

# Acil serviste ekokardiyografi kullanımı

Dr. Ebru Özpelit

DEÜ Kardiyoloji

15.06.2014-izmir

# Acil serviste EKO

- Acil servislerin yoğun ortamında, hızlı ve kolay uygulanabilir, kolay erişilebilir ve güvenilir tanı yöntemlerine ihtiyaç vardır.
- EKO, tüm bu gereksinimleri karşılayan bir tanı yöntemidir.
- Ancak EKO'da görüntü elde edilmesi ve yorumlanması tamamen operatör bağımlı olduğu için yeterli eğitim ve pratik deneyim mutlak gereklidir.



# **Emergency echocardiography: the European Association of Cardiovascular Imaging recommendations**

*versus*

**AMERICAN SOCIETY OF ECHOCARDIOGRAPHY CONSENSUS STATEMENT**

**Focused Cardiac Ultrasound in the Emergent Setting:  
A Consensus Statement of the American Society of  
Echocardiography and American College of  
Emergency Physicians**

# Kardiyolog ya da değil eğitim aynı!!!

**Table 3** Minimal requirements for training and expertise for cardiologists and non-cardiologists<sup>a</sup> for unaided performing/interpretation of adult echocardiography in emergency settings (modified from Popescu et al.<sup>1</sup>)

Level of competence in emergency echocardiography	Profile of individual performing emergency echocardiography	Minimal number of examinations performed to become competent <sup>b</sup>	Achieved level of expertise according to EAE recommendations	Level of competence to be achieved according to ESC Core Curriculum <sup>c</sup>	Additional education/training requirements
Independent operator	Cardiologists (completed training according to ESC Core Curriculum requirements for general training for cardiologists)	350 (TTE)	Basic echocardiography	<ul style="list-style-type: none"> <li>• Level III in general adult TTE</li> <li>• Level II in TEE</li> <li>• Level I in stress echocardiography</li> </ul>	Highly recommended <ul style="list-style-type: none"> <li>• 150 emergency cases interpreted/reported</li> </ul>
	Non-cardiologists <sup>a</sup> (completed training in their own specialties, but not in cardiology)	350 <sup>d</sup> (TTE)	Basic echocardiography	<ul style="list-style-type: none"> <li>• Level III in general adult TTE</li> <li>• Level II in TEE</li> <li>• Level I in stress echocardiography</li> </ul>	Mandatory <ul style="list-style-type: none"> <li>• Theoretical: specific knowledge on emergency cardiovascular diseases/conditions (see list, <a href="#">Table 4</a>),</li> <li>• Practical skills: 150 emergency cases interpreted/reported; 50 of which personally performed and documented</li> </ul>

# Kardiyolog olmayan EKO'cular için, EKO eğitimine dahil edilmesi gereken başlıklar

**Table 4** Proposed list of emergency cardiovascular diseases/conditions to be included in additional theoretical learning program

- Acute coronary syndrome/acute myocardial infarction
- Mechanical complications of acute myocardial infarction
- Acute aortic syndrome/aortic dissection
- Acute pulmonary embolism
- Acute heart failure/cardiogenic shock
- Acute pericarditis
- Cardiac tamponade
- Acute myocarditis
- Pneumothorax
- Cardiomyopathies
- Aortic stenosis
- Acute valvular regurgitation
- Hypertrophic cardiomyopathy
- Takotsubo cardiomyopathy
- Prosthetic valve dysfunction
- Cardiac sources of embolism (tumours and masses)
- Ventricular assist device malfunction
- Acute complications of interventional procedures in the catheterization and electrophysiological laboratories
- Acute complications of cardiac surgery
- Endocarditis
- Traumatic injuries of the heart

# Acilde EKO yapabilmek için gereken bilgi donanımı

- Indication and limitations of emergency echocardiography
- Knowledge about technical settings, artefacts, and pitfalls of echocardiography
- Knowledge about anatomy and topography of the heart and the great thoracic arteries and veins
- Standardized echocardiographic examination and documentation; value of non-standardized views
- Analysis of left and right cardiac chamber size and function
  - Detection of cardiogenic shock and its differentiation from other causes of shock
  - Detection of regional left-ventricular dysfunction
  - Detection of right-ventricular function, including right heart infarction
  - Detection of acute pulmonary embolism
- Detection of acute valvular disease
- Analysis and detection of pericardial effusion
  - Differentiation between effusion and haematoma
  - Differentiation between haemodynamically stable situations and tamponade
  - Differentiation between pleural and pericardial effusion
- Analysis of intra-and extravascular volume status
  - Detection of hypovolaemia
  - Detection of normal and pathological vein status
  - Differentiation between different causes of increased central venous pressure
  - Detection of increased extravascular lung water (B-lines—lung comets)
- Analysis of the thoracic aorta
  - Detection of acute aortic dissection (haematoma, ulcer)
  - Detection of ectasia and aneurysm
- Detection of prosthetic valve malfunction
- Detection and differential diagnosis of cardiac masses—cardiac sources of embolism
- Assessment of patient with chest trauma

# Kardiyak yada kardiyak olasılıklı acillerde EKO'nun yeri-1

Emergency clinical presentations	Causes <sup>a</sup>	Echocardiography recommended <sup>b,c</sup>	Echocardiography not recommended <sup>c</sup>
Acute chest pain	Frequent: ACS, AoD, PE, MP, Ptx Less frequent: ADHF, T, AVR/PVD	<ol style="list-style-type: none"> <li>1. Evaluation of acute chest pain in patients with suspected myocardial ischaemia/infarction and non-diagnostic ECG and cardiac enzymes, and when resting echocardiogram can be performed during the pain.</li> <li>2. Evaluation of acute chest pain in patients with known underlying cardiac disease (valvular, pericardial, or primary myocardial disease).</li> <li>3. Evaluation of patients with chest pain and haemodynamic instability unresponsive to simple therapeutic measures.</li> <li>4. Evaluation of chest pain in patients with suspected acute aortic syndromes, pulmonary embolism, myopericarditis, and Takotsubo cardiomyopathy.</li> <li>5. As an initial imaging modality for diagnosis of suspected aortic dissection in the emergency setting.</li> <li>6. Guiding the therapeutic approach in patients with known pulmonary embolism (e.g. thrombectomy and thrombolytics).</li> <li>7. In patients with suspected pericardial disease, including effusion, constriction, or effusive-constrictive process.</li> <li>8. In patients with suspected bleeding in the pericardial space (e.g. trauma, perforation)</li> <li>9. Guidance and monitoring of pericardiocentesis.</li> </ol>	<ol style="list-style-type: none"> <li>1. Evaluation of chest pain when non-cardiac aetiology is apparent.</li> <li>2. Evaluation of chest pain in patients with confirmed diagnosis of myocardial ischaemia/infarction.</li> <li>3. In patients with suspected pulmonary embolism to establish or rule-out the diagnosis.</li> <li>4. As an elective diagnostic strategy in haemodynamically stable, normotensive patients with suspected pulmonary embolism.</li> </ol>
Acute dyspnoea	Frequent: ADHF, PE, T, AVR/PVD, ACS Less frequent: AoD, PTx, MP	<ol style="list-style-type: none"> <li>1. Distinguishing cardiac vs. non-cardiac aetiology of dyspnoea in patients in whom clinical and laboratory findings are ambiguous.</li> <li>2. Assessment of left-ventricular size, shape, and global and regional function in patients with suspected clinical diagnosis of heart failure.</li> <li>3. Detection of echocardiographic signs of tamponade.</li> <li>4. Detection of acute valvular regurgitation and/or prosthetic valve dysfunction.</li> <li>5. Detection of suspected complication of myocardial ischaemia/infarction, including but not limited to acute mitral regurgitation, ventricular septal defect, free-wall rupture/tamponade, right-ventricular involvement, heart failure.</li> </ol>	



# Kardiyak yada kardiyak olasılıklı acillerde EKO'nun yeri-2

Emergency clinical presentations	Causes <sup>a</sup>	Echocardiography recommended <sup>b,c</sup>	Echocardiography not recommended <sup>c</sup>
Haemodynamic instability/shock	Frequent: ADHF, T, AVR/PVD, PE, ACS Less frequent: AoD, PTx, MP	1. For differential diagnosis of the cause of hypotension or shock, by detecting cardiac or non-cardiac aetiologies. 2. Rapid identification of pericardial effusion, left-ventricular or right-ventricular dysfunction, and acute valvular dysfunction. 3. Rapid assessment of intravascular volume status.	In patients suffering from shock of apparently non-cardiac aetiology (e.g. anaphylactic, neurogenic, haemorrhagic, etc.).
Chest trauma	Frequent: T, AoD, PTx Less frequent: ACS, AVR/PVD	Detection of pericardial effusion, myocardial contusion or laceration, regional wall motion abnormalities, acute valvular regurgitation, and aortic dissection in patients with severe deceleration injury or chest trauma.	Routine evaluation in the setting of mild chest trauma with no electrocardiographic changes or biomarker elevation.
Cardiac arrest/CPR	Frequent: ACS, PE, T Less frequent: AoD, MP, AVR/	Identification of the (unexpected) cause of cardiac arrest in order to guide CPR (e.g. tamponade, pulmonary embolism, hypovolemic heart, hypertrophic cardiomyopathy).	As a routine procedure during CPR, or if it interferes with CPR.



**Table 8** 'ABCD approach' in performing emergency echocardiography

A	<b>A</b> wareness	<ul style="list-style-type: none"><li>• Fight against routine</li><li>• Think beyond apparent explanations</li></ul>
B	<b>B</b> e Suspicious	<ul style="list-style-type: none"><li>• Referral diagnosis may be misleading</li><li>• Never trust, confirm</li></ul>
C	<b>C</b> omprehensiveness	<ul style="list-style-type: none"><li>• Do as complete examination as suitable</li><li>• Careful interpretation</li></ul>
D	<b>D</b> ouble R <sup>a</sup>	<ul style="list-style-type: none"><li>• The study should be recorded and reviewed</li><li>• Team work is crucial</li></ul>

# Odaklanmış Kardiyak US

- Ayrıntılı bir EKO değildir; belli sorulara cevap vermek amacını taşıyan kardiyak US'dur.
- FOCUS: Focused cardiac ultrasound
- Point-of- care cardiac US
- BECH: bedside echo

# Odaklanmış EKO eğitimi

- **AS USG uygulamaları**

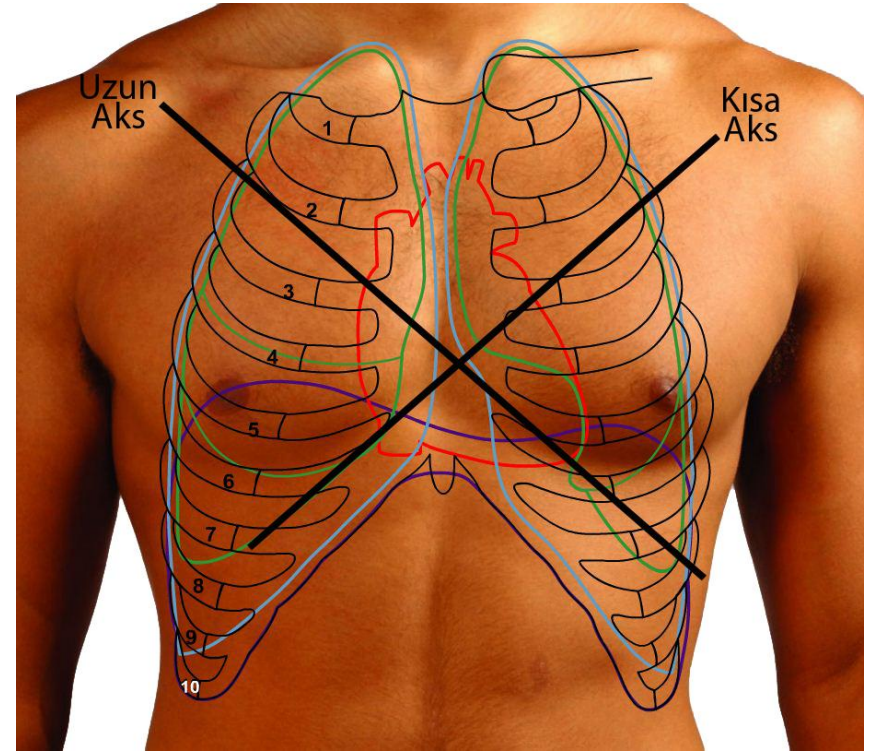
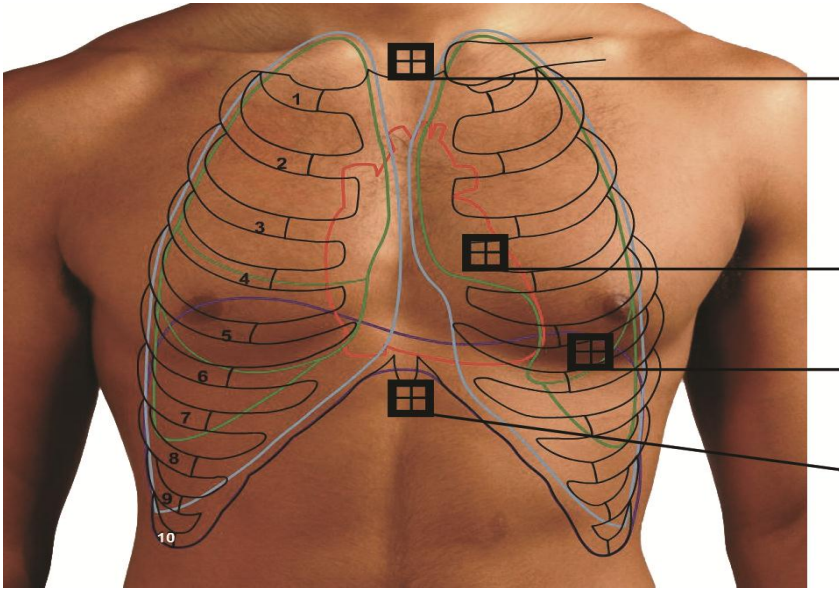
- 1-Travma
- 2-Intrauterin gebelik
- 3-Abd. aort anevrizması
- 4-Kardiyak
- 5-Biliyer sistem
- 6-Üriner sistem
- 7-DVT
- 8-Yumuşak doku – kas/isk. Sistemi
- 9-Toraks
- 10-Oküler
- 11-İnvaziv prosedürlere kılavuzluk

- Her bir başlık için en az 25 dokümente Usg
- Toplamda 150 acil USG uygulaması gerekli

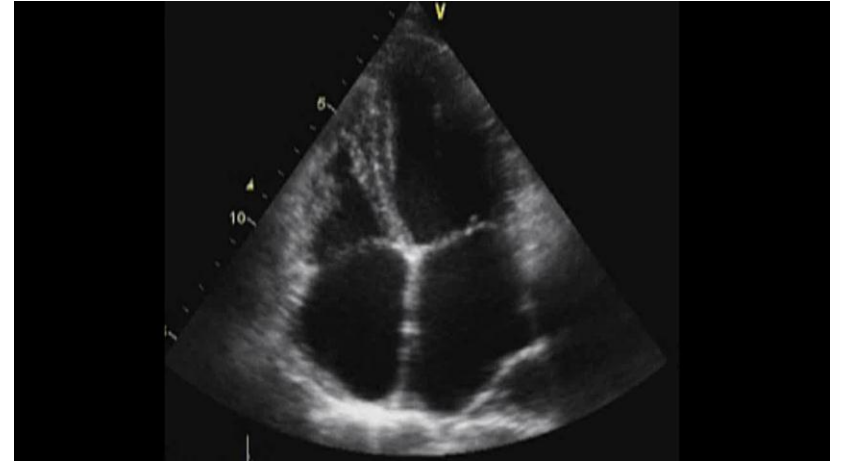
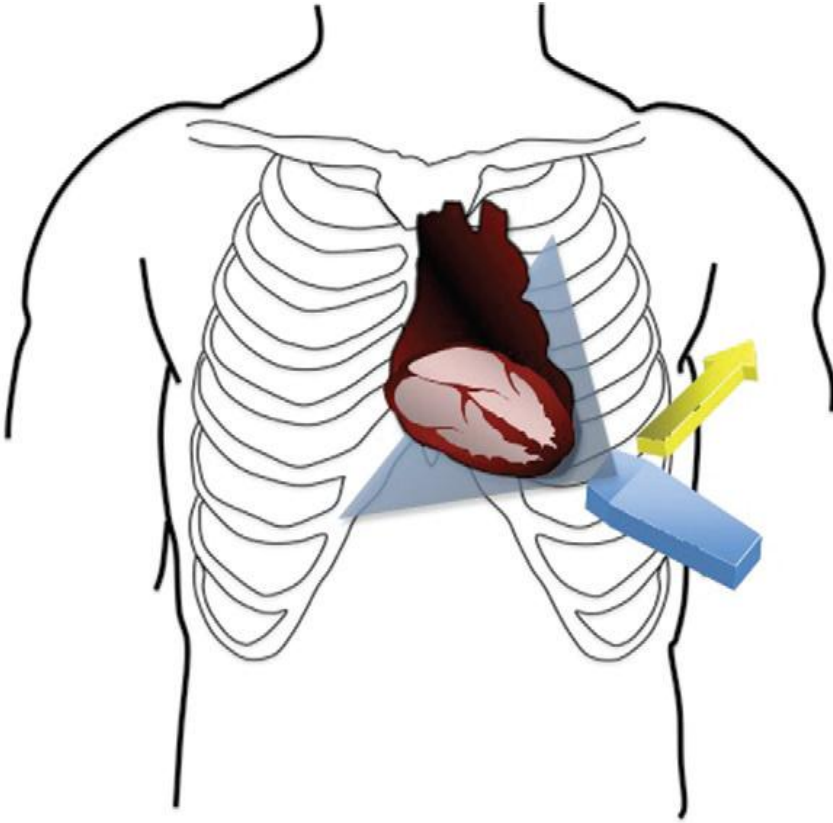
# FOCUS

- Perikardiyal effüzyon değerlendirmesi
- Sol ventrikül sistolik fonk. değerlendirmesi
- AKS tanısında-şüphede kalınan durumlarda
- Masif pulmoner emboli tanısı
- Aort diseksiyonu tanısında
- Sebebi belli olmayan hipotansiyon
- Kardiyak arrest sürecinde(nabızsız aktivite mi asistoli mi???)
- Künt göğüs travmalarında

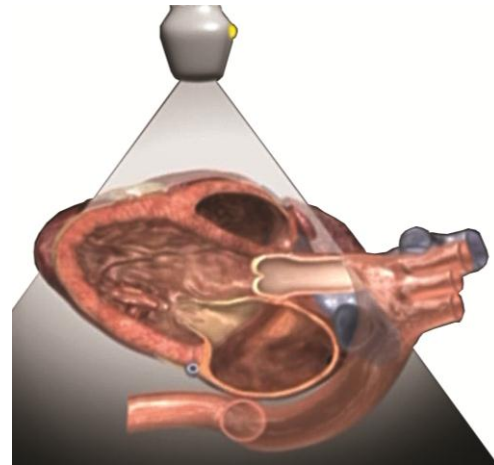
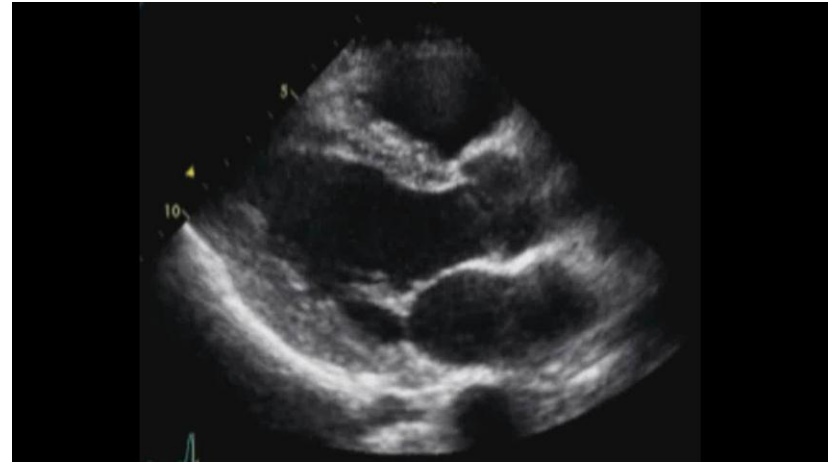
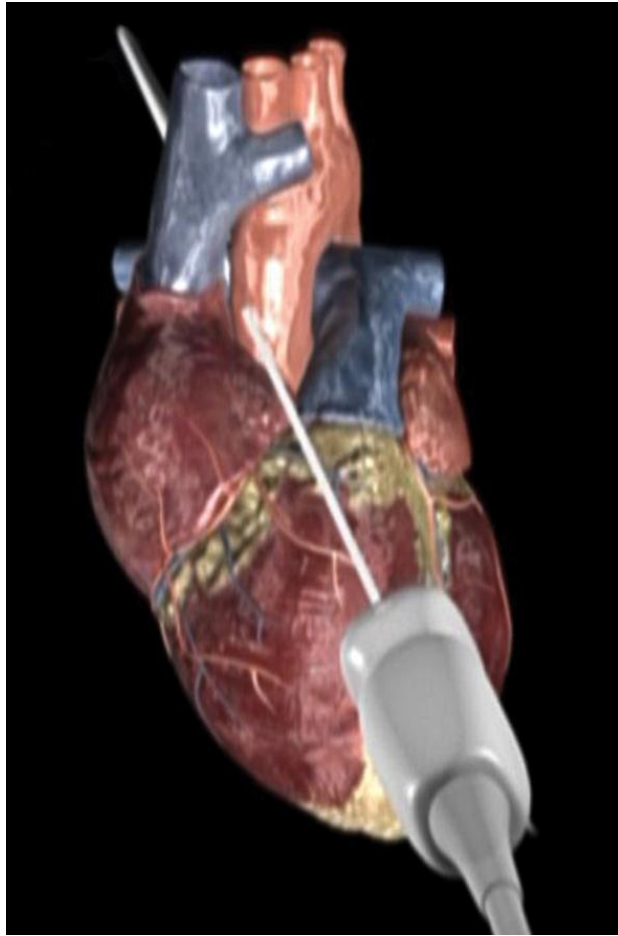
# EKO-görüntü pencereleri



# Apikal dört boşluk

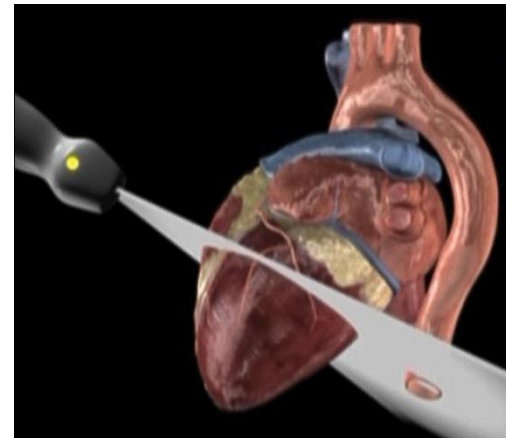
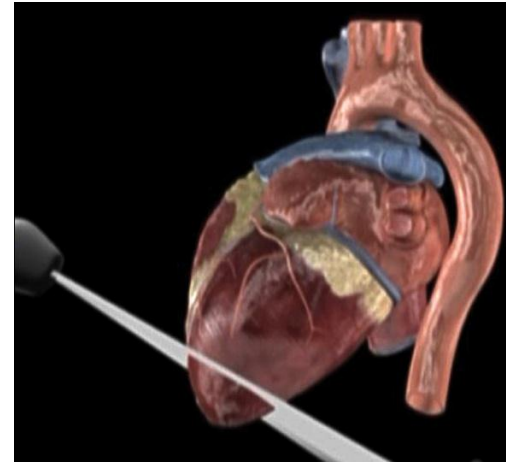
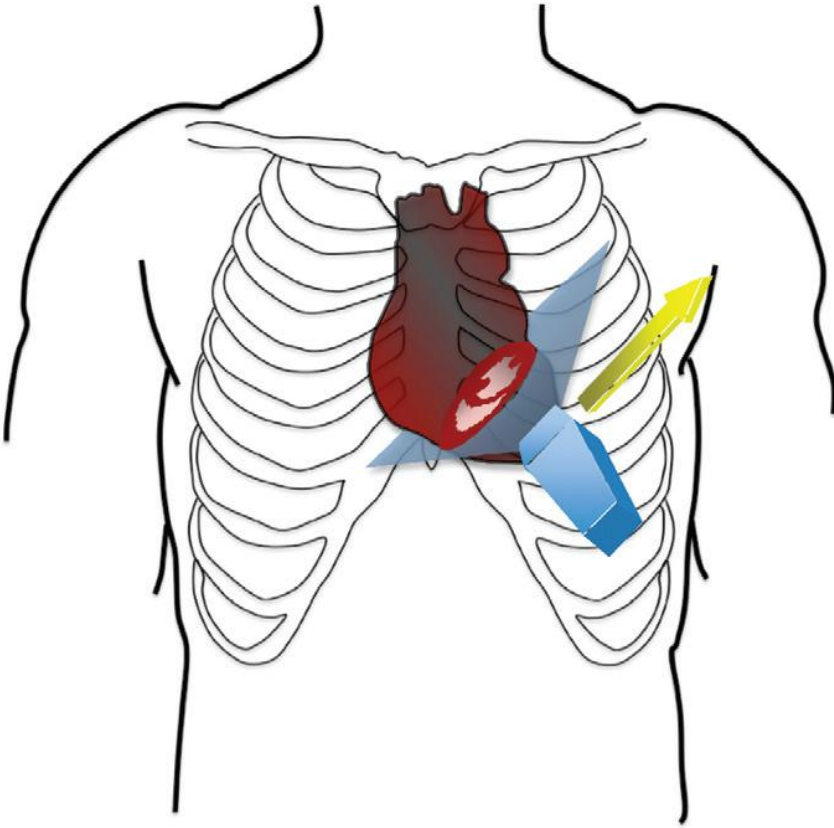


# Parasternal uzun aks

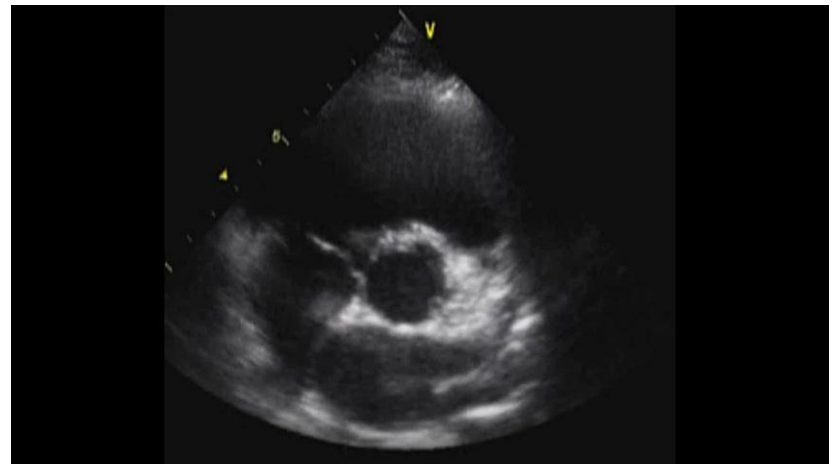
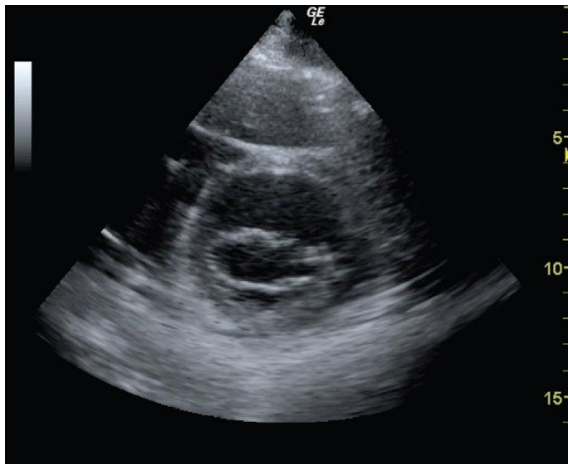
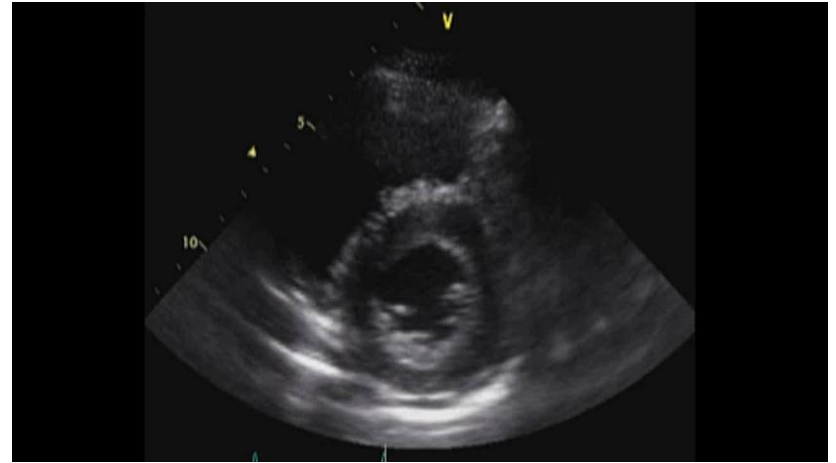
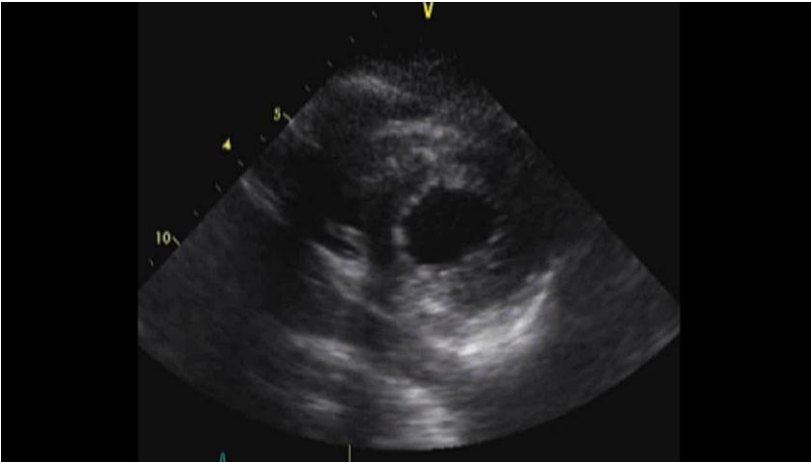




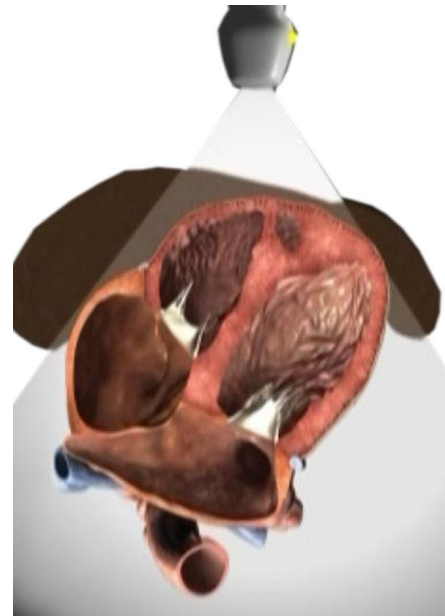
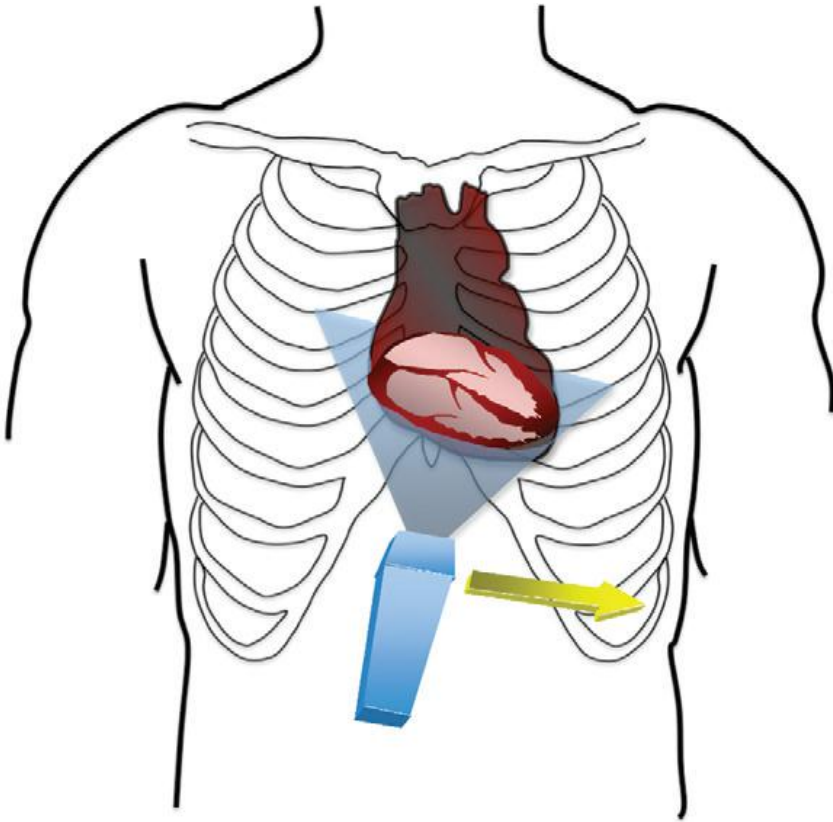
# Parasternal kısa aks



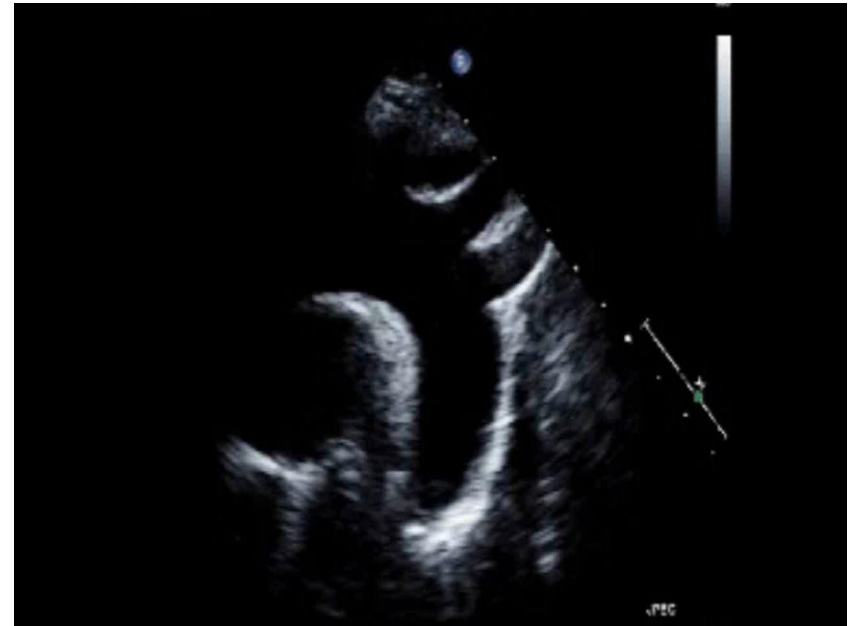
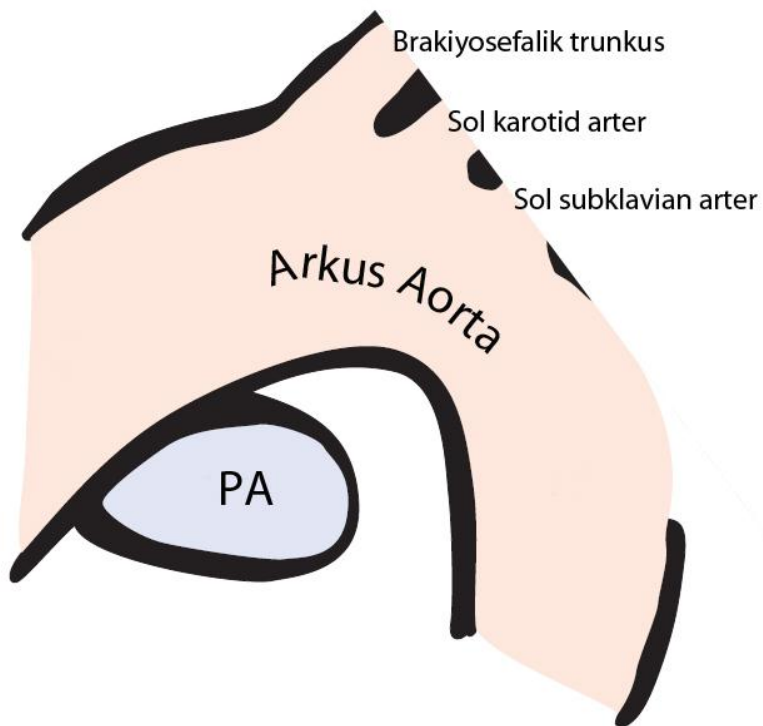
# Parasternal kısa aks



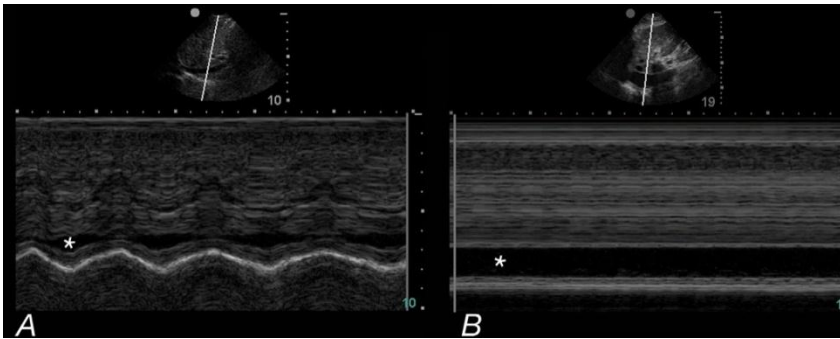
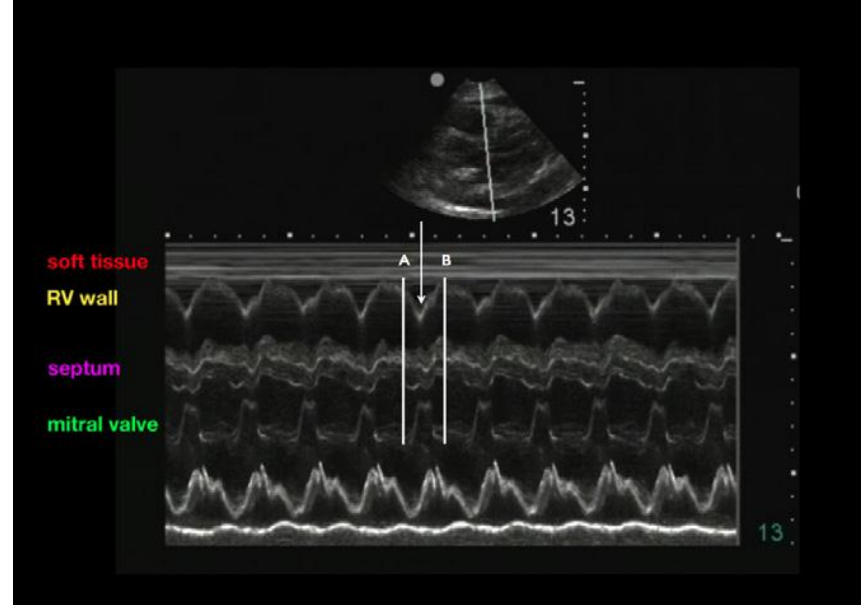
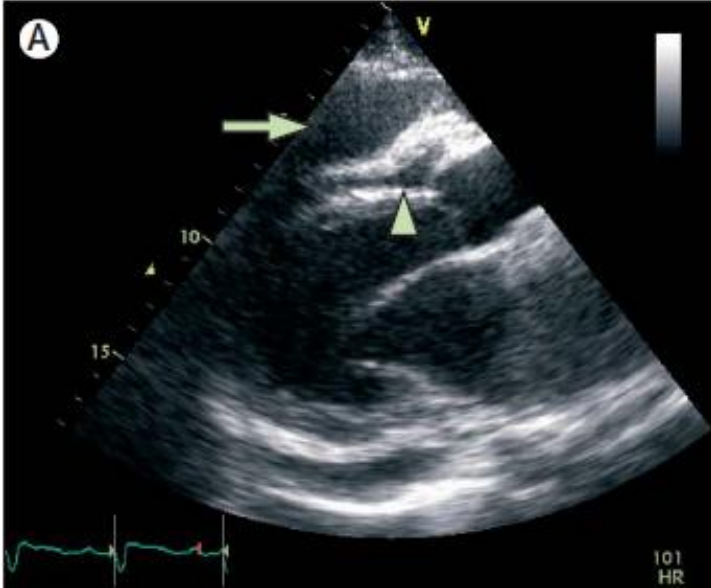
# Subkostal pencere



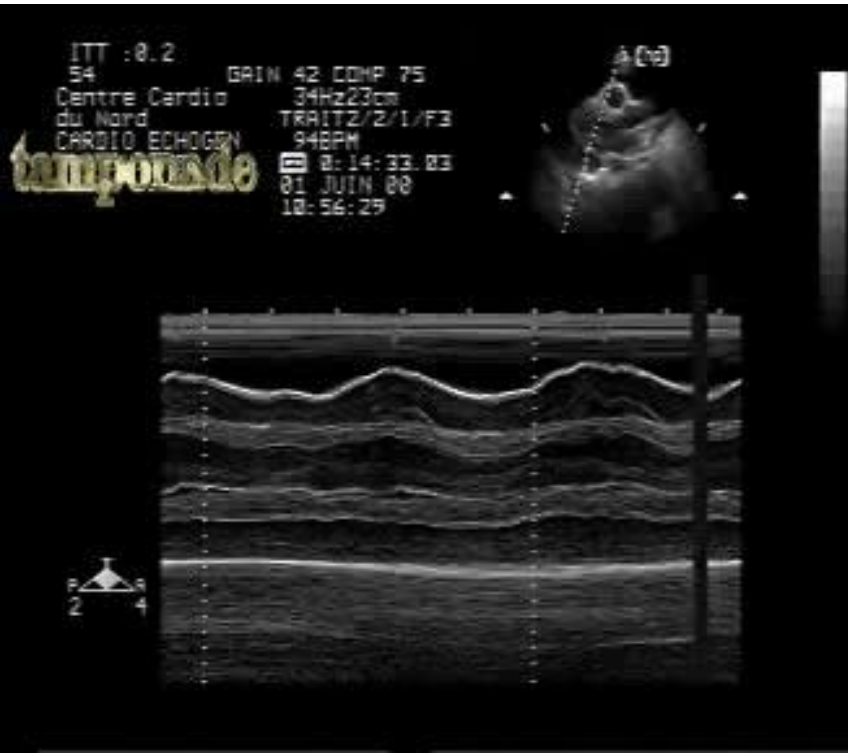
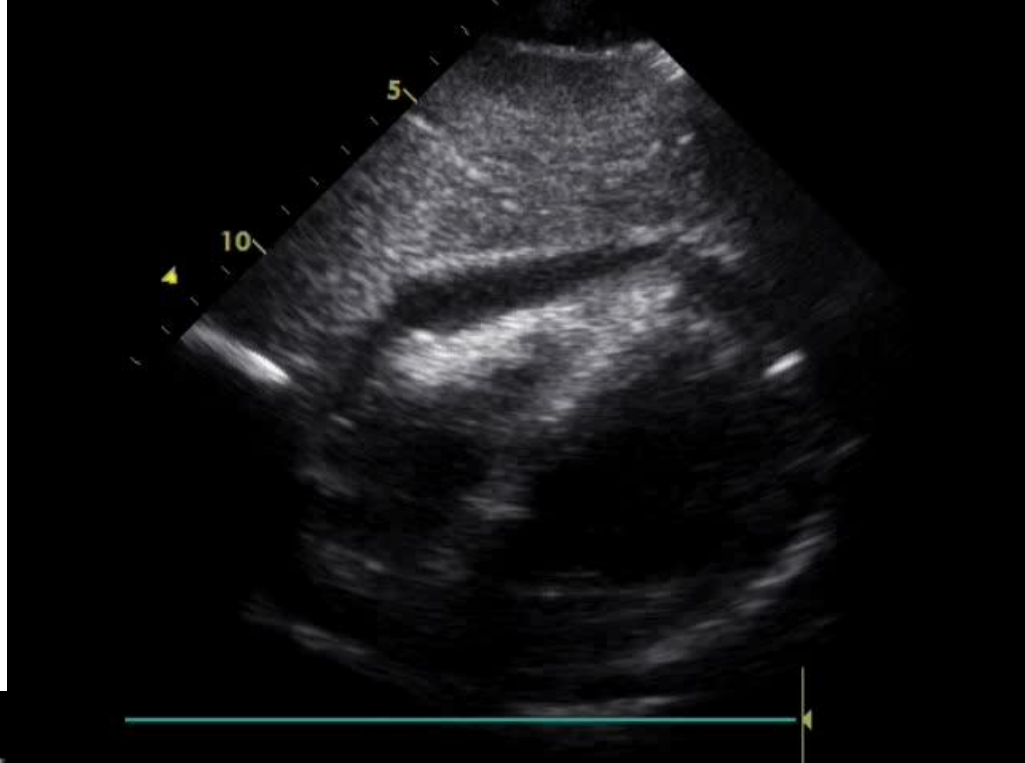
# Suprasternal pencere



# Perikardial tamponad

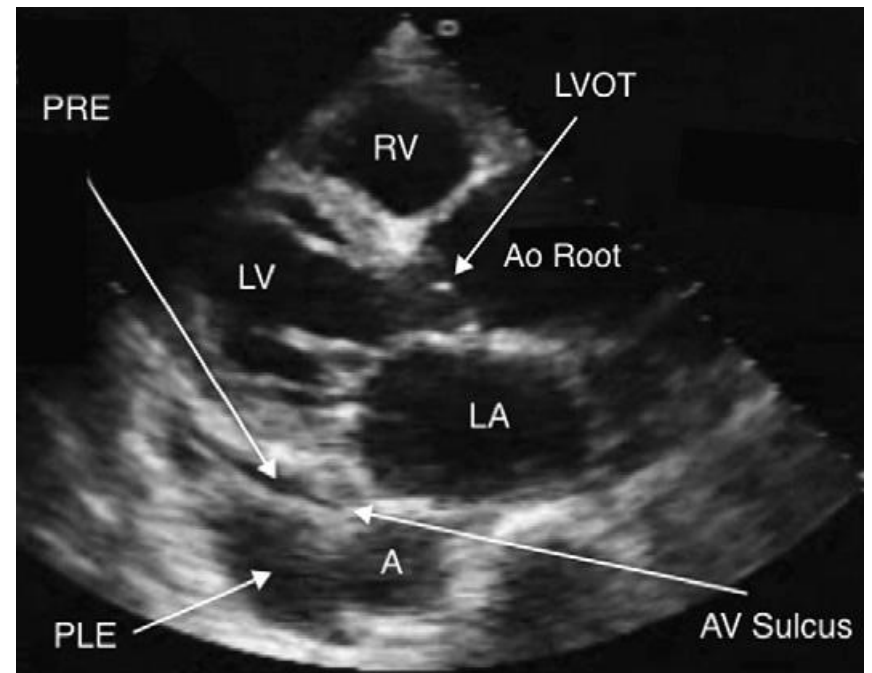
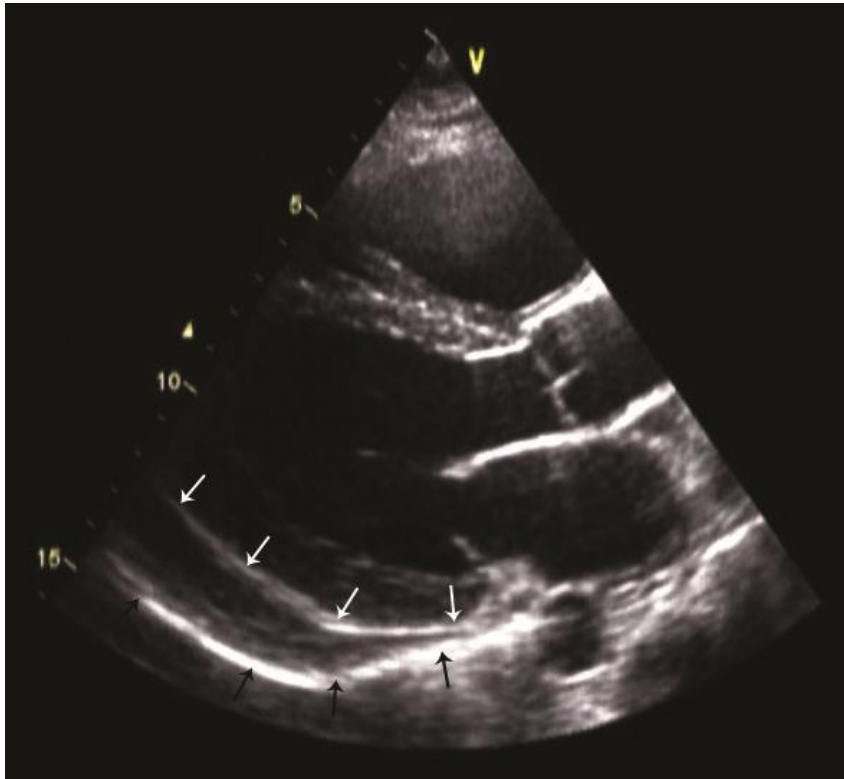


- 1-Sağ yapıların diastolik kollapsı
- 2-IVC 'da dolgunluk
- 3-Mitral ve triküspit inflow akımlarda solunumsal değişkenlik



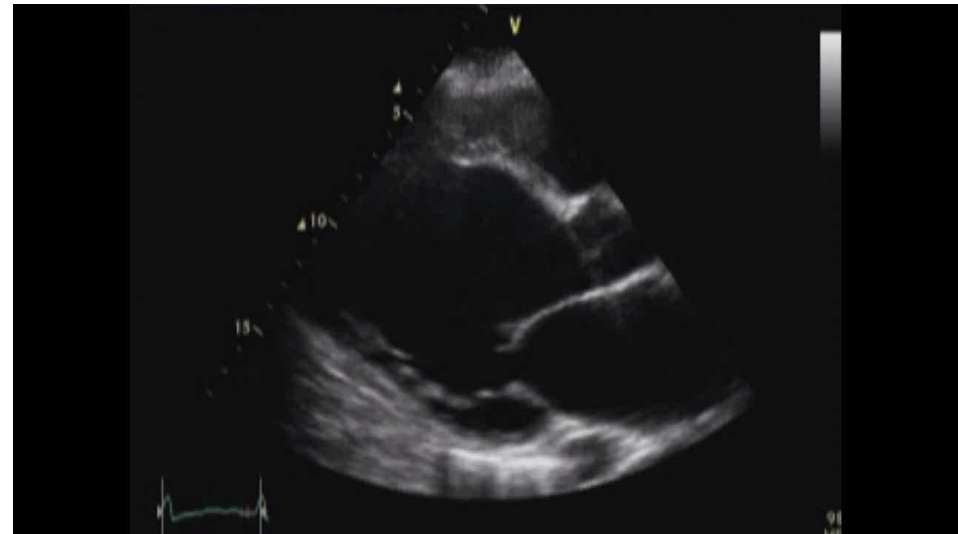
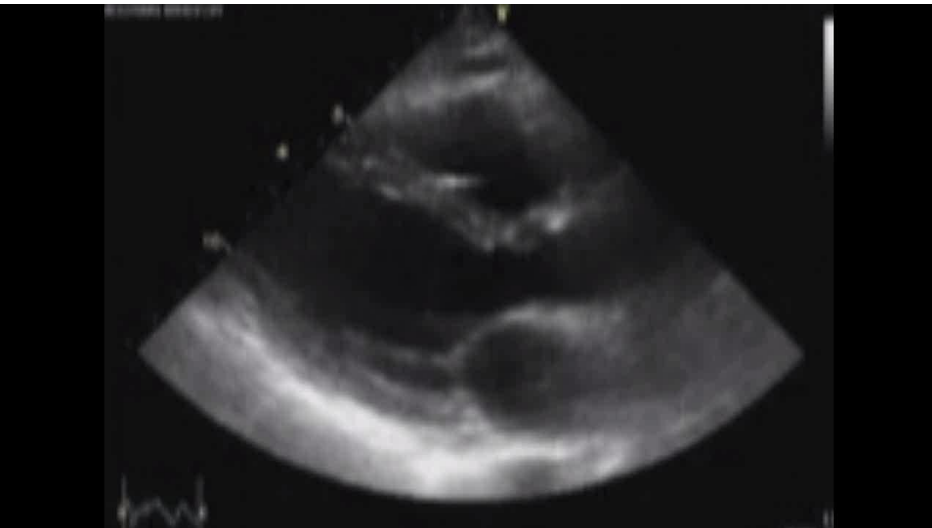
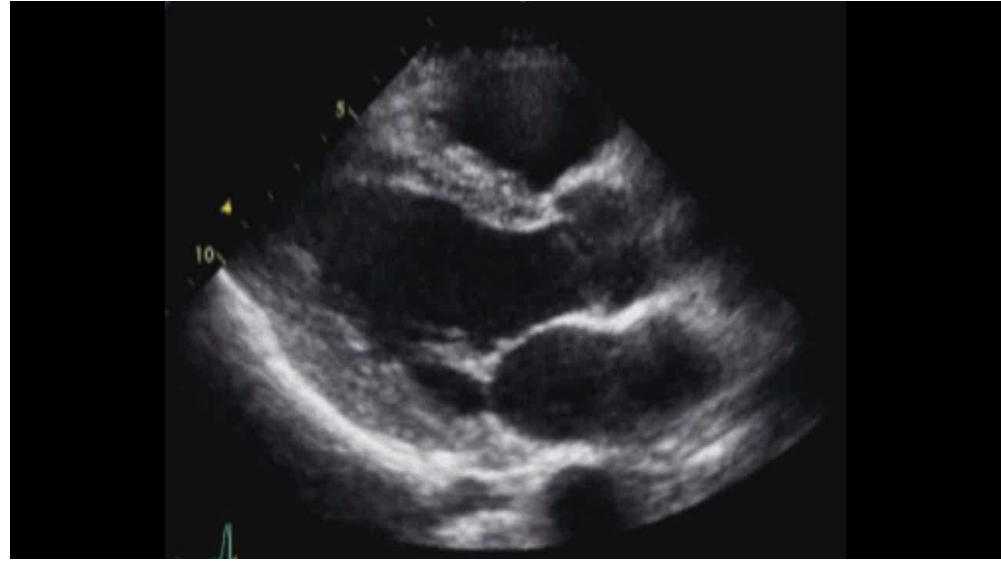


# Plevral-perikardiyal mayi ayrımı

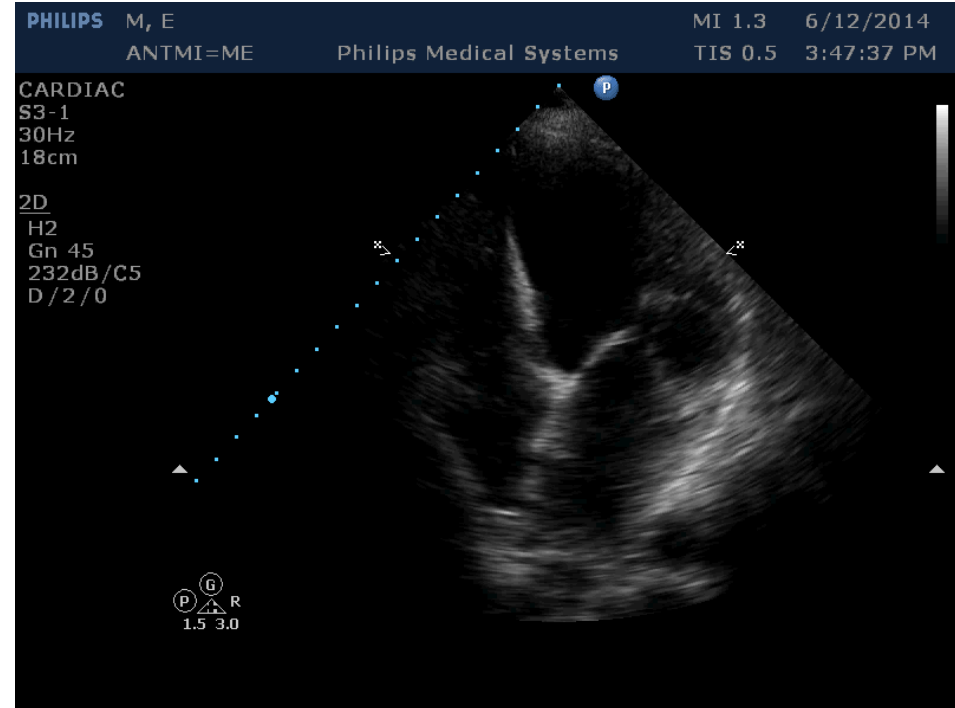
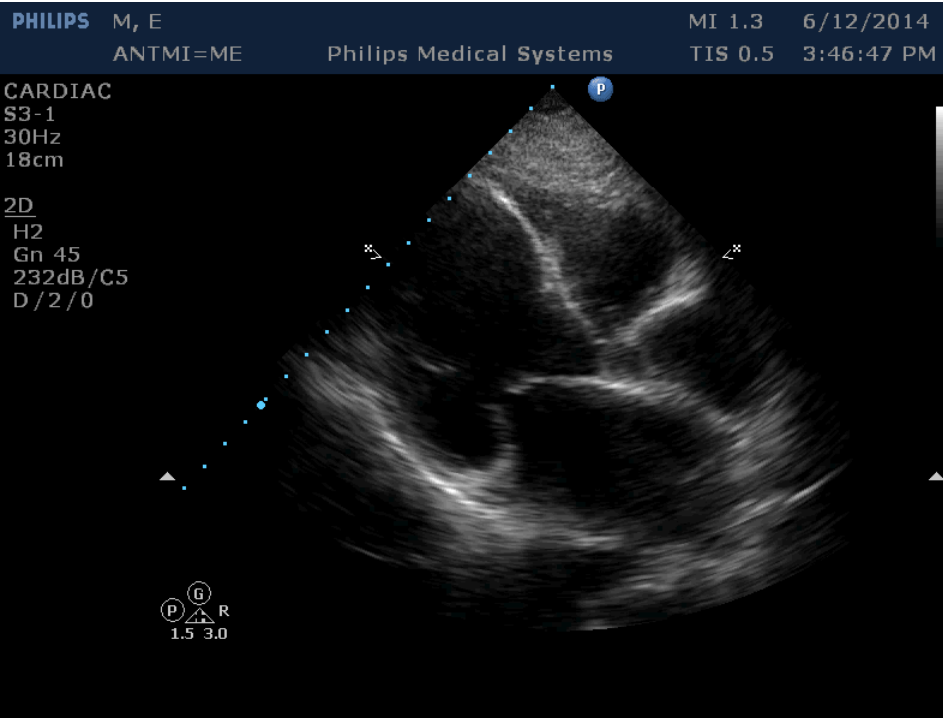




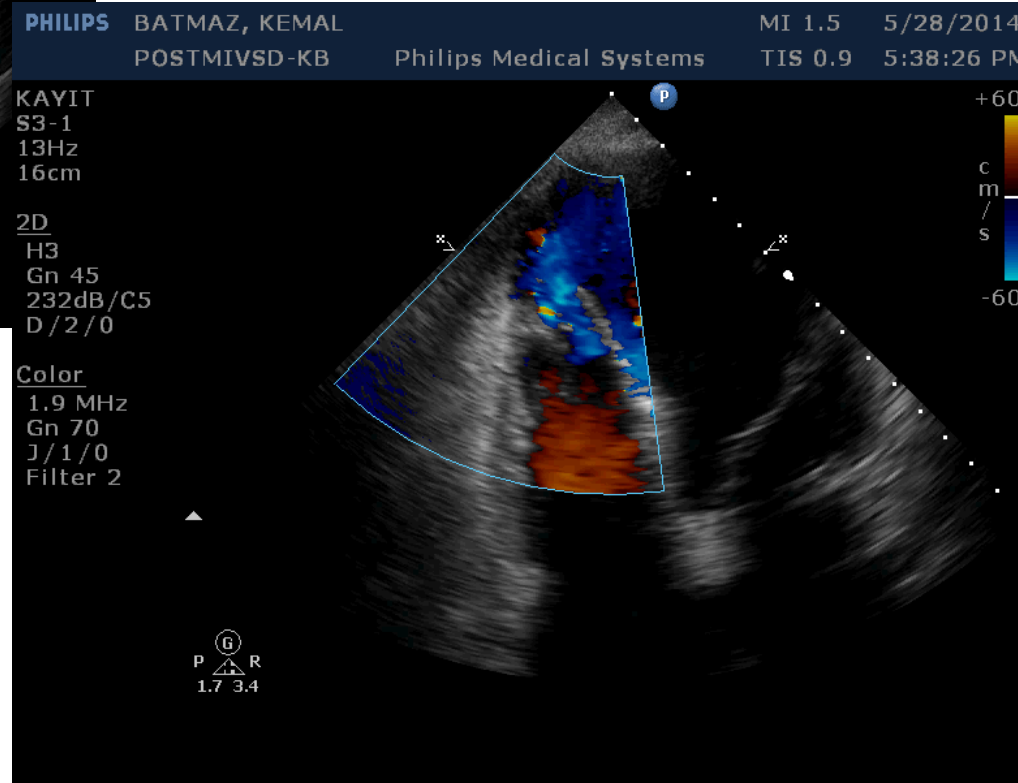
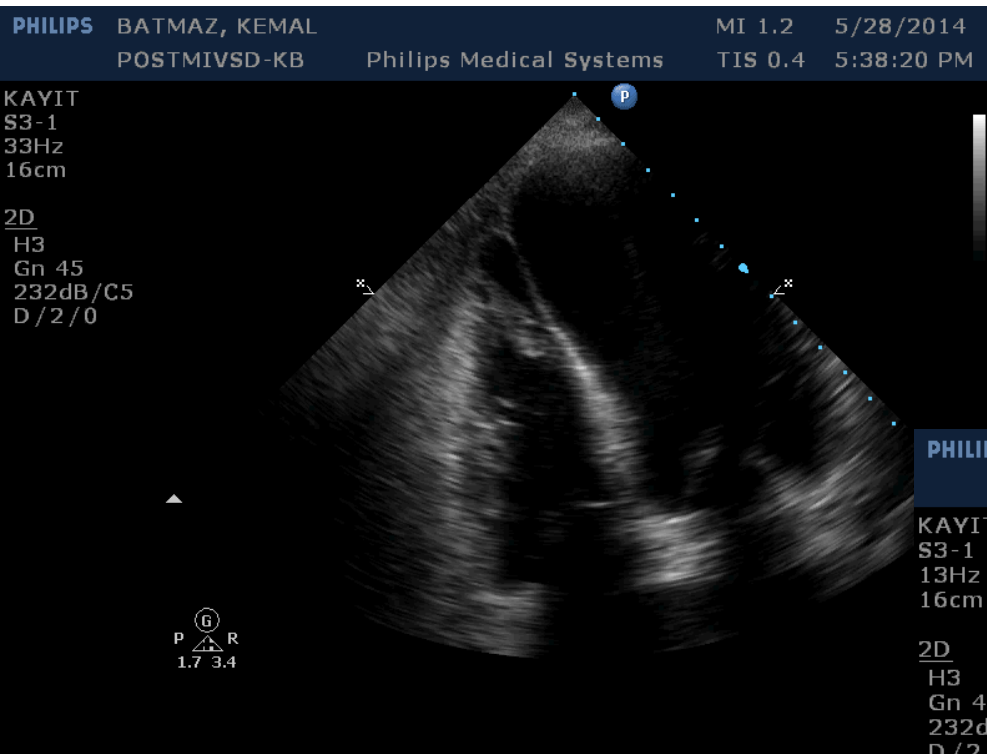
# Sol ventrikül fonksiyonlarının değerlendirilmesi



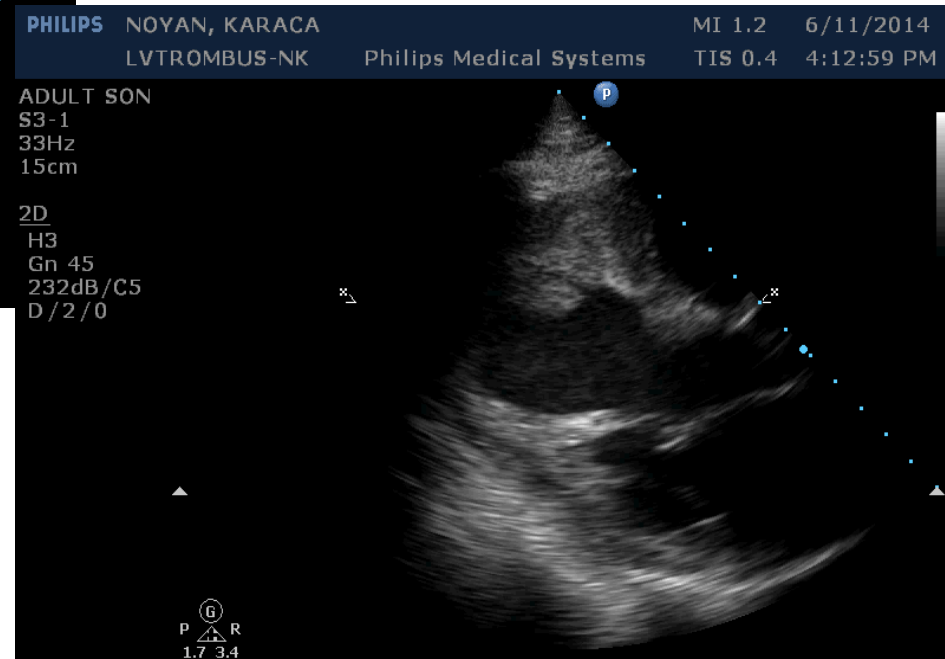
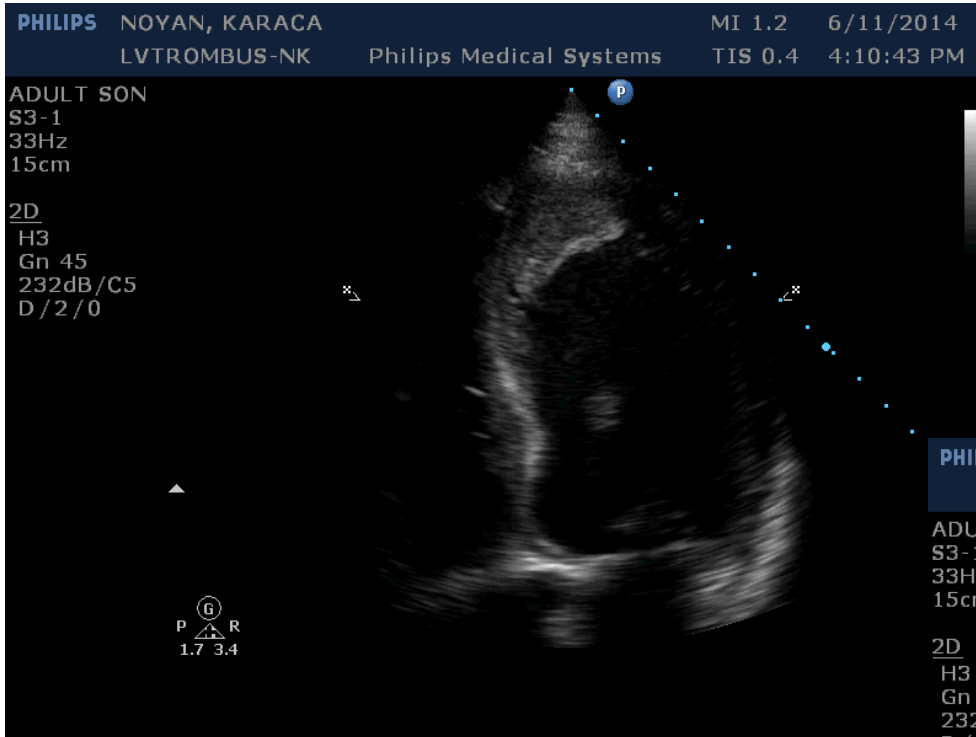
# LV Duvar hareketi bozukluğu



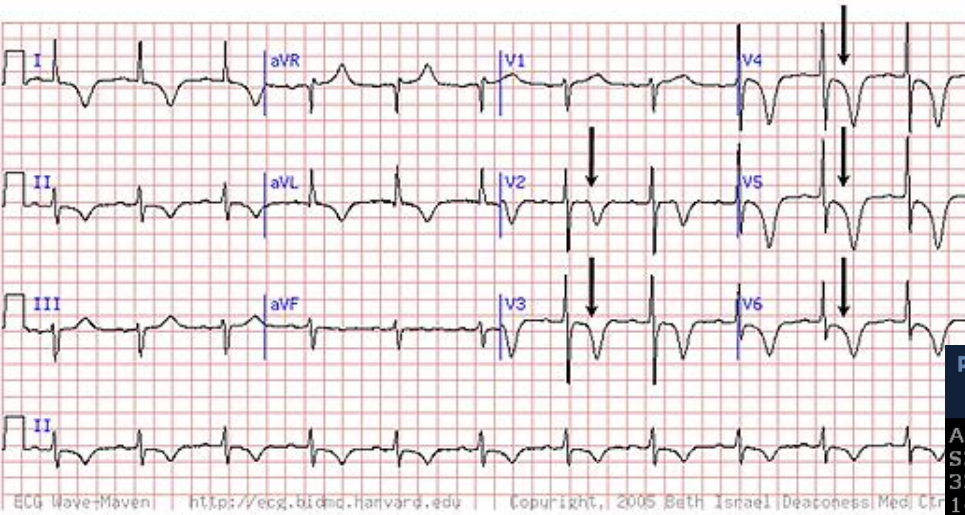
# AMI mekanik komplikasyonları



# Post-MI komplikasyonlar



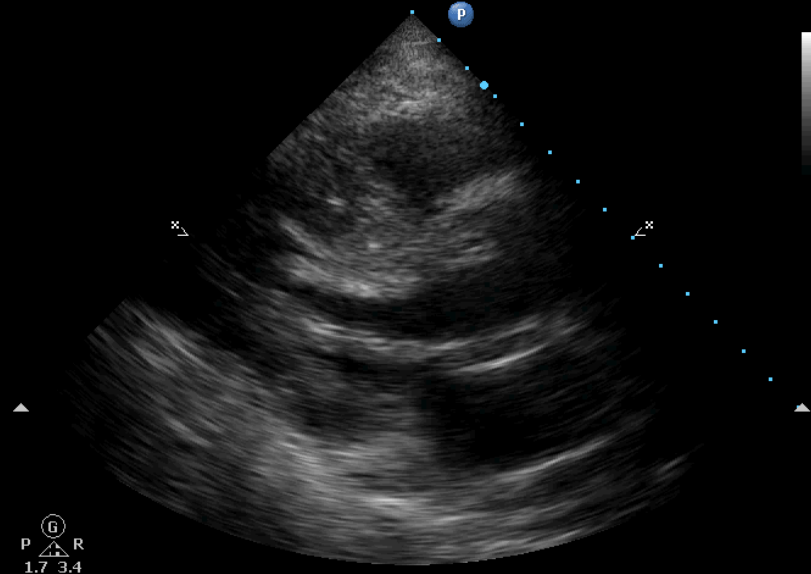
# AKS ayırıcı tanısında EKO



PHILIPS BAHRI, TUNCER MI 1.2 9/26/2011  
POST ABL HOCM BT Philips Medical Systems TIS 0.4 4:10:06 PM

Adult  
S3-1  
33Hz  
14cm

2D  
H3  
Gn 53  
232dB/C5  
D/2/0

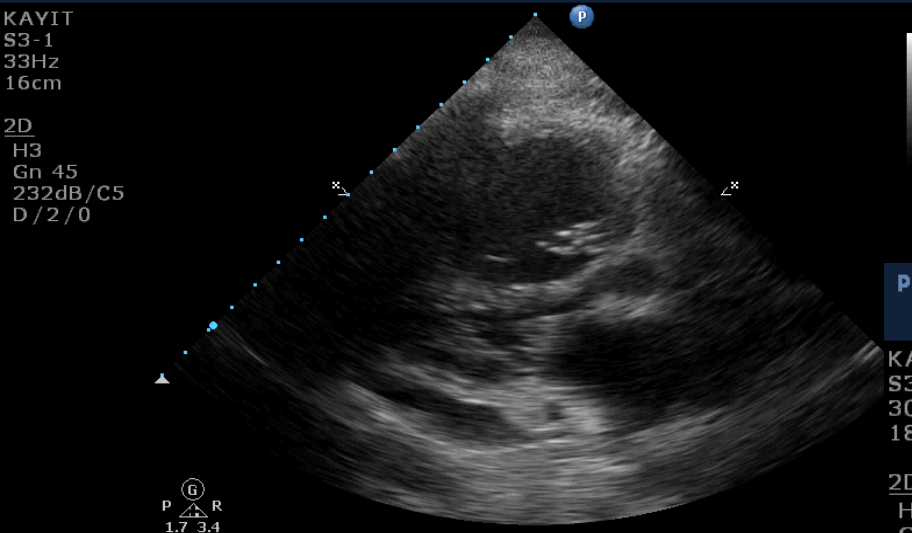


# Pulmoner emboli

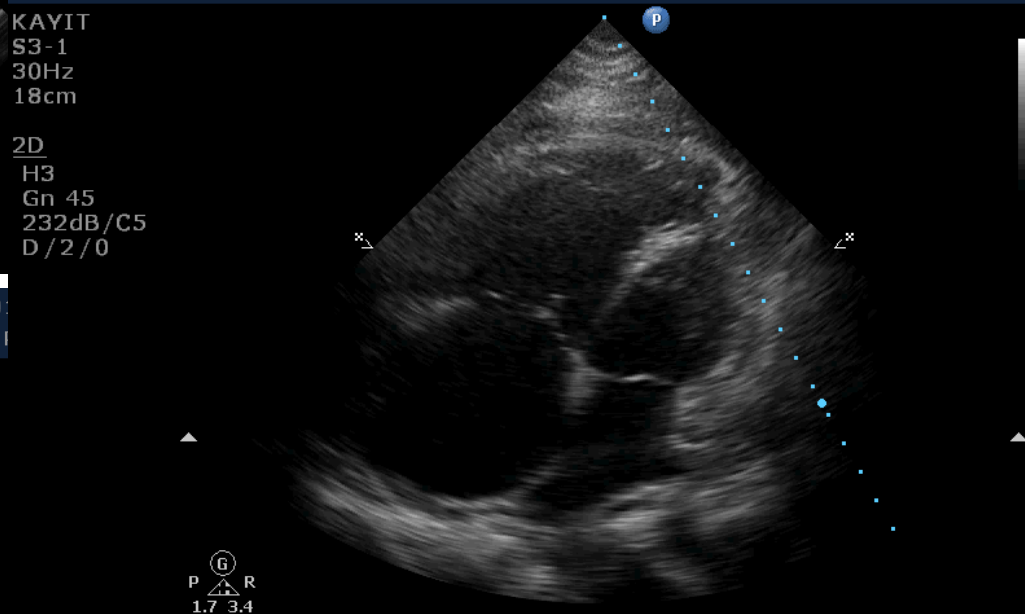


- **Direkt bulgular**
  - 1-sağ kalp boşluklarında trombüs
  - 2-PA'da trombüs
- **İndirekt bulgular**
  - 1-RV genişlemesi
  - 2-RV disfonksiyonu
  - 3-Mc-Connel bulgusu
  - 4-IVS'de düzleşme
  - 5-IVC'da dilatasyon
  - 6-Alt ext. Venlerinde DVT

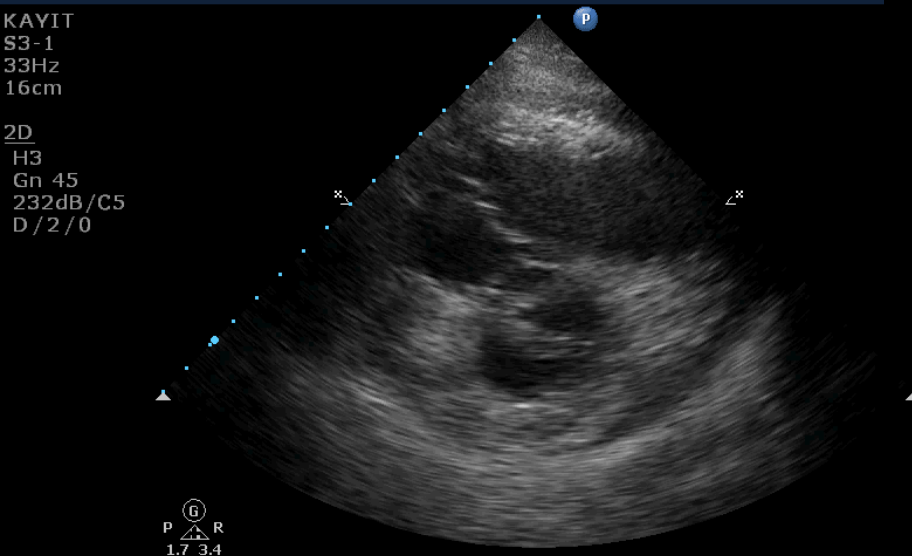
PHILIPS RABIA, OZCAN MI 1.2 5/21/2014  
14-05-21-151838 Philips Medical Systems TIS 0.4 3:21:37 PM



PHILIPS RABIA, OZCAN MI 1.4 5/21/2014  
14-05-21-151838 Philips Medical Systems TIS 0.6 3:23:45 PM

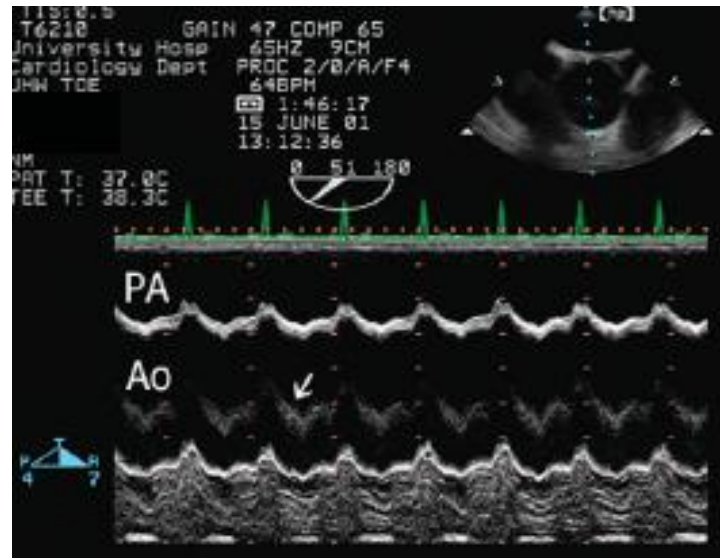
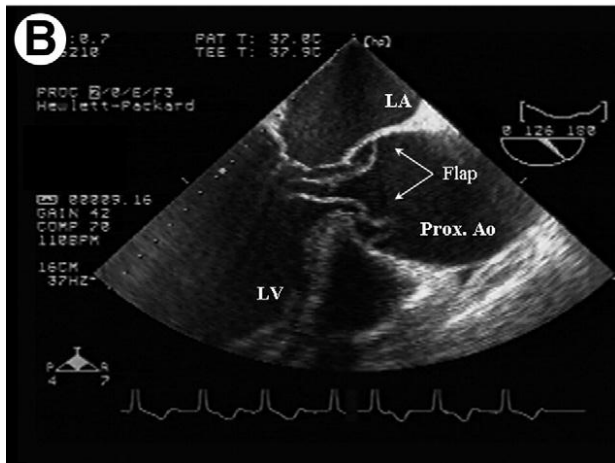
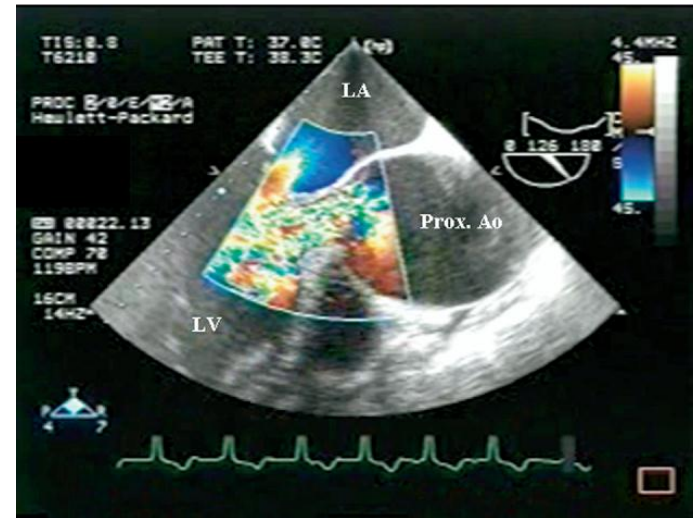
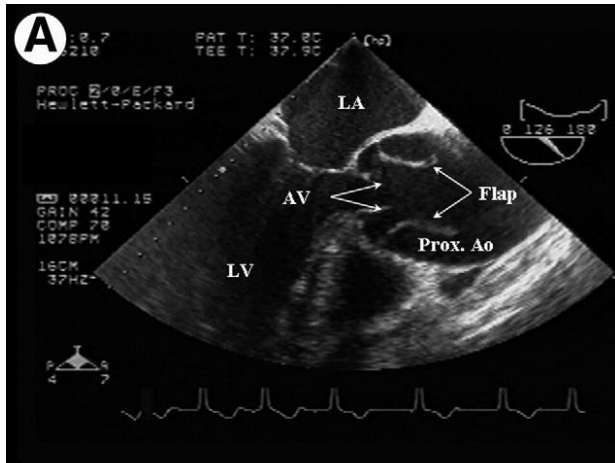


PHILIPS RABIA, OZCAN MI 1.2 5/21/2014  
14-05-21-151838 Philips Medical Systems TIS 0.4 3:21:59 PM



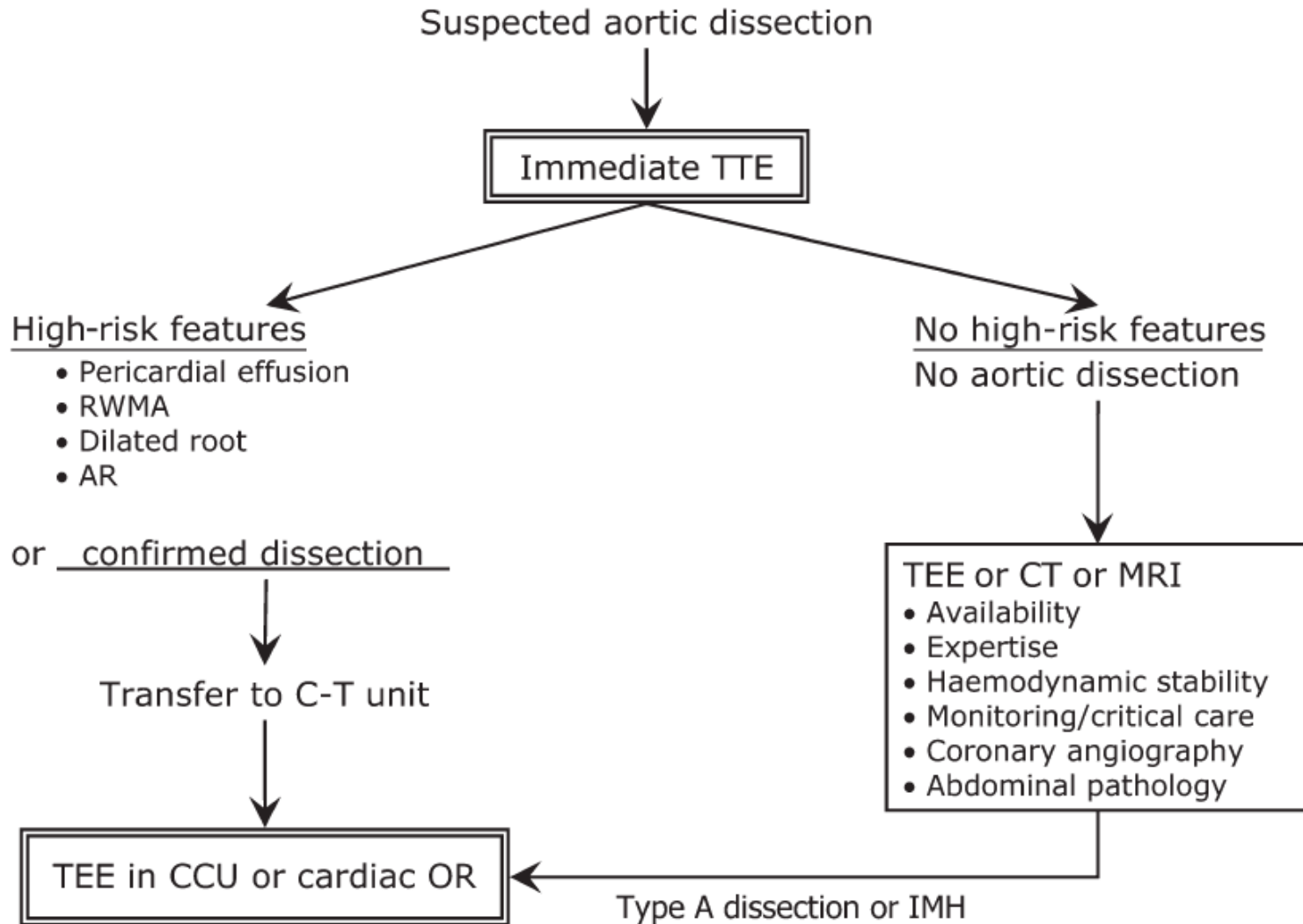


# Aort disseksiyonu



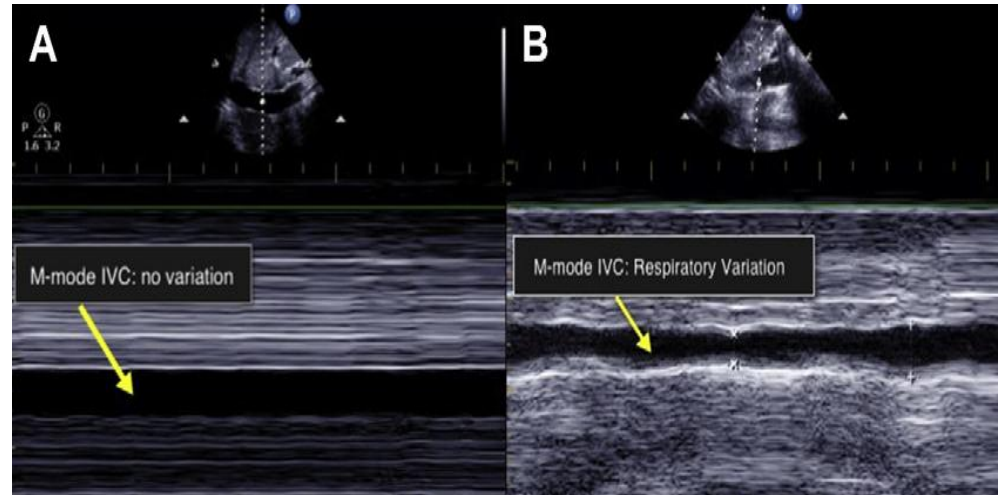
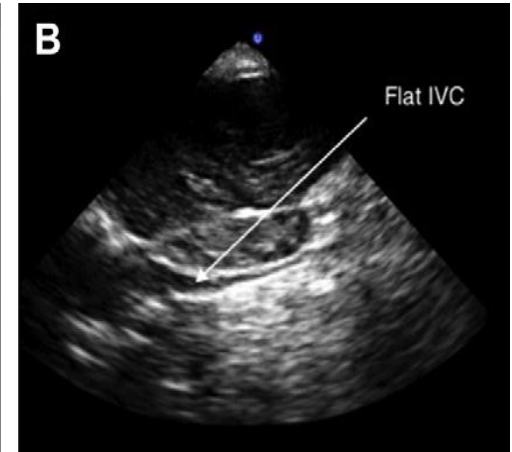
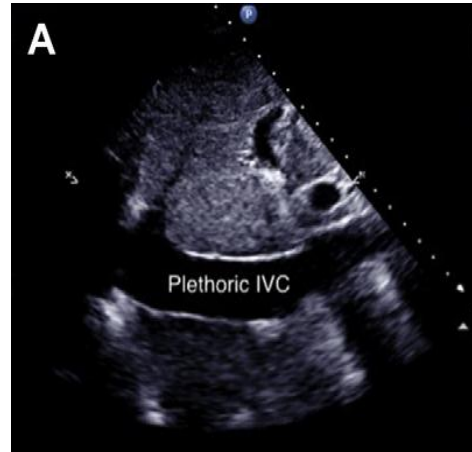


# Aort diseksiyonu şüphesi

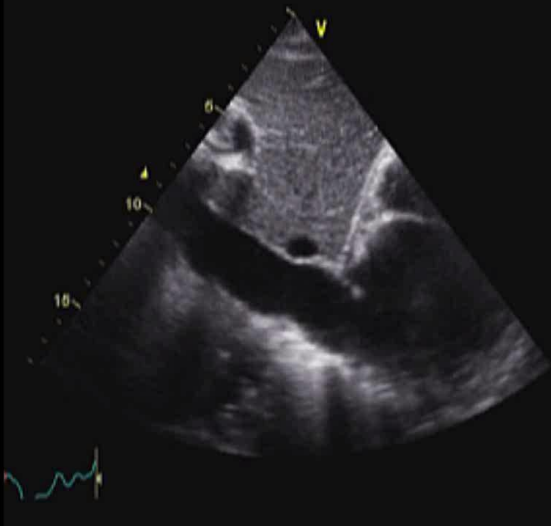


# Hipotansif hastanın değerlendirmesi

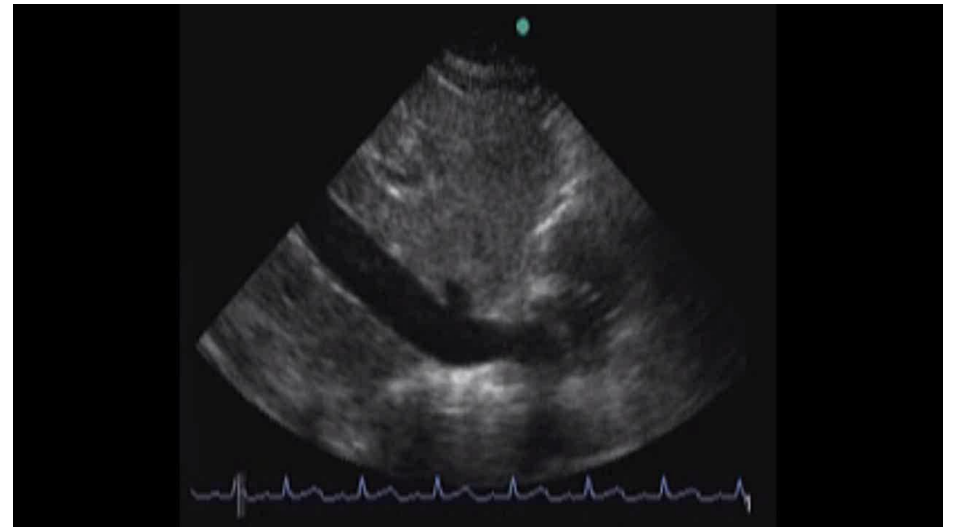
- Tamponad
- Aort diseksiyonu
- Akut pulmoner emboli
- Hipovolemik şok
- Kardiyojenik şok
- Sepsis



# IVC ile volüm deęerlendirmesi



IVC size (cm)	Respiratory Change	CVP (cm)
< 1.5	Total collapse	0-5
1.5-2.5	> 50% collapse	5-10
1.5-2.5	< 50% collapse	11-15
> 2.5	< 50% collapse	16-20
> 2.5	No change	> 20



# Kardiyak arrest sırasında EKO

- FEEL:Focused echocardiographic evaluation in life support
- Gerçek ve yalancı nabızsız elektriksel aktivite ayırımında önemli
- Kardiyak arrestin altta yatan nedeni saptamada değerli

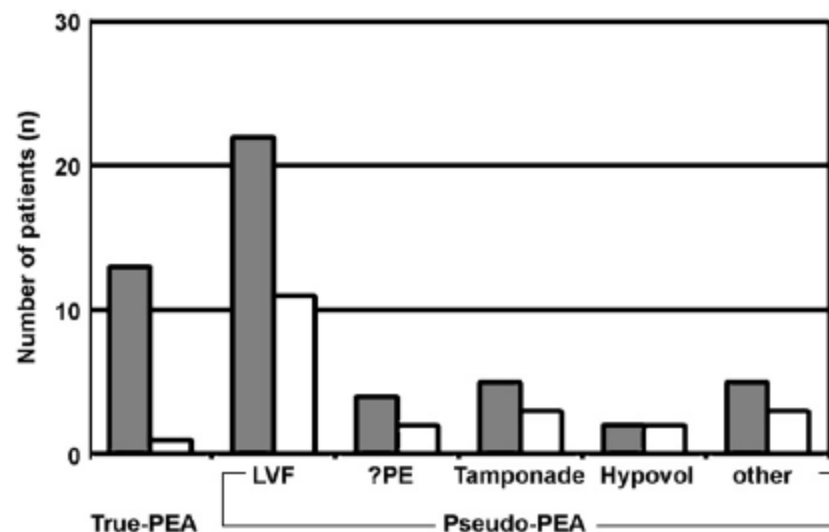




## Clinical paper

# Focused echocardiographic evaluation in life support and peri-resuscitation of emergency patients: A prospective trial<sup>☆,☆☆</sup>

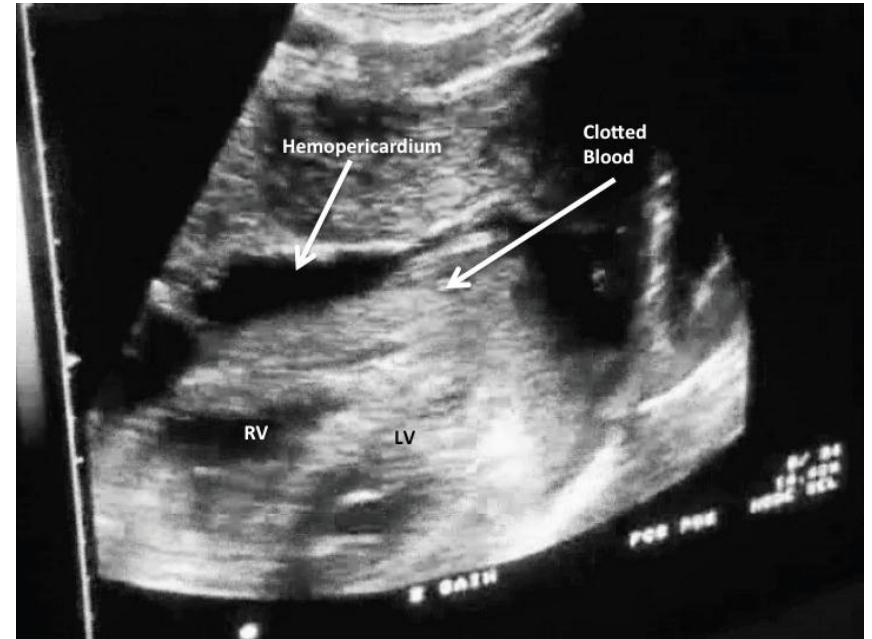
**Results:** A total of 230 patients were included, with 204 undergoing a FEEL examination during ongoing cardiac arrest (100) and in a shock state (104). Images of diagnostic quality were obtained in 96%. In 35% of those with an ECG diagnosis of asystole, and 58% of those with PEA, coordinated cardiac motion was detected, and associated with increased survival. Echocardiographic findings altered management in 78% of cases.





# Künt göğüs travmalarında EKO

- Kalp kapaklarında, büyük damarlarda ve myokardiumda yırtık ile sonlanabilir.
- Perikardiyal mayii ve tamponad değerlendirmesi en temel hedef.
- Perikardiyal hematoma RV miyokardı ile karışabilir!!!



# Performance of emergency physicians in point-of-care echocardiography following limited training

Aida Bustam,<sup>1</sup> Muhaimin Noor Azhar,<sup>1</sup> Ramesh Singh Veriah,<sup>2</sup>  
Kulenthiran Arumugam,<sup>3</sup> Alexander Loch<sup>4</sup> *Bustam A, et al. Emerg Med J 2014;*

## Visual Estimation of Bedside Echocardiographic Ejection Fraction by Emergency Physicians

Erden E. Ünlüer, MD\*  
Arif Karagöz, MD\*  
Haldun Akoğlu, MD†  
Serdar Bayata, MD\*

\* Izmir Katip Çelebi University Atatürk Research and Training Hospital, Turkey  
† Kartal Lütfi Kırdar Research and Training Hospital, Turkey

[West J Emerg Med. 2014;15(2):221–226.]

## Determination of Left Ventricular Function by Emergency Physician Echocardiography of Hypotensive Patients

ACADEMIC EMERGENCY MEDICINE • March 2002, Volume 9, Number 3

FOCUS eğitimi almış acil servis hekimlerince yapılan EKO güvenilir!!!

# Sonuçlar

- Acil serviste kardiyak US mutlak gereklidir.
- Hekimlerin eğitimleri önemlidir.
- Günlük pratik uygulama ve tecrübe, tanısal doğrulukta en belirleyici parametredir.

***İlginiz için teşekkürler....***