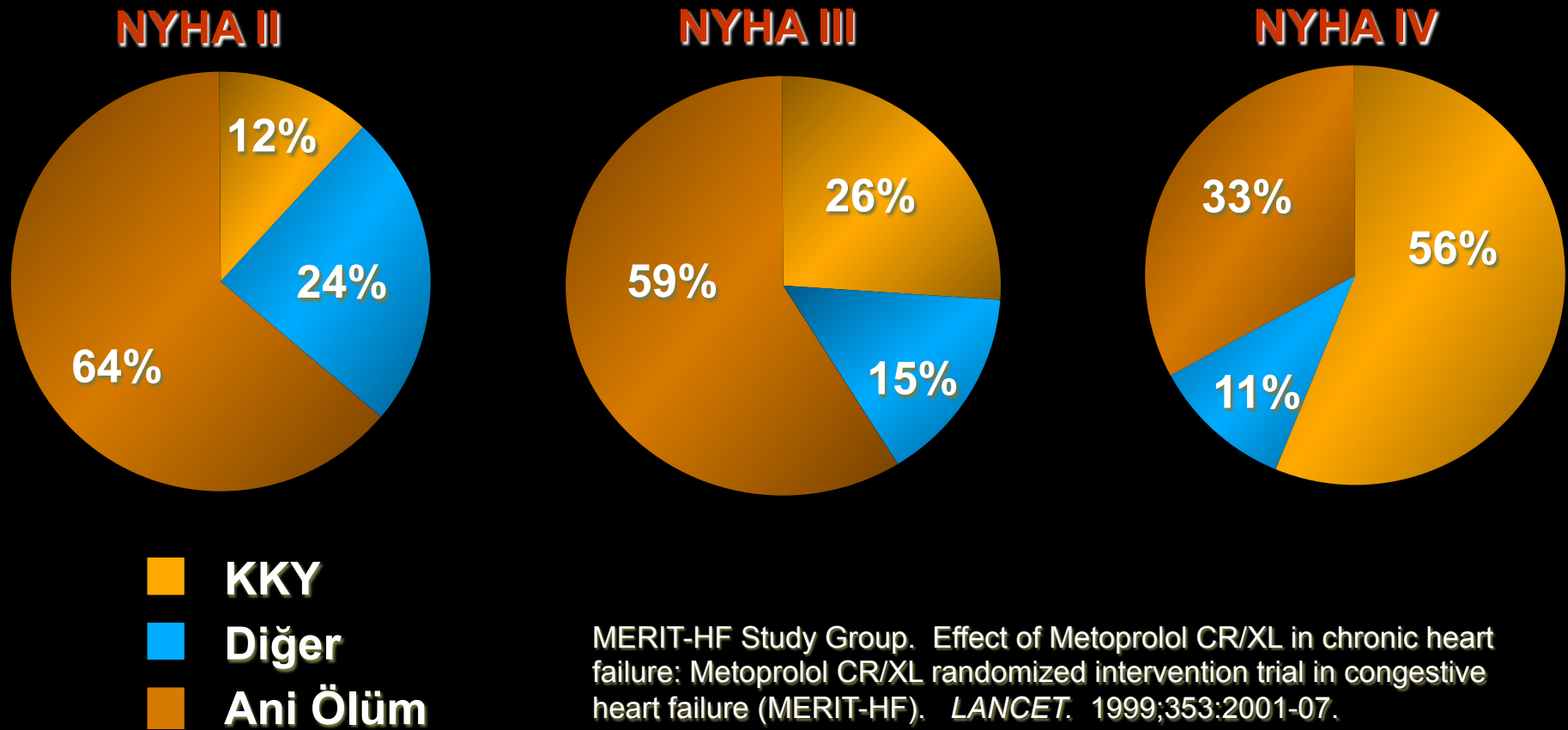


Kardiyak Resenkronizasyon Tedavisi (CRT)

Dr. Sabri Demircan
Ondokuz Mayıs Üniversitesi
Tıp Fakültesi Kardiyoloji ABD

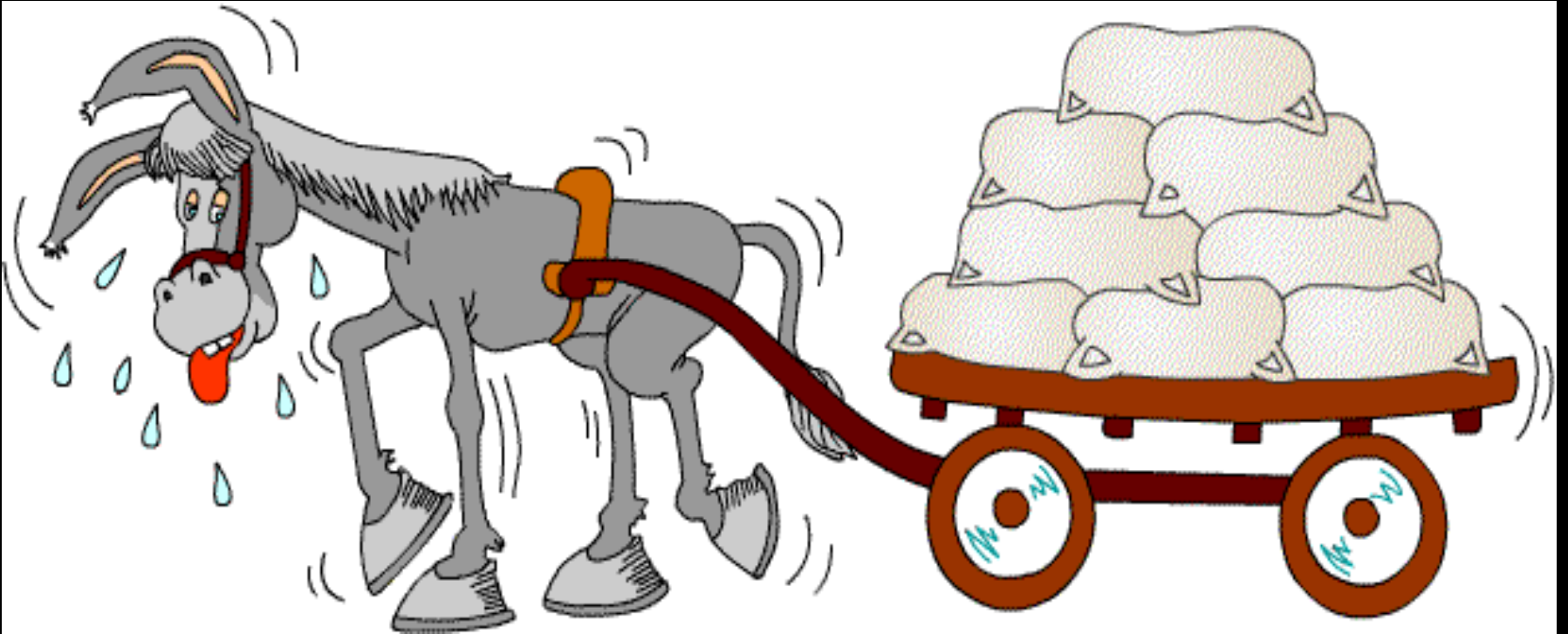
Kalp Yetersizliğinin Ciddiyeti

Ölüm Nedenleri

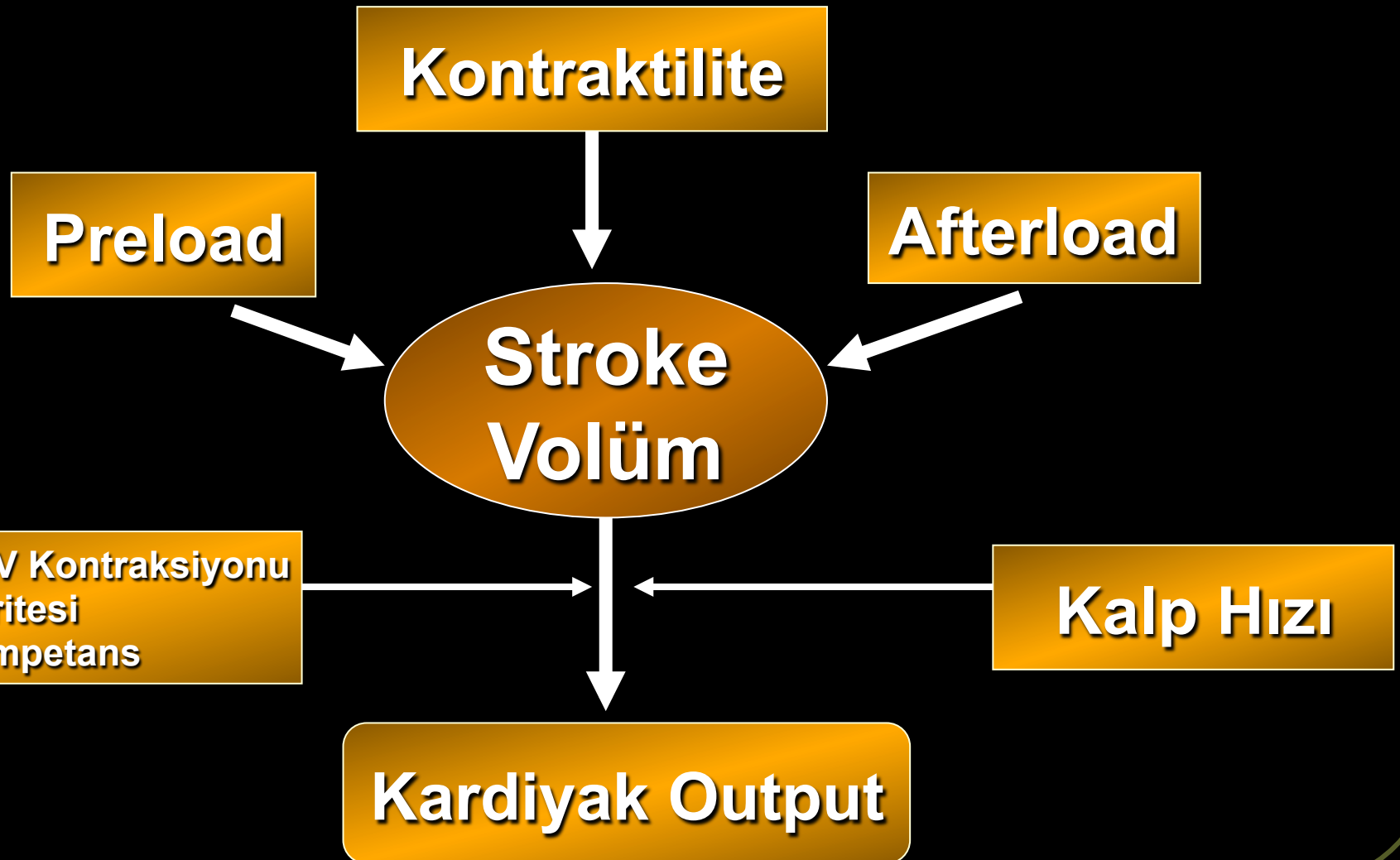


Kalp yetersizliđi

Ventriküler disfonksiyon gnlk yařamda hastaların rutin aktivitelerini yapabilmesini engeller...



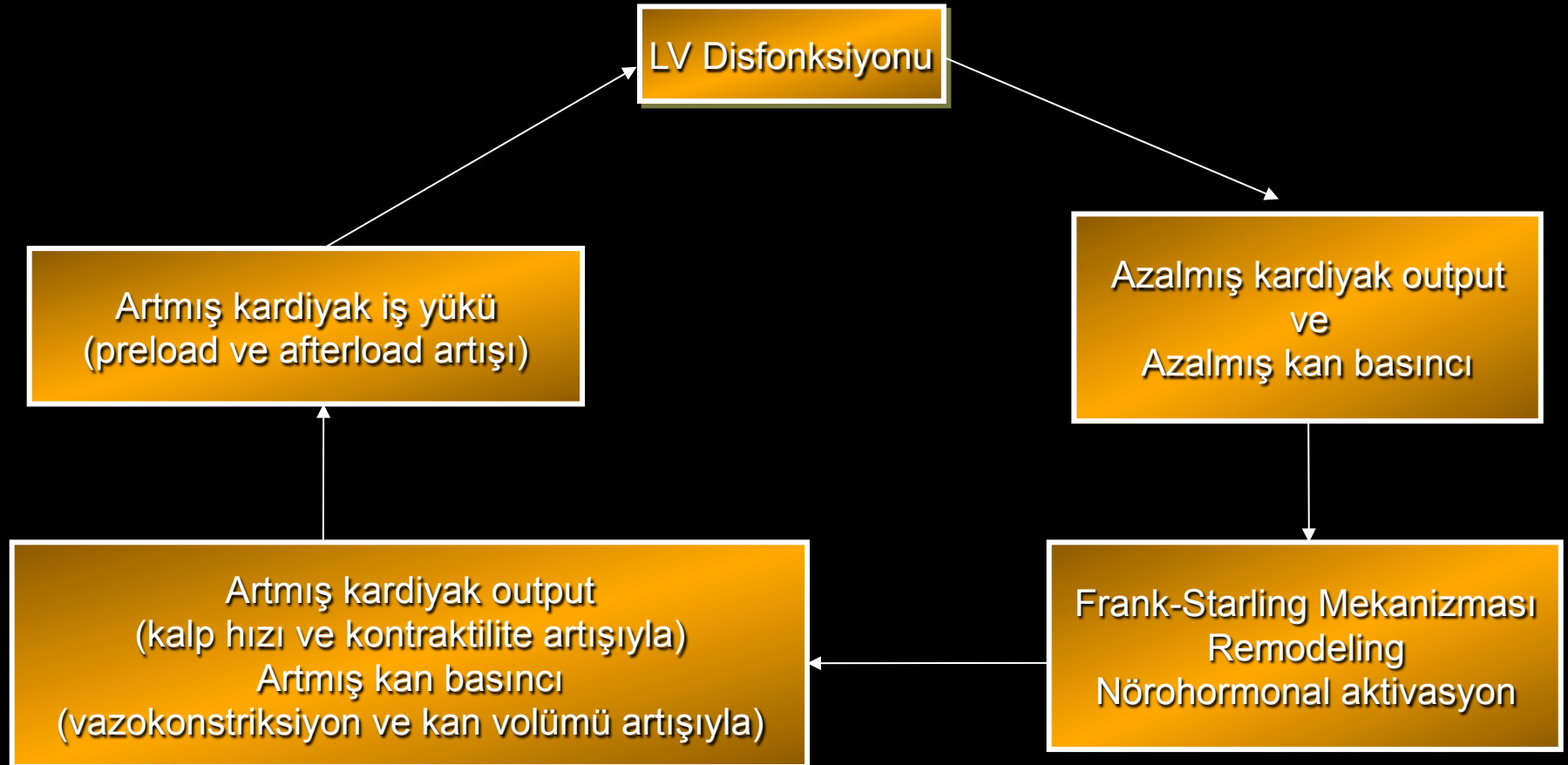
Ventriküler Fonksiyonun Belirleyicileri



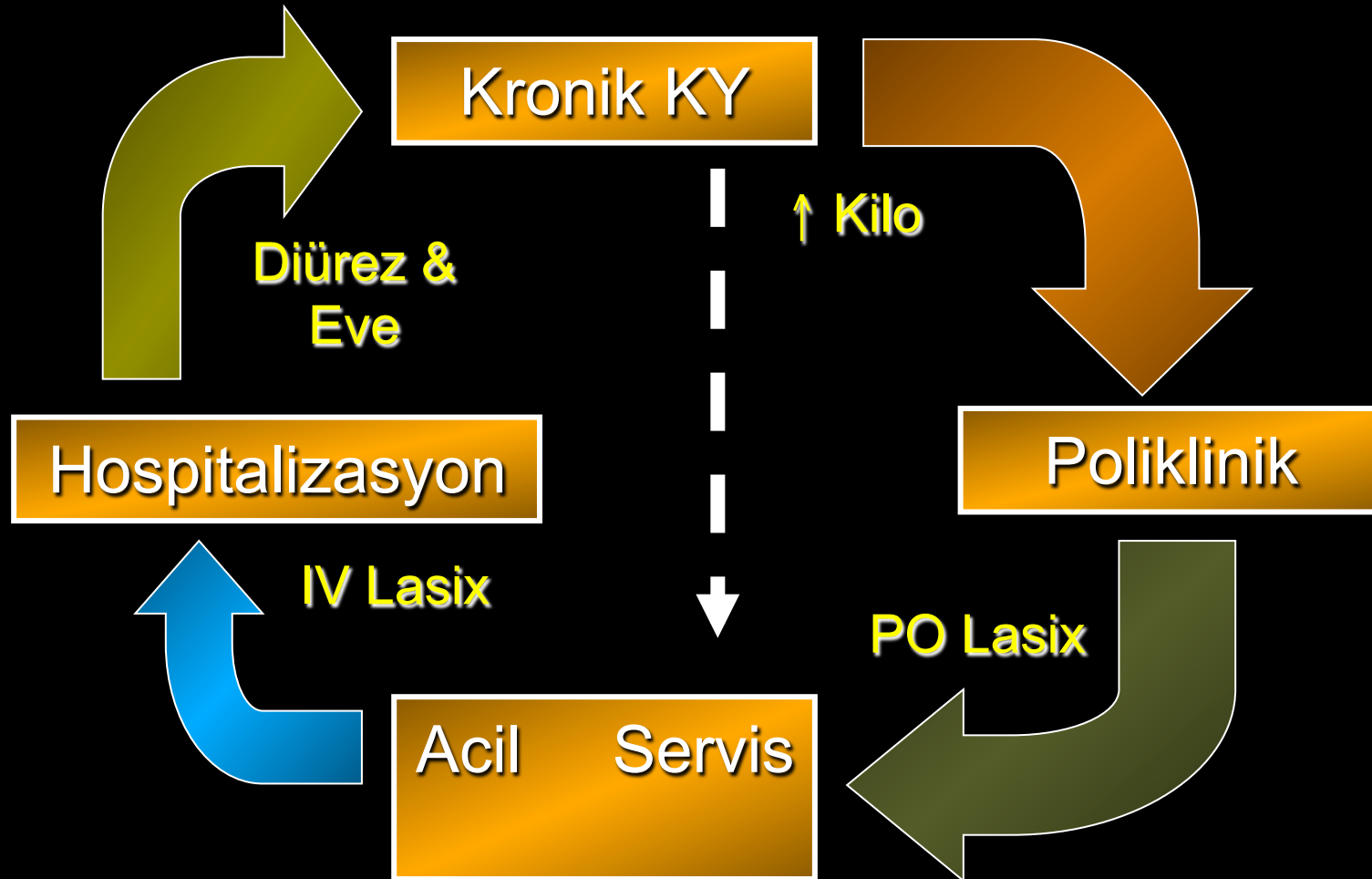
Kompansatuvar Mekanizmalar

- Frank-Starling Mekanizması
- Nörohormonal Aktivasyon
 - Sempatik sinir sistemi
 - RAAS
 - Vazopressin (ADH)
- Ventriküler Remodeling

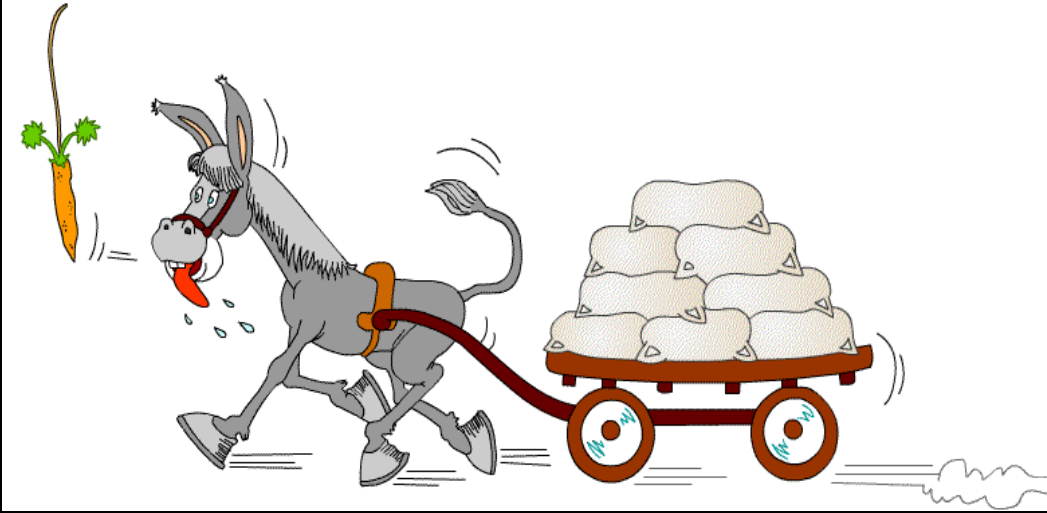
Kalp Yetersizliği Kaskadı



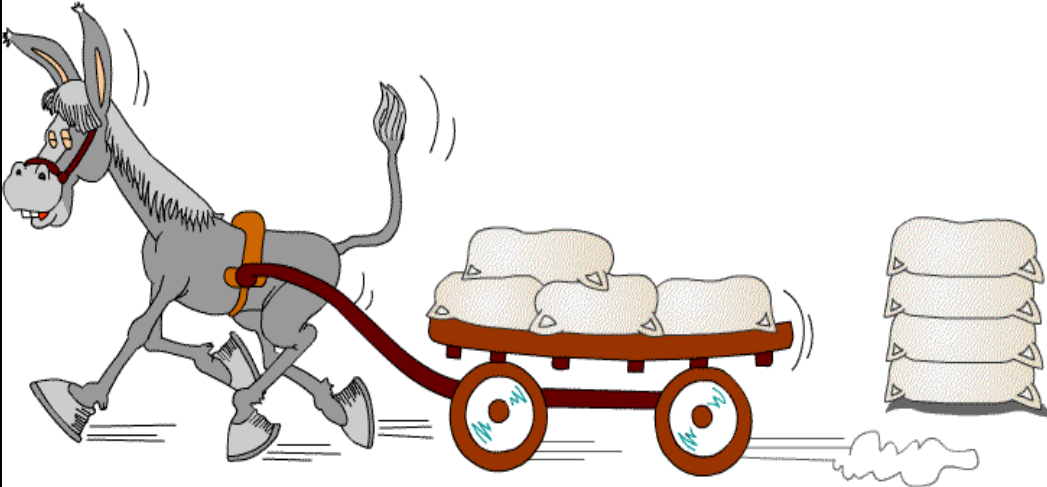
Kalp Yetersizliđi Kaskadı



Farmakolojik Tedavi

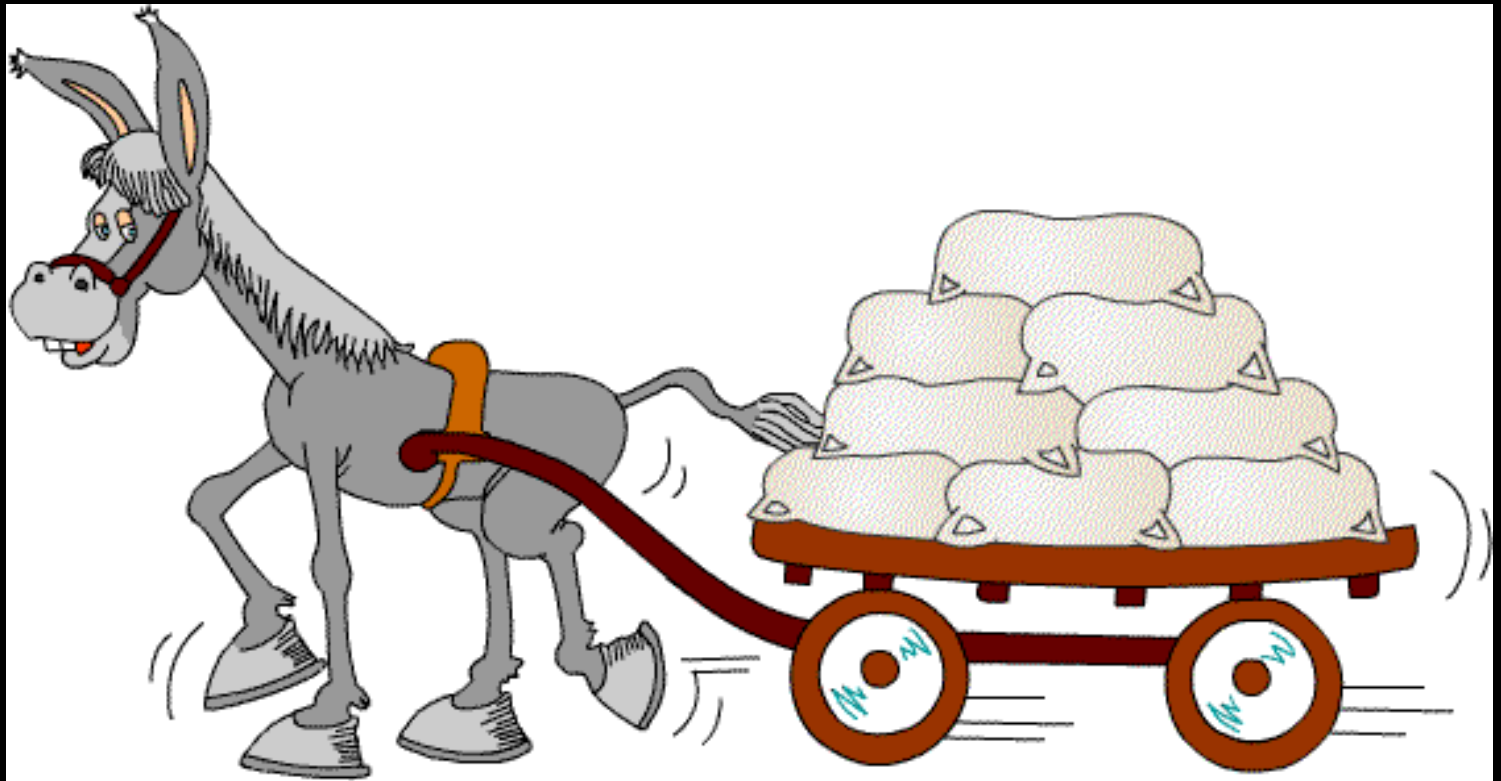


Dijital
İnotropikler



ACE-İnh.
Diüretikler

β -Blokörler



CRT

Kalbin etkinliđini artırır



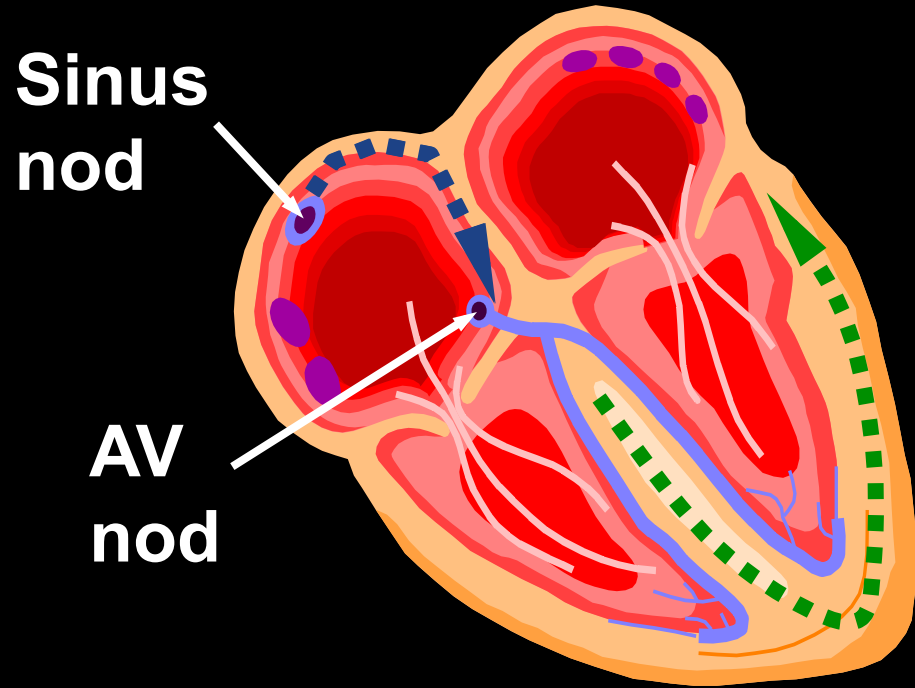
Kalp yetersizliği ile ilişkili sorunlar

- **İleti bozuklukları**
- **Duvar hareket anormallikleri**
- **Mitral yetersizliği**

Bu sorunlar dolum, kontraktilite ve de kardiyak outputu önemli derecede etkilemektedir.

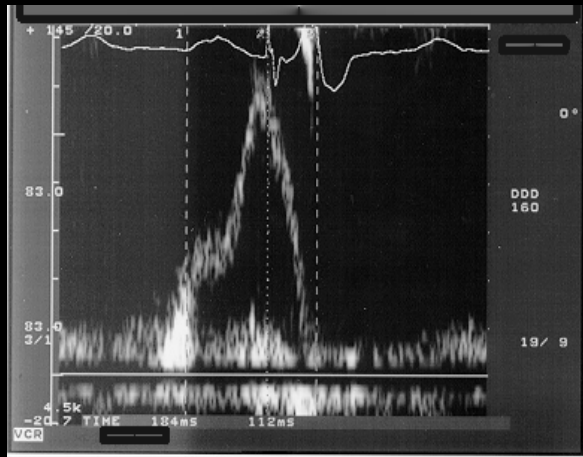
İleti bozuklukları

AV ileti gecikmesi

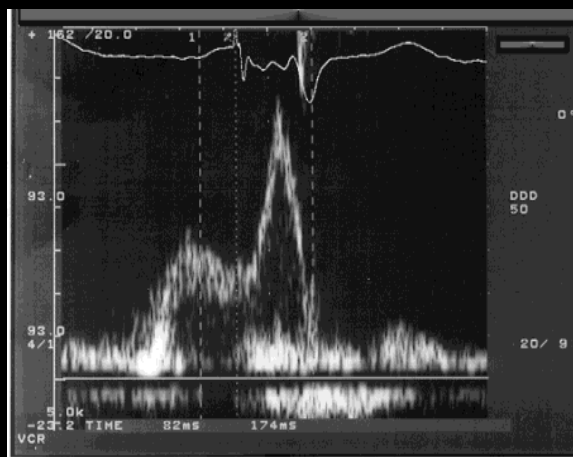


- Atrial sistolün suboptimal katılımı
- Doluş peryodunda kısalma
- Mitral yetersizliği

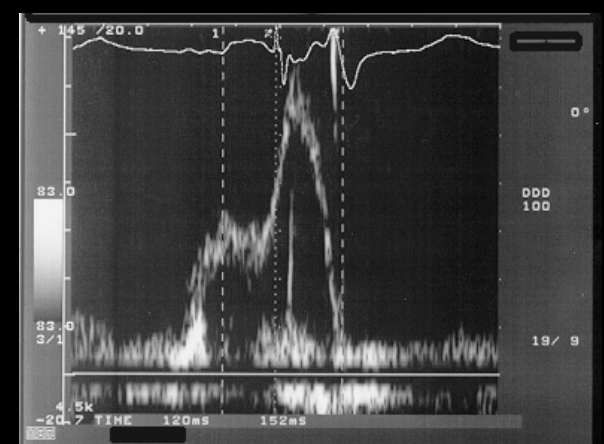
Optimal AV Delay (Ritter Metodu)



**Uzun AV Delay
160 ms**



**Kısa AV Delay
50 ms**

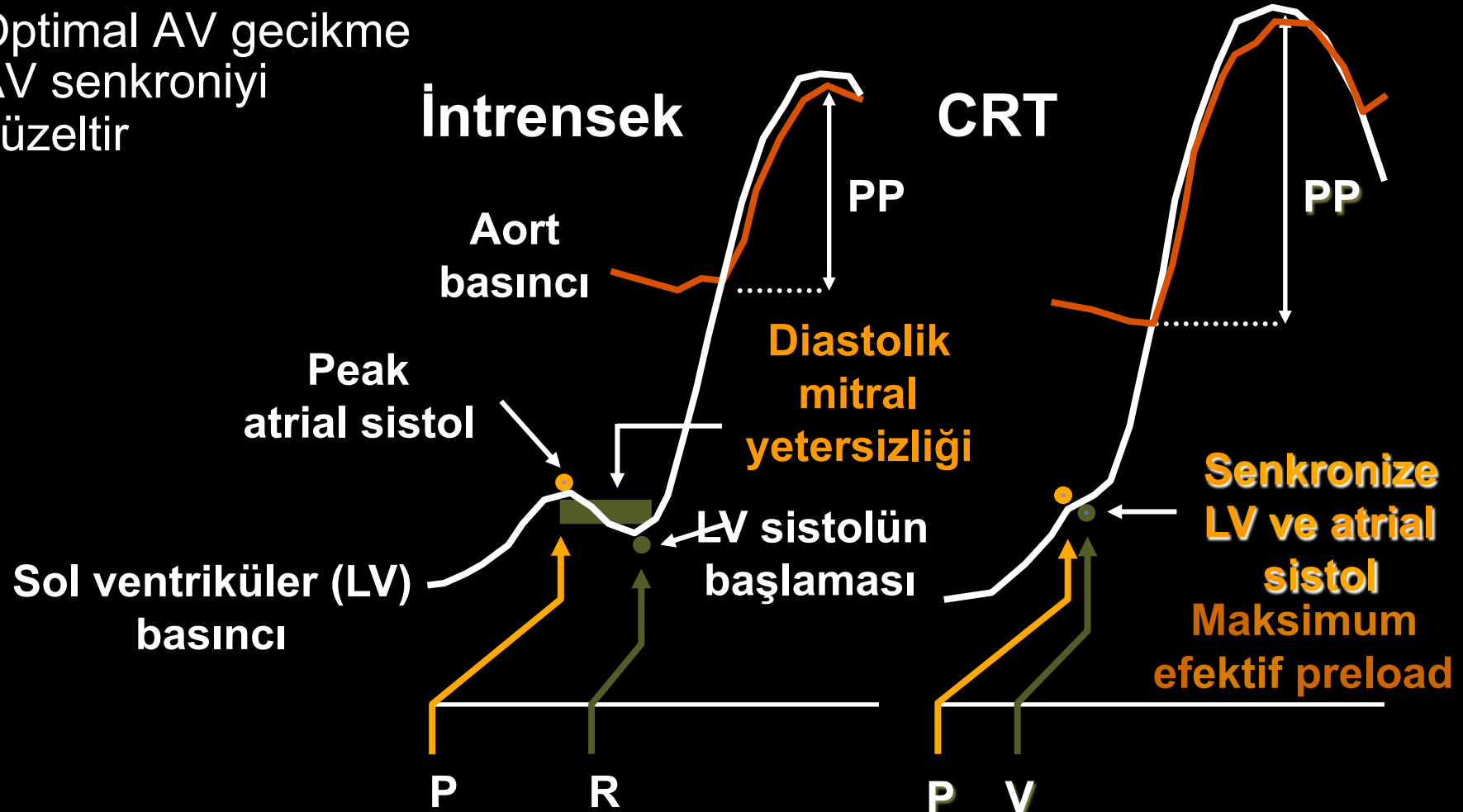


**Optimal AV Delay
100 ms**

İleti bozuklukları

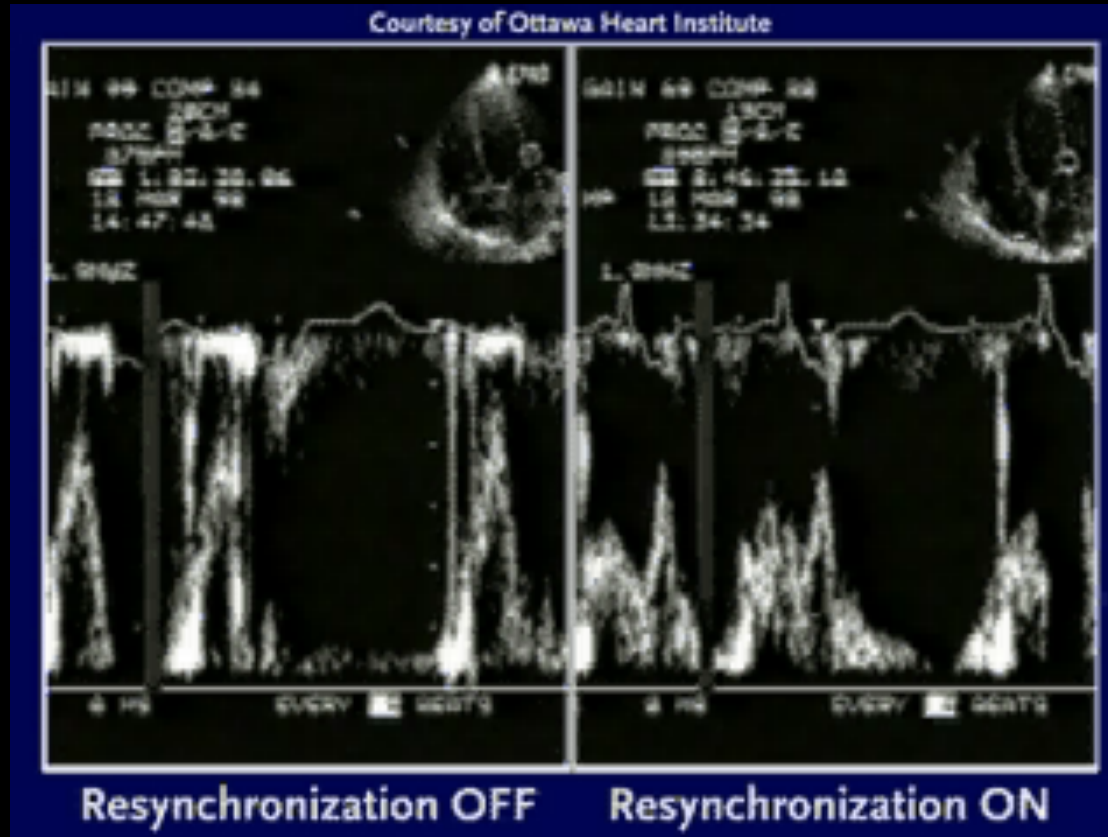
AV ileti gecikmesi

Optimal AV gecikme
AV senkroniyi
düzeltir



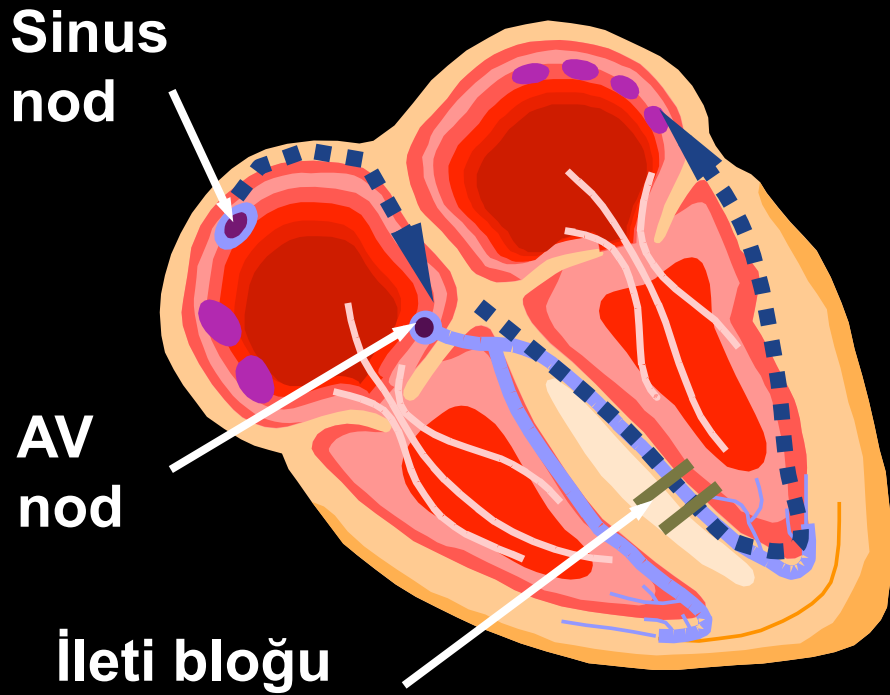
AV intervalinin optimizasyonu

- Mitral yetersizliğinde azalma
- Diastolik doluş zamanında artış



İleti bozuklukları

Ventriküler aktivasyonda gecikme



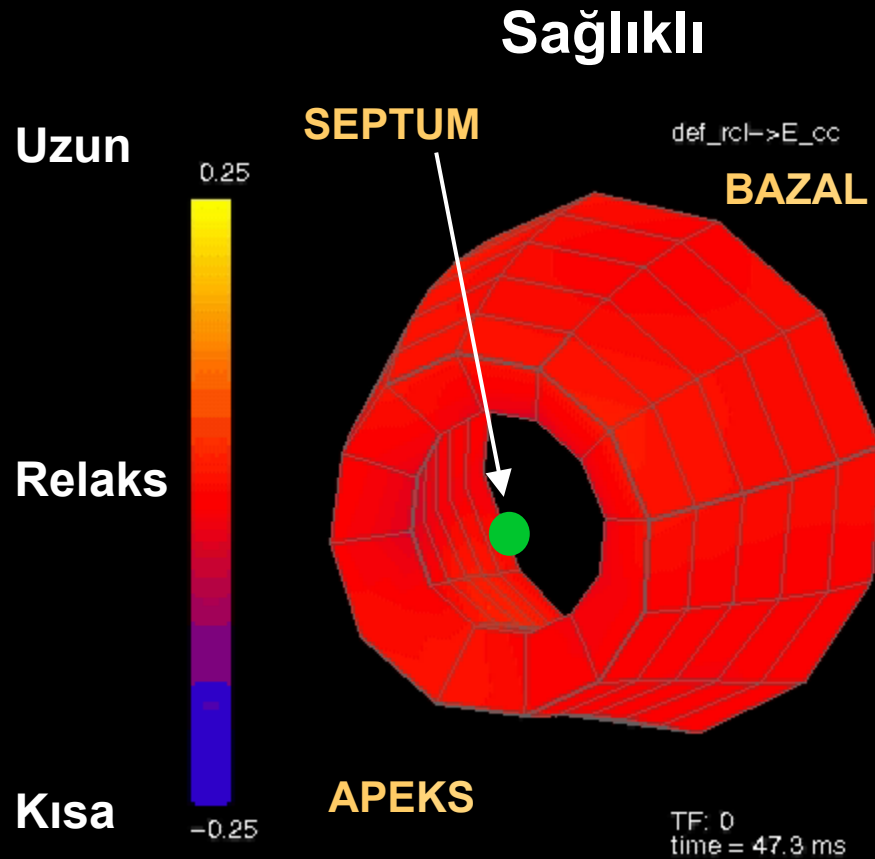
Orta ve ileri derecede kalp yetersizliği (NYHA sınıf III veya IV) hastalarının 1/3'den fazlasında QRS süresinin ≥ 130 msn olmasıyla belirlenen **ventriküler dissenkroni** vardır.

Bu hastalarda;

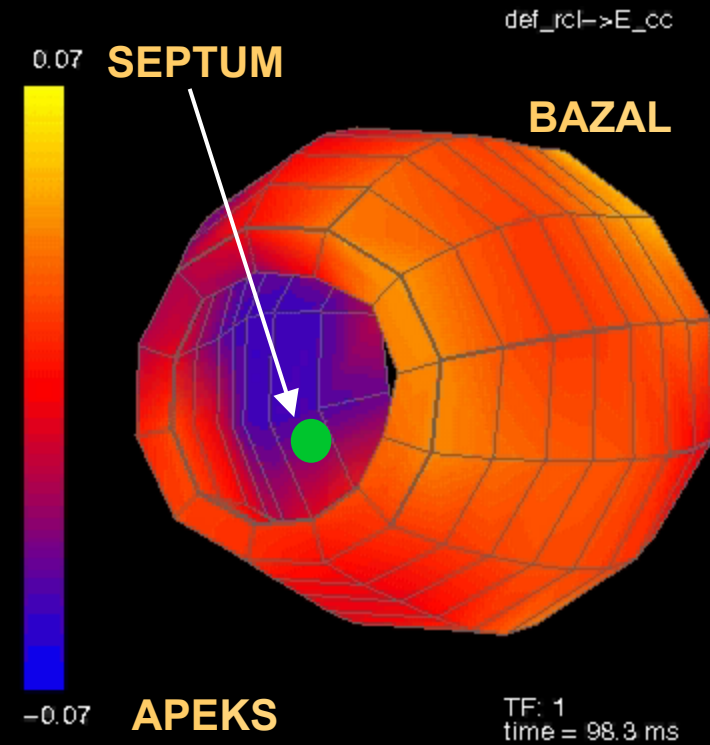
- Lateral duvar kontraksiyonunda gecikme
- Dizorganize ventriküler kontraksiyon
- Azalmış pompa etkinliği
- Azalmış egzersiz toleransı

Duvar hareket anormallikleri

Anormal lokal duvar strain



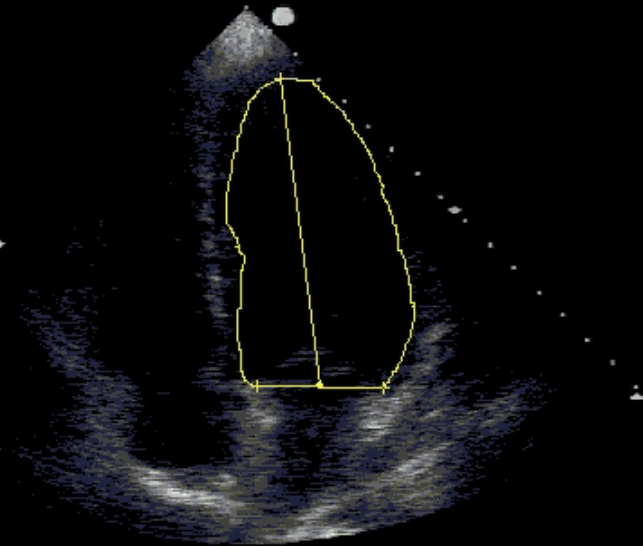
Dilate Kardiyomiyopati (KMP)



Duvar hareket anormallikleri

Sağlıklı

8/2.7-L
20 JAN 94
15:26:35
PROC 2/0/R
AZL KINDER-
CARDIOLOGIE
PED. CARDIAC
ID:
LKES
DEMO
H. BOSCH
00714
50MM/S
XMIT:A
62BPM
16CM
33HZ



1.98 SEC

1/1

DKMP

MI: 1.7
54 2.1/4.2
15 DEC 98
10:26:58
PRDC 0/0/E/FB
Hewlett-Packard

12weeks BV-PACE
BR
0:24:56.18
GAIN 76
COMP 65
73BPM

16CM
25HZ

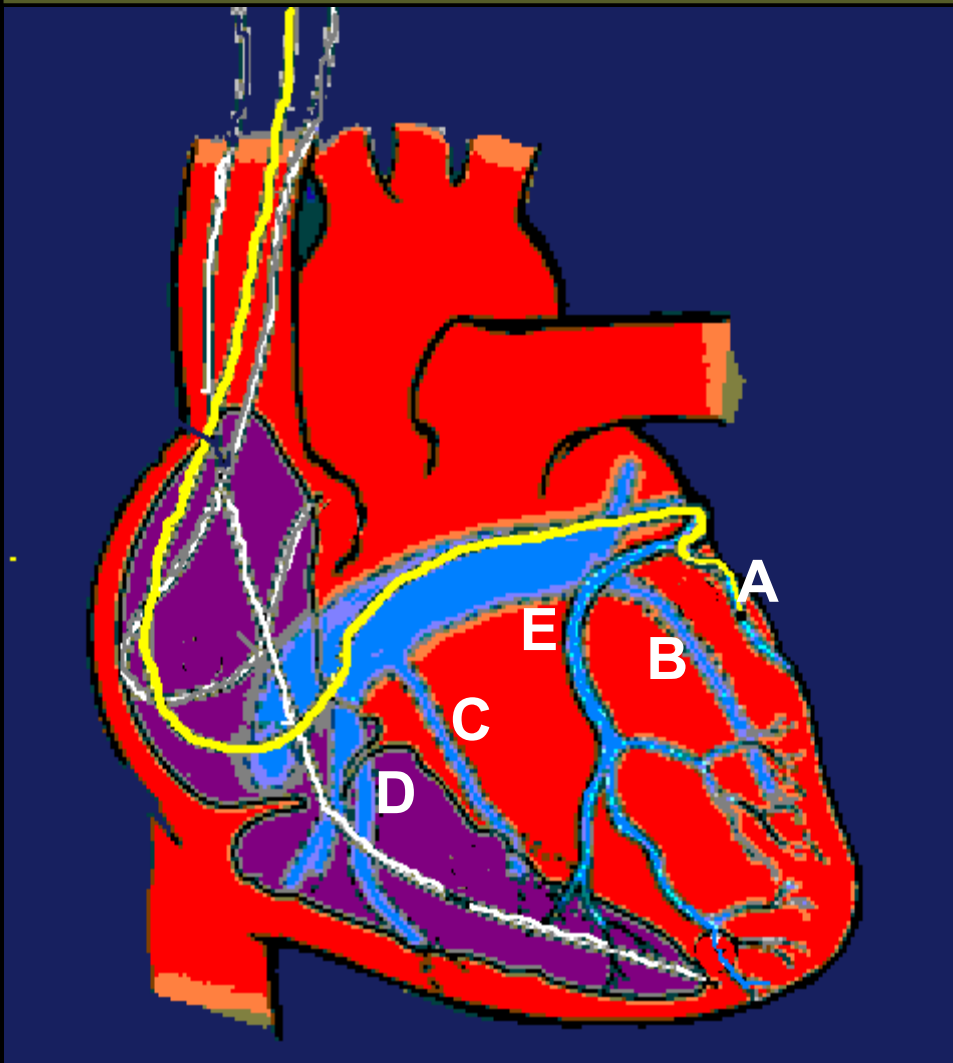
2.1 4.2



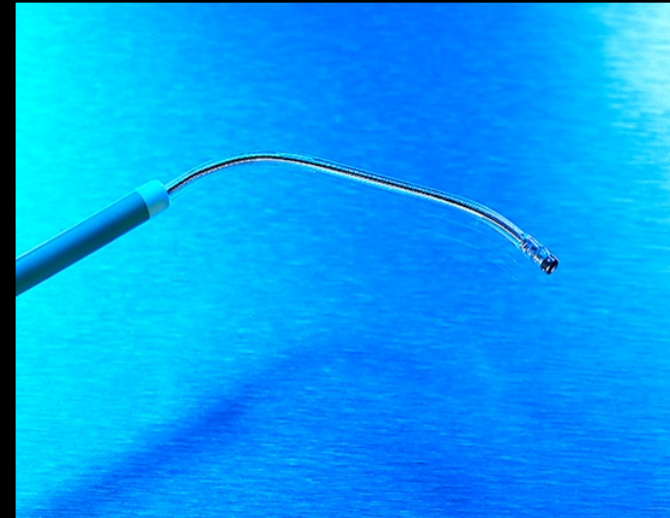
(c) RWTH Aachen



CRT

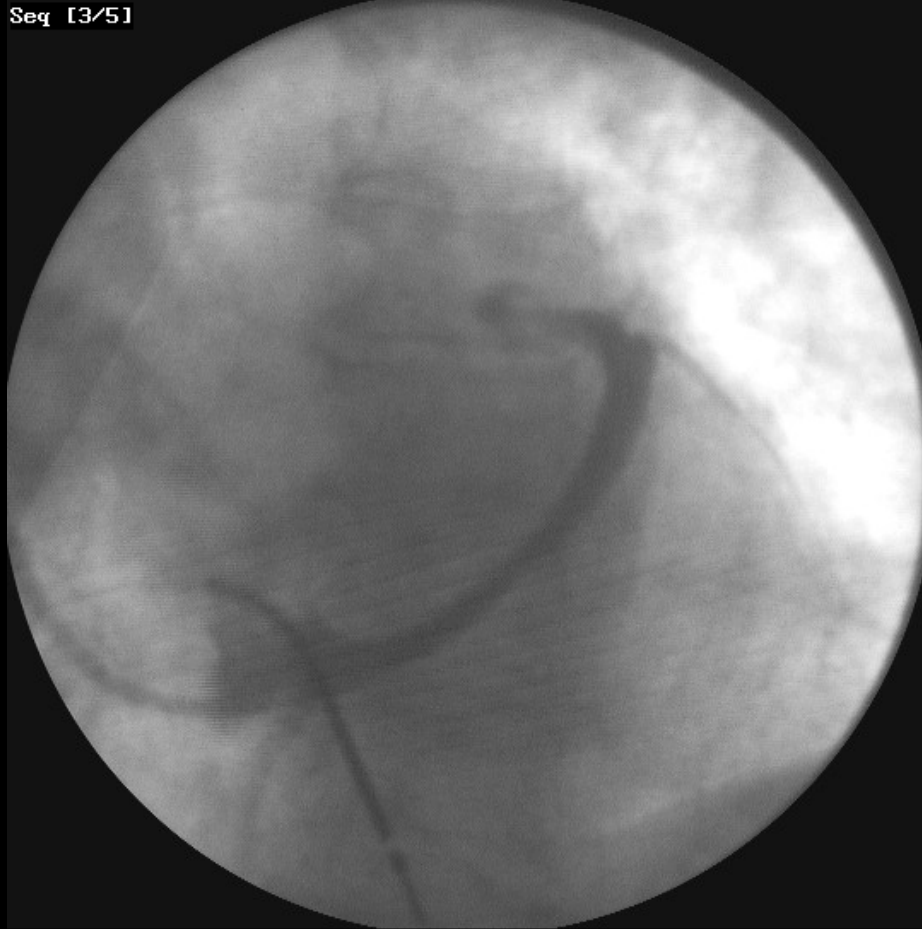


- A. Lateral (marjinal) kardiyak ven
- B. Postero-lateral kardiyak ven
- C. Posterior kardiyak ven
- D. Middle kardiyak ven
- E. Büyük kardiyak ven

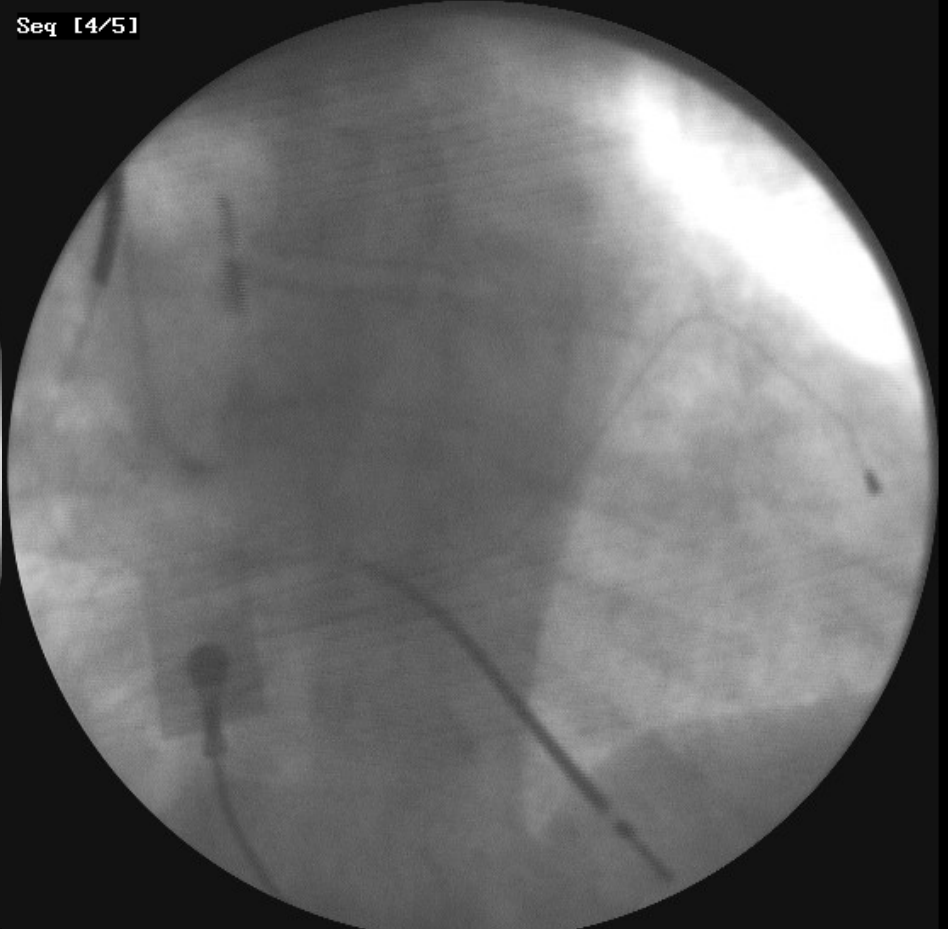


CS Anjiyografisi

Seq [3/5]



Seq [4/5]

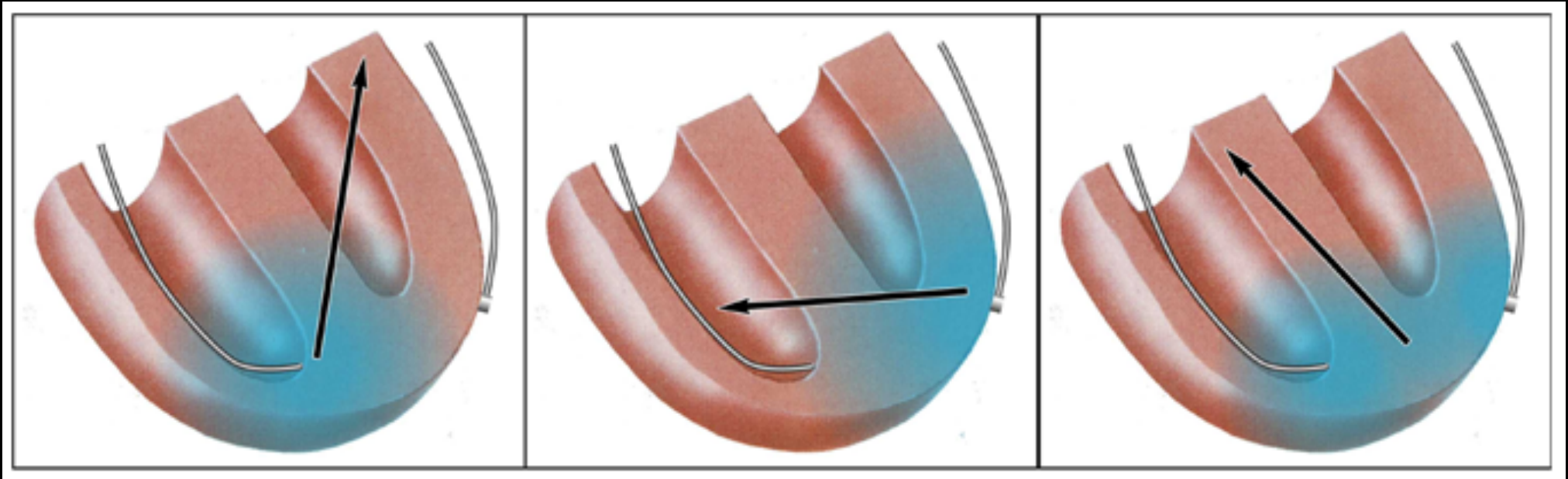


Pacing sonrası vektörel değişiklikler

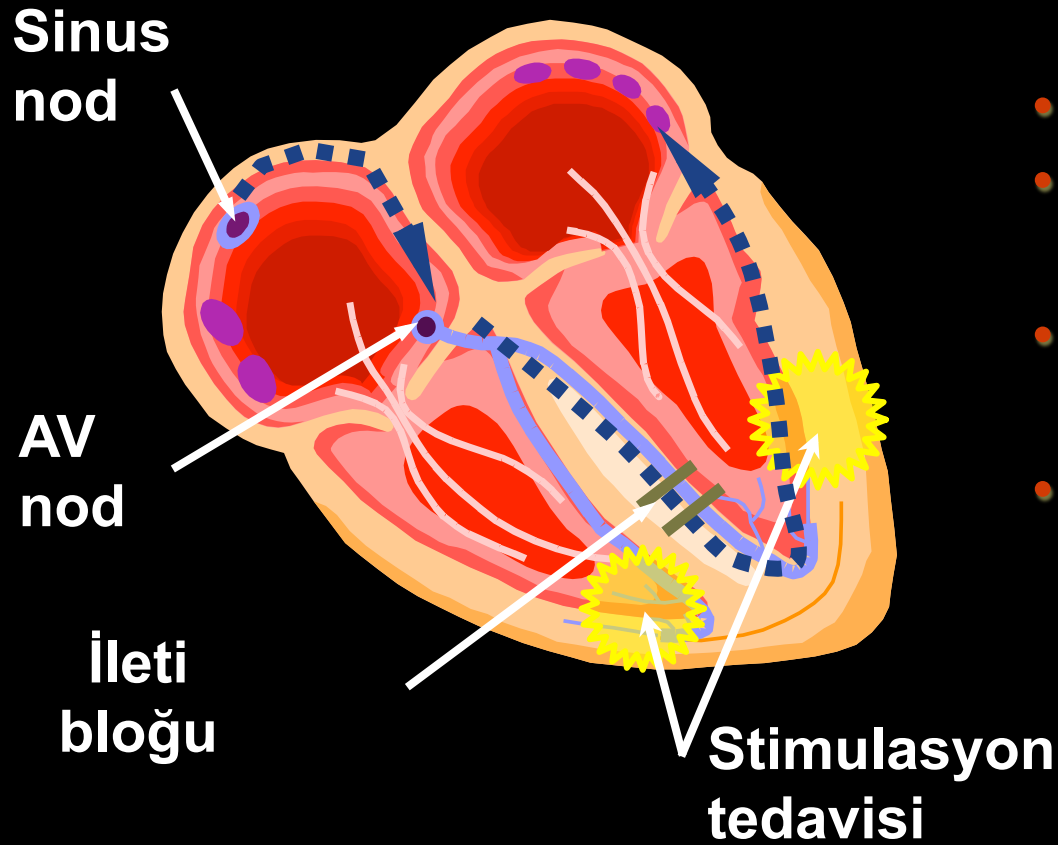
RV Pacing

LV Pacing

BiV Pacing



Ventriküler resenkronizasyon

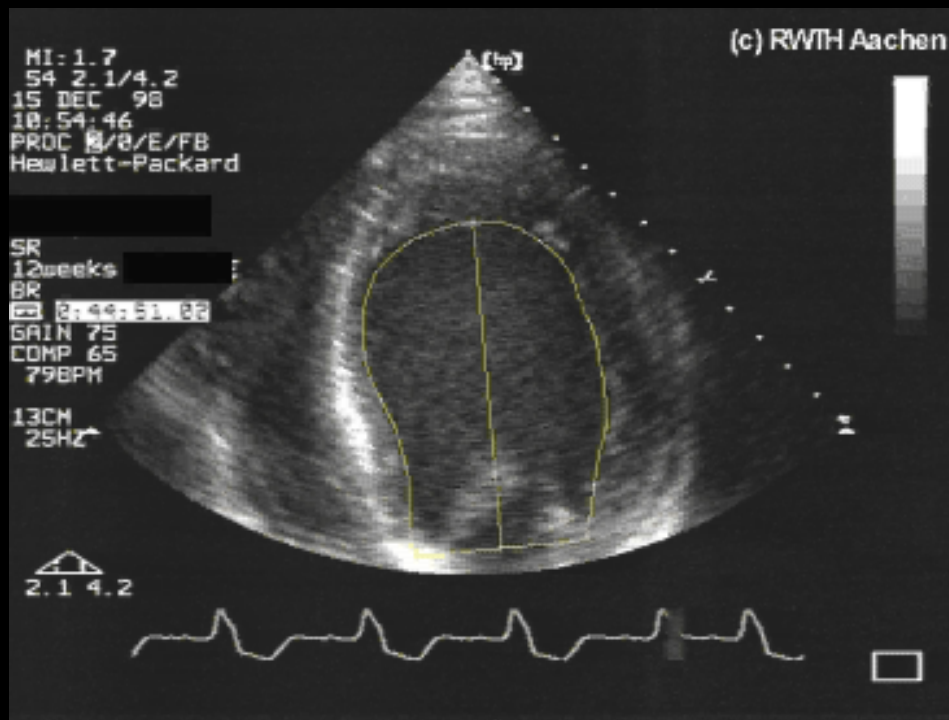


- Intraventriküler aktivasyon
- Organize ventriküler aktivasyon
- Koordine septal ve serbest duvar kontraksiyonu
- Pompa etkinliğinin düzelmesi

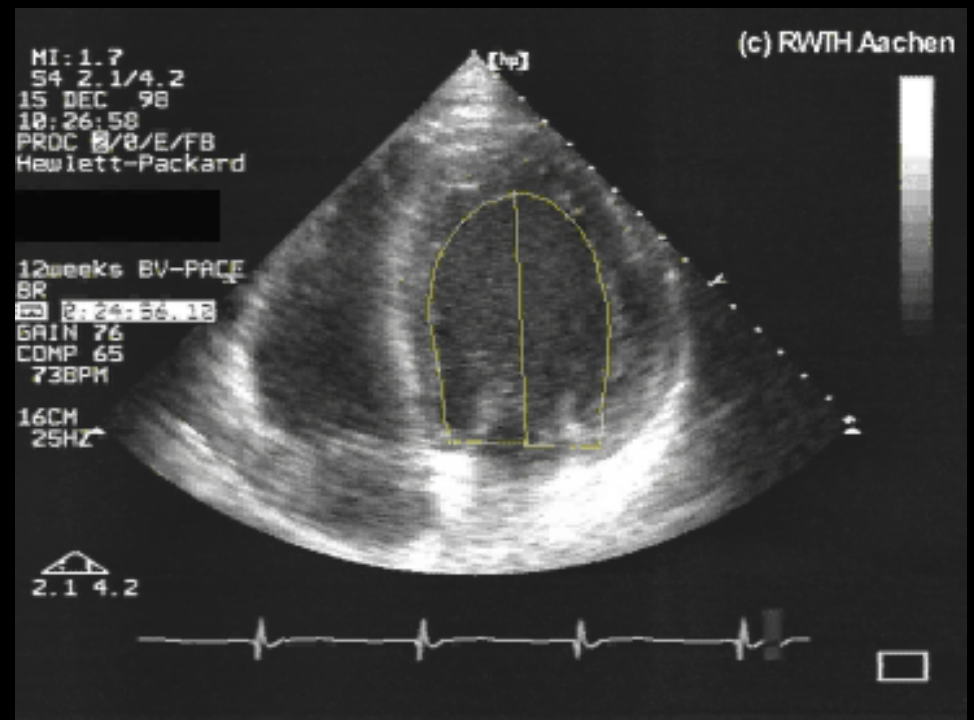
CRT

Global senkroni

Bazal



CRT Sonrası



Comparison of Medical Therapy, Pacing, and Defibrillation in Heart Failure

COMPANION

Dizayn

- 1600 hasta
 - Orta ve ileri kalp yetersizliği
 - $QRS \geq 120$ ms ve PR interval > 150 ms
1. Optimal medikal tedavi
 2. Optimal ilaç + CRT
 3. Optimal ilaç + CRT-ICD (CRT-D)

Sonuçlar

- **Primer son nokta**
 - ✓ Tüm nedenlere bağlı ölüm ve hospitalizasyon CRT grubunda % 19; CRT-D grubunda % 20 azaldı.
 - ✓ Kalp yetersizliğine bağlı hospitalizasyon ve ölüm CRT grubunda % 34; CRT-D grubunda % 40 azalma gösterdi.
- **Sekonder son nokta**
 - ✓ Yalnız CRT uygulanan grupta tüm nedenlere bağlı mortalitede % 24'lük anlamlı olmayan azalma eğilimi saptandı.
 - ✓ Defibrilatörle beraber CRT uygulanan grupta tüm nedenlere bağlı mortalite anlamlı bir şekilde (% 36) azaldı.

***Cardiac
Resynchronization
Heart Failure***

CARE-HF

Dizayn

- Randomize, kontrollü,
- Medikal tedavi & CRT
- NYHA sınıf 3-4 KY'li 813 hasta
- Standart ilaç tedavisi
- LVEF $\leq$ %35
- QRS süresi en az 120 ms

Sonuç

- CRT grubunda LVEF, NYHA sınıfı, end-sistolik volüm, mitral kapak fonksiyonu, kan basıncı, hayat kalitesinde anlamlı düzelme
- 18 ay sonraki NT-proBNP düzeylerinde dramatik düzelme

Kardiyak Resenkronizasyon Tedavisi

Endikasyonlar

- Orta – ileri (NYHA sınıf III/IV) kalp yetersizliği
- Optimal medikal tedaviye rağmen semptomatik
- $QRS \geq 120$ msn
- $LVEF \leq 35\%$
- Normal sinüs ritm

Kardiyak Resenkronizasyon Tedavisi

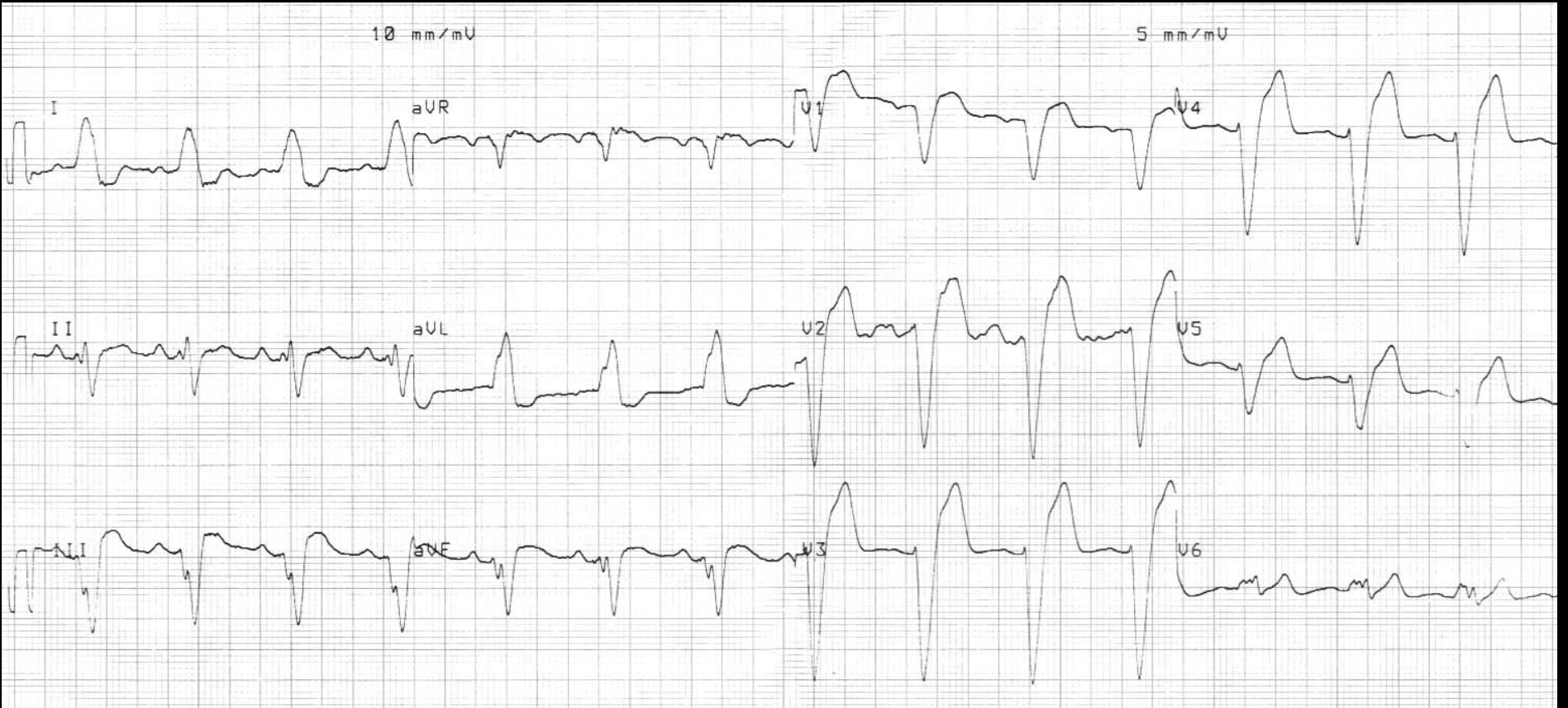
Endikasyonlar

- AF + geniş QRS + düşük EF
- Pacemaker nedenli KMP (Upgrade)
- Dar QRS'li hastalar
- Başka nedenle pacemaker gereksinimi
- Düşük EF + Geniş QRS + Sınıf 1-2 hastalar

European analysis at 24 months in REVERSE

End point	CRT-off (n=82)	CRT-on (n=180)	p
Clinical worsening* (%)	34	19	0.01
LVESV (mL/m²)	94.5	69.7	<0.0001
LVEDV (mL/m²)	132	103	<0.0001
LVEF (%)	29.9	34.8	<0.0001
First hospitalization or death (%)	24.0	11.7	0.003

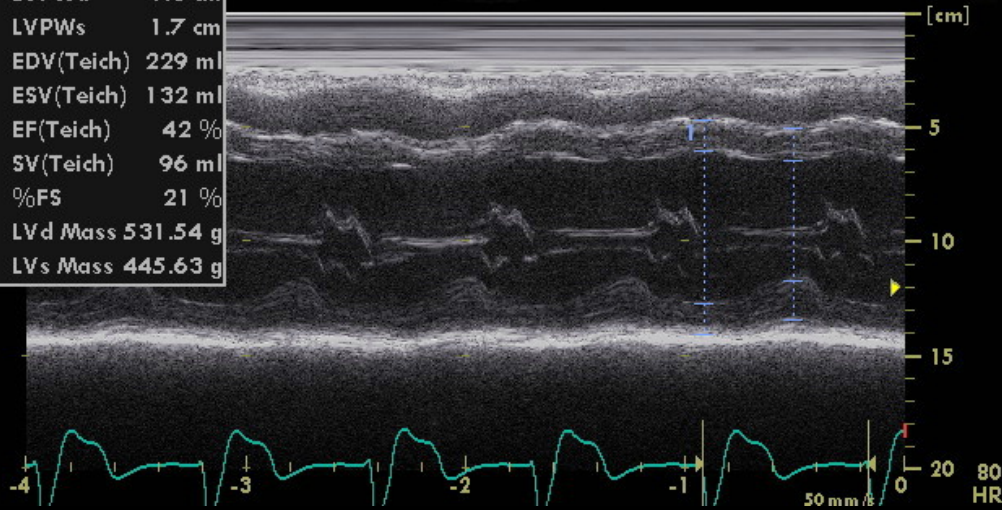
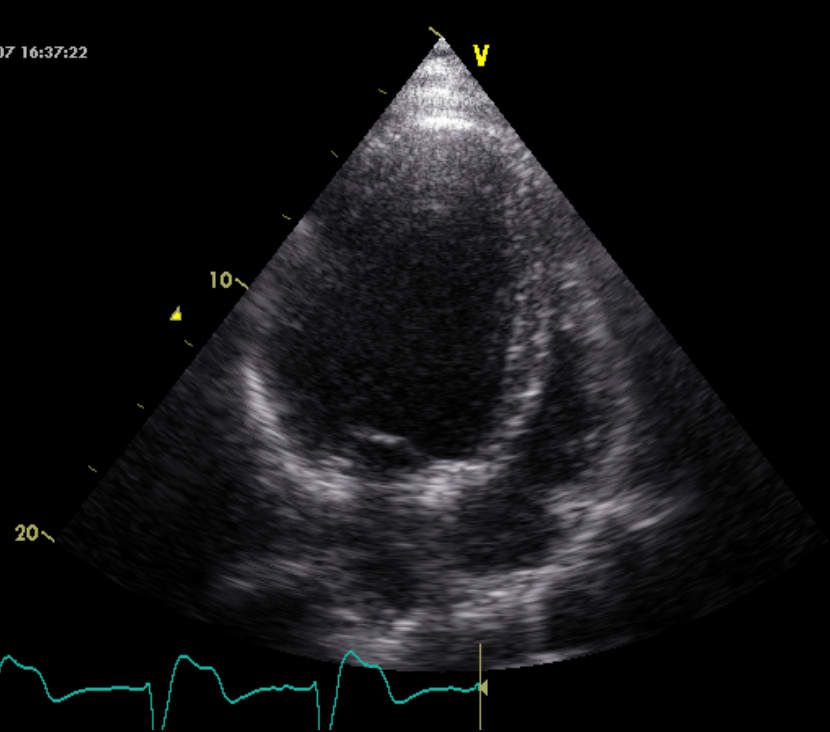
Örnek olgular



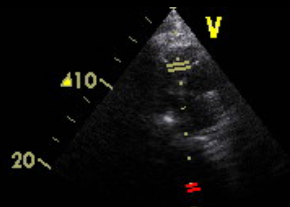
1	IVSd	1.3 cm
	IVSs	1.4 cm
	LVIDd	6.7 cm
	LVIDs	5.2 cm
	LVPWd	1.3 cm
	LVPWs	1.7 cm
	EDV(Teich)	229 ml
	ESV(Teich)	132 ml
	EF(Teich)	42 %
	SV(Teich)	96 ml
	%FS	21 %
	LVd Mass	531.54 g
	LVs Mass	445.63 g



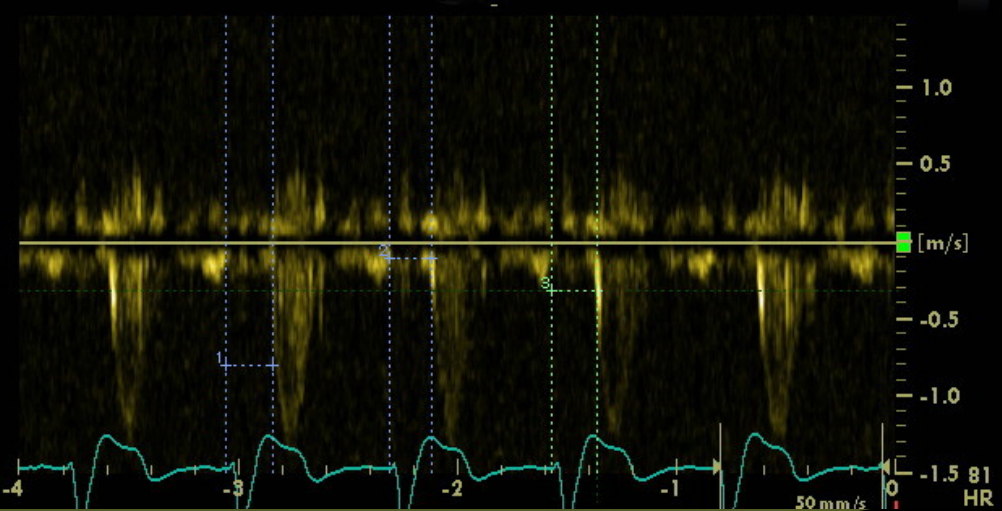
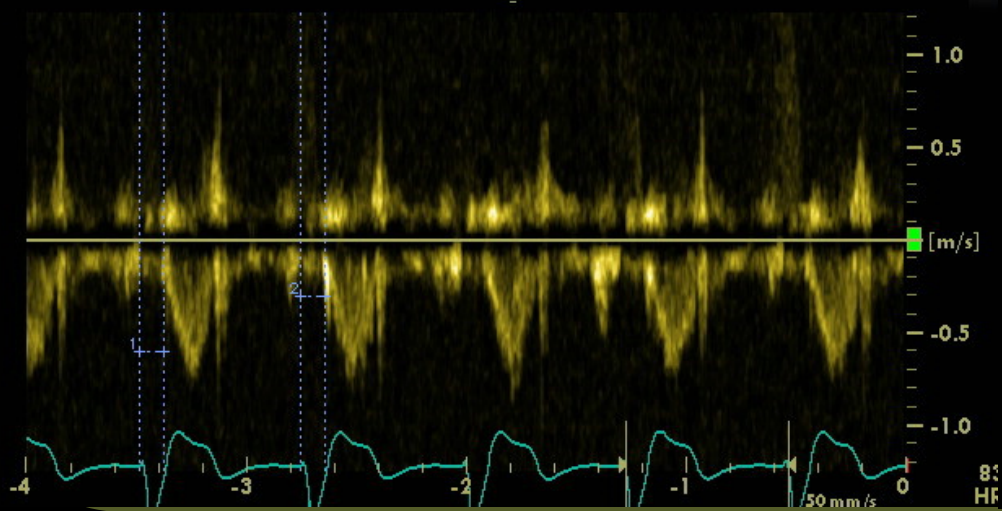
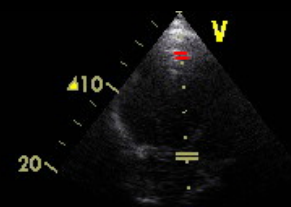
16/11/2007 16:37:22

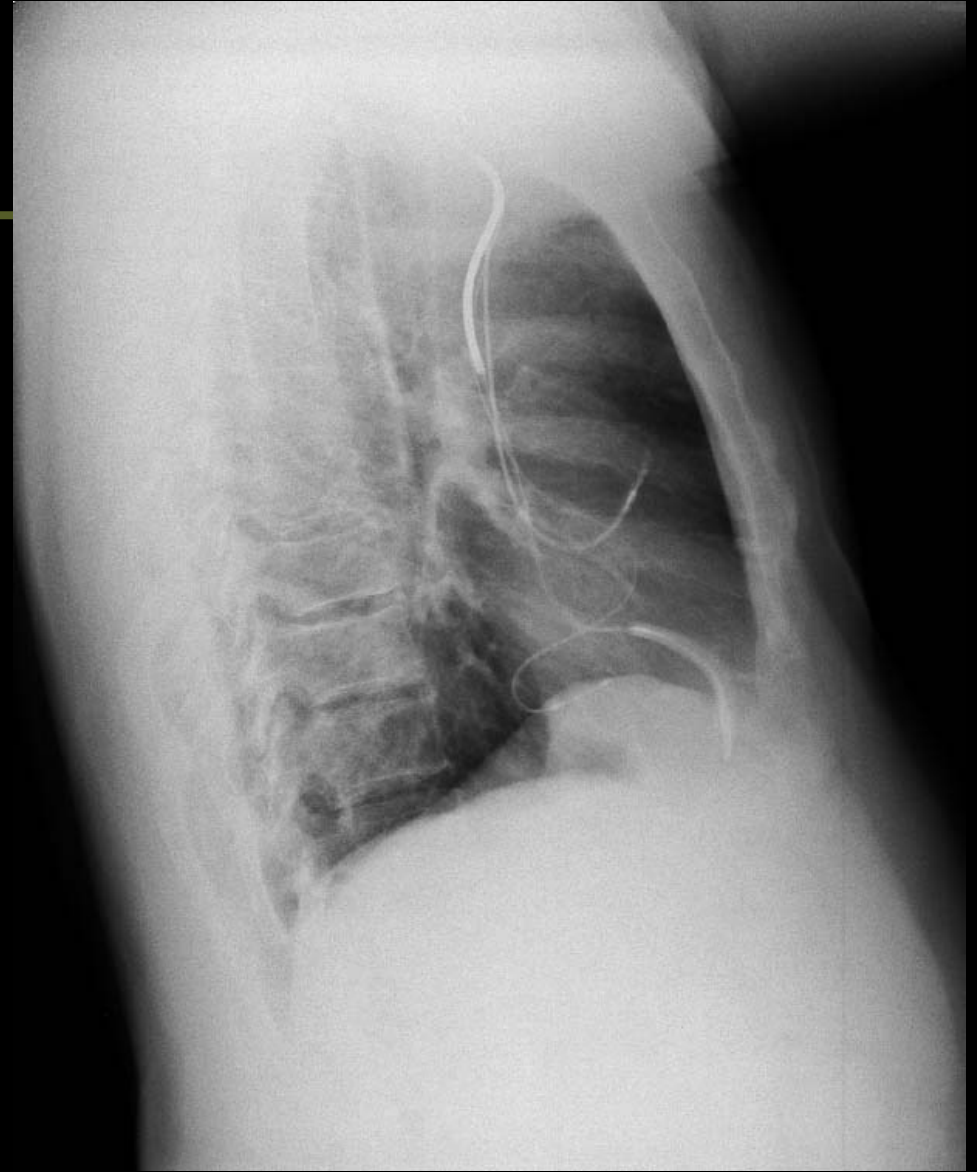
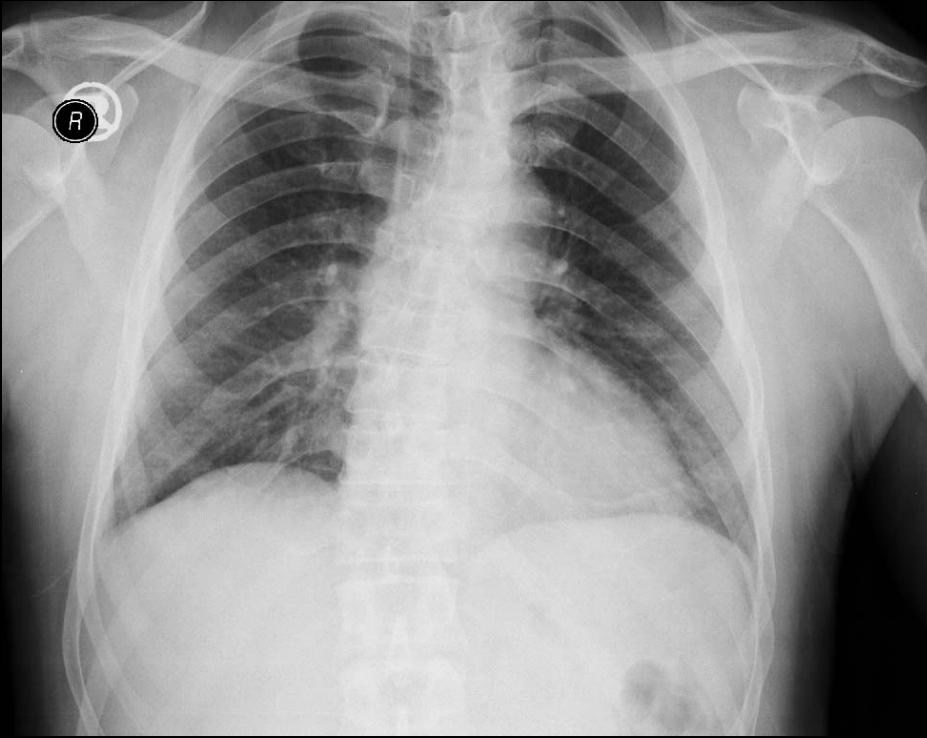


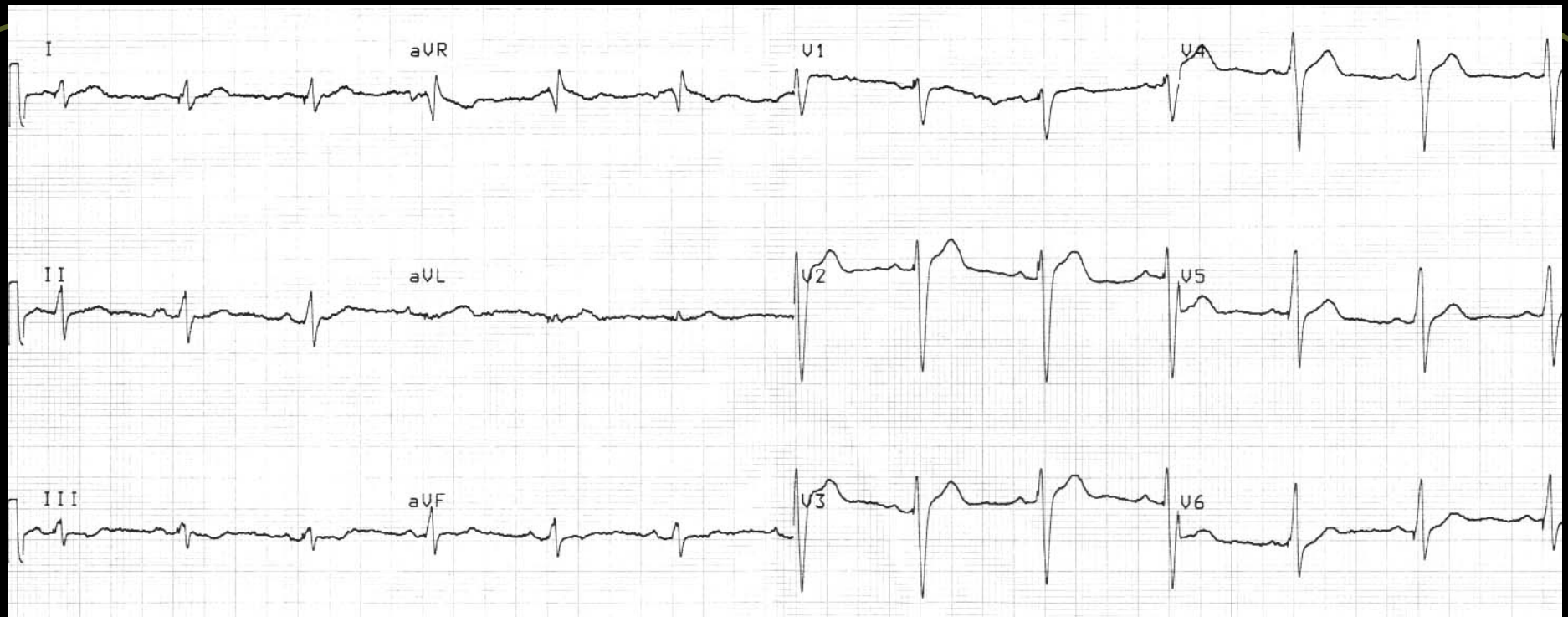
2	Time	111 ms
1	Time	111 ms



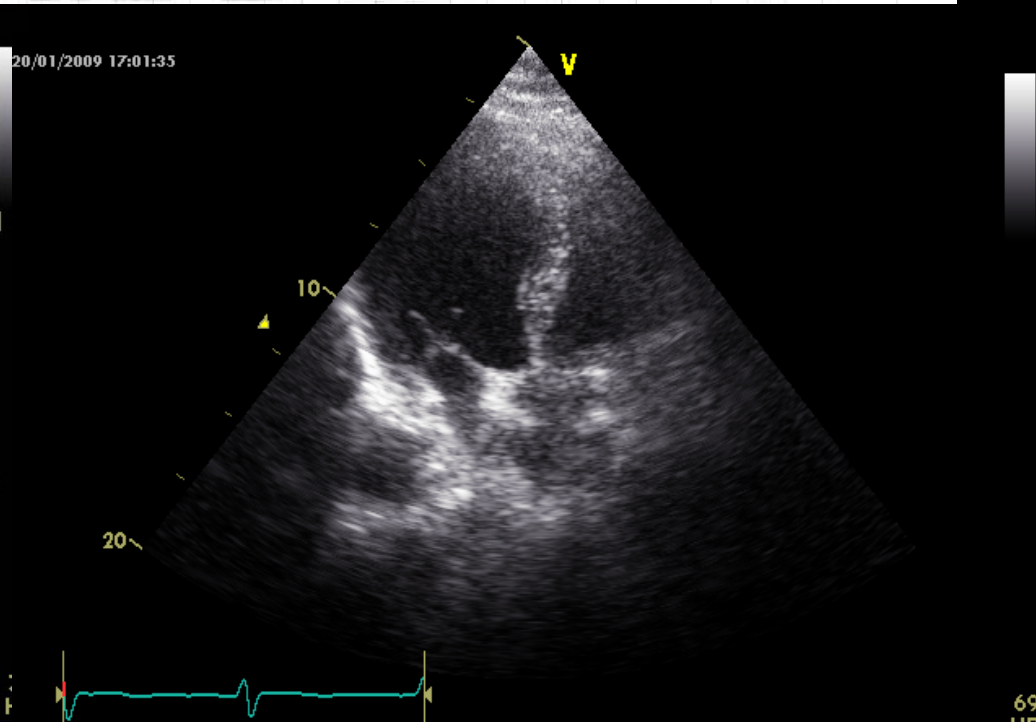
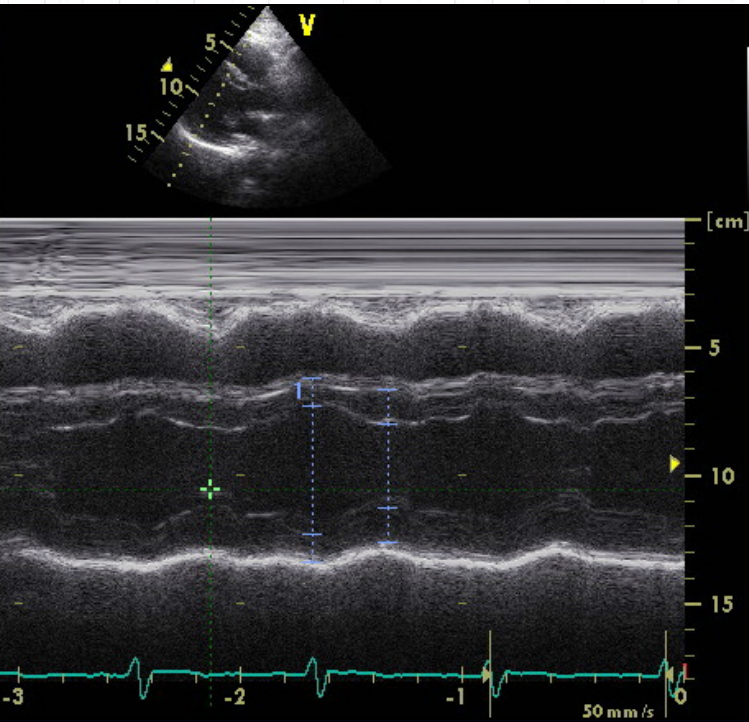
3	Time	207 ms
2	Time	192 ms
1	Time	214 ms



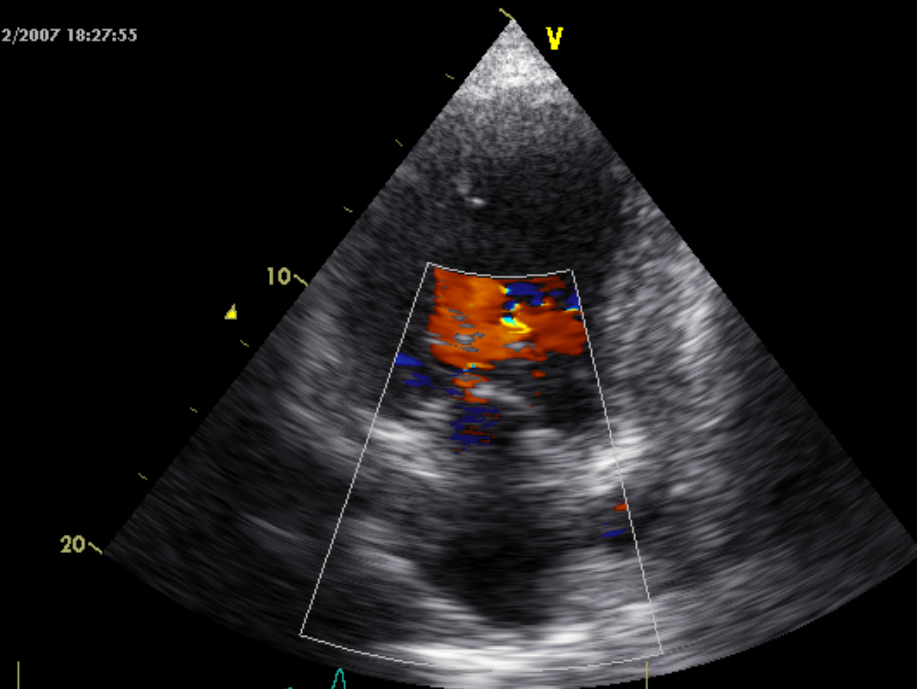




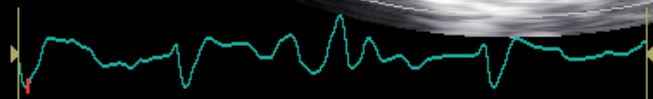
+	d	10.5 cm
1	IVSd	1.1 cm
	IVSs	1.3 cm
	LVIDd	5.0 cm
	LVIDs	3.3 cm
	LVPWd	1.1 cm
	LVPWs	1.3 cm
	EDV(Teich)	117 ml
	ESV(Teich)	43 ml
	EF(Teich)	64 %
	SV(Teich)	74 ml
	%FS	35 %
	LVd Mass	238.03 g
	LVs Mass	168.07 g



07/12/2007 18:27:55

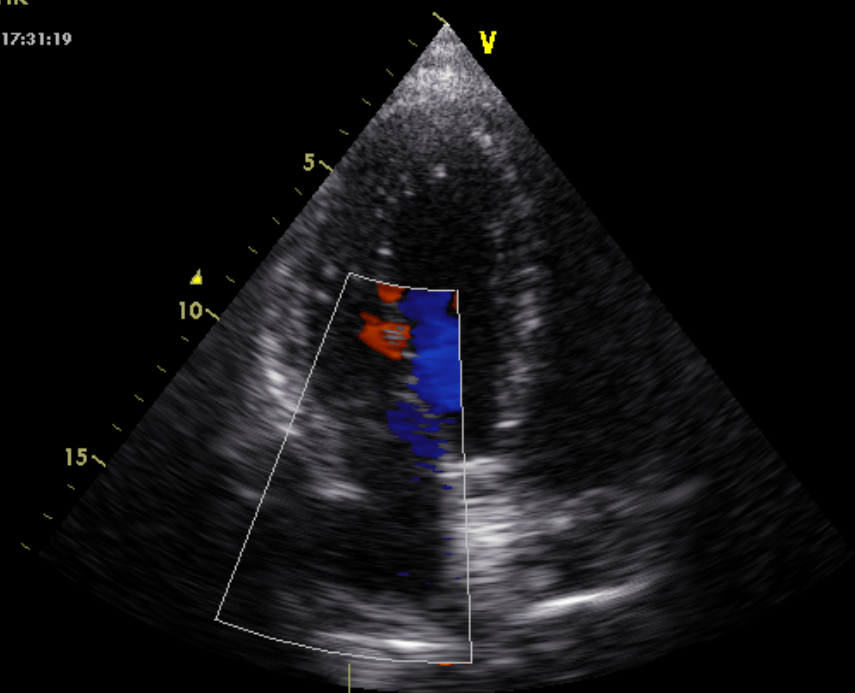


.57
-.57

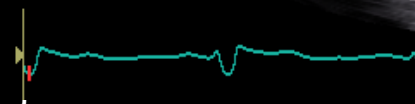


96
HR

21/01/2009 17:31:19



.64
-.64



65
HR

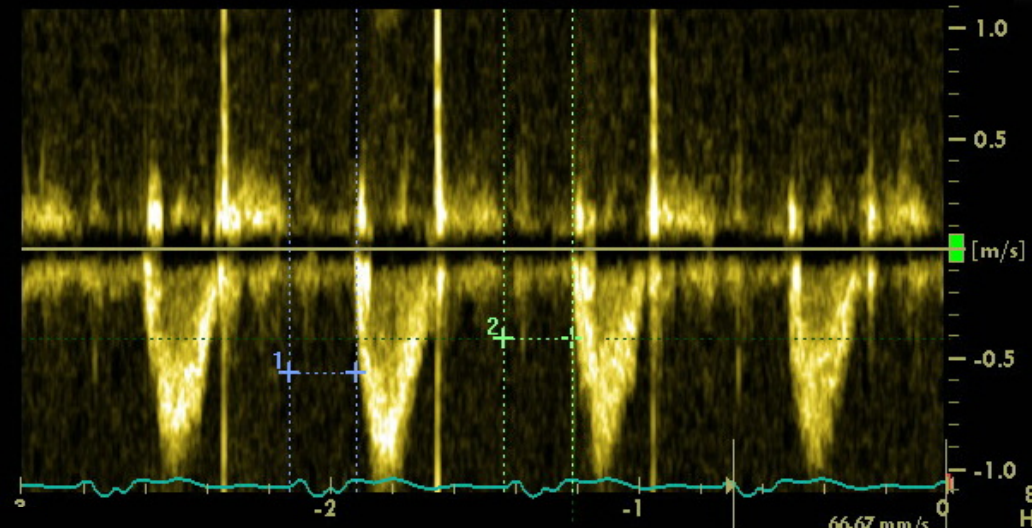
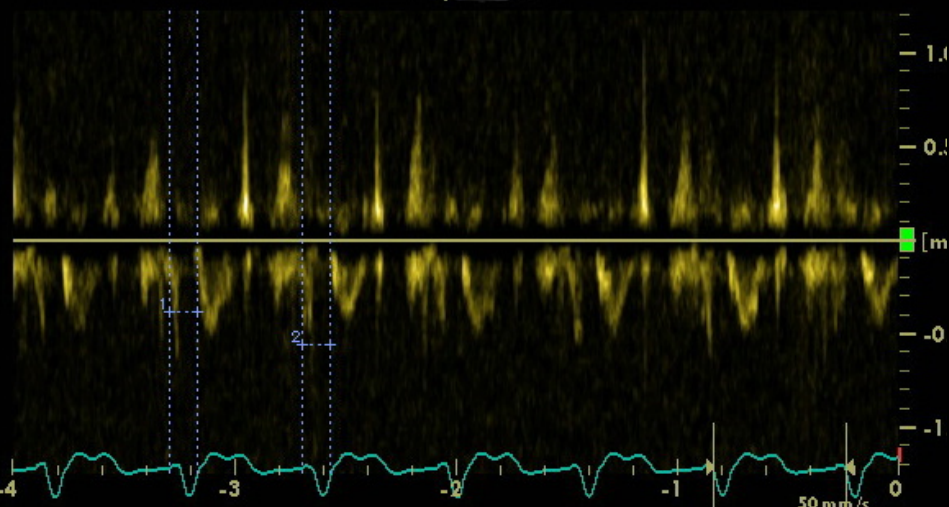
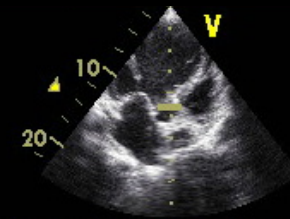
September 20, 2014

Kardiy

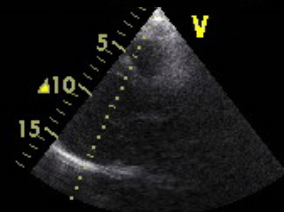
2 Time 126 ms
1 Time 126 ms



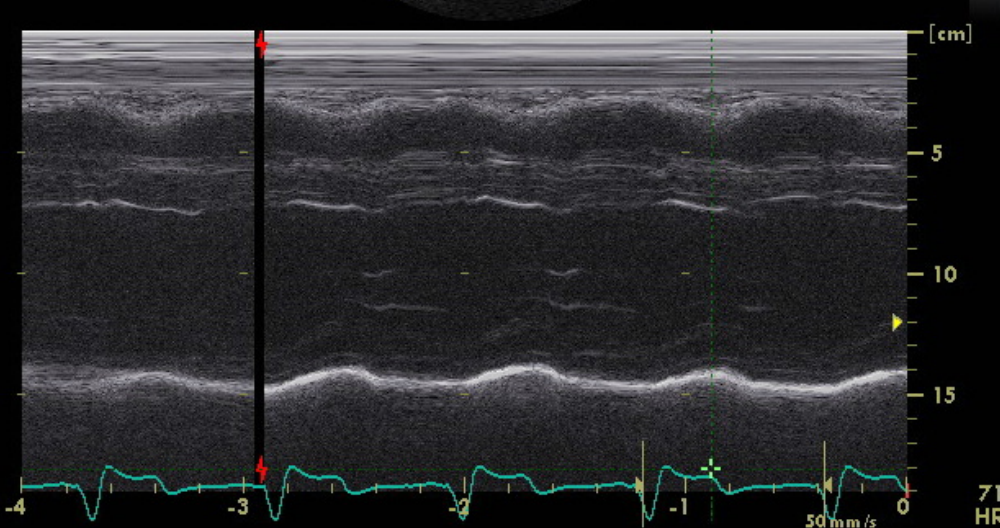
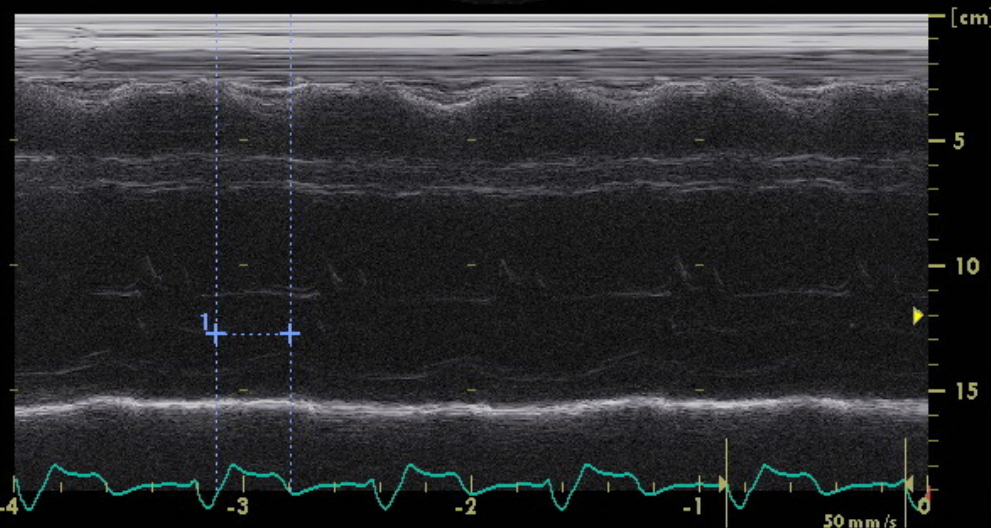
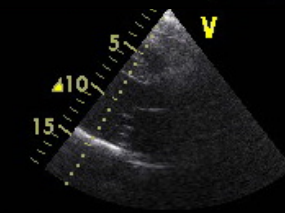
2 Time 222 ms
1 Time 216 ms



1 Time 0.33 s



d 18.1 cm

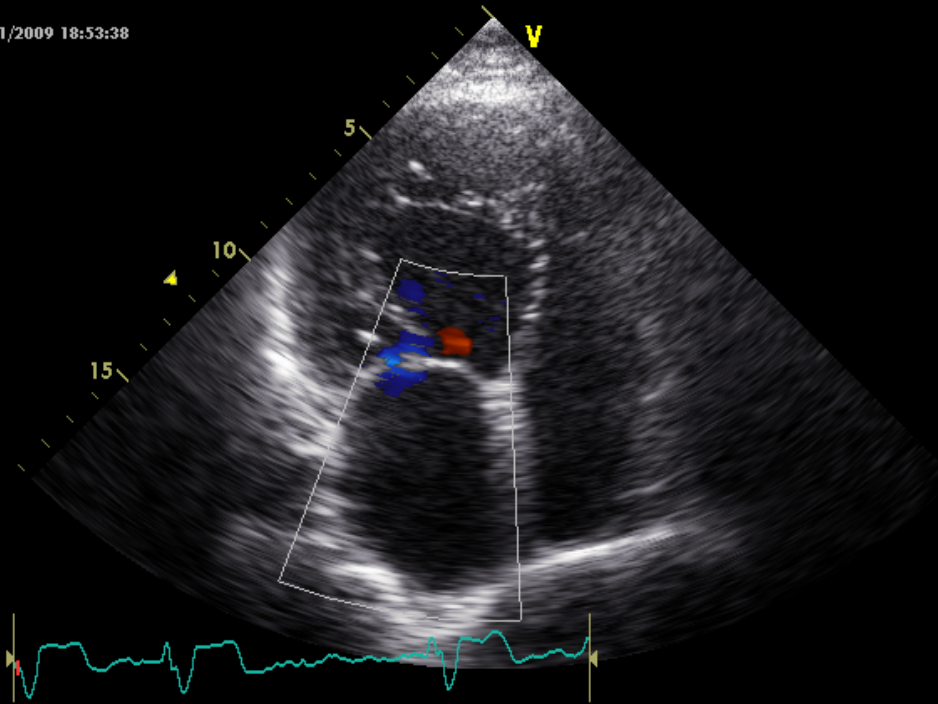


September 20, 2014

Kardiyoloji Semineri 2009

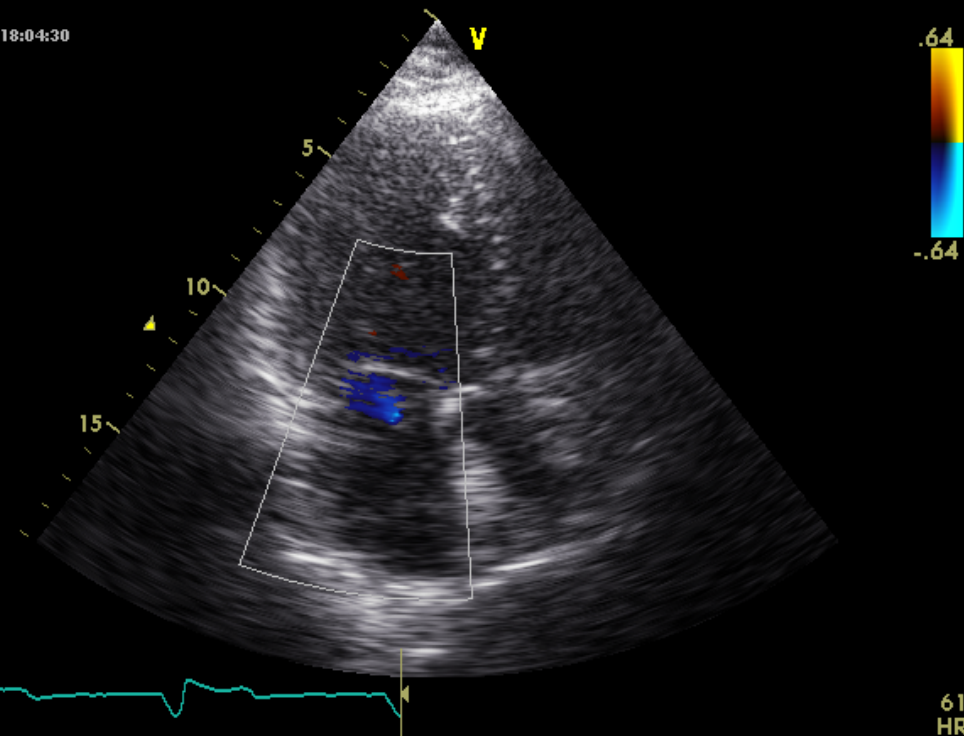
38

27/01/2009 18:53:38



80

03/03/2009 18:04:30



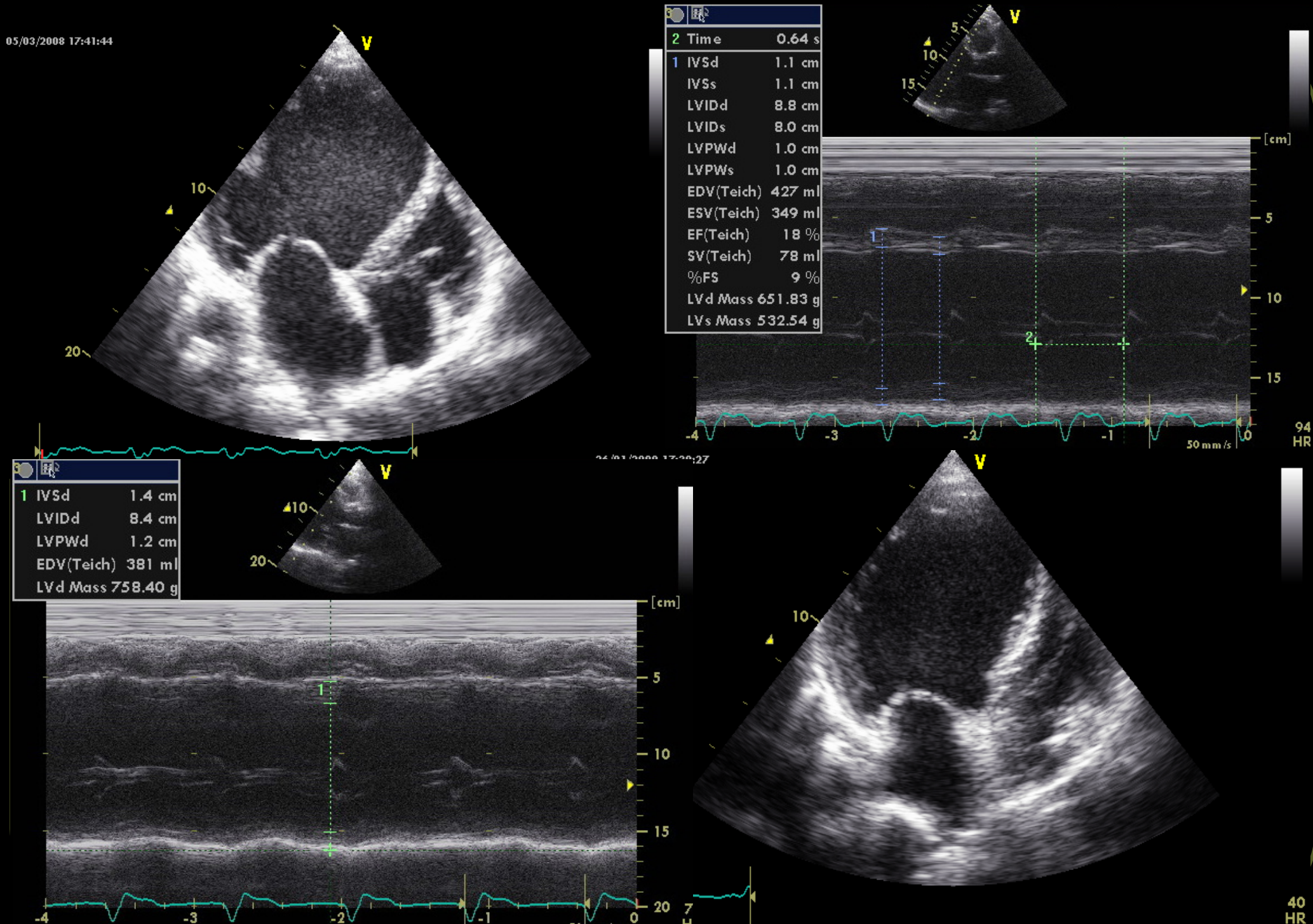
61
HR

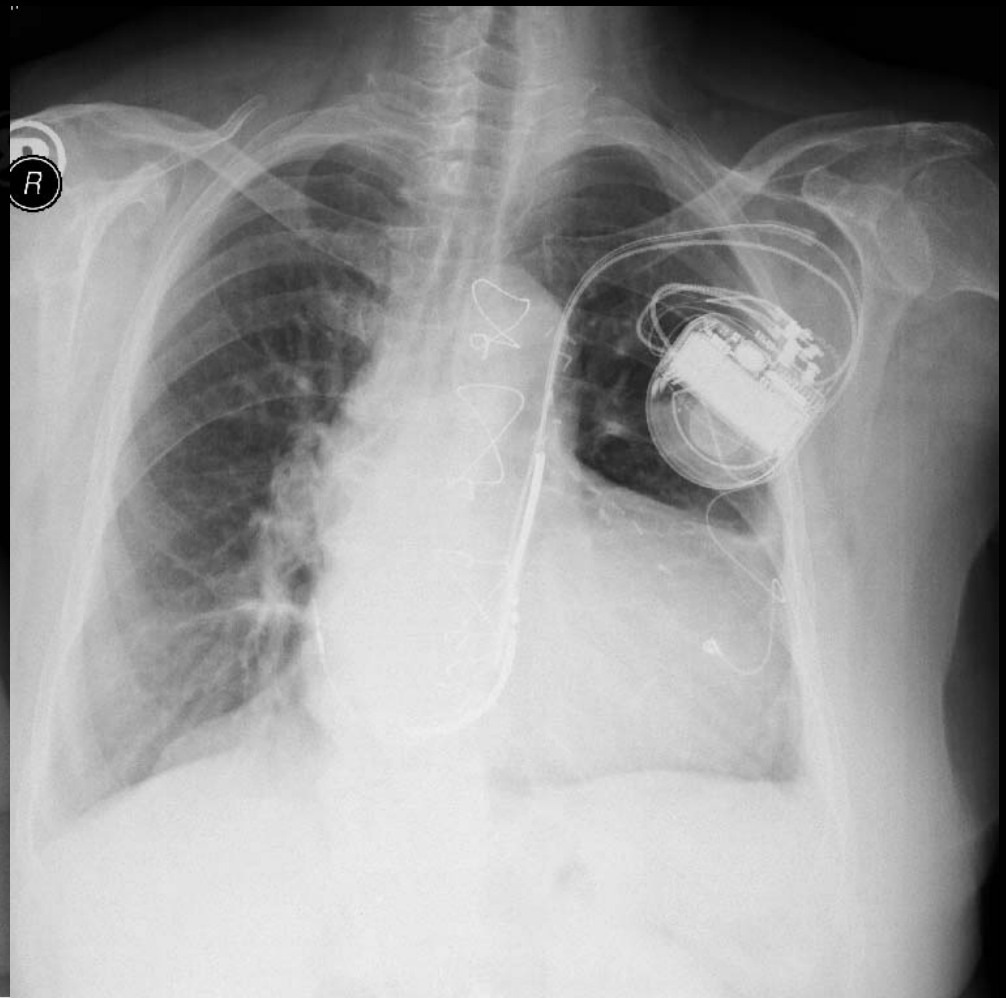
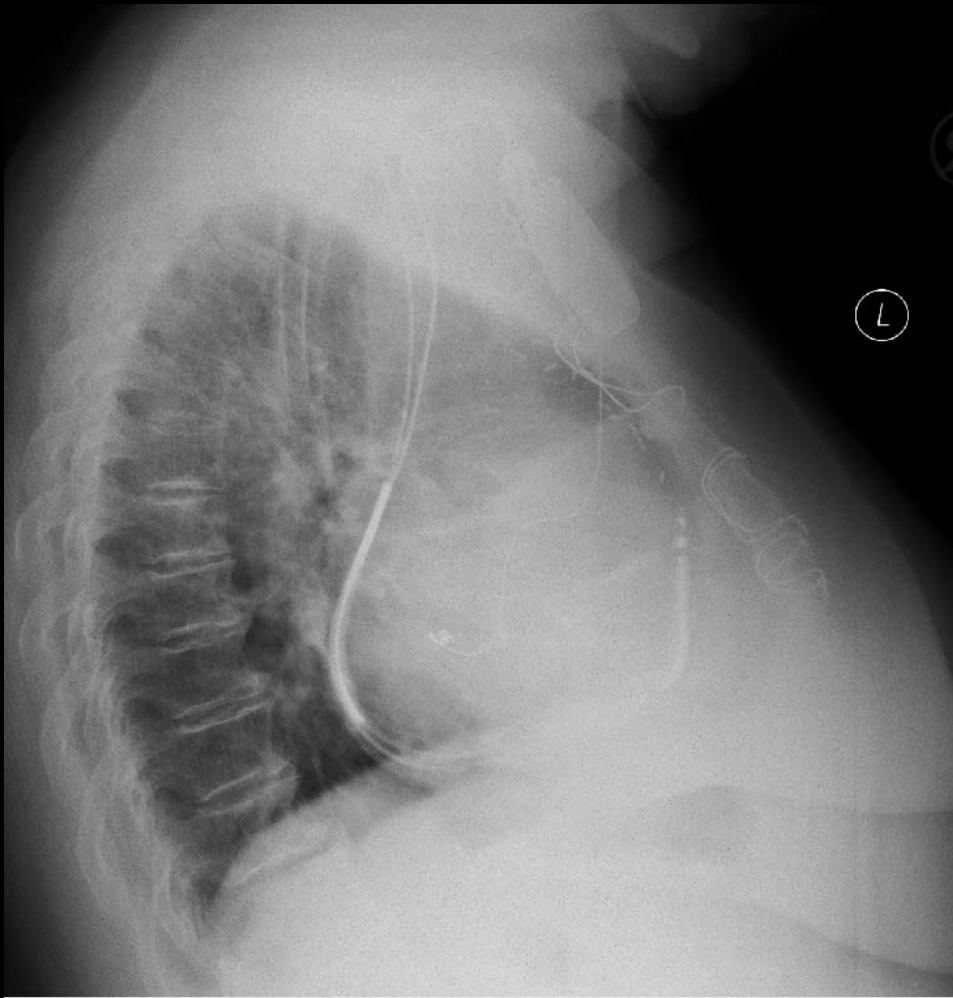
September 20, 2014

Kardiyoloji Semineri 2009

39

05/03/2008 17:41:44





Kardiyak Resenkronizasyon Tedavisi

Endikasyonlar (Sınıf 1)

- Orta – ileri (NYHA sınıf III/IV) kalp yetersizliği
- Optimal medikal tedaviye rağmen semptomatik
- $QRS \geq 120$ msn
- $LVEF \leq 35\%$
- Normal sinüs ritm

Kardiyak Resenkronizasyon Tedavisi

Endikasyonlar (Sınıf 2a)

- Orta – ileri (NYHA sınıf III/IV) kalp yetersizliği
- Optimal medikal tedaviye rağmen semptomatik
- $QRS \geq 120$ msn
- $LVEF \leq 35\%$
- Atriyal fibrilasyon

Kardiyak Resenkronizasyon Tedavisi

Endikasyonlar (Sınıf 2a)

- Orta – ileri (NYHA sınıf III/IV) kalp yetersizliği
- Optimal medikal tedaviye rağmen semptomatik
- LVEF $\leq$ 35%
- Başka nedenle pacemaker bağımlılığı

Kardiyak Resenkronizasyon Tedavisi

Endikasyonlar (Sınıf 2b)

- Optimal medikal tedavi altında sınıf 1 veya 2
- LVEF $\leq$ 35%
- Pacemaker veya ICD implantasyonu endikasyonu ve sık ventriküler pacing ihtiyacı bekleniyor

Kardiyak Resenkronizasyon Tedavisi

Endikasyonlar (Sınıf 3)

- Asemptomatik
- Düşük LVEF
- Başka bir nedenden dolayı pacemaker endikasyonu yok

Veya

- Eşlik eden hastalık nedeniyle yaşam beklentisi düşük veya fonksiyonel durumu kötü olan hastalar

Kardiyak Resenkronizasyon Tedavisi

Endikasyonlar (Sınıf 3)

- Asemptomatik
- Düşük LVEF
- Başka bir nedenden dolayı pacemaker endikasyonu yok