Atriyal Fibrilasyonda Pulmoner Ven Dışı Tetikleyiciler

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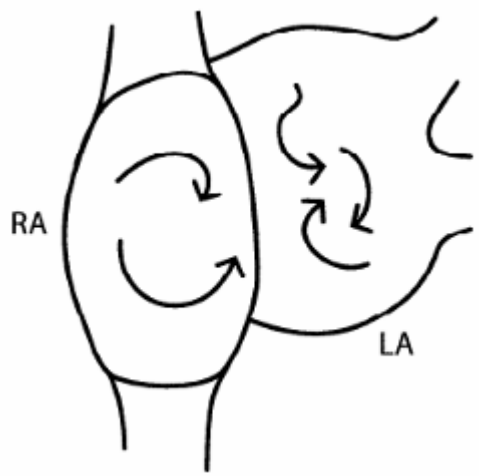
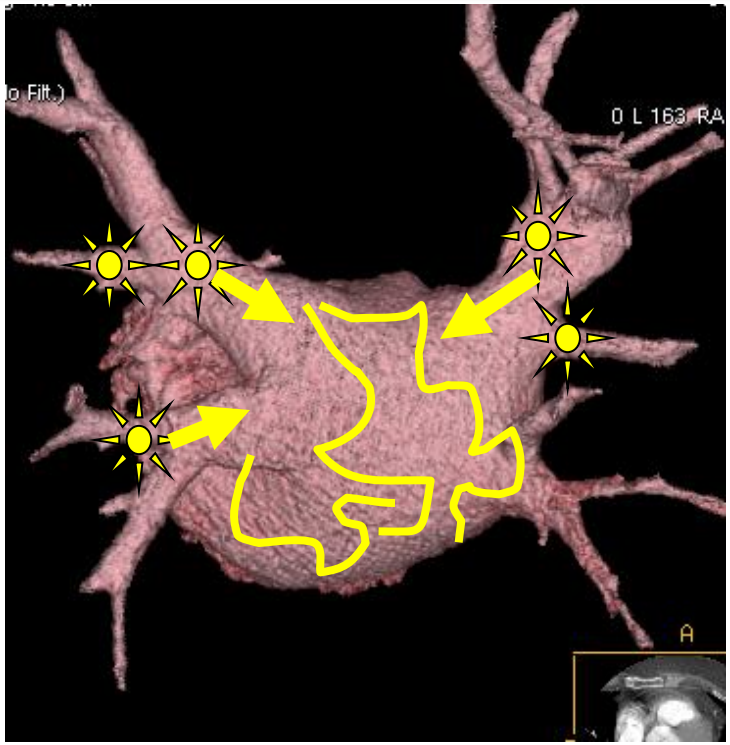
Ankara

AF mekanizması ile ilgili hipotezler

1990'ların başında Moe'nin "***Multiple Wavelet Hypothesis***" ve tedavi için cerrahi Maze tekniği



- *1990'ların sonunda "**venous wave hypothesis** "* ve tedavi için PV izolasyonu



Haissaguerre, NEJM. 1998

SPONTANEOUS INITIATION OF ATRIAL FIBRILLATION BY ECTOPIC BEATS ORIGINATING IN THE PULMONARY VEINS

MICHEL HAÏSSAGUERRE, M.D., PIERRE JAÏS, M.D., DIPEN C. SHAH, M.D., ATSUSHI TAKAHASHI, M.D., MÉLÈZE HOCINI, M.D., GILLES QUINIOU, M.D., STÉPHANE GARRIGUE, M.D., ALAIN LE MOUROUX, M.D., PHILIPPE LE MÉTAYER, M.D., AND JACQUES CLÉMENTY, M.D.

N Engl J Med 1998;339:659-66.

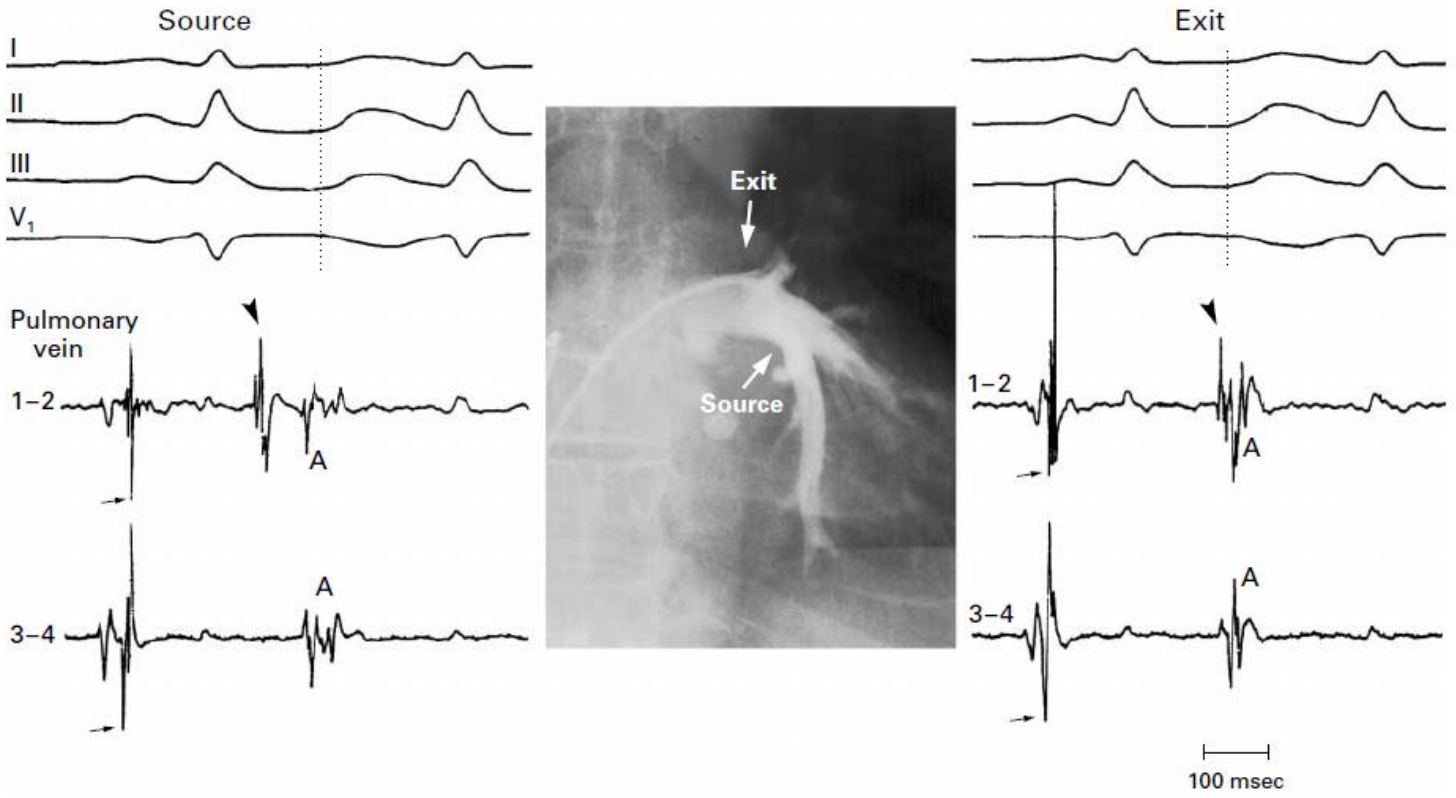
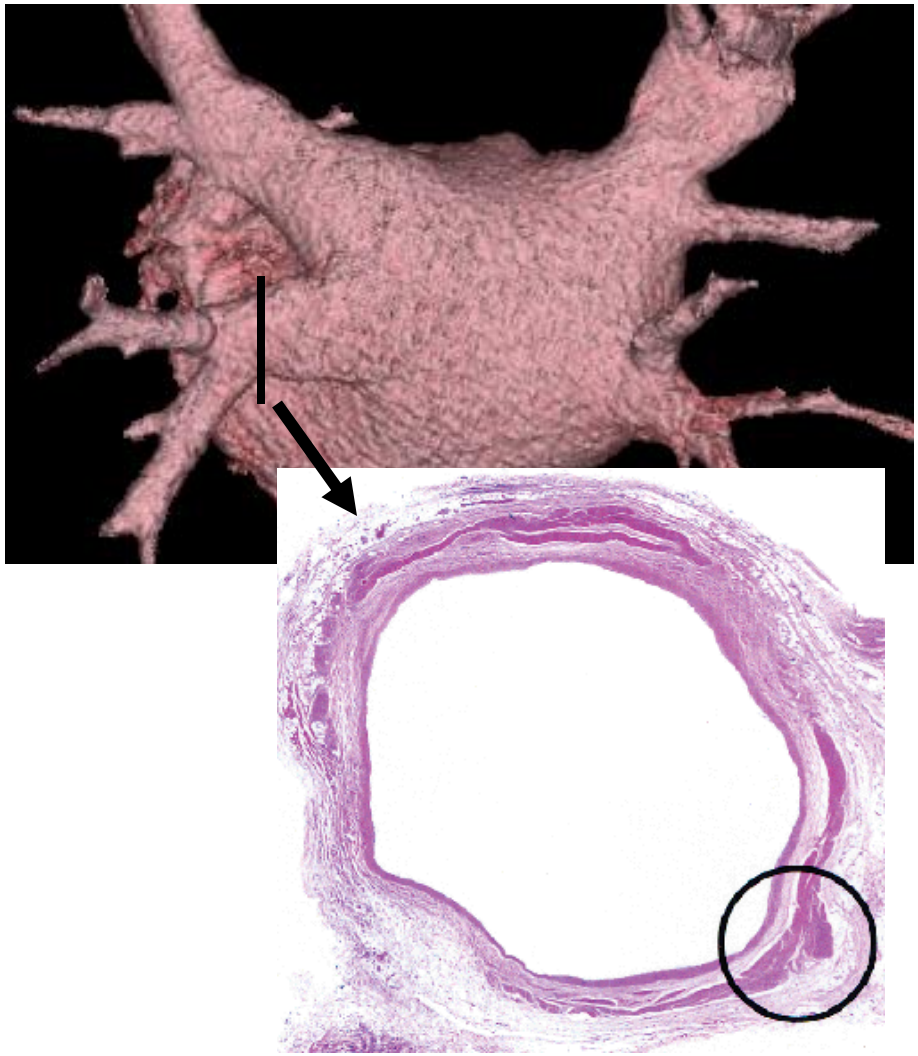


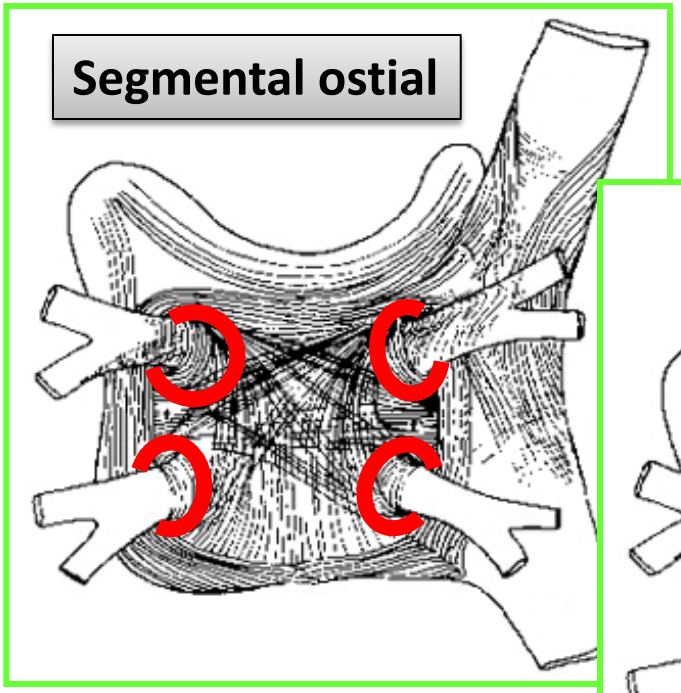
Figure 2. Angiogram of a Left Inferior Pulmonary Vein Depicting the Source and Exit of Ectopic Activity.

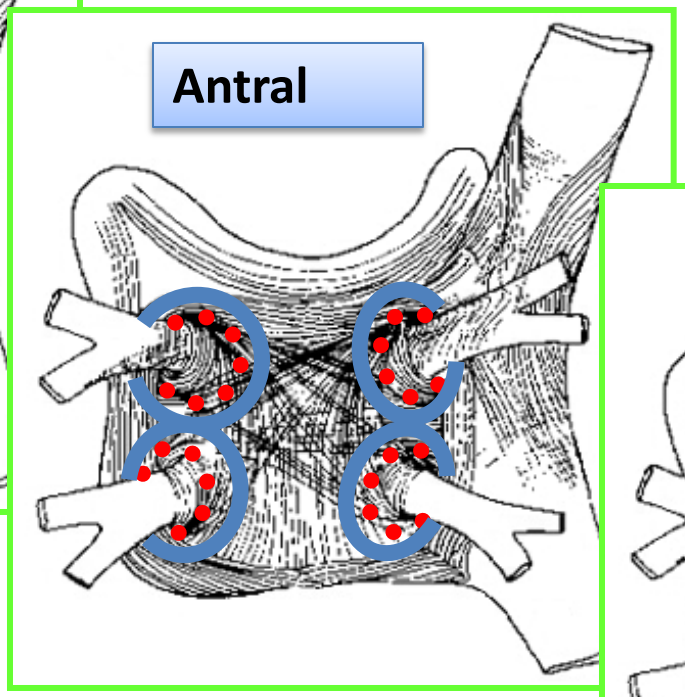
Pulmoner venler en önemli AF tetikleyicisidir

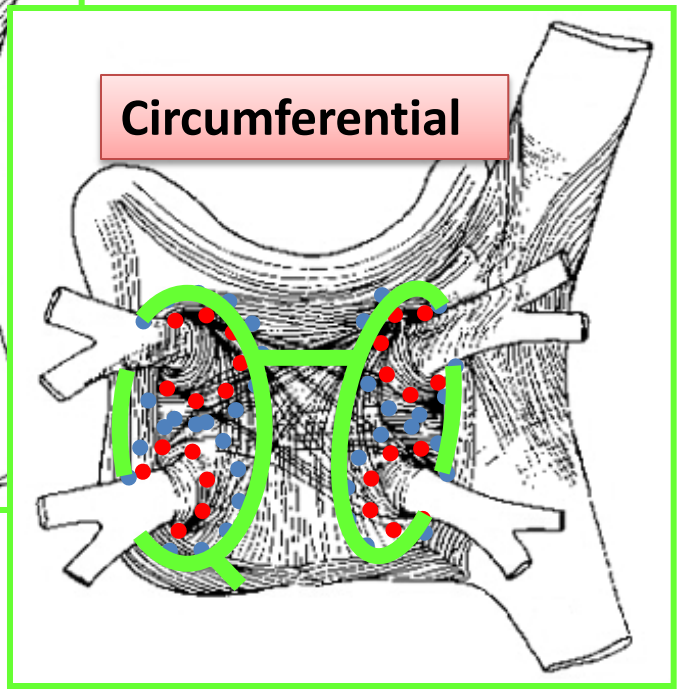


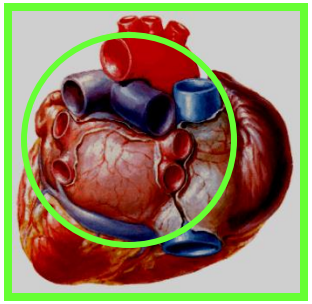
Paroksismal AF ‘de AF’yi başlatan ektopik aktivite odakları %90-95 pulmoner venlerin içindedir

Hedef PV İzolasyonu

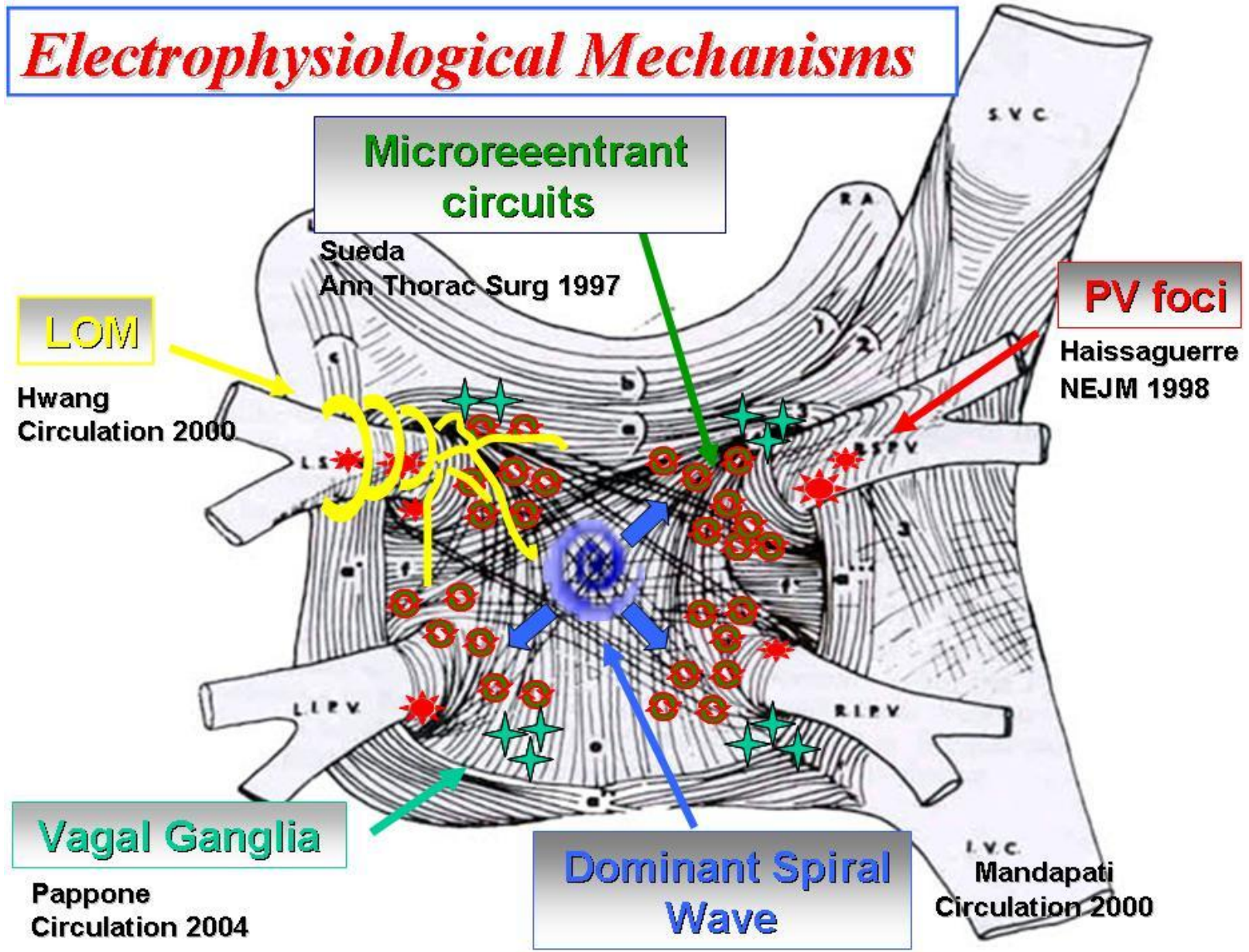








Electrophysiological Mechanisms



PV izolasyonu yeterli mi?

- Paroksismal AF'de PV izolasyonu ile sinüs ritminde kalma %60-70,
- PV dışı tetikleyicilerin de AF'yi başlattığı görülmüştür. Bu oran %3-47 arasındadır,
- Bazı çalışmalarda nüks vakalarında bütün PV'ler izole görünse de %24'e varan oranda PV dışı tetikleyiciler sorumlu bulunmuştur (genel olarak %3-10),
- Demek ki PV dışı tetikleyiciler hem AF'yi ilk kez başlatabilir hem de PV izolasyonu sonrası nükslerden sorumlu olabilirler

PV Dışı Tetikleyiciler

- Genel olarak PV dışı tetikleyicilerin oranı %14-28
- Özellikle kadınlarda ve sol atriyumu büyük olanlarda daha sık,
- En sık odaklar;

✓ Vena kava superior,
✓ Sol atriyum arka duvarı,
✓ Krista terminalis,
✓ Koroner sinüs,
✓ Marshall ligamenti,
✓ İnteratriyal septum,

- AVRT ve AVNRT gibi SVT'lerin de AF'yi başlattığı bildirilmiştir (%4)

PV Dışı Tetikleyiciler

INCIDENCE OF ATRIAL FIBRILLATION ORIGINATING FROM NON-PULMONARY VEIN AREAS

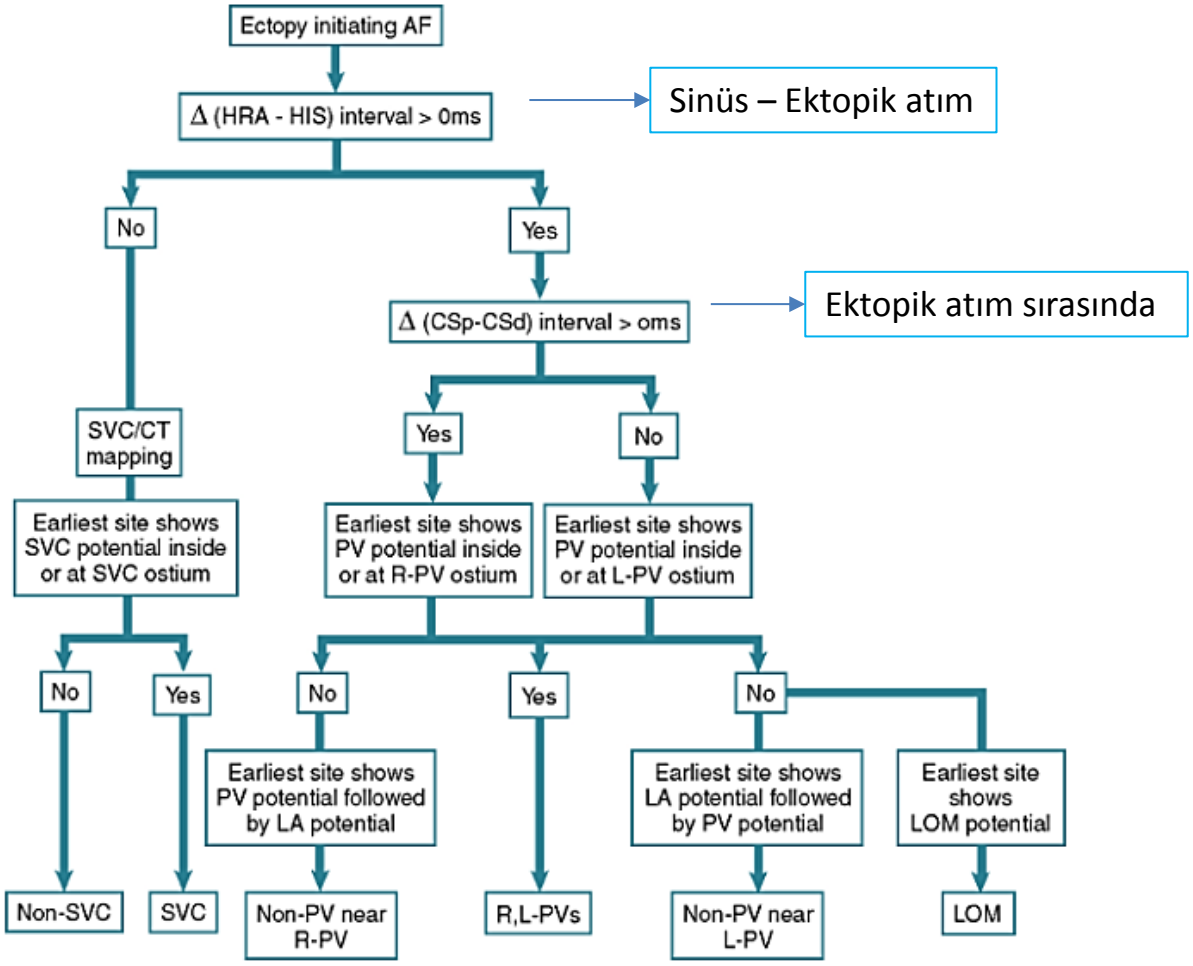
Study	No. of Patients		Age (yr) (Mean ± SD) and Gender	No. of Ectopic Foci		Location of Ectopy (No. of Foci)								
	Total	Non-PV Ectopy		Total	Non-PV	Mapping Tool	RA	SVC	CS	IAS	LA	LOM	SVT	Other
Lin et al, 2003[6]	240	68 (28%)	61 ± 13, 43M/25F	358	73 (20%)	C, basket, ICE	CT (10)	27	1	1	PW (28)	6	—	—
Shah et al, 2003[7]	160†	36 (24%)	53 ± 11, 130M/30F	NA	85	C	5	3‡	4	—	PW (30), PV os (39), others (5)	—	—	—
Beldner et al, 2004[8]	401	68 (17%)	NA	NA	83	C, ICE, Carto	CT (11), TA (4), ER (13)	4	3	FO (4)	PW (15), MA (7)	—	20*	2
Suzuki et al, 2004[9]	127§	18 (14%)	53 ± 11, 106M/21F	NA	20	C	CT (4)	5	1	7	2	1	—	—
Kurotobi et al, 2006[10]	97	63 (65%)	59 ± 11, 71M/26F	269	99 (37%)**	C	CT (3)	28 (6)	10 (2)	—	42 (17)	11	—	—
Yamada et al, 2007[11]	147	31 (21%)	NA	NA	38	Basket	CT (5)	12	2	5	9	—	—	5†
Valles et al, 2008[12]	45	NA	56 ± 9, 35M/10F	57	6	C	CT (2)	2	1	—	1	—	—	—
Total	1217	284 (24.2%)	—	—	404	—	62 (15.3%)	81 (20.0%)	22 (5.3%)	17 (4.2%)	178 (44.1%)	18 (4.5%)	20 (5.0%)	7 (1.7%)

PV Dışı Tetikleyicilerinin Tanısı
Provakatif Manevralar

- İlk basamak spontan ektopik atımların AF'yi başlattığını görmek,
- Bunun için bazal ve isoproterenol infüzyonu sonrası kayıtlar alınır,
- Eğer spontan ektopi yoksa HRA ve CS'den kısa süreli intermittant pacing yapılır (8-12 vuru, 200-300 ms uzunlukta),
- Hala AF başlamamışsa burst pacing yapılır,
- AF başlamış ve >5 dk sürmüşse eksternal CV yapılır ve tekrar spontan AF başlaması izlenir (en az 2 kere),
- Eğer hep aynı ektopi ve bununla başlayan AF gösterilirse en erken ektopik odak AF tetikleyicisi olarak kabul edilir.

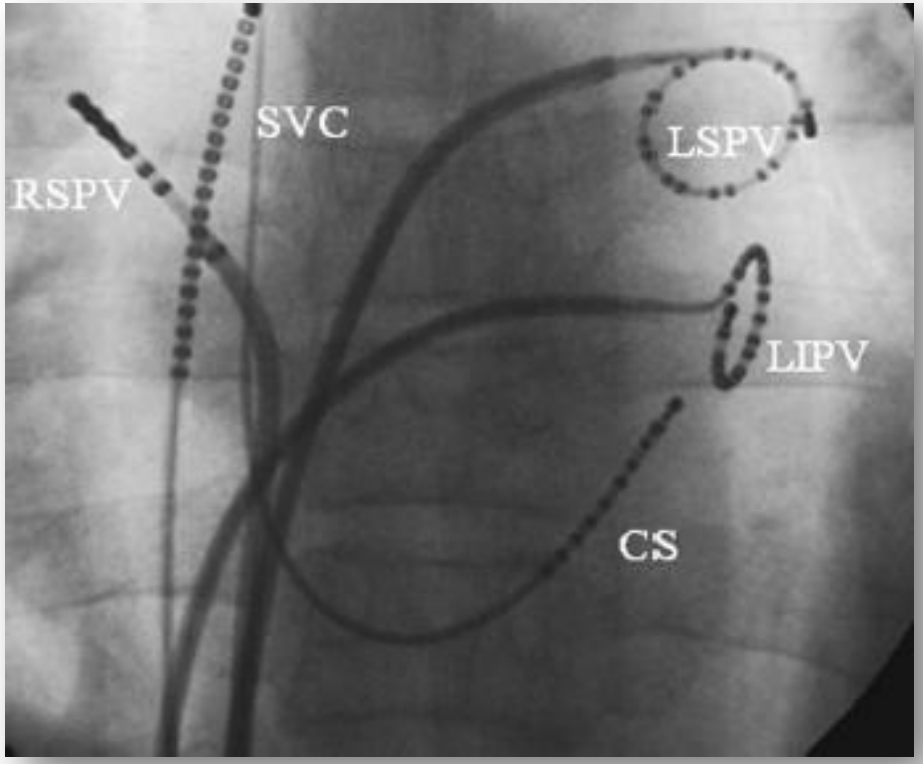
Ektopik Odağın Lokalizasyonu

HRA, His ve CS kateterler kayıtlarından



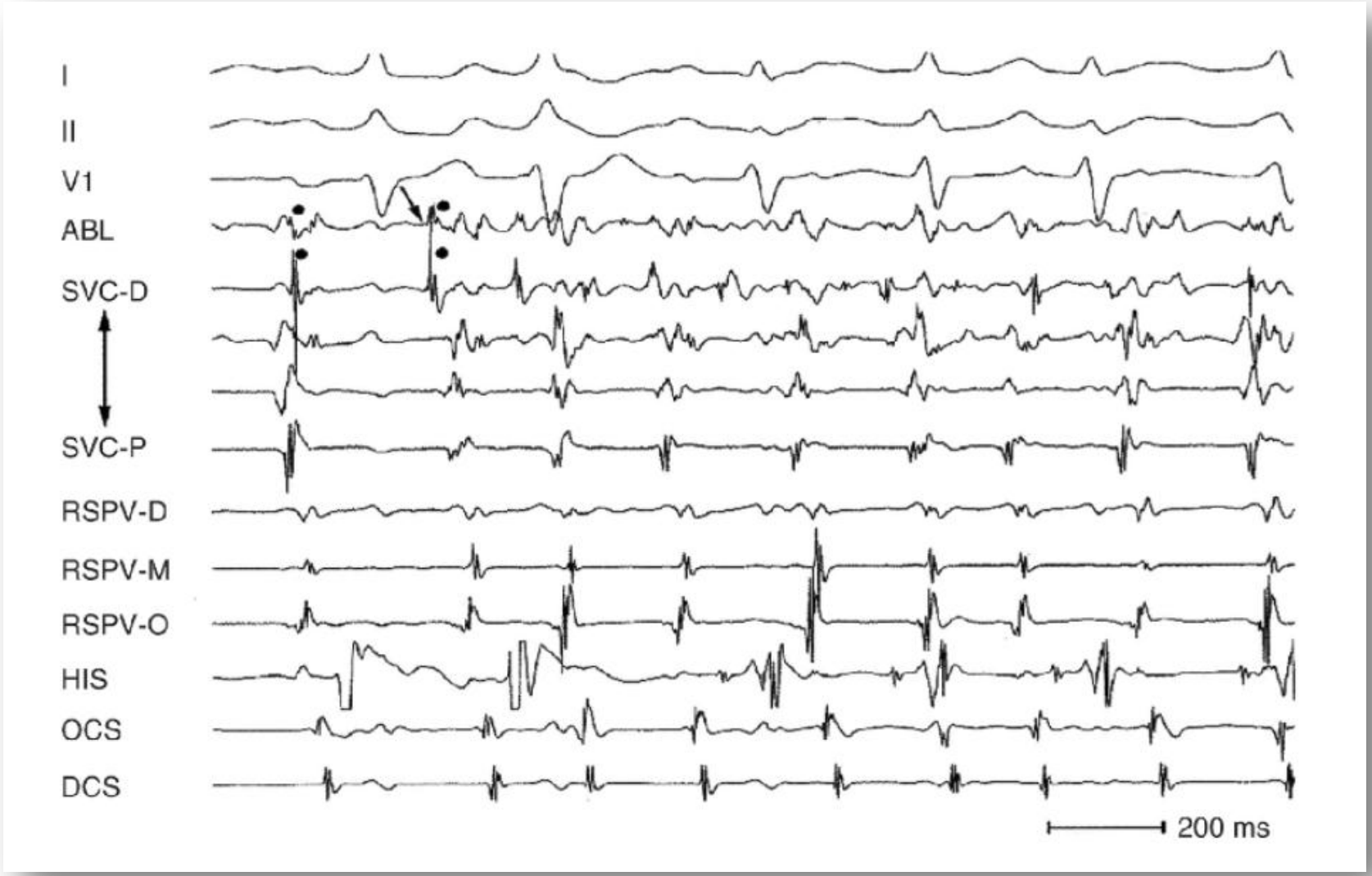
Taipei approach.
Heart Rhythm. 2006;3:1388

PV Dışı Odağın Tanısı



EKG,
Çoklu kateter,
Pacing manevraları,
Provatif ilaçlar (isoproterenol, adenozin)

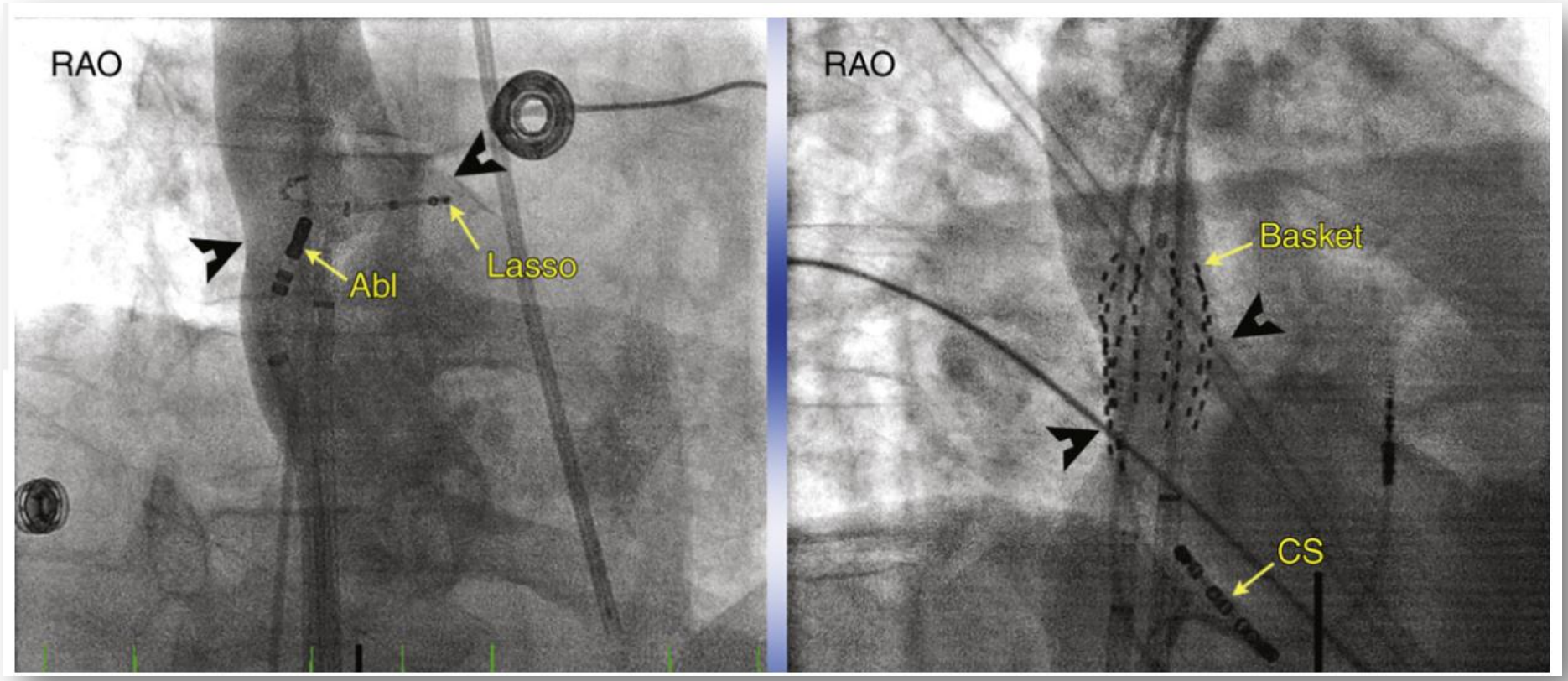
Superior Vena Cava



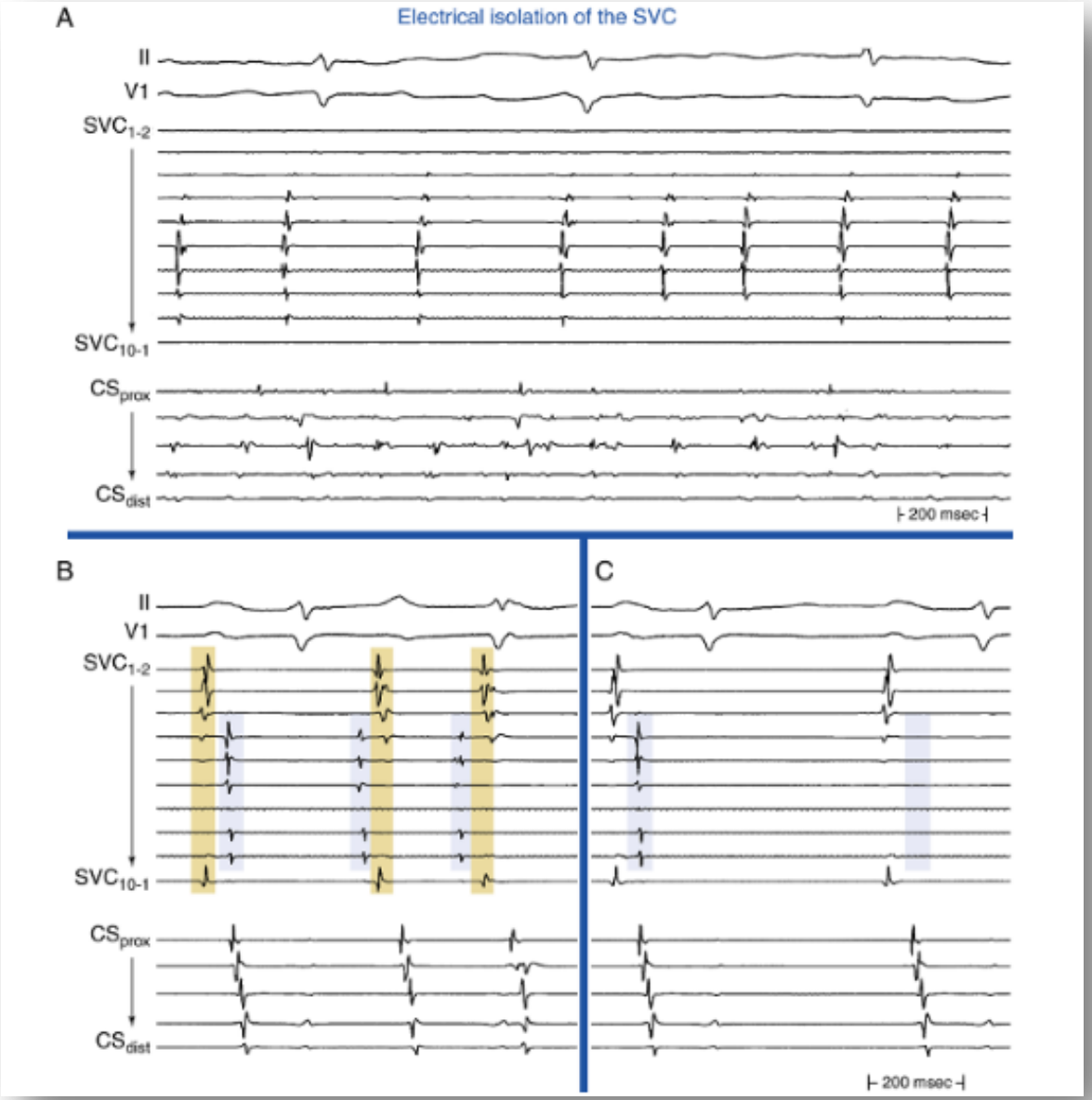
Superior Vena Cava
Ablasyon için ipuçları

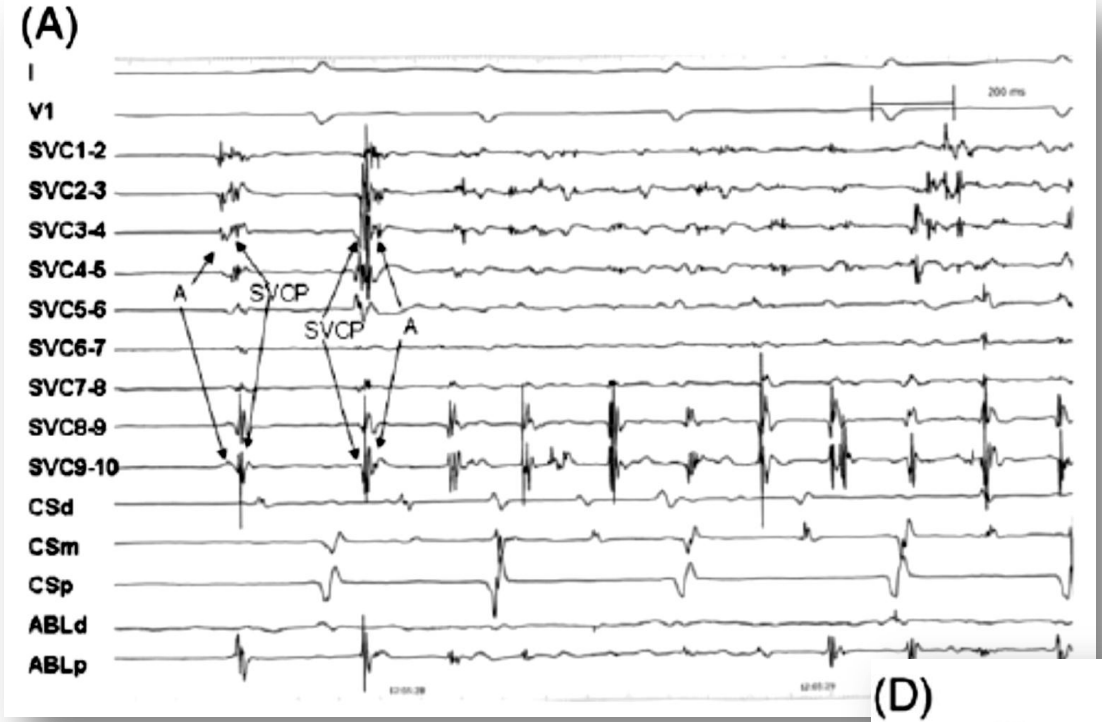
- Önce pigtail kateter ile SVC anjiogramı yapılarak SVC-RA birleşme yeri belirlenmelidir,
- Ablasyon için sirküler kateter (Lasso), basket kateter veya 3-D mapping kullanılabilir,
- SVC, PV'lere göre daha geniştir ve eksantrik şekillidir. Bu nedenle lasso yerletirirken manuplasyon gerektirir,
- Hedef bölge SVC-RA junctiondaki RA ve SVC potansiyellerinin birlikte alındığı yerdir,
- RF enerji bu bölgenin 5 mm altına verilmelidir,
- SVC'nin içinden fokal ablasyon değil RA tarafından çevresel ablasyon yapılmalıdır,
- Son nokta RA ile SVC arasında iletim bloğu oluşturmaktır,
- SVC içinden ablasyon SVC stenozuna neden olabilir,
- Ablasyon sırasında sinüs hızının artması sinüs nodunun hasarlanabileceğini gösterir,
- SVC posterolateralinde frenik sinir seyrettiği için ablasyon öncesi bu bölgeden yüksek outputlu pacing yapılmalıdır.

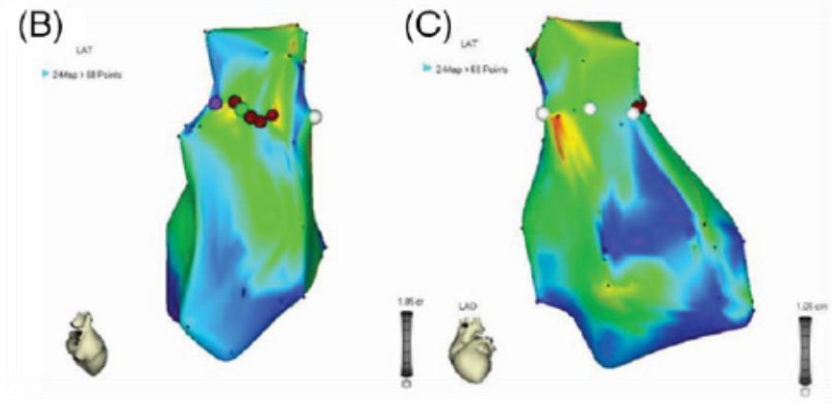
Superior Vena Cava

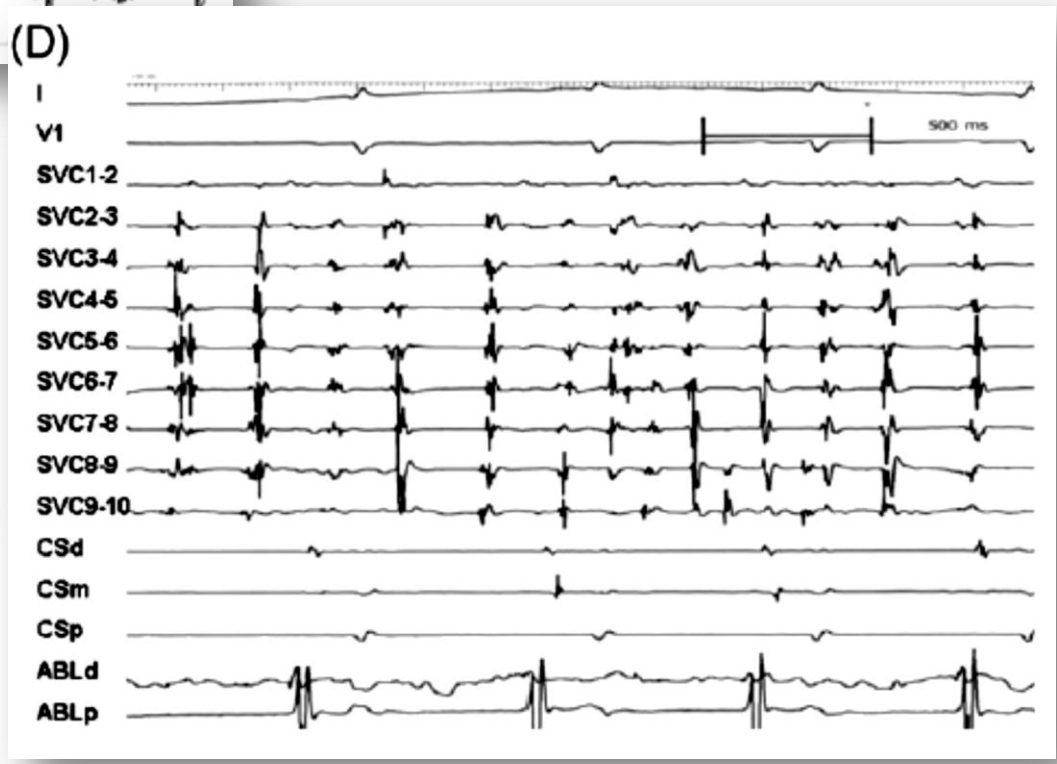


Superior Vena Cava




(A)
I
V1
SVC1-2
SVC2-3
SVC3-4
SVC4-5
SVC5-6
SVC6-7
SVC7-8
SVC8-9
SVC9-10
CSd
CSm
CSp
ABLd
ABLp
200 ms
A
SVCP
SVCP
A


(B)
LAT
(C)
LAT


(D)
I
V1
SVC1-2
SVC2-3
SVC3-4
SVC4-5
SVC5-6
SVC6-7
SVC7-8
SVC8-9
SVC9-10
CSd
CSm
CSp
ABLd
ABLp
500 ms

SVC Ablasyon Sonuçları

RESULTS OF RADIOFREQUENCY CATHETER ABLATION OF ATRIAL FIBRILLATION ORIGINATING FROM THE VENA CAVA

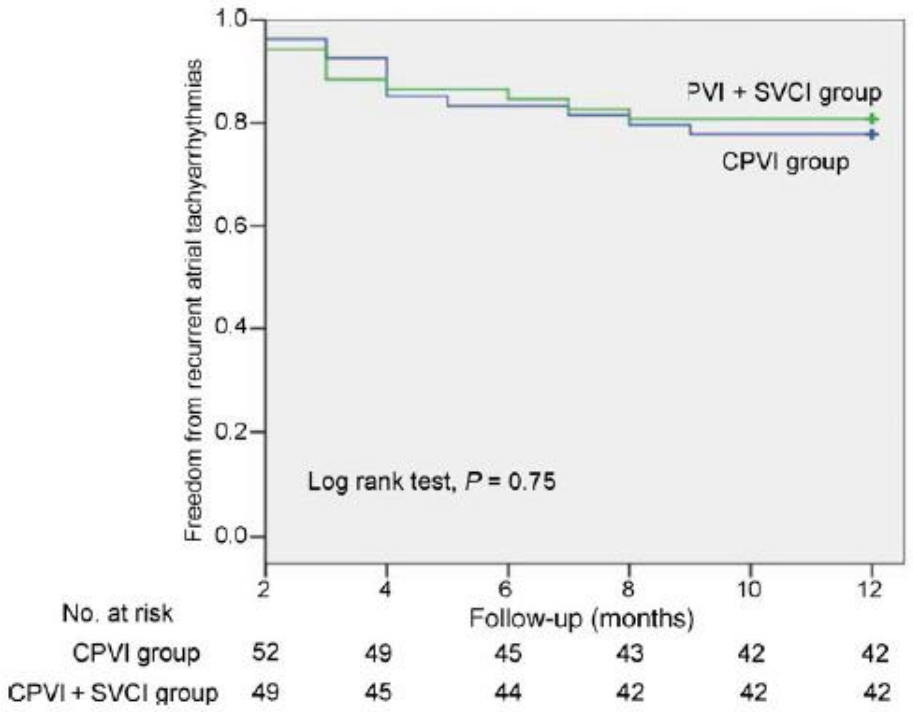
Study	No. of Patients	Mean Age (yr) by Gender	Mapping Tool	Location of Ectopies	Ablation Method (No. of Patients)	Multiple Foci	Acute Success	Complications	Recurrence	Follow-Up (mo)
Chang et al, 2001[14]	2	57 (F), 50 (M)	C	SVC	Focal	NA	Yes	NA	No	6, 3
Ooie et al, 2002[15]	1	42 (F)	Circular	SVC	Isolation	NA	Yes	No	No	7
Goya et al, 2002[16]	16	59±5	Carto, circular	SVC*	Isolation	NA	16 (100%)	0 (0%)	NA†	13±1
Shah et al, 2003[7]	1	50 (M) 60 (F),	Basket	SVC	Isolation	NA	Yes	NA	No	12
Mansour et al, 2002[17]	2	22 (M)	EnSite, C	IVC-os PL	Focal	No	Yes	No	No	9, 2
Liu et al, 2003[18]	2	57 (F), 73 (M)	EnSite	SVC	Isolation	NA	Yes	No	No	2, 2
Weiss et al, 2003[19]	1	54 (M)	EnSite	SVC	Isolation	NA	Yes	NA	No	4
Lin et al, 2003[5]	27	57±12	Basket, C	SVC	Focal (20) Isolation (7)	12 (44%)	27 (100%)	0 (0%)	3 (11%)	NA
Scavee et al, 2003[20]	1	44 (NA)	Circular	IVC-os PM	Isolation	No	Yes	No	No	14
Jayam et al, 2004[21]	1	39 (M)	Basket	SVC	Isolation	NA	Yes	NA	NA	NA
Hsu et al, 2004[22]	5	46±11, 1F/4M	Carto, circular	PLSVC	Isolation	NA	4 (75%)‡	No	1 (25%)	15±10
Elayi et al, 2006[23]	6	50±6, 2F / 4M	Carto, circular	PLSVC	Isolation	NA**	6 (100%)	No	No	13±7
Pastor et al, 2007[24]	3	50±11, 2F / 1M	C, Circular	SVC	Focal (2) Isolation (1)	Yes††	3 (100%)	NA	No	29±17
Liu et al, 2007[25]	4	50±11, 4M	Carto, circular	PLSVC	Isolation	NA	4 (100%)§	No	1 (25%)	18±7
Total	72	—	—	—	—	—	71 (98.6%)	0 (0%)	5 (7.0%)	—

Pulmonary vein isolation combined with superior vena cava isolation for atrial fibrillation ablation: a prospective randomized study

Europace (2008) 10, 600–605

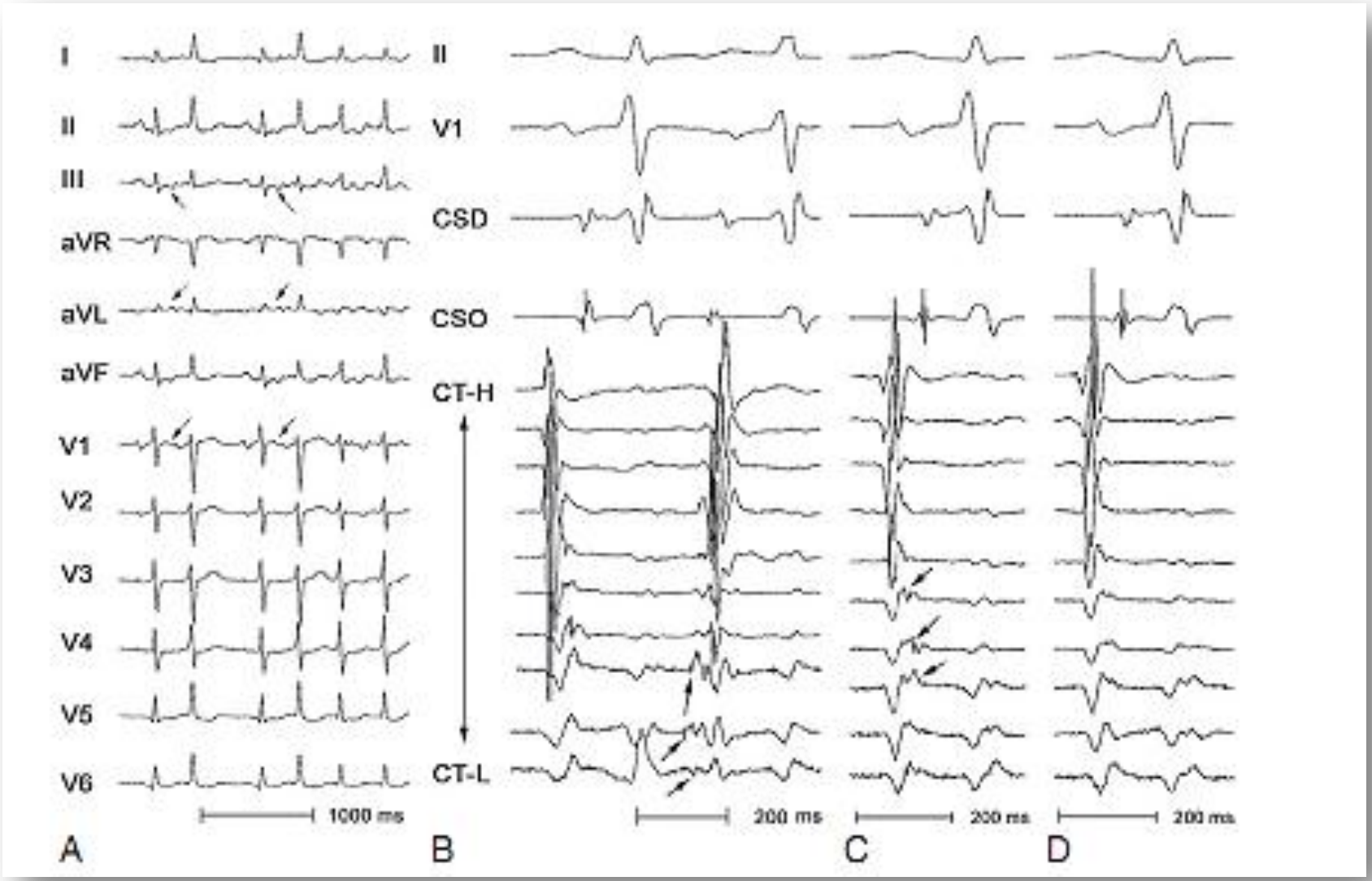
Table 3 Results of circular mapping by Lasso during reablation procedure

	CPVI ($n = 54$)	CPVI + SVCI ($n = 52$)	*P*-value
Cases with ATa recurrence, *n* (%)	12 (22.2)	10 (19.2)	0.70
Reablation cases, *n* (%)	9/54 (16.7)	8/52 (15.4)	0.86
Proportion of PV reconnection in reablation cases, *n* (%)	7 (77.8)	8 (100)	0.16
LSPV	7 (77.8)	7 (87.5)	0.60
LIPV	6 (66.7)	8 (100)	0.07
RSPV	6 (66.7)	4 (50)	0.49
RIPV	7 (77.8)	4 (50)	0.23
Proportion of SVC reconnection	–	0	–

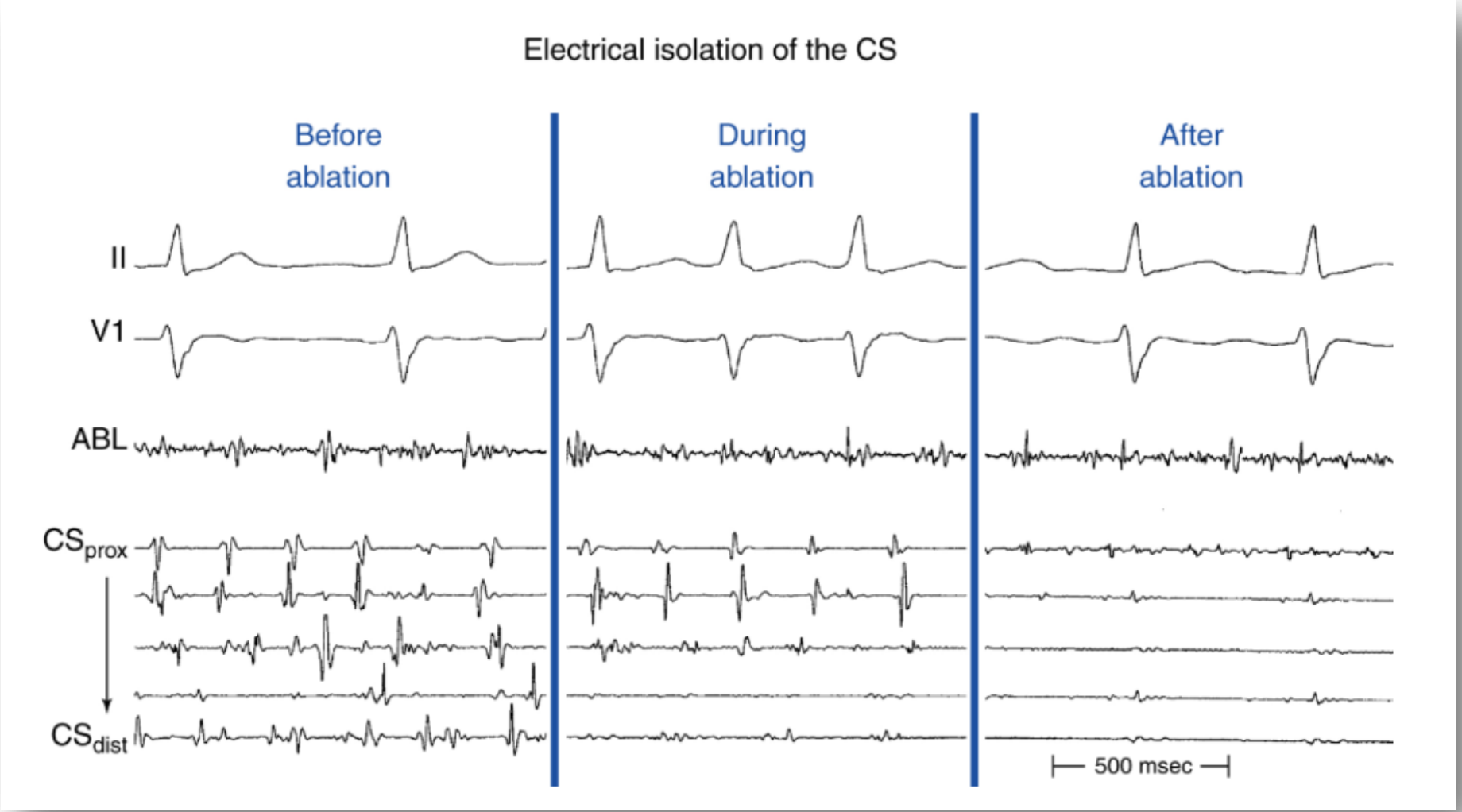


Conclusion In our series of paroxysmal AF patients, empirically adding SVCI to CPVI did not significantly reduce the AF recurrence after ablation. Superior vena cava isolation may be useful, however, in selected patients in whom the SVC is identified as a trigger for AF. However, because of the preliminary property of the study and its relatively small sample size, the impact of SVCI on clinical results should be evaluated in a large series of patients.

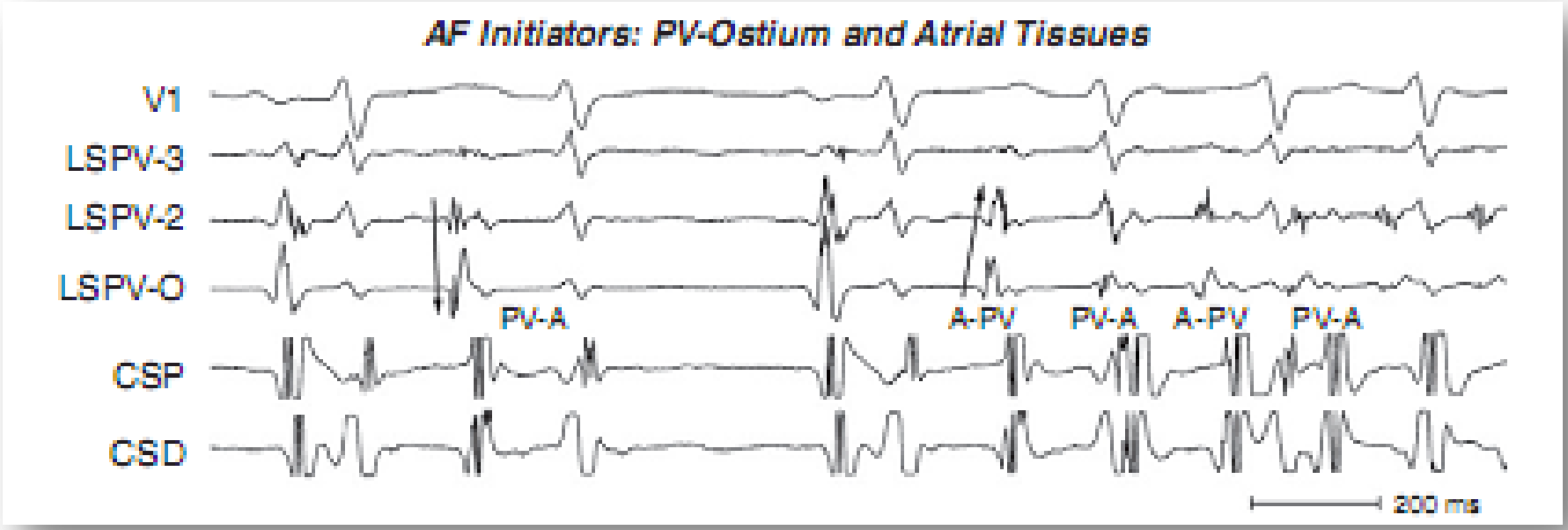
Krista Terminalis



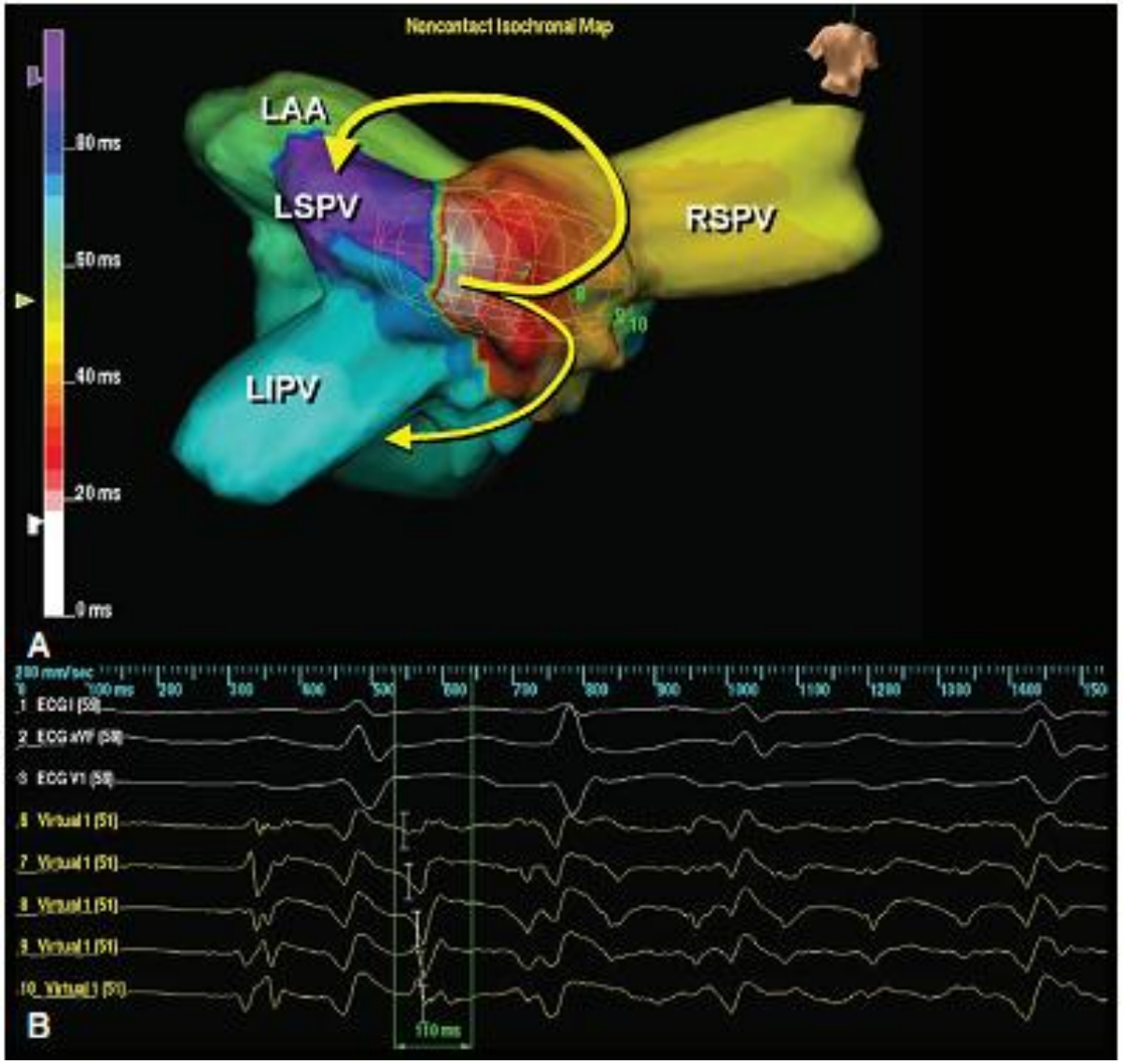
Koroner Sinüs



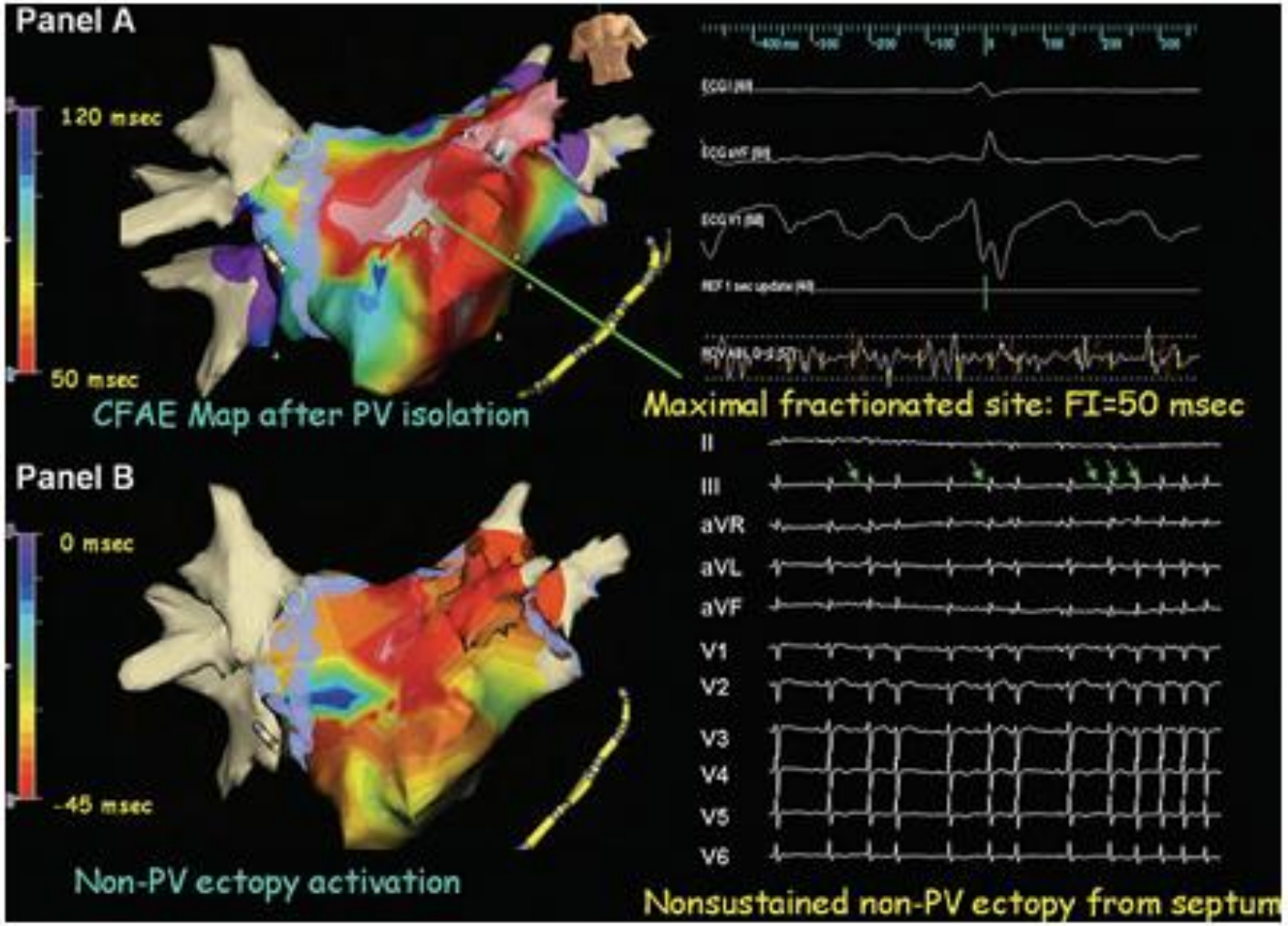
Sol Atriyum Ektopisi



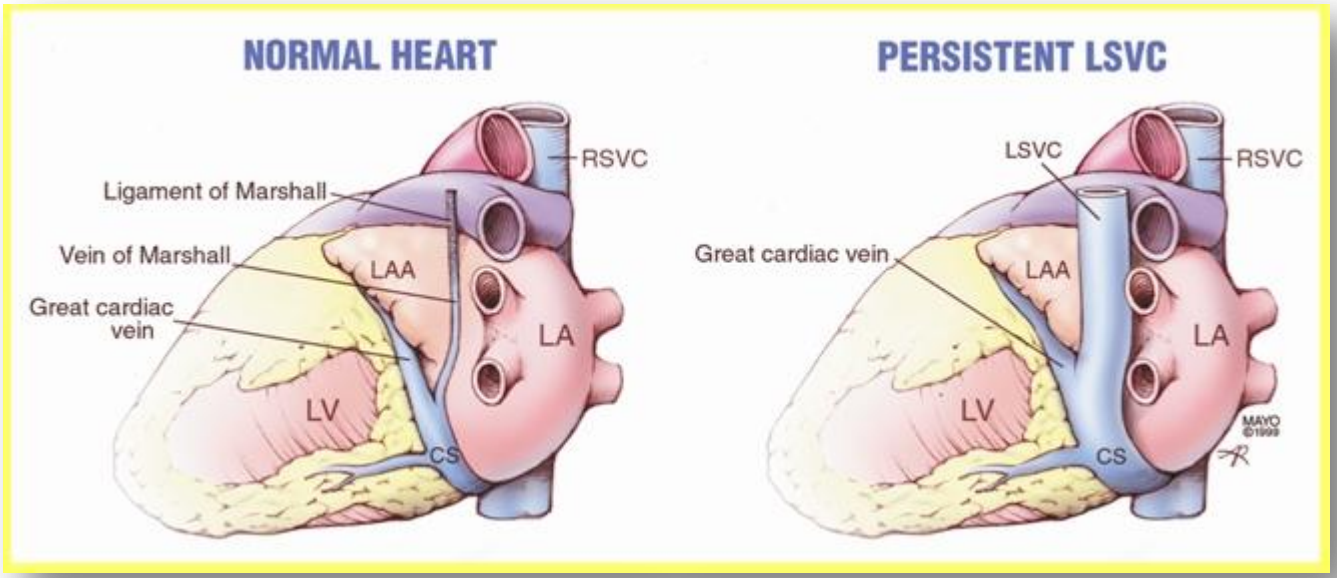
Sol Atriyum Posteriyor Duvar

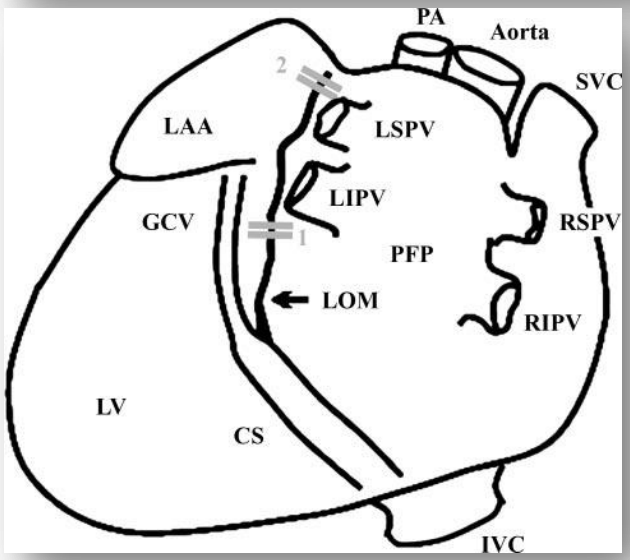


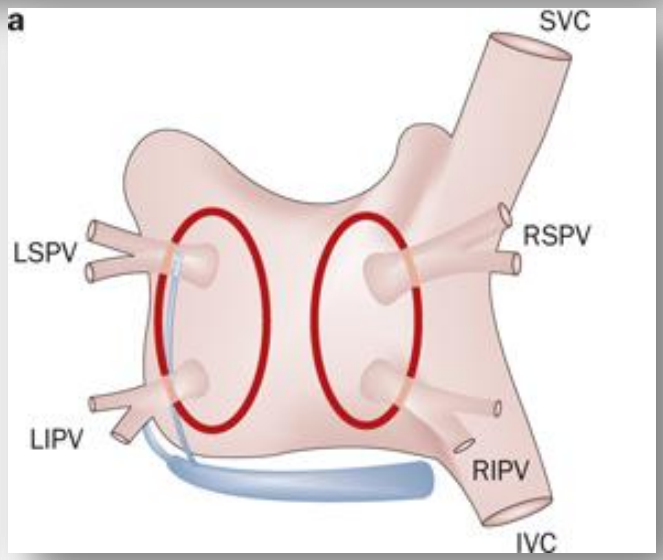
Sol Atriyum Septal, CFAE ile Non-PV ektopi ilişkisi



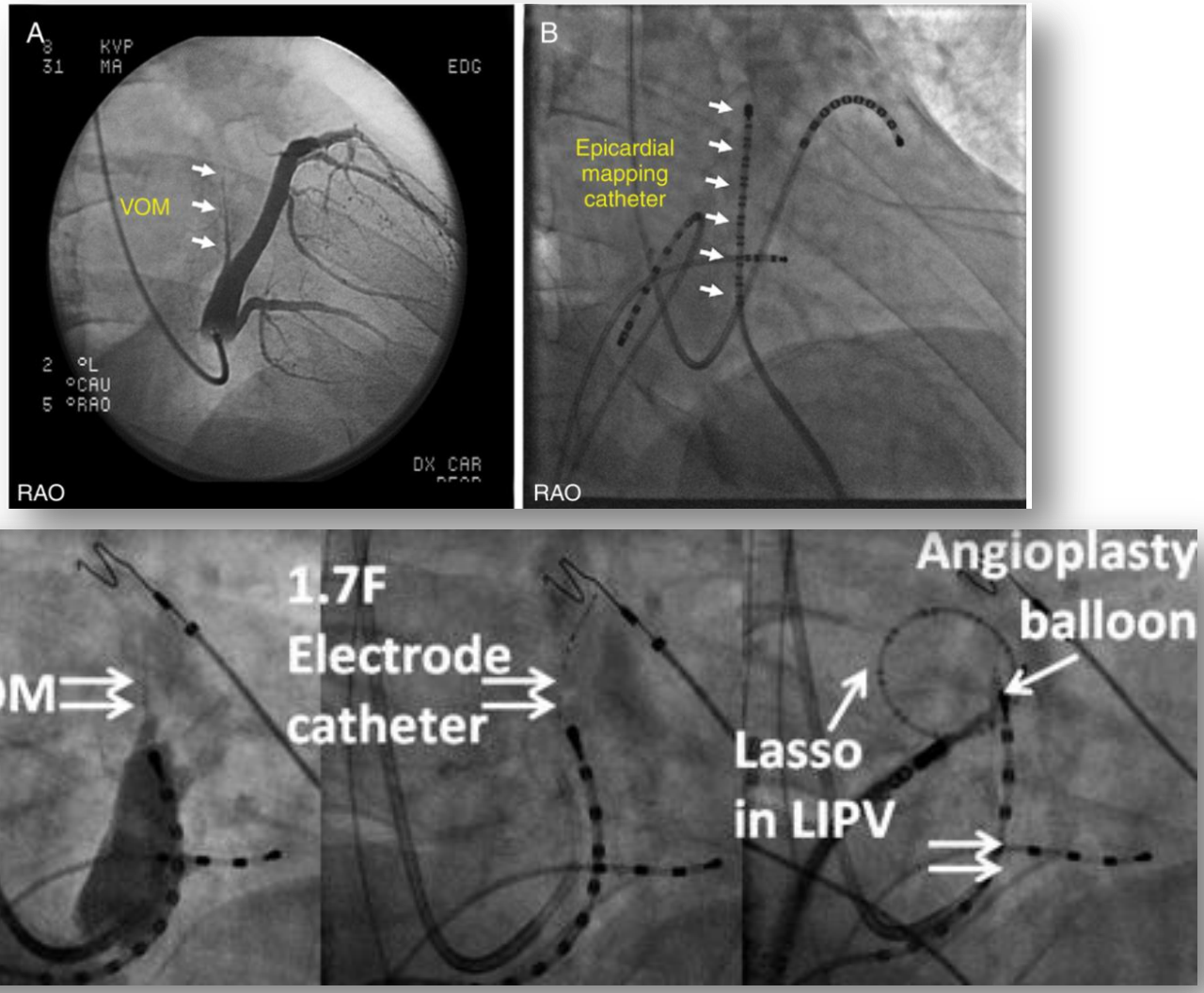
Marshall Ligamenti







Marshall Ligamenti- Mapping



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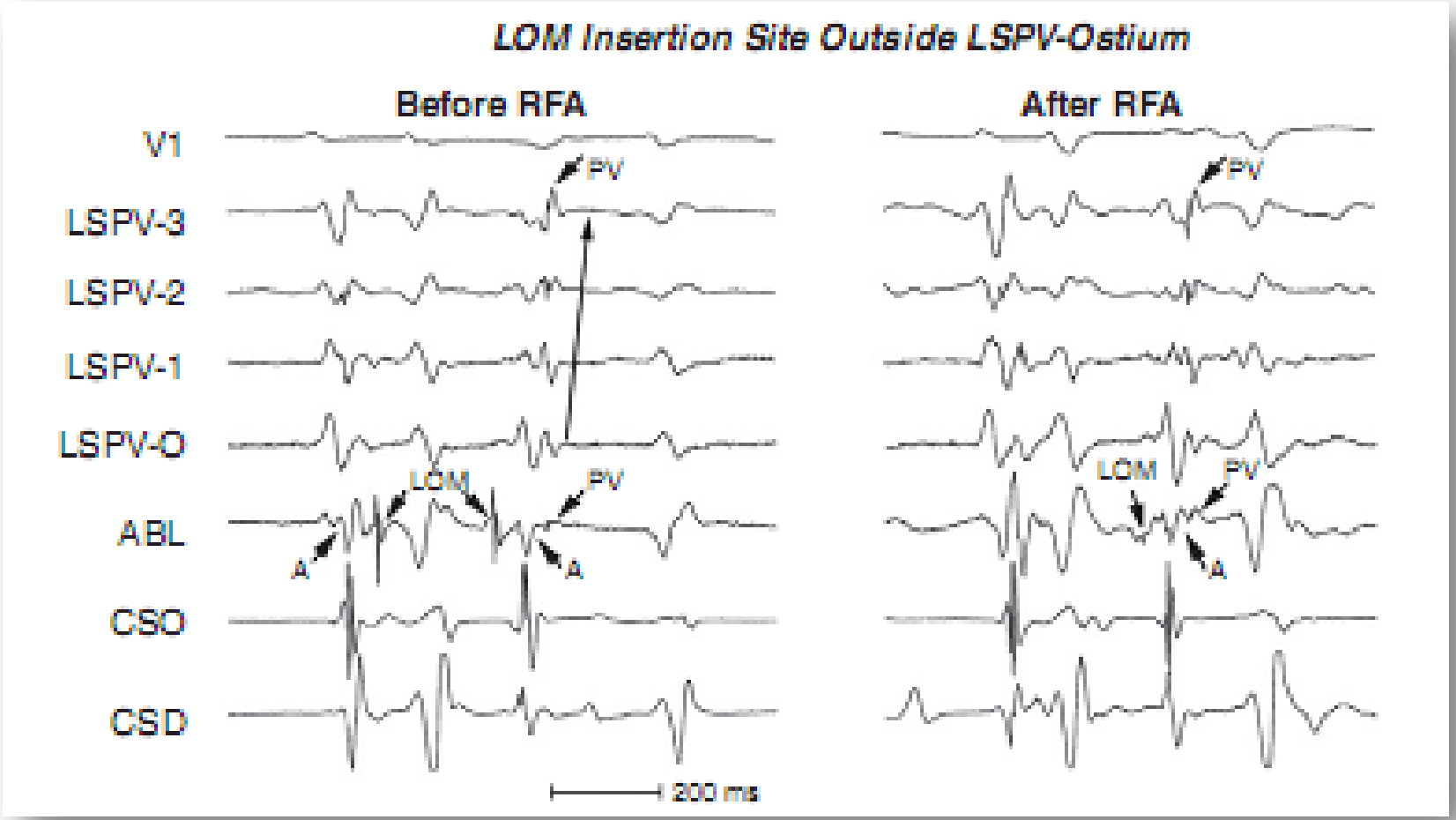

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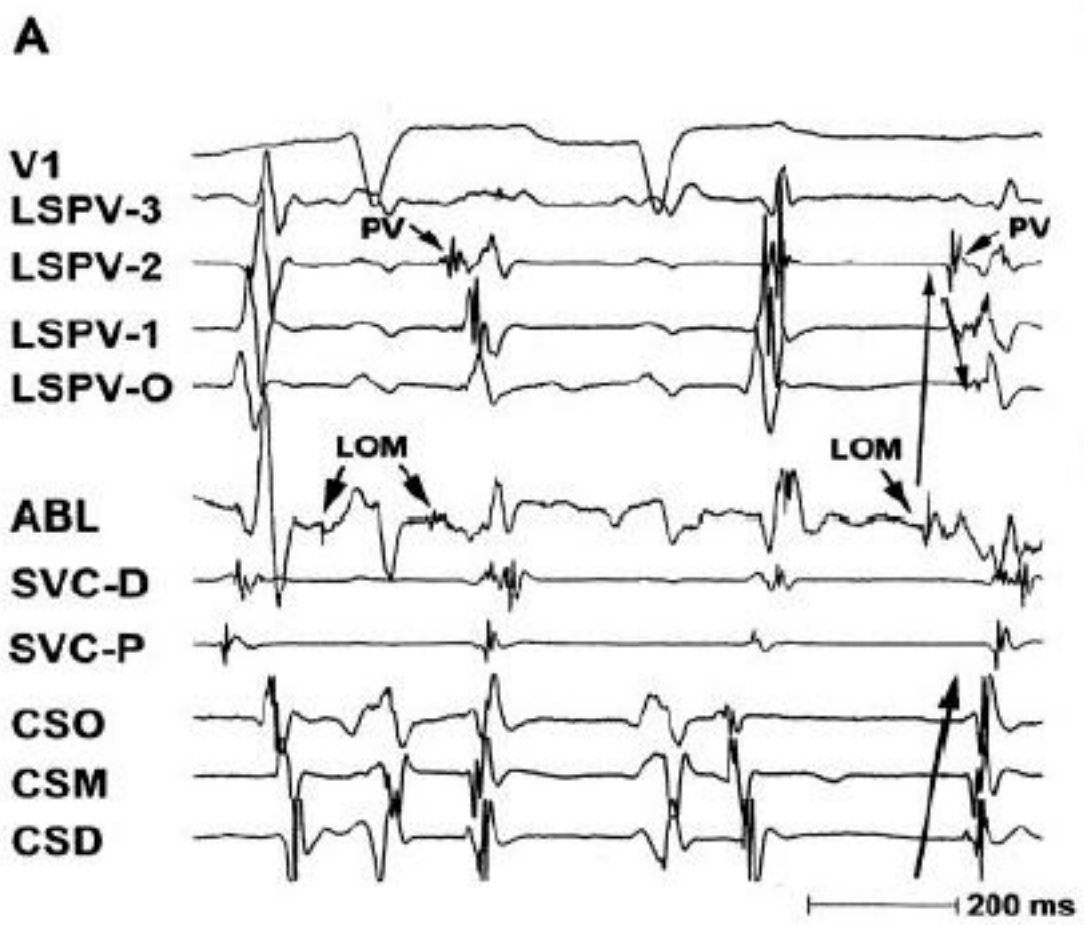
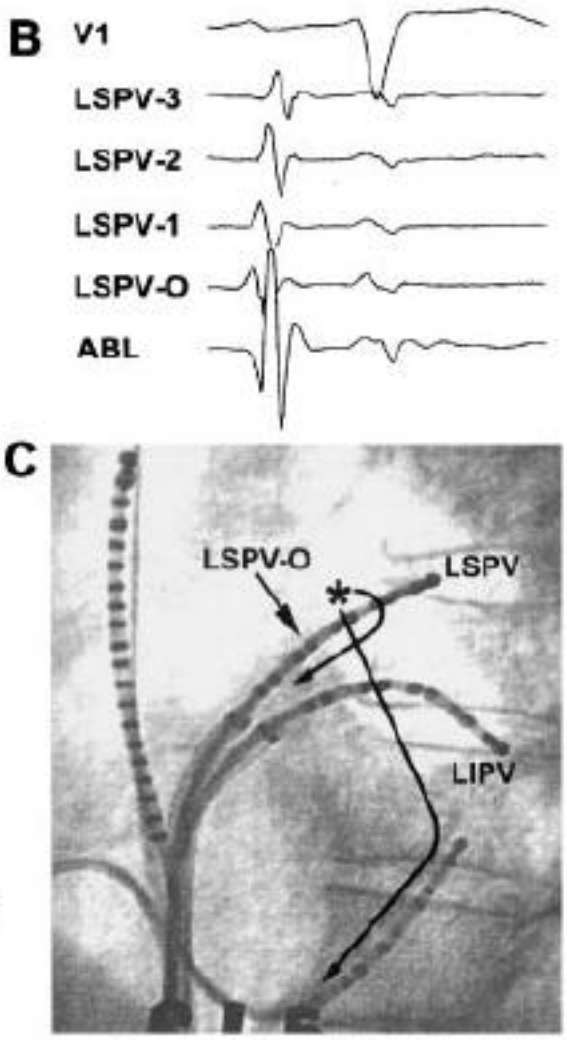
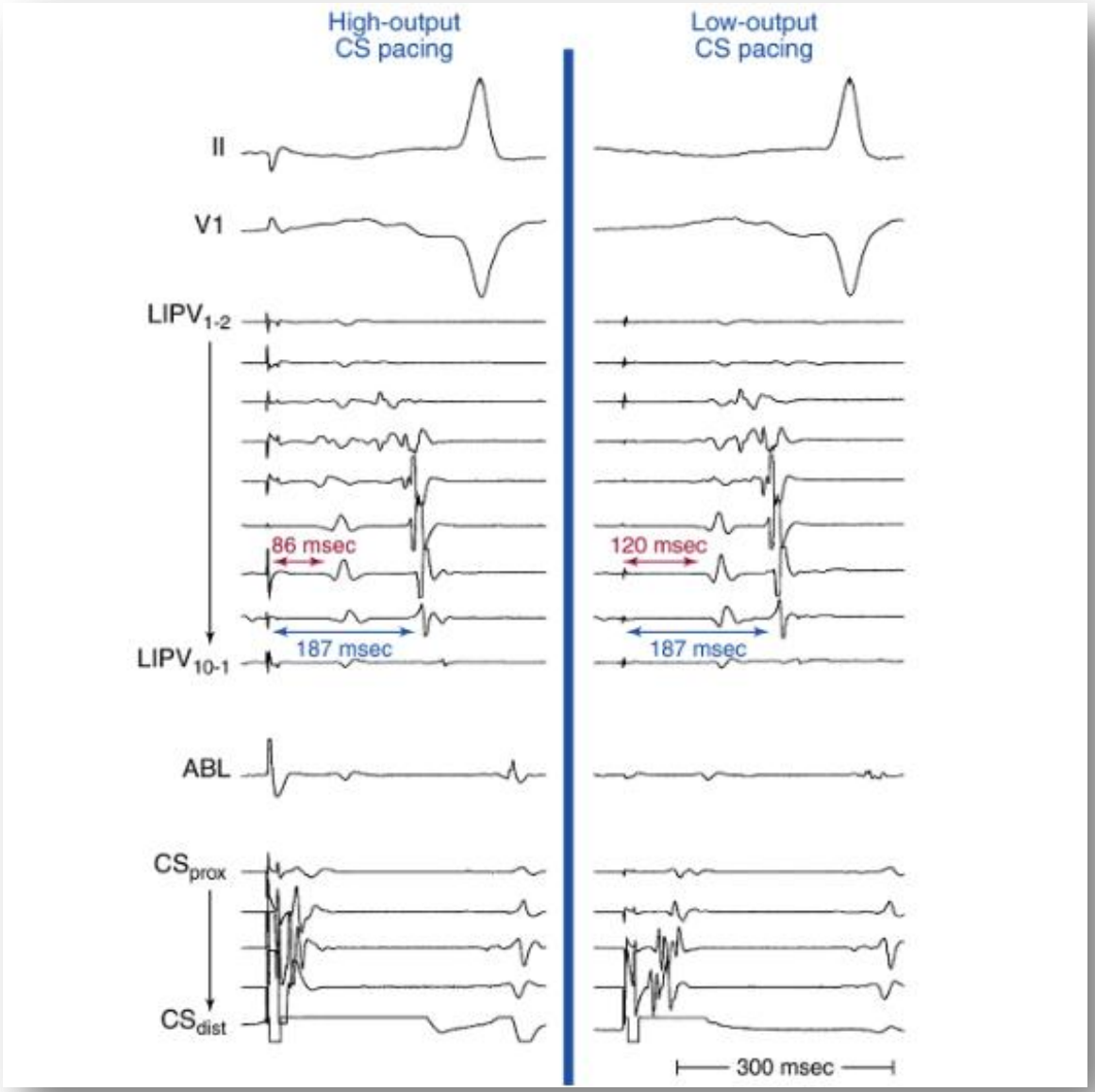
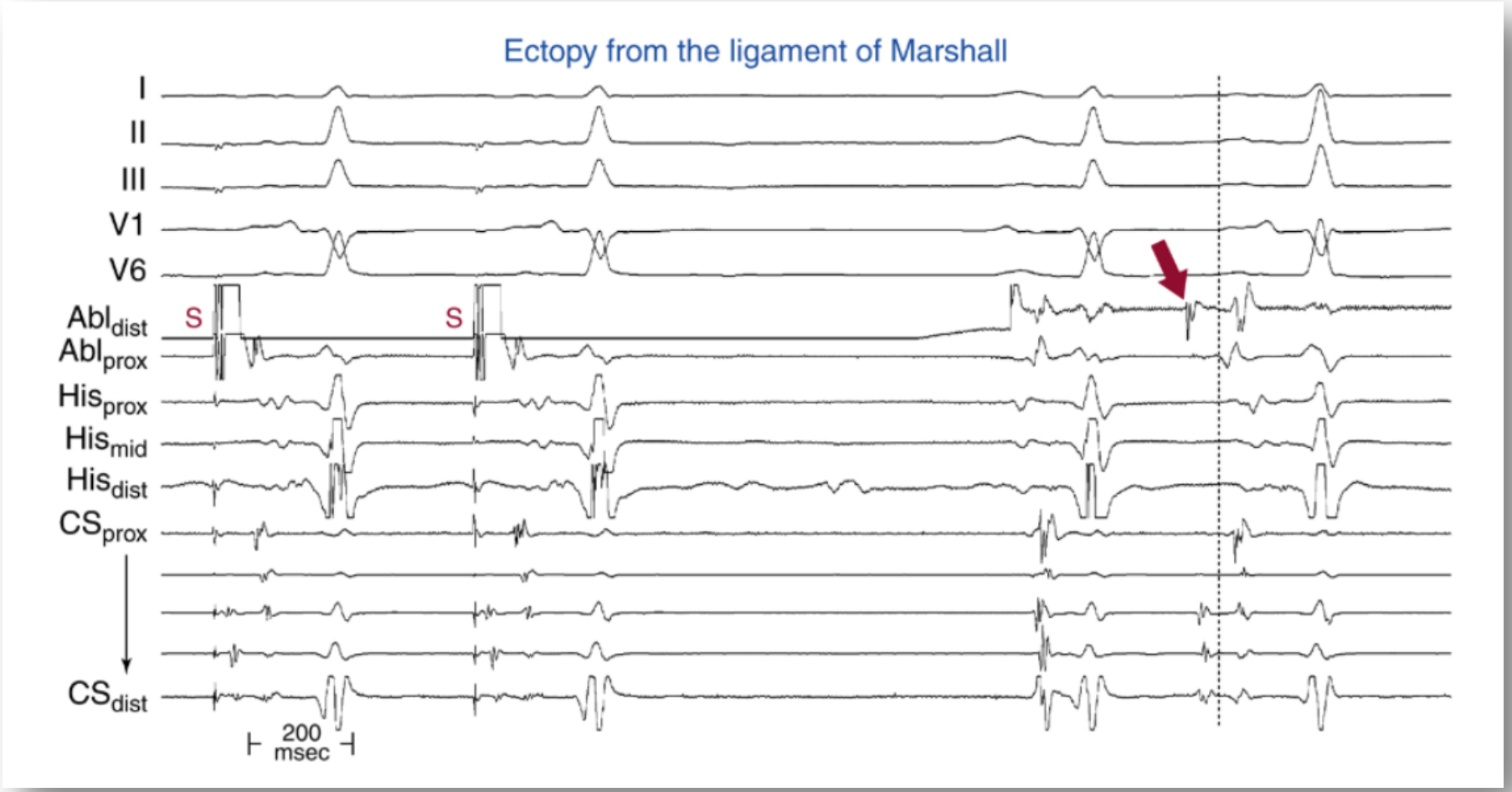




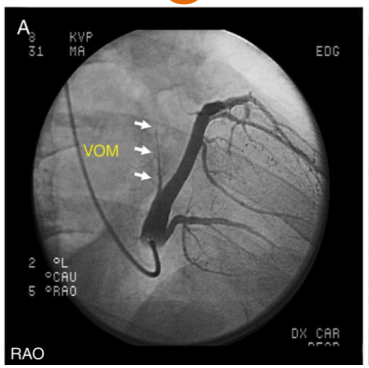
Marshall Ligamenti- Mapping

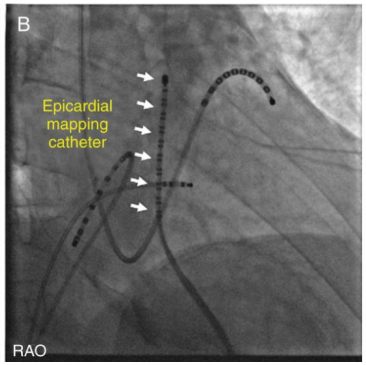


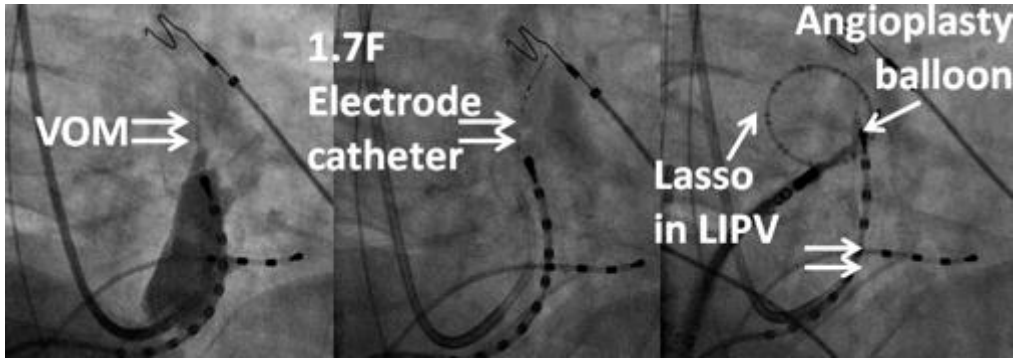
Marshall Ligamenti- Mapping



Marshall Ligamenti- Ablasyon







RESULTS OF RADIOFREQUENCY CATHETER ABLATION OF ATRIAL FIBRILLATION ORIGINATING FROM THE LIGAMENT OF MARSHALL

Study	No. of Patients	Mean Age (yr) by Gender	Mapping Tool	Mapping Site	Ablation Sites (No. of Patients)	Ablation Method	Multiple Foci	Acute Success	Complications	Recurrence	Follow-Up (mo)
Katritsis et al, 2001[27]	10*	54.2±9.4 (NA)	C	LA, CS	LA (4), CS (1), LA/CS (5)	Focal	Yes	7 (70.0%)†	1 (10%) ‡	NA	11±5
Polymeropoulos et al, 2002[28]	1	66 (F)	Carto	LA, CS	LA	Focal	Yes	Yes	No	No	3
Lin et al, 2003[6]	6	66±13 (NA)	C	LA, CS	LSPV-os (5), -inside (1)	Focal	5 (83%)	3 (50.0%)	No	3 (50.0%)	NA
Hwang et al, 2004[29]	21	43.2±8.7 (5F/16M)	Microelectrode	VOM	VOM insertion sites	Focal	Yes	18 (85.7%)	No	2 (11.1%)	19±10
Kurotobi et al, 2006[30]	11	NA	C	LA	Distal end of VOM (LA posterior 5, lateral 4, roof 2)	Focal	NA	11 (100%)	NA	NA	NA
Total	49	—	—	—	—	—	—	40 (81.6%)	1 (2.0%)	5 (10.2%)	—

Catheter Ablation of Paroxysmal Atrial Fibrillation Initiated by Non–Pulmonary Vein Ectopy

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Circulation. 2003;107:3176-3183.

TABLE 1. Clinical and Electrophysiological Characteristics and Ablation Results in Patients With PAF Initiated by Non-PV Ectopy

Group	Patients, n	Age, y	History, y	Other SHD, %	LA Size, mm	Multiple AF Foci, %	Late Recurrence, %
LPFW	27	63±14	5.2±4.0	50	39.5±5.9	100	56
SVC	27	57±12	4.7±4.8	22	36.8±5.1	44	26
CT	10	63±12	4.1±3.2	0	29.7±5.0	40	20
LOM	6	66±13	3.1±2.5	50	41.3±1.5	83	50
CSO	1	67	1	0	...	0	0
IAS	1	44	2	100	...	100	100

SHD indicates structural heart disease.

Multiple Arrhythmogenic Foci Associated With the Development of Perpetuation of Atrial Fibrillation

Circ Arrhythm Electrophysiol. 2010;3:39-45

Table 4. Comparison of Characteristics of Arrhythmogenic Foci Between Paroxysmal and Persistent AF

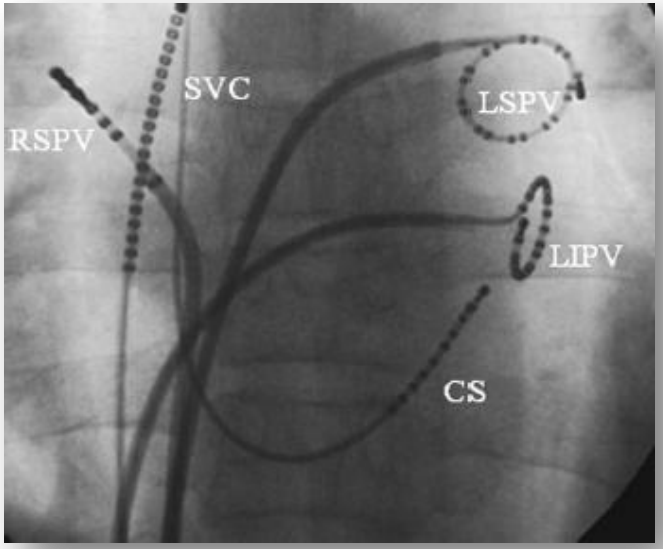
	Paroxysmal (n=170)	Persistent (n=44)	*P* Value
PV foci, %	89	93	0.40
Non-PV foci, %	45	61	0.041
Total No. of foci, counts	2.28±0.12	3.03±0.14	<0.001
No. of non-PV foci, counts	0.98±0.14	2.23±0.16	<0.001
Foci in the left atrium, %	90	96	0.26
Foci in the right atrium, %	28	56	<0.001
Multiple foci (>2)	65%	88%	0.002

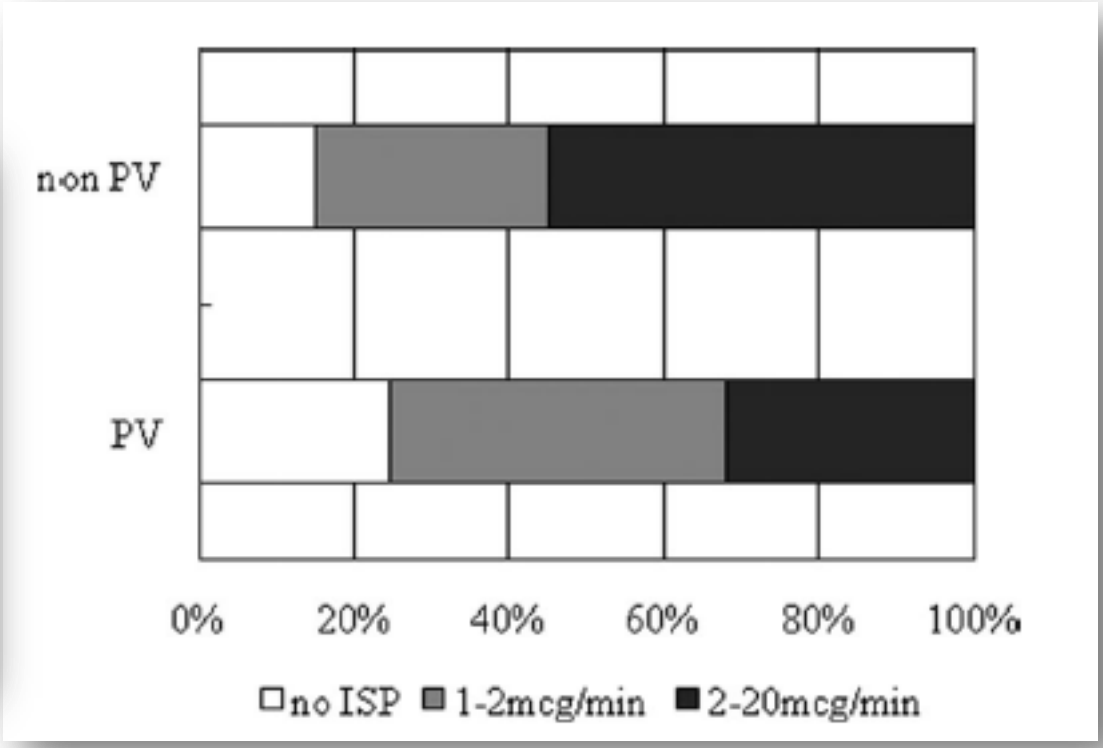
No. of foci are expressed as mean±SEM.

Table 5. Results of Multivariate Analysis of Persistent AF

	Individual Variable		Multivariable	
	Odds Ratio (95% CI)	*P* Value	Odds Ratio (95% CI)	*P* Value
Multiple foci, yes/no	4.15 (1.51–11.08)	0.002	4.69 (1.82–12.09)	<0.001
LAD, mm	1.17 (1.10–1.26)	<0.001	1.14 (1.04–1.25)	0.004
LVEF, %	1.03 (1.01–1.04)	0.004		
Male sex, yes/no	2.52 (1.10–5.76)	0.025		
Age, y	0.98 (0.95–1.01)	0.087		
Hypertension, yes/no	1.13 (0.57–2.22)	0.65		
SHD, yes/no	1.27 (0.80–2.03)	0.67		
AF duration, mo	1.00 (0.99–1.00)	0.68		
No. of AAAs, counts	0.84 (0.66–1.07)	0.50		

Multiple Arrhythmogenic Foci Associated With the Development of Perpetuation of Atrial Fibrillation





Benim Çıkardığım Sonuç

- AF fizyopatolojisi çok kompleks,
- AF'den sadece PV'ler sorumlu değil,
- Bir ya da daha fazla PV dışı AF tetikleyicisi olabilir,
- AF ablasyonunda ilk işlemde ve özellikle nükslerde PV dışı tetikleyiciler hatırlanmalıdır,
- Özellikle AF kronikleştikçe PV dışı odaklar artmaktadır,
- PV dışı odakların araştırılması için multiple odaklar dikkatlice incelenmelidir,
- AF ablasyonu sadece anatomik değildir ve ciddi elektrofizyoloji bilgisi gerektirir,
- Bütün bunları uygulaması için elektrofizyoloğun çok sabırlı olması gerekir.