

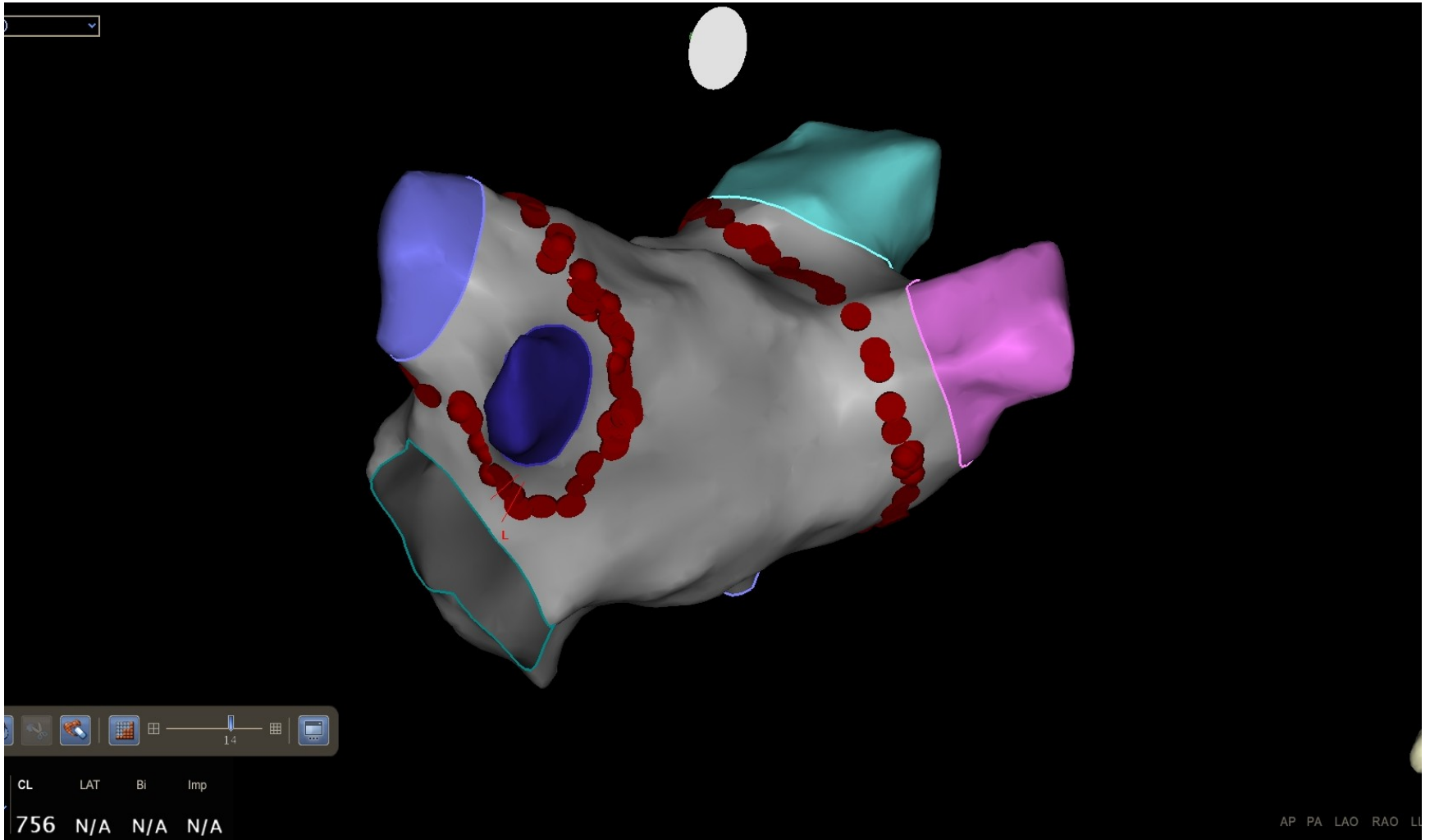
PAF ABLASYONUNDA LEZYON ETKİNLİĞİ

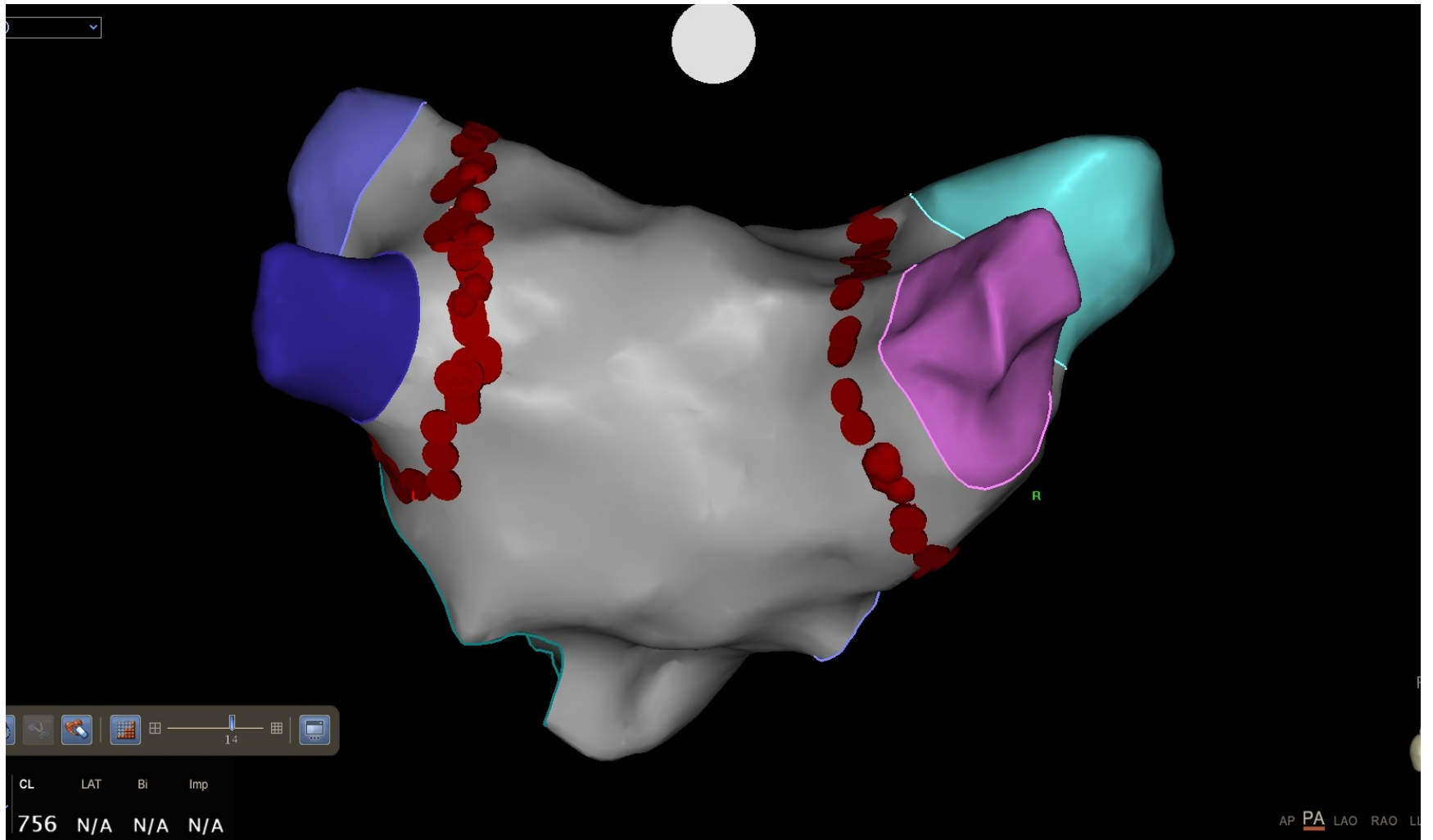
Doç. Dr. Duhan Fatih Bayrak
Acıbadem Üniversitesi, İstanbul

Paroksizmal Atriyal fibrilasyon ablasyonu

- Pulmoner ven izolasyonu (PVI) temel hedef
- PVI durabilitesi en önemli unsur
- Her noktada efektif lezyon kritik

Sirkumferensiyal Pulmoner Ven Ablasyonu (CPVA, WACA), Kompleks haritalama ile

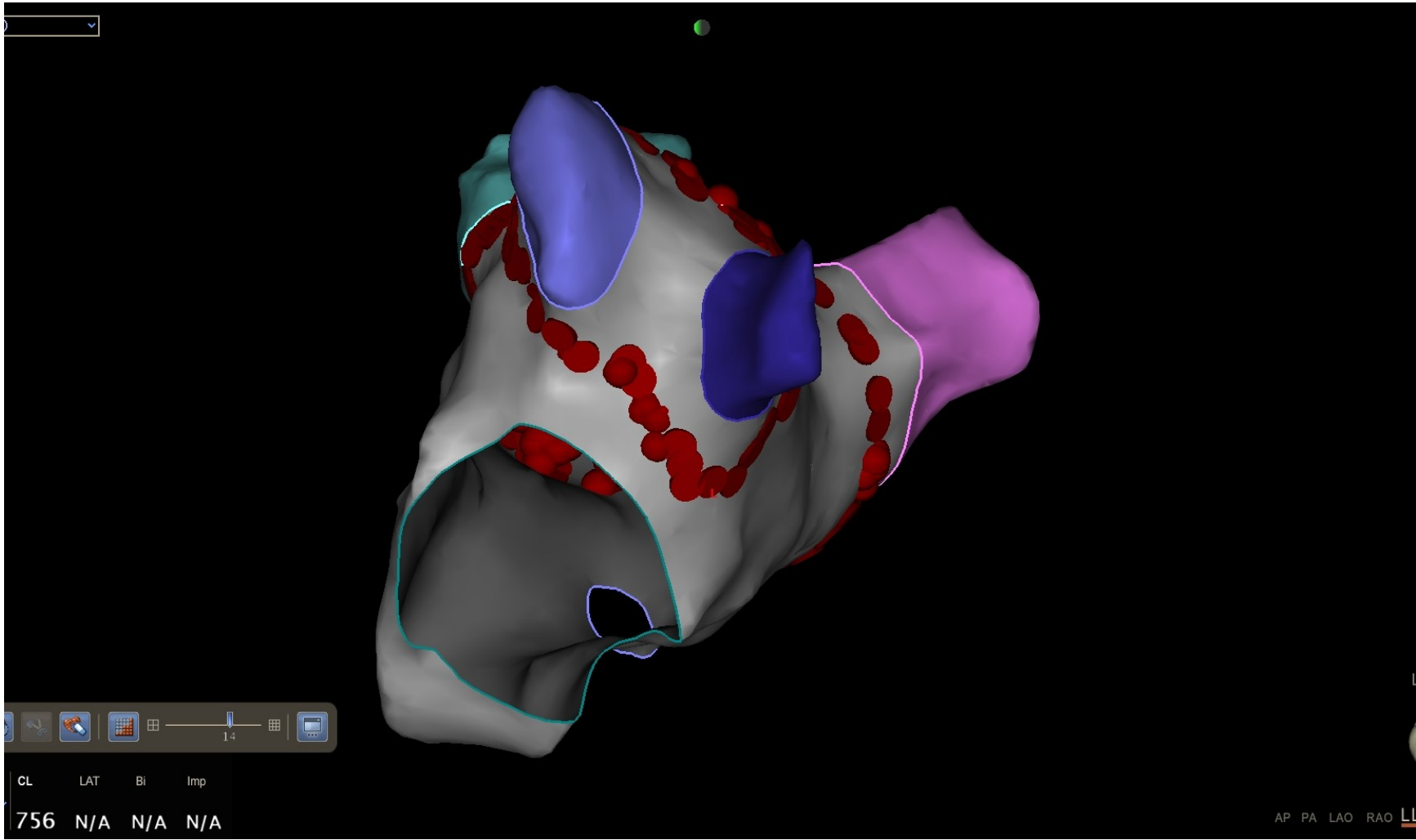




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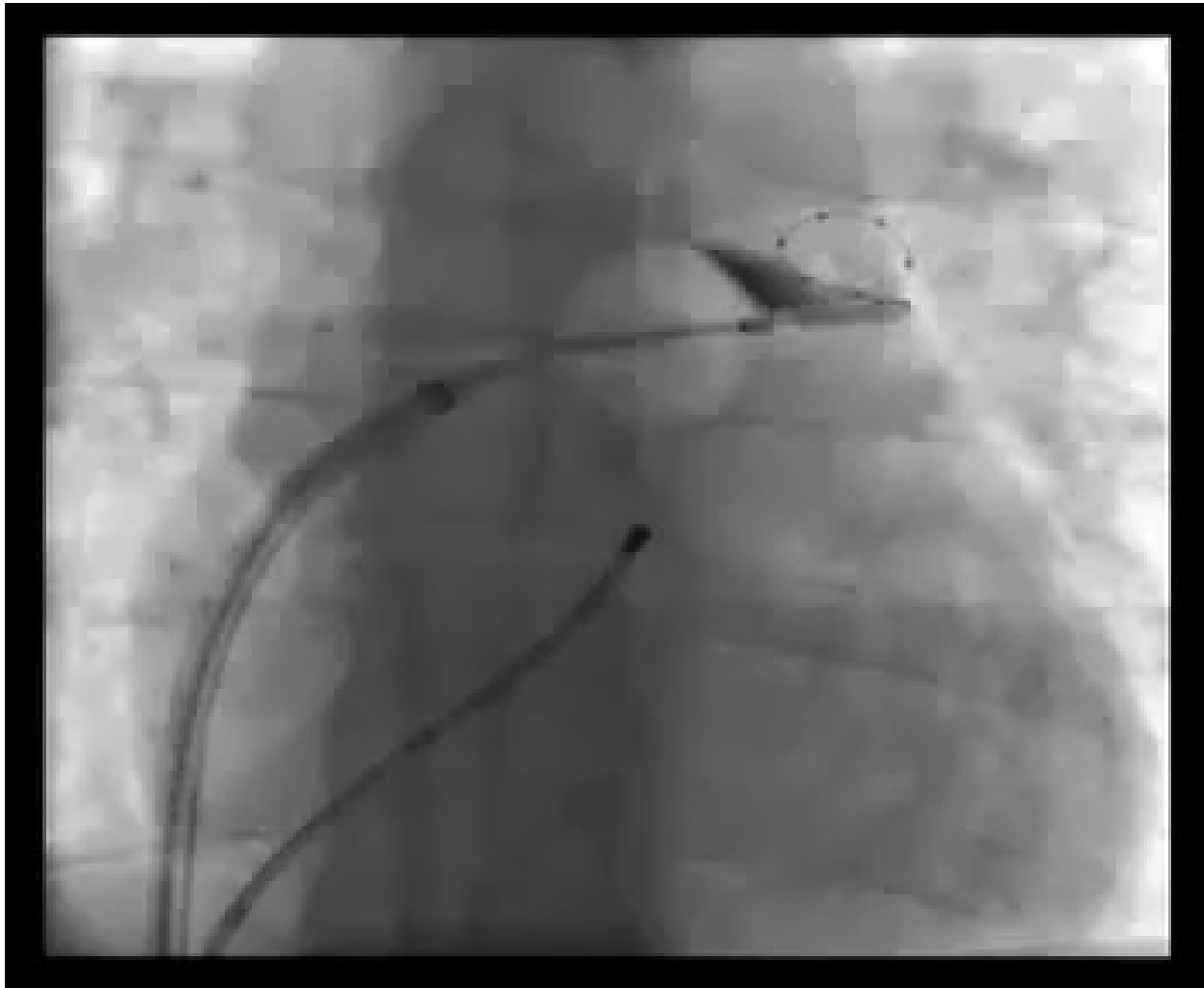
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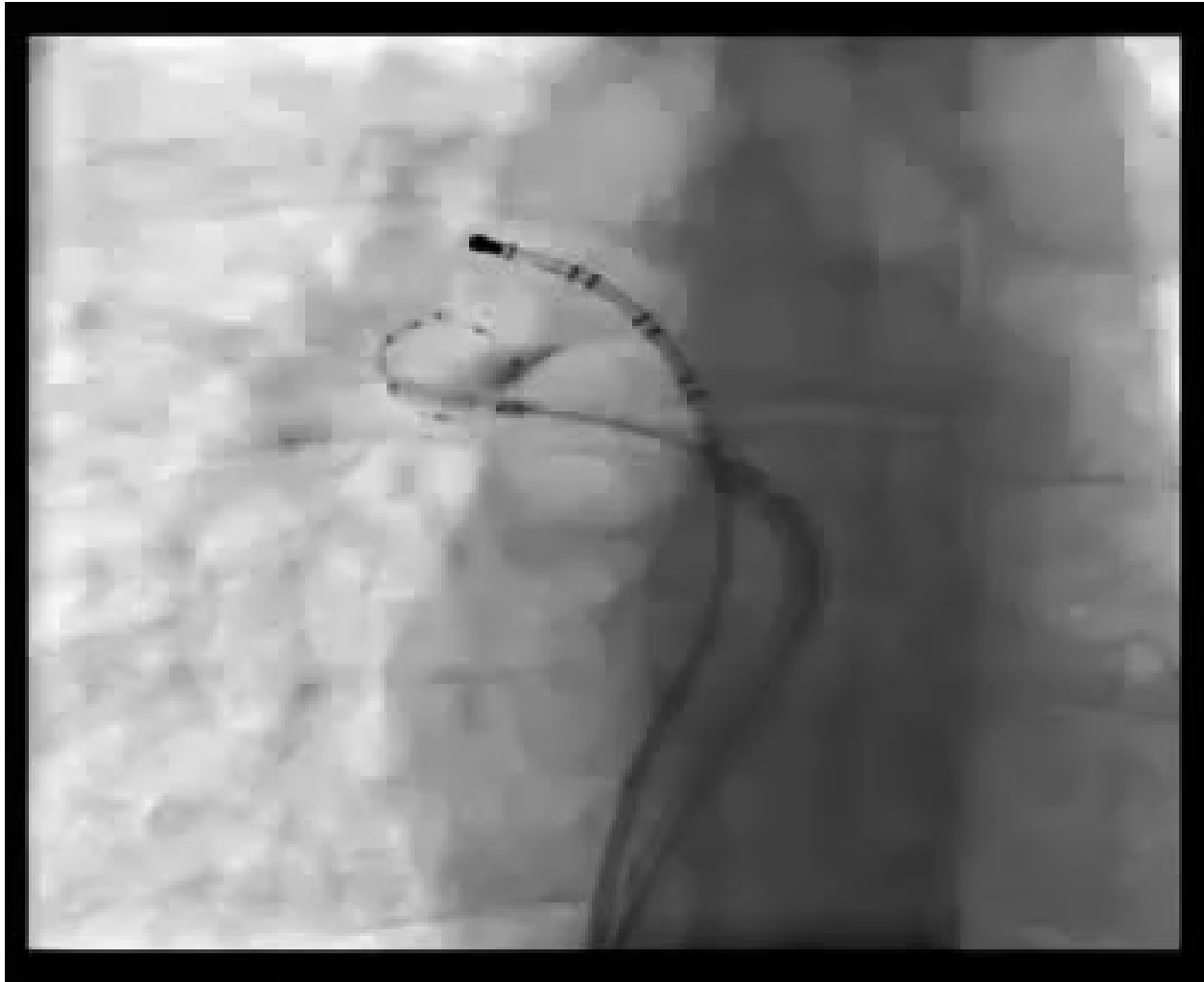
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Kriyobalon

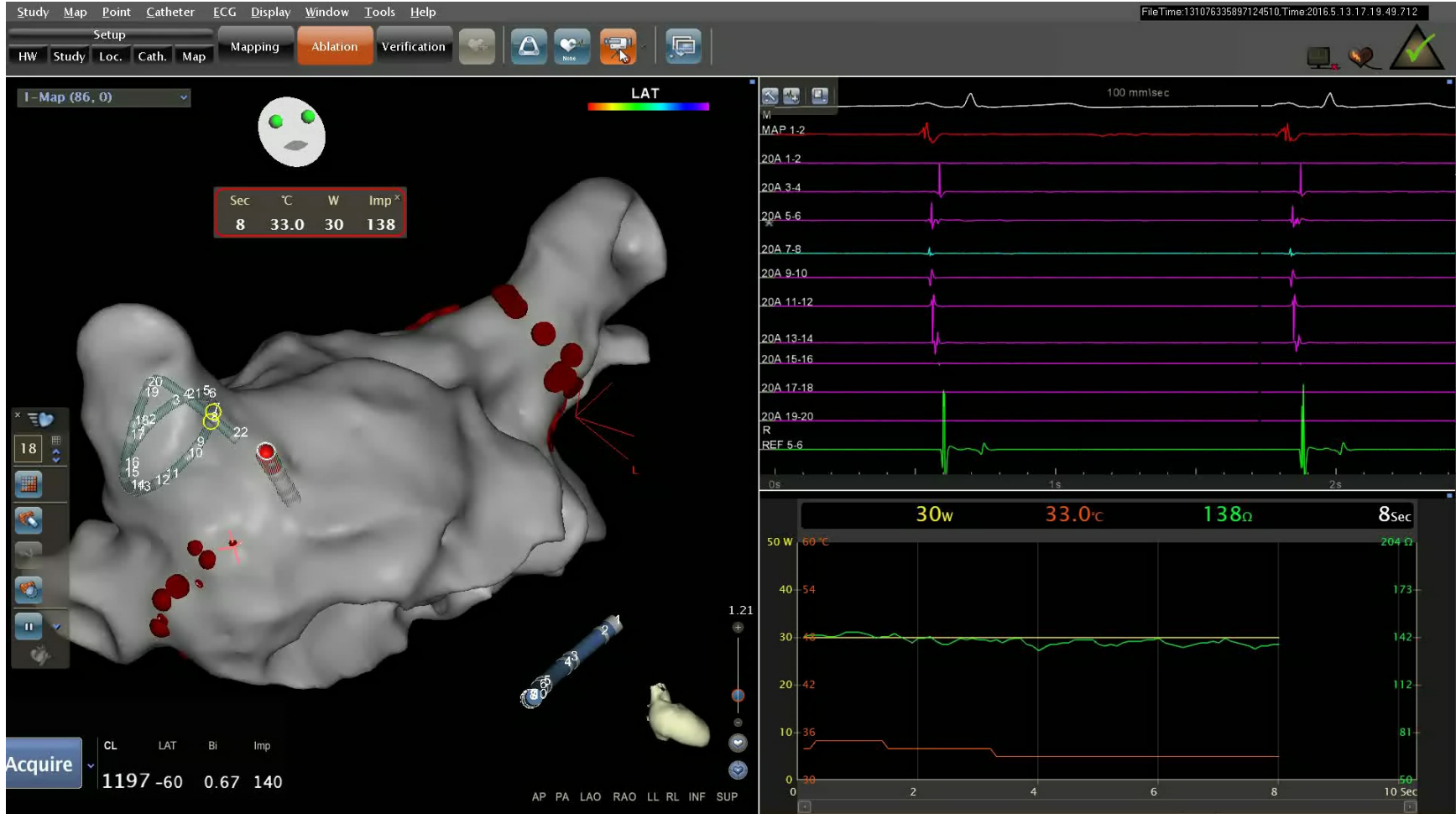




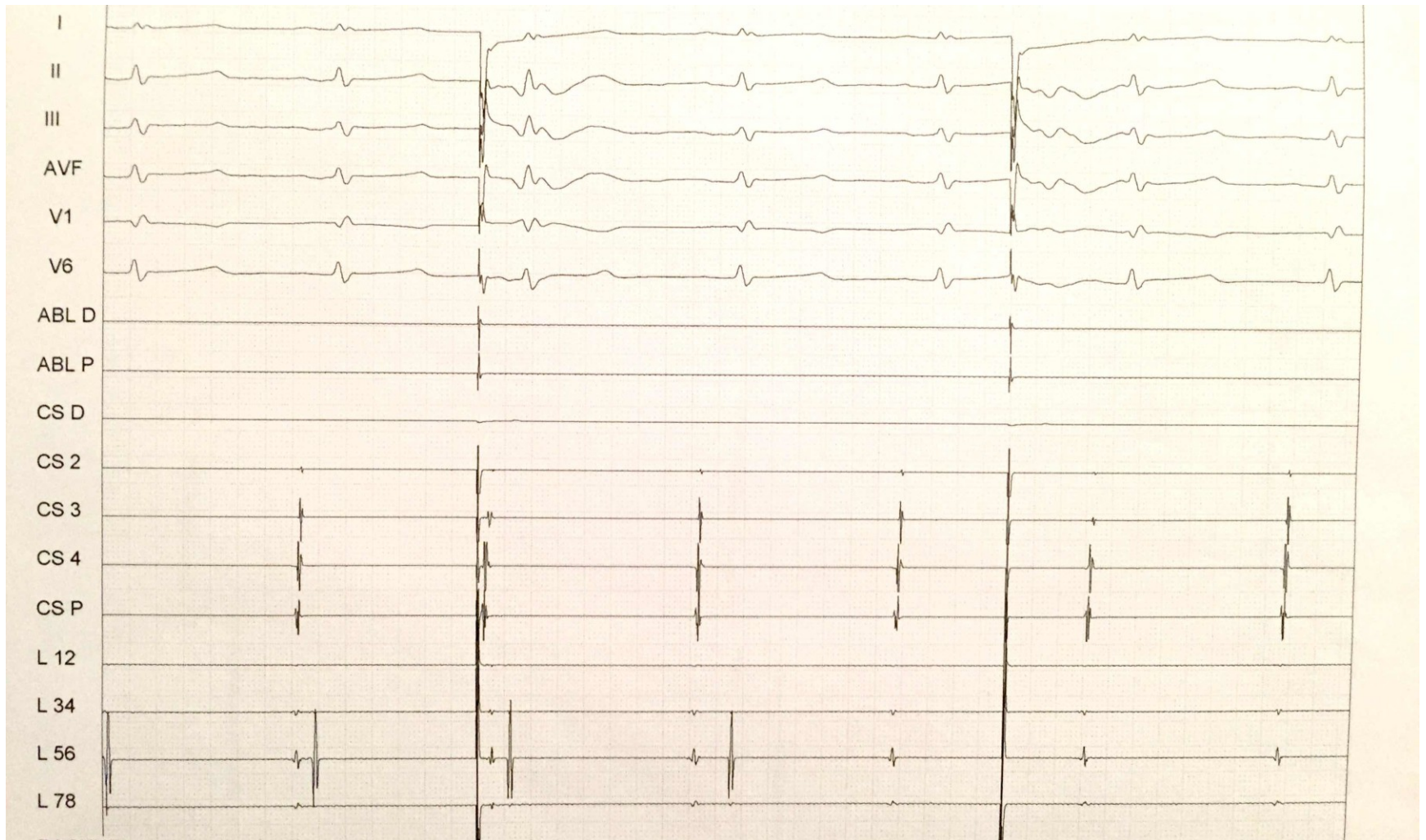
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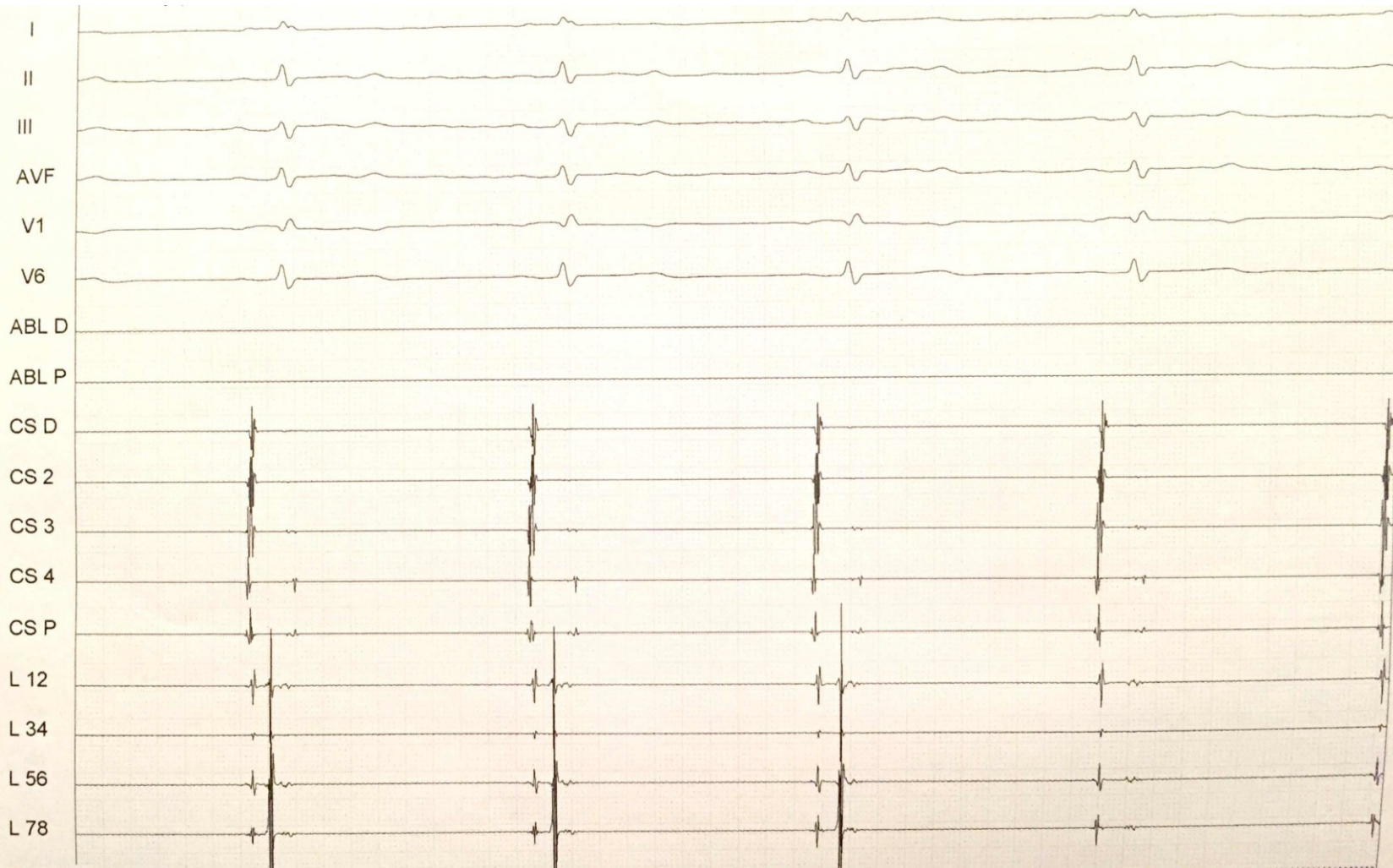
- Lokal egm kuülmesi ve impedans düşüşü
- Giriş çıkış bloęu
- Ablasyon hattında pacing
- Adenozin, dormant ileti
- Contact force
- Bekleme süresi

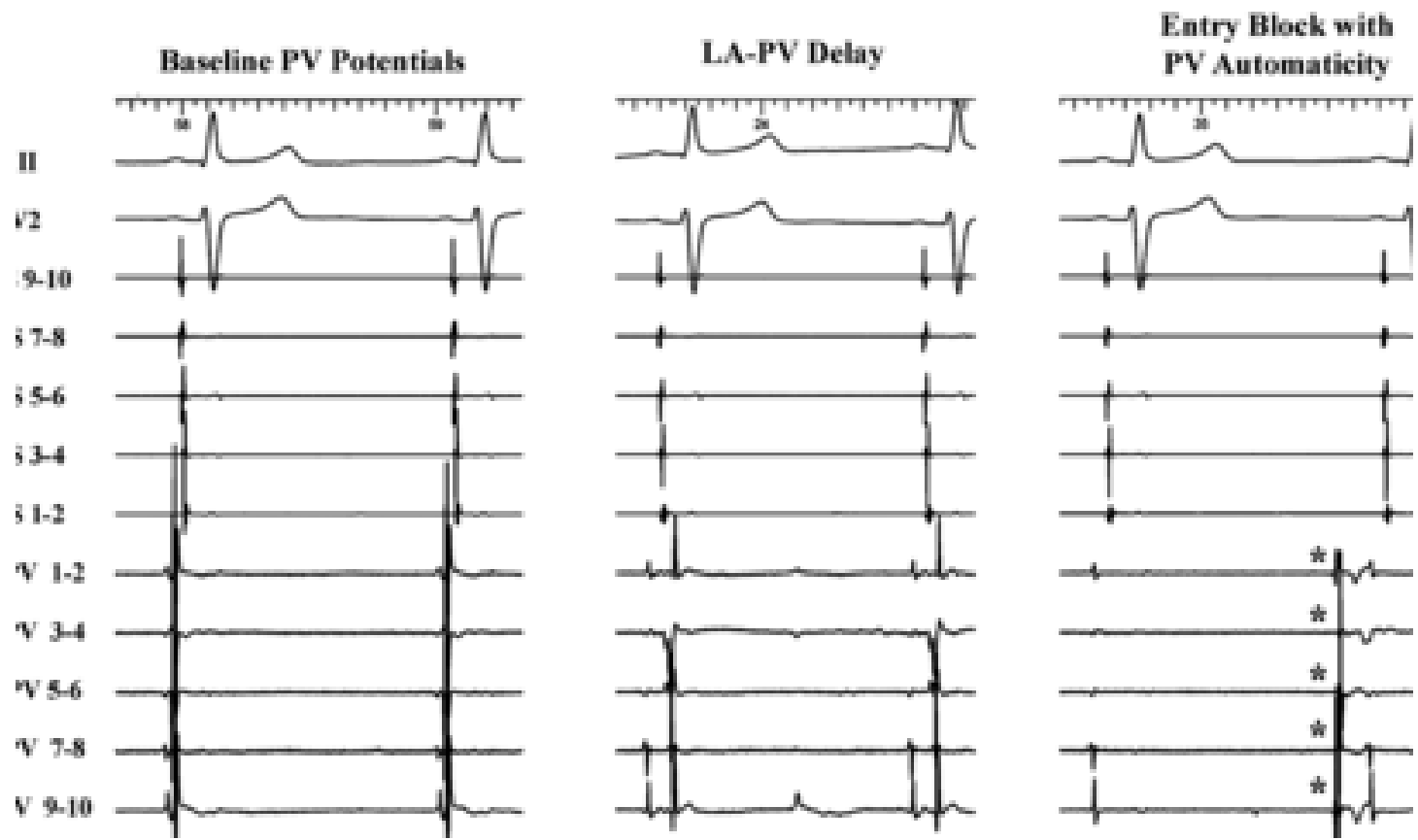
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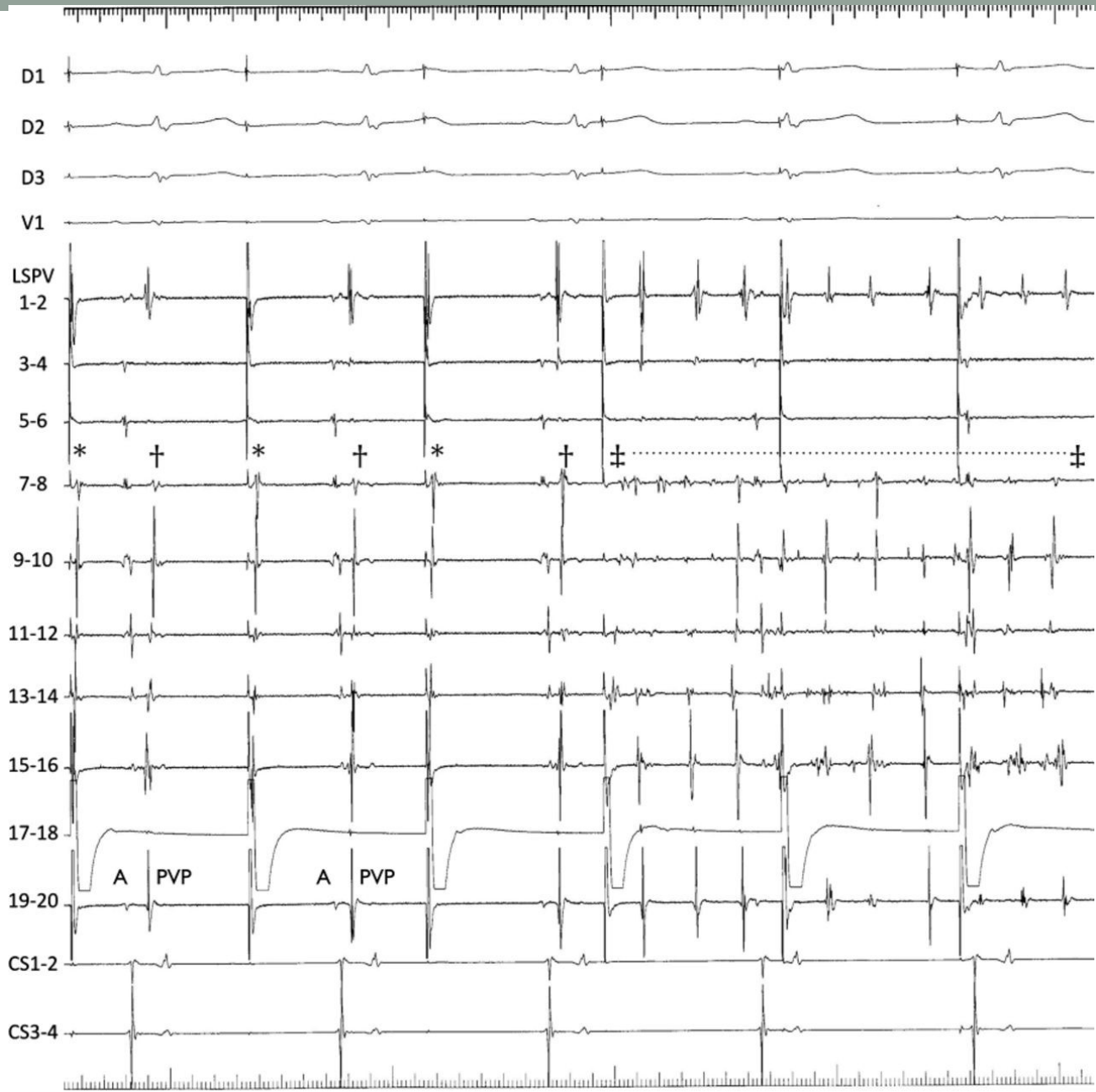


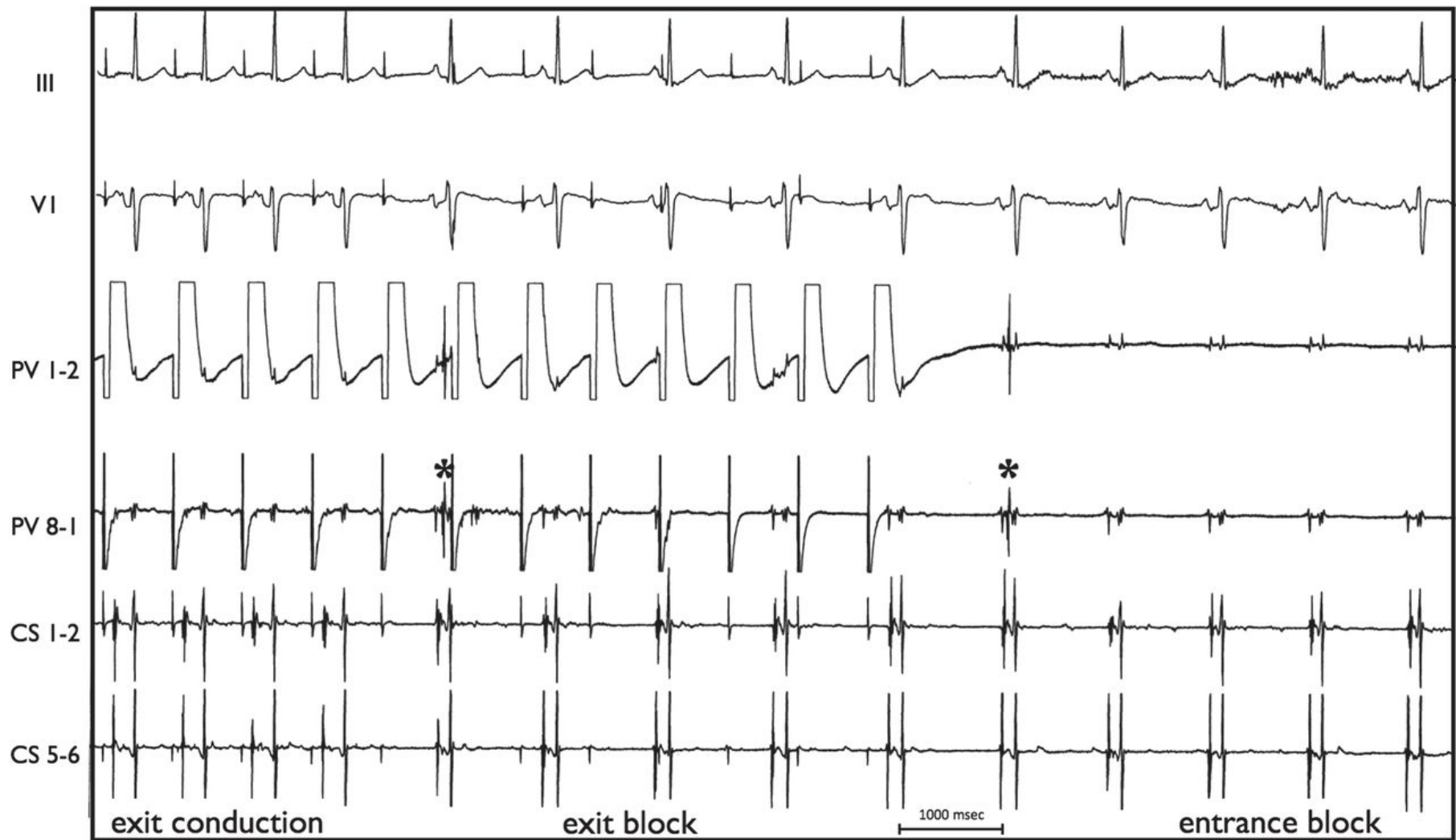
Giriş çıkış bloğu

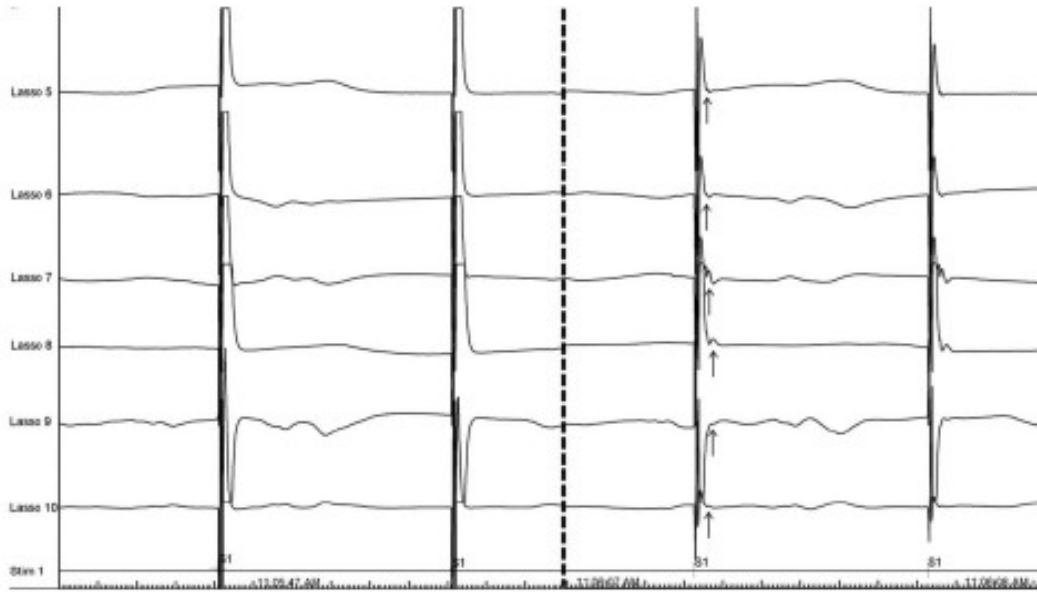
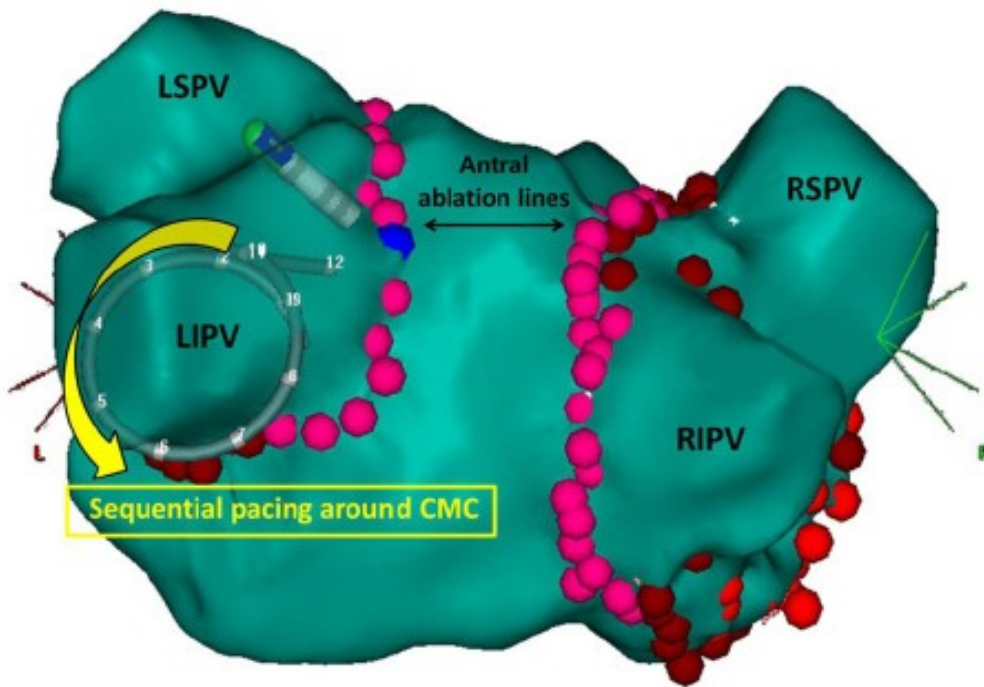












Pacing lasso 3 at 10 mA/2ms
No PV sleeve capture seen

Pacing lasso 3 at 3 mA/2ms
Unmasked PV sleeve capture

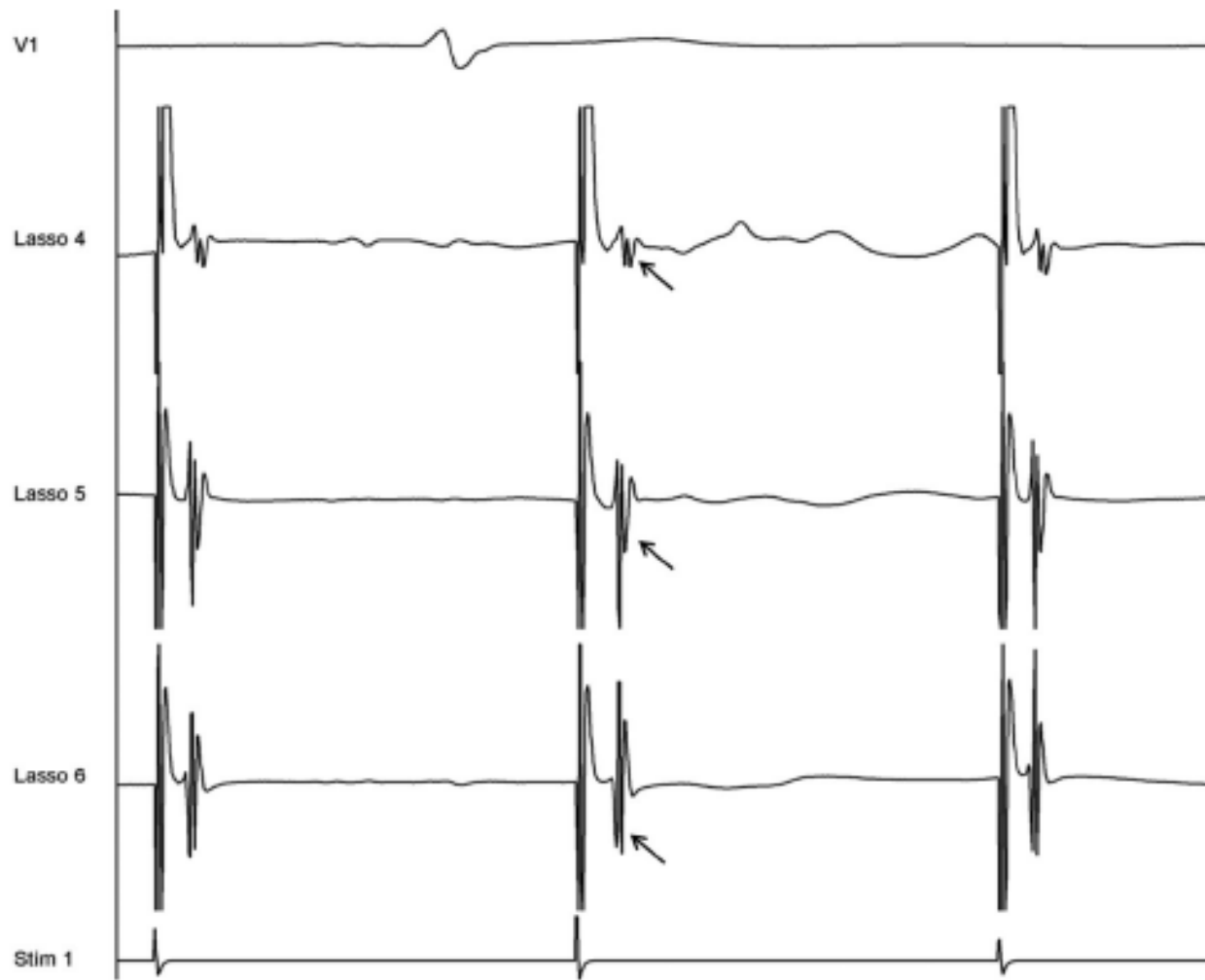
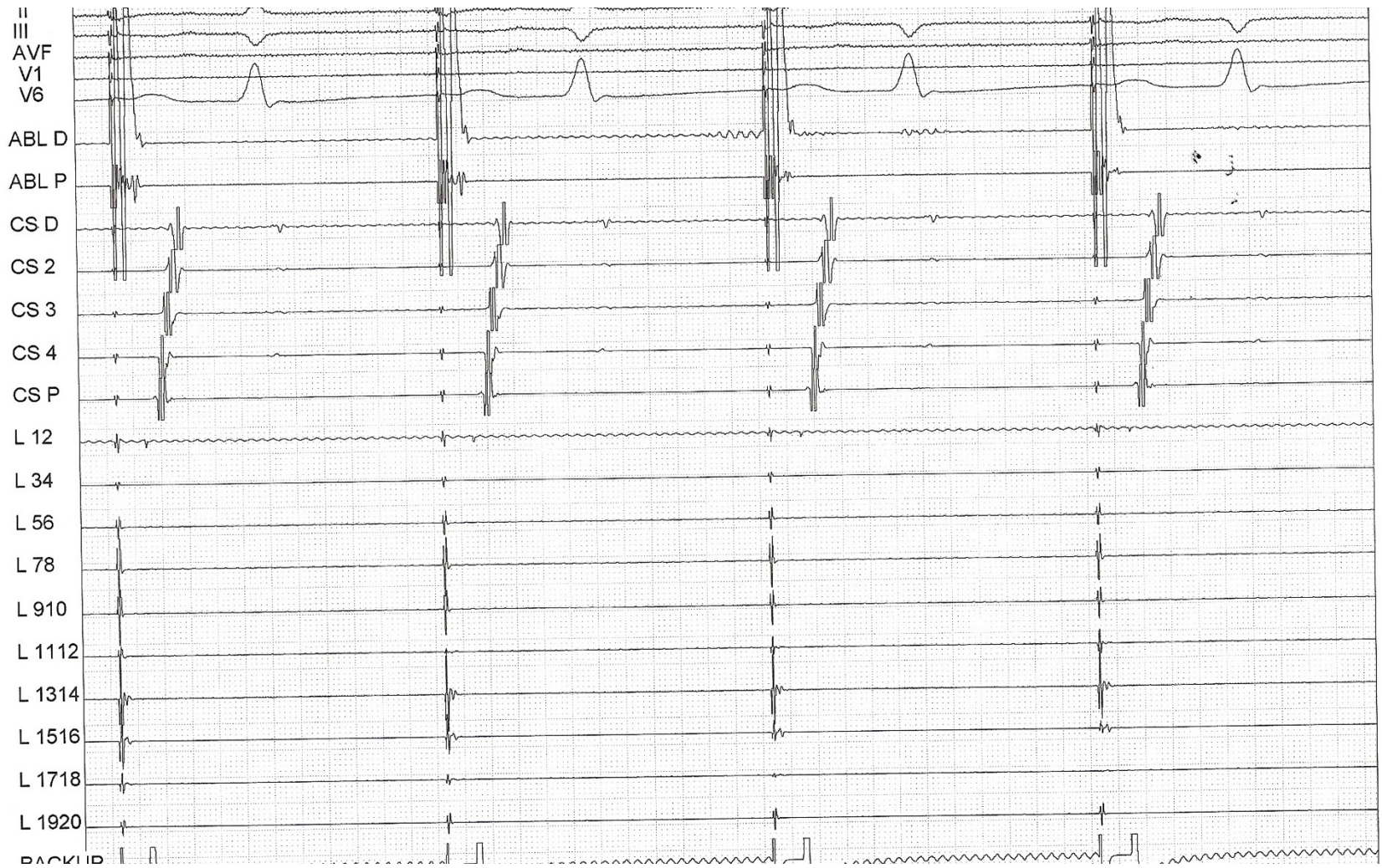


Figure 5. Left inferior Pulmonary Vein Sleeve Capture during Lasso Pacing, after PVI. PV potential was clearly seen after the pacing spike (arrows), with no conduction to the LA. Decreasing pacing output to confirm PV sleeve capture was not necessary.



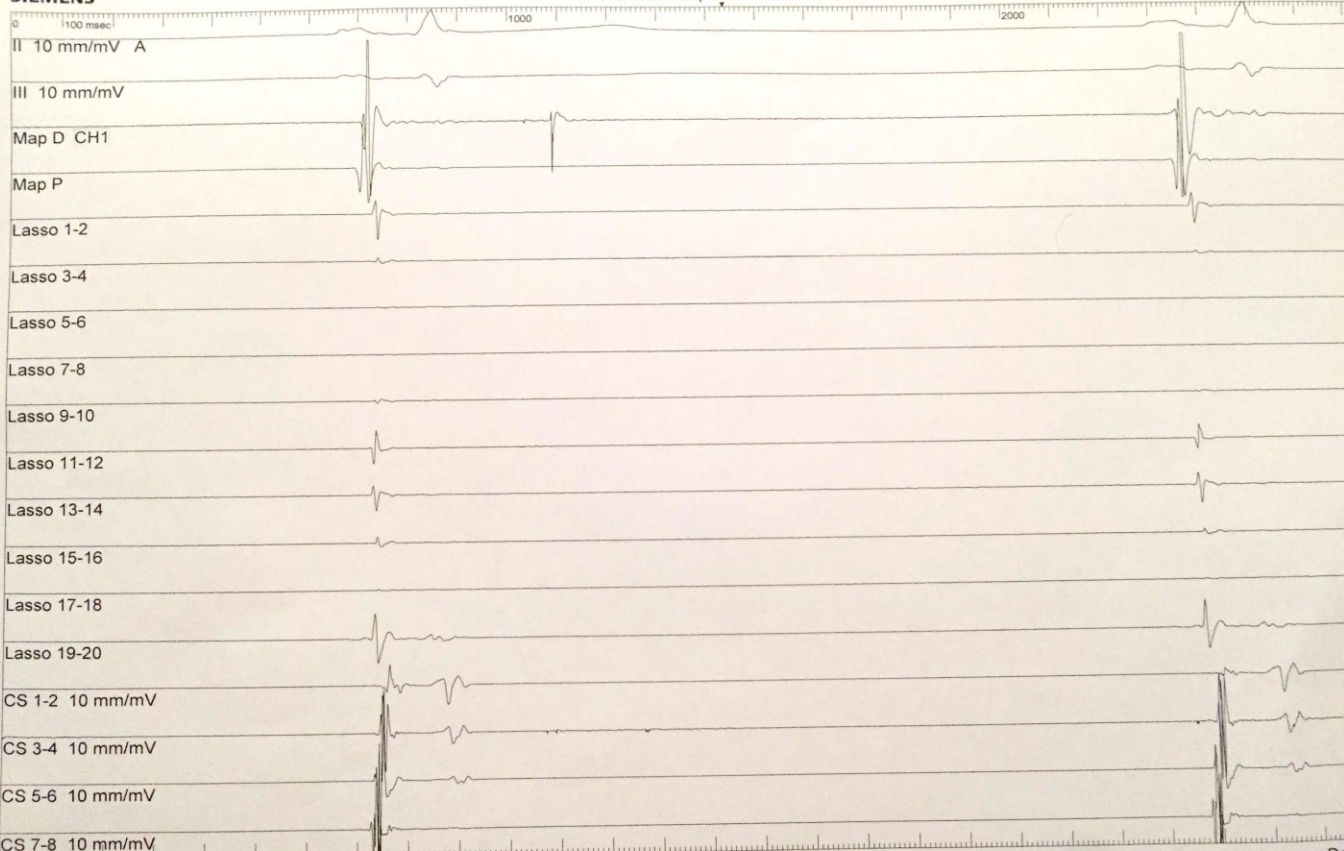




1. Baseline: Snapshot 10:09:34-14 s

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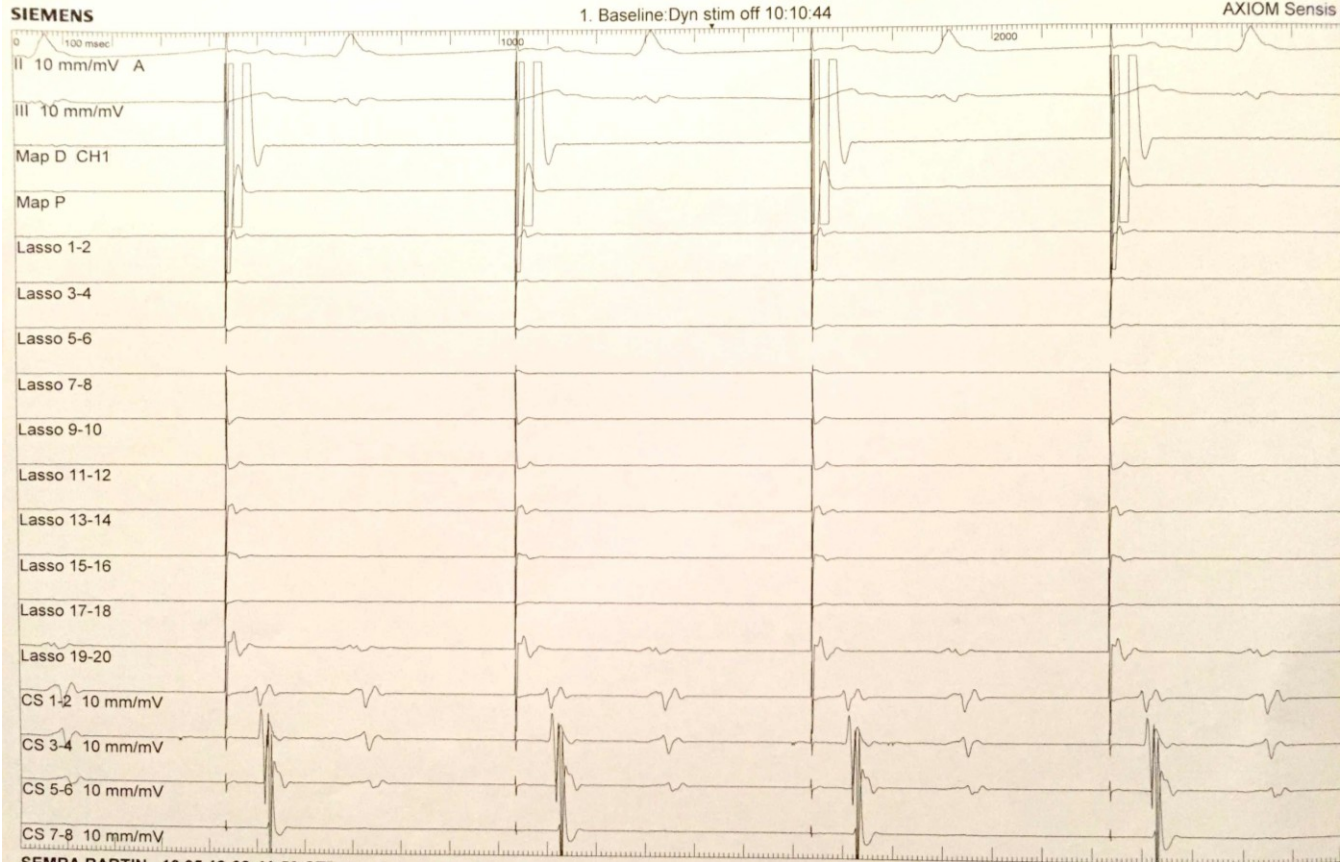
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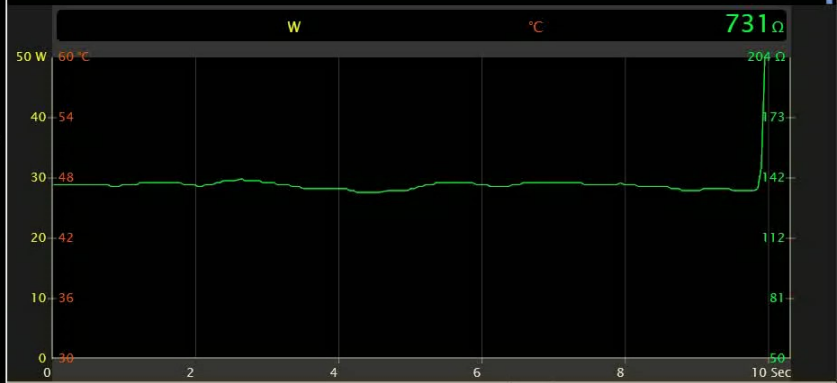
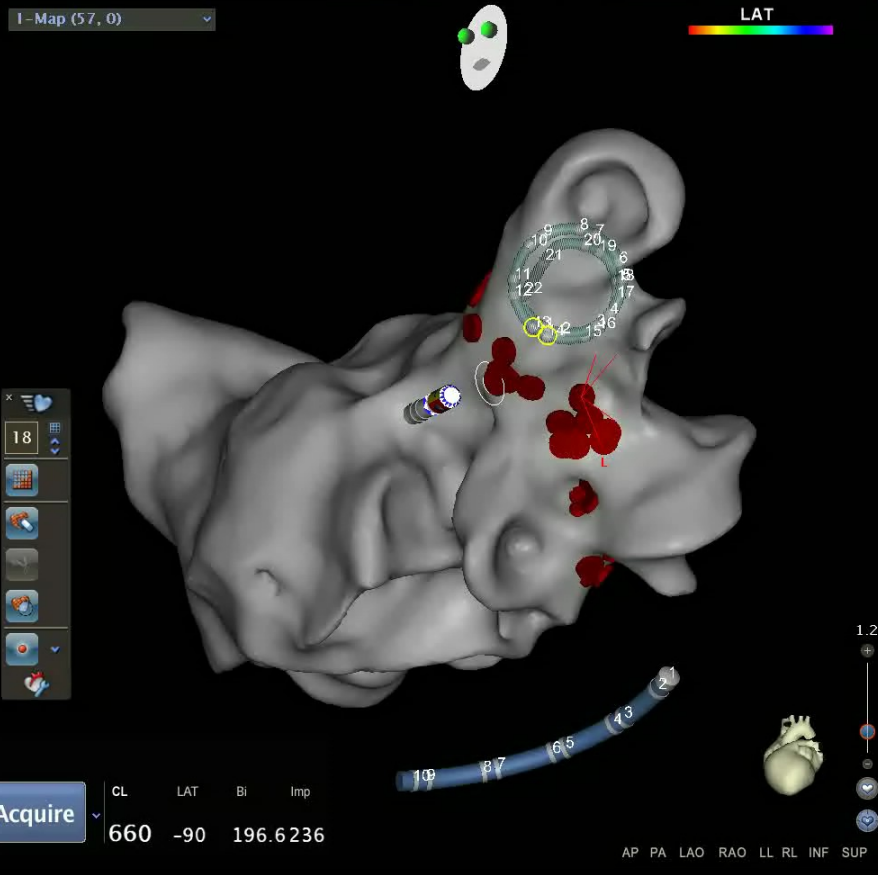
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AP PA LAO RAO LL RL INF SUP

Ablasyon hattında pacing

Loss of Local Capture of the Pulmonary Vein Myocardium After Antral Isolation: Prevalence and Clinical Significance

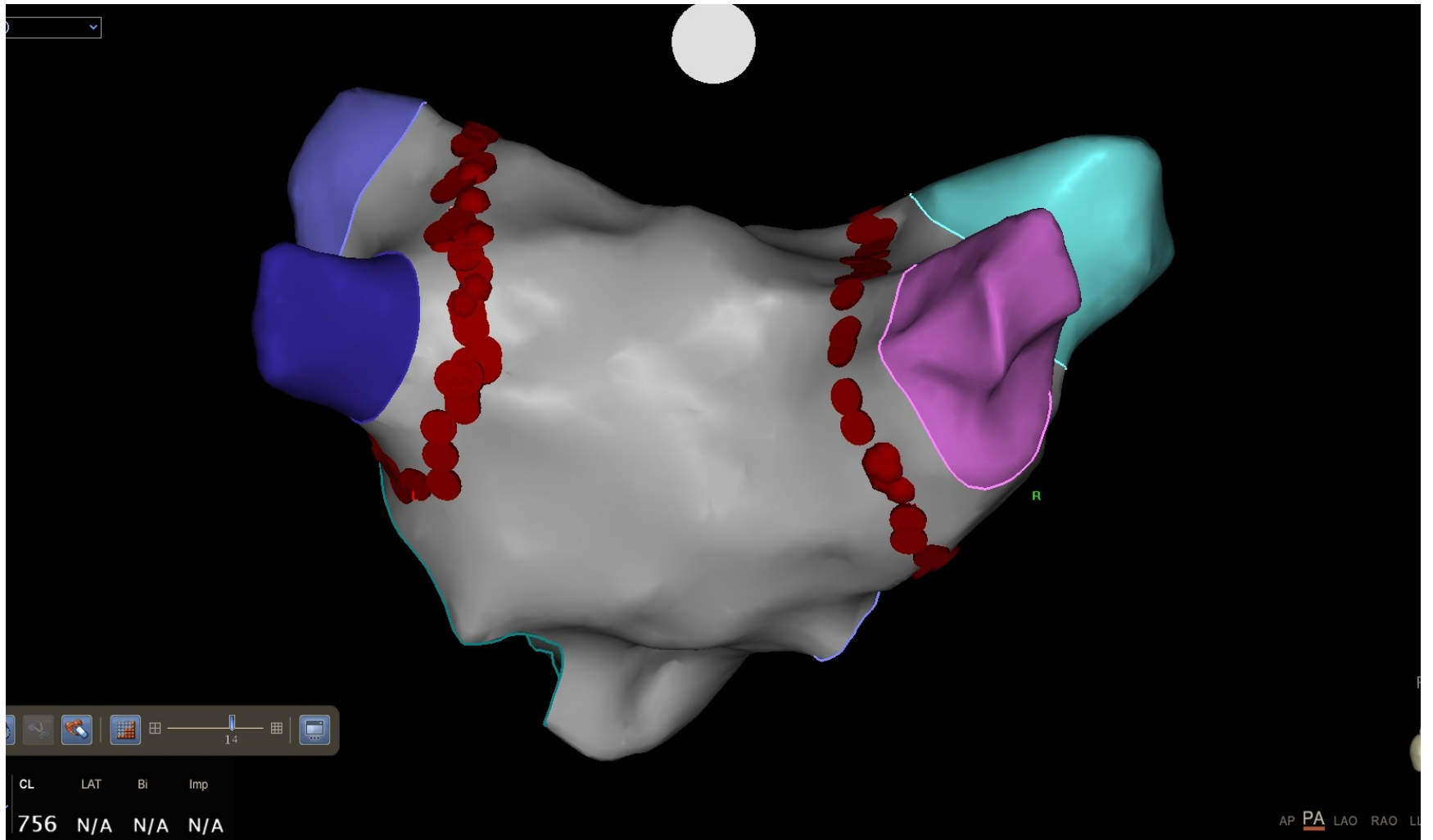
FABIEN SQUARA, M.D.,* IOAN LIUBA, M.D.,† WILLIAM CHIK, M.D.,†
PASQUALE SANTANGELI, M.D.,† ERICA S. ZADO, PA.-C.,† DAVID J. CALLANS, M.D.,† and
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Loss of Pulmonary Vein Capture After Isolation. Introduction: Capture of the myocardial sleeves of the pulmonary veins (PV) during PV pacing is mandatory for assessing exit block after PV isolation (PVI). However, previous studies reported that a significant proportion of PVs failed to demonstrate local capture after PVI. We designed this study to evaluate the prevalence and the clinical significance of loss of PV capture after PVI.

Methods and Results: Thirty patients (14 redo) undergoing antral PVI were included. Before and after PVI, local PV capture was assessed during circumferential pacing (10 mA/2 milliseconds) with a circular multipolar catheter (CMC), using EGM analysis from each dipole of the CMC and from the ablation catheter placed in ipsilateral PV. Pacing output was varied to optimize identification of sleeve capture. All PVs demonstrated sleeve capture before PVI, but only 81% and 40% after first time and redo PVI, respectively ($P < 0.001$ vs. before PVI). In multivariate analysis, absence of spontaneous PV depolarizations after PVI and previous PVI procedures were associated with less PV sleeve capture after PVI (40% sleeve capture, $P < 0.001$ for both). Loss of PV local capture by design was coincident with the development of PV entrance block and importantly predicted absence of acute reconnection during adenosine challenge with 96% positive predictive value (23% negative predictive value).

Conclusion: Loss of PV local capture is common after antral PVI resulting in entrance block, and may be used as a specific alternate endpoint for PV electrical isolation. Additionally, loss of PV local capture may identify PVs at very low risk of acute reconnection during adenosine challenge. (*J Cardiovasc Electrophysiol*, Vol. 26, pp. 242-250, March 2015)



CL LAT Bi Imp

756 N/A N/A N/A

AP PA LAO RAO LI

Adenozin

Adenosine-guided pulmonary vein isolation for the treatment of paroxysmal atrial fibrillation: an international, multicentre, randomised superiority trial

*Laurent Macle, Paul Khairy, Rukshen Weerasooriya, Paul Novak, Atul Verma, Stephan Willems, Thomas Arentz, Isabel Deisenhofer, George Veenhuyzen, Christophe Scavée, Pierre Jais, Helmut Puererfellner, Sylvie Levesque, Jason G Andrade, Lena Rivard, Peter G Guerra, Marc Dubuc, Bernard Thibault, Mario Talajic, Denis Roy, Stanley Nattel, for the ADVICE trial investigators**

Summary

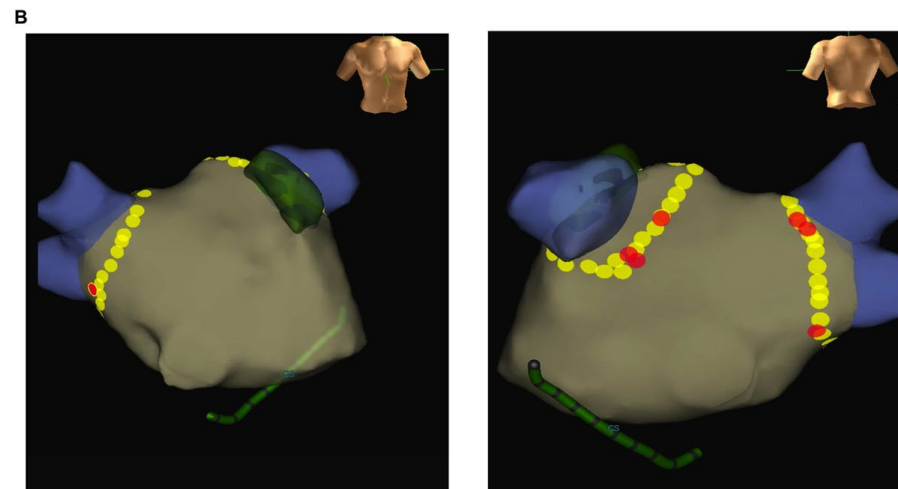
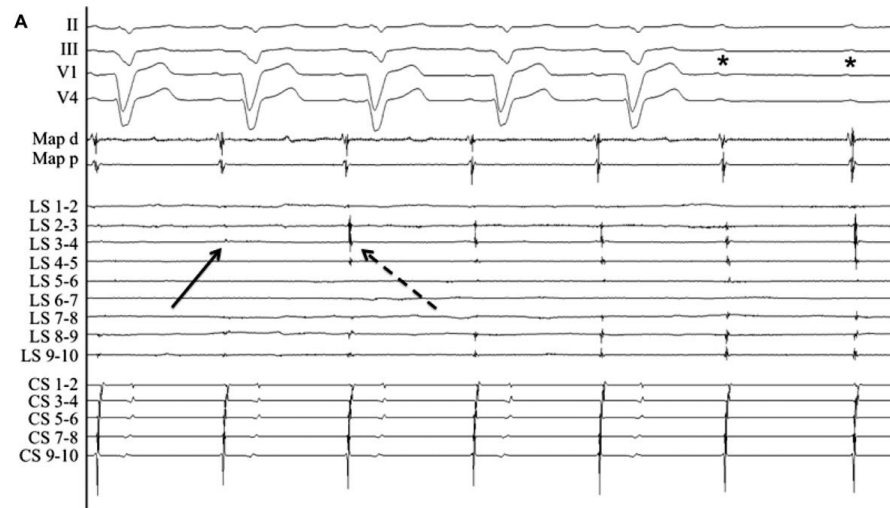
Background Catheter ablation is increasingly used to manage atrial fibrillation, but arrhythmia recurrences are common. Adenosine might identify pulmonary veins at risk of reconnection by unmasking dormant conduction, and thereby guide additional ablation to improve arrhythmia-free survival. We assessed whether adenosine-guided pulmonary vein isolation could prevent arrhythmia recurrence in patients undergoing radiofrequency catheter ablation for paroxysmal atrial fibrillation.

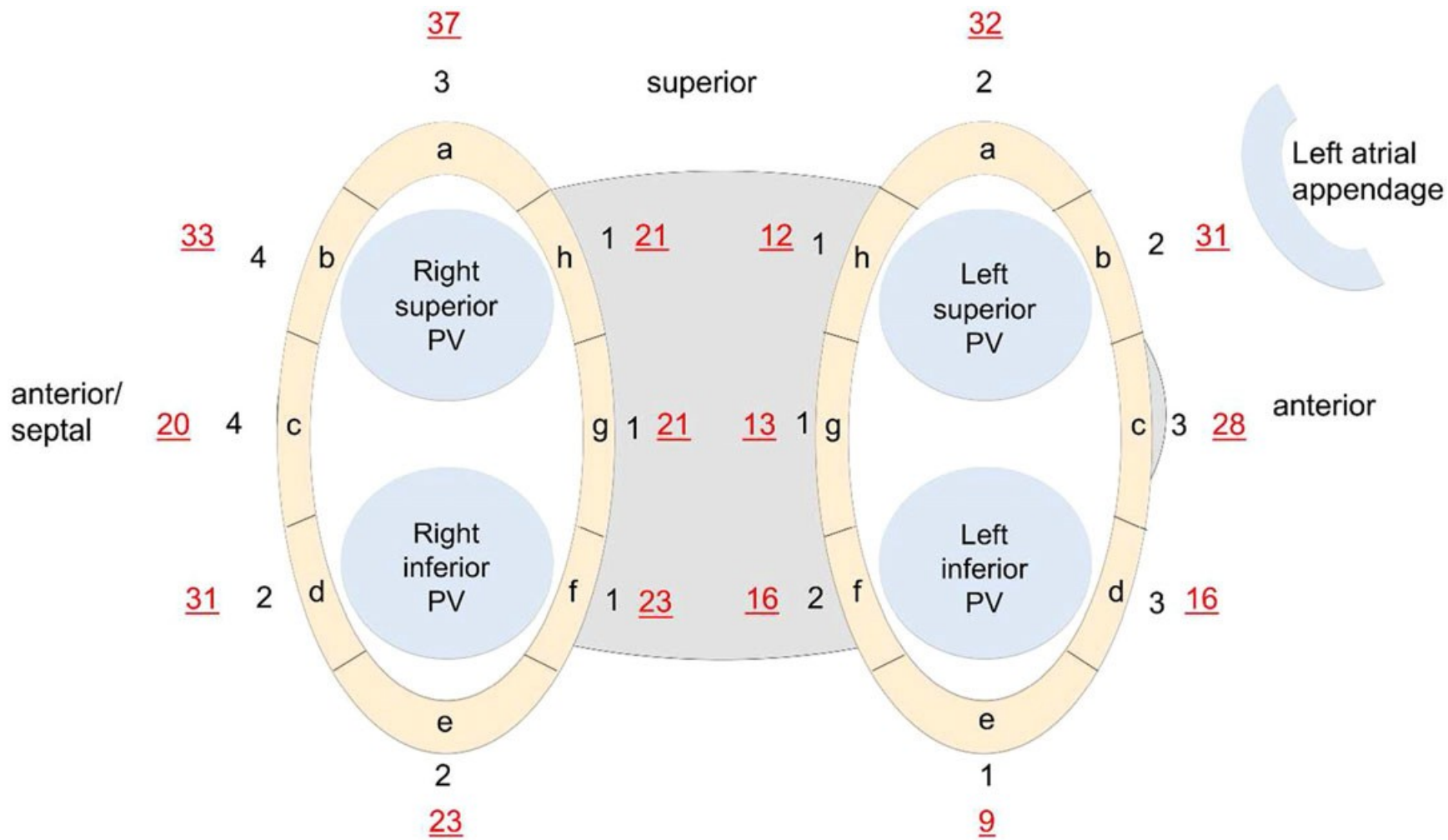
Methods We did this randomised trial at 18 hospitals in Australia, Europe, and North America. We enrolled patients aged older than 18 years who had had at least three symptomatic atrial fibrillation episodes in the past 6 months, and for whom treatment with an antiarrhythmic drug failed. After pulmonary vein isolation, intravenous adenosine was administered. If dormant conduction was present, patients were randomly assigned (1:1) to additional adenosine-guided ablation to abolish dormant conduction or to no further ablation. If no dormant conduction was revealed, randomly selected patients were included in a registry. Patients were masked to treatment allocation and outcomes were assessed by a masked adjudicating committee. Patients were followed up for 1 year. The primary outcome was time to symptomatic atrial tachyarrhythmia after a single procedure in the intention-to-treat population. The trial is registered with ClinicalTrials.gov, number NCT01058980.

Findings Adenosine unmasked dormant pulmonary vein conduction in 284 (53%) of 534 patients. 102 (69·4%) of 147 patients with additional adenosine-guided ablation were free from symptomatic atrial tachyarrhythmia compared with 58 (42·3%) of 137 patients with no further ablation, corresponding to an absolute risk reduction of 27·1% (95% CI 15·9–38·2; $p < 0·0001$) and a hazard ratio of 0·44 (95% CI 0·31–0·64; $p < 0·0001$). Of 115 patients without dormant pulmonary vein conduction, 64 (55·7%) remained free from symptomatic atrial tachyarrhythmia ($p = 0·0191$ vs dormant conduction with no further ablation). Occurrences of serious adverse events were similar in each group. One death (massive stroke) was deemed probably related to ablation in a patient included in the registry.

Interpretation Adenosine testing to identify and target dormant pulmonary vein conduction during catheter ablation of atrial fibrillation is a safe and highly effective strategy to improve arrhythmia-free survival in patients with paroxysmal atrial fibrillation. This approach should be considered for incorporation into routine clinical practice.

Adenozin





Contact force

Paroxysmal AF Catheter Ablation With a Contact Force Sensing Catheter



Results of the Prospective, Multicenter SMART-AF Trial

Andrea Natale, MD,*†‡§¶||¶ Vivek Y. Reddy, MD,# George Monir, MD,** David J. Wilber, MD,†† Bruce D. Lindsay, MD,‡‡ H. Thomas McElderry, MD,§§ Charan Kantipudi, MD,||| Moussa C. Mansour, MD,¶¶ Daniel P. Melby, MD,## Douglas L. Packer, MD,*** Hiroshi Nakagawa, MD,††† Baohui Zhang, MS, SM,‡‡‡ Robert B. Stagg, PhD,‡‡‡ Lee Ming Boo, PHARM D,‡‡‡ Francis E. Marchlinski, MD§§§§

ABSTRACT

BACKGROUND Catheter ablation is important for treatment of paroxysmal atrial fibrillation (PAF). Limited animal and human studies suggest a correlation between electrode-tissue contact and radiofrequency lesion generation.

OBJECTIVES The study sought to assess the safety and effectiveness of an irrigated, contact force (CF)-sensing catheter in the treatment of drug refractory symptomatic PAF.

METHODS A prospective, multicenter, nonrandomized study was conducted. Enrollment criteria included: ≥ 3 symptomatic episodes of PAF within 6 months of enrollment and failure of ≥ 1 antiarrhythmic drug (Class I to IV). Ablation included pulmonary vein isolation with confirmed entrance block as procedural endpoint.

RESULTS A total of 172 patients were enrolled at 21 sites, where 161 patients had a study catheter inserted and 160 patients underwent radiofrequency application. Procedural-related serious adverse events occurring within 7 days of the procedure included tamponade ($n = 4$), pericarditis ($n = 3$), heart block ($n = 1$, prior to radiofrequency application), and vascular access complications ($n = 4$). By Kaplan-Meier analyses, 12-month freedom from atrial fibrillation/atrial flutter/atrial tachycardia recurrence was 72.5%. The average CF per procedure was 17.9 ± 9.4 g. When the CF employed was between investigator selected working ranges $\geq 80\%$ of the time during therapy, outcomes were 4.25 times more likely to be successful ($p = 0.0054$; 95% confidence interval: 1.53 to 11.79).

CONCLUSIONS The SMART-AF trial demonstrated that this irrigated CF-sensing catheter is safe and effective for the treatment of drug refractory symptomatic PAF, with no unanticipated device-related adverse events. The increased percent of time within investigator-targeted CF ranges correlates with increased freedom from arrhythmia recurrence. Stable CF during radiofrequency application increases the likelihood of 12-month success. (THERMOCOOL® SMARTTOUCH® Catheter for Treatment of Symptomatic Paroxysmal Atrial Fibrillation; NCT01385202) (J Am Coll Cardiol 2014;64:647-56) © 2014 by the American College of Cardiology Foundation. Open access under CC BY-NC-ND license.

Contact force

The relationship between contact force and clinical outcome during radiofrequency catheter ablation of atrial fibrillation in the TOCCATA study

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BACKGROUND The clinical efficacy of catheter ablation of paroxysmal atrial fibrillation (AF) remains limited by difficulty in achieving durable pulmonary vein isolation (PVI). Suboptimal catheter tip-to-tissue contact force (CF) during lesion delivery is believed to reduce clinical efficacy.

OBJECTIVE To determine the relationship between catheter CF during irrigated catheter ablation for AF and clinical recurrences during follow-up.

METHODS Thirty-two patients with paroxysmal AF underwent PVI by using a radiofrequency ablation catheter with a CF sensor integrated at its tip, and they were followed for 12 months. The relationship between the CF and clinical outcomes was determined.

RESULTS Acute PVI was achieved in 100% of the veins. Thirty-five percent (351 of 1017) of the applications were placed with an average CF of <10 g (low CF). All patients treated with an average CF of <10 g (5 of 5 patients) experienced recurrences, whereas 80% of the patients treated with an average CF of >20 g (8 of 10

patients) were free from AF recurrence at 12 months. The analysis of the average force-time integral showed that 75% of the patients treated with <500 gs were recurrent whereas only 31% of the patients treated with >1000 gs had recurrences at 12 months.

CONCLUSIONS The CF during catheter ablation for AF correlates with clinical outcome. Arrhythmia control is best achieved when ablation lesions are placed with an average CF of >20 g, and clinical failure is universally noted with an average CF of <10 g.

KEYWORDS Ablation; Atrial fibrillation; Catheter ablation; Supraventricular tachycardia; Contact force

ABBREVIATIONS AF = atrial fibrillation; CF = contact force; FTI = force-time integral; PV = pulmonary vein; PVI = pulmonary vein isolation; RF = radiofrequency

(Heart Rhythm 2012;9:1789–1795) © 2012 Published by Elsevier Inc. on behalf of Heart Rhythm Society.

Prospective Characterization of Catheter–Tissue Contact Force at Different Anatomic Sites During Antral Pulmonary Vein Isolation

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Background—Catheter–tissue contact is critical for effective lesion creation. We characterized the contact force (CF) at different anatomic sites during antral pulmonary vein (PV) isolation for atrial fibrillation.

Methods and Results—Two experienced operators performed PV isolation in 22 patients facilitated by a novel CF-sensing ablation catheter in a blinded fashion. Average CF and force-time integral data from 1602 lesions were analyzed. The left and right PV antra were divided into the following: carina, superior, inferior, anterior, and posterior quadrants for analysis. There was significant variability in CF within and between different PV quadrants ($P<0.05$). Lowest CF of all left PV sites was at the carina and anterior quadrant, whereas highest CF was at the superior and inferior quadrants ($P<0.05$). Lowest CF of all right PV sites was at the carina, whereas highest CF was at the anterior and inferior quadrants ($P<0.05$). When comparing similar PV quadrants on the left versus right (eg, left carina versus right carina), CF was always higher in the right PVs ($P<0.05$), except at the superior quadrant where CF was similar in the left and right PVs ($P=0.19$). There was no specific pattern of anatomic distribution of excess CF ($P=0.39$).

Conclusions—Monitoring of catheter–tissue CF during PV isolation demonstrates significant variability in CF within and between different PV antral sites. Sites of lowest CF were the carina and anterior left PVs and the carina of the right PVs. This information may be important for improving ablation efficacy and clinical outcomes during PV isolation. (*Circ Arrhythm Electrophysiol.* 2012;5:1124-1129.)

Electrical Reconnection After Pulmonary Vein Isolation Is Contingent on Contact Force During Initial Treatment

Results From the EFFICAS I Study

Petr Neuzil, MD, PhD; Vivek Y. Reddy, MD; Josef Kautzner, MD, PhD; Jan Petru, MD; Dan Wichterle, MD, PhD; Dipen Shah, MD; Hendrik Lambert, PhD; Aude Yulzari, MSc; Erik Wissner, MD; Karl-Heinz Kuck, MD, PhD, FHRS

Background—Pulmonary vein isolation is the most prevalent approach for catheter ablation of paroxysmal atrial fibrillation. Long-term success of the procedure is diminished by arrhythmia recurrences occurring predominantly because of reconnections in previously isolated pulmonary veins. The aim of the EFFICAS I multicenter study was to demonstrate the correlation between contact force (CF) parameters during initial procedure and the incidence of isolation gaps (gap) at 3-month follow-up.

Method and Results—A radiofrequency ablation catheter with integrated CF sensor (TactiCath, Endosense, Geneva, Switzerland) was used to perform pulmonary vein isolation in 46 patients with paroxysmal atrial fibrillation. During the ablation procedure, the operator was blinded to CF information. At follow-up, an interventional diagnostic procedure was performed to assess gap location as correlated to index procedure ablation parameters. At follow-up, 65% (26/40) of patients showed ≥ 1 gaps. Ablations with minimum Force–Time Integral (FTI) < 400 gs showed increased likelihood for reconnection ($P < 0.001$). Reconnection correlated strongly with minimum CF ($P < 0.0001$) and minimum FTI ($P = 0.0007$) at the site of gap. Gap occurrence showed a strong trend with lower average CF and average FTI. CF and FTI are generally higher on the right side, although the left anterior segment presents a unique challenge to achieve stable position with good CF.

Conclusions—Minimum CF and minimum FTI values are strong predictors of gap formation. Optimal CF parameter recommendations are a target CF of 20 g and a minimum FTI of 400 gs for each new lesion. (*Circ Arrhythm Electrophysiol.* 2013;6:327-333.)

Clinical Impact of an Open-Irrigated Radiofrequency Catheter with Direct Force Measurement on Atrial Fibrillation Ablation

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MICHAEL DERNDORFER, M.D., JOSEF AICHINGER, M.D., SIEGMUND WINTER, M.D.,
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Background: *Electrode-tissue contact is crucial for adequate lesion formation in radiofrequency catheter ablation (RFCA).*

Objective: *We assessed the impact of direct catheter force measurement on acute procedural parameters during RFCA of atrial fibrillation (AF).*

Methods: *Fifty consecutive patients (28 male) with paroxysmal AF who underwent their first procedure of circumferential pulmonary vein (PV) isolation (PVI) were assigned to either RFCA using (1) a standard 3.5-mm open-irrigated-tip catheter or (2) a catheter with contact force measurement capabilities. Using the endpoint of PVI with entry and exit block, acute procedural parameters were assessed.*

Results: *Procedural data showed a remarkable decline in ablation time (radiofrequency time needed for PVI) from 50.5 ± 15.9 to 39.0 ± 11.0 minutes ($P = 0.007$) with a reduction in overall procedure duration from 185 ± 46 to 154 ± 39 minutes ($P = 0.022$). In parallel, the total energy delivered could be significantly reduced from $70,926 \pm 19,470$ to $58,511 \pm 14,655$ Ws ($P = 0.019$). The number of acute PV reconnections declined from 36% to 12% ($P = 0.095$).*

Conclusions: *The use of contact force sensing technology is able to significantly reduce ablation and procedure times in PVI. In addition, energy delivery is substantially reduced by avoiding radiofrequency ablation in positions with insufficient surface contact. Procedural efficacy and safety of this new feature have to be evaluated in larger cohorts. (PACE 2012; 35:1312–1318)*

Ablation Effect Indicated by Impedance Fall is Correlated with Contact Force Level During Ablation for Atrial Fibrillation

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PER IVAR HOFF, M.D., PETER SCHUSTER, M.D., PH.D., OLE-JØRGEN OHM, M.D., PH.D.,
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From the Department of Heart Disease, Haukeland University Hospital and Department of Clinical Science,
University of Bergen, Bergen, Norway

Contact Force Correlates with Impedance Fall During Ablation. *Introduction:* Previous studies have validated the use of impedance fall as a measure of the effects of ablation. We investigated whether catheter-to-tissue contact force correlated with impedance fall during atrial fibrillation ablation.

Methods and Results: A total of 394 ablation points from 35 patients who underwent atrial fibrillation ablation were selected and analyzed in terms of the presence of stable catheter contact in non-ablated areas in the left atrium. A fixed power output (30 W) was applied for 60 seconds. Contact force, impedance fall, and force-direction angle were retrieved and exported for off-line analysis. Qualified points were divided into 5 groups according to the level of contact force (1–5 g, 6–10 g, 11–15 g, 16–20 g, and >20 g). An acute impedance fall was observed in the first 10 seconds followed by a plateau in group I and by a further fall in the other groups. Group V showed a rise in impedance during the last 20 seconds of ablation. Levels of impedance fall at each time point were significantly different among all the groups ($P < 0.001$) except between groups III and IV. There was a significant correlation between contact force and maximum impedance fall ($\rho = 0.54$, $P < 0.01$). Lesions with a force-direction angle of 0–30° had significantly lower contact force and maximum impedance fall than those with angles of 30–60° and 60–135° ($P < 0.01$).

Conclusions: Under stable catheter conditions, contact force correlates with impedance fall during 60 seconds of ablation. Contact force exceeding 5 g produces greater impedance fall, which probably indicates adequate lesion formation. A contact force greater than 20 g may lead to late tissue overheating. (*J Cardiovasc Electrophysiol*, Vol. pp. 1-6)

Low contact force and force–time integral predict early recovery and dormant conduction revealed by adenosine after pulmonary vein isolation

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Aim

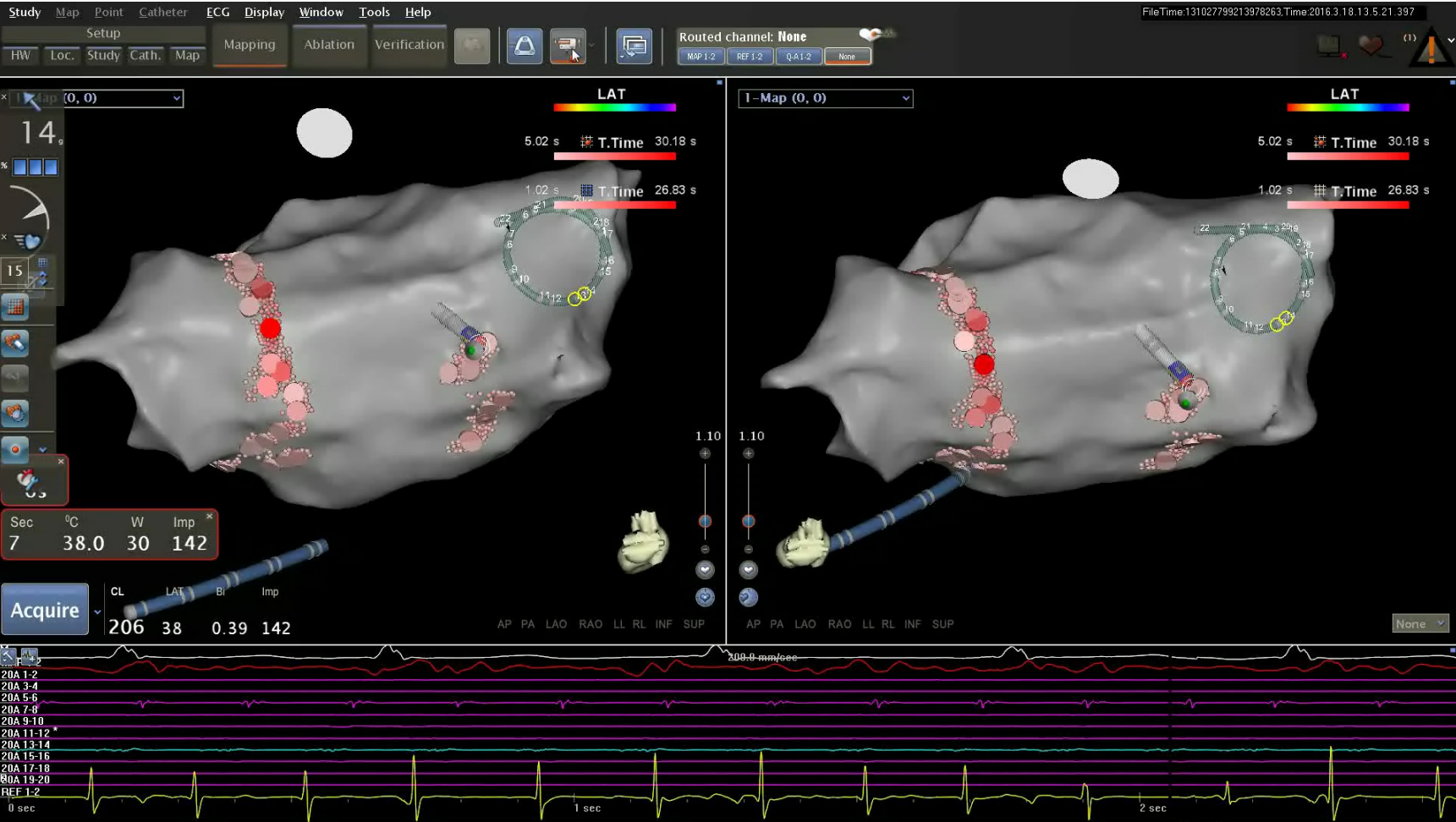
After pulmonary vein isolation (PVI), dormant conduction (DC) is present in at least one vein in a substantial number of patients. The present study seeks to determine whether there is a relationship between poor contact forces (CF) and the presence of DC after PVI.

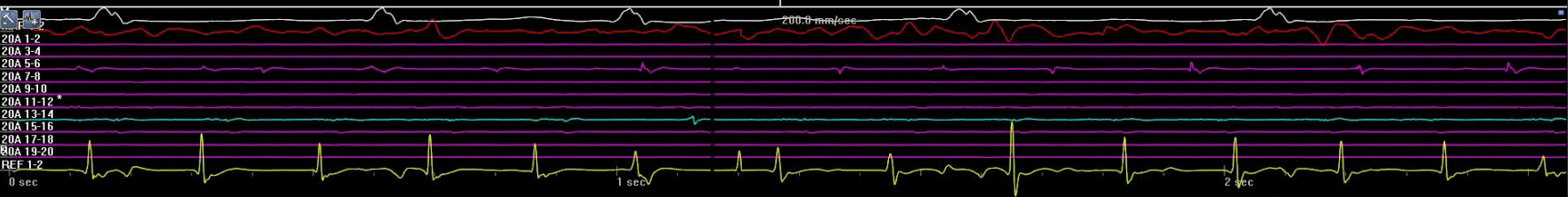
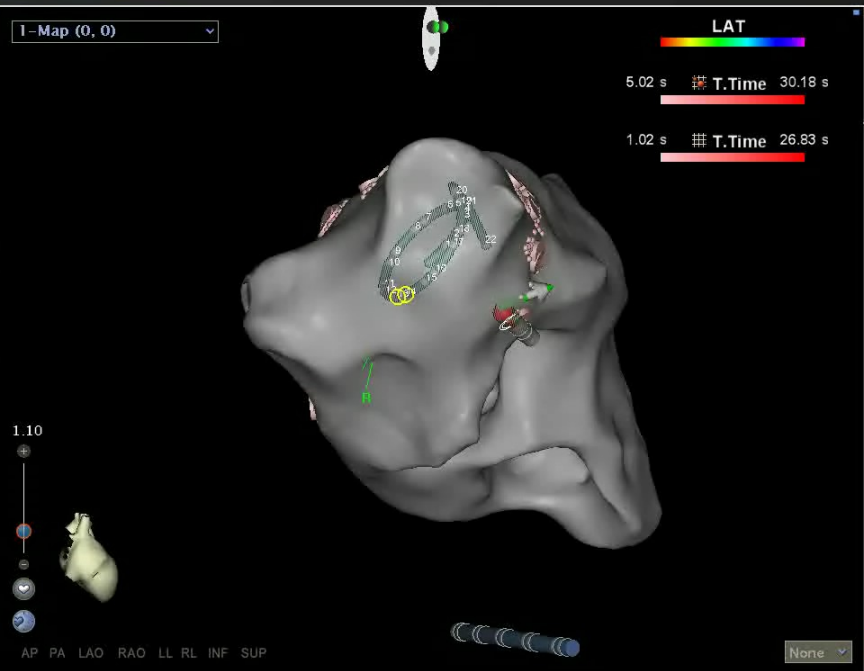
Methods and results

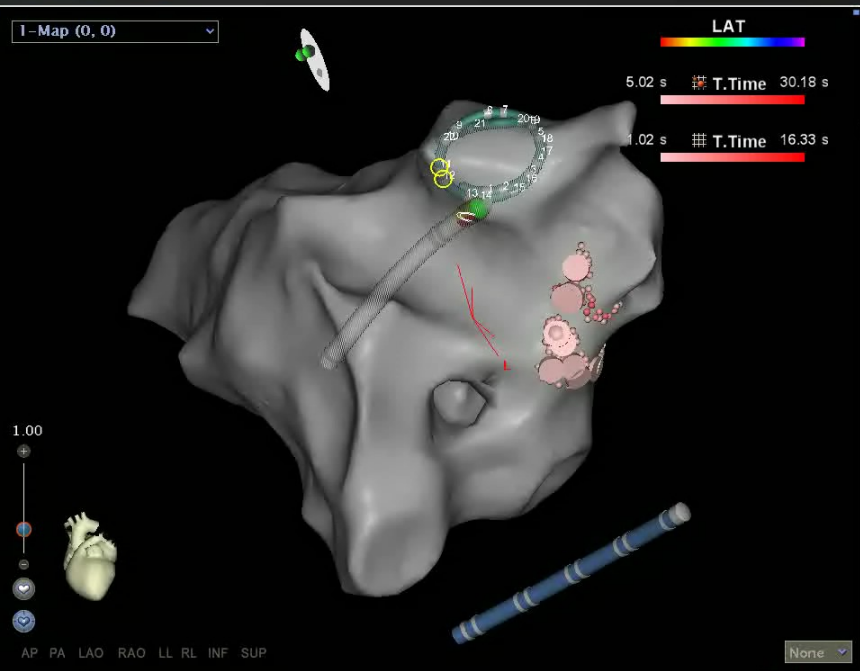
This prospective, operator-blinded, non-randomized dual-centre trial enrolled 34 consecutive patients with paroxysmal atrial fibrillation who were candidates for PVI. Radiofrequency (RF) energy was delivered by using an irrigated-tip force-sensing ablation catheter (TactiCath®, St Jude Medical) at pre-defined target power. The operators were blinded to the CF data at all times. A total of 1476 RF applications were delivered in 743 pre-defined PV segments. For each application, the precise location of the catheter was registered and the following data were extracted from the TactiCath® unit: application duration, minimum contact force, maximum contact force, average contact force (CF), and force–time integral (FTI). Sixty minutes after PVI, spontaneous early recovery (ER) of the left atrium (LA) to PV conduction was evaluated. In the absence of ER, the presence of a DC was evaluated by using intravenous adenosine (ATP). In the 34 patients recruited (23 males; mean age: 62 ± 9 years), all PVs were successfully isolated. At the end of the 60 min waiting period, 22 patients demonstrated at least one spontaneous ER or DC under ATP. The mean CF and FTI per PV segment differed significantly among the different veins but the sites of ER and DC were evenly distributed. However, both the minimum, the first and the mean CF and FTI per PV segment were significantly lower in the PV segments presenting either ER or DC as compared with those without ER or DC (mean CF: 4.9 ± 4.8 vs. 12.2 ± 1.65 g and mean FTI: 297 ± 291 vs. 860 ± 81 g s, $P < 0.001$ for both). Using multivariate analysis, both the mean CF and the FTI per lesion remained significantly associated with the risk of ER or DC. Moreover, a CF < 5 g per PV segment predicted ER+ and DC+ with a sensitivity of 71% and specificity of 82%. In contrast, ER and DC were very unlikely if RF application was performed with a mean CF > 10 g (negative predictive value: 98.7%).

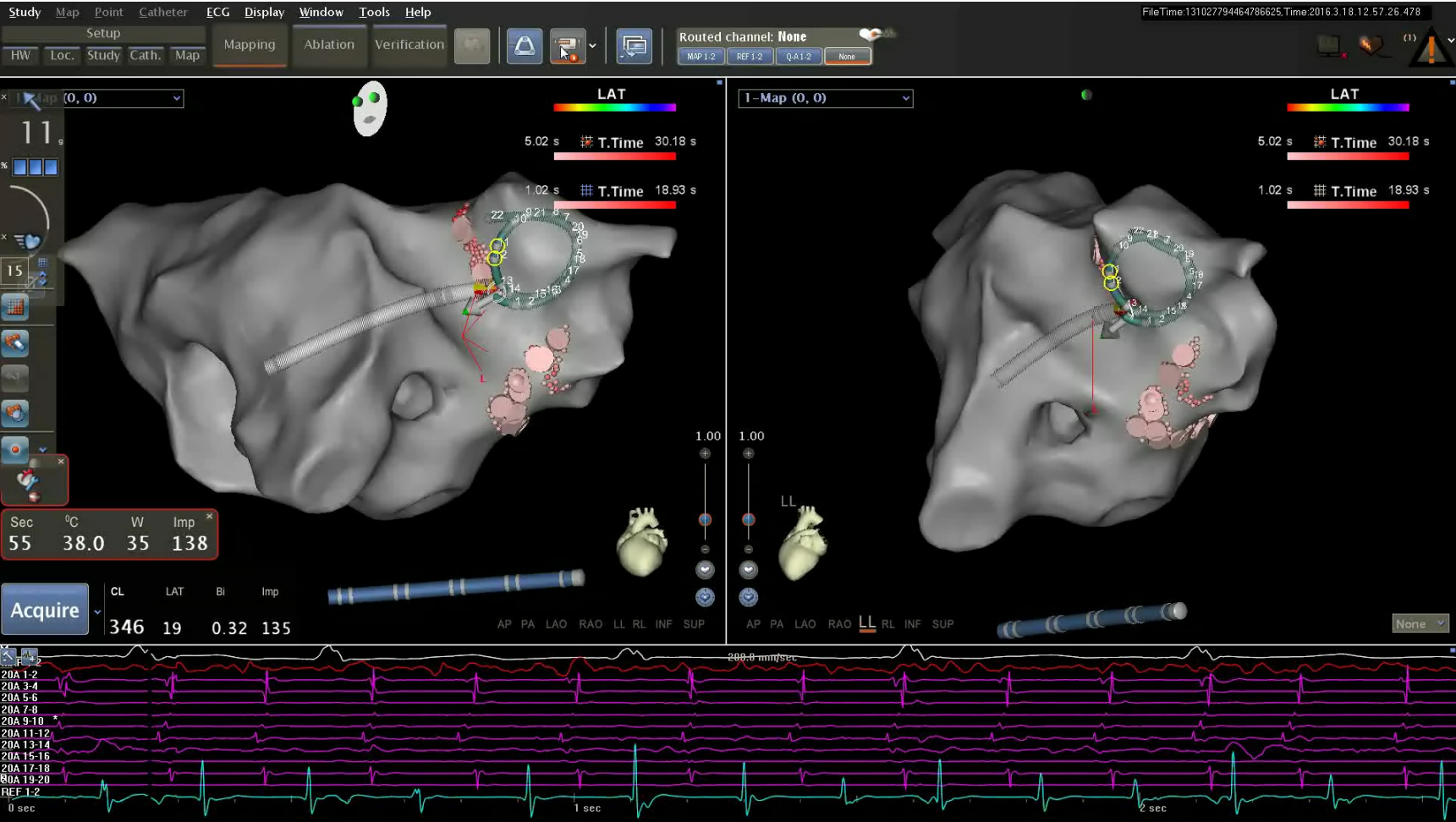
Conclusion

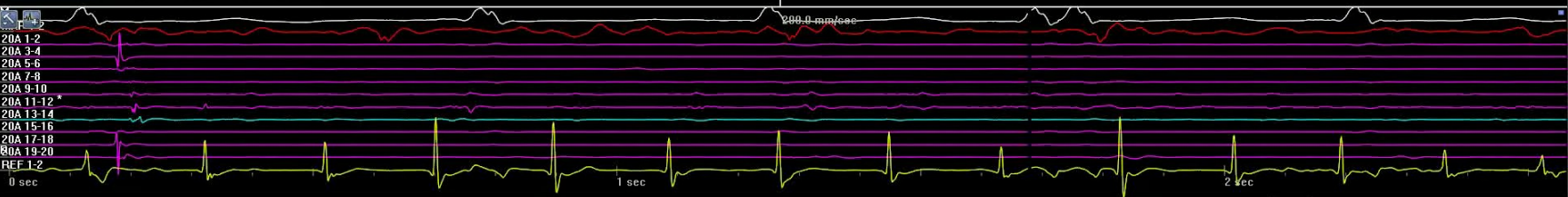
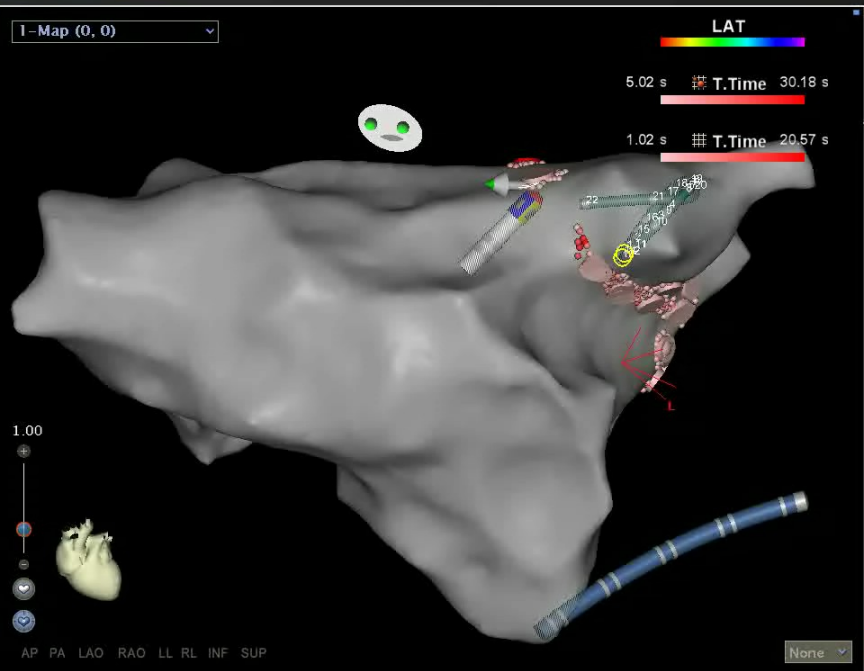
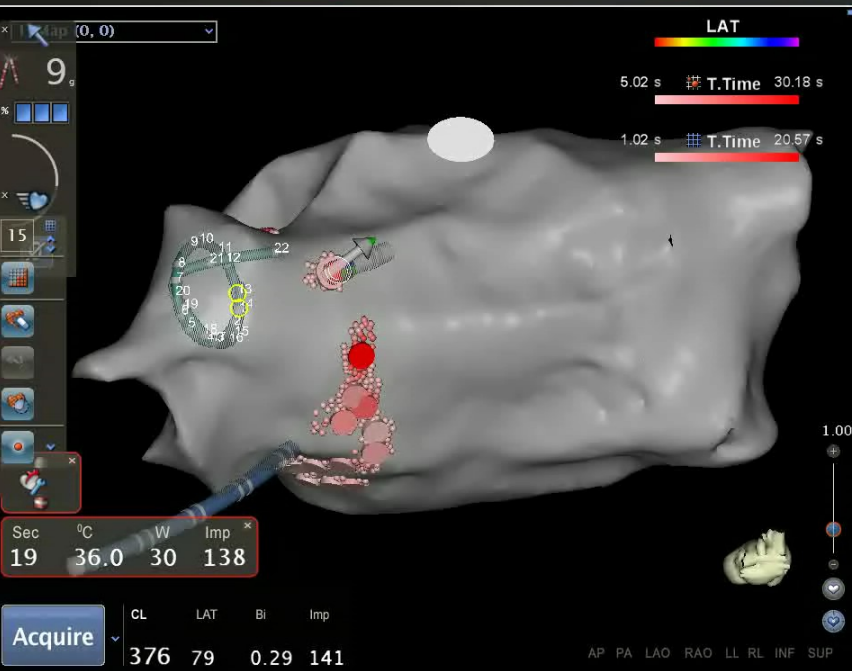
Both a low CF and a low FTI are associated with the ER of the PV and DC after PVI.

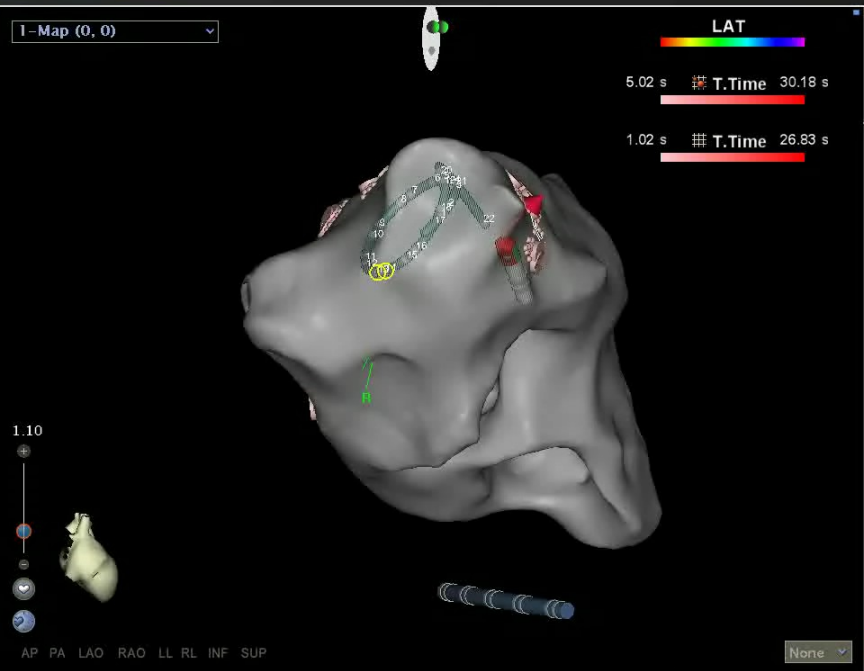
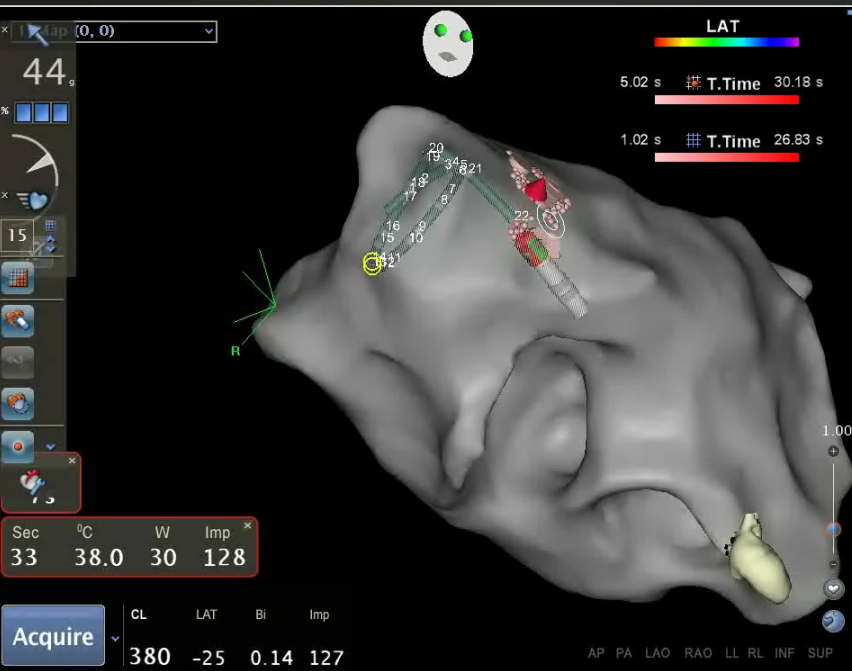












Ablasyon sonrasında bekleme süresi

Early pulmonary vein reconnection as a predictor of left atrial ablation outcomes for paroxysmal atrial fibrillation

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Aim

The objective of the study was to investigate whether early pulmonary vein reconnection (PVR) is a predictor of late arrhythmia recurrence after a single ablation procedure for paroxysmal atrial fibrillation (AF). Further ablation was delivered to patients with acute PVR to test whether this strategy could reduce recurrences.

Methods and results

One hundred and forty-four consecutive patients with symptomatic, drug-refractory paroxysmal AF, undergoing pulmonary vein isolation (PVI), were assigned to the 'PVR30 test' group, where PVR was monitored for 30 min after initial PVI and further ablation was applied if needed, and compared with a control group of 128 patients, where the procedure was terminated after initial successful isolation. During a mean follow-up of 17.7 months, sinus rhythm was maintained in 101 patients in the 'PVR30 test' group (70.1%) vs. 78 in the control group (60.9%) ($P = 0.13$). Among patients with acute PVR and reablation after 30 min, the recurrence rate was 45.3 vs. 39.1% in the control group ($P = 0.47$). Multi-variable logistic regression analysis showed that PVR was independently associated with AF recurrence (adjusted hazard ratio 4.7, 95% confidence interval 1.8–12.2), along with left atrial diameter (adjusted hazard ratio 1.3/mm of higher diameter, 95% confidence interval 1.2–1.4).

Conclusion

In patients with paroxysmal AF undergoing a single ablation procedure, PVR 30 min after the initial PVI is associated with late AF recurrence. However, the strategy of 30 min waiting and reablating does not appear to be superior to immediate termination of the procedure after initial PVI.

Özet

- Temel strateji her noktada efektif lezyon oluşturmak
- Contact force, impedans düşüşü ve egm küçülmesi ve takiben giriş çıkış bloklarının gösterilmesi önemli
- Sonrasında dormant iletiyi göstermek amaçlı adenozin uygulanması
- 30 dk bekleme süresi
- Yüksek doz izoproterenol ile ven dışı odak aranması