



RADYOLOJİ YÖNTEMLERİNDEN ELDE EDİLEN BULGULAR

Prof. Dr. Nilgün Işıksalan Özbülbül

Bilkent Şehir Hastanesi, Kalp Damar Hastanesi, Radyoloji Kliniği

Ankara

İNFEKTİF ENDOKARDİT
2023'TE NELER DEĞİŞTİ?

Ankara Üniversitesi İbn-i Sina Hastanesi
Hasan Ali Yücel Salonu, Ankara

IEÇG KLİNİK DERNEĞİ İNFEKTİF ENDOKARDİT VE DİĞER
KARDİYOYASKÜLER İNFEKSİYONLAR ÇALIŞMA GRUBU



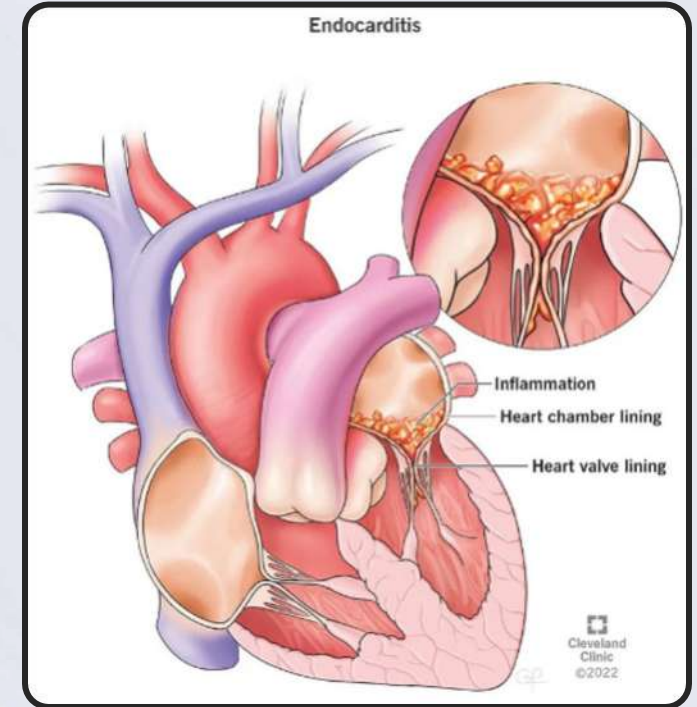
14 EKİM 2023

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İNFEKTİF ENDOKARDİT

- ▶ Endokardium inflamasyonu
- ▶ Valv ve korda tendinea
- ▶ Protez kapak ve implante kardiyak device
- ▶ Etken, bakteriyel (Gram + kok)
- ▶ Predispozan faktörler (endokardiyal injury, kateter, elektrod vs.)
- ▶ E/K: 2/1
- ▶ Sıklığı: 13.8 /100.000/yıl - 66300 ölüm (2019)*





Tanı

- ▶ Duke kriterleri 1994
- ▶ Modifiye Duke kriterleri 2000
- ▶ ESC 2015
- ▶ Modifiye Duke-ISCVID IE Kriterleri 2023-Update





Table 2. Definitions of Terms Used in the 2023 Duke-International Society for Cardiovascular Infectious Diseases Infective Endocarditis (IE) Criteria for the Diagnosis of IE, With Proposed Changes in Bold Type

I. MAJOR CRITERIA

A. Microbiologic Major Criteria

(1) Positive blood cultures

i. Microorganisms that commonly cause IE^a isolated from 2 or more separate blood culture sets (Typical)^b

or

ii. Microorganisms that occasionally or rarely cause IE isolated from 3 or more separate blood culture sets (Nontypical)^b

(2) Positive laboratory tests

i. Positive polymerase chain reaction (PCR) or other nucleic acid-based technique^c for *Coxiella burnetii*, *Bartonella* species, or *Tropheryma whippelii* from blood

or

ii. *Coxiella burnetii* antiphase I immunoglobulin G (IgG) antibody titer >1:800 [24]^d, or isolated from a single blood culture

or

iii. Indirect immunofluorescence assays (IFA) for detection of IgM and IgG antibodies to *Bartonella henselae* or *Bartonella quintana* with immunoglobulin G (IgG) titer \geq 1:800 [24, 25]^d

B. Imaging Major Criteria

(1) Echocardiography and **cardiac computed tomography (CT) imaging**

i. Echocardiography and/or cardiac CT showing vegetation,^e valvular/leaflet perforation,^f valvular/leaflet aneurysm,^g abscess,^h pseudoaneurysm,ⁱ or intracardiac fistula^j

or

ii. Significant new valvular regurgitation on echocardiography as compared with previous imaging. Worsening or changing of preexisting regurgitation is not sufficient.

or

iii. New partial dehiscence of prosthetic valve as compared with previous imaging [52]

(2) **Positron emission computed tomography with 18F-fluorodeoxyglucose ([18F]FDG PET/CT imaging)**

Abnormal metabolic activity^k involving a native or prosthetic valve, ascending aortic graft (with concomitant evidence of valve involvement), intracardiac device leads or other prosthetic material^{lm}

C. Surgical Major Criteria

Evidence of IE documented by direct inspection during heart surgery neither Major Imaging Criteria nor subsequent histologic or microbiologic confirmationⁿ

II. MINOR CRITERIA

A. Predisposition

– **Previous history of IE**

– Prosthetic valve^o

– Previous valve repair^o

– Congenital heart disease^p

– More than mild regurgitation or stenosis of any etiology

– **Endovascular intracardiac implantable electronic device (CIED)**

– Hypertrophic obstructive cardiomyopathy

– Injection drug use

B. *Fever Documented temperature greater than 38.0 °C (100.4 °F)*

C. *Vascular Phenomena Clinical or radiological evidence of arterial emboli, septic pulmonary infarcts, **cerebral or splenic abscess**, mycotic aneurysm, intracranial hemorrhage, conjunctival hemorrhages, Janeway lesions, purulent purpura*

D. *Immunologic Phenomena Positive rheumatoid factor, Osler nodes, Roth spots, or immune complex-mediated glomerulonephritis^q*

E. *Microbiologic Evidence, Falling Short of a Major Criterion*

1) Positive blood cultures for a microorganism consistent with IE but not meeting the requirements for Major Criterion^r

or

2) **Positive culture, PCR, or other nucleic acid based test (amplicon or shotgun sequencing, *in situ* hybridization) for an organism consistent with IE^r from a sterile body site other than cardiac tissue, cardiac prosthesis, or arterial embolus; or a single finding of a skin bacterium by PCR on a valve or wire without additional clinical or microbiological supporting evidence [51]**

F. Imaging Criteria

Abnormal metabolic activity as detected by [18F]FDG PET/CT within 3 mo of implantation of prosthetic valve, ascending aortic graft (with concomitant evidence of valve involvement), intracardiac device leads or other prosthetic material

G. *Physical Examination Criteria^s*

New valvular regurgitation identified on auscultation if echocardiography is not available. Worsening or changing of preexisting murmur not sufficient

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GÖRÜNTÜLEME



KARDİYAK BİLGİSAYARLI TOMOGRAFİ (BT)

- ▶ **Vejetasyonlarda Kardiyak BT<Eko**
- ▶ **Paravalvüler lezyonlar Kardiyak BT>Eko**
- ▶ **Valvüler ve paravalvüler lezyonlarda Kardiyak BT+Eko**
- ▶ **TEE kontrendike veya suboptimal (kalsifikasyon, kardiyak implant) ise Kardiyak BT**

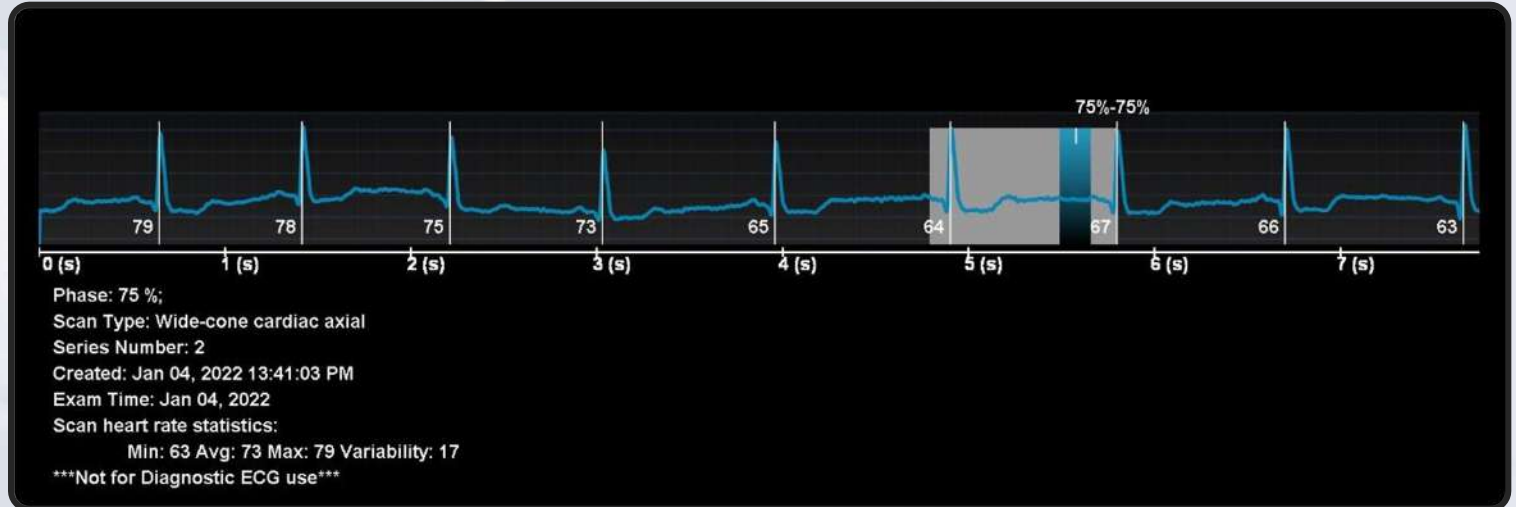


KARDİYAK BT



Çekim Protokolü

- ▶ EKG-tetiklemeli, prospektif
- ▶ Diastolik faz-Multifaz rekonstrükte görüntüler (%0-100 rekonstr, %10-20 interval)
- ▶ İzotropik data set
- ▶ Kısa aks-uzun aks-multiplanar inceleme





KARDİYAK BT

Kontrast madde

- ▶ İlgilenilen anatomik bölgeye göre

Tarama alanı

- ▶ Karina- kalp apeksi
- ▶ Tüm toraks (pacemaker, ICD)

Tarama zamanı

- ▶ Üç fazlı tarama
- ▶ Kontrastsız
- ▶ Prospektif tarama
- ▶ Geç fazda tarama

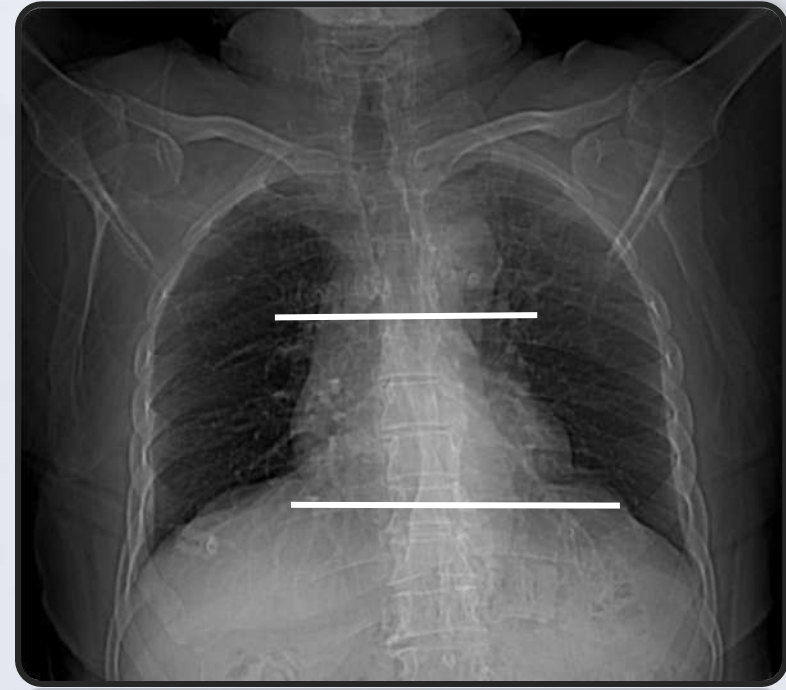




Table 2: Echocardiographic and Cardiac CT Findings of IE

Imaging Finding	Echocardiography	Cardiac CT
Vegetation	Oscillating or nonoscillating intracardiac echogenicity attached to cardiac valves; though can attach to chordae, chamber walls, and intracardiac devices	Low-to-intermediate attenuation lesions of variable sizes or focal thickening along valves, endocardium, or prosthesis
Perivalvular extension		
Perivalvular abscess	Nonhomogeneous perivalvular thickening with high echogenicity or echo poor appearance	Low-attenuation area with a peripheral enhancing rim. Soft-tissue thickening surrounding cardiac or major vascular structures can be seen that may represent phlegmon or early abscess formation.
Pseudoaneurysm	Pulsatile perivalvular echo-free space at color Doppler imaging. Direct connection with cardiovascular lumen may be seen.	Perivalvular contrast material-filled cavity, often with visualized direct connection with aortic root or cardiac chamber
Fistula	Color Doppler imaging shows flow of communication between two neighboring cavities; commonly between aortic root or coronary sinus and cardiac chambers	Contrast agent-filled tract interconnecting cardiac chamber with adjacent aortic root or coronary sinus
Prosthesis dehiscence	Paravalvular regurgitant flow on color Doppler assessment with or without prosthesis rocking motion	Malalignment of prosthesis with tissue defect between annulus and prosthesis. Rocking motions of the prosthetic valve of more than 15° on cine CT images can be seen.
Other leaflet abnormalities		
Leaflet perforation	Leaflet tissue defect with evidence of flow through the defect on color Doppler images	Leaflet tissue defect observed in two different dimensional views
Aneurysm	Distorted leaflet with saccular outpouching and loss of its homogeneous curvature	Leaflet saccular outpouching

Source.—Reference 3 (echocardiography findings) and references 11,12, and 22 (CT findings).



Kardiyak BT Bulguları: İE



Vejetasyon

- ▶ Endokardiyal yüzey/proteze tutunan enfekte yd lezyonu
- ▶ BT: Valv, endokard, protezde izo-hipodens
- ▶ EKG-tetiklemeli BT + Eko vejetasyon tespitinde duyarlılık %63 → %100*
- ▶ 1 cm < aort kapağı vejetasyonlarda BT duyarlılığı %100**
- ▶ 1 cm > vejetasyonların %53'ü BT ile tespit edilememiş***



*Habets J, et al. Int J Cardiovasc Imaging 2014

**Gahide G, et al. AJR Am J Roentgenol 2010

***Kim IC, et al. Circ Cardiovasc Imaging 2018



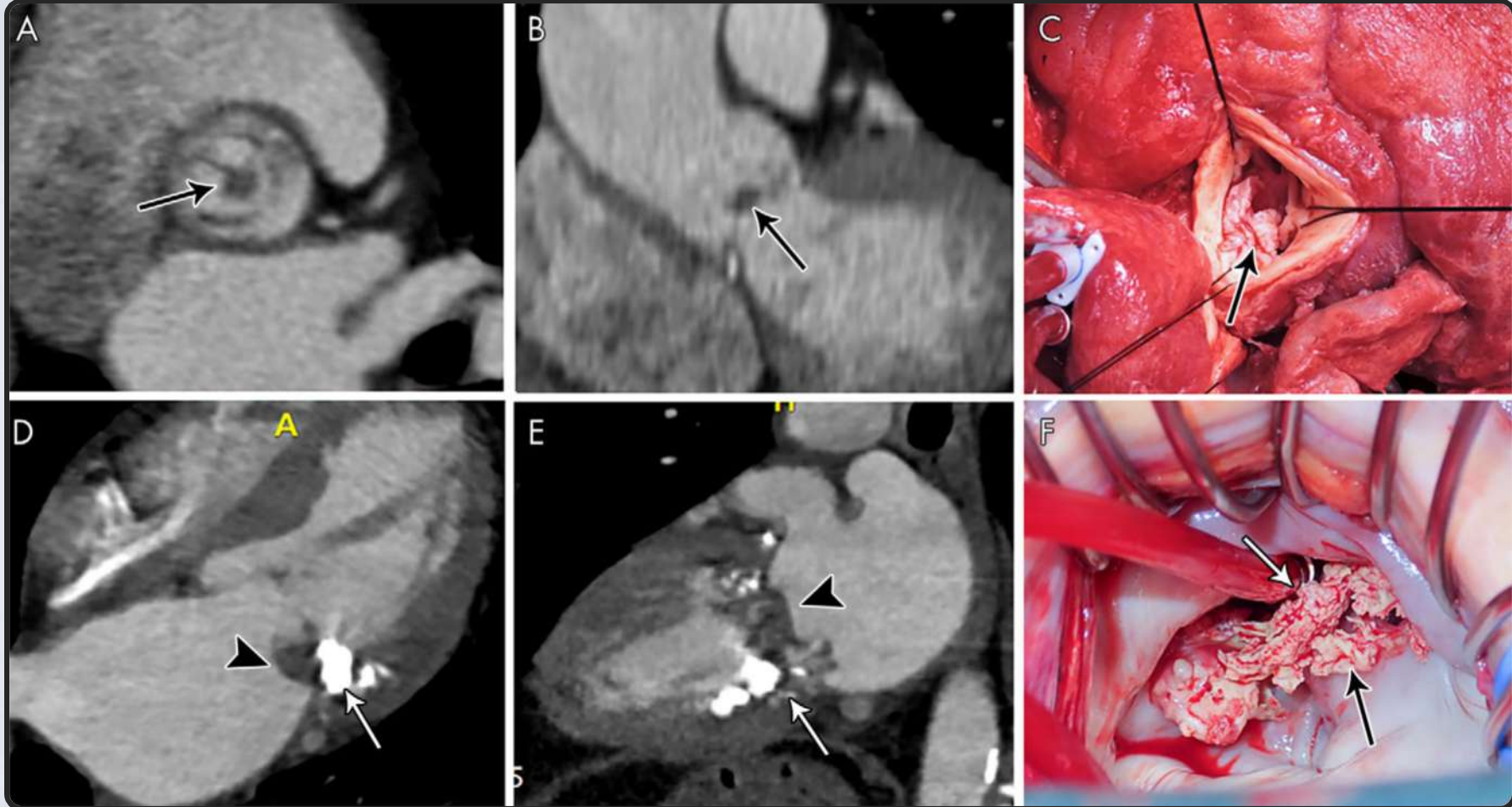
Vejetasyon

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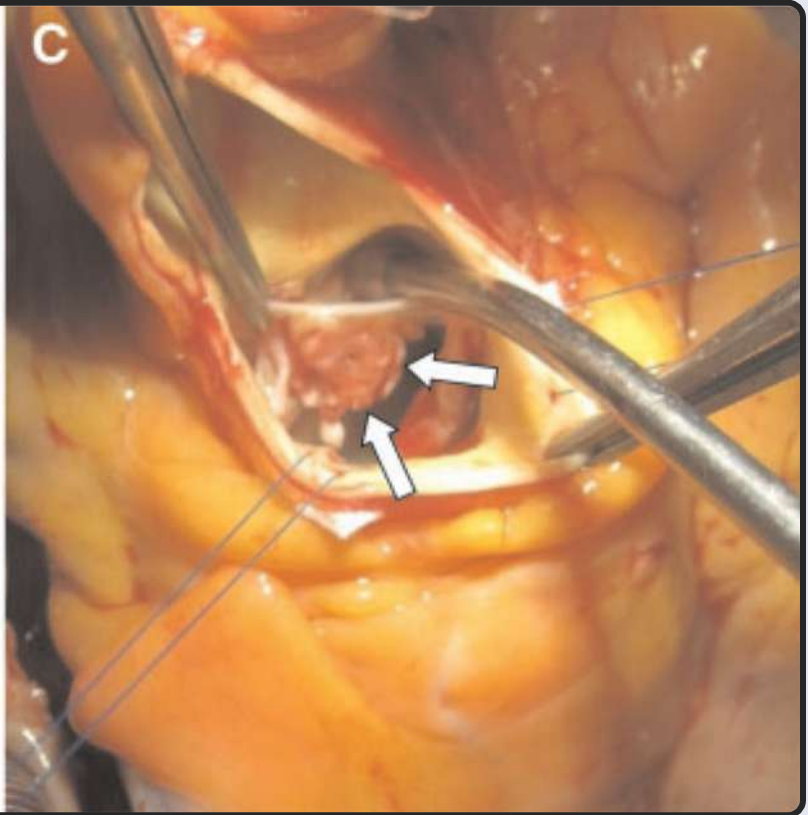
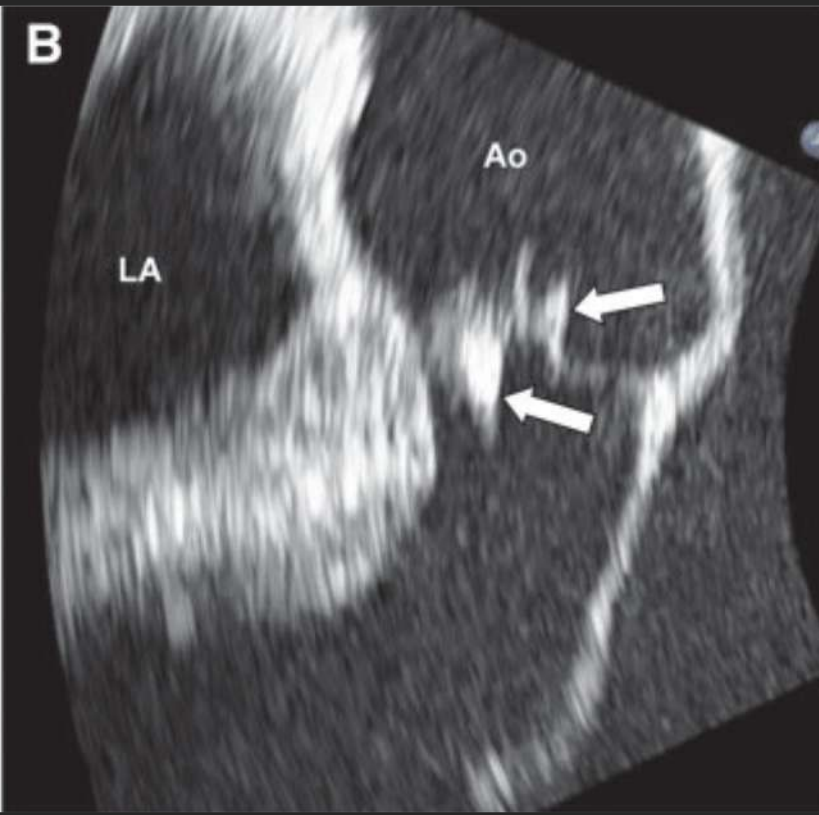
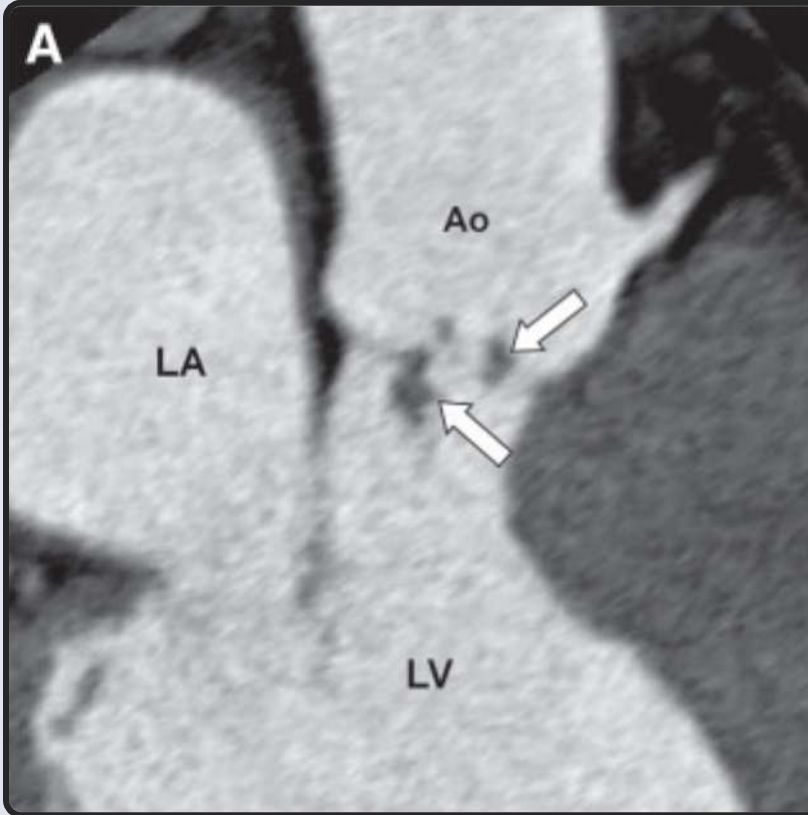
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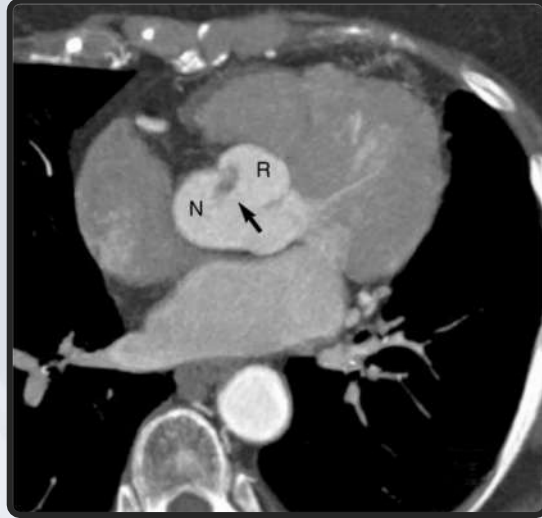
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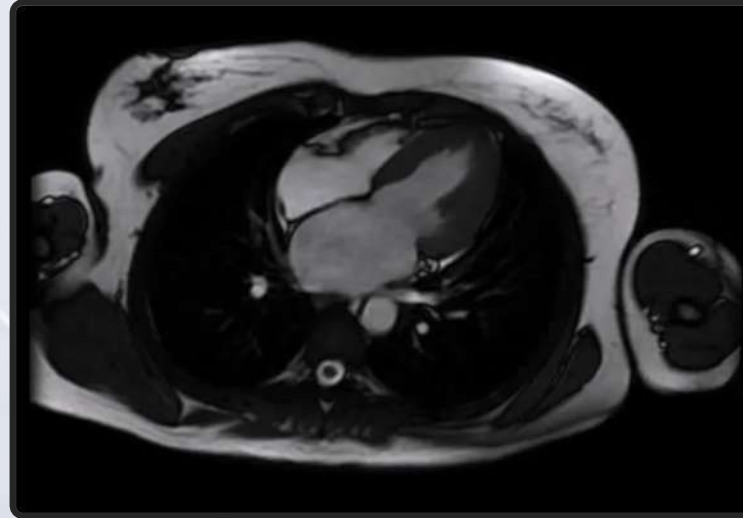
Vejetasyon



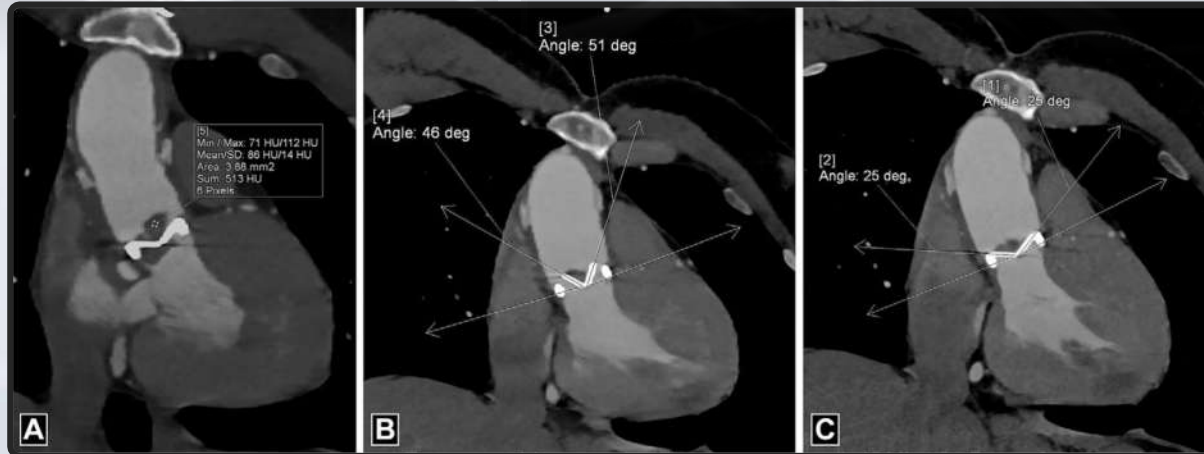
Vejetasyon - Ayırıcı Tanı



Fibroelastom



Non-bakteriyel trombotik endokardit



A

B

C

Trombüs



Kardiyak BT Bulguları: İE



Perivalvular uzanım

- ▶ Abse
- ▶ Psödoanevrizma
- ▶ Fistül

Nativ kapakta %29
Protez kapakta %55



Mortalite ve morbidite artışı
Cerrahi

Abse ve psödoanevrizmanın gösterilmesinde duyarlılık ve özgüllük açısından

- ▶ Metalik kapakta BT>Eko
- ▶ Bioprotez kapakta BT<Eko*

Abse - Psödoanevrizma





Abse - Psödoanevrizma

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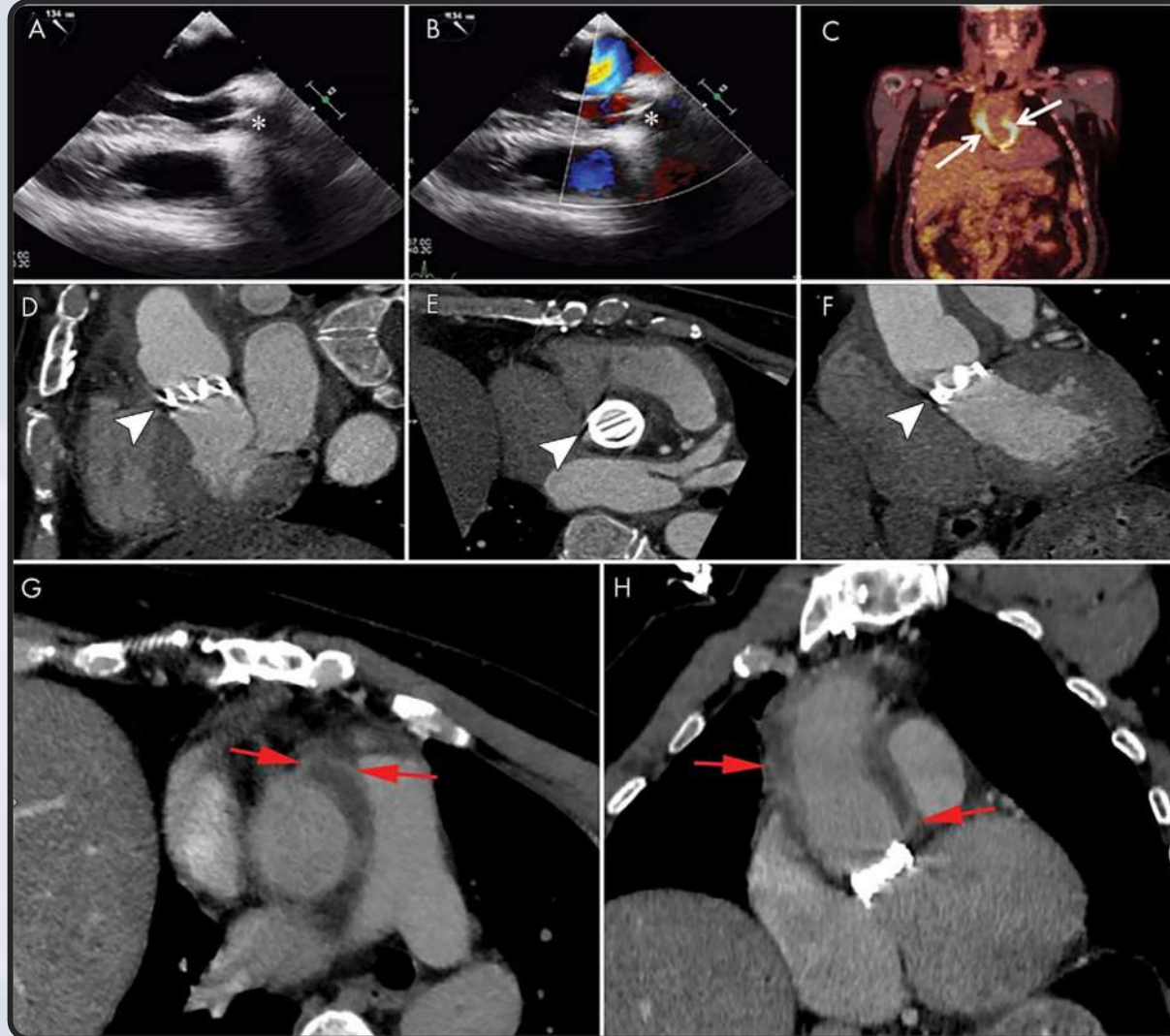


Abse

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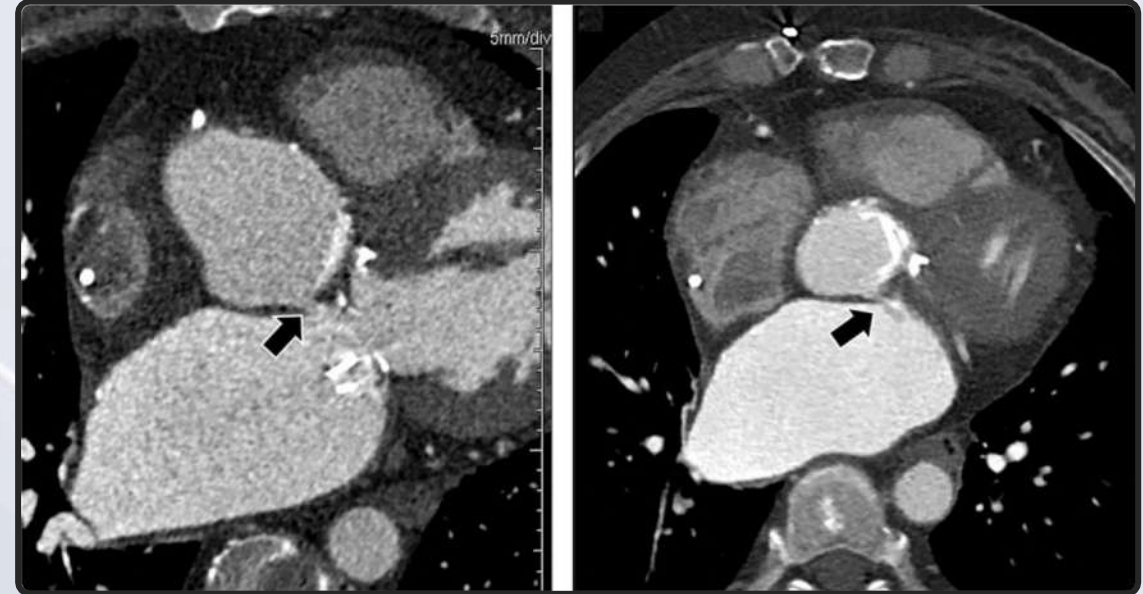
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Fistül

- ▶ Nadir, ciddi komplikasyon
- ▶ Sıklıkla abse veya psödoanevrizma sekeliyle ilişkili
- ▶ Aortokaviter fistül (**kötü prognosis**)
- ▶ TEE-Kardiyak BT



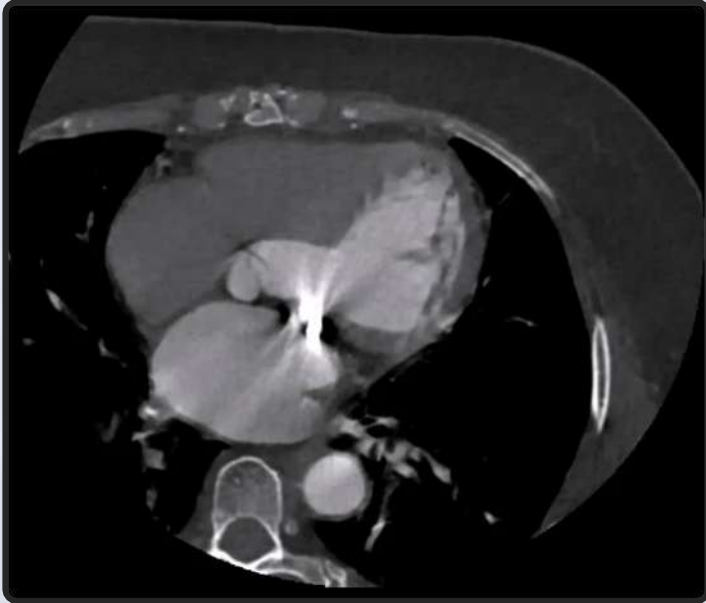
Protez Kapak Disfonksiyonu

► Nadir, hayatı tehdit edebilir

► İlk yöntem Eko

- Metal proteze bağlı akustik gölgelenme
- Yetersiz-kötü akustik pencere
- Kompleks anatomi

Kardiyak BT
Fonksiyonel ve
Anatomik bilgi





Dehissens



- ▶ Valvüler ringde destrüksiyon → dehissens, paravalvüler kaçak
- ▶ Protez malalignment
- ▶ Anulus ile protez arasında gap
- ▶ Paravalvüler kaçakta TEE > Kardiyak BT (duyarlılık %69 vs %44)*

Dehissens - Paravalvüler Kaçak

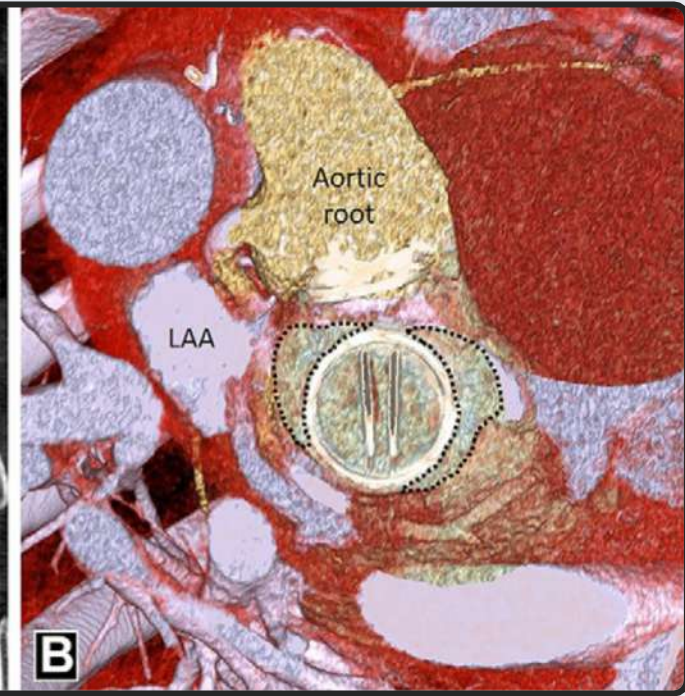
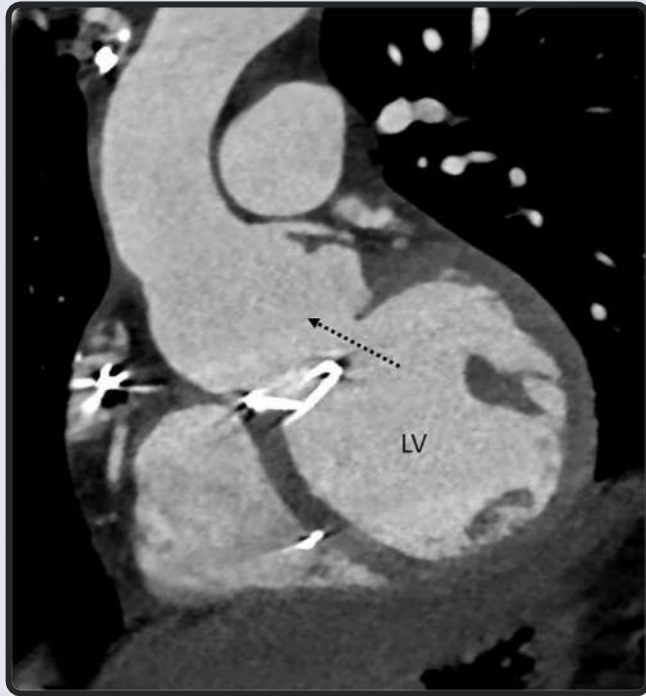




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Saeedan MB,
et al.
Radiology:
Cardiothoracic
Imaging 2021

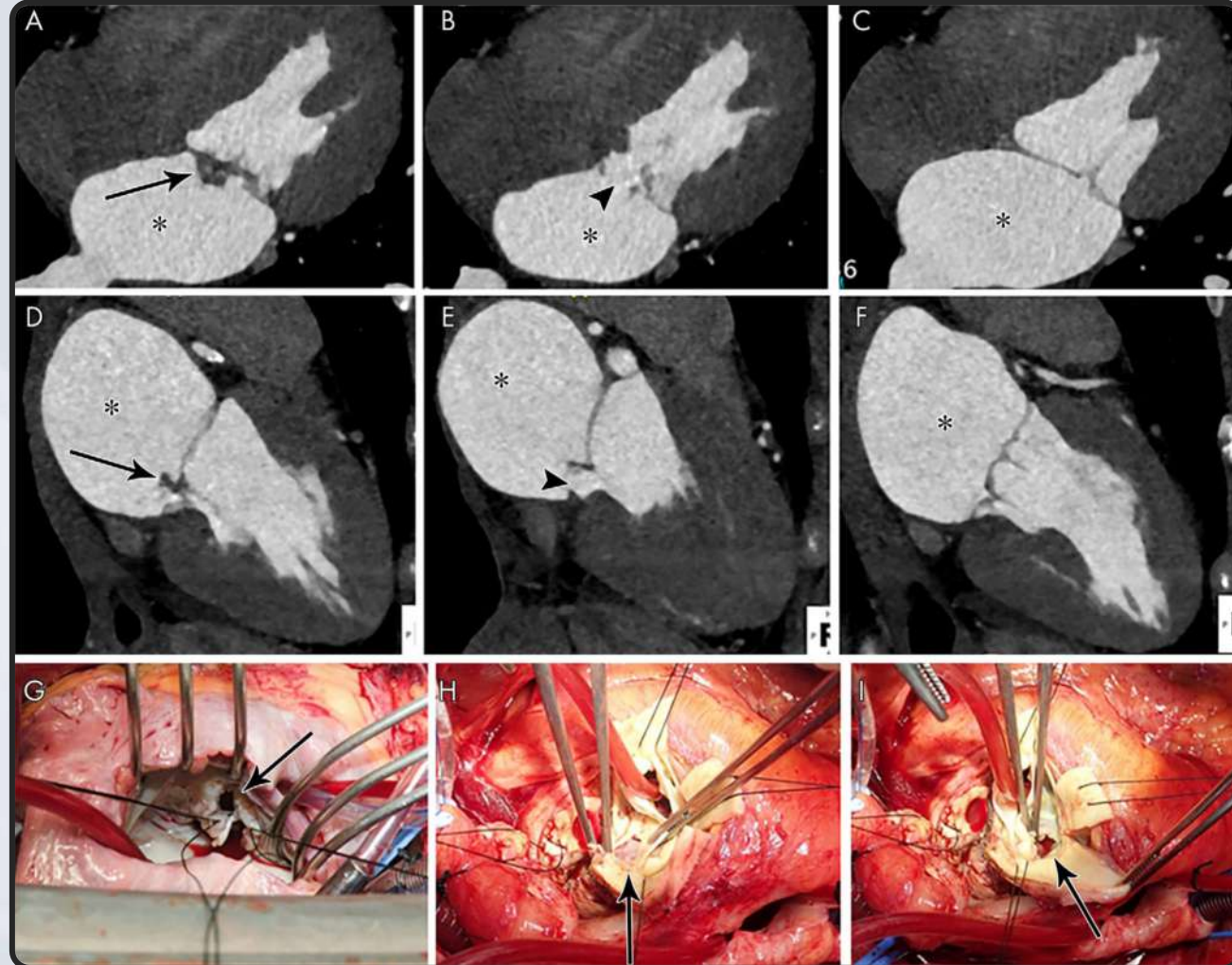


Leaflet Perforasyonu

- ▶ Sık rastlanır
- ▶ Ciddi kapak yetmezliği +
- ▶ BT: Leaflet defekti - devamlılığında bozulma
- ▶ TEE vs Kardiyak BT duyarlılık %75 vs %43
özgüllük %79 vs %89*

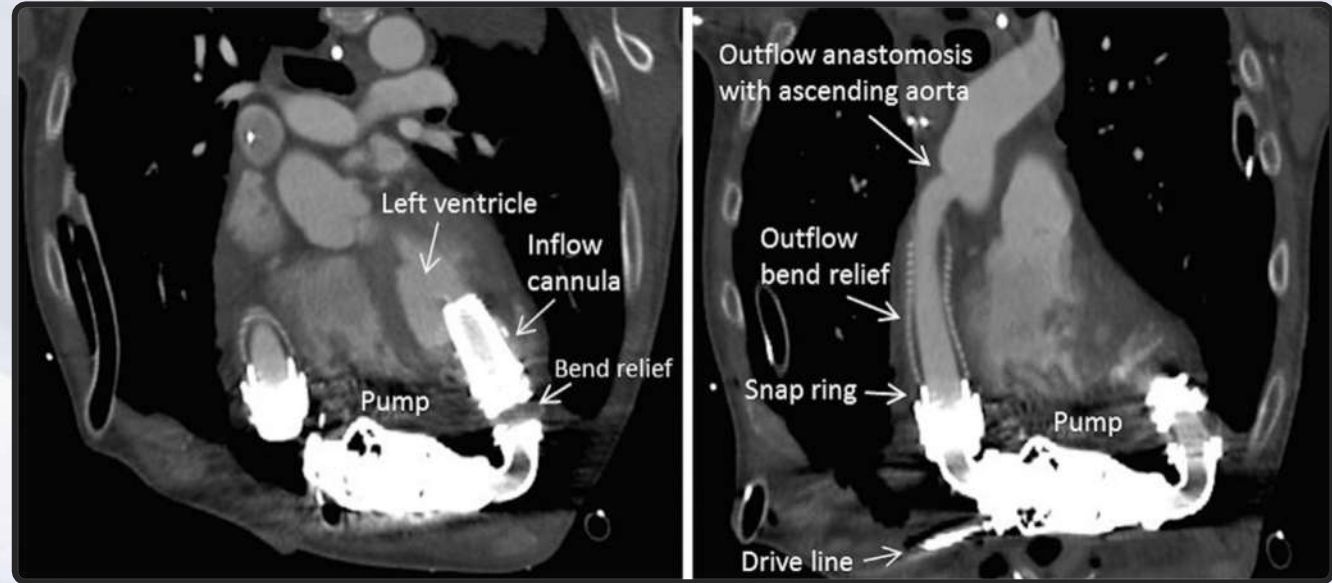


Leaflet Perforasyonu



Kardiyak Implante Elektronik Cihaz - İE

- ▶ LVAD enfeksiyonu, sıklıkla abdomen duvarı giriş yerinde ancak derin dokuya ilerleyebilir*
- ▶ Işın sertleşmesi ve saçılmayla oluşan artefaktlar nedeniyle BT kullanımını **sınırlı**
- ▶ **PET-BT** faydalı

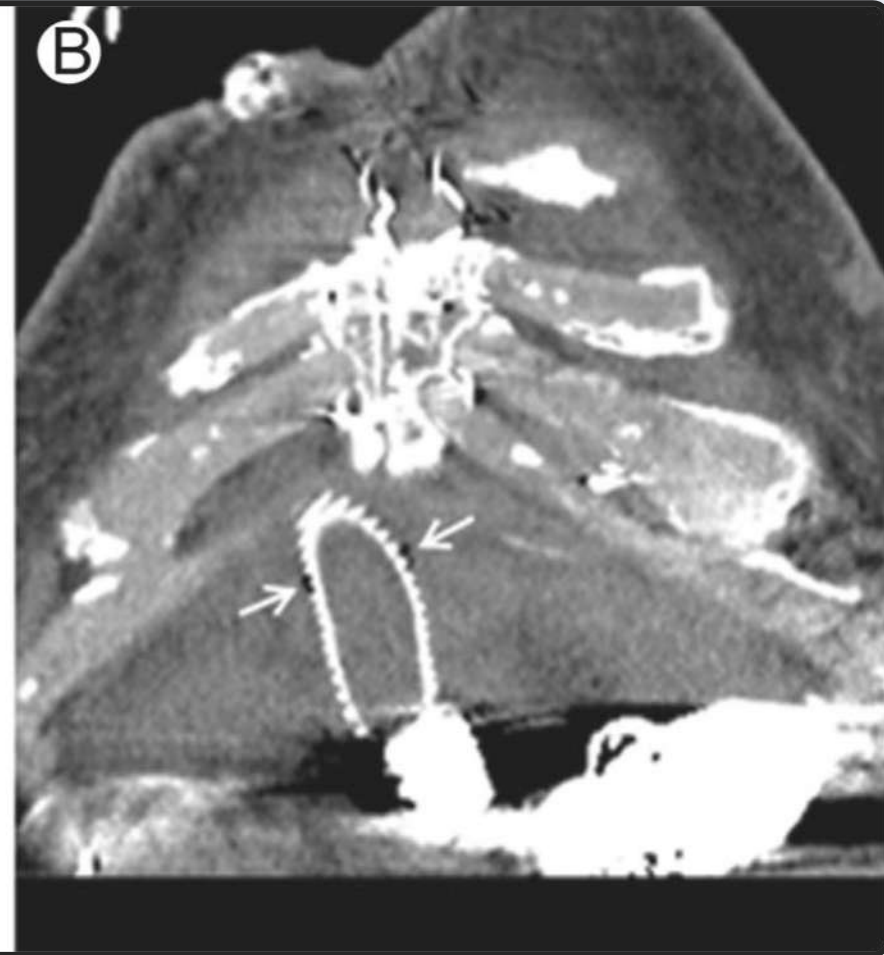
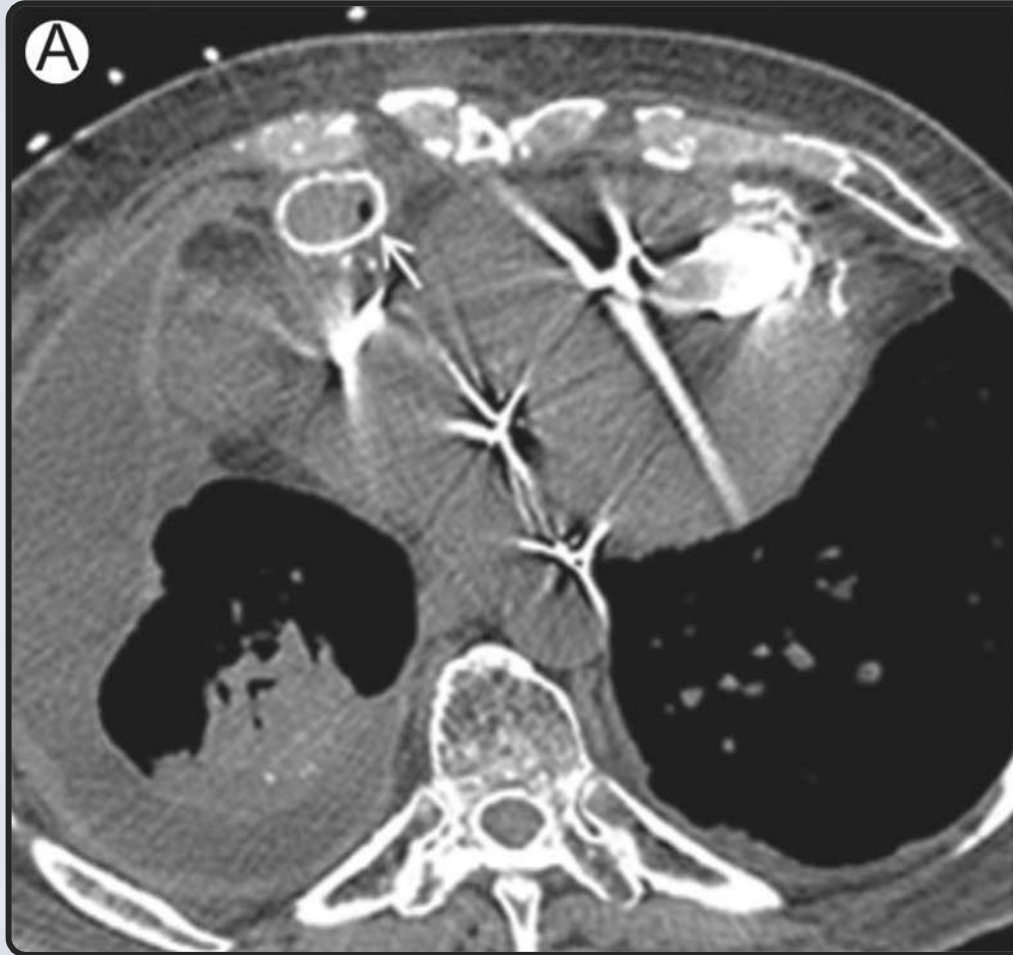


LVAD Enfeksiyonu

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Ekstrakardiyak Bulgular: İE



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- **Previous history of IE**
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- More than mild regurgitation or stenosis of any etiology
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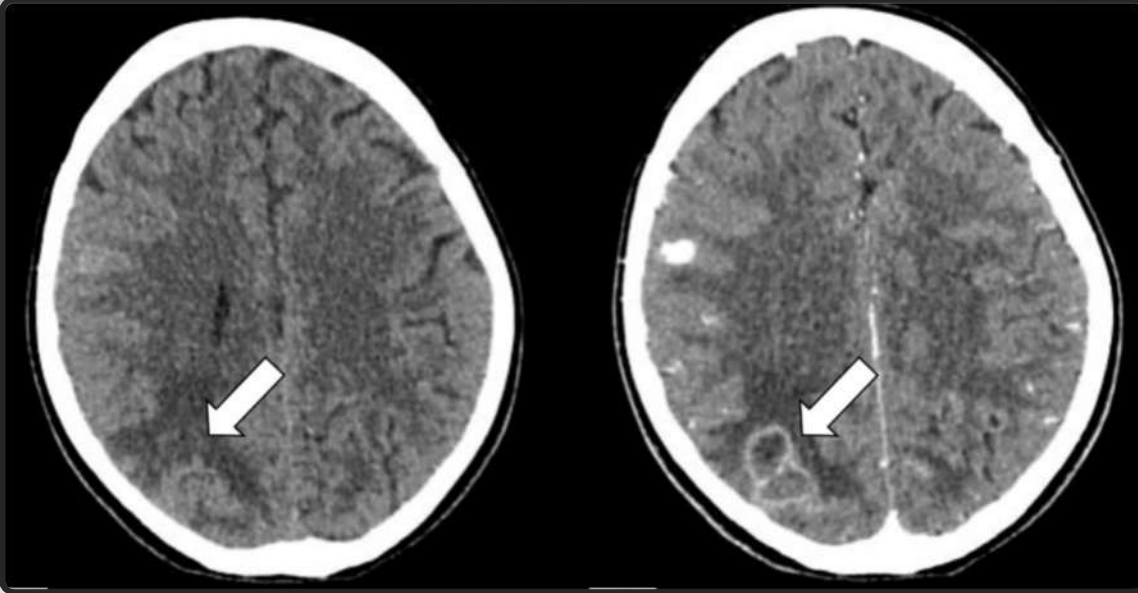
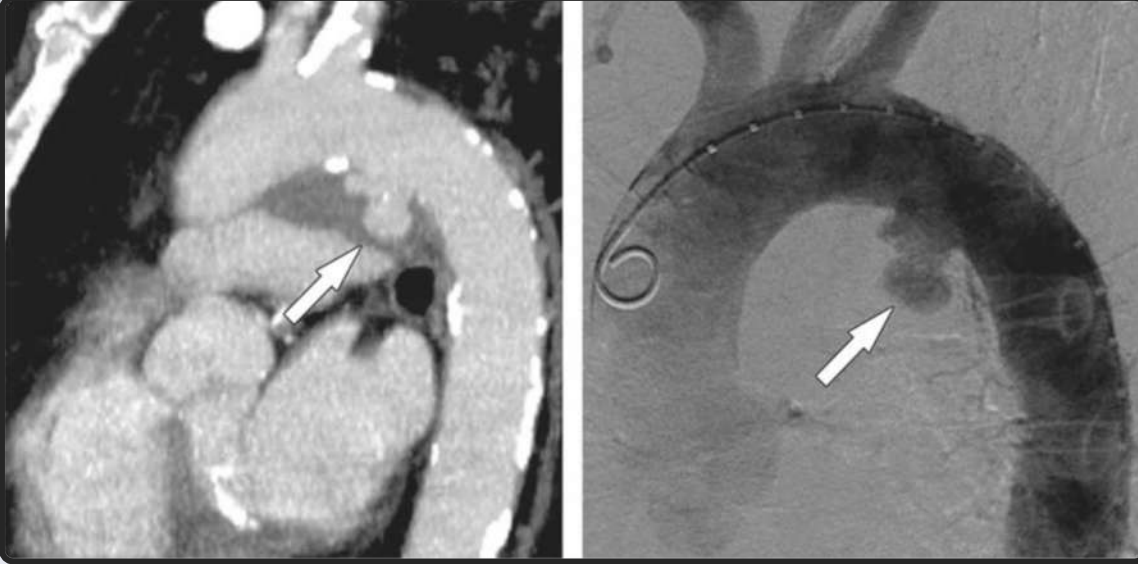


Ekstrakardiyak Bulgular



Emboli ve Mikotik Abse

- ▶ Sol kalp İE veya sağ kalp İE + intrakardiyak şant varsa sistemik embolizasyon görülebilir
- ▶ **>10 mm ve mobil** vejetasyonlarda sık
- ▶ Mikotik anevrizmalar için **BT Anjiyografi**
- ▶ Serebral abse için **Kranial MRG**
- ▶ Splenik abse ve enfarkt için **BT**



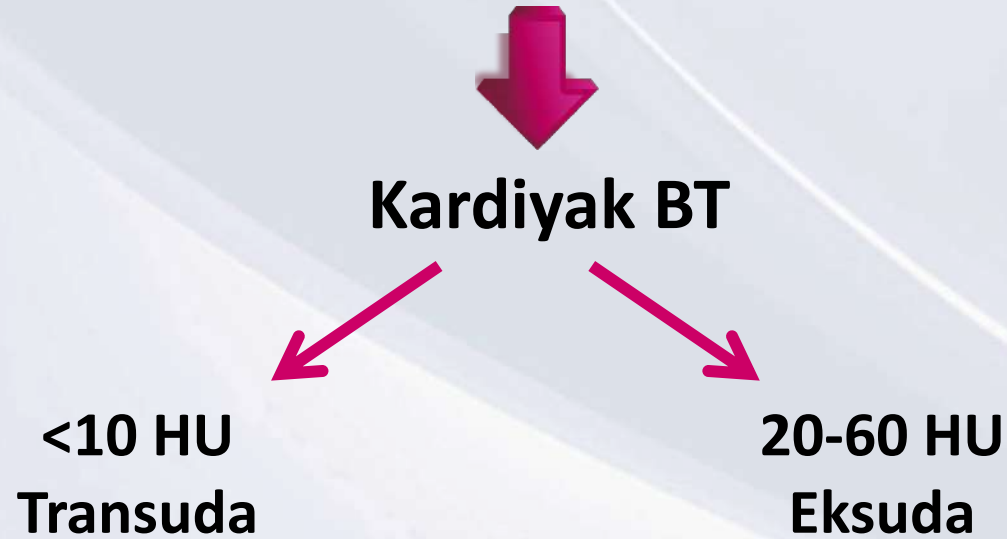


Kapak Dışı Kardiyak Komplikasyonlar



Perikardit-Perikardial Effüzyon

- Pürülan perikardit-Transuda effüzyon **ayırımı önemli**



Kapak Dışı Kardiyak Komplikasyonlar

Bakteriyel Myokardit

- ▶ Nadir
- ▶ Direkt yayılım
- ▶ Kardiyak MRG





Teşekkür ederim...

