ZOR AKSESUAR YOLLARIN ABLASYONU

Epikardiyal Yerleşimli Aksesuar Yollar

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Ablasyon Tedavisi
Başarı Oranları

Aritmi Tipi	Başarı oranı (%)
WPW veya AVRT (gizli AP)	85-95
AVNRT	95+
Atriyal fibrilasyon	60-70
Tipik atriyal flutter	80-90
Atriyal taşikardi	70-80
Ventriküler taşikardi (Normal kalp)	90
Ventriküler taşikardi (Yapısal kalp hastalığı	70-90

Aksesuar Yol Ablasyonu
Başarısızlık Nedenleri

- AP bölgesine kateterin ulaştırılamaması (% 25)
- Kateter stabilizasyonundaki sorunlar (% 23)
- AP oblik seyri nedeniyle mapping yetersizliği (% 11)
- Sağ taraflı posteroseptal AP'nin soldan ablasyonu (% 6)
- Aksesuar lokalizasyondaki hatalar (% 9)
- Epikardiyal lokalizasyon (% 8)
- Tekrarlayan atriyal fibrilasyon (% 3)
- Komplikasyon oluşması (% 3)
- Triküspit annulustan 2 cm uzakta anterior sağ ventrikülde yerleşimli nadir sağ taraf AP (% 1.5)
- Açıklanamayan faktörler (% 11)

Morady F, J Am Coll Cardiol 1996;27:683-9.

Aksesuar Yol Ablasyonu
Başarısızlık Nedenleri

- Derin yerleşim
- Anatomik zorluklar
- Ek yapısal anormallikler
- AV noda yakınlık
- Multiple aksesuar yol varlığı
- Epikardiyal lokalizasyon

Scanavacca MI, et al. Circ Arrhythm Electrophysiol 2015;8:128-136.

Başarısız Aksesuar Yol Ablasyonu

Çözümler

- Daha deneyimli operatörle yer değiştirme
- Farklı ablasyon kateteri kullanma
- Retrograd yoldan transseptale geçiş
- İnferior vena kaval yaklaşımdan süperiora geçiş
- Uzun sheath kullanımı
- Ventrikül ve atriyal yüzden detaylı haritalama
- AP potansiyelini koroner sinüs içinde arama

Morady F, J Am Coll Cardiol 1996;27:683-9.

Epikardiyal aksesuar yolun tedavisi

- Cerrahi
- Torakoskopi
- Epikardiyal damarlar (koroner sinüs)
- Subksifoid yol

Guiraudon GM, et al. Circulation 1986;74:525–529.
Graffigna A, et al. J Card Surg 1993;8:108 –116.
Inoue Y, et al. Surg Today 2000;30: 811– 815.
Watanabe G, et al. Pacing Clin Electrophysiol 1998;21:553–558.
Stellbrink C, et al. J Cardiovasc Electrophysiol 1997;8:916 –921.

Epikardiyal Ablasyon

- 1996 yılında kadar endokardiyal mapping ve ablasyon aritmilerin ablasyonunda standart yaklaşım olarak kullanılmıştır.
- Endokardiyal ablasyonun yapılamadığı veya başarısız olduğu WPW sendromu olgularında aksesuar yolun cerrahi olarak rezeksiyonu 1969 yılında tanımlanmıştır.
- Sosa ve ark. Chagas kardiyomiyopatisi olan olgularda VT ablasyonunu tanımlamasıyla epikardiyal yaklaşım gereken aritmilerin ablasyonunda yeni bir alternatif yol ortaya konmuştur.

Guiraudon GM, et al: Circulation 1986;74:525–529.
Sealy WC, et al. Ann Thorac Surg 1969;8:1–11.
Sosa E, et al. J Cardiovasc Electrophysiol 1996;7:531–536.

Epikardiyal ablasyon uygulanabilecek aritmiler

- Ventriküler taşikardi
  - NIKMP % 28 – 35
  - ARVD/RVC %41
  - İskemik KMP %16 -23
  - Chagas hastalığı
- Atriyal fibrilasyon
- Aksesuar yollar

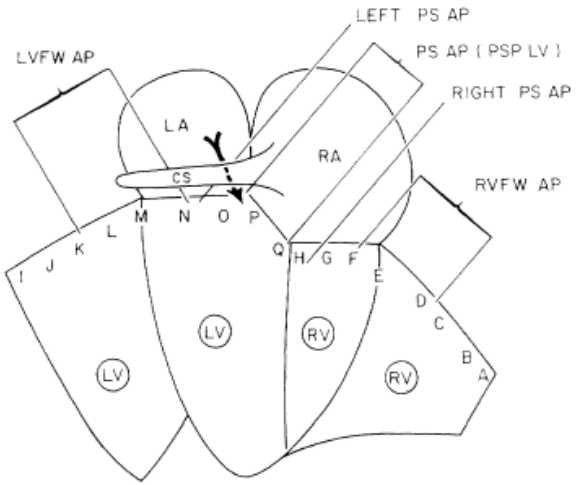
Soejima K, J Am Coll Cardiol 2004
Sosa E, J Am Coll Cardiol 2000
Sacher F, J Am Coll Cardiol 2010

Surgery for Wolff-Parkinson-White syndrome: further experience with an epicardial approach

GERARD M. GUIRAUDON, M.D., GEORGE J. KLEIN, M.D., ARJUN D. SHARMA, M.D., DOUGLAS L. JONES, PH.D., AND DOUGLAS G. MCLELLAN, M.A.

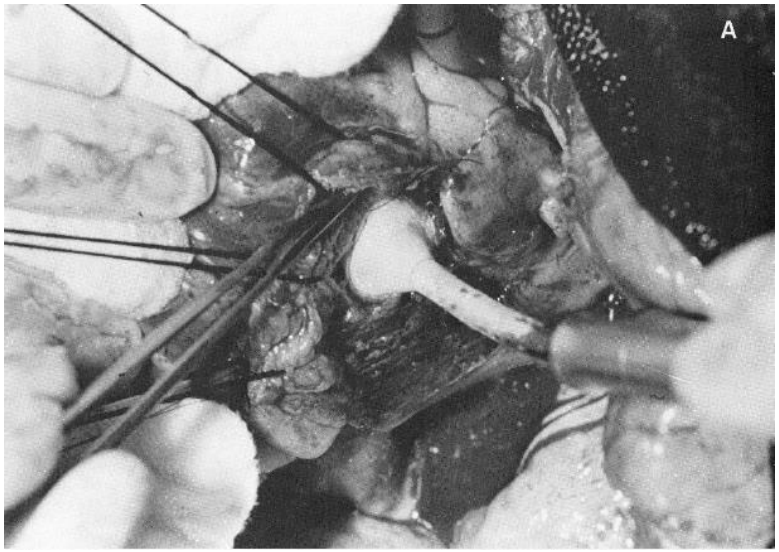
ABSTRACT We have previously reported the use of an epicardial approach for ablation of left ventricular free wall accessory atrioventricular pathways. The technique involves mobilization of the atrioventricular fat pad and exposure and cryoablation of the atrioventricular junction at the site of the accessory pathway on the normothermic beating heart. Here we describe our further experience with left ventricular free wall accessory pathways and right ventricular free wall accessory pathways. Our experience is based on 53 consecutive patients. There were 35 male and 18 female subjects, 6 to 52 (mean 41.4) years old. Forty-eight patients had a left ventricular free wall accessory pathway, and five had a right ventricular free wall accessory pathway. Two patients had an associated anterior septal accessory pathway. Five patients had associated cardiac abnormalities, including atrial septal defect, aortic insufficiency, mitral valve prolapse, Ebstein's anomaly, and cardiomyopathy. The accessory pathway was ablated in 52 patients who remain arrhythmia free without medication after a mean follow-up period of 12 months. The accessory pathway was permanently modified in one patient. There were no postoperative complications. This epicardial approach can be performed with normothermic cardiopulmonary bypass or without bypass. It does not require cross-clamping of the aorta, allowing a greater margin of safety when this is required for concomitant procedures.

Circulation 74, No. 3, 525–529, 1986.

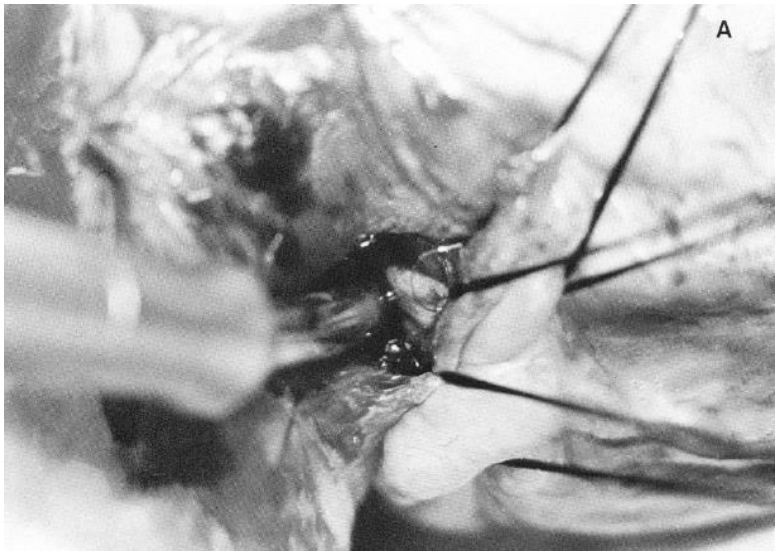


RING MAP OF "FREE WALL" AP IN THE WPW SYNDROME

Guiraudon GM, et al: Circulation 1986;74:525–529.



Sol serbest duvar (cryo)



Posterior septal (cryo)

Epikardiyal aksesuar yol

Tanı

- EKG
- Önceki elektrofizyolojik çalışma ve başarısız ablasyon

Epikardiyal aksesuar yol
Lokalizasyon

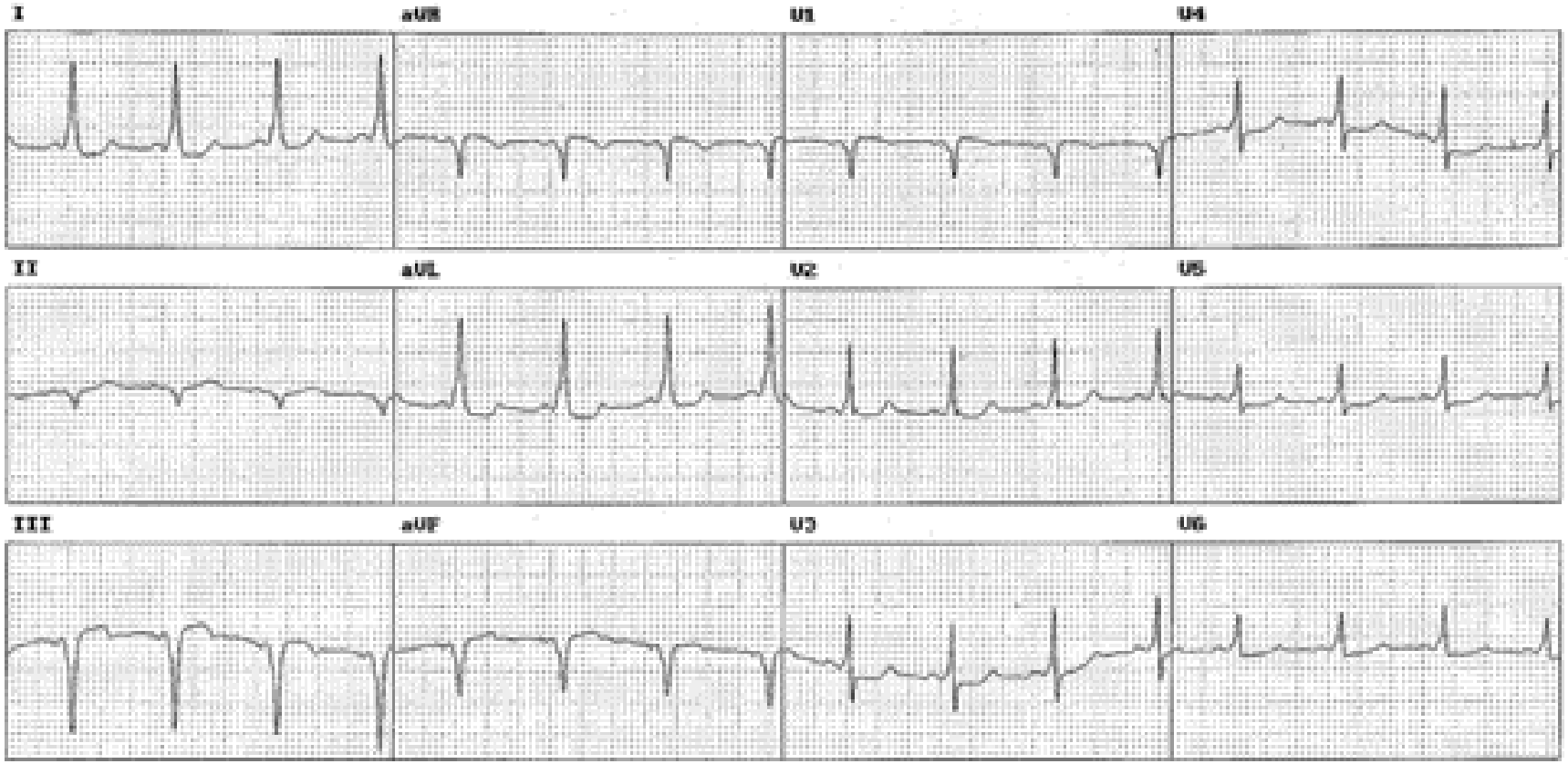
- Koroner sinüs (posteroseptal)
- Sağ serbest duvar (atriyal appendiks - miyokart arası)

Epikardiyal posteroseptal aksesuar yol

- Koroner sinüsün atriyum ve ventrikül arasında elektriksel iletiyi yapabilen musküler yapıya sahiptir.
- Anatomik varyasyon varlığında epikardiyal AP predispozisyonu artar (olguların % 30'unda middle kardiyak vende divertikül)
- Epikardiyal posteroseptal aksesuar yol tanısı
  - En sensitif bulgu derivasyon II'de negatif delta dalgası (olguların % 87'sinde)
  - En spesifik bulgu AVR'de pozitif delta dalgası ve V6'da derin S dalgası (R≤S)

Sun Y, et al. Circulation 2002;106:1362–7.
Takahashi A, et al. J Cardiovasc Electrophysiol 1998;9:1015–25.
Haghjoo M, et al. Pacing Clin Electrophysiol 2008.

Sağ posteroseptal aksesuar yol

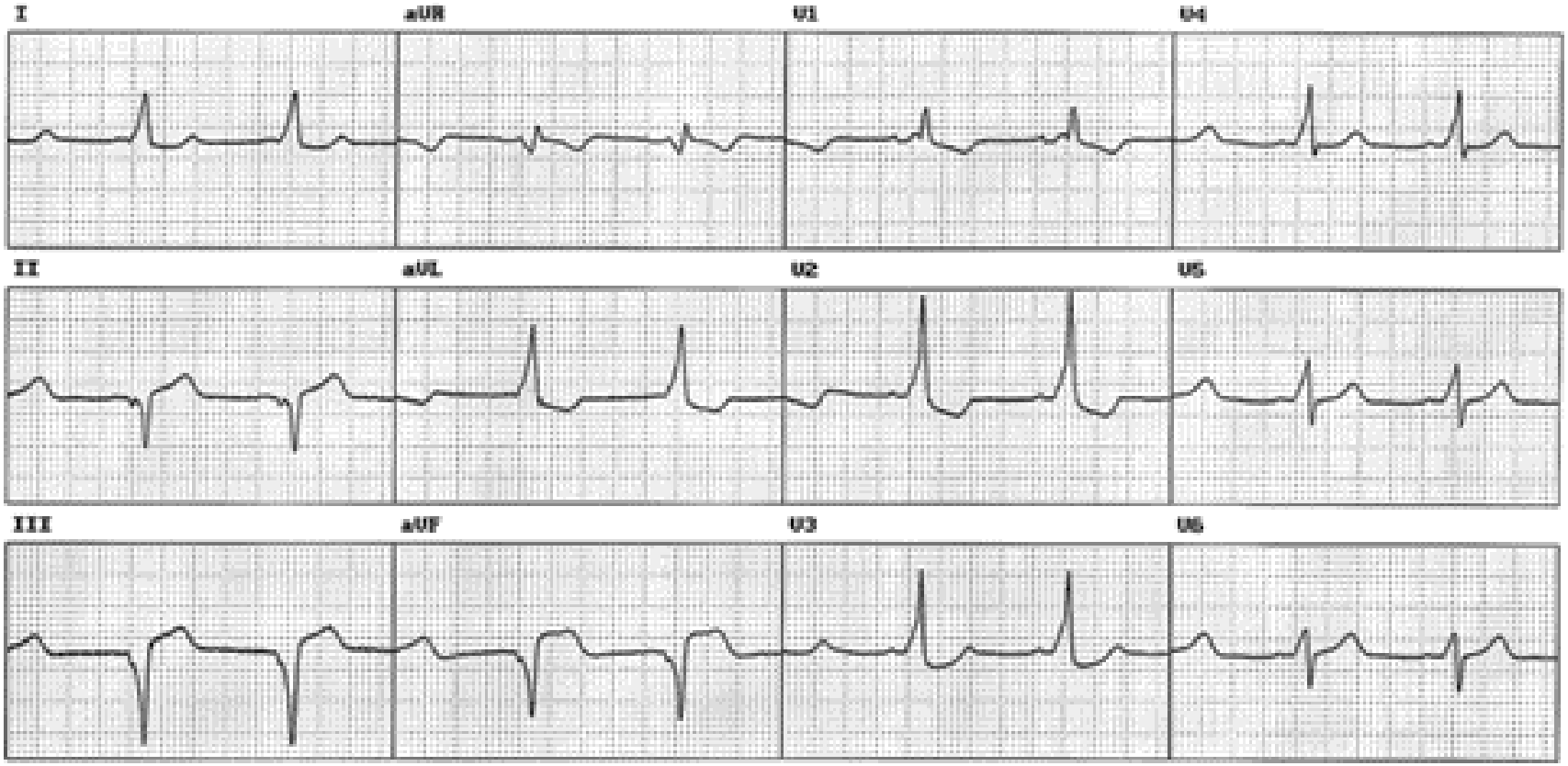


Haghjoo M, et al. Pacing Clin Electrophysiol. 2008

Sol posteroseptal aksesuar yol

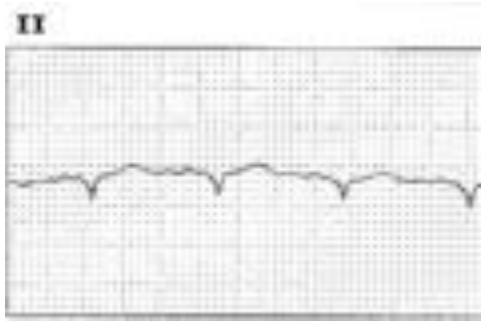
Haghjoo M, et al. Pacing Clin Electrophysiol. 2008

Epikardiyal posteroseptal aksesuar yol



Haghjoo M, et al. Pacing Clin Electrophysiol. 2008

Sağ posteroseptal



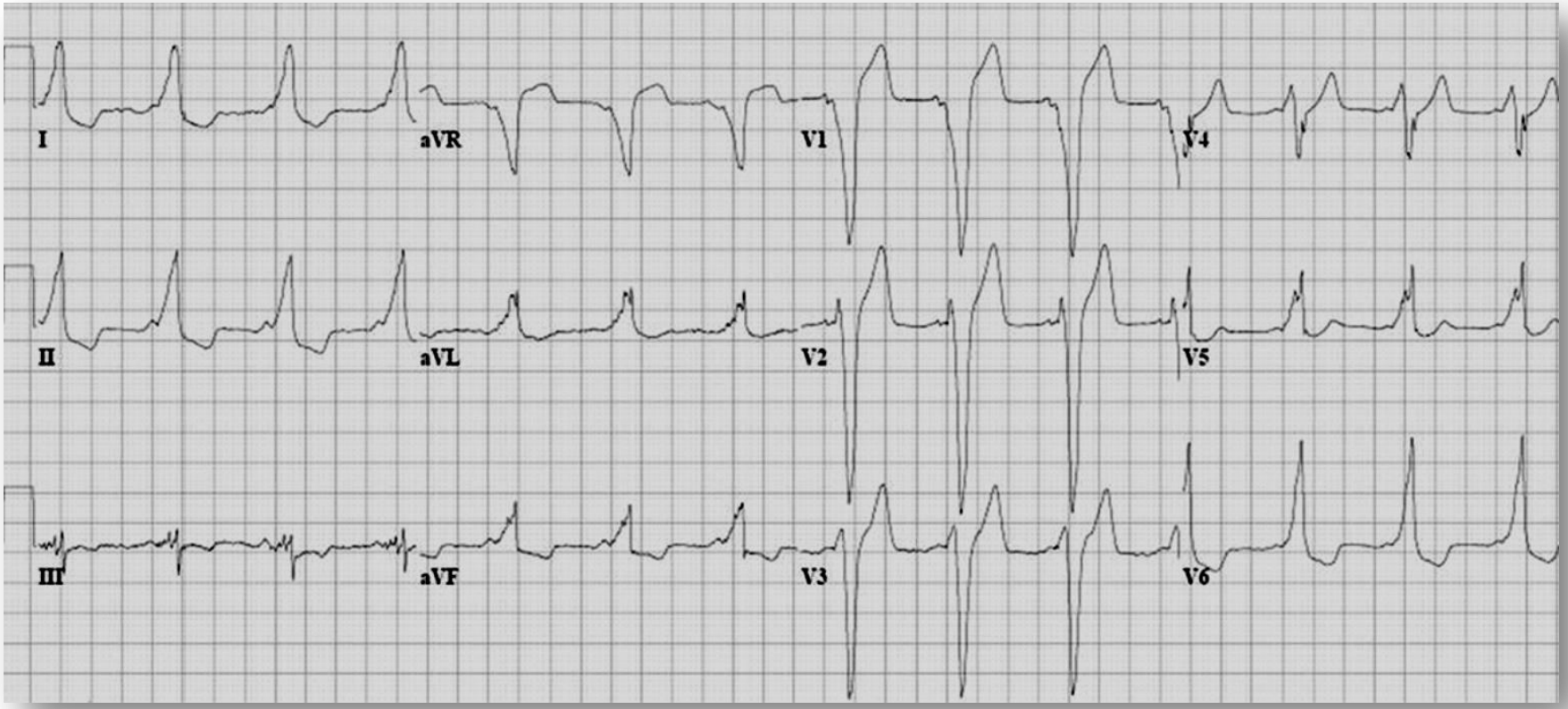
Sol posteroseptal

Epikardiyal posteroseptal

Sağ serbest duvar aksesuar yol

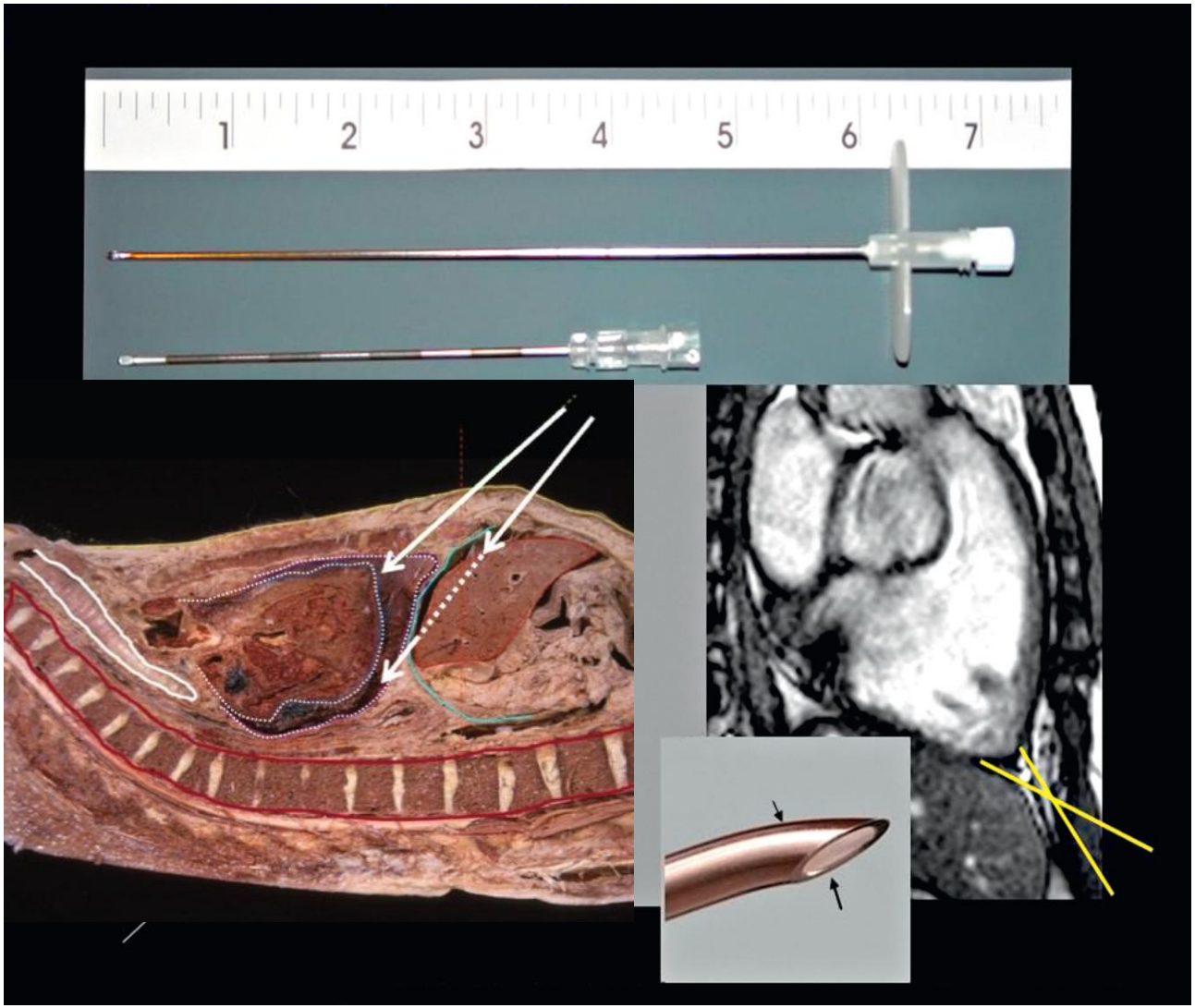
- Sağ atriyal appendiks sağ ventrikülün önüne doğru temasla atriyoventriküler konneksiyon sağlayabilir.
- Sağ serbest duvara ait aksesuar yolun (endokardiyal ve epikardiyal) EKG bulgusu *V1 derivasyonunda negatif delta dalgası*dır.
- Epikardiyal ablasyon kararı vermek için endokardiyal olarak ablasyon için yeterli kayıt alınamaması en iyi yoldur.

Sağ serbest duvar aksesuar yol

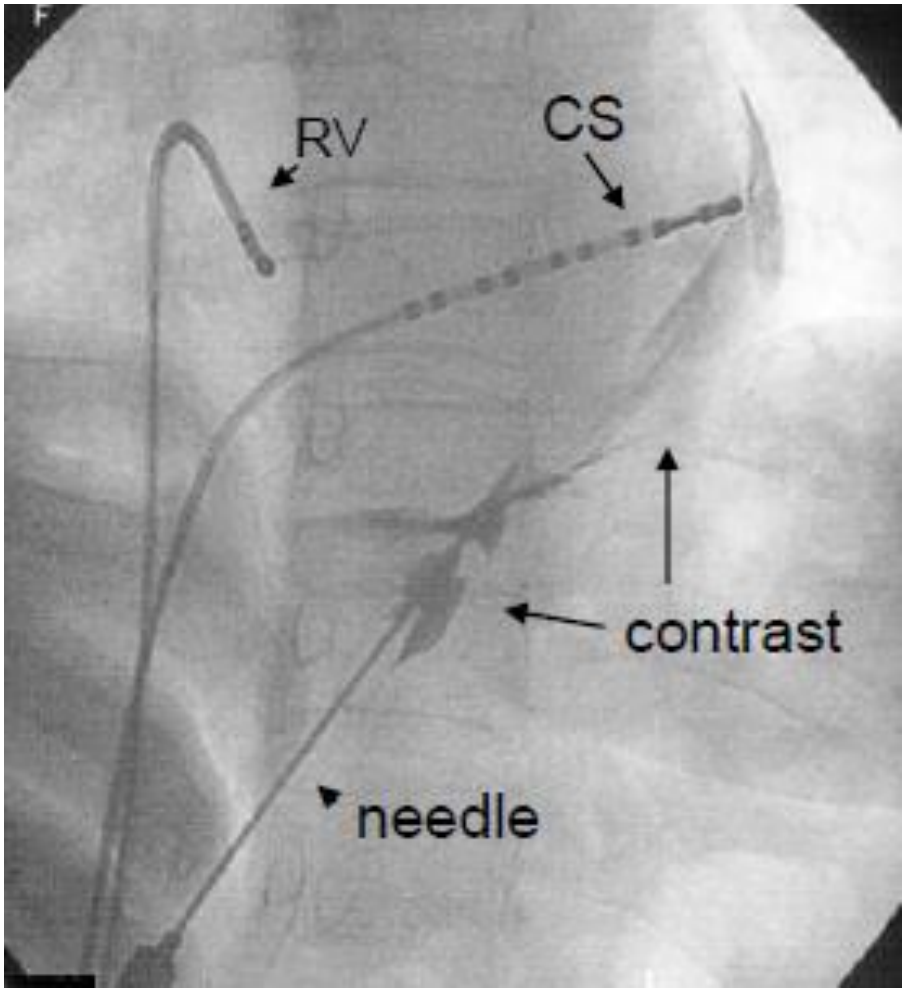


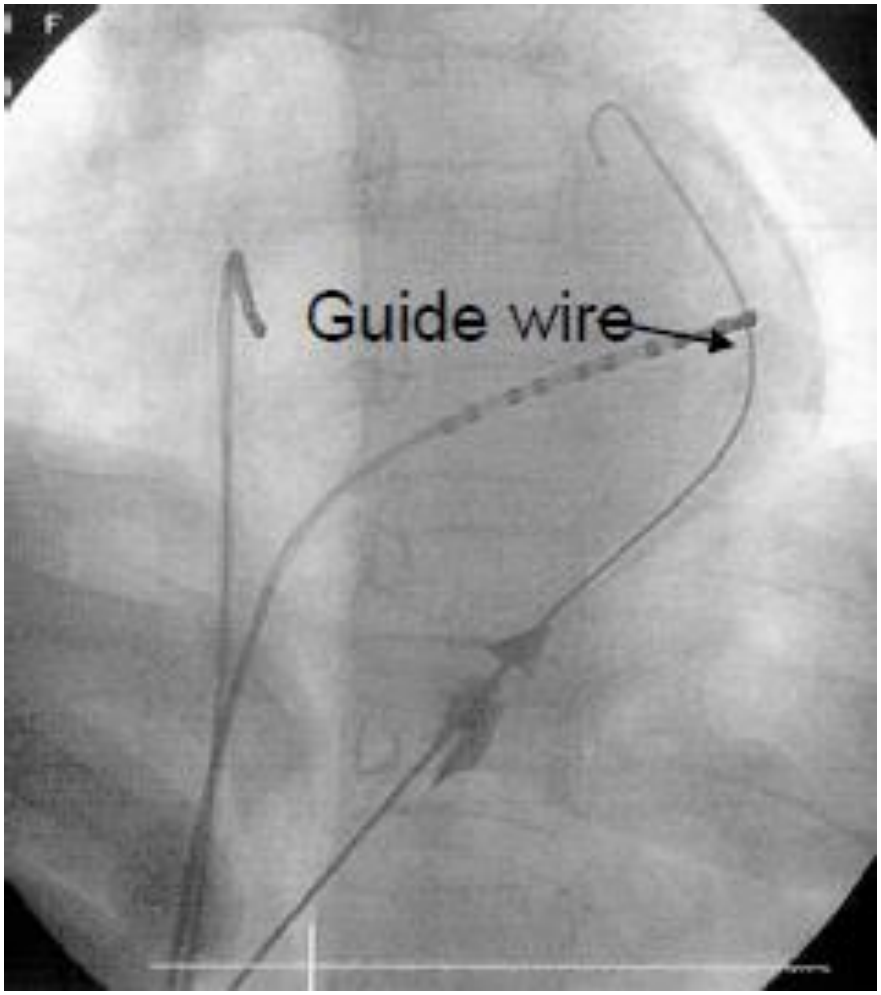
Subksifoidal Girişim
Teknik

- Epidural giriş iğnesi – tuohy iğnesi
- Referans kateterler
  - Koroner sinüs kateteri
  - RV apeksine kateter
- Genel anestezi
- Damar kılıfı
- Kontrast madde
- Floroskopi


1
2
3
4
5
6
7

Subksifoidal Girişim





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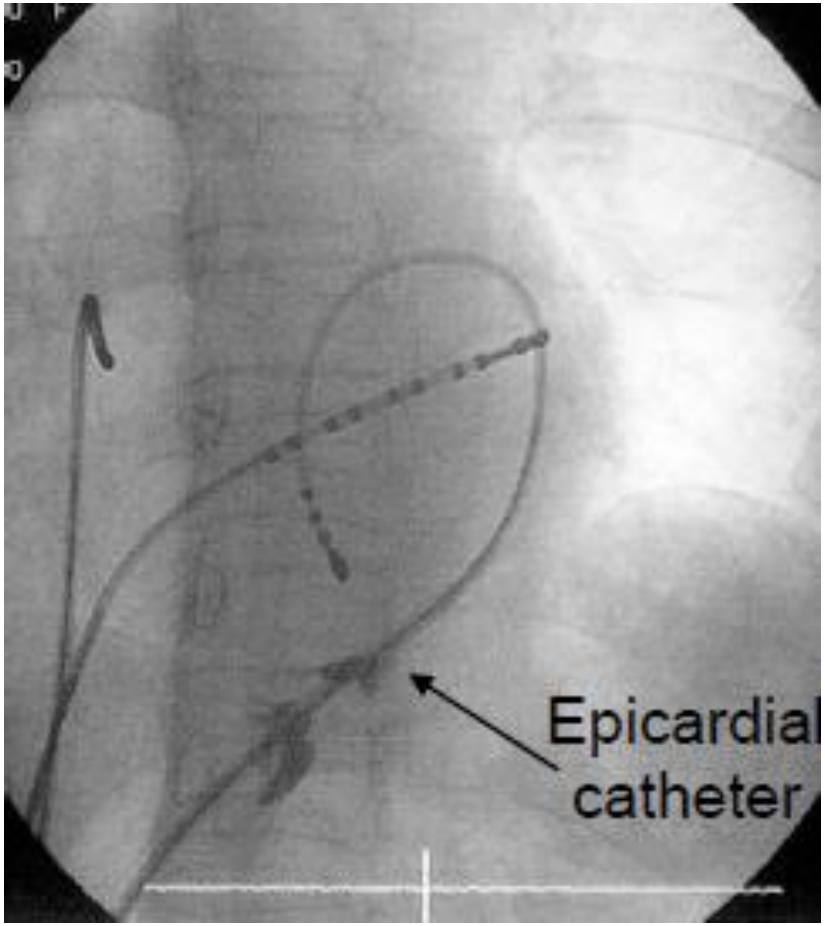
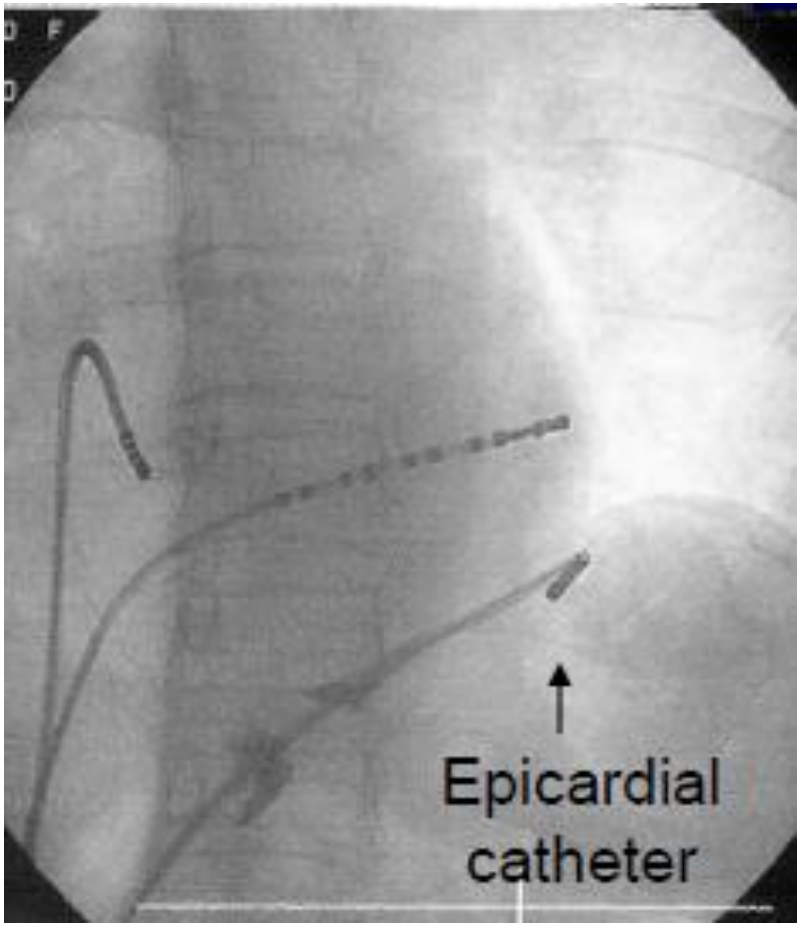




Epikardiyal haritalama

- Floroskopi
- Elektro-anatomik haritalama sistemleri

- Endokardiyal haritalama ile benzer
- Epikardiyal yağ dokusuda skar bölgeleri gibi düşük amplitüdlü sinyallere neden olur

Epikardiyal ablasyon

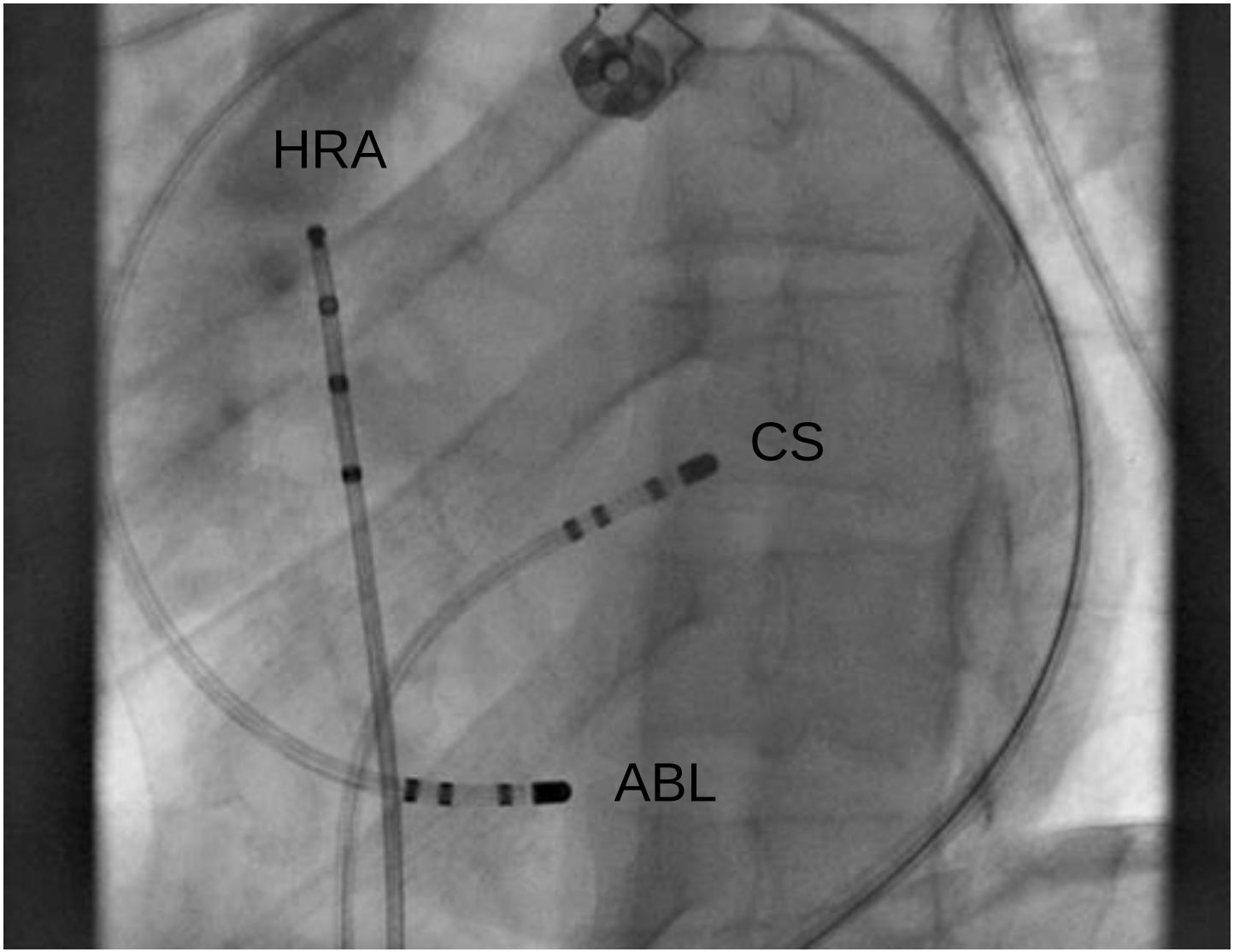
- RF
- Cryo-ablasyon

Olgu

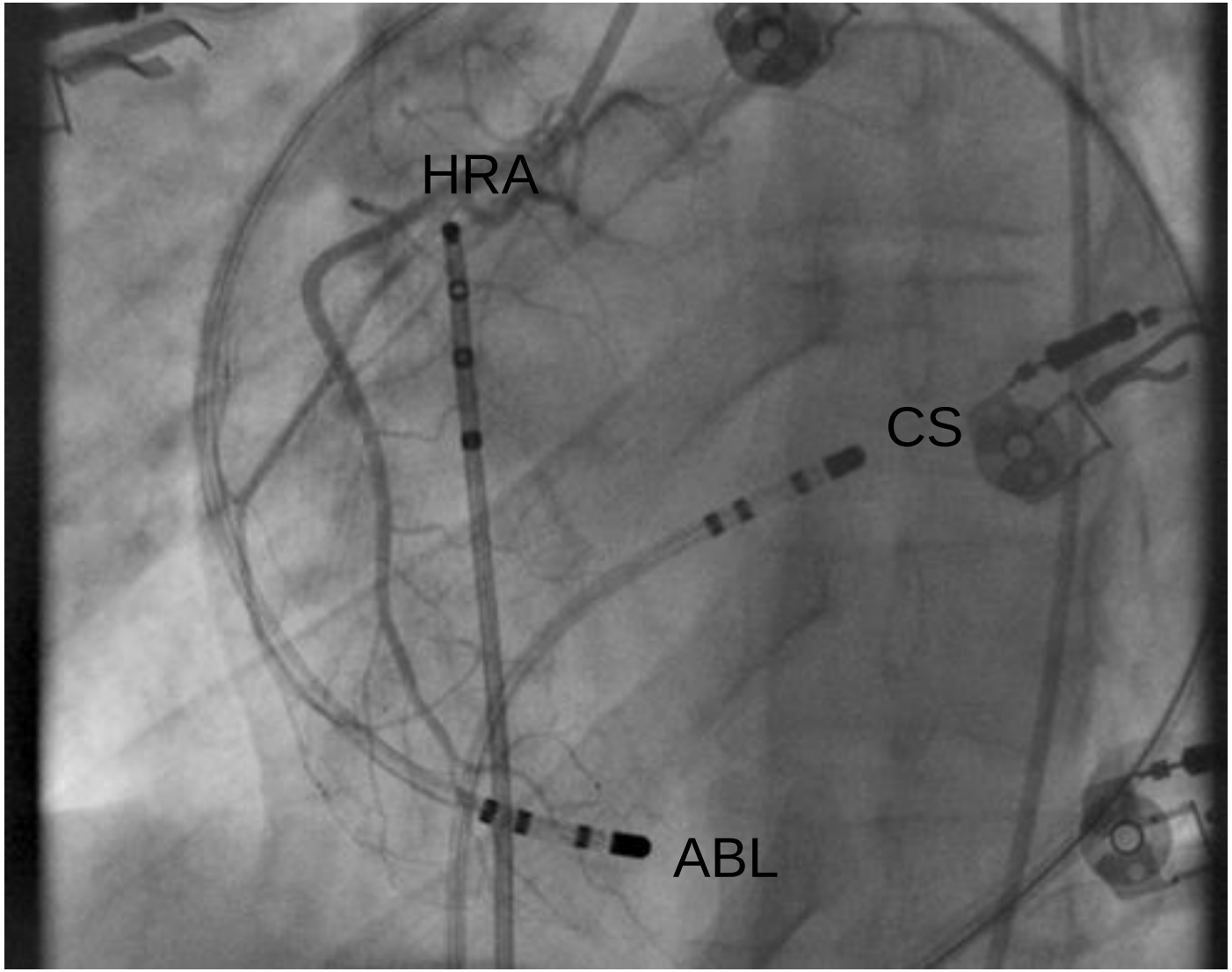
- Yapısal kalp hastalığı olmayan 24 yaşındaki erkek hasta
- Tekrarlayan çarpıntı ve manifest preeksitasyon mevcut
- İki kez başarısız endokardiyal ablasyon öyküsü


ekrem gökaslan
I
II
III
HRAd
HRAp
RF
A
V
A
V
ABL d
ABL px
CSd
CS34

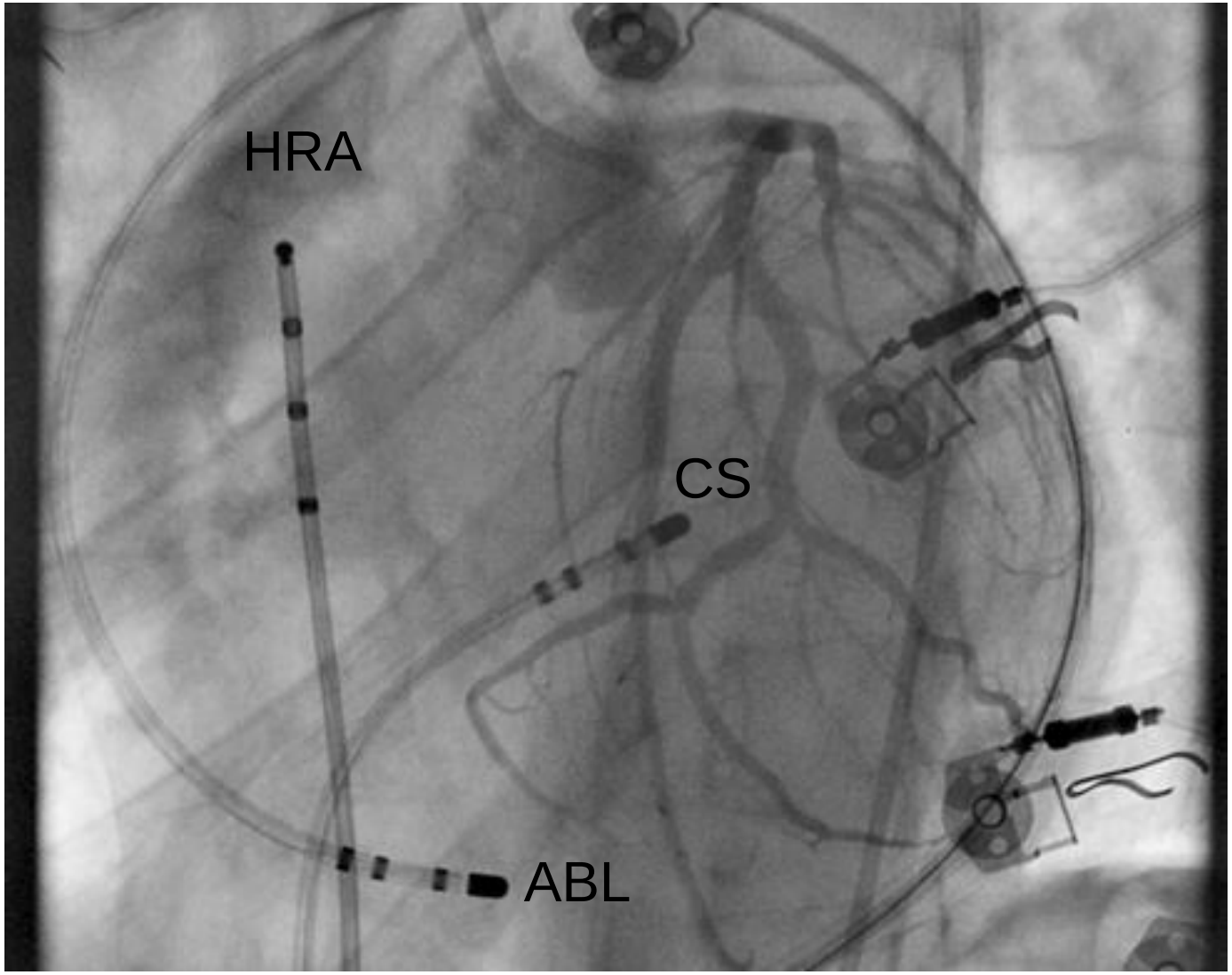
LAO



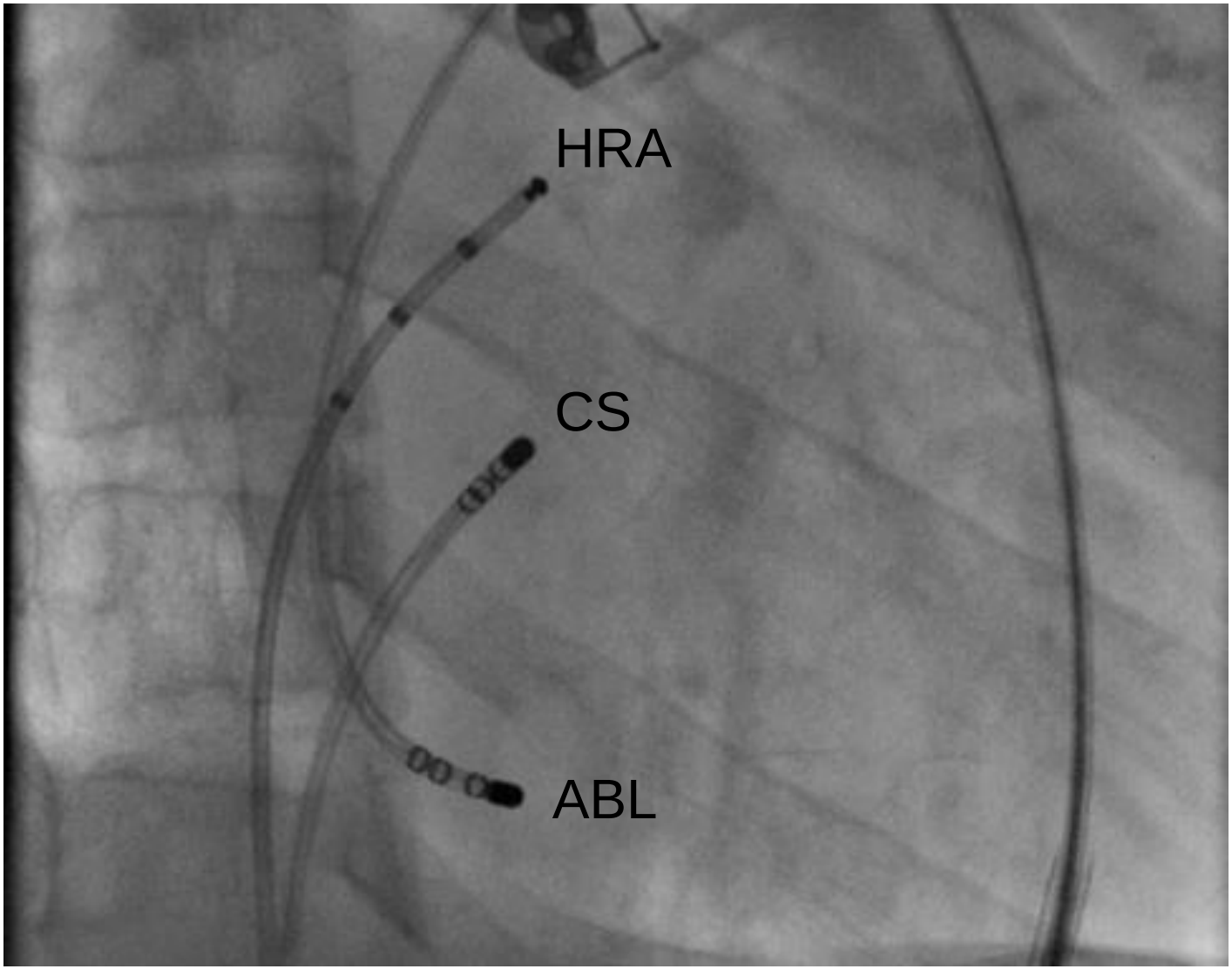
LAO



LAO



RAO




ekrem göksalan
I
II
III
AVR
AVL
AVF
V1
V2
V3
V4
V5
V6
10 mm/mV 25 mm/s

Original Article

Accessory Atrioventricular Pathways Refractory to Catheter Ablation

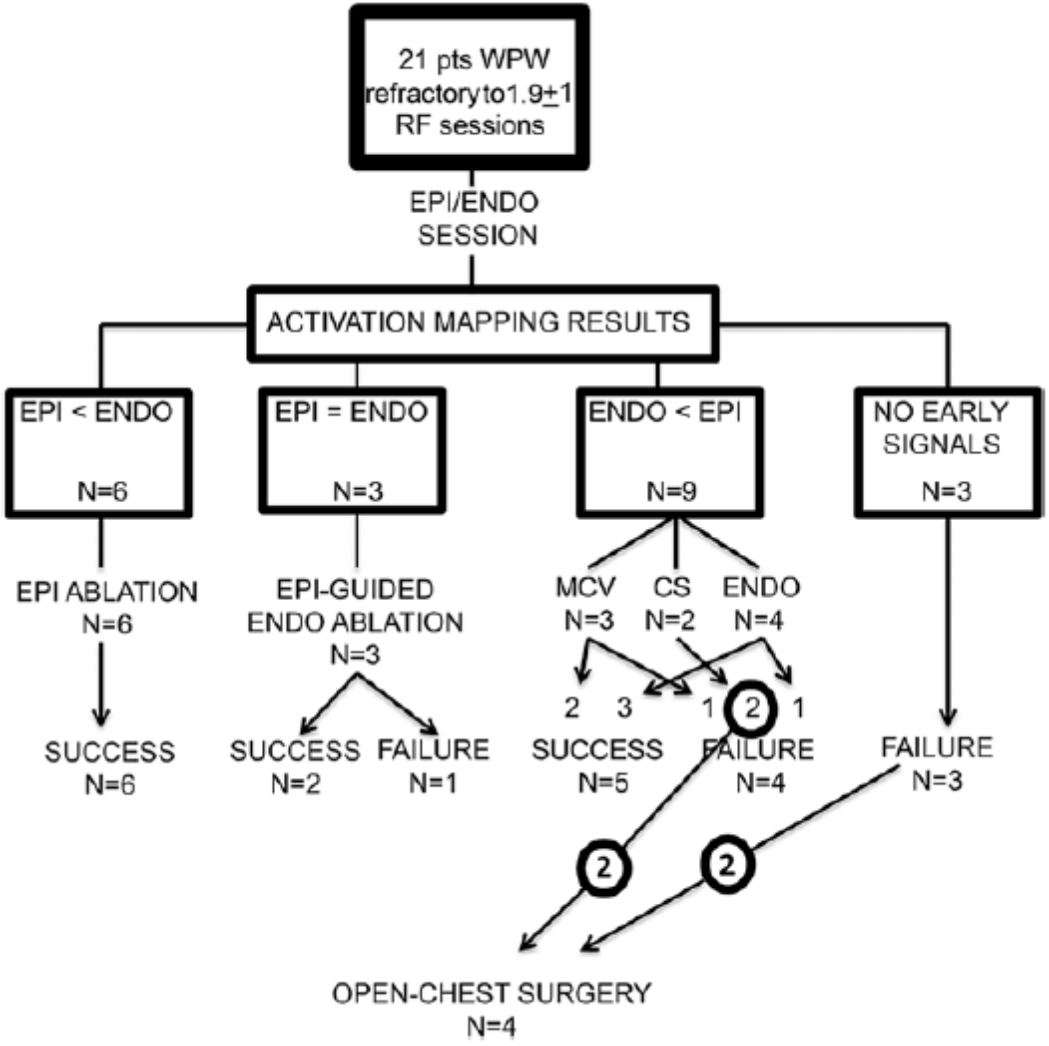
Role of Percutaneous Epicardial Approach

Maurício Ibrahim Scanavacca, MD, PhD*; Eduardo Back Sternick, MD, PhD, FHRS*; Cristiano Pisani, MD*; Sissy Lara, MD; Carina Hardy, MD; André d'Ávila, MD, PhD; Frederico Soares Correa, MD; Francisco Darrieux, MD; Denise Hachul, MD, PhD; Miguel Barbero Marcial, MD, PhD; Eduardo A. Sosa, MD, PhD

Background—Epicardial mapping and ablation of accessory pathways through a subxiphoid approach can be an alternative when endocardial or epicardial transvenous mapping has failed.

Methods and Results—We reviewed acute and long-term follow-up of 21 patients (14 males) referred for percutaneous epicardial accessory pathway ablation. There was a median of 2 previous failed procedures. All patients were highly symptomatic, 8 had atrial fibrillation (3 with cardiac arrest) and 13 had frequent symptomatic episodes of atrioventricular reentrant tachycardia. Six patients (28.5%) had a successful epicardial ablation. Five patients (23.8%) underwent a successful repeated endocardial mapping, and ablation after epicardial mapping yielded no early activation site. Epicardial mapping was helpful in guiding endocardial ablation in 2 patients (9.5%), showing that the earliest activation was simultaneous at the epicardium and endocardium. Four patients (19%) underwent successful open-chest surgery after failing epicardial/endocardial ablation. Two patients (9.5%) remained controlled under antiarrhythmic drugs after unsuccessful endocardial/epicardial ablation. Two patients had a coronary sinus diverticulum and one a right atrium to right ventricle diverticulum. Three patients acquired postablation coronary sinus stenosis. There was no major complication related to pericardial access.

Conclusions—Percutaneous epicardial approach is an alternative when conventional endocardial or transvenous epicardial ablation fails in the elimination of the accessory pathway. A new attempt by endocardial approach was successful in a significant number of patients. Open-chest surgery may be required in symptomatic cases refractory to endocardial–epicardial approach. (***Circ Arrhythm Electrophysiol*. 2015;8:128-136. DOI: 10.1161/CIRCEP.114.002373.**)

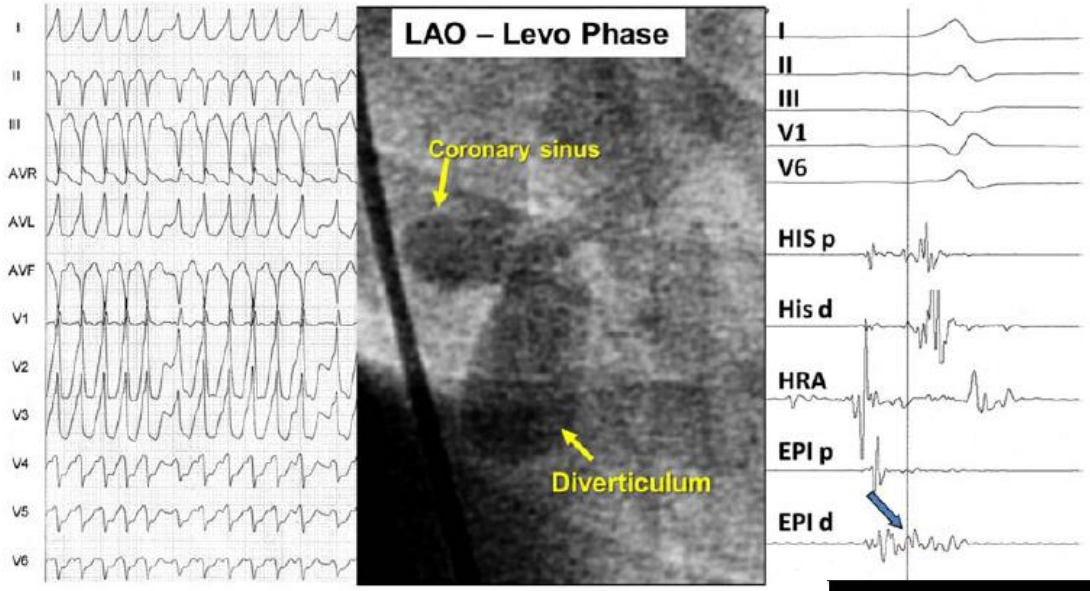


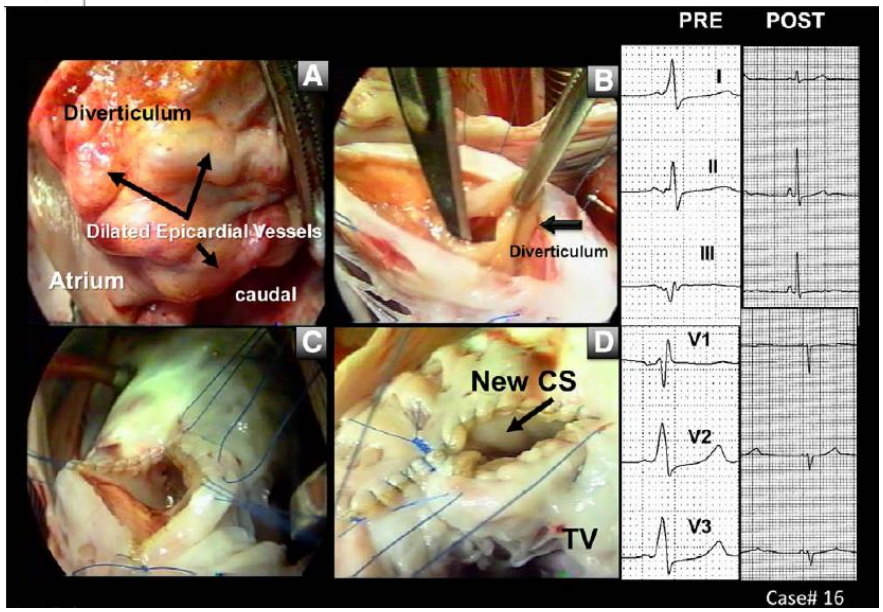
Scanavacca MI, et al. Circ Arrhythm Electrophysiol 2015;8:128-136.

Table 2. Results of Mapping, Ablation, and Outcomes After Endocardial/Epicardial Approach

Case	Accessory Pathway	Ablation Catheter Access: Epicardial/ TS/RTA/Jug/Fem	Anatomic Abnormality	Earliest Activation	Transient Success	Successful RFCA	Irrigated-Tip	Successful Surgery	Complications
1	RAS	Epicardial/Fem/Jug	No	No early signals		No	No	Yes	
2	LP	Epicardial/TS	No	Epicardial < posterior vein		Epicardial	No		
3	LAS	Epicardial/TS/RTA	No	Endocardial < Epicardial		No	No		Hemopericardium
4	LAL	Epicardial/TS	CS stenosis	CS < Epicardial	CS distal	No	Yes	Yes	
5	LFW	Epicardial/TS	CS stenosis	CS < Epicardial	CS distal	No	Yes	Yes	
6	LP+LFW	Epicardial/TS	No	Endocardial=Epicardial		Endocardial	No		
7	RPS	Epicardial/Fem	CS diverticulum	MCV < Epicardial < Endocardial	CS Diverticulum	MCV	No		
8	MCV+RPS	Epicardial/Fem	No	Endocardial < Epicardial		Endocardial	No		
9	RPS	Epicardial/Fem	No	MCV < Epicardial < Endocardial Epicardial		MCV	No		
10	RPS	Epicardial/TS/Fem	No	Epicardial		Epicardial	Yes		
11	RPS	Epicardial/TS/Fem	No	Epicardial	MCV	Epicardial-RV	Yes		
12	RPS	Epicardial/TS/Fem	No	Epicardial		Epicardial	Yes		
13	RP	Epicardial/Fem	No	Epicardial		Epicardial	No		
14	RPS	Epicardial/Fem	No	Endocardial < Epicardial		Endocardial-RV	No		
15	RPS+RP	Epicardial/TS/Fem	CS stenosis	Endocardial < Epicardial		Endocardial	No		
16	RP	Epicardial/Fem/Jug	CS diverticulum+CS ostium atresia	No early signals		No	Yes		
17	PS	Epicardial/TS/Fem	No	MCV < Epicardial < ENDOCARDIAL	MCV	No	No		
18	PS	Epicardial/TS	No	MCV=Epicardial		No	No		
19	LPS	Epicardial/TS/RTA/ Fem	No	Endocardial=Epicardial		Endocardial	No		Pericarditis
20	PS	Epicardial/TS	No	No early signals		No	No		
21	RL	Epicardial/Fem	RA diverticulum	Epicardial		Epicardial	Yes		

Scanavacca MI, et al. Circ Arrhythm Electrophysiol 2015;8:128-136.



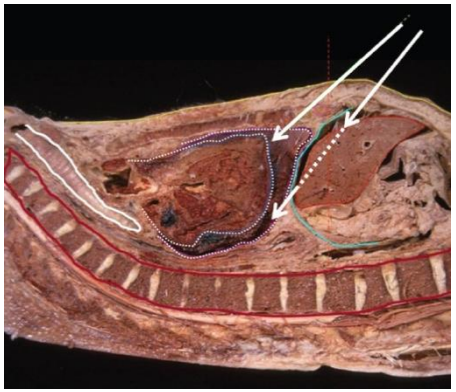


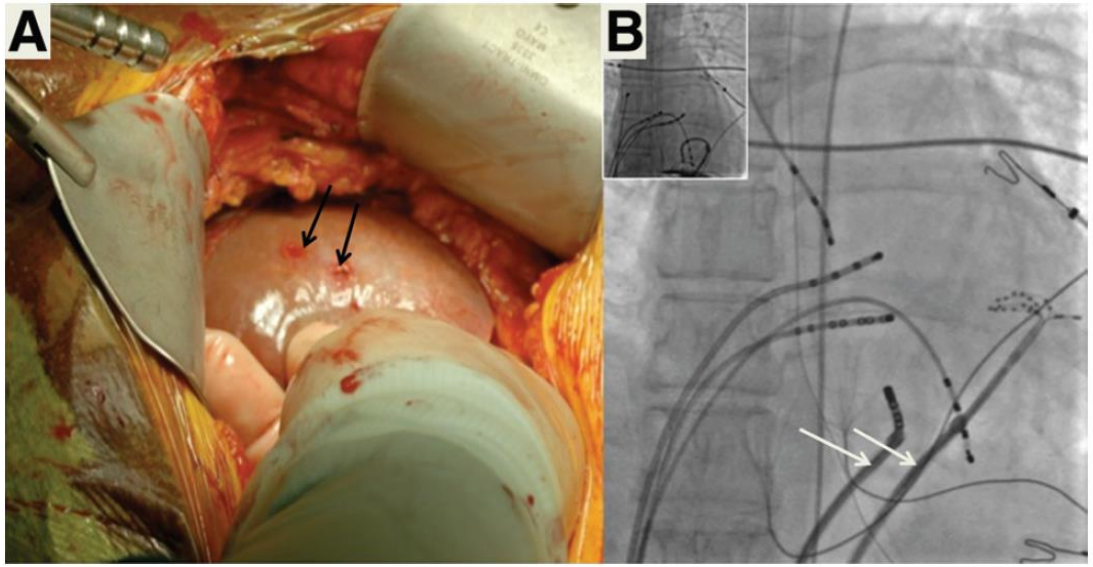
Scanavacca MI, et al. Circ Arrhythm Electrophysiol 2015;8:128-136.

Subksifoidal Girişim
Major Komplikasyonlar

Komplikasyon	Mekanizma	Önlem	Tedavi
İntra-abdominal kanama	Diyafragmatik damar rüptürü	İğne ucunun kontrast enjeksiyonuyla kontrolü	Kan transfüzyonu, laparotomi
Gastroparezi	Vagusun ösefageal pleksusunda hasar	Eş zamanlı ösefagus pozisyonu ve ısısının takibi	Motilite artıcı ilaçlar, endoskpik botilinum enjeksiyonu, endoskopik pilorik dilatasyon, cerrahi
Diyafram paralizi	Frenik ssinir hasarı	Frenik sinir mapping, perikartta kontrollü balon şişirme (hava+saline)	Bronkodilatasyon, diğer semptomların konservatif tedavisi
Koroner oklüzyon	Koroner arterlerin ablasyonla hasarı	Eş zamanlı koroner anjiyografi, endokardiyal ventriküler potansiyellerin takibi	Medikal veya cerrahi girişim
Defibrilasyon eşiğinde artış	Perikart yüzeyinde rezidü hava	İşlem sonrası havanın çıkarılması	Sternal defibrilasyon pad'inin lateral yerleştirilmesi
Kardiyak tamponad ve perforasyon	Sağ ventrikül ponksiyonu	Kontrastla iğne ucunun lokalizasyonu, giriş için basınç duyarlı iğne kullanımı	Acil perikardiyosentez veya pencere

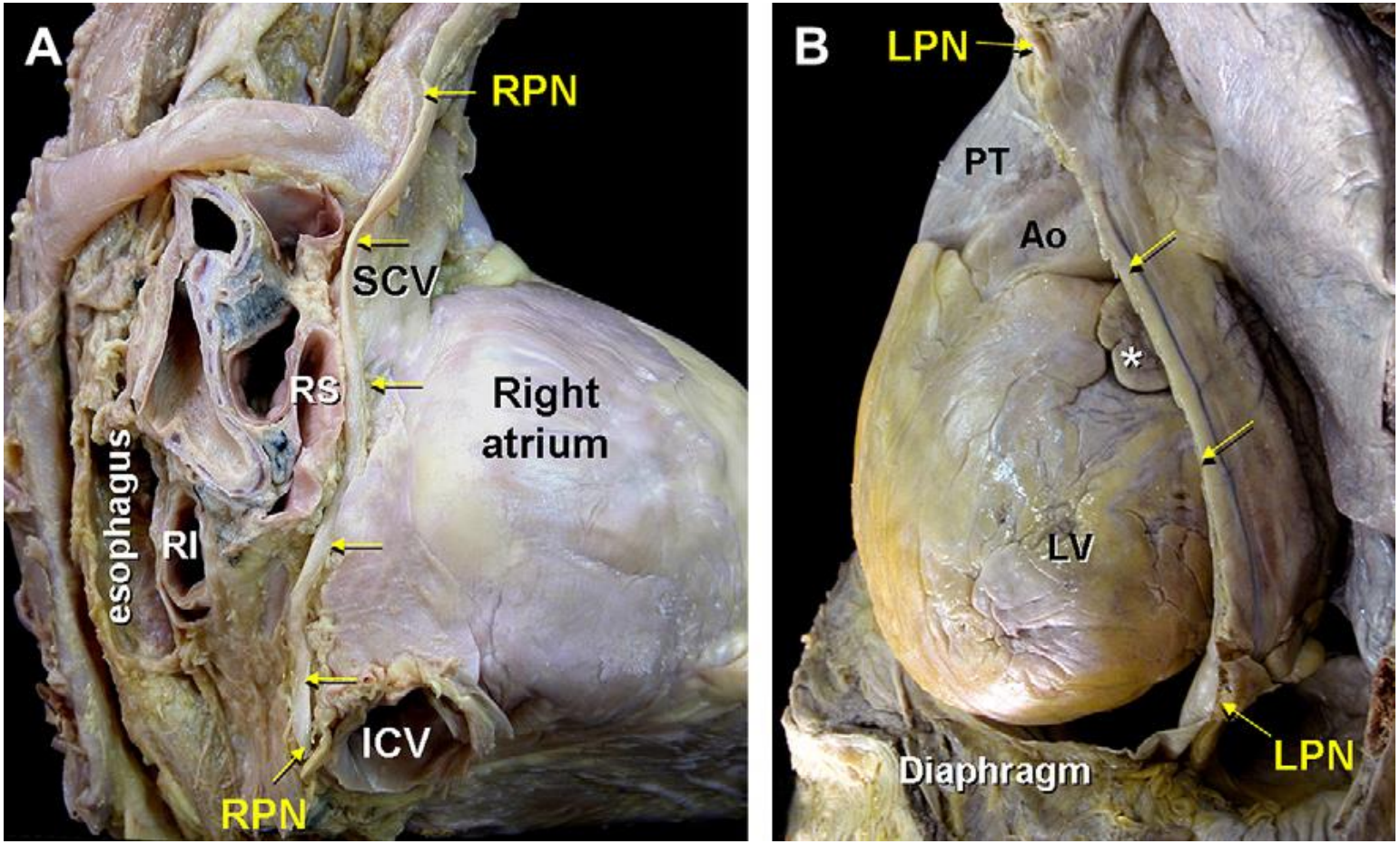
Epikardiyal Ablasyon
Komplikasyonlar





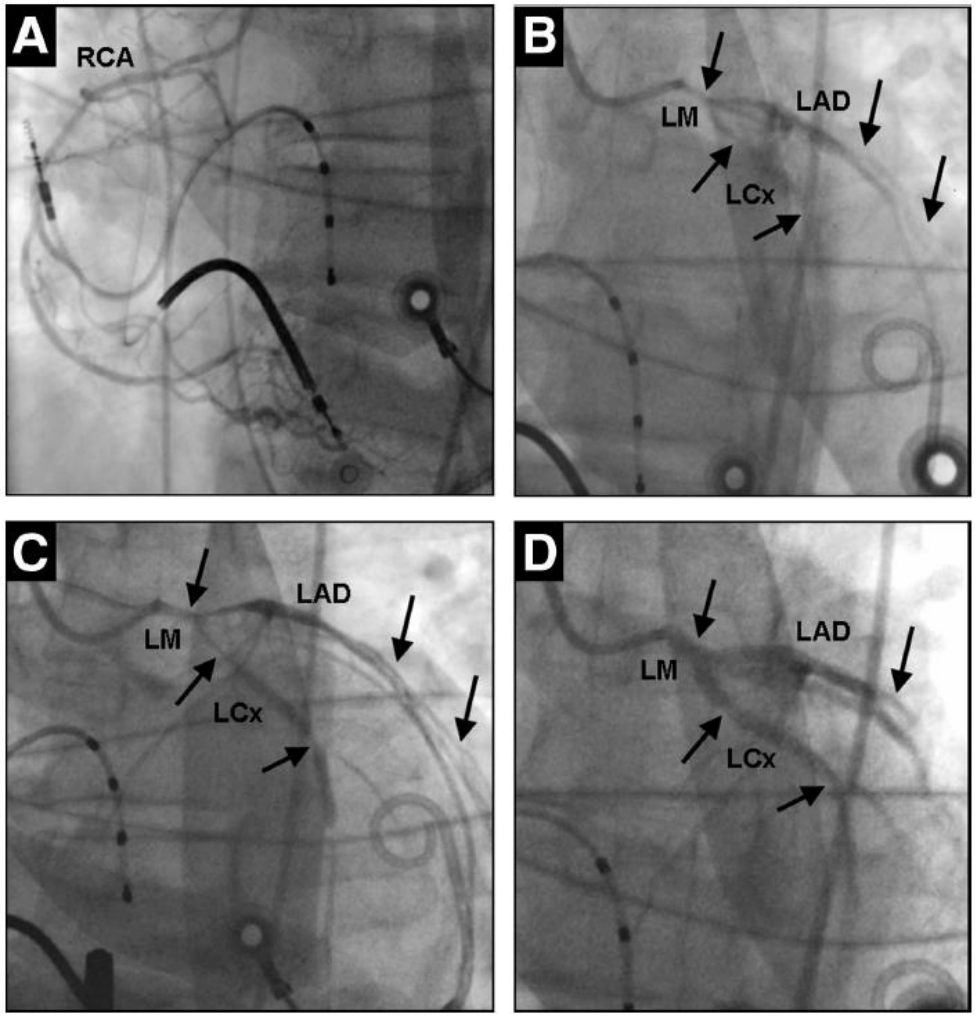
Koruth, JS, et al. Circ Arrhythm Electrophysiol 2011;4:882-888

Frenik Sinir



Ernst S, et al. Card Electrophysiol Clin 2010;2:1–8.

Epikardiyal Ablasyon
Komplikasyonlar



Koruth JS, et al. Circ Arrhythm Electrophysiol 2011;4:882-888

Subksifoidal Girişim
İşlem sonrası komplikasyonlar

- Tamponad
  - Hemdinamik takip
  - Sheath'in bırakılarak aralıklı aspirasyon
  - EKO takibi
  - Cerrahi pencere
- Perikardit
  - Sık görülür
  - NSAID
  - Metil prednizolon (0.5-1.0 mg/kg)
  - Triamsinolon (2.0 mg/kg)
- Plevrit

Acute and Chronic Effects of Epicardial Radiofrequency Applications Delivered on Epicardial Coronary Arteries

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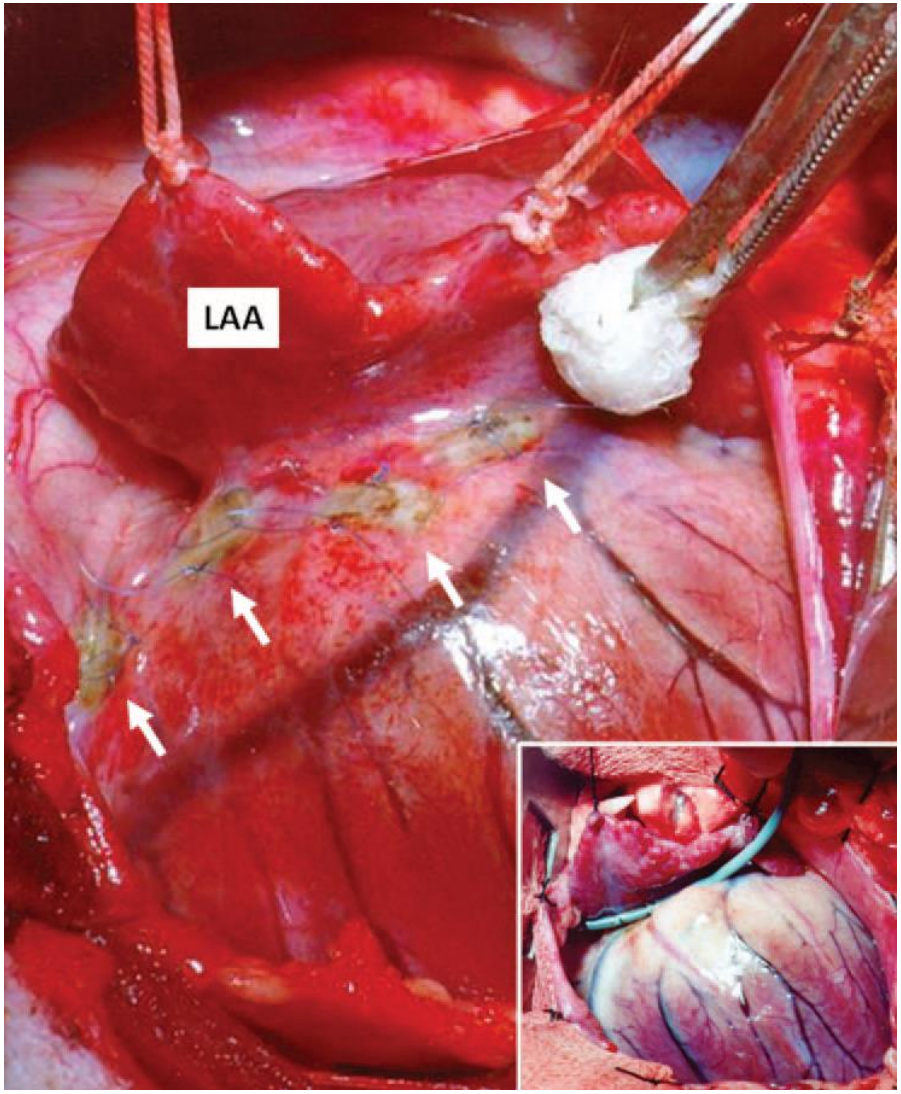
Background—Epicardial coronary injury is by far the most feared complication of epicardial ablation. Little information is available regarding the chronic effects of delivering radiofrequency in the vicinity of large coronary vessels, and the long-term impact of this approach for mapping and ablation on epicardial vessel integrity is poorly understood. Therefore, the aim of this study was to characterize the acute and chronic histopathologic changes produced by in vivo epicardial pulses of radiofrequency ablation on coronary artery of porcine hearts.

Methods and Results—Seven pigs underwent a left thoracotomy. The catheter was sutured adjacent to the left anterior descending artery and left circumflex artery, and 20 pulses of radiofrequency energy were applied. Radiofrequency lesions located no more than 1 mm of the vessel were used for this analysis. Three animals were euthanized 20 days (acute phase) after the procedure and 4 animals after 70 days (chronic phase). The following parameters were obtained in each vessel analyzed: (1) internal and external perimeter; (2) vessel wall thickness; (3) tunica media thickness, and (4) tunica intima thickness. The presence of adipose tissue around the coronary arteries, the distance between the artery and the epicardium, and the anatomic relationship of the artery with the coronary vein was also documented for each section. Sixteen of 20 (80%) sections analyzed, showed intimal thickening with a mean of 0.18 ± 0.14 mm compared with 0.13 ± 0.16 mm in the acute phase ($P=0.331$). The mean tunica media thickness was 0.25 ± 0.10 mm in the chronic phase animals compared with 0.18 ± 0.03 mm in the acute phase animals ($P=0.021$). A clear protective effect of pericardial fat and coronary veins was also present. A positive correlation between depth of radiofrequency lesion and the degree of vessel injury expressed as intimal and media thickening ($P=0.001$) was present. A negative correlation was identified ($r=-0.83$; $P=0.002$) between intimal thickening and distance between epicardium and coronary artery.

Conclusions—In this porcine model of in vivo epicardial radiofrequency ablation in proximity to coronary arteries leads to acute and chronic histopathologic changes characterized by tunica intima and media thickening, with replacement of smooth muscle cells with extracellular matrix, but no significant stenosis was observed up to 70 days after the ablation. The absence of acute coronary occlusion or injury does not preclude subsequent significant arterial damage, which frequently occurs when epicardial radiofrequency applications are delivered in close vicinity to the vessels. (***Circ Arrhythm Electrophysiol.*** **2011;4:526-531.**)



Viles – Gonzales JF, et al. Circ Arrhythm Electrophysiol 2011;4:526-531.

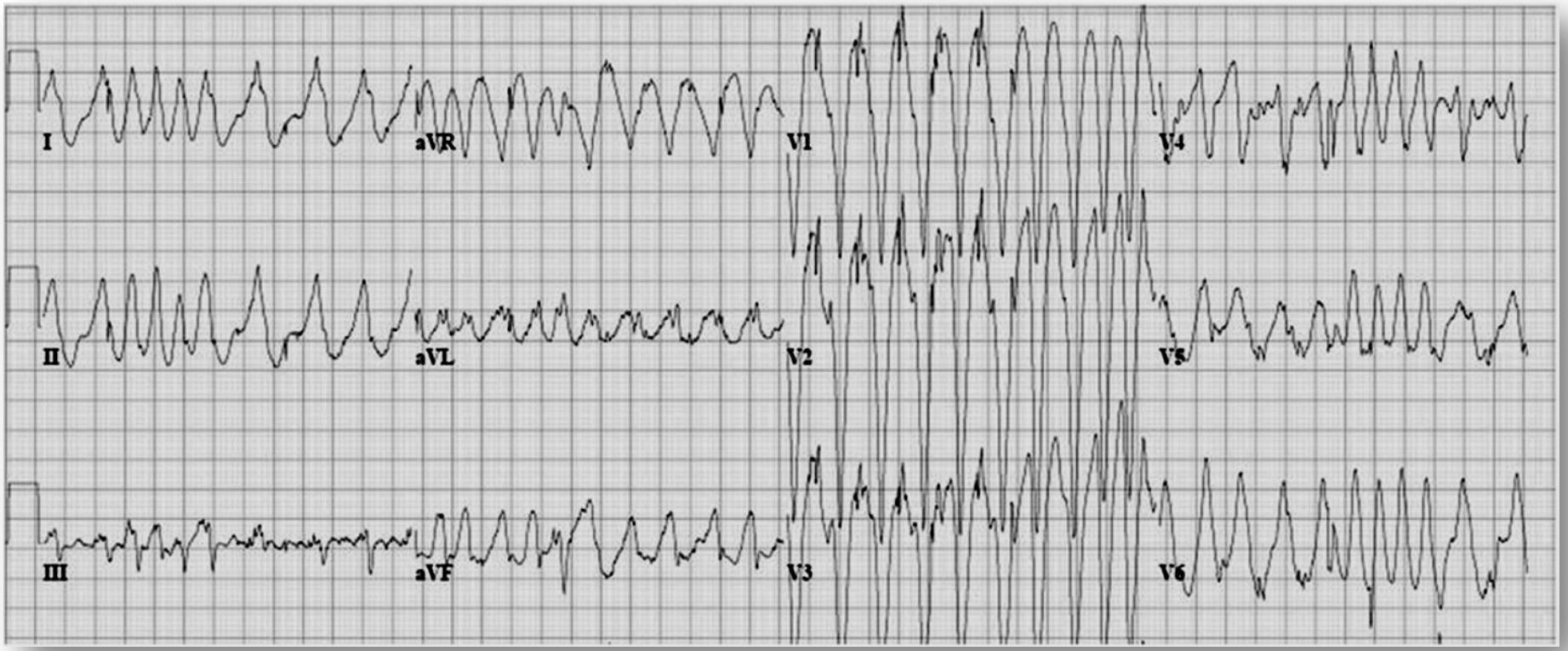
Preeksitasyonda Ablasyon

- SVT atağı
- Senkop öyküsü
- Ailede ani ölüm öyküsü
- Bazı asemptomatik hastalar

Epikardiyal Aksesuar Yolun Ablasyonu

- İlaca rağmen SVT atağı
- Senkop öyküsü
- Aksesuar yolun elektrofizyolojik özellikleri

Epikardiyal Aksesuar Yolun Ablasyonu



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