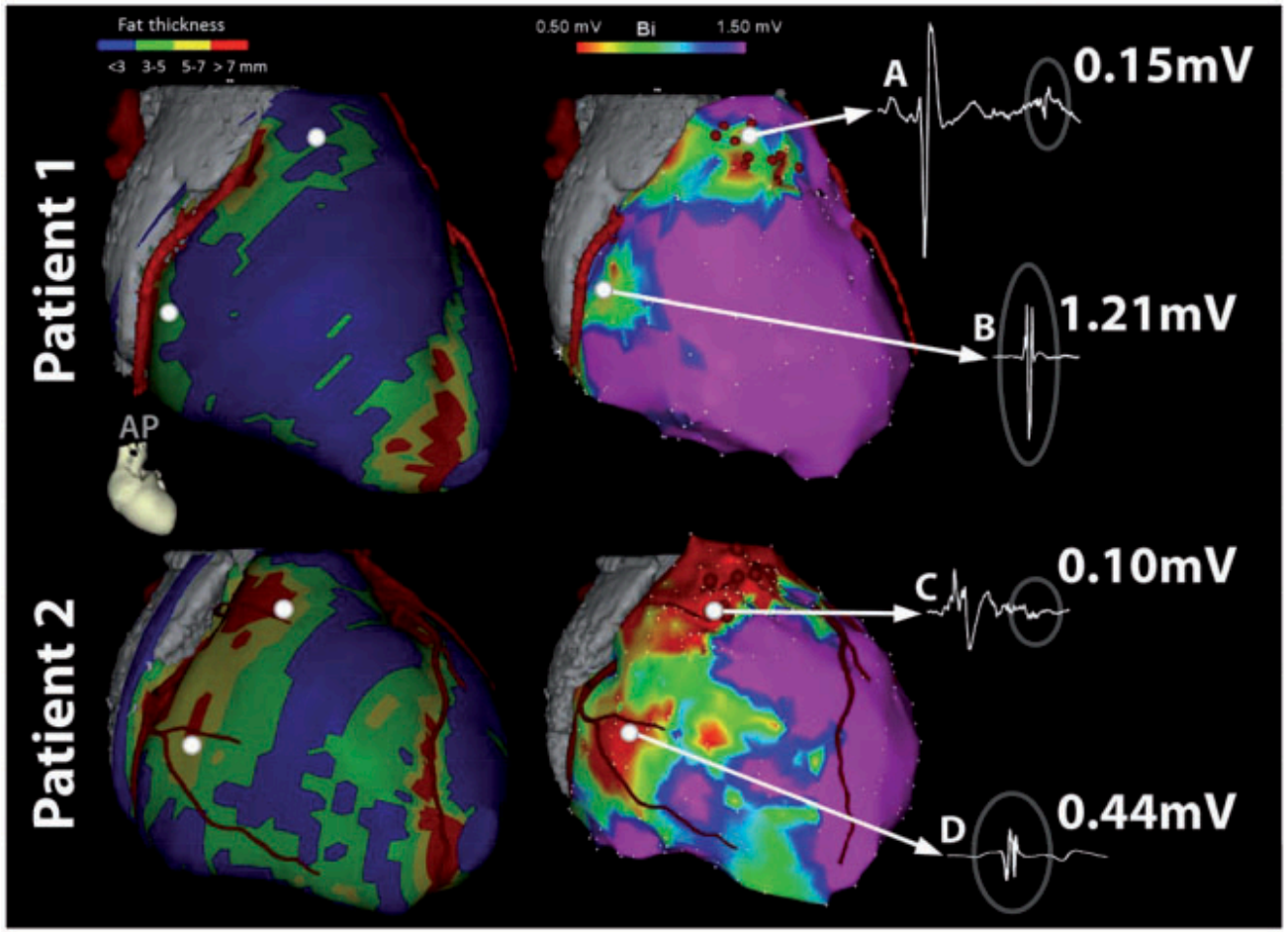


Epicardial fat thickness of **greater than 5 mm *may*** attenuate peak-to-peak myocardial electrogram amplitude, augment tissue impedance and pacing capture, and impede RF energy delivery.

Aryana A et al. Card Electrophysiol Clin. 2017 Mar;9(1):119-131.

Fat and Coronary Arteries





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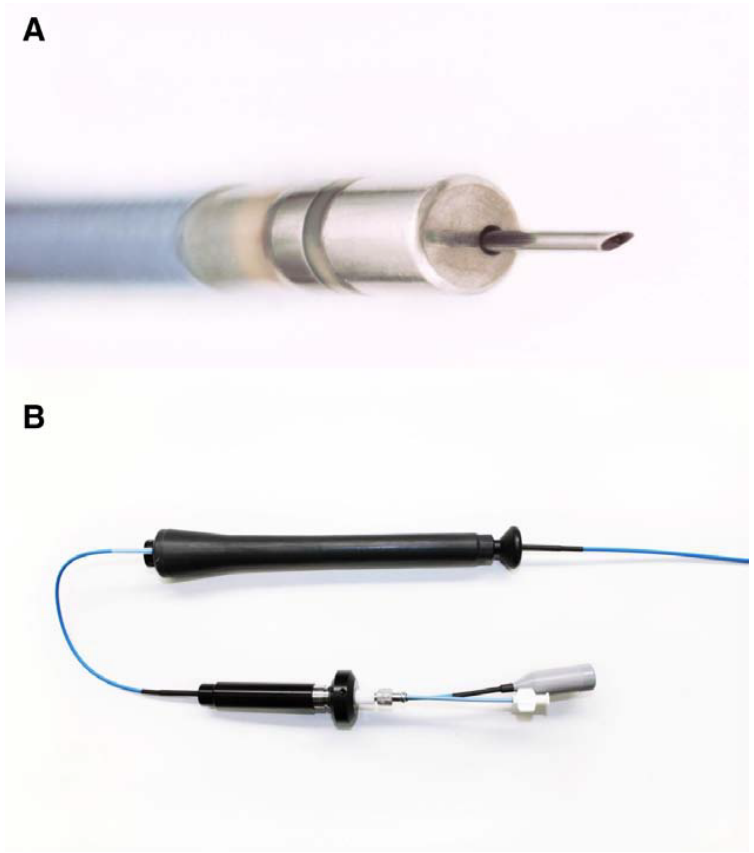
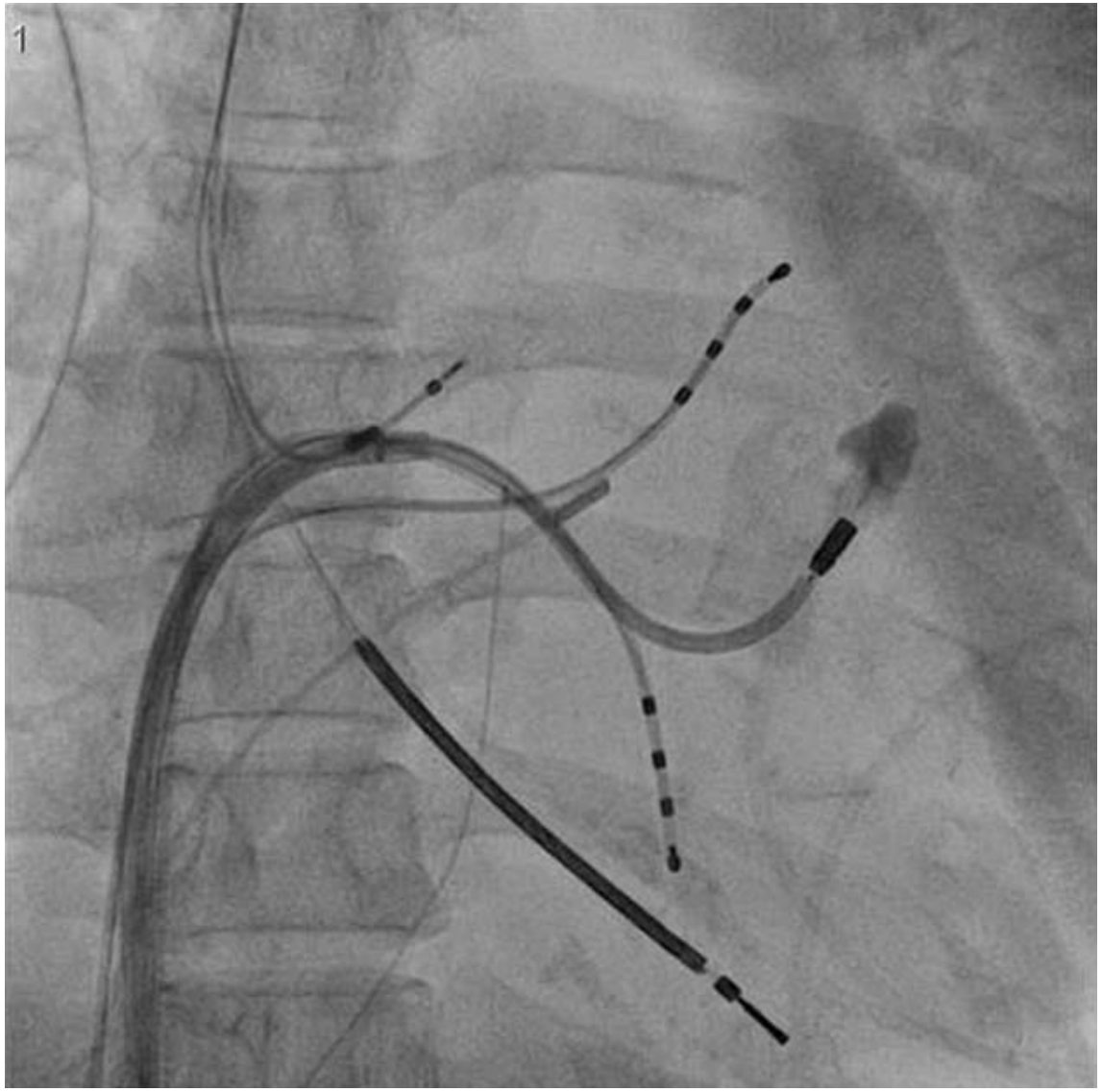
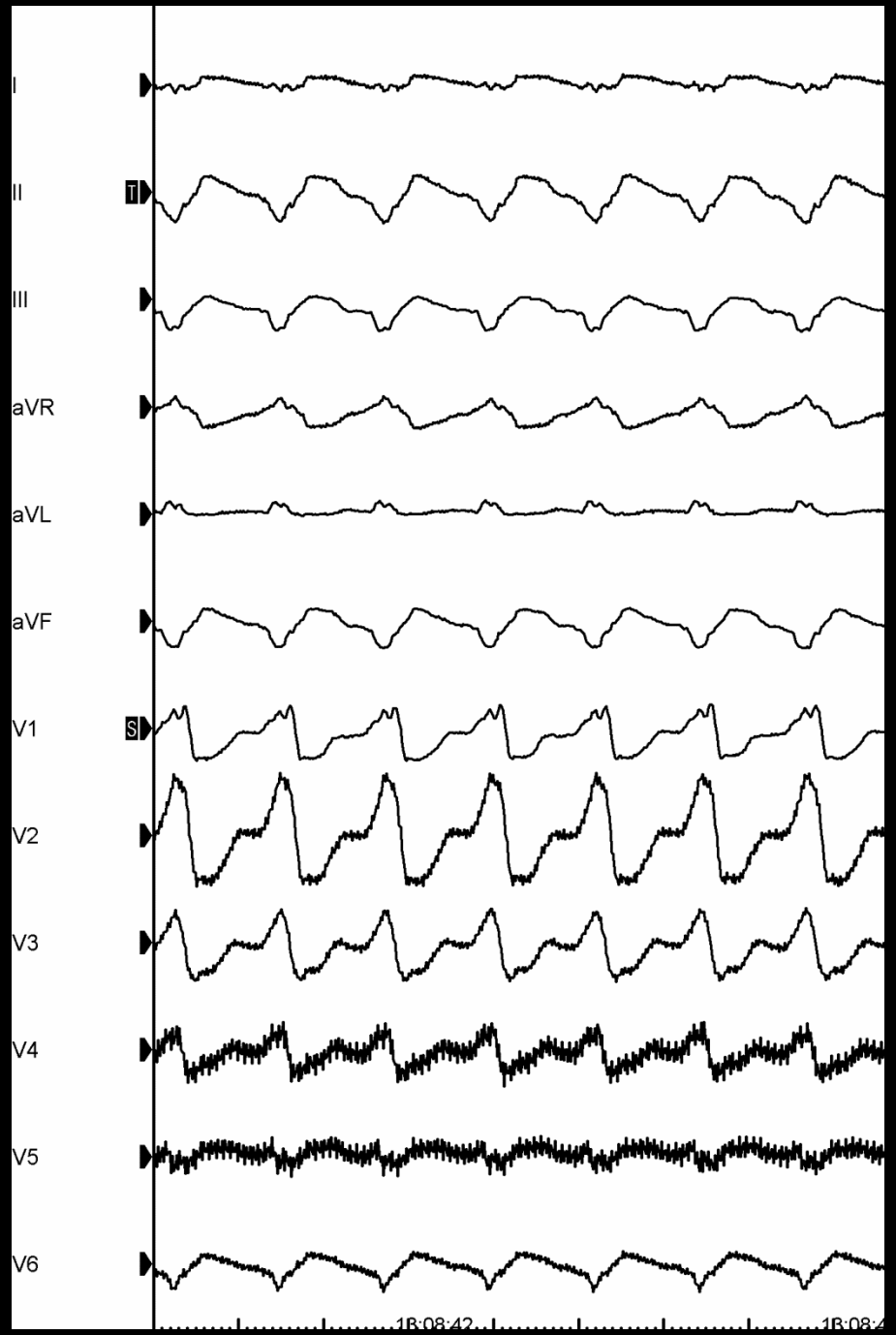
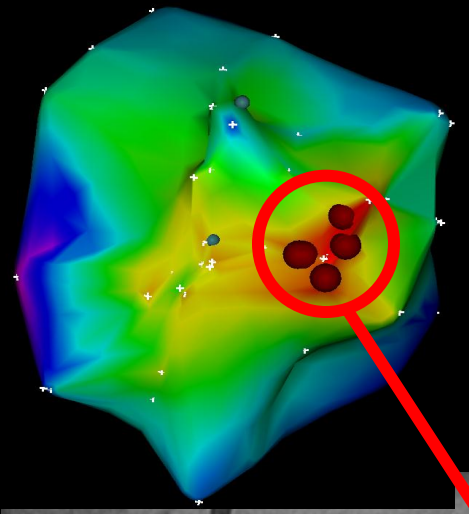
Deep Substrate





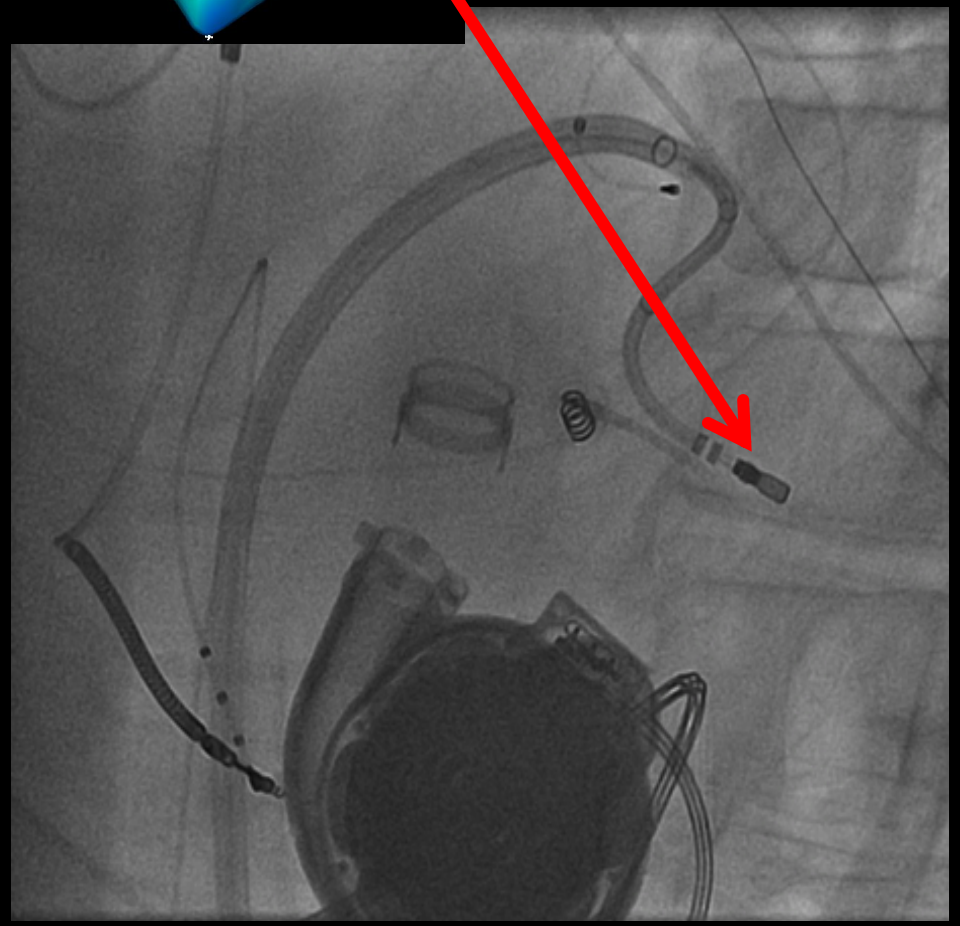
Circulation. 2013;128:2289–2295





Epicardial VT
LVAD

LV Left Lateral



Conclusion

Epicardial catheter ablation has **steadily evolved into a practical and widely used approach for the treatment of VT in a broad range of disease substrates**.

Efforts were made in **improving the safety** of the access and **prevention of injury to adjacent structures** especially in patients with prior operation and/or Ablation.

The last decade has yielded **improvements** in the **cardiac imaging** and **energy delivery to the epicardial VT substrate**.

There is tremendous need and potential for exploring **alternate energy sources** and **delivery methods** to further improve the results and success associated with epicardial catheter ablation of VT.

Presentation available at:
https://www.arasharya.de/resources/