



10. Atrial Fibrilasyon Zirvesi 2021

11-13 Kasım 2021 • Calista Kongre Merkezi Antalya

TİPİK ATRİYAL FLUTTER ABLASYONU

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Başkent Üniversitesi Tıp Fakültesi

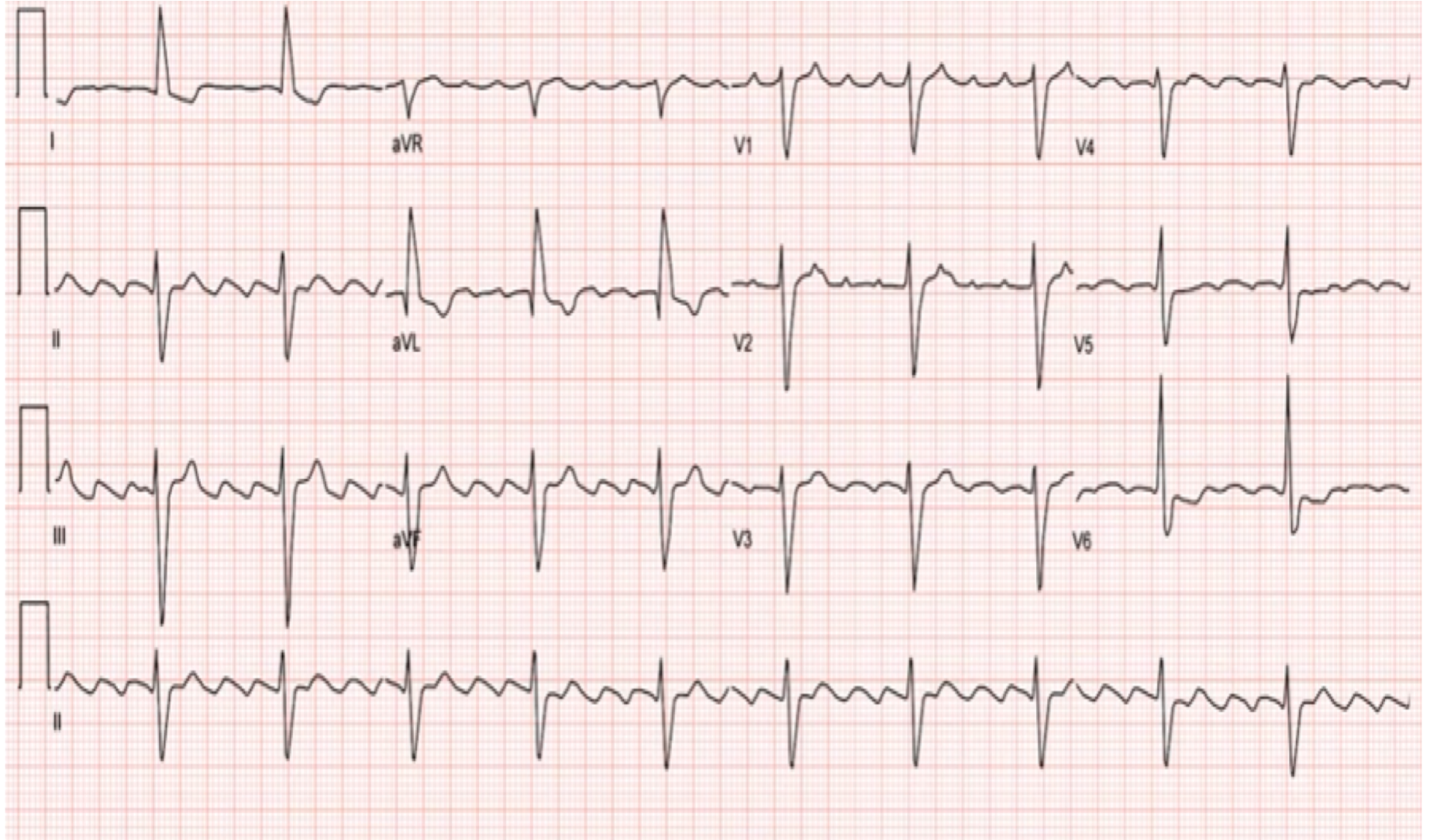
Kardiyoloji Ana Bilim Dalı

İstanbul S.U.A.M.

Vaka Örnekleri

- 66 y E, VKİ: 30 kg/m²
- EHRA 2a çarpıntı yakınmaları, son 1 haftadır devamlı çarpıntı
- Angina, Senkop, PND yok
- 15 yıldır HT, 10 yıldır DM T2, KOAH, 8 yıl önce KABCx3, 5 yıl önce HSS nedeniyle çift odacıklı KKP
- Sigarayı 10 yıldır bırakmış. 44 pak/yıl sigara

Başvuru EKG'si



Flutter? «Tipik» Atrial Flutter? Atriyal Taşikardi?

- En 1 derivasyonda daimi elektriksel aktivite
- Makroreentran disritmi terminolojisi
- Atriyal Taşikardi/Flutter/Mekanizma ayrımı için atrial hız ($>240/\text{dk}$), izoelektrik hattın seçilebilmesi, P'nin dar/geniş olması ($<185 \text{ ms}$), düzenlilik ($\Delta \text{CL } \%15$ 'in altında) vb. kriterler iyi çalışmamış
- Geçirilmiş cerrahiler, ileri dilatasyonlar, geniş ablasyonlar, kullanılan AA ilaçlar EKG kriterlerini boşa çıkarabilir
- Güncel Uzlaşısı: Mekanistik Tasnif! Sağ Atrial Makroreentran taşikardiler CTI bağımlı/bağımlı olmayan olarak kabaca tasnif edilmiş (ESC-NASPE 2001 Uzlaşısı Raporu (*J Cardiovasc Electrophysiol.* 2001;12:852–866))

Trial Flutter CTI block: balloon

TABLE 1

Focal atrial tachycardia

Macroreentrant

Macroreentrant Atrial Tachycardia/Atrial Flutter

- Constant regular P-wave/flutter wave morphology
- Rate typically >250 bpm*
- Mechanism: Macroreentry



Focal Atrial Tachycardia

- Discrete P waves with isoelectric segment
- Rate typically 100–250 bpm*
- Mechanisms: Microreentry or automaticity

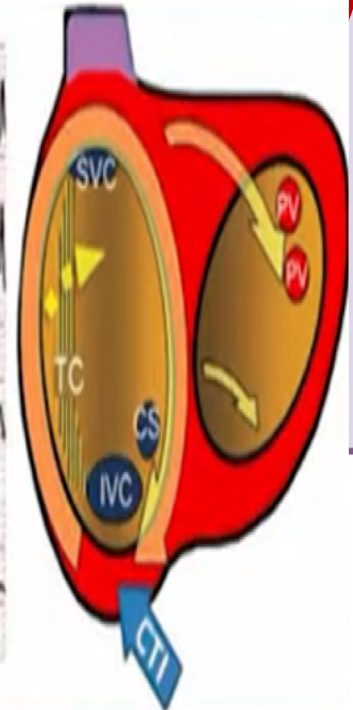


al atrial flutter

atrial cycle length 220 ms (270/min)

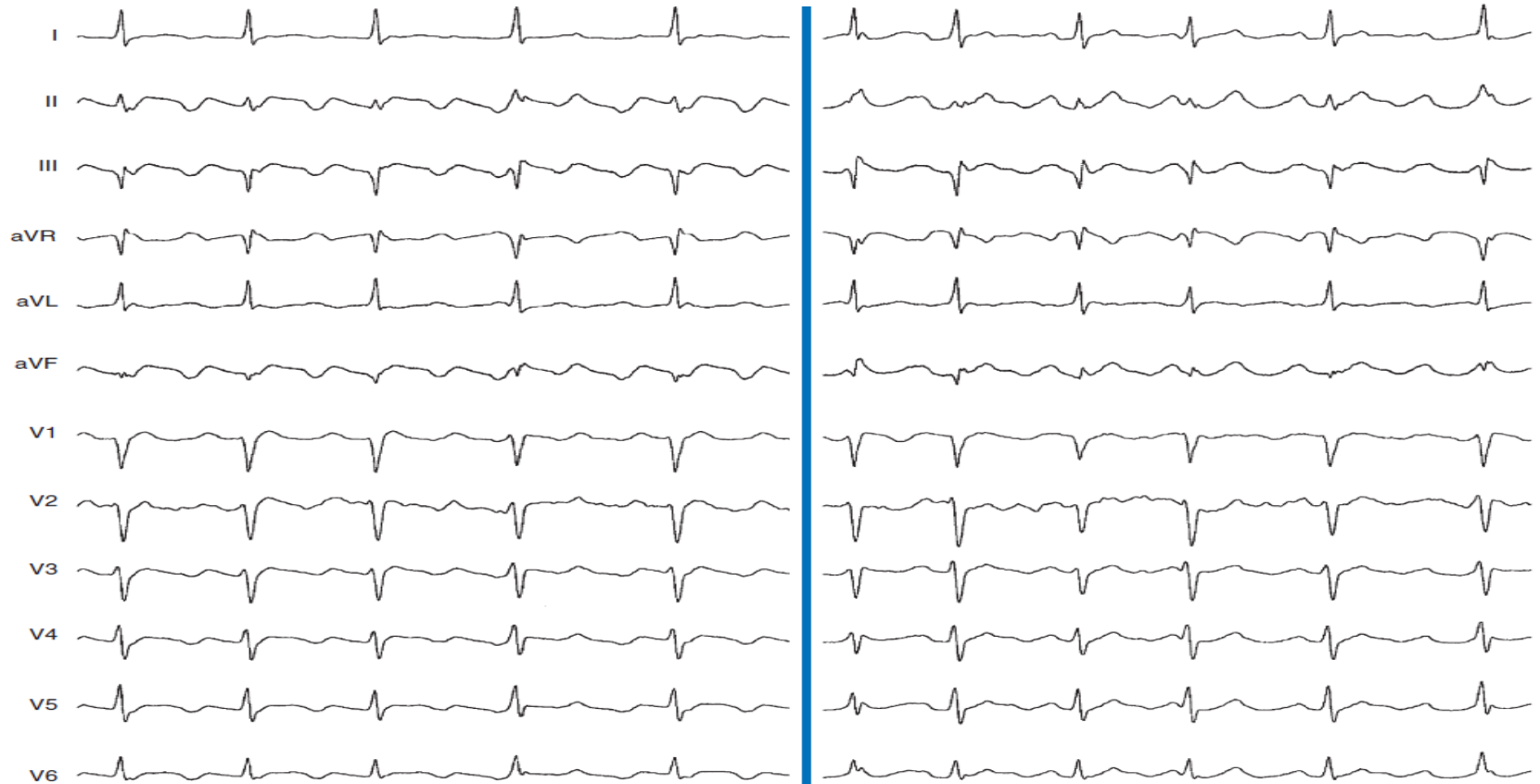


atrial cycle length 240 ms (250/min)



Counterclockwise AFL

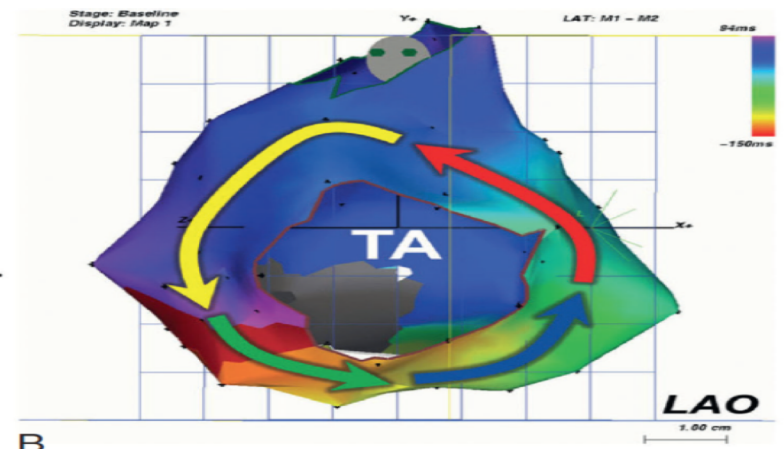
Clockwise AFL



- Isthmus / CS ostium
- Interatrial septum
- Upper part of RA free wall
- Lower part of RA free wall



A



B

- AF'den sonraki en sık erişkin SVT ancak gerçek prevalans muhtemelen daha fazla.
- Özelleşmiş merkezlerde AVNRT ve AF'den sonra en sık 3. tedavi edilen disritmi
- AF birlikteliği serilerde %30 ila %70!
- İnsidans E: 125 K: 59/100.000 kişi yılı ve artıyor...

Ne yapalım?

Recommendations	Class ^a	Level ^b
Anticoagulation, as in AF, is recommended for patients with atrial flutter and concomitant AF. ⁴	I	B
Patients with atrial flutter without AF should be considered for anticoagulation, but the threshold for initiation has not been established. ^{241–247}	IIa	C

Chronic therapy

Catheter ablation should be considered after the first episode of symptomatic typical atrial flutter. ^{262,263}	IIa
Catheter ablation is recommended for symptomatic, recurrent episodes of CTI-dependent flutter. ^{262–264}	I
Catheter ablation in experienced centres is recommended for symptomatic, recurrent episodes of non-CTI-dependent flutter. ^{224,265–269}	I
Catheter ablation is recommended in patients with persistent atrial flutter or in the presence of depressed LV systolic function due to TCM. ^{233,234}	I
Beta-blockers or non-dihydropyridine calcium channel blockers (verapamil or diltiazem, in the absence HFrEF) should be considered if ablation is not desirable or feasible. ^{237,270}	IIa
Amiodarone may be considered to maintain sinus rhythm if the above measures fail. ²⁶³	IIb
AV nodal ablation with subsequent pacing ('ablate and pace'), either biventricular or His-bundle pacing, should be considered if all the above fail and the patient has symptomatic persistent macro-re-entrant atrial arrhythmias with fast ventricular rates.	IIa

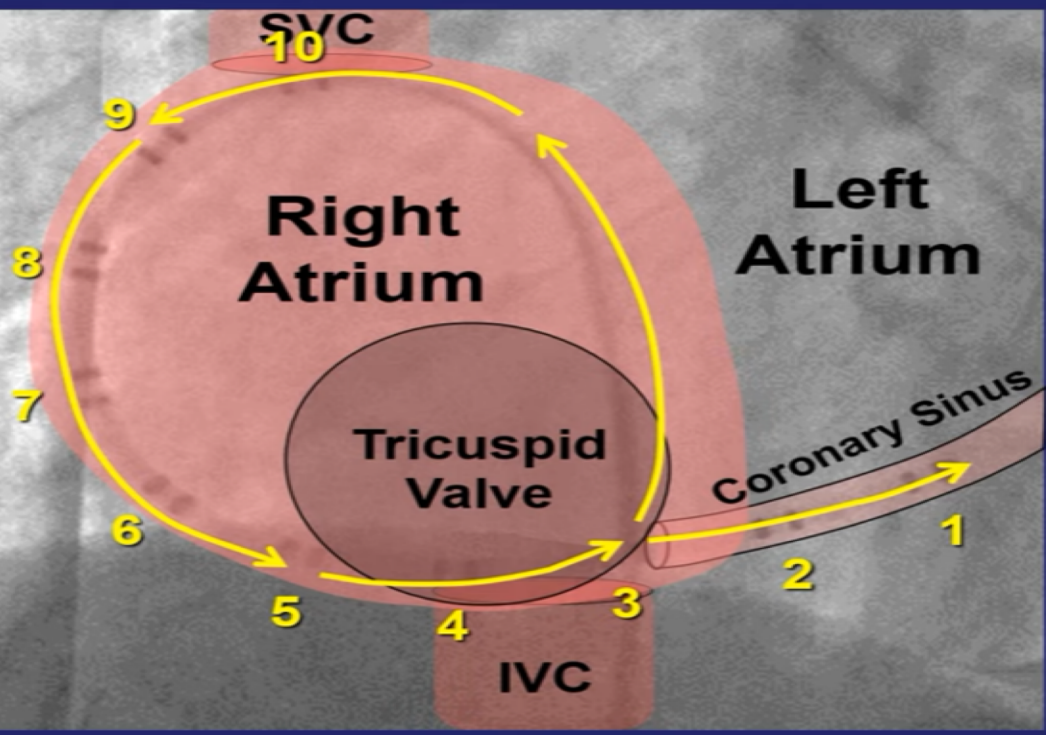
- 1 yıl önce MPS negatif.
- Hemogram, TSH ve kan biyokimyası normal
- LVEF %60, Biatrial dilatasyon, LAVI: 44 ml/m²
- Bisoprolol 2x10 mg, Perindopril 10 mg, ASA 100 mg
- TEE yapıldı ve LAA temiz. YOAK planlandı (CHADSVASC: 4)
- Olası CCW sağ atrial flutter için ablasyon planlandı

EFÇ/Ablasyon Planı

- Opiad+midazolam, derin sedasyon...
- YOAK'lara devam, Varfarin alıyorsa INR: 2-2,5 arası
- EKO iyi incelenmeli. RA ve LA çaplar
- TEE zamanlaması? Genelde işlemden kısa süre önce...
- Cerrahi hikayesi varsa ameliyat notları, dikişler

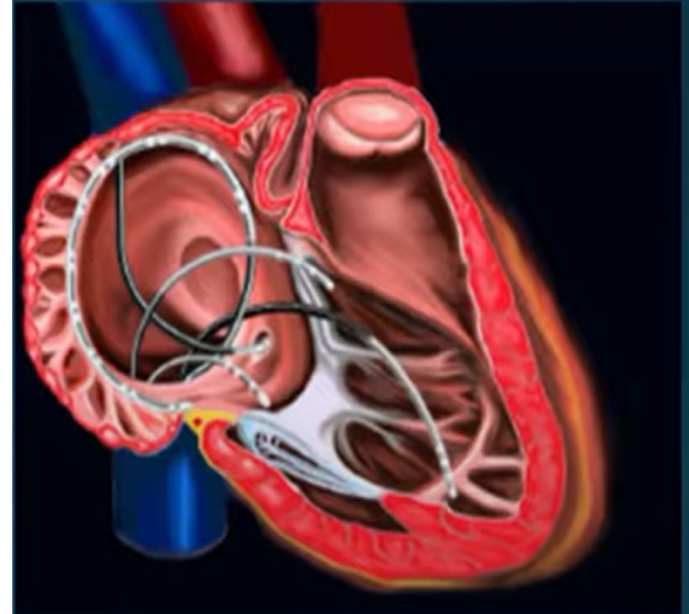
EFÇ/Ablasyon Planı

- 3B haritalama floroskopi süresini anlamlı azaltıyor ancak maliyet? Etkinlik blok gösterildiğinde benzer. Ancak kompleks anatomilerde ve cerrahi hikayesinde ön planda.
- Öncelikle tanıdan emin olunacak ve mekanizma tespit edilecek. 3B imkanı varsa önce elektriksel/entrainment haritalama mı yoksa aktivasyon haritası mı?
- En az 2 noktadan PPI-TCL < 20 ms, gizli entrainment
- Sinüste ise CS-os'tan burst pacing??
- CS-proks pacing ile ablasyon olası



Tanısal kateterler:

- Duo-dekapolar (Halo) kateter konvansiyonel için optimal
- Halo septal-TK anulusta + CS
- 2 dekapolar (CS) kateteri/Halo ant CT/TK anuler bölgede ve CS'de. (İsthmal bölgeyi kapsamadığımızı bilerek)
- Sadece CS ve ablasyon
- 3B multipolar kateterler/yüksek çözünürlüklü kateterler
- His kateteri?
- RV kateter?
- 2 veya 3 venöz ponksiyon, mutlaka uzun kılıf

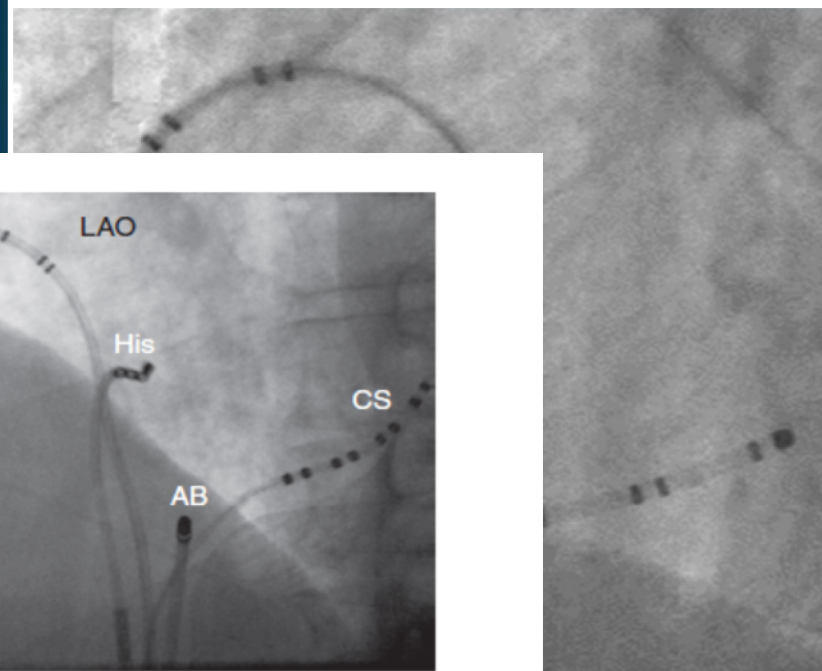
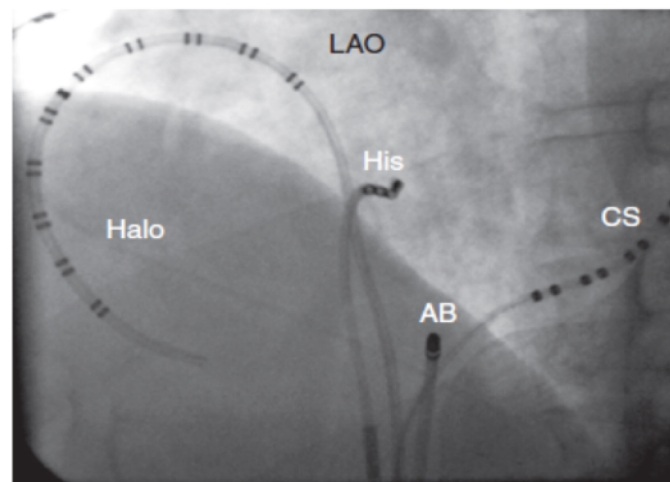
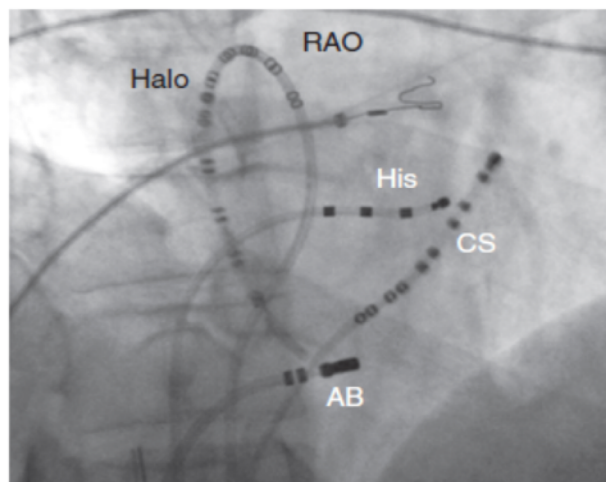


RAO 35°

LAO 45°

DuoDec

DuoDec



RAO

INCORRECT POSITION

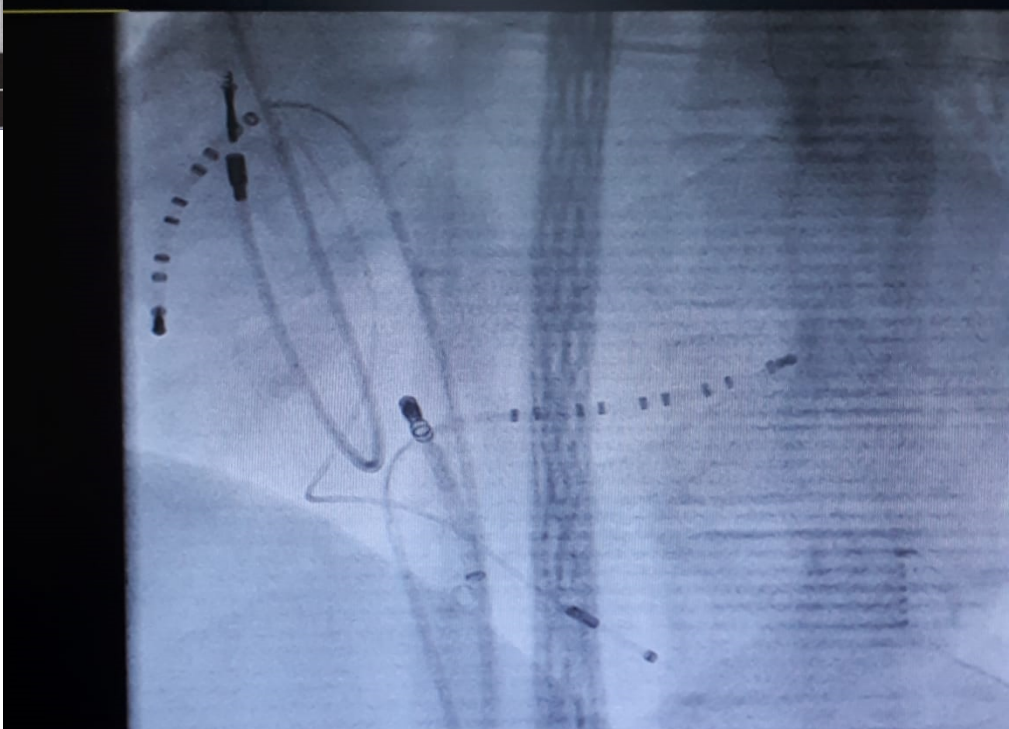
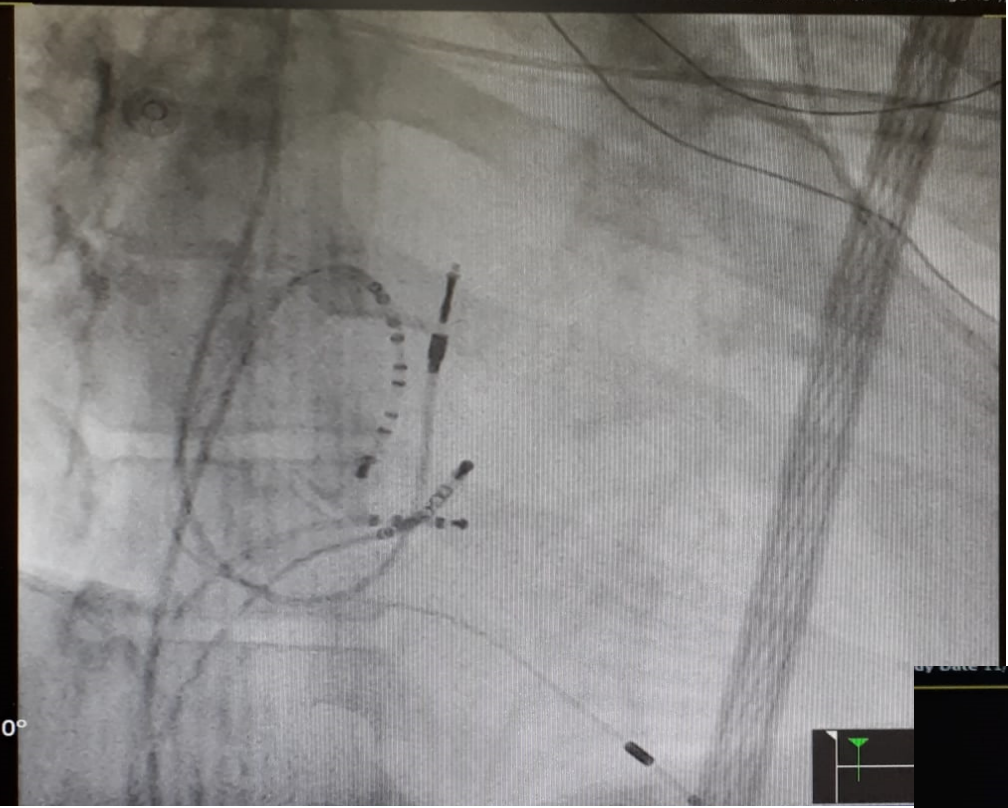
RAO

LAO

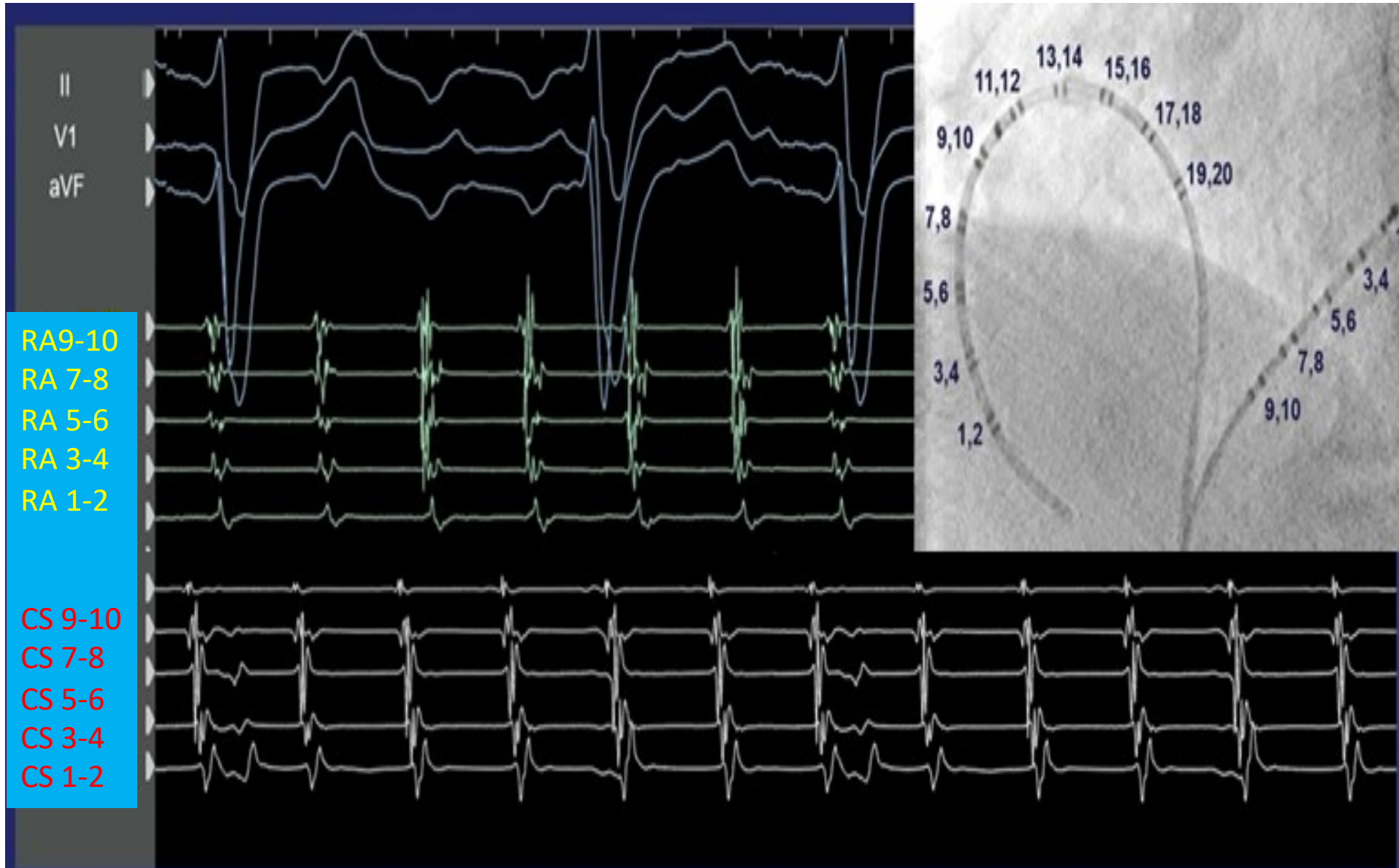
CORRECT POSITION

RAO

LAO



İLK TRASE



V1

II

RA 7-8

RA 5-6

RA 3-4

RA 1-2

CS 5-6

CS 3-4

CS 1-2

240 ms

63 ms

TCL: 258 ms

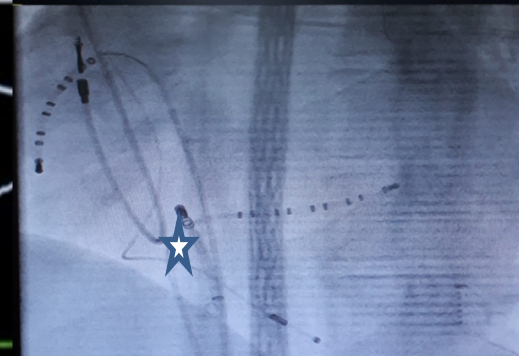
55 ms

Abl D

265 ms

240 ms

CTI PPI-TCL: 7
ms



V1

S

II

RA 7-8

CL: 240 ms

TCL: 258 ms

RA 5-6

PCL: 240 ms

PPI: 273 ms

PPI-TCL: 15 ms

RA 3-4

RA 1-2

CS 5-6

CS 3-4

CS 1-2



V1

S

II

RA 7-8

RA 5-6

RA 3-4

RA 1-2

CS 5-6

CS 3-4

CS 1-2

PCL: 240 ms

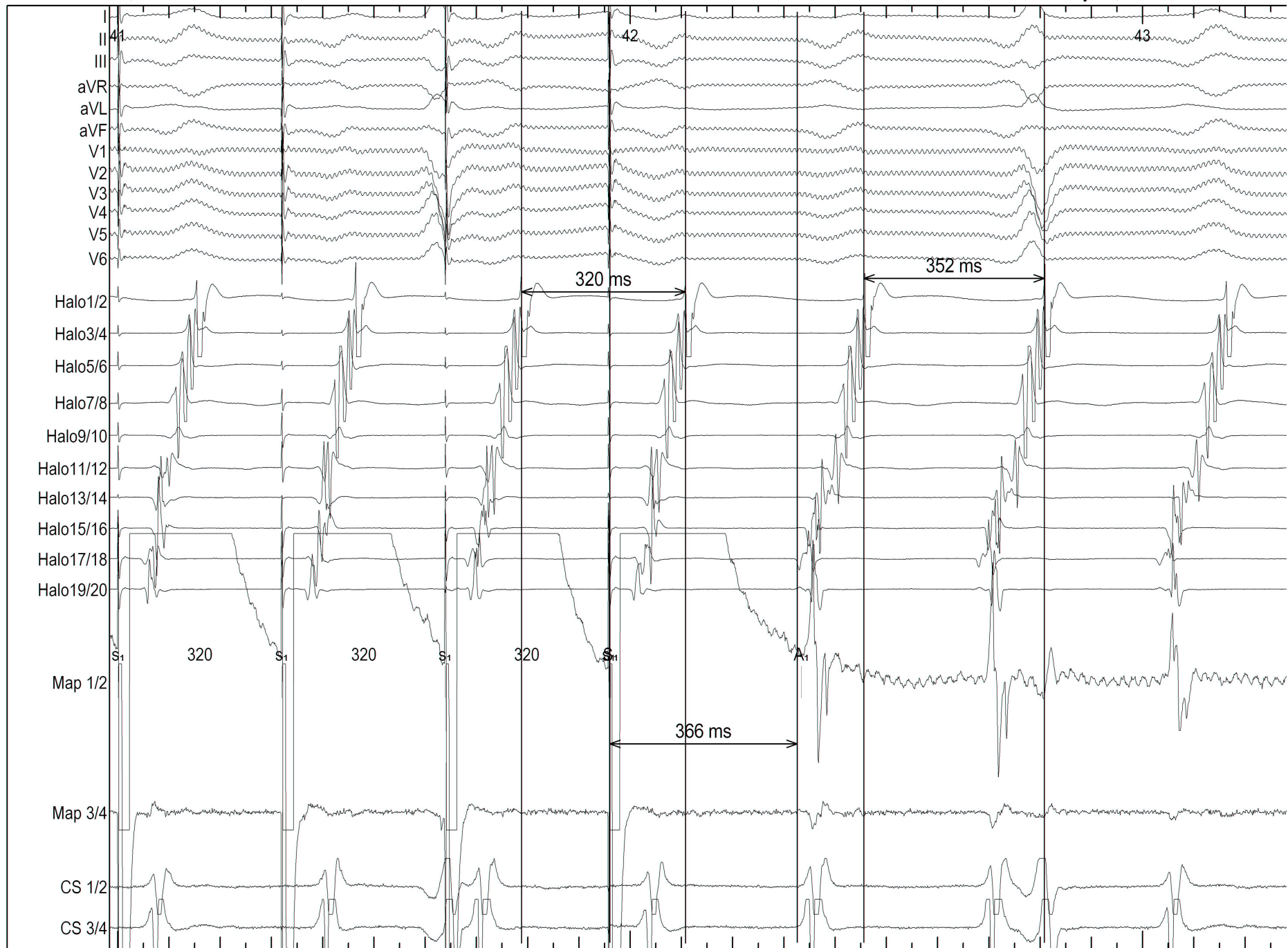
TCL: 258 ms

PPI: 340 ms

PPI-TCL: 82 ms



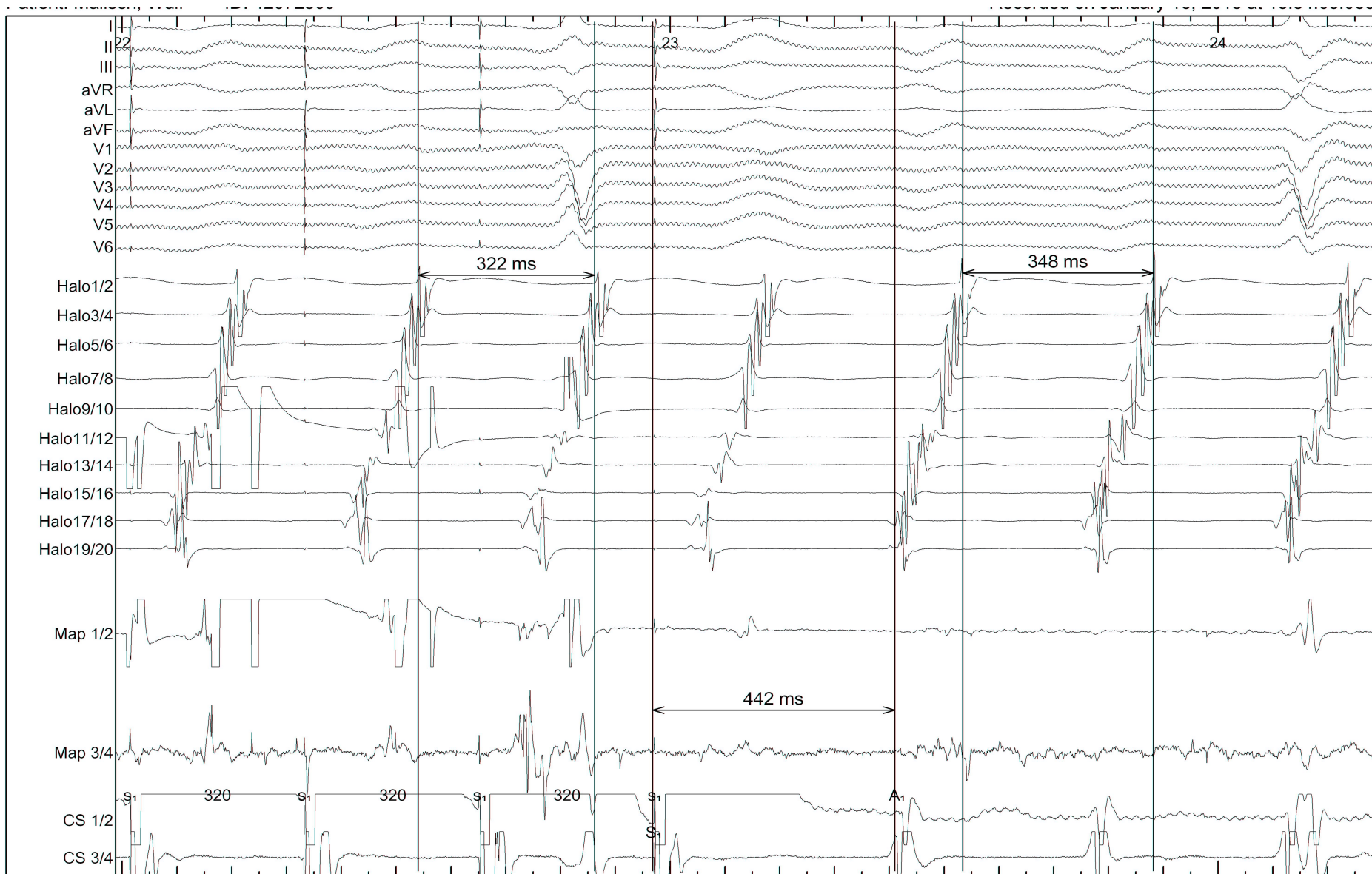


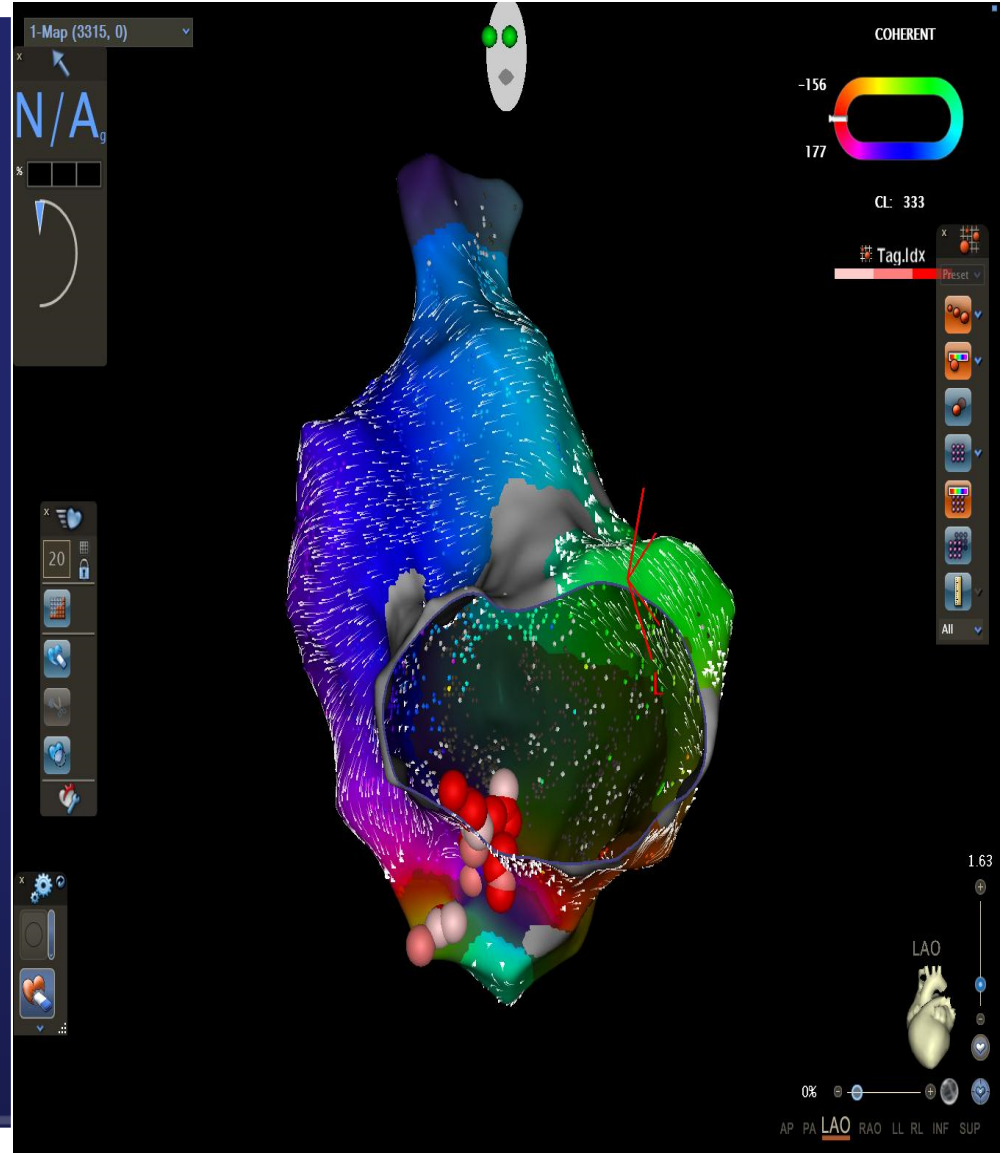
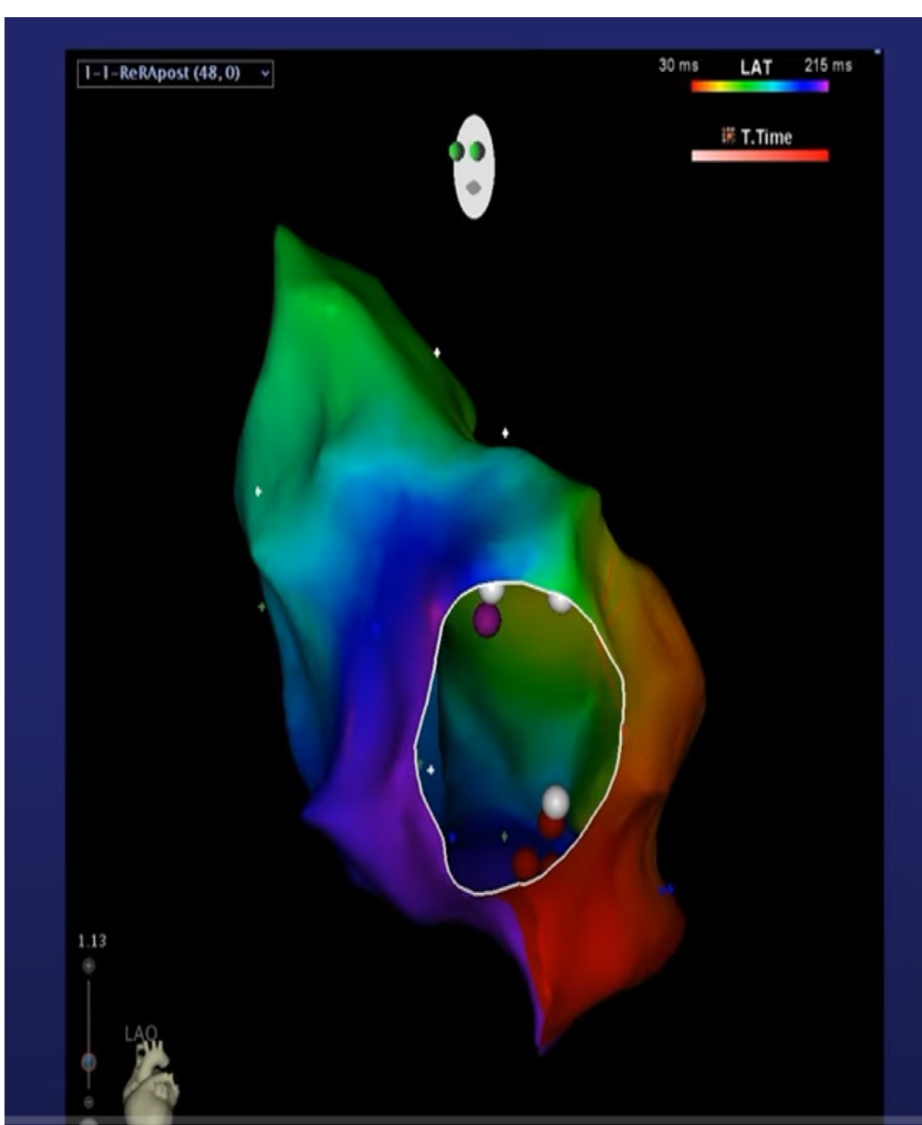


HALO 1-2 TK INF LATERAL

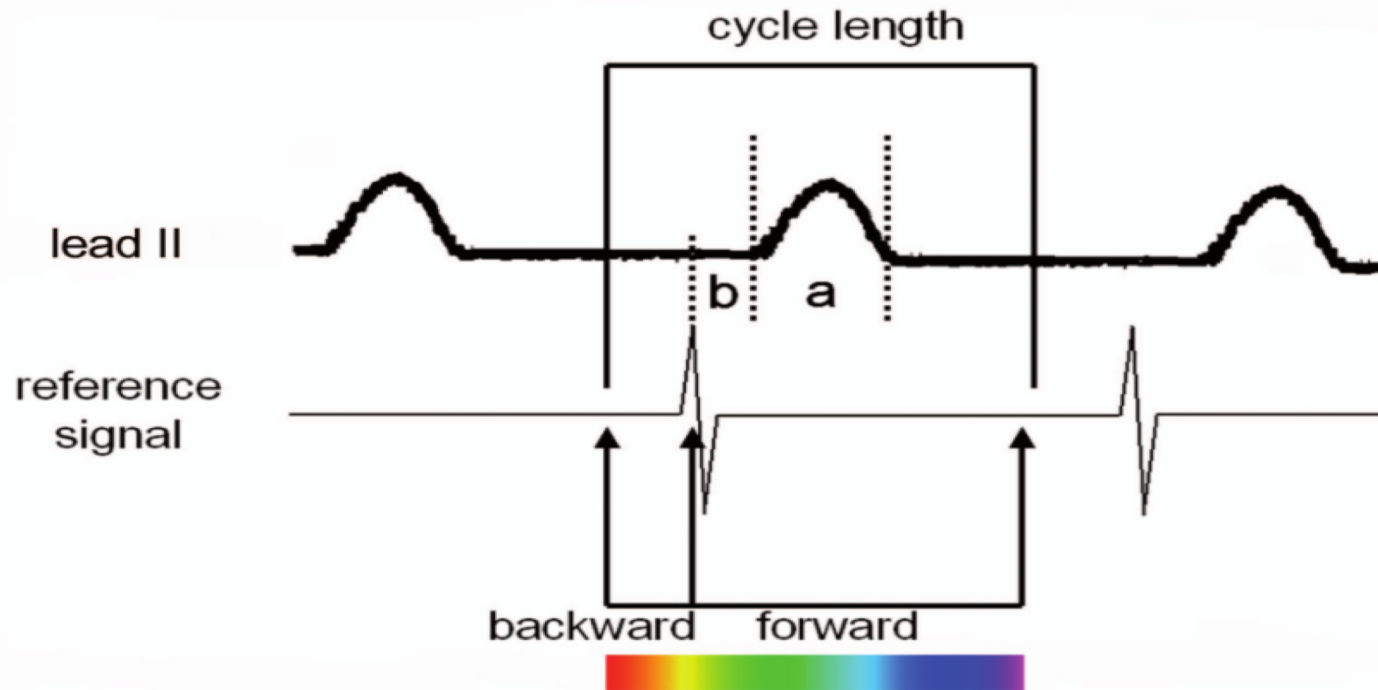


CS DISTAL





De Ponti

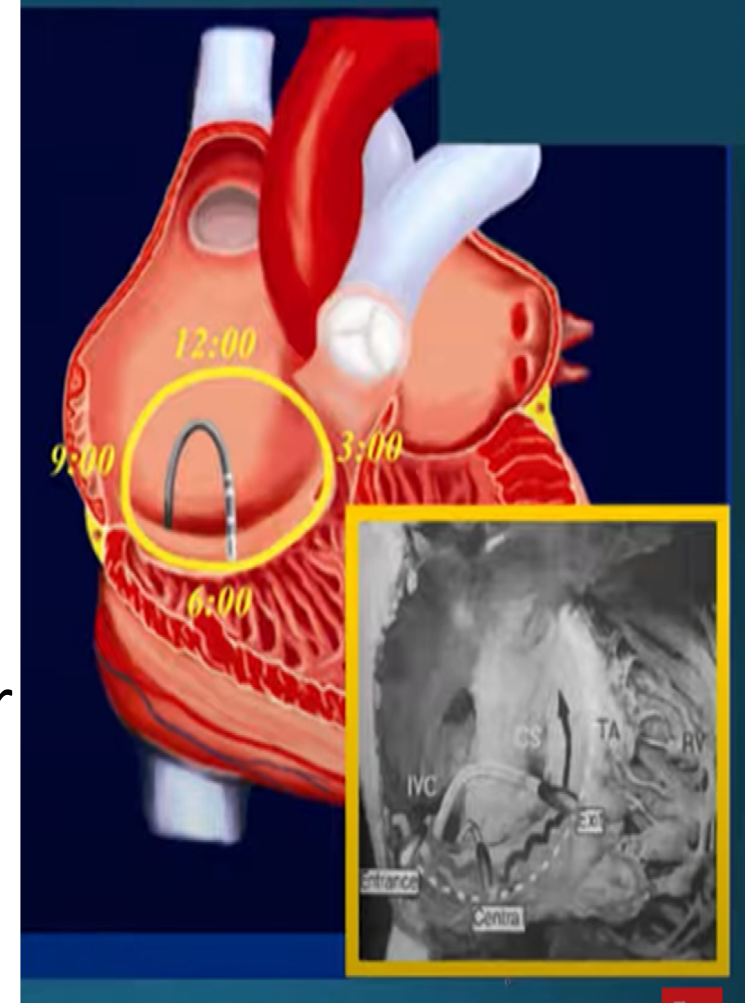


$$\text{Backward interval} = \frac{\text{TCL} - \text{DUR}^{\text{PW}}}{2} + \text{Interval}^{\text{PWonset-ref}}$$

$$\text{Forward interval} = (\text{TCL} - \text{Backward interval}) \cdot 0.90$$

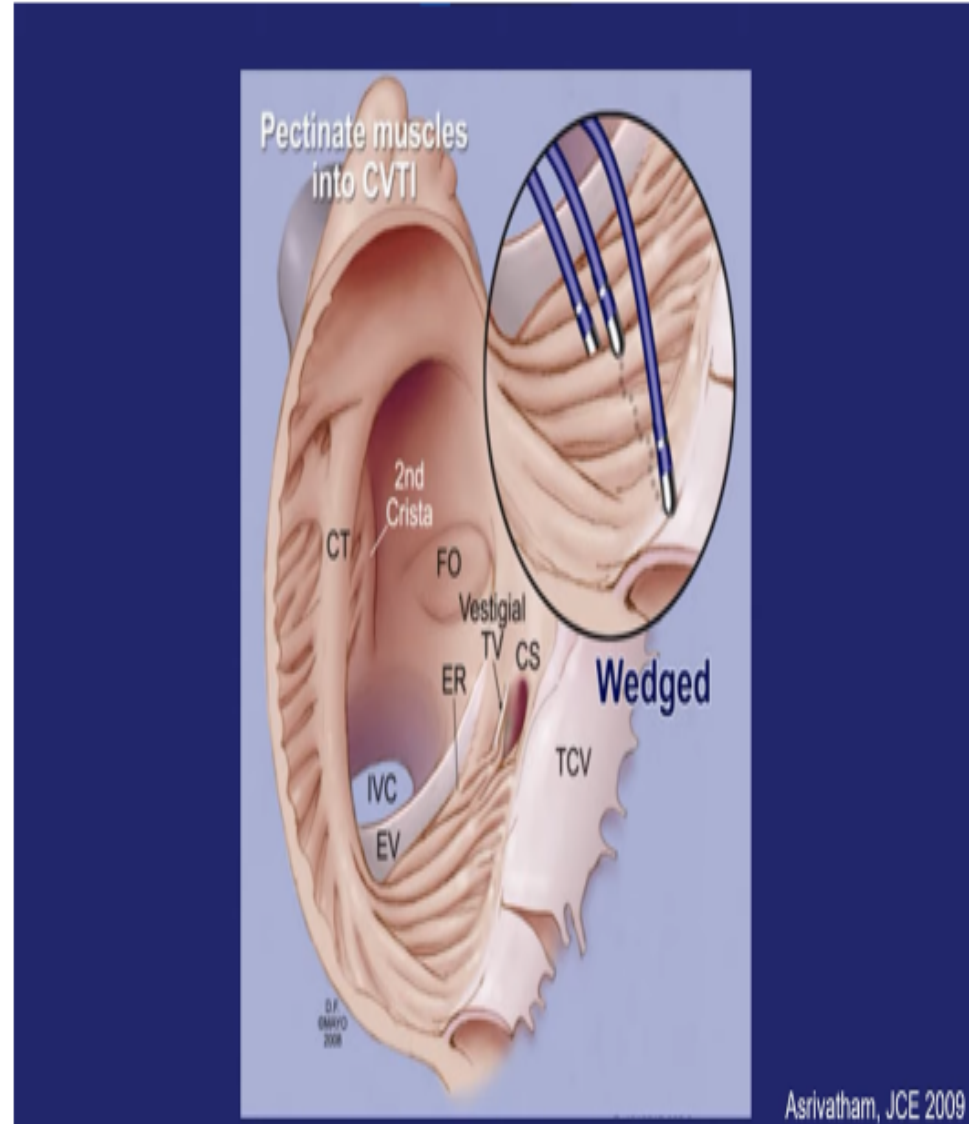
Ablasyon Kateterleri ve İşlem

- 8 mm, 80-100 W, 50-70 C (sinyal çözünürlüğü kötü ancak düz septumda işlem daha çabuk)
- 4 mm irigasyonlu kateter, 35-50 W, 40-50 C (komplike anatomide irigasyon güvenliği artırıyor)
- Merkezi isthmusu hedefle! (Saat 6-7 yönü, teorik en ince kısım). Saat 8'de yol uzun, pektinat kaslar fazla. Saat 5-4 güvenlik ve olası poş sorunu! AV nodal arter/AV nod hasarı?



Ablasyon işlemi

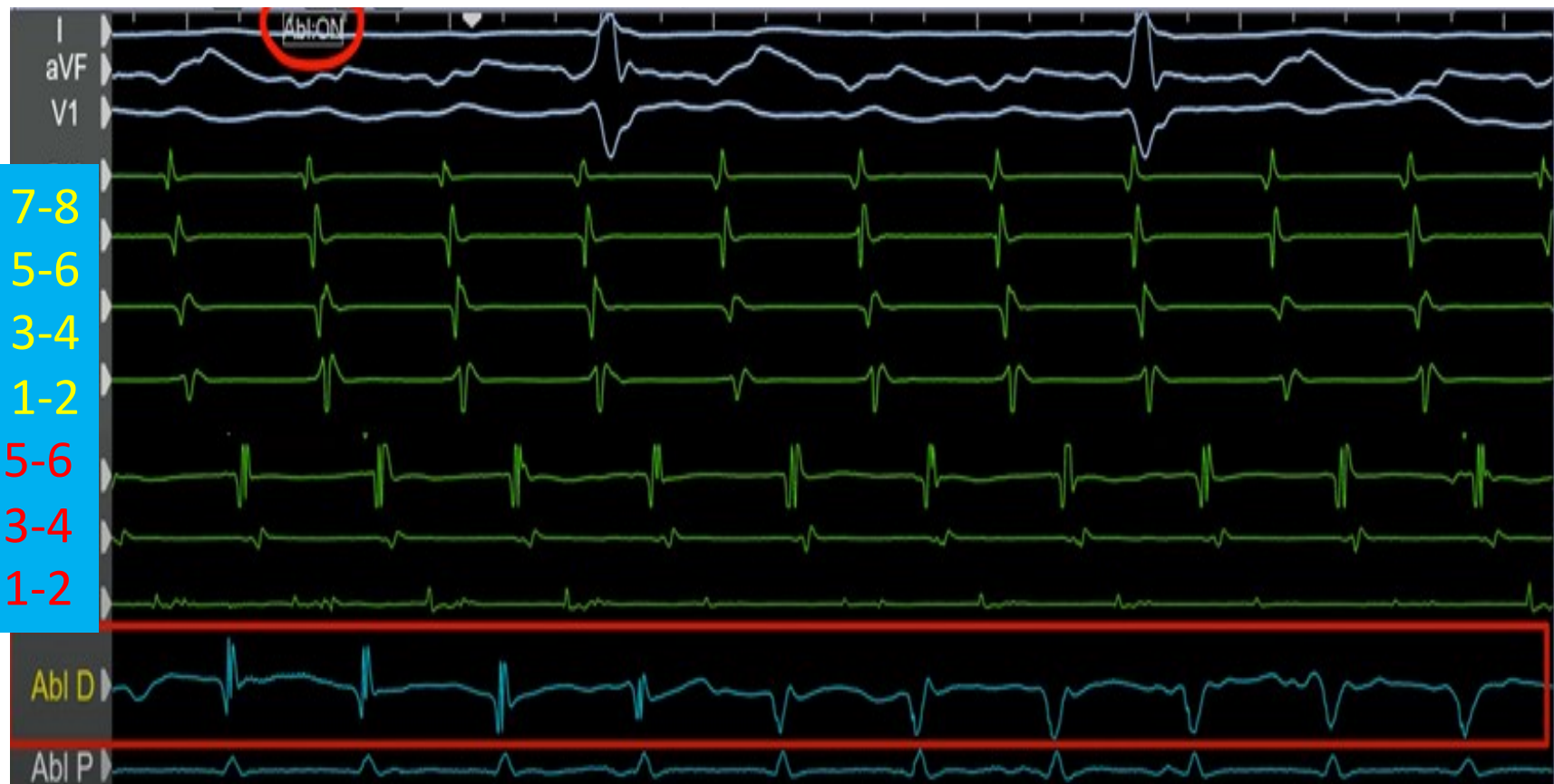
- TKA A:V EGM 1:4 gibi başla, IVC'ye atriyal EGM'ler kaybolana kadar
- %50-90 sinyal erimesi
- %10 empedans düşüşü
- Devamlı çekme (8mm) veya nokta nokta (irigasyonlu)
- Temas bilgili kateter anlamlı olarak prosedür etkinliğini artırıyor (empedans ve EGM takibine göre)



Ablasyon



RA 7-8
RA 5-6
RA 3-4
RA 1-2
CS 5-6
CS 3-4
CS 1-2



aVF

RA 7-8

RA 5-6

RA 3-4

RA 1-2

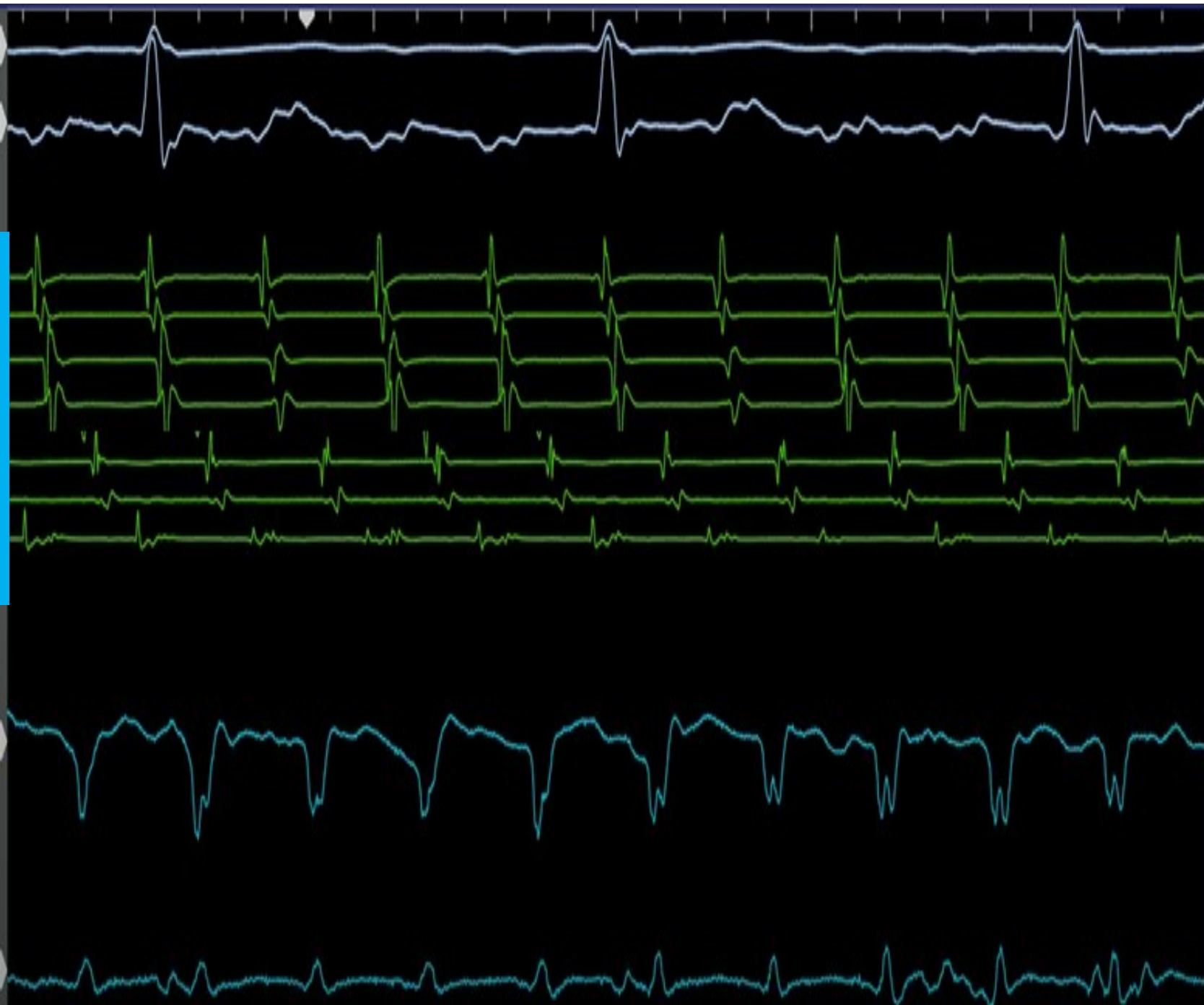
CS 5-6

CS 3-4

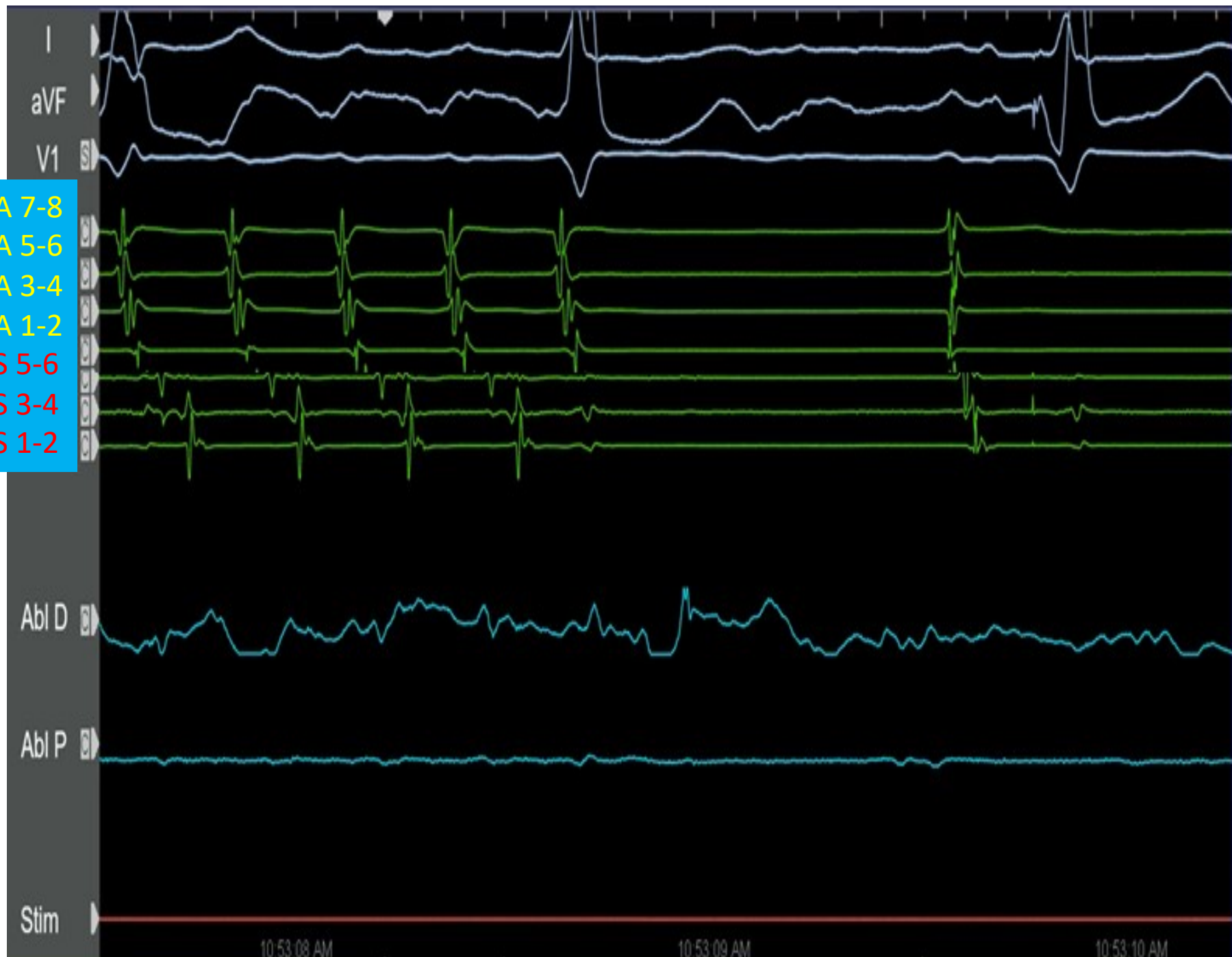
CS 1-2

Abi D

Abi P



RA 7-8
RA 5-6
RA 3-4
RA 1-2
CS 5-6
CS 3-4
CS 1-2



Sonlanım noktalarının kontrolü

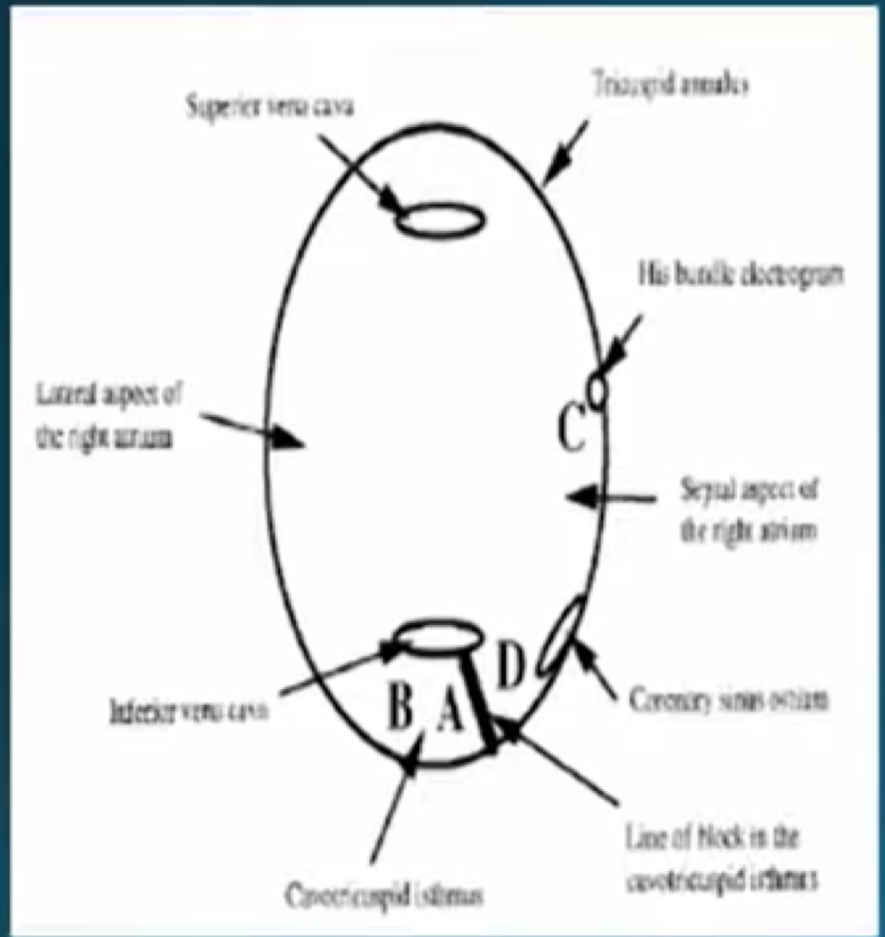
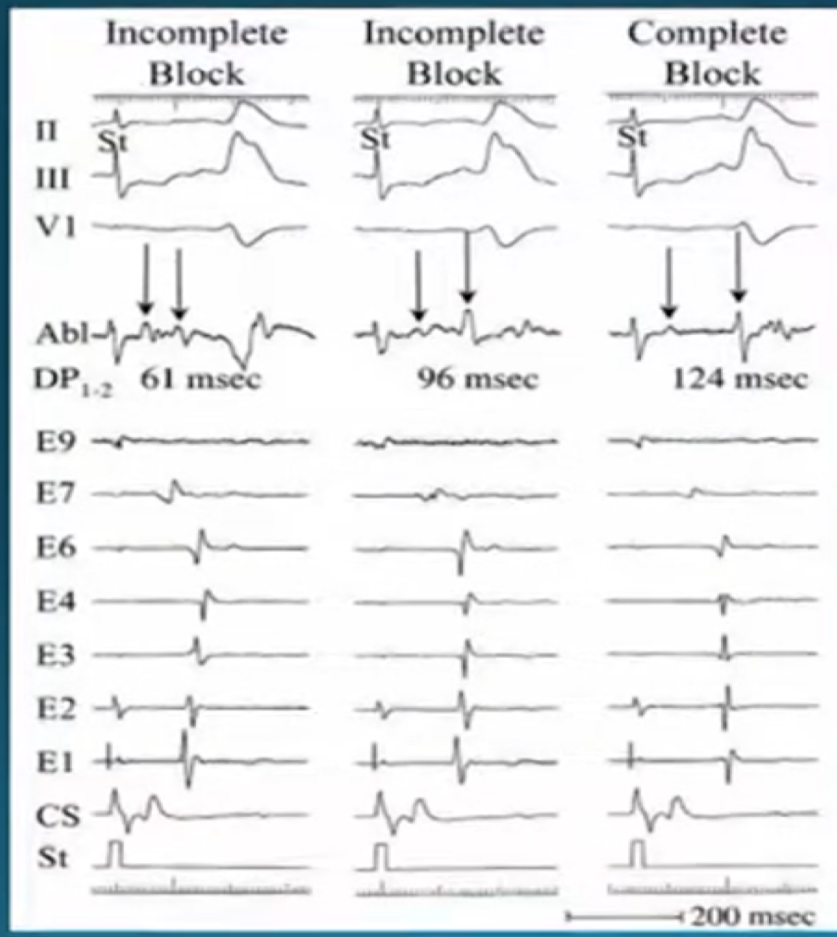
- Flutterın durması hedef değil
- İki yönlü CTI bloğu mutlaka gösterilmeli. En az 30 dk sonra yeniden ispatla. Modern teknikler sonrasındaki serilerde bile halen anlamlı!

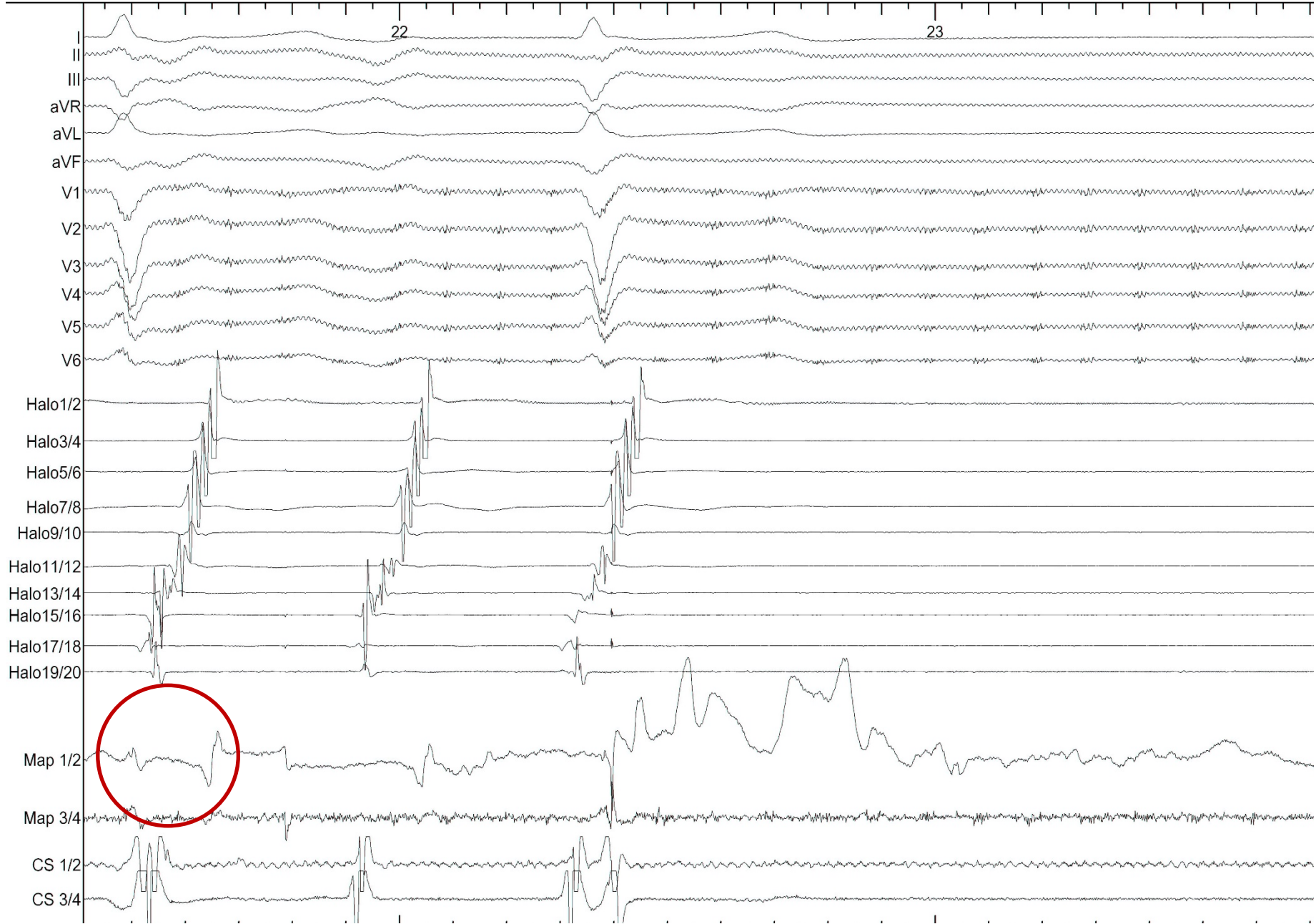
En sık uygulananlar:

- İkili potansiyellerin tüm CTI hattında geniş şekilde (>110 ms) gösterilmesi (CS-proks pace altında)
- Diferansiyel pacing
- Sinüste yapıldı ise trans-isthmal ileti süresi >150 ms olması veya bazal sürenin %50'si kadar artması (hangisi büyükse)

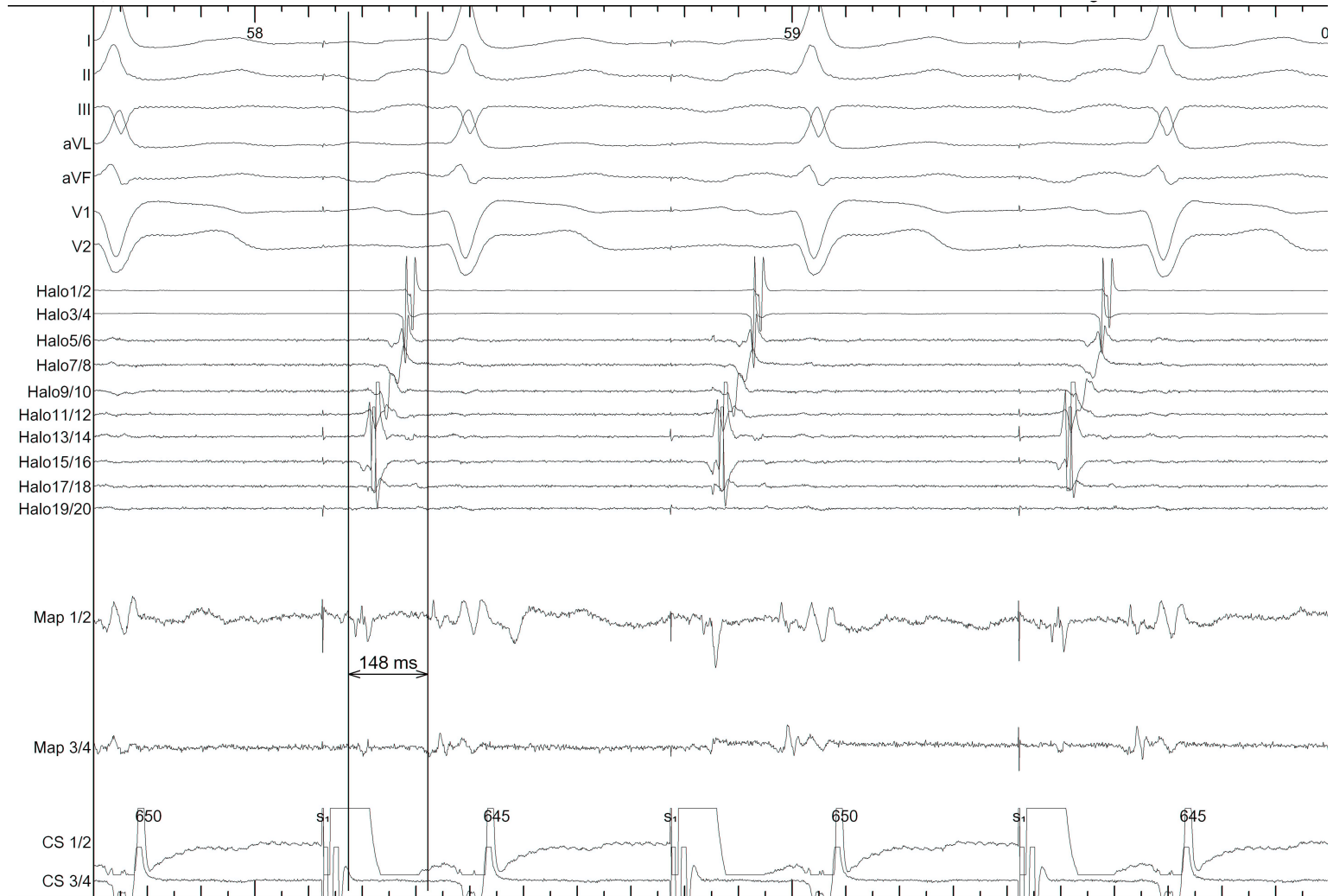
TABLE 12.1 Confirmation of Bidirectional Isthmus Block

Method	Technique	Observations Consistent With CTI Block
Atrial activation sequence during atrial pacing	Mapping inferolateral RA activation sequence during pacing from the CS os (at PCL of 600 msec)	Clockwise CTI block is indicated by the observation of a purely descending (craniocaudal) wavefront at the inferolateral wall down to the CTI (proximal-to-distal activation sequence on the Halo catheter positioned around the tricuspid annulus)
Atrial activation sequence during atrial pacing	Mapping septal RA activation sequence during pacing from the low lateral RA (at PCL of 600 msec)	Counterclockwise CTI block is indicated by the observation of a completely descending (craniocaudal) wavefront at the RA septum, with CS os activation occurring after activation of the high RA and the HB region
Transisthmus conduction interval	Measuring transisthmus conduction interval during pacing from CS os, then from low lateral RA pacing (Transisthmus interval equals the interval from the stimulus artifact from one side of the isthmus to the atrial electrogram recorded on the contralateral side)	Prolongation of transisthmus interval post ablation by >50% from baseline (or to an absolute value of ≥ 150 msec)
Double potentials	Mapping of double potentials along the entire CTI ablation line during pacing from either side of the CTI (CS os or low lateral RA, at PCL of 600 msec)	The presence complete corridor of widely spaced double potentials (separated by an interval of ≥ 110 msec) along the entire CTI ablation line
Differential pacing	Mapping of double potentials along the entire CTI ablation line during pacing from low lateral RA, then from midlateral RA (at PCL of 600 msec)	Separation between the double potentials is decreased upon moving the pacing site away from the ablation line (from low lateral to midlateral RA)
Differential pacing	Mapping activation at the CTI ablation line during pacing from low lateral RA, then from midlateral RA, or from CS os then RA septum (at PCL of 600 msec)	Moving the pacing site away from the ablation line (from low lateral to midlateral RA or from CS os to RA septum) shortens the conduction time to the contralateral side of the ablation line
Incremental pacing	Mapping of double potentials along the CTI ablation line during pacing from low lateral RA, then from CS os (at PCLs of 600 msec then 300 msec)	Minimal (<20 msec) variation in the distance between the double potentials in response to progressively faster pacing rates
Incremental pacing	Measuring the interval between atrial electrograms at the HB region and CS os (His-to-CS os interval) during pacing from low lateral RA (at PCLs of 600 msec then 300 msec)	Minimal (<10 msec) variation in the His-to-CS os interval in response to progressively faster pacing rates
Unipolar electrogram morphology	Recording unipolar electrograms at the CTI ablation line during pacing from either side of the CTI (CS os or low lateral RA, at PCL of 600 msec)	Unipolar electrogram recorded at the edge of the ablation line contralateral to the pacing site exhibits monophasic R or Rs wave (large positive deflection followed by a negative deflection with R/s ratio >3:1)
Bipolar electrogram morphology	Recording bipolar electrogram just lateral to the CTI ablation line during pacing from the CS os (at PCL of 600 msec)	Bipolar electrogram polarity reverses (as compared to preablation electrogram polarity)
Electroanatomic mapping	Electroanatomic mapping	Pacing from one side of the ablation line results in an activation wavefront propagating in one direction around the tricuspid annulus, with the latest activation in the CTI immediately on the contralateral side of the ablation line

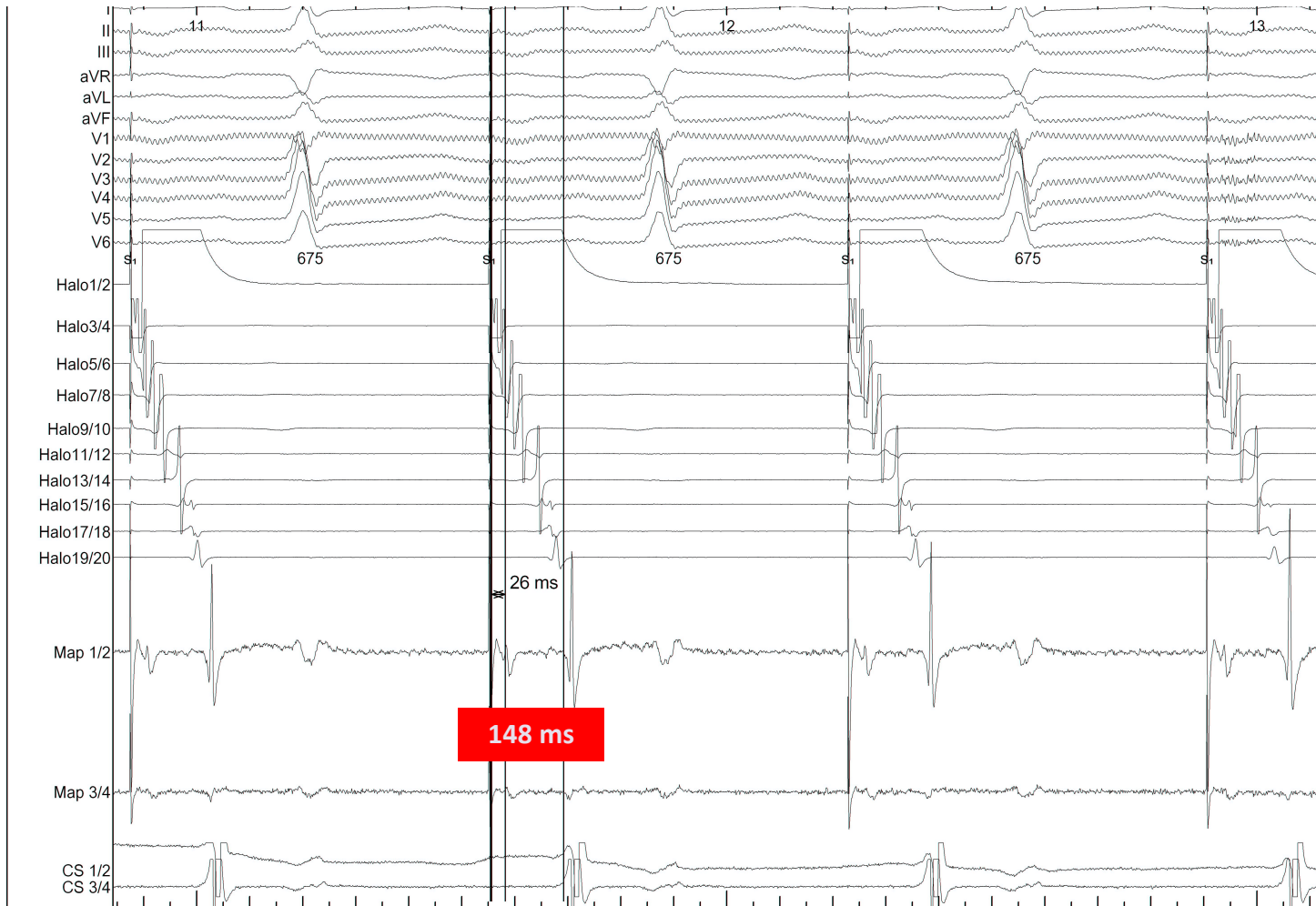




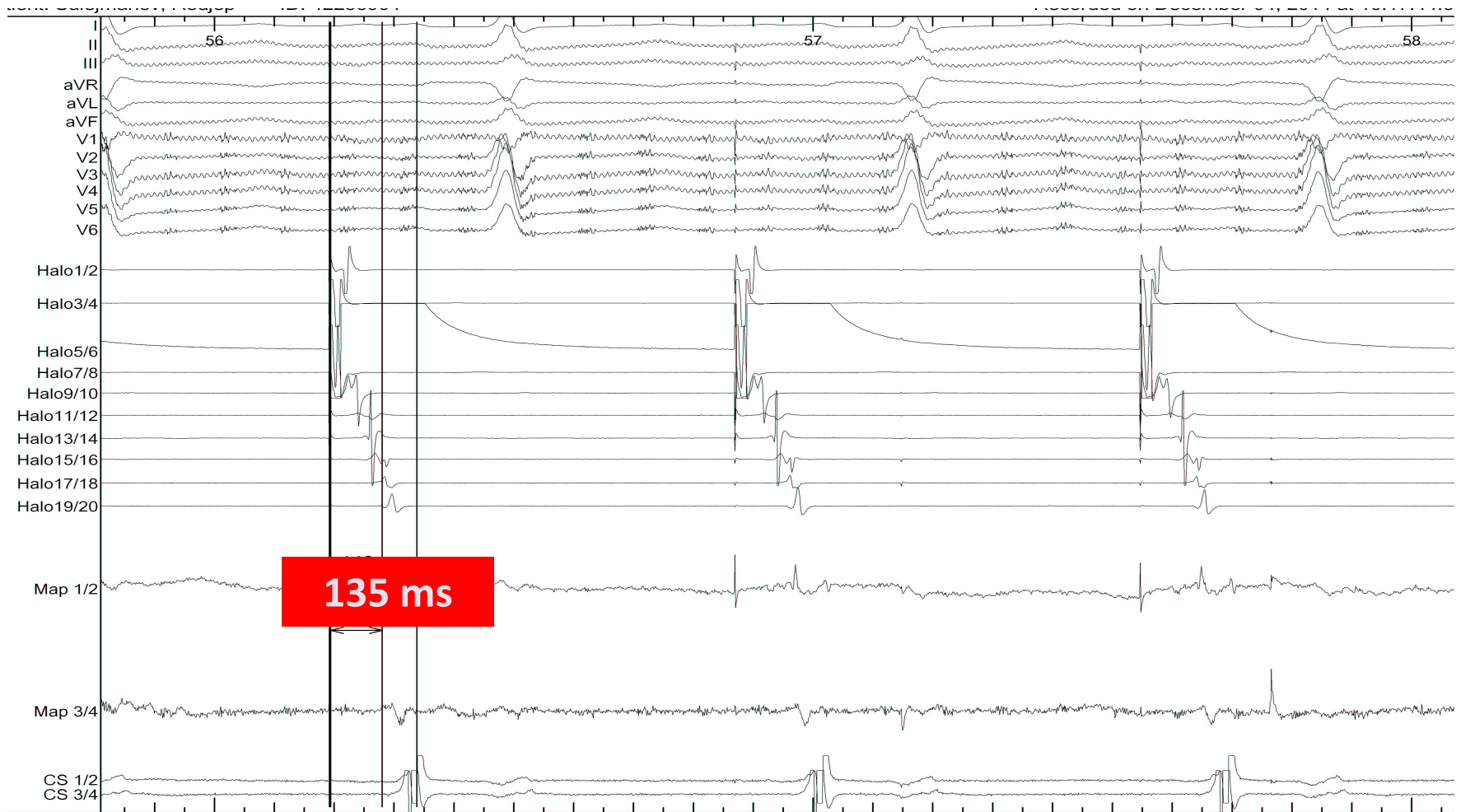
2li potansiyel ve bipolar vektör değişikliği



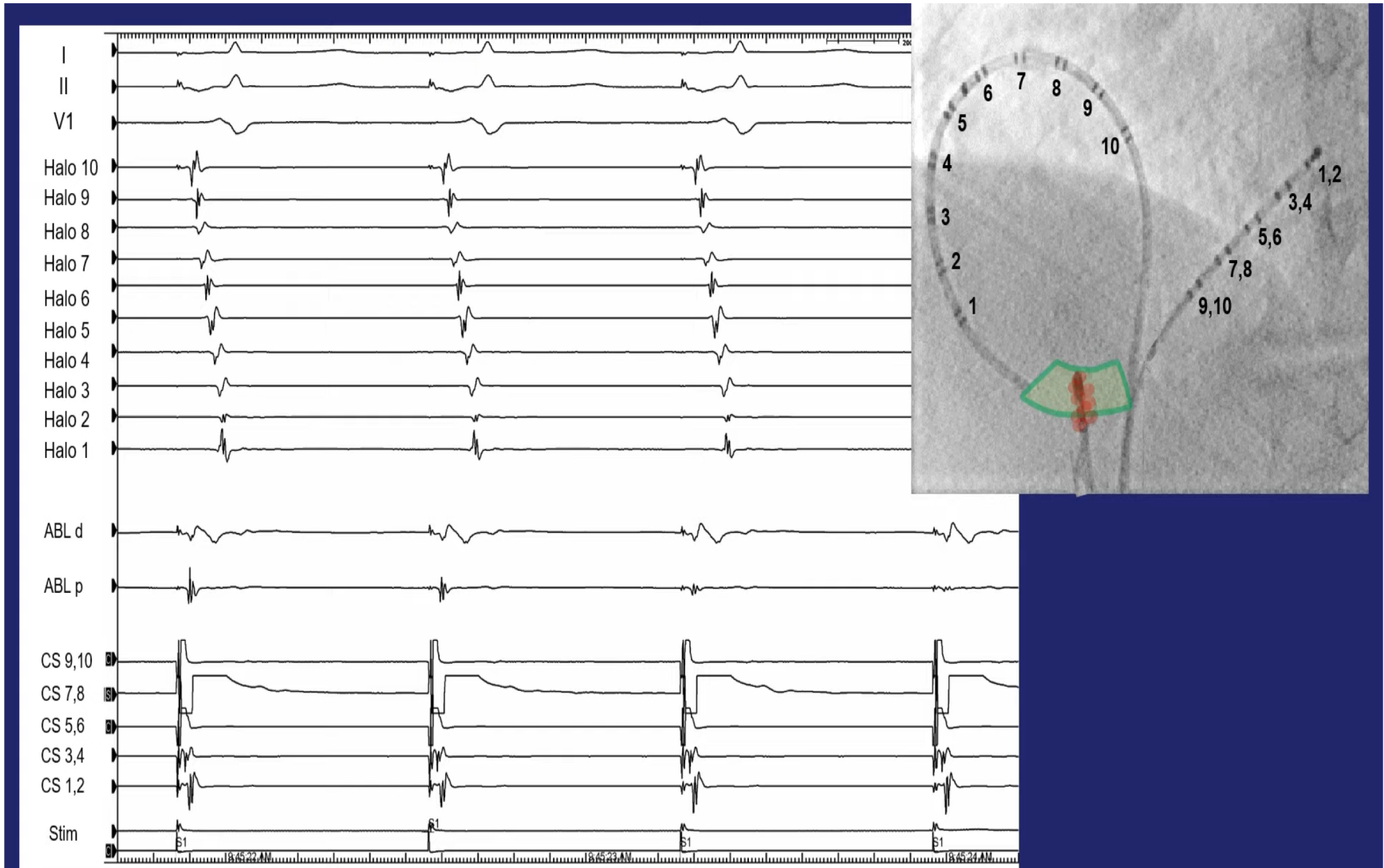
Halo1-2 diferansiyel pacing



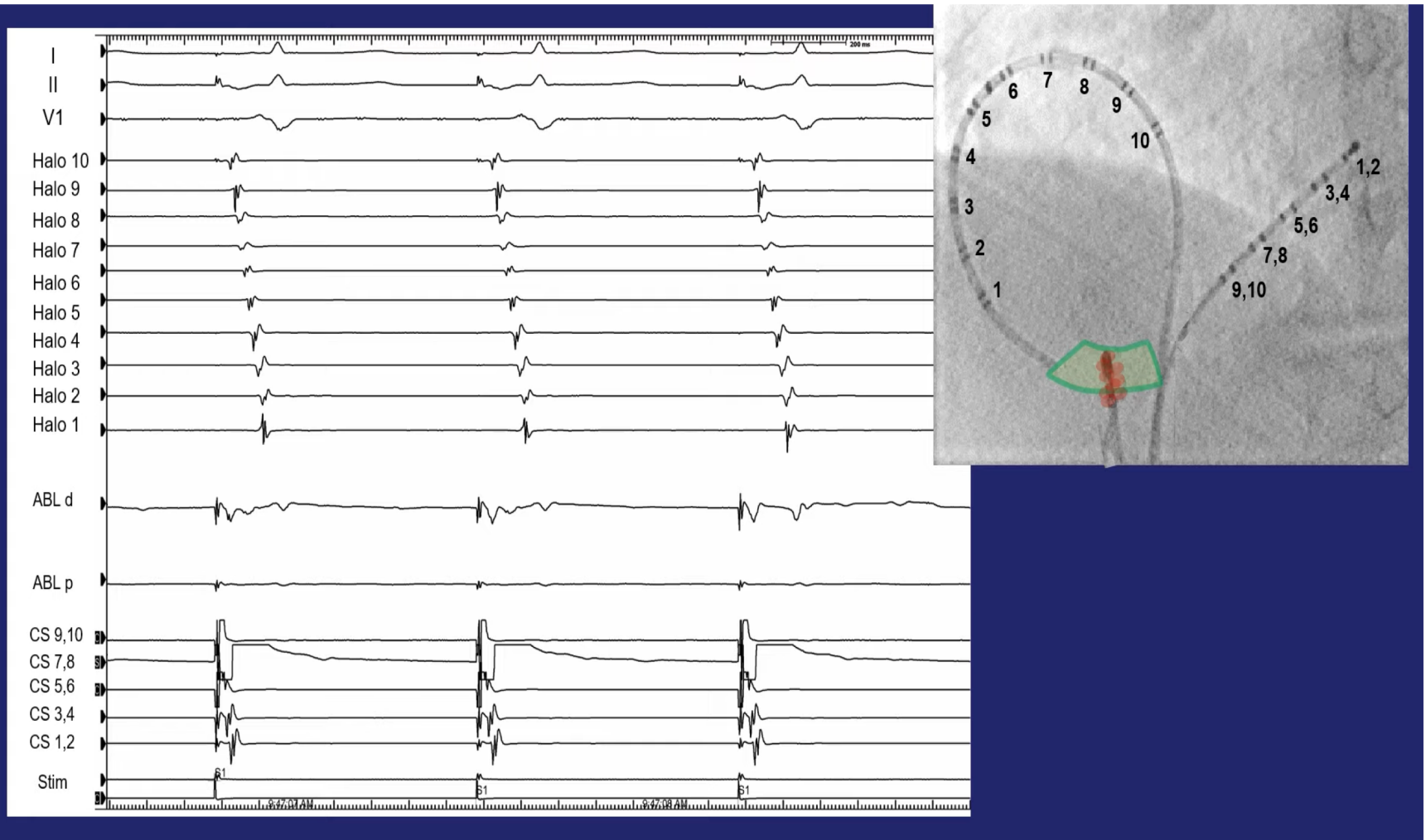
Halo 5-6 diferansiyel pacing



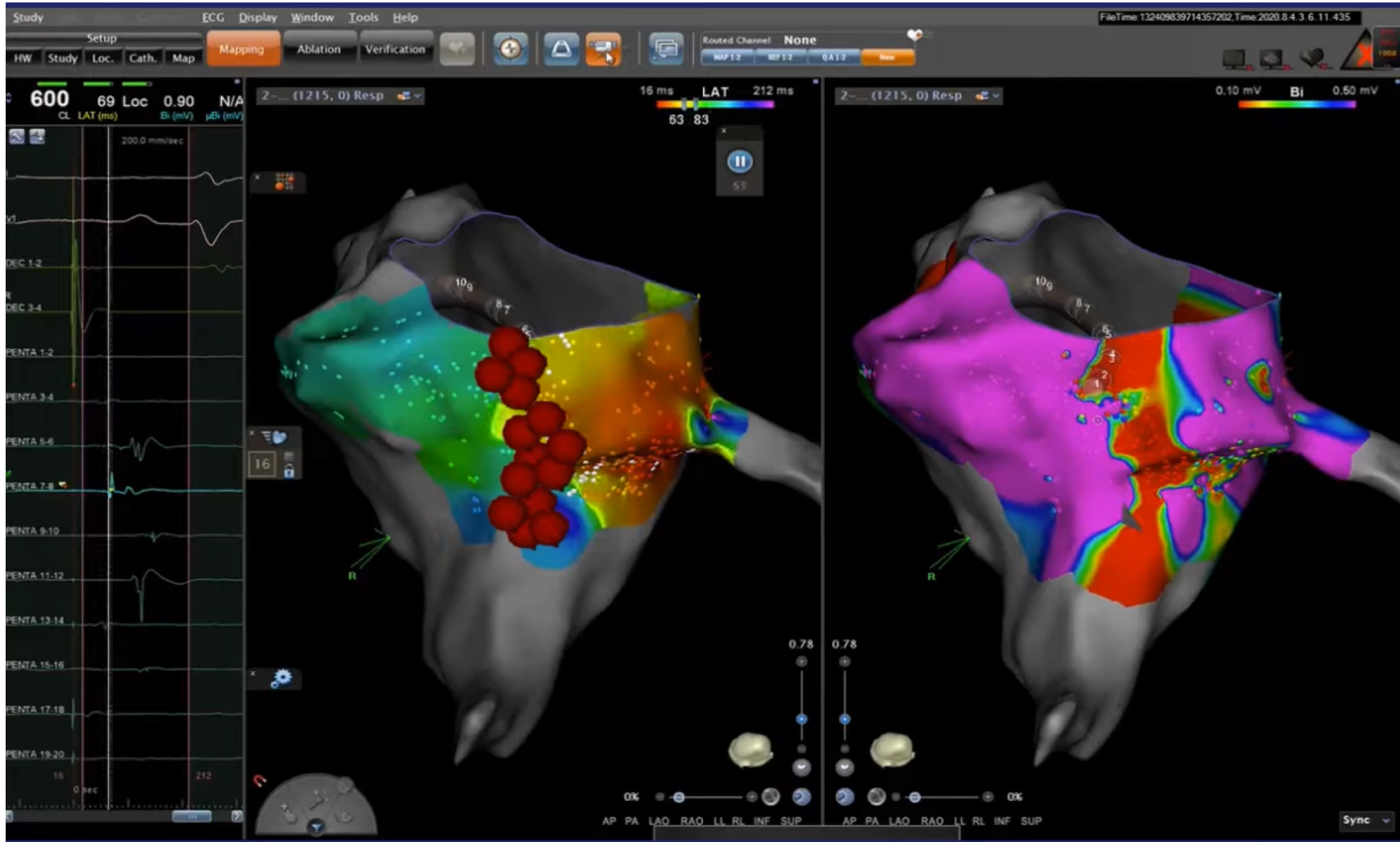
Isthmal Blok var mı?

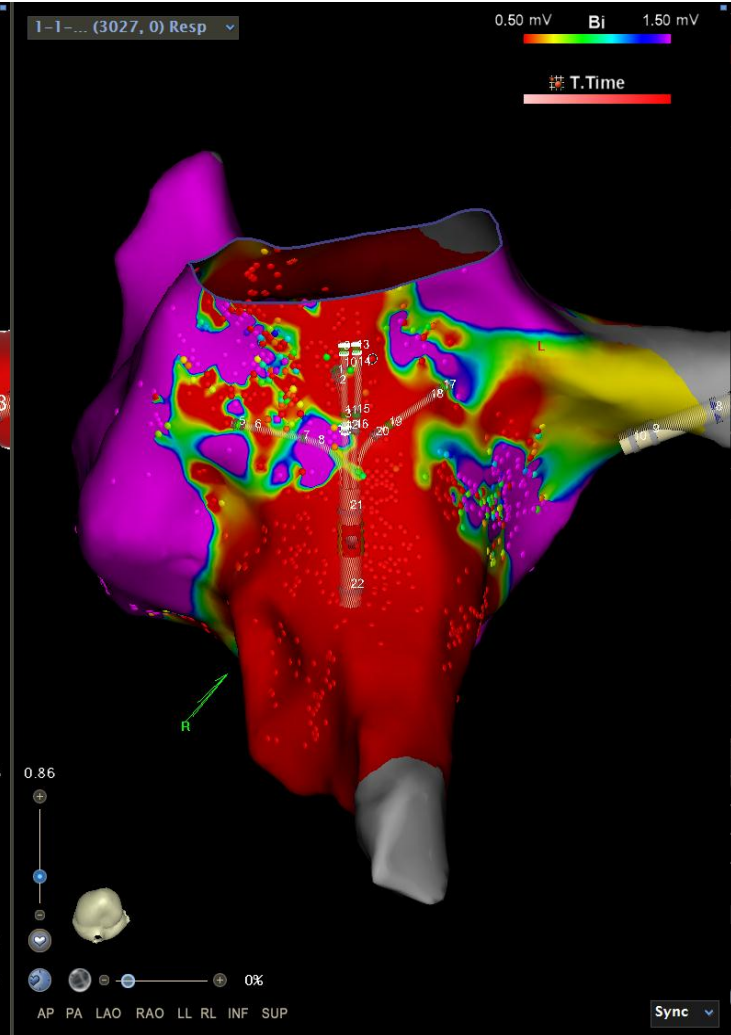
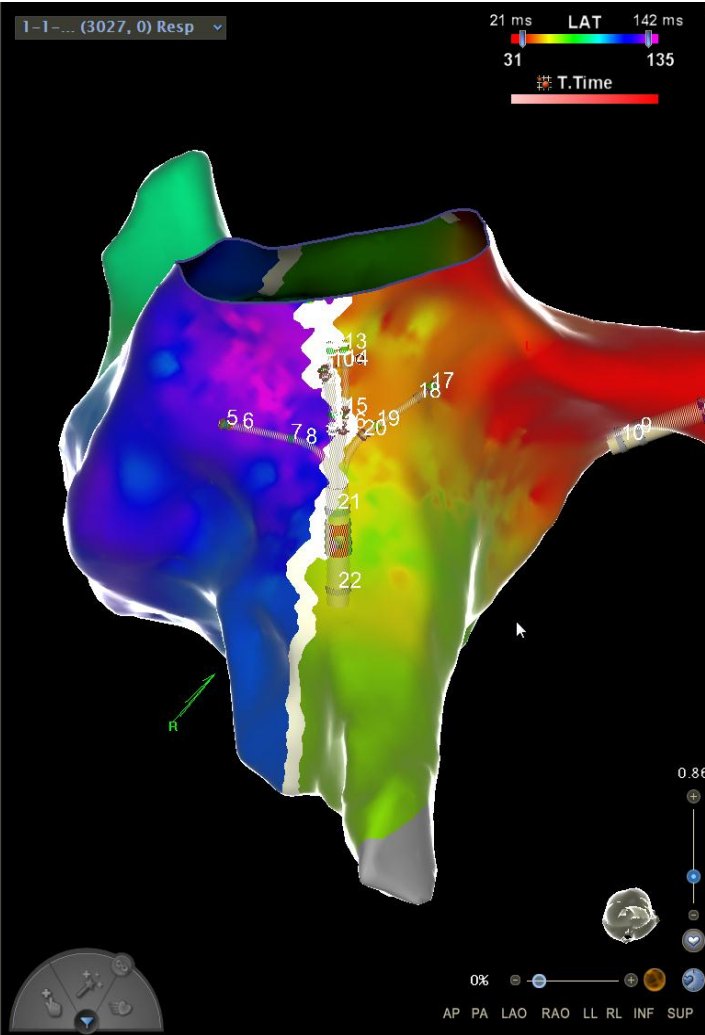
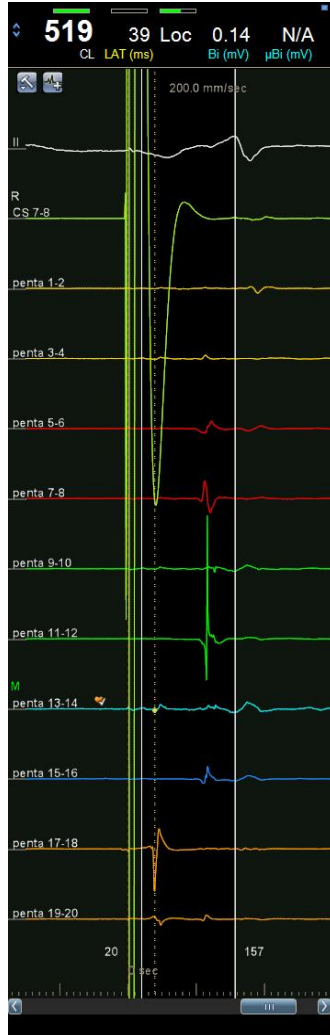


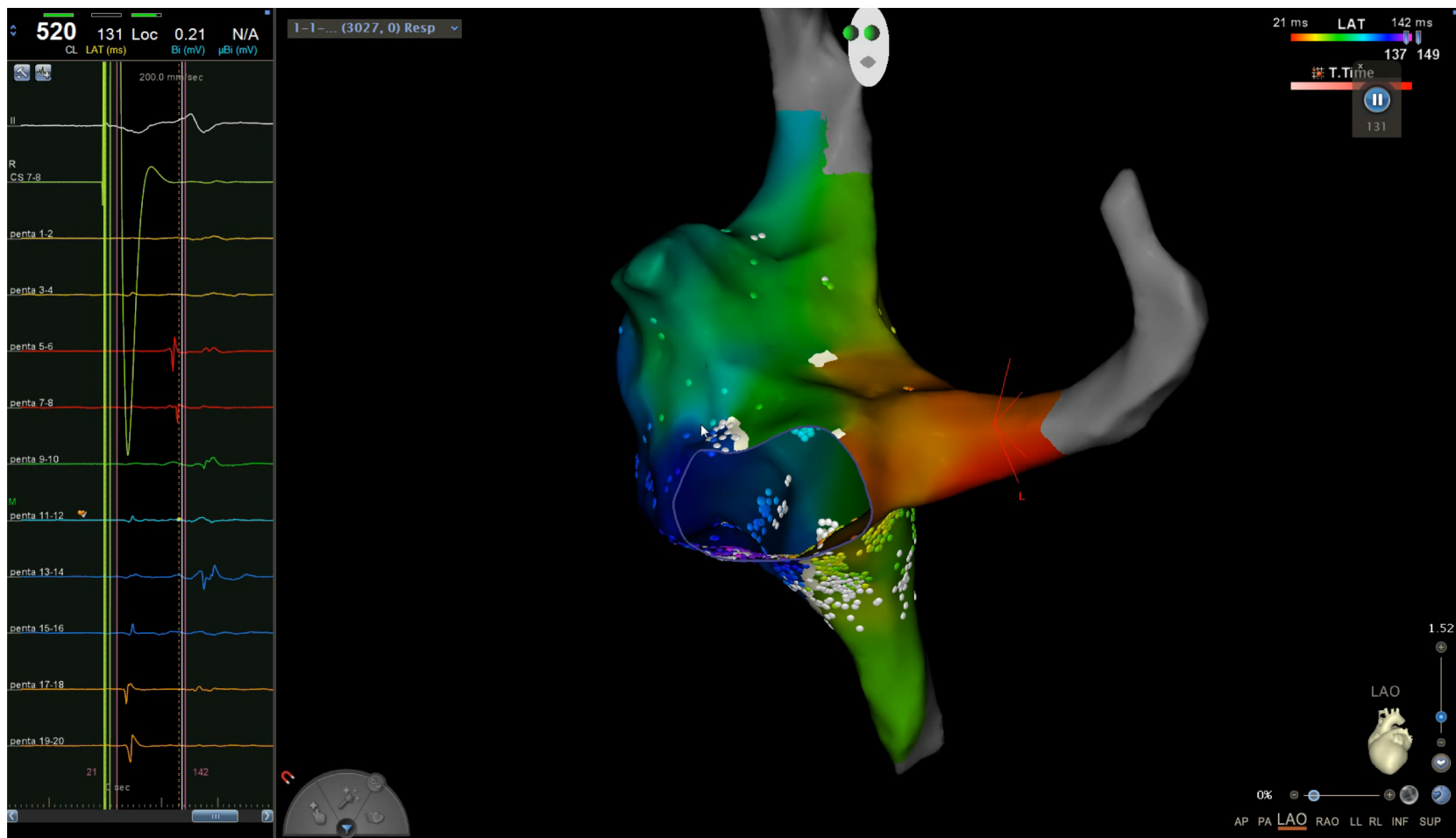
İsthmal blok artık var!



Aktivasyon-propagasyon haritası ile hat kontrolü

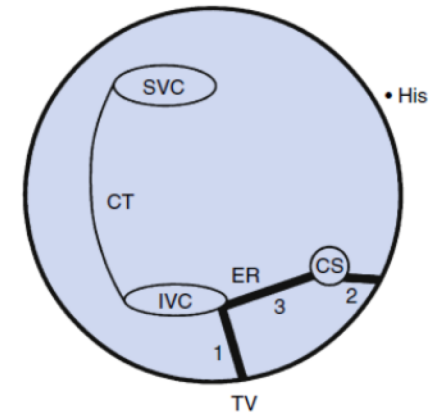
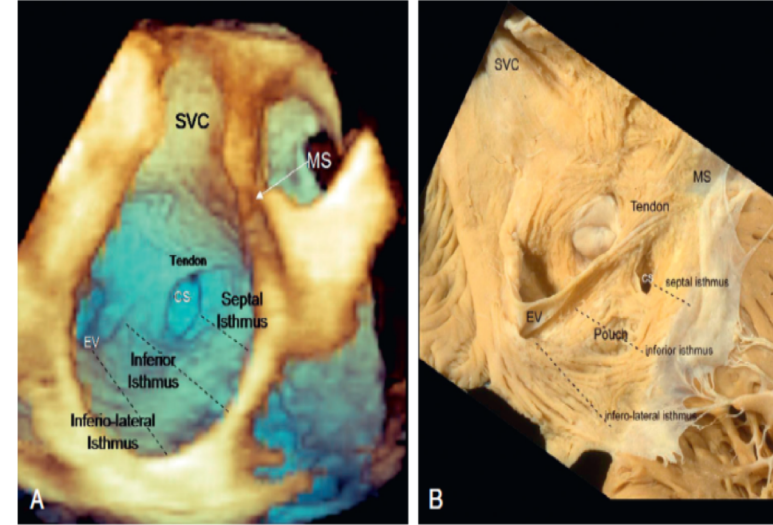


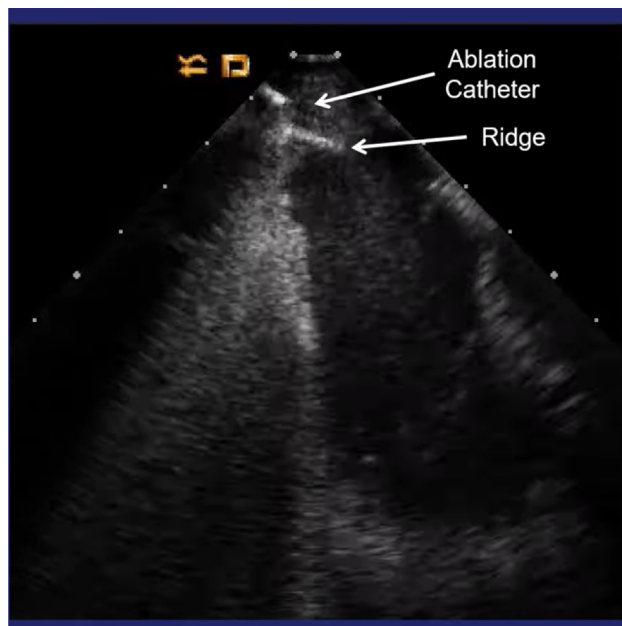


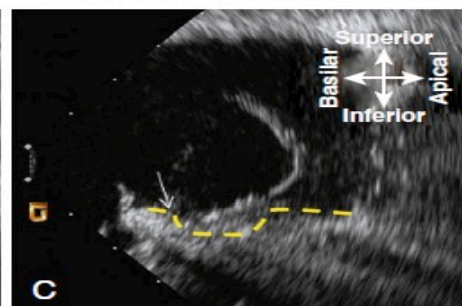
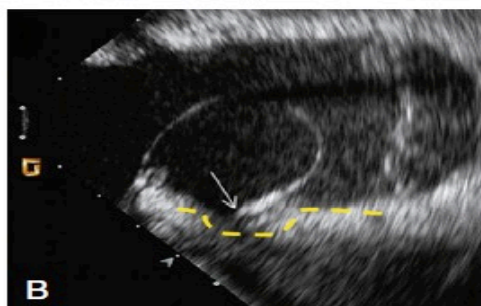
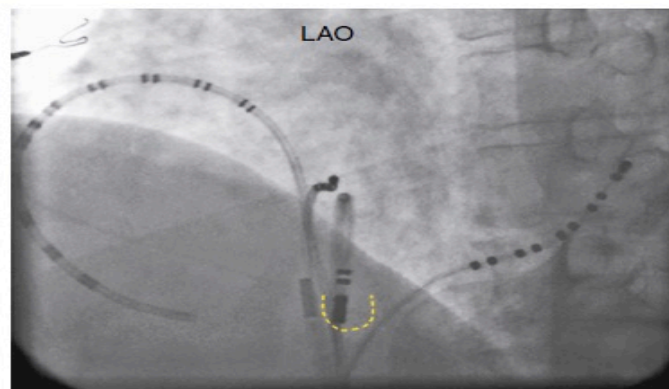
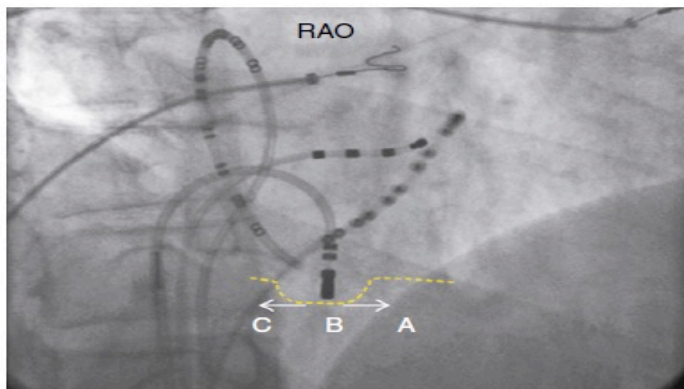


ZOR/BAŞARISIZ ABLASYON!

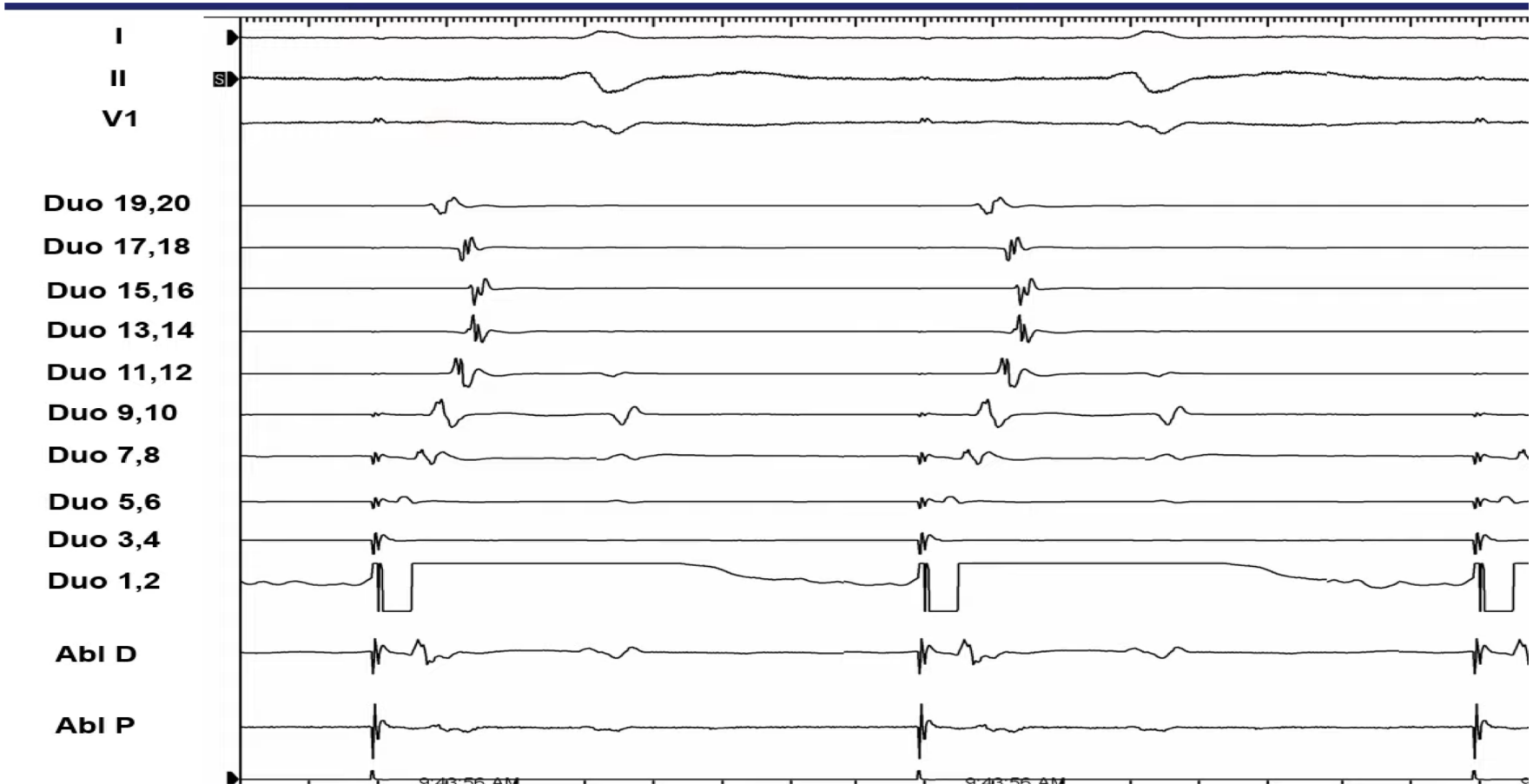
- En önemli ve sık sebep anatomi (Poşlar, belirgin eustachian valve, tepeler, vadiler, pektinat kaslar...)
- Yetersiz temas, uzun kılıf kullanmamak, küçük açılı ablasyon kateteri veya kılıf
- Alternatif çizgi çekmek. Lateral, CS-IVC, CS-TKA??
- RA içinde ters loop yapıp TK altına/EV altına girmeye çalışmak, vertikal çekme ile poş içine girmek?
- IK EKO! Her iki yönden yakmak



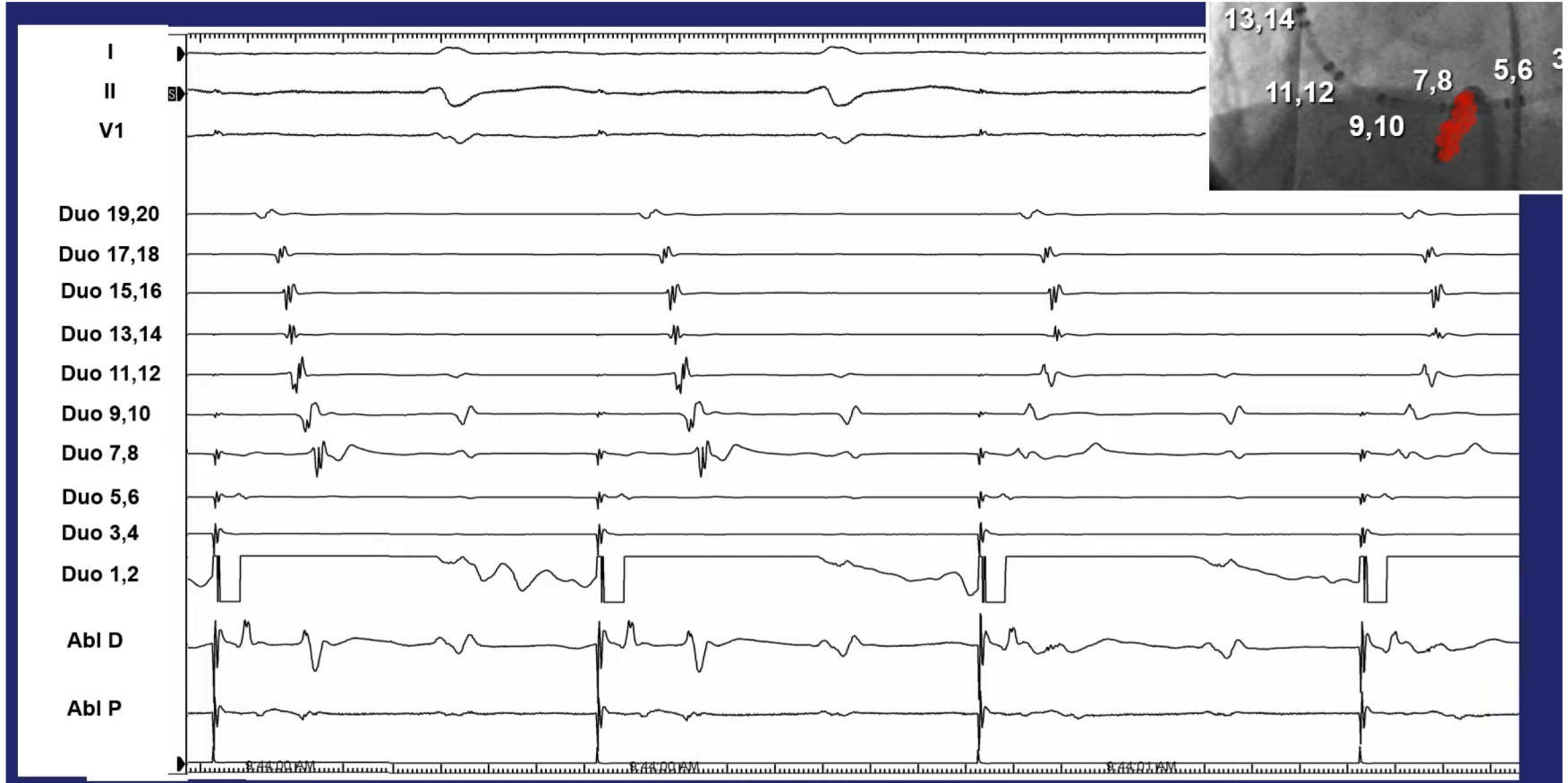




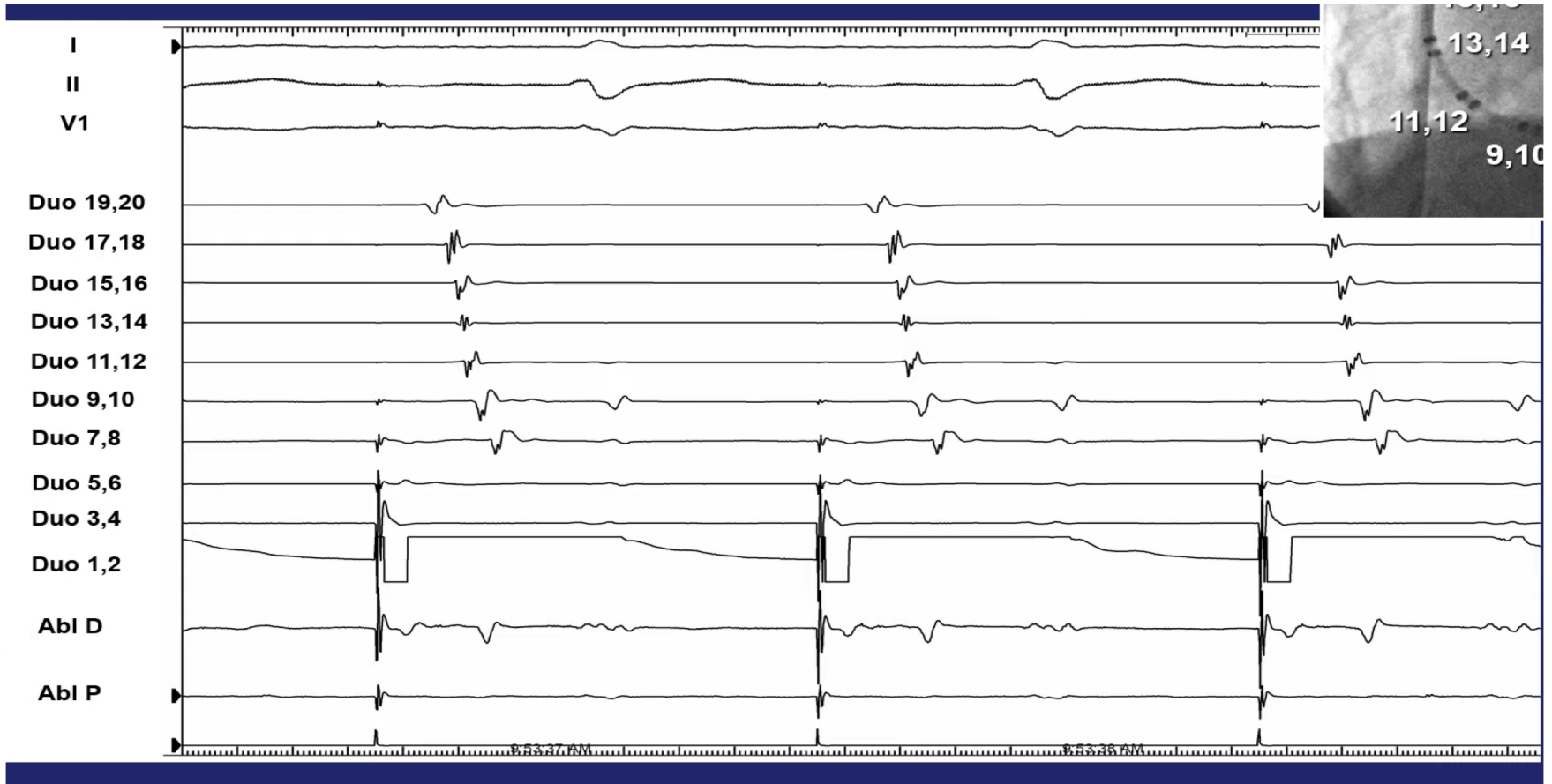
CS Pacing ile ablasyon



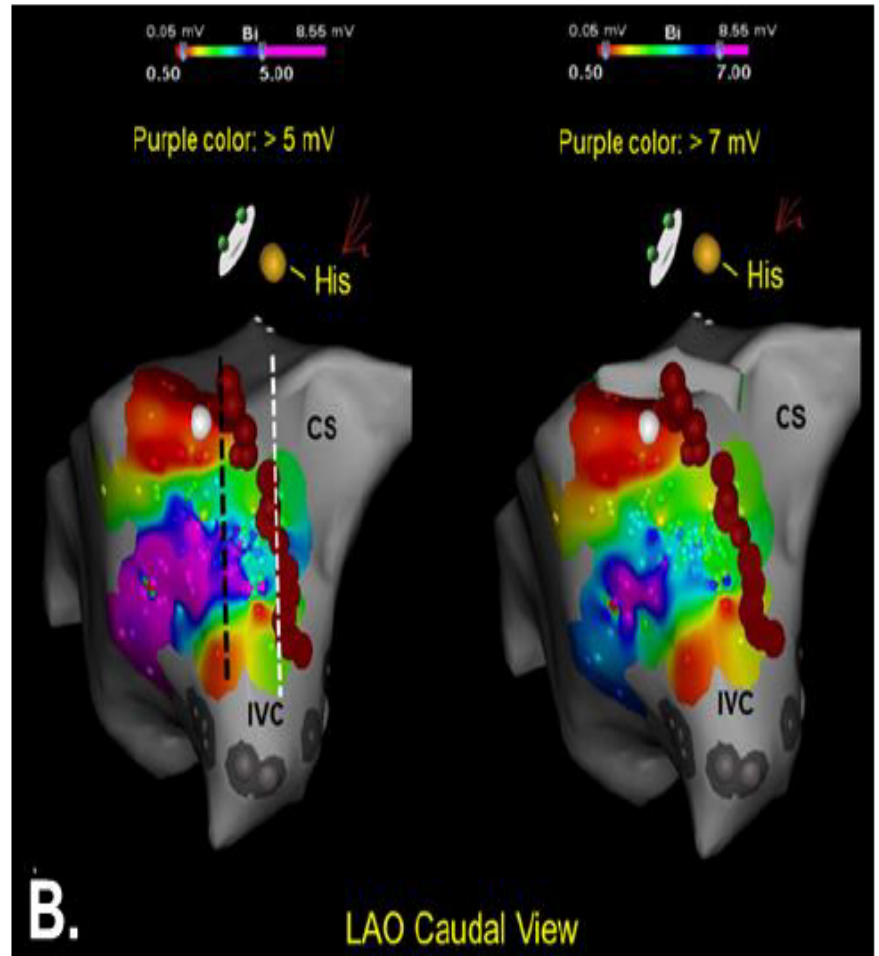
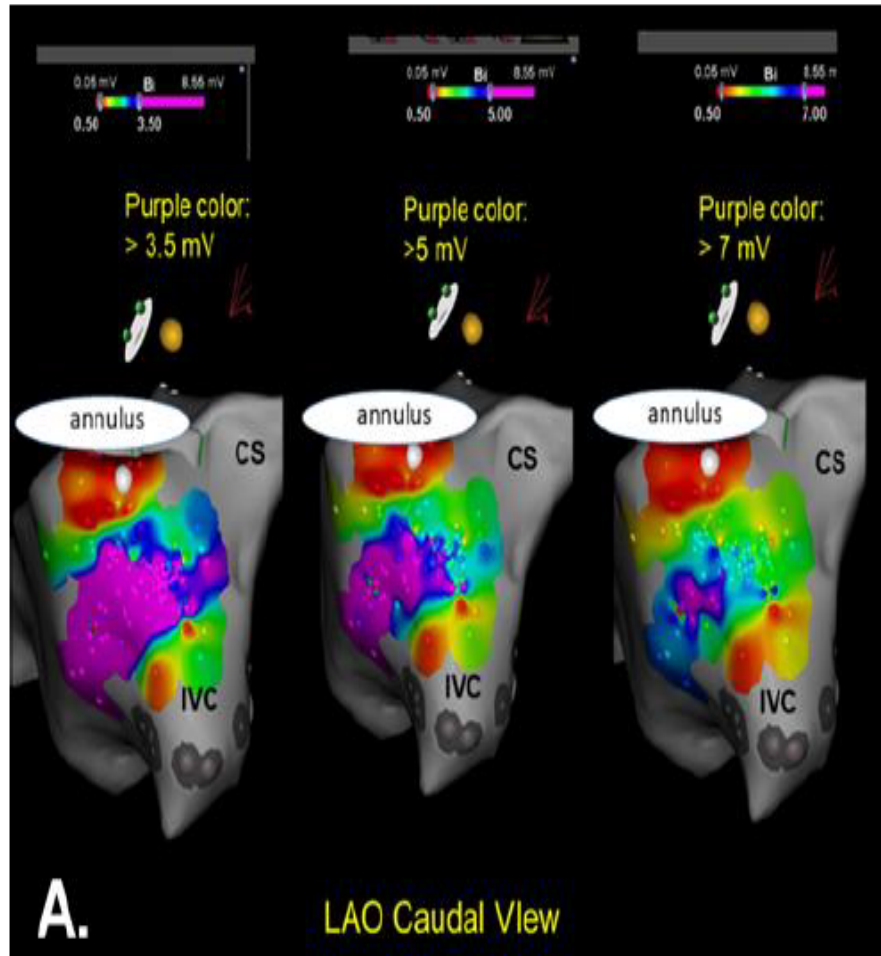
Isthmal ileti dönüyor!



Olası kalıcı blok



Voltaj Temelli Ablasyon Hattı



Sonuç

- EKG traseleri iyi incelenmeli ve ön tanılarımız olmalı
- Hastaların metabolik hastalıkları, yapısal kalp hastalığı, cerrahi geçmişi çok önemli.
- Atriyal aktivasyon paternleri ve entrainment halen vazgeçilmez
- 3B kısıtlılıklarının önüne geçmek için WOI yüzey P dalgasından belirle, parçalı sinyalleri çevre referansı ile irdele. Emin değilsen hiç dahil etme!
- En az 2 CTI blok kriterini göstermeye çalış ve 30 dk bekle
- Voltaj haritası eşliğinde ablasyon imkanlarını hatırla.

TEŞEKKÜRLER...