

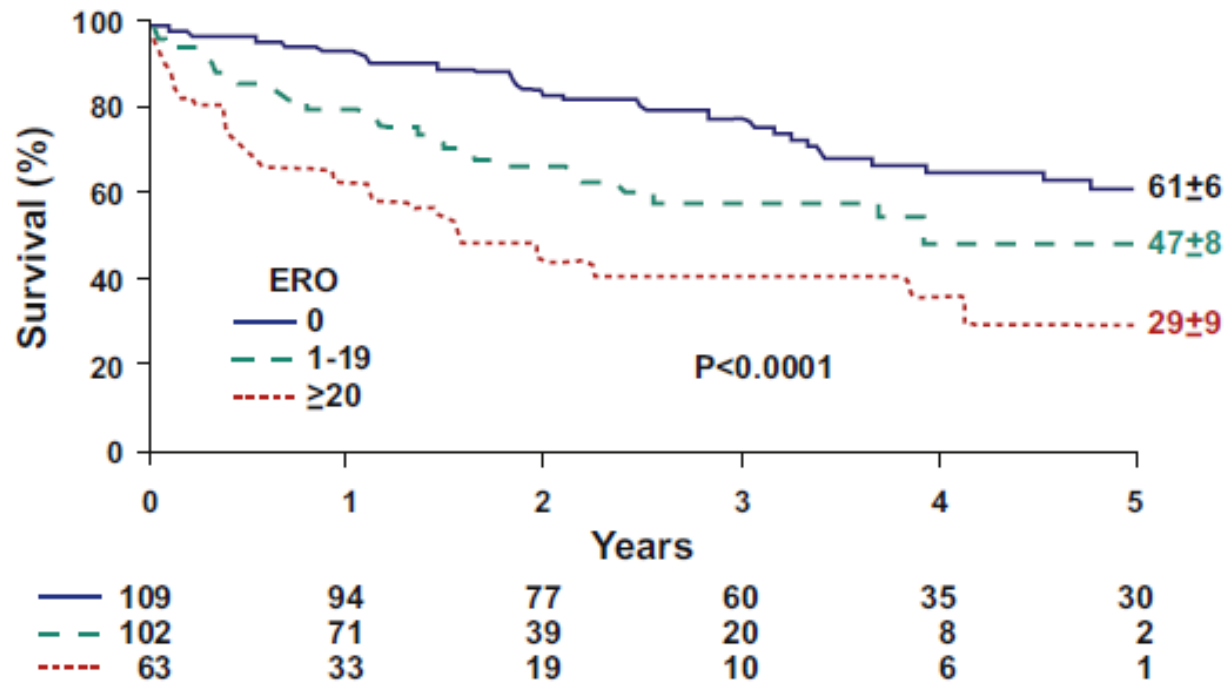
# İskemik Mitral Yetersizliđi-Suçlu Kim?

**Doç.Dr.Gökhan Kahveci**

**18.02.2017**

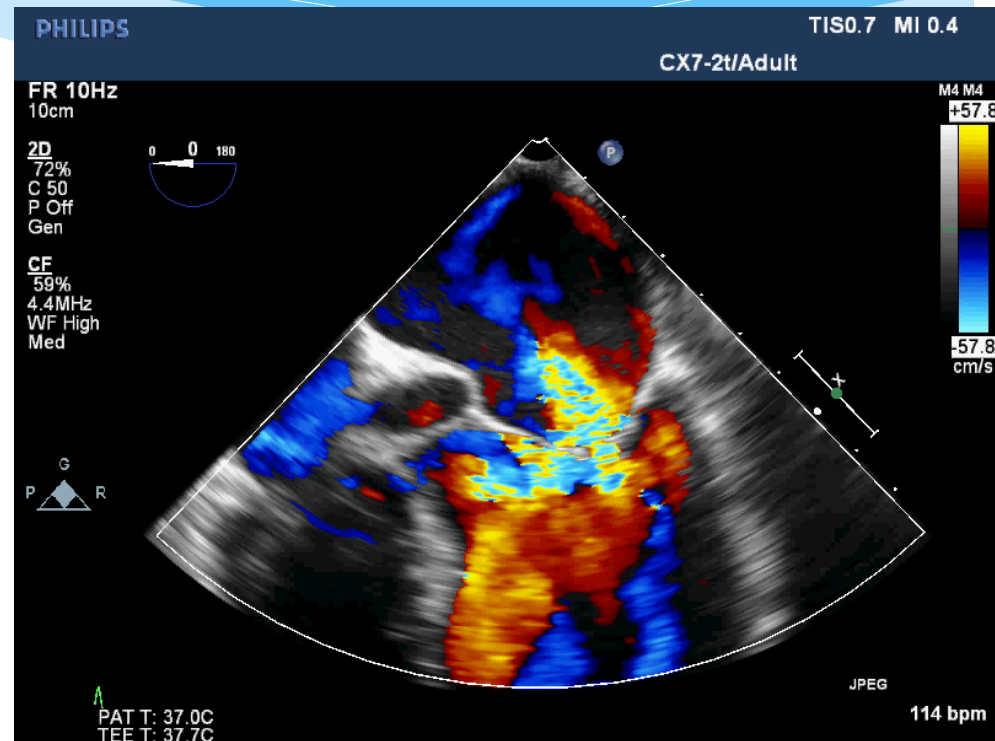
**İstanbul Girişimsel Kardiyoloji Kursu 2017**

# Akut MI Sonrası Sağkalım

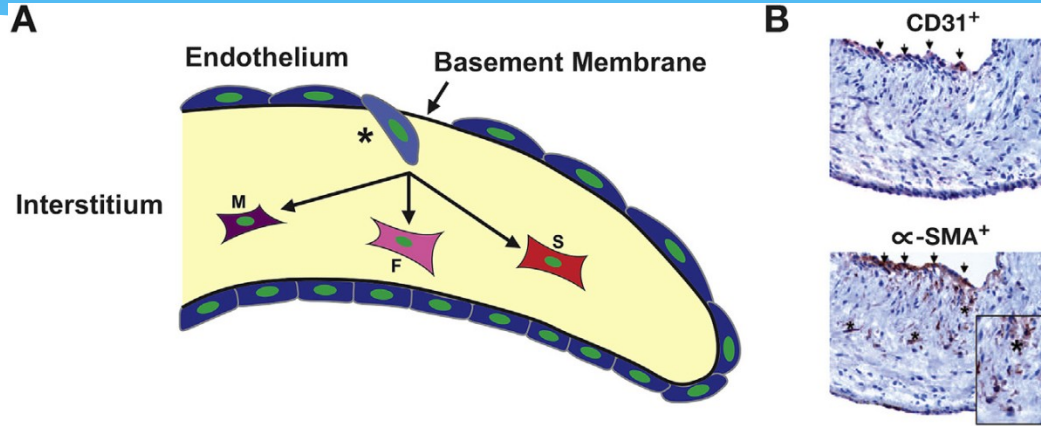


# İskemik MY

\* Prevalans → %20-50



# Patogenez-Mitral Kapakta Değişiklikler

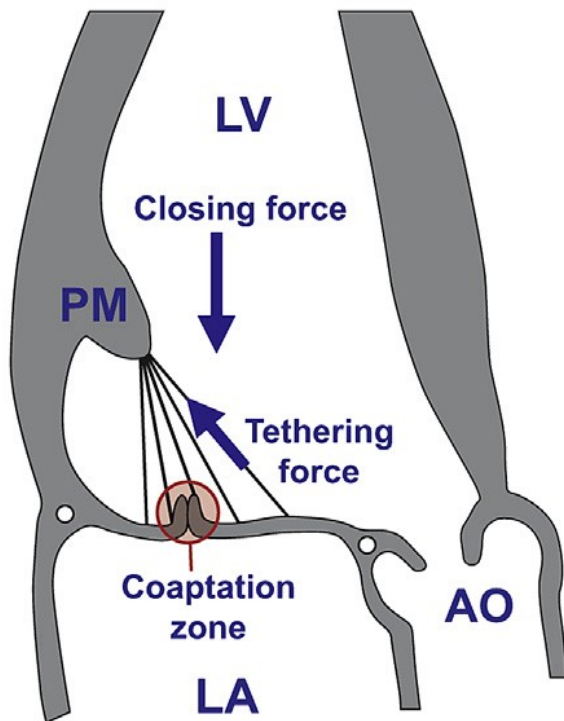


- \* Kapaklar yapısal olarak **NORMAL** dir??
  - \* LEAFLET TETHERING
- ↓
- \* Epitelyal Hc → Mezankime Geçiş → Farklılaşma
  - \* Leaflet yüzey alanı artar. Kalınlık hafif artar
- ↓
- «Tethering Induced Valve Remodelling»

# Ventriküler Yeniden Şekillenme (Remodelling)!!!

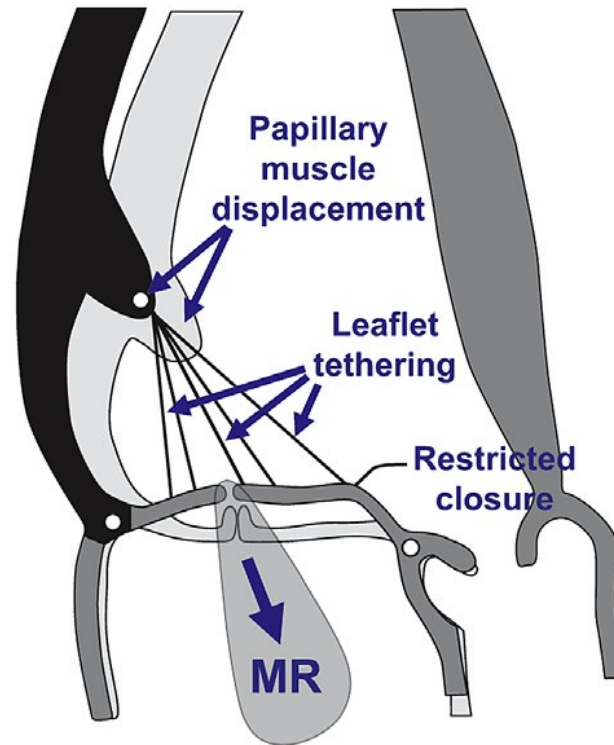
**A**

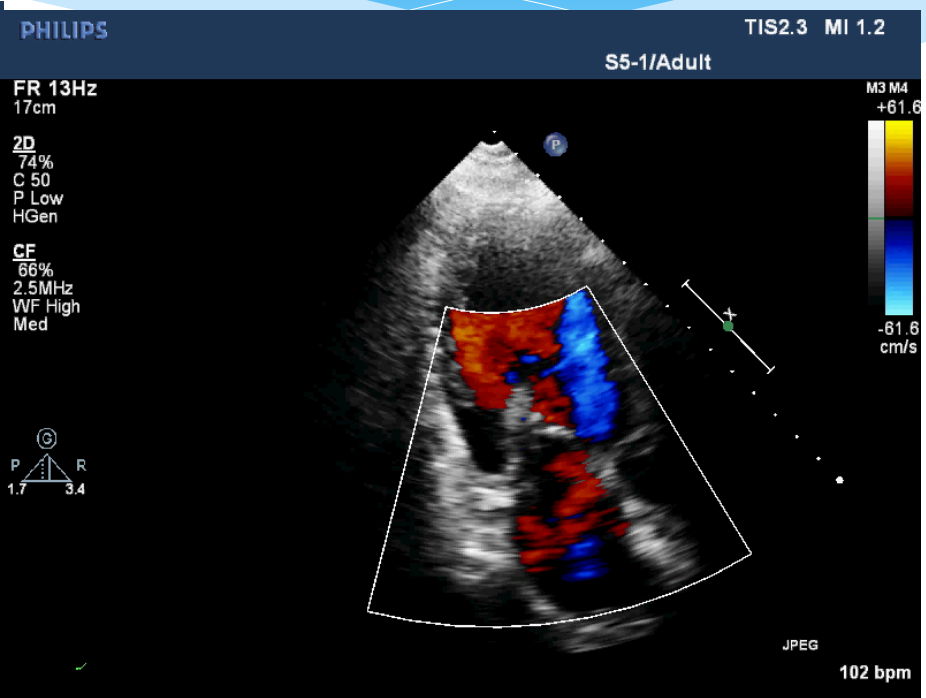
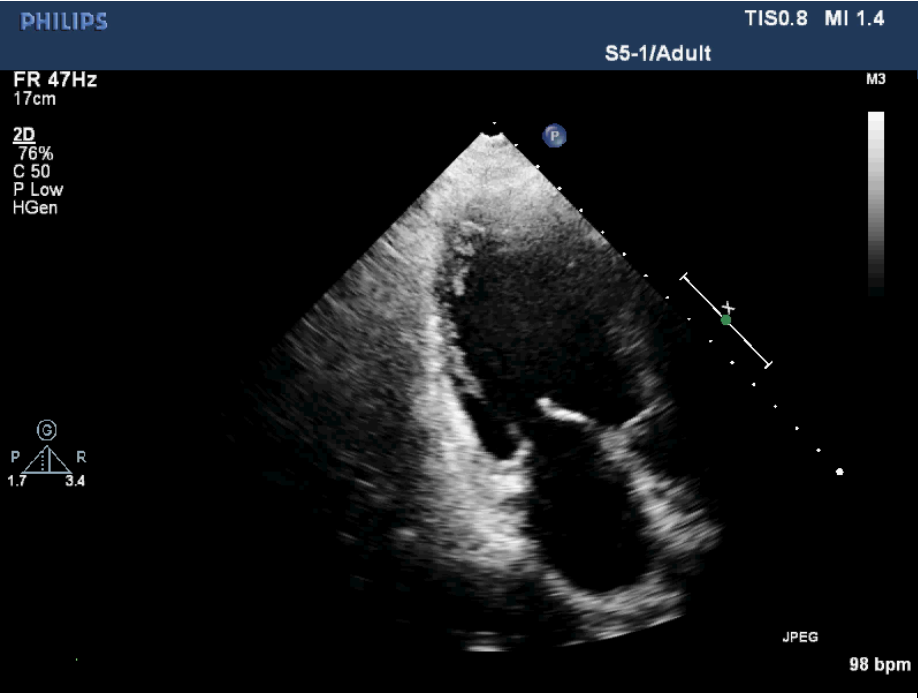
**Normal**



**B**

**Infarct**

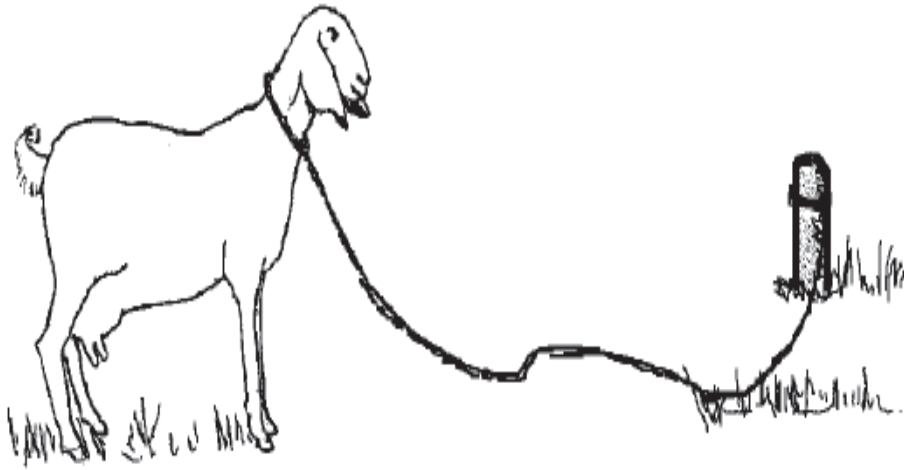




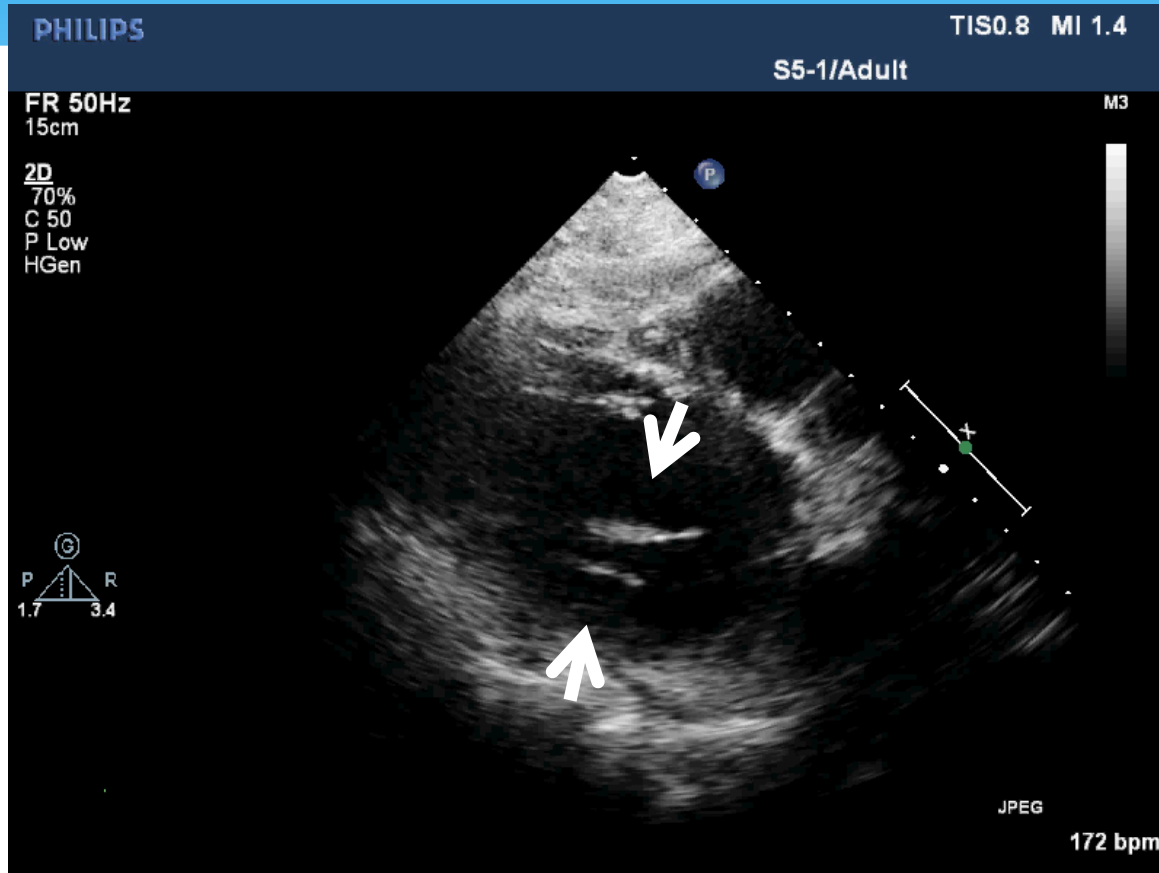
# TETHERING

- \* Tethering = Bir hayvanı bir iple kazığa bağlamak

«GERİLME»

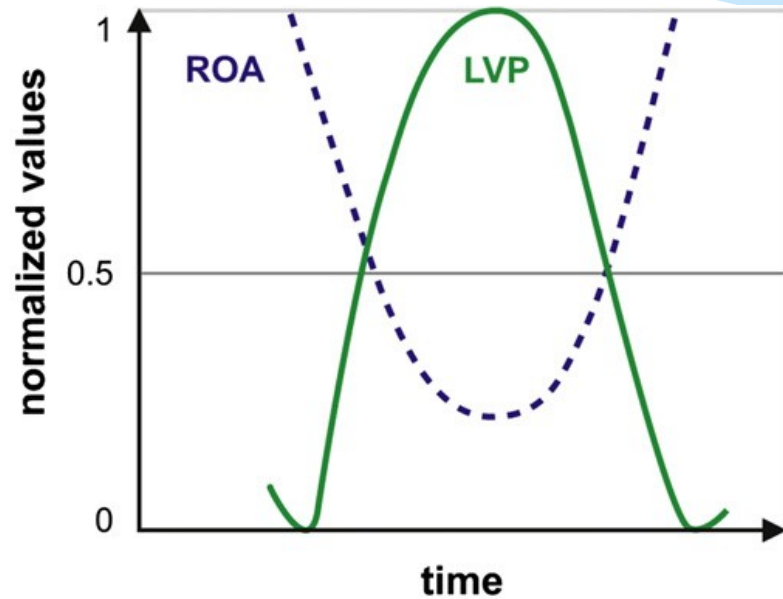


# TETHERING

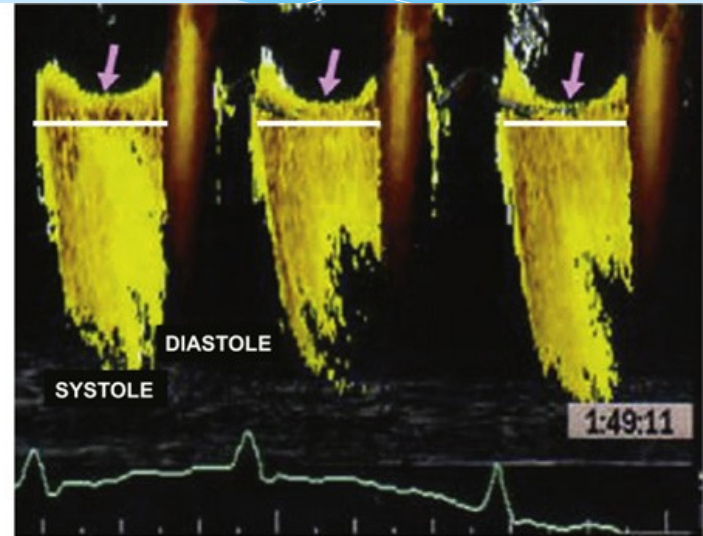




# Ventrikül Kapanma Kuvveti-Tethering Kuvveti

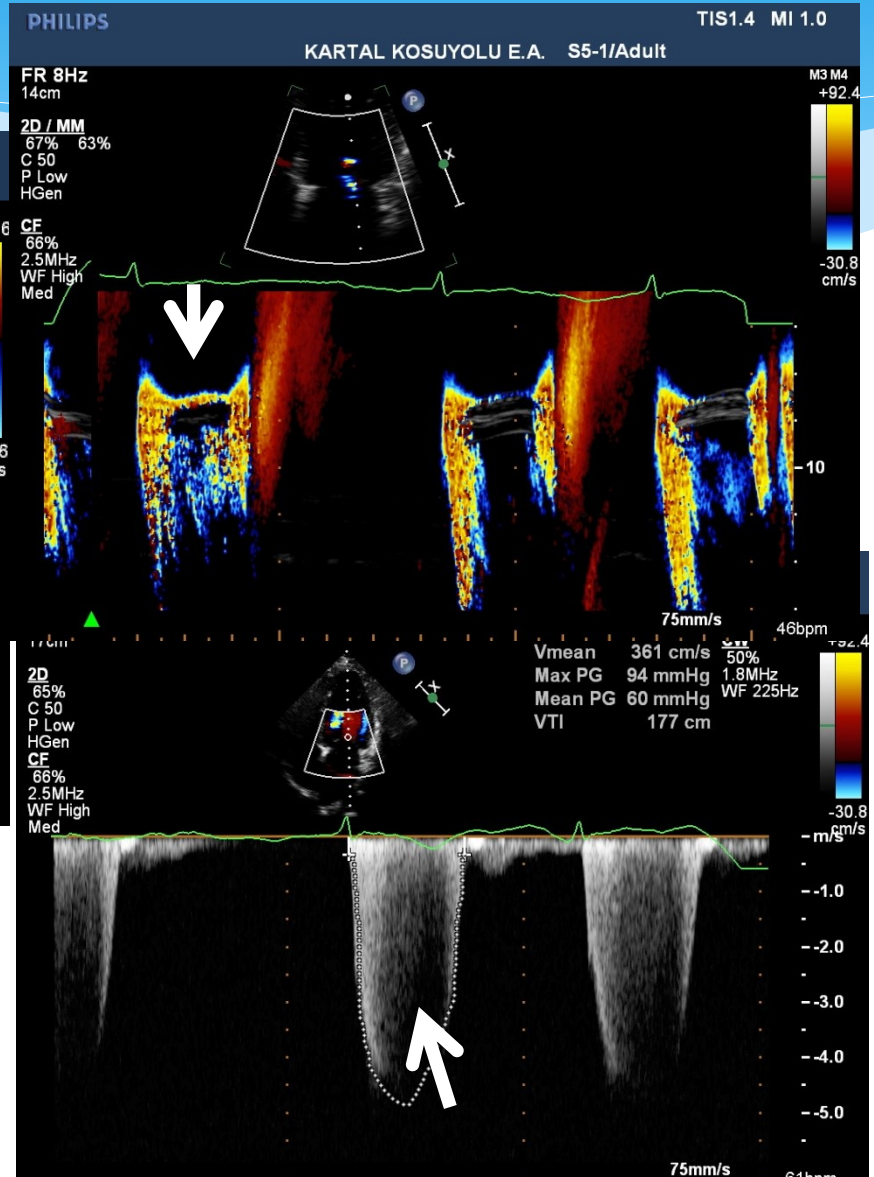
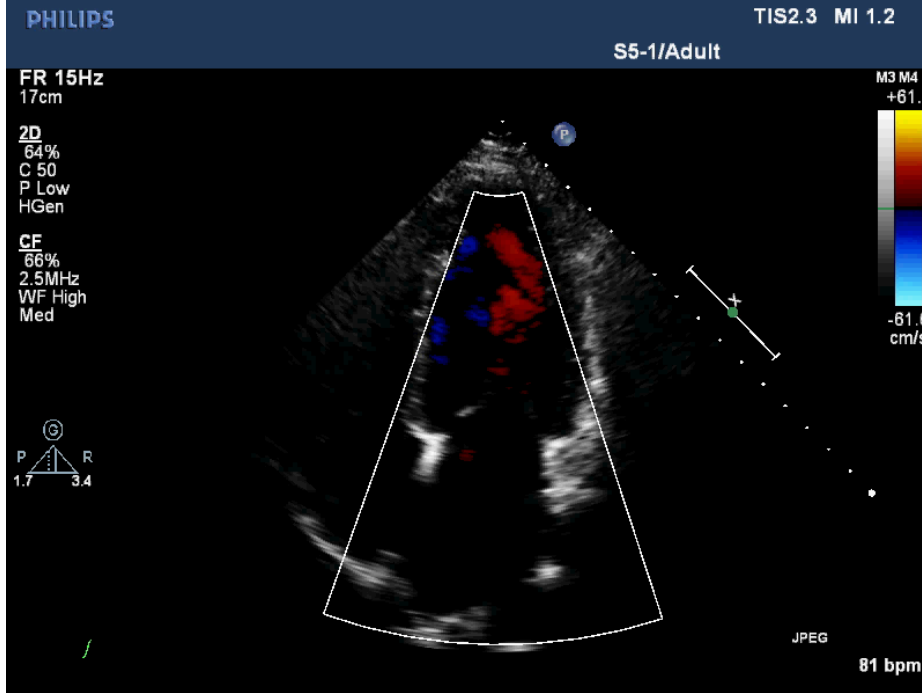


**A**

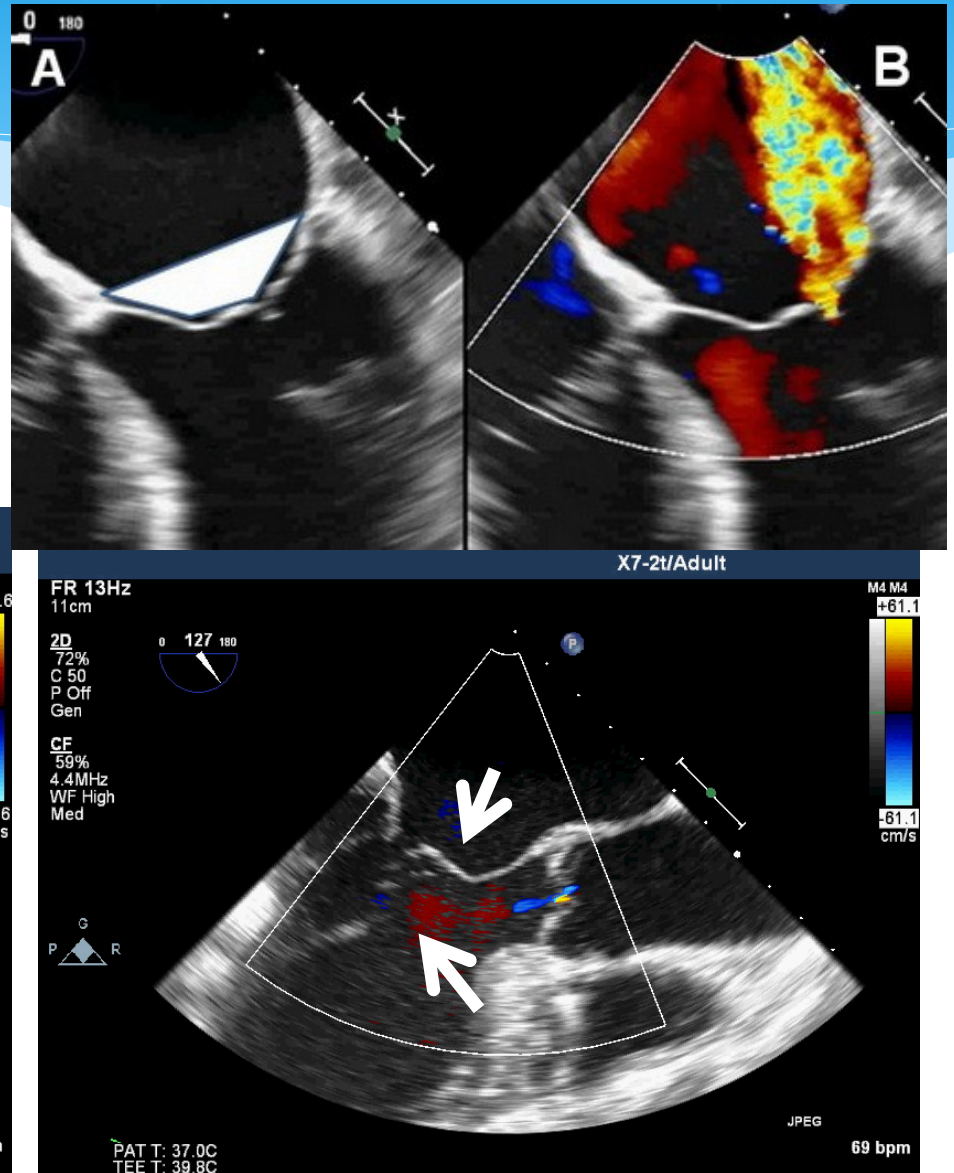
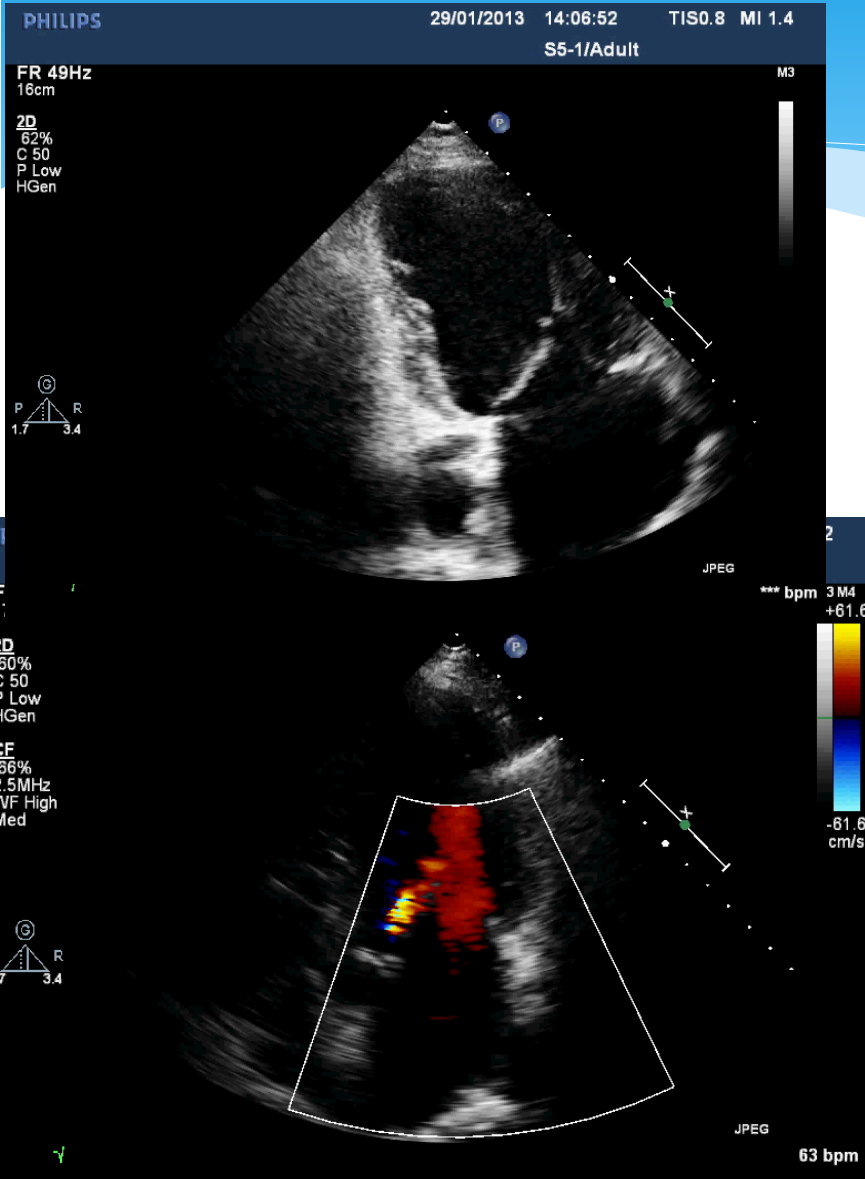


**B**

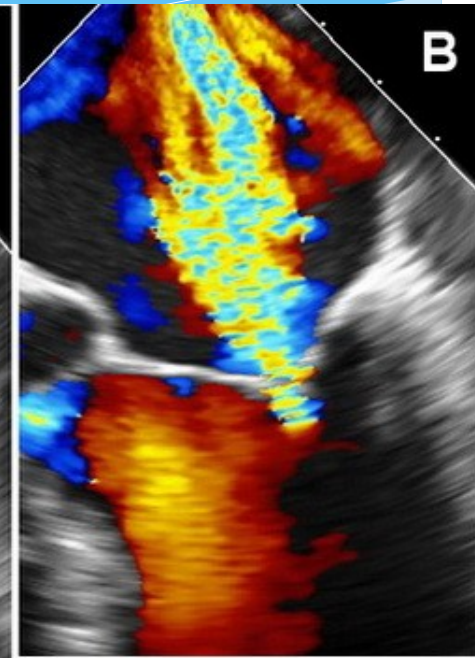
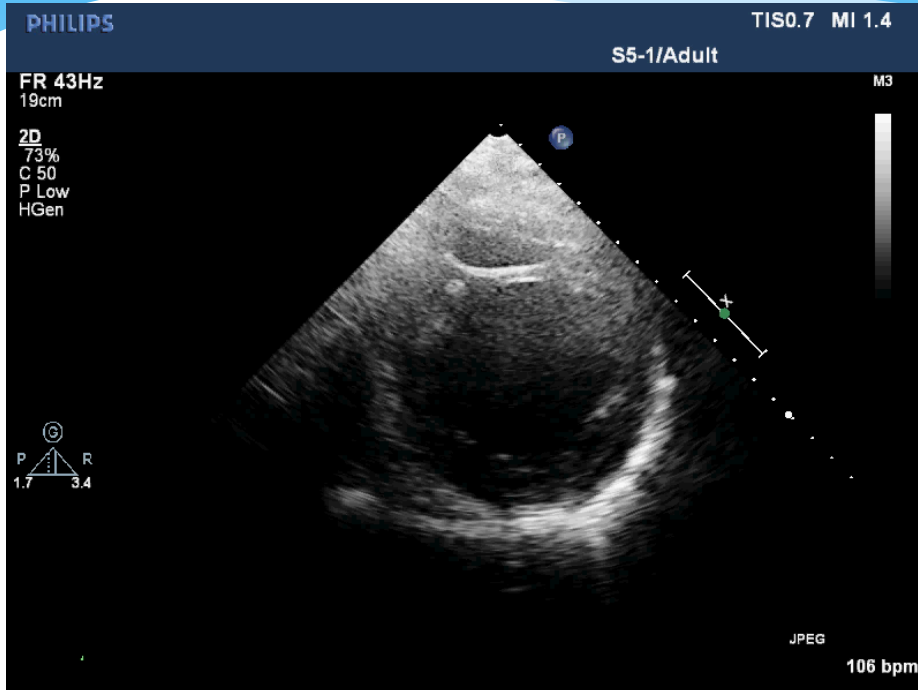
# ERO da Midsistolik Azalma



# Asimetrik Tethering-inferior MI



# Simetrik Tethering-Ant MI



Global remodelling

# Papiller Kaslar

\* Papiller kas disfonksiyonu??

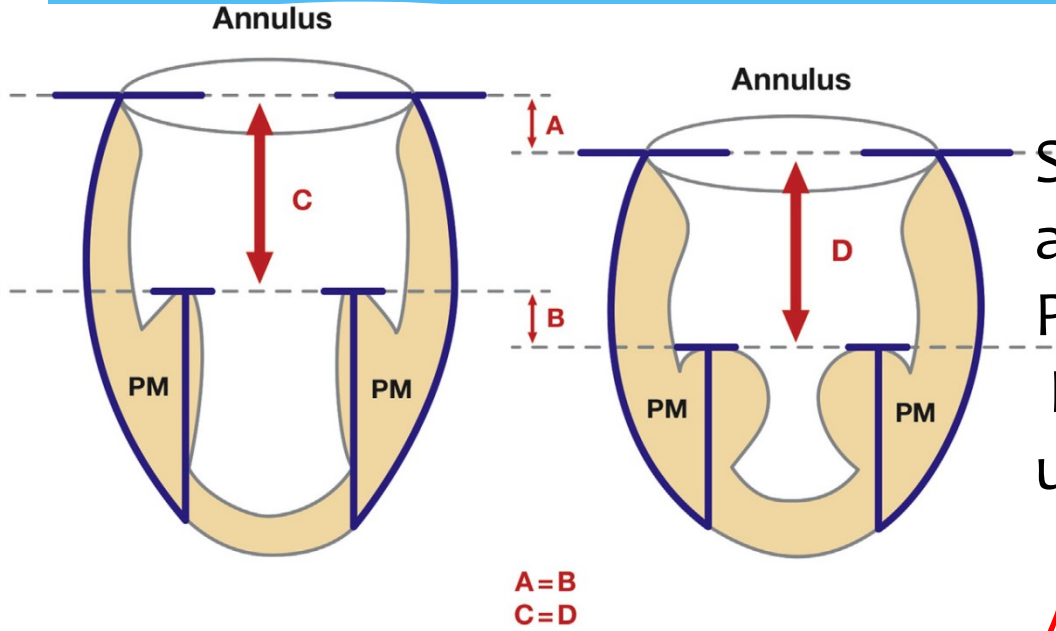
## **Paradoxical Decrease in Ischemic Mitral Regurgitation With Papillary Muscle Dysfunction**

**Insights From Three-Dimensional and Contrast Echocardiography  
With Strain Rate Measurement**

Emmanuel Messas, MD, MSc; J. Luis Guerrero, BS; Mark D. Handschumacher, BS;  
Chi-Ming Chow, MD; Suzanne Sullivan, BS; Ehud Schwammenthal, MD, PhD; Robert A. Levine, MD

*(Circulation. 2001;104:1952-1957.)*

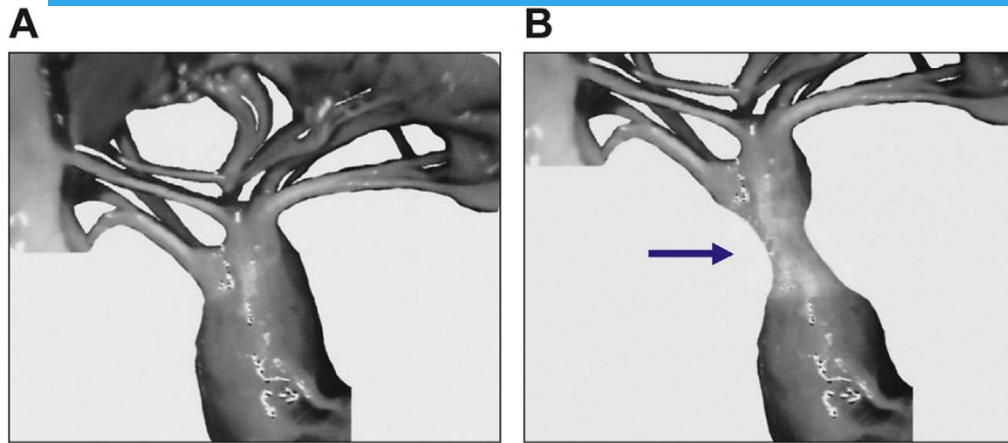
# Papiller Kaslar



Sistolde, anulus yaklaşık 1 cm apekse doğru yaklaşırken, Papiller kaslar da 1 cm kısalırlar. Böylece anulus-papiller kas başı uzaklık sabit kalır

**ANULOPAPİLLER DENGESİ**

# Papiller Kaslar



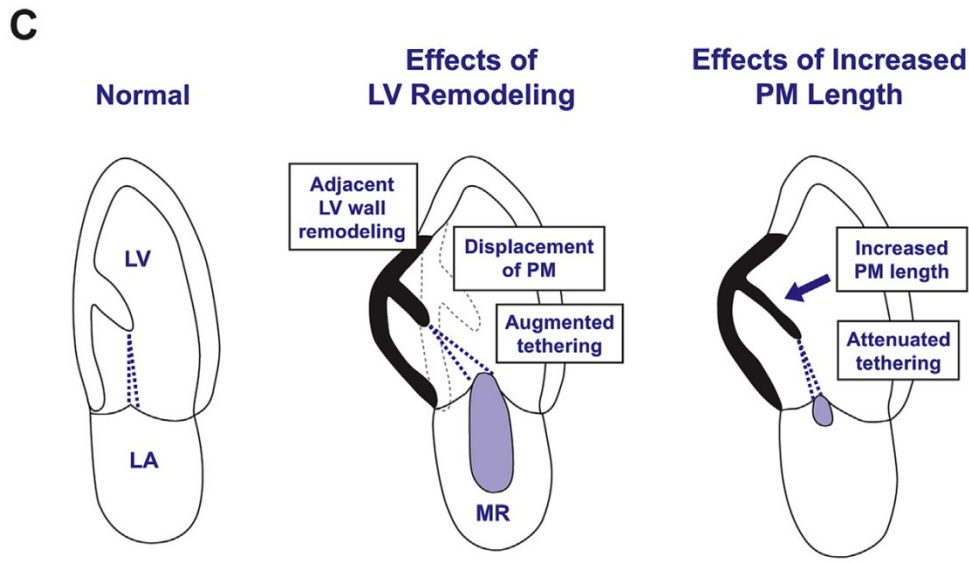
Akut MI → Papiller kas fraksiyonel kısılması yarı yarıya azalır → Anulopapiller uzaklık azalır → Tethering azalır



Kronik dönem → Sistolde kısalmak yerine tersine uzarlar → Skara bağlı boyları uzar → Tethering azalır

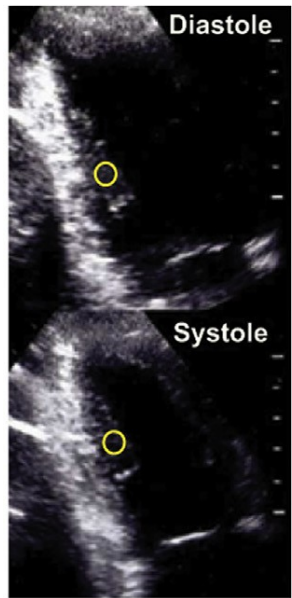


İskemik Mitral Kapak Prolapsusu



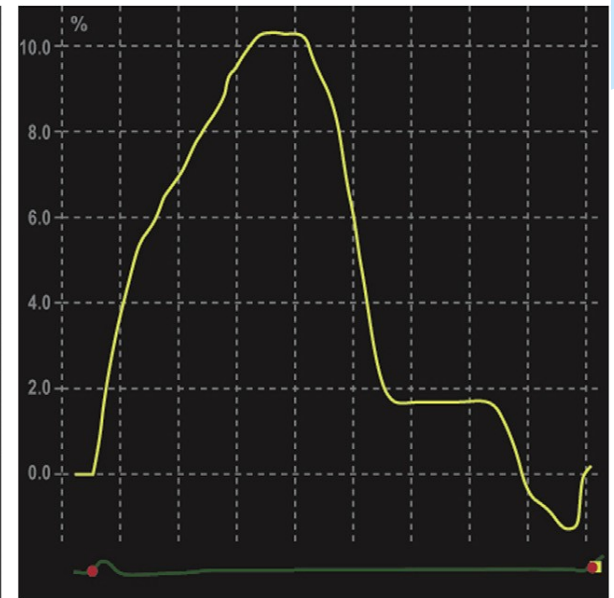
# Papiller Kaslar

**A**



**Normal**

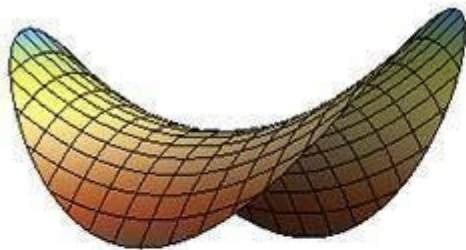
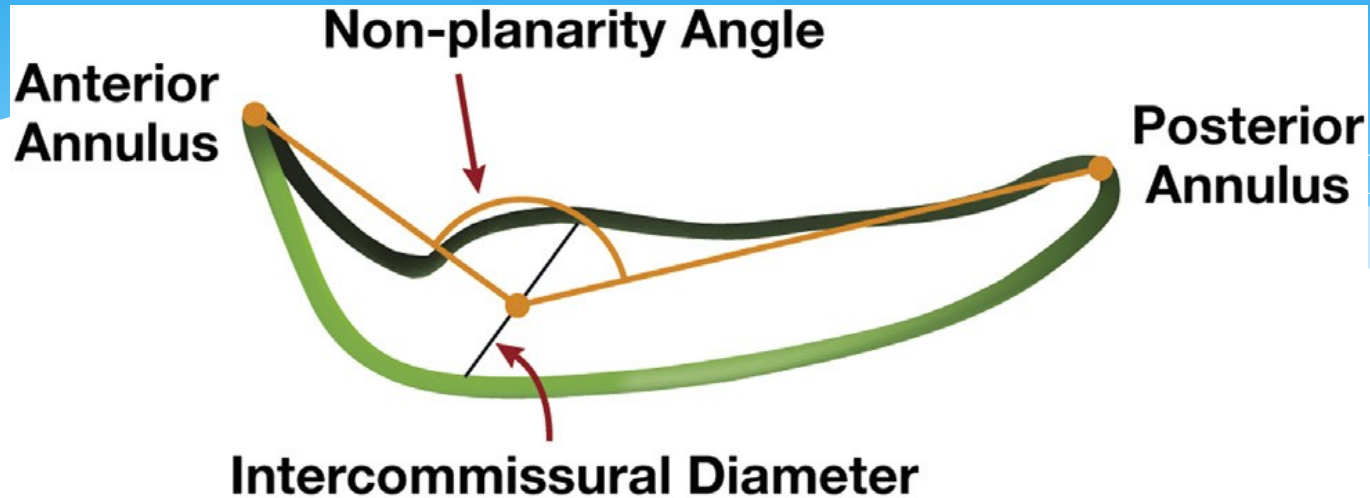
**B**



**MI**



# Mitral Annulus



$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = cz$$



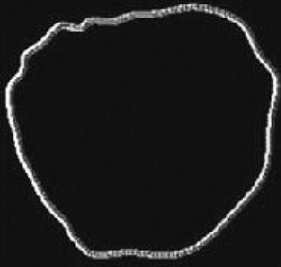
Eyer şeklinde

veya

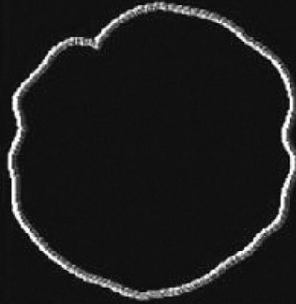
Pringles şeklinde

**Pringles are examples of hyperbolic paraboloids.**

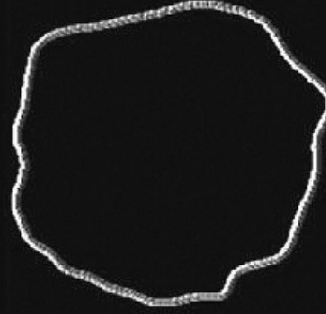
# Mitral Anulus



Normal



Inferior MI



Anterior MI

## Anulusun 3 temel hareketi:

1. Anulusta sfinkter benzeri hareket (yakınındaki myokarda bağlı)  
Anüler alanda azalma

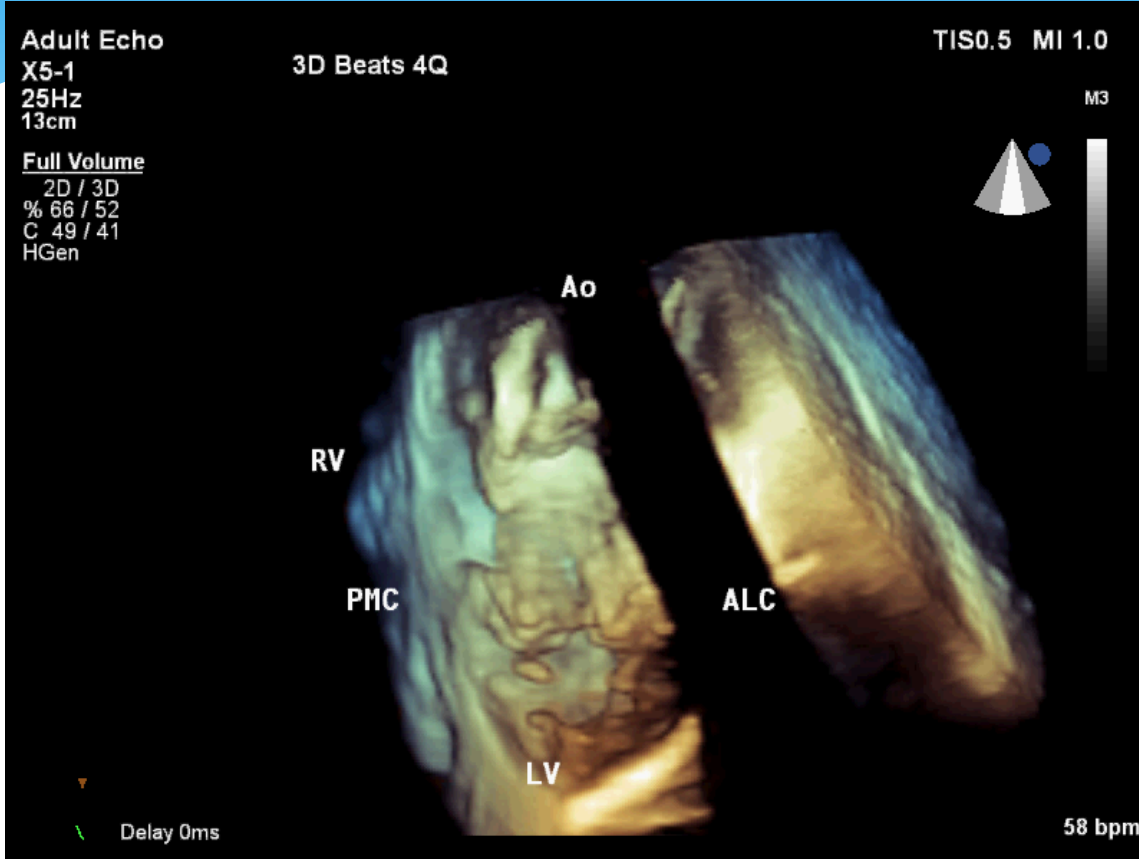
2. Apekse doğru hareket

3. Intercommiissural ekseninde katlanma  
(saddle deepening)

Watanabe B, Circulation  
2005

Anüler alanda artış ve daha düz bir anulus

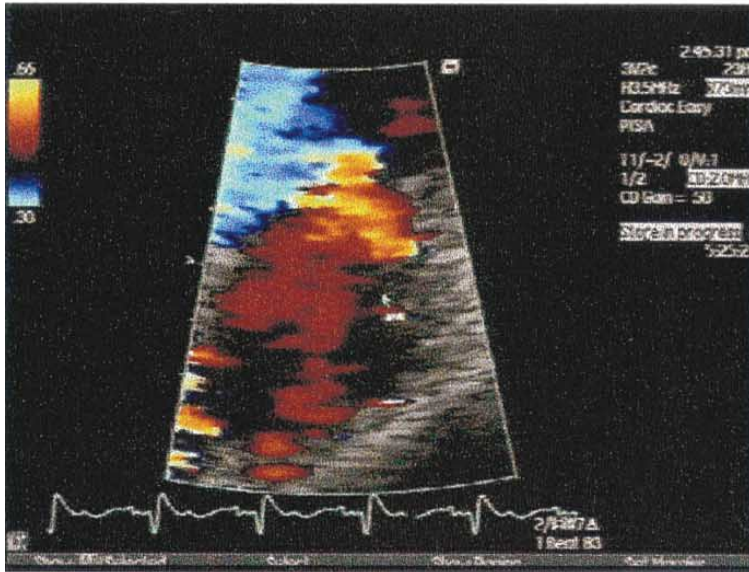
# Mitral Anulus



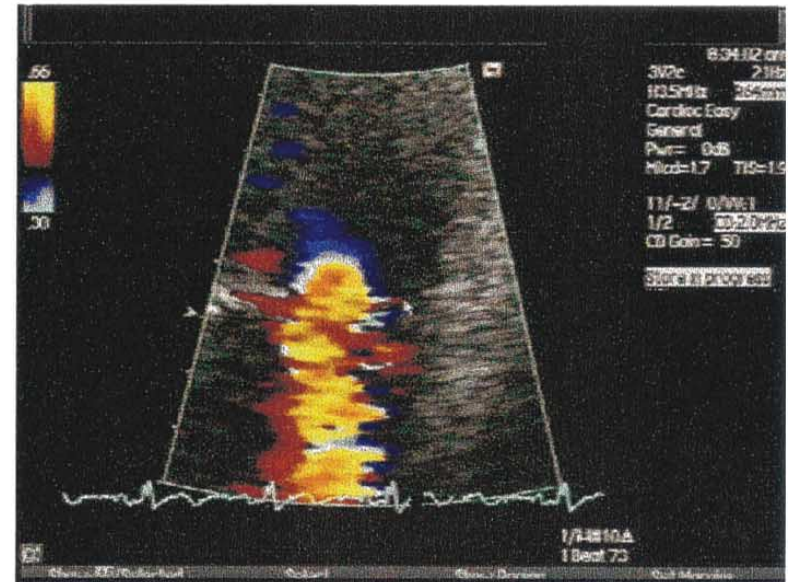
Anulusta sfinkter benzeri  
Hareket (yakınındaki myokarda  
bağlı)  
Anüler alanda azalma

# Önyük = Afterload

**A. REST**



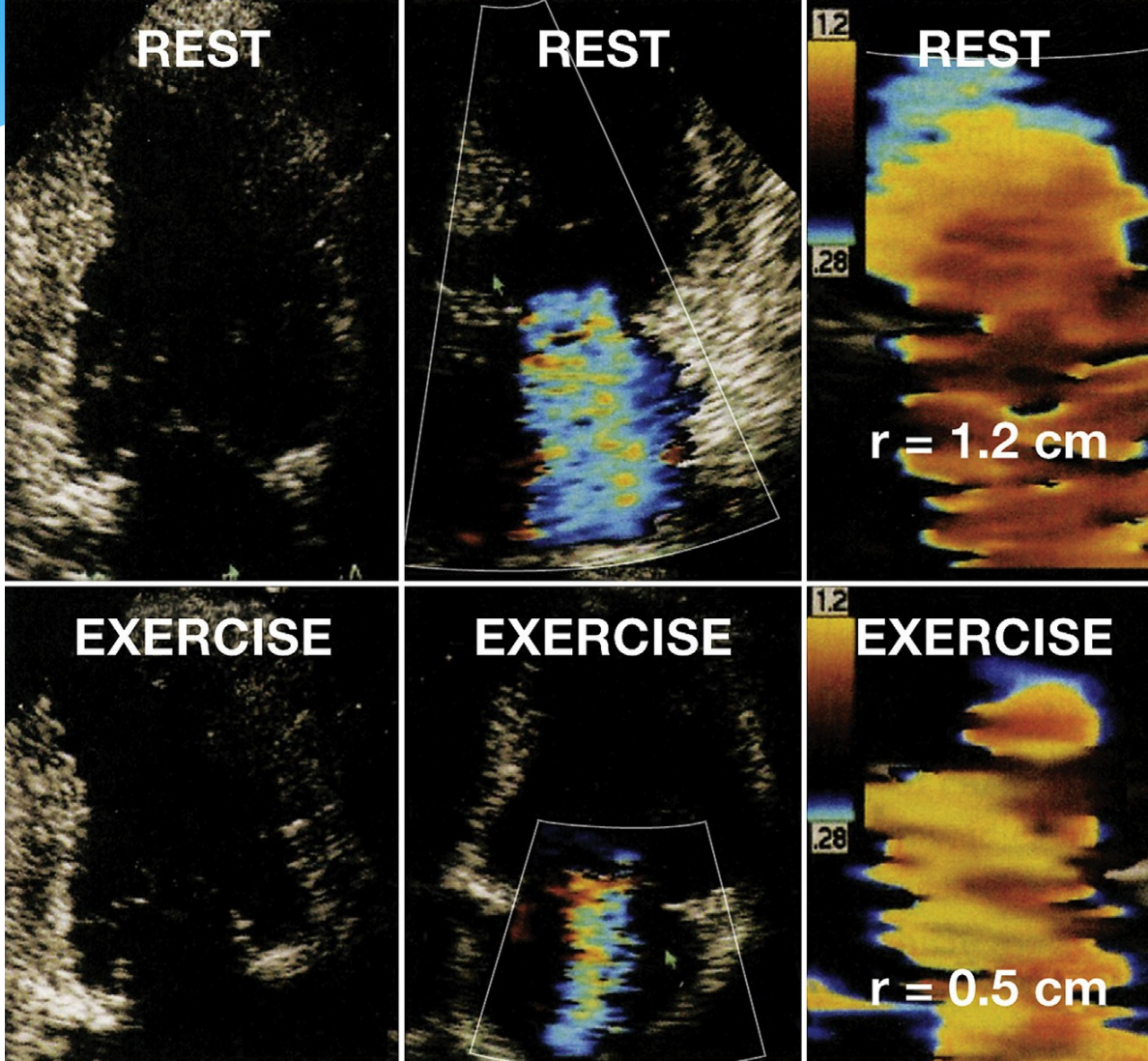
**B. EXERCISE**



Lebrun F, 2001 JACC

Egzersiz ile ERO da 13 mm<sup>2</sup> lik artış kötü prognostik gösterge

# Önyük = Afterload



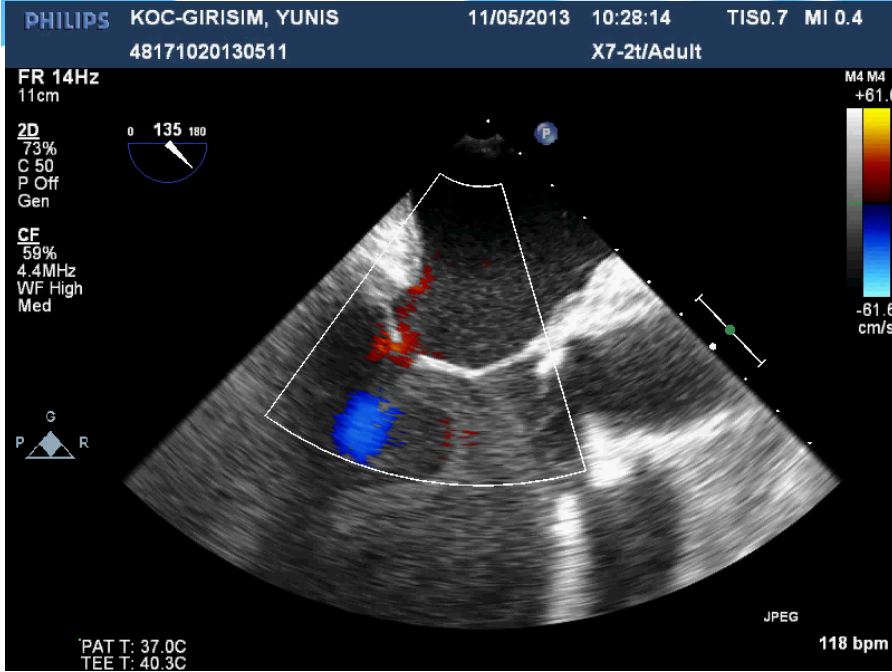
Egzersiz ile kronik inferior MI da MY azalması



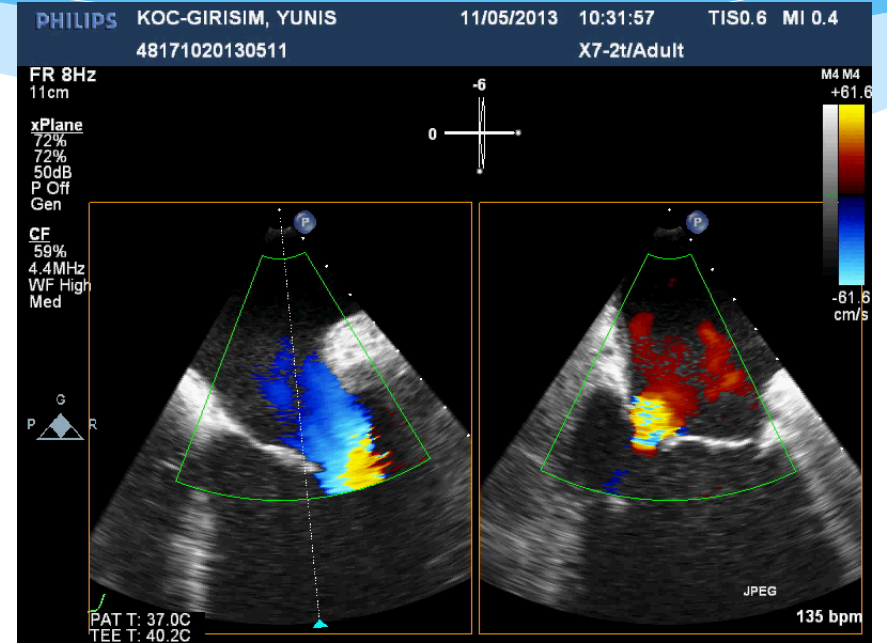
Bazal kontraktıl rezervle ilişkilidir

Lancellotti p, JACC 2004

# Afterload düşüşü-Anestezi

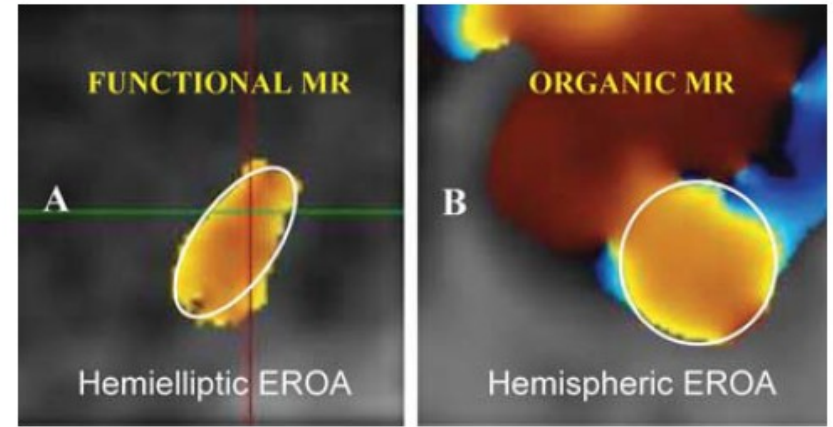
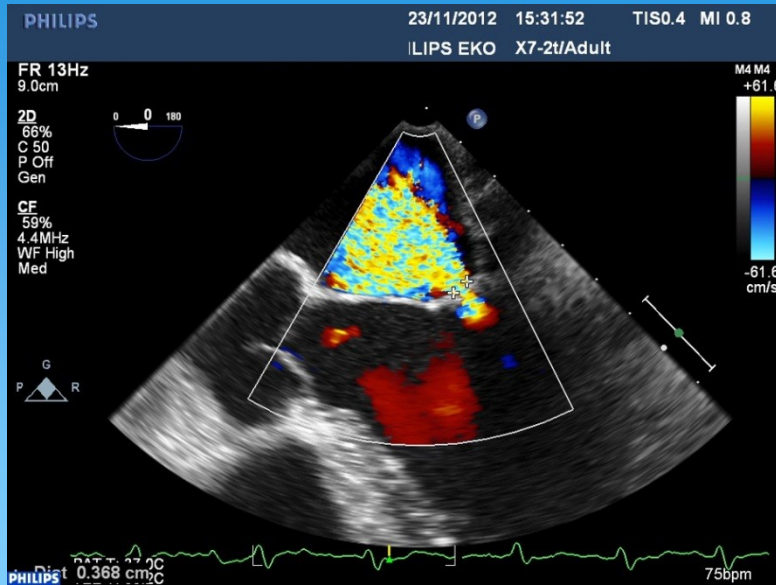


SKB:70 mm Hg

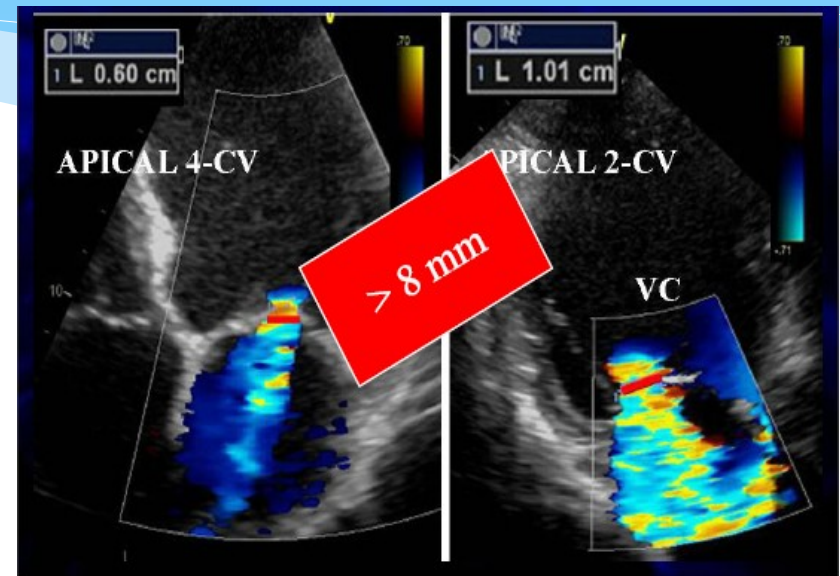
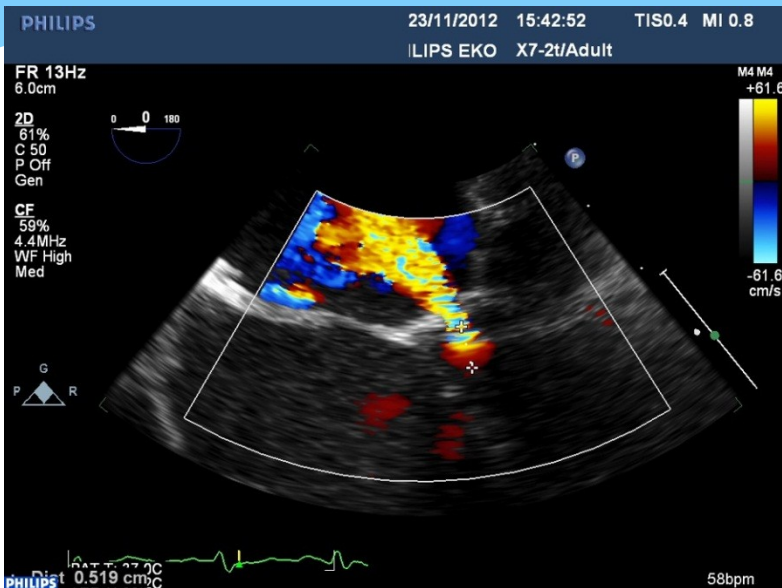


Vazopresör sonrası SKB:120 mm Hg

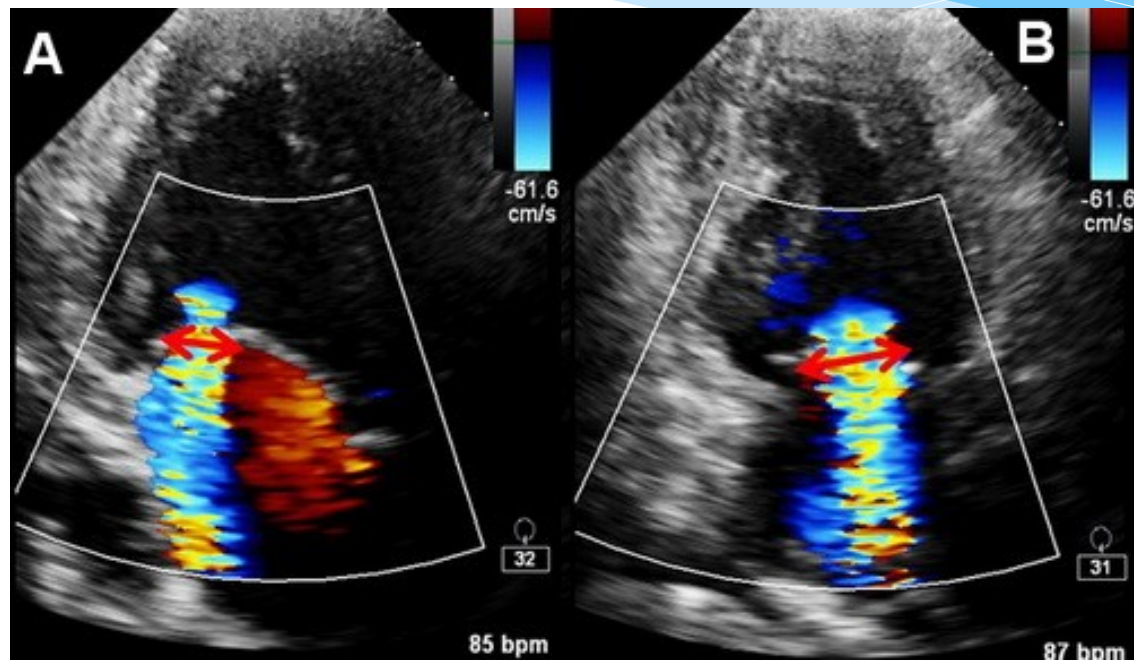
# EKO



**Figure 23** 3D shape of the flow convergence in functional (A) (hemielliptic) and organic mitral regurgitation (B) (hemispheric).

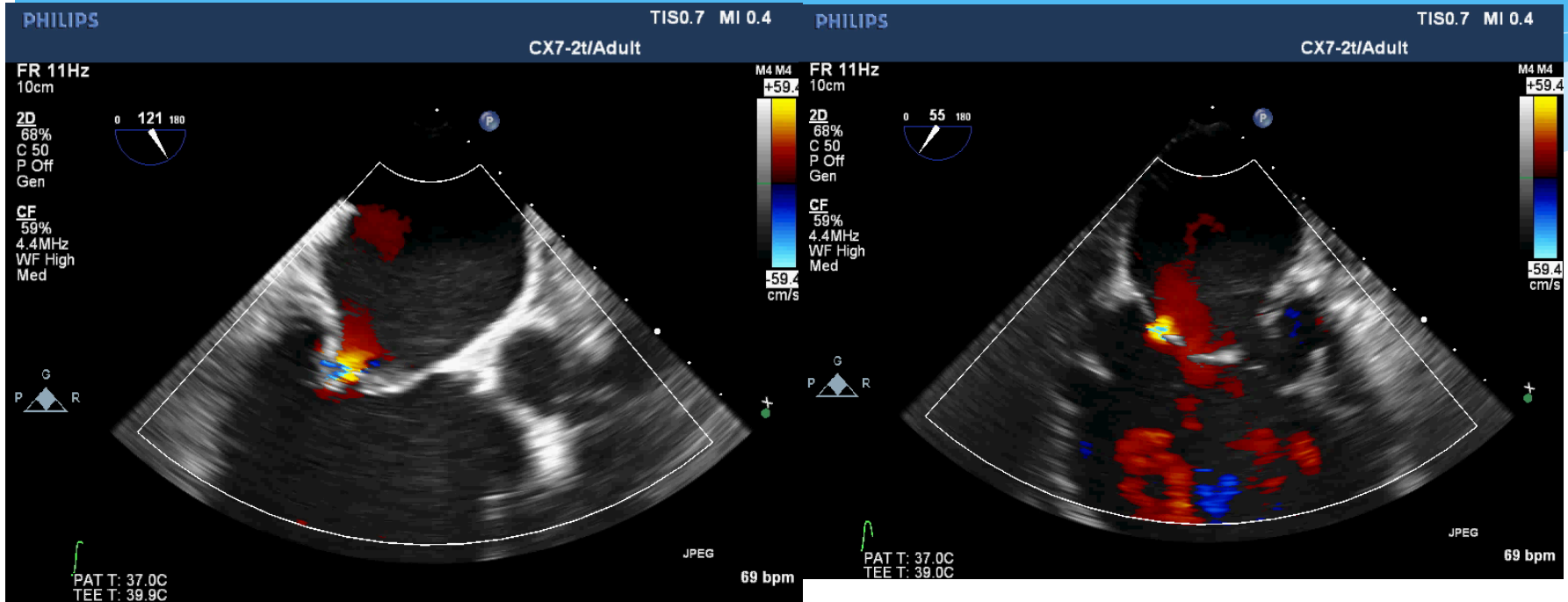


# EKO-VC





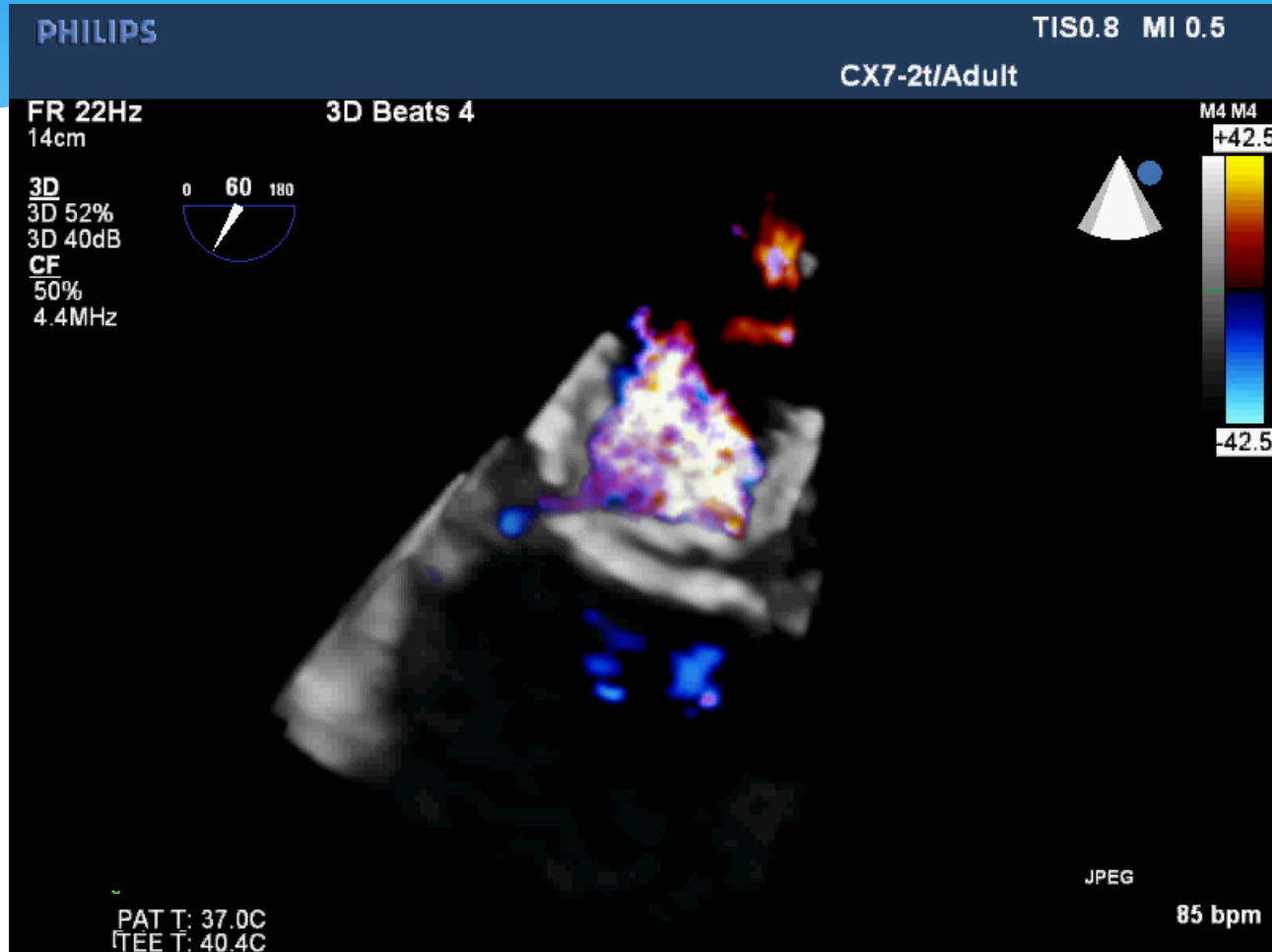
# EKO-VC



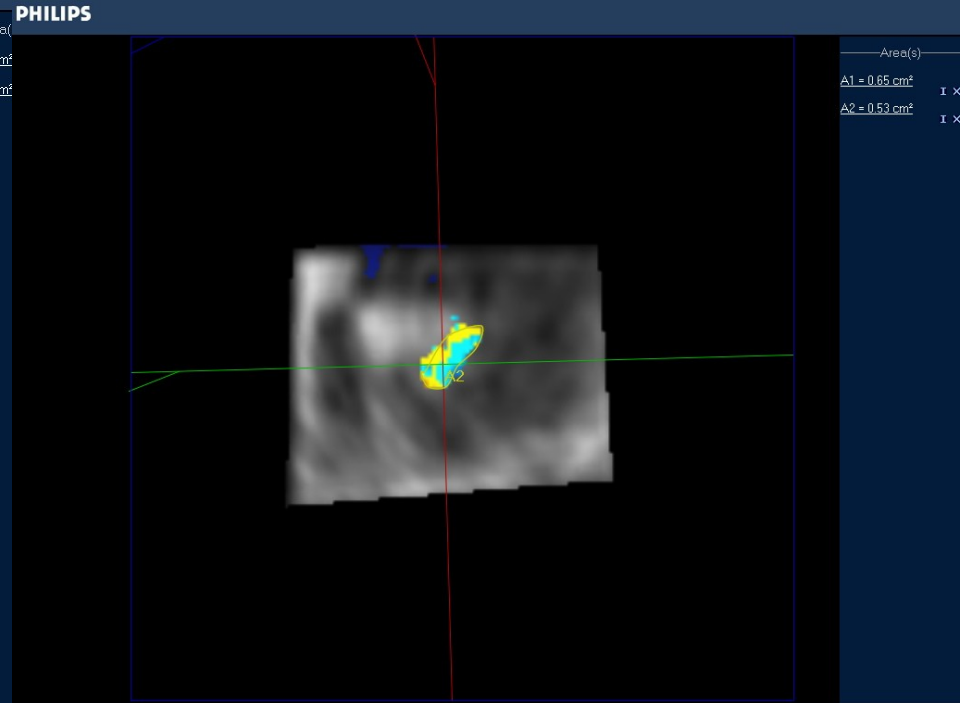
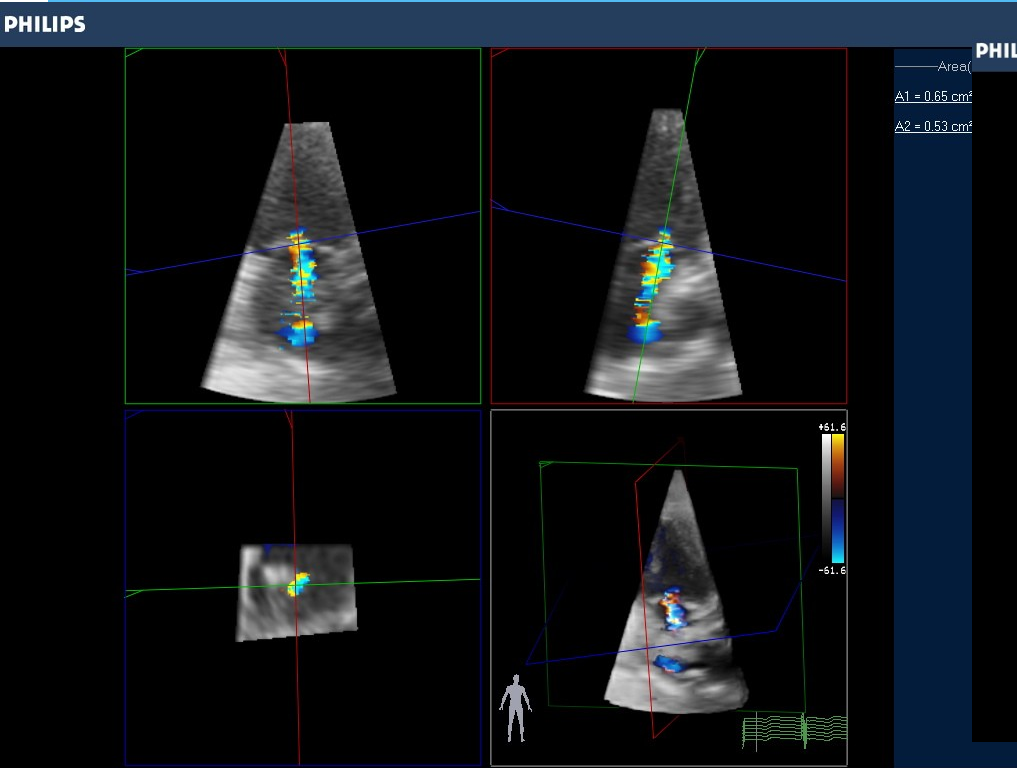
LVOT

Bikommissural

# EKO-VC

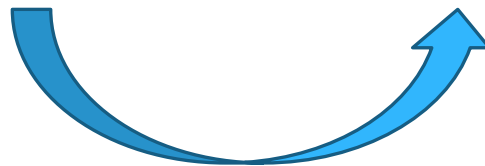
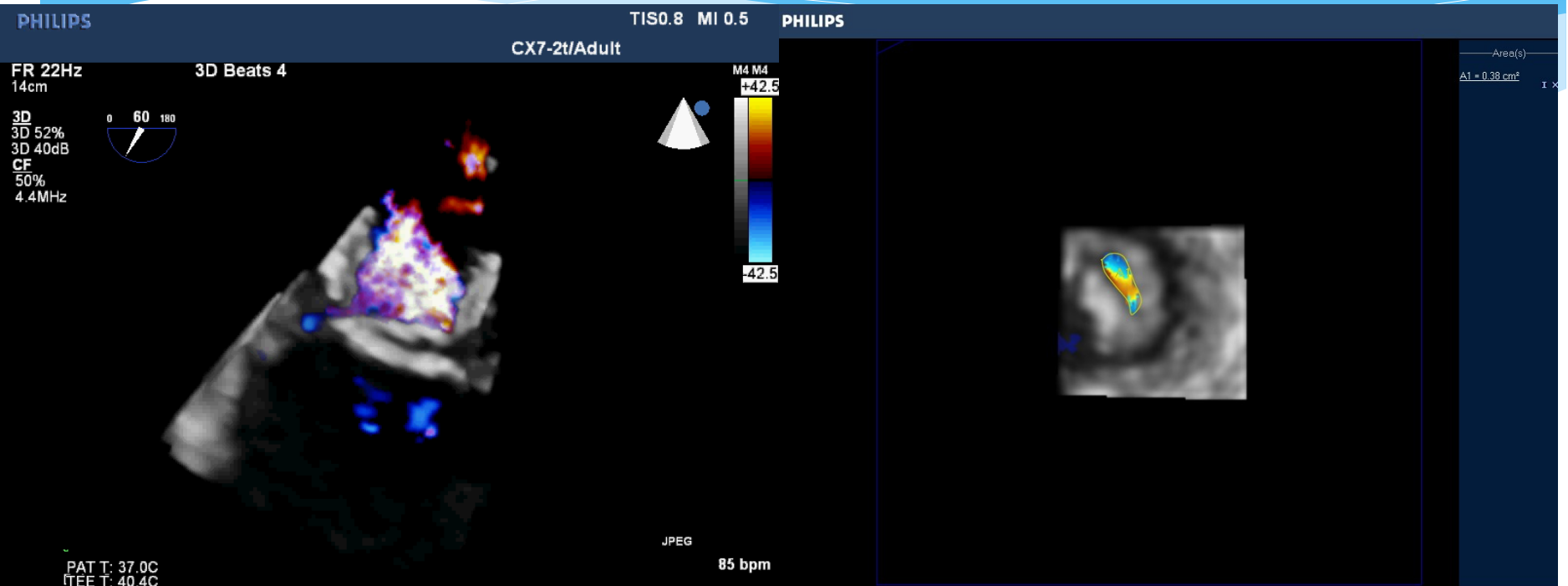


# EKO-VENA KONTRAKTA ALANI

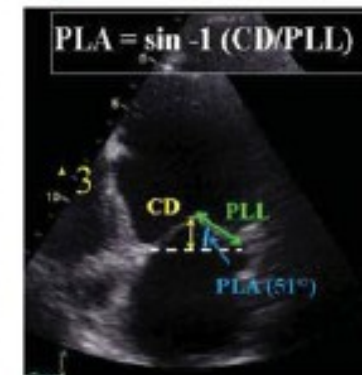
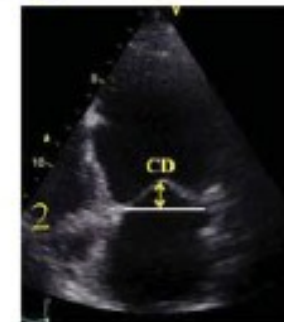
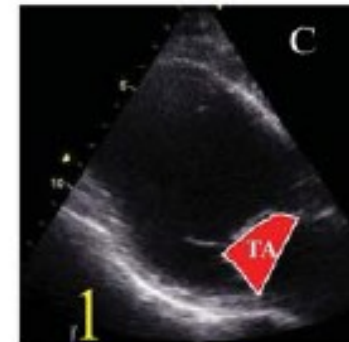
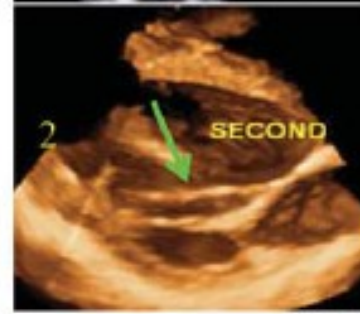
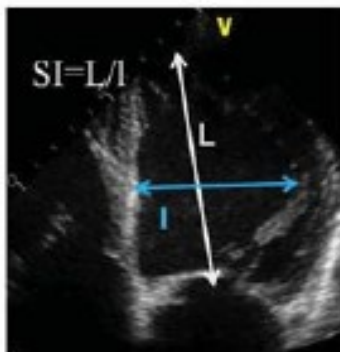


$VCA > 0.41 \text{ cm}^2 \rightarrow$  ileri MY

# EKO-VENA KONTRAKTA ALANI

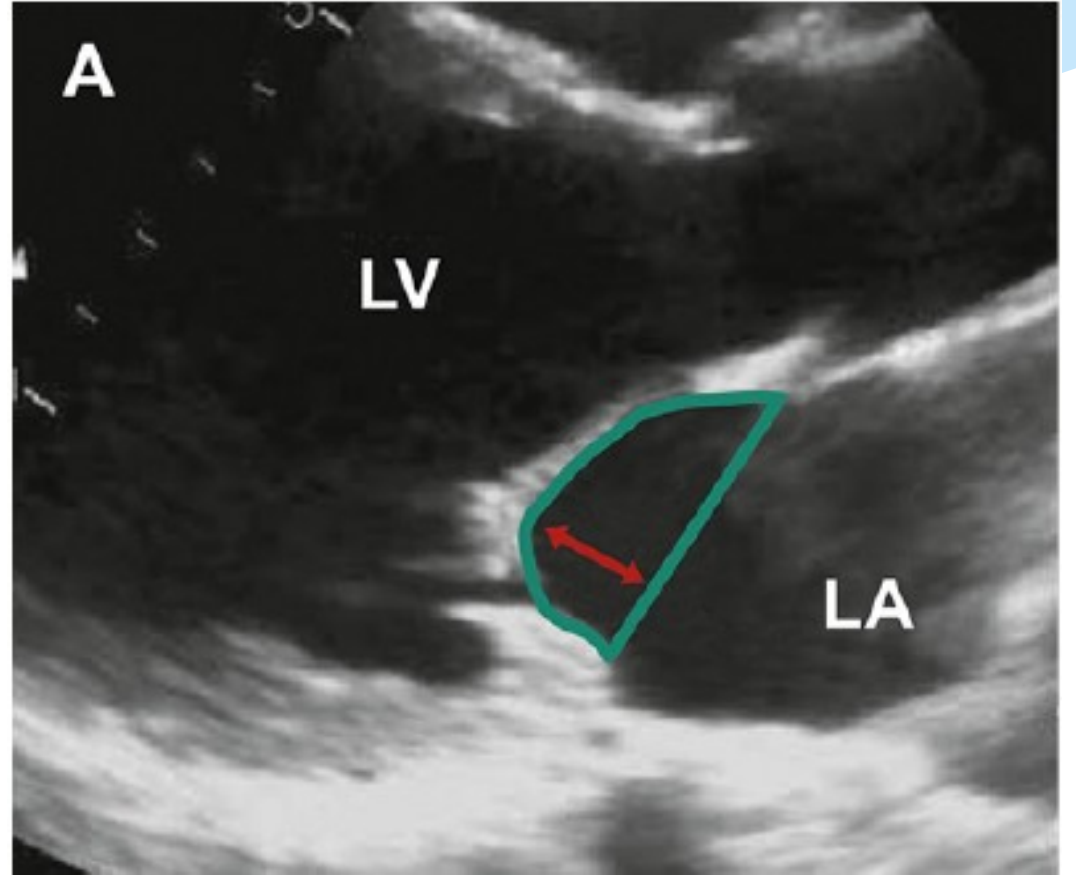


# Ventriküler Remodelling ve Mitral Kapak Deformasyon İndeksleri

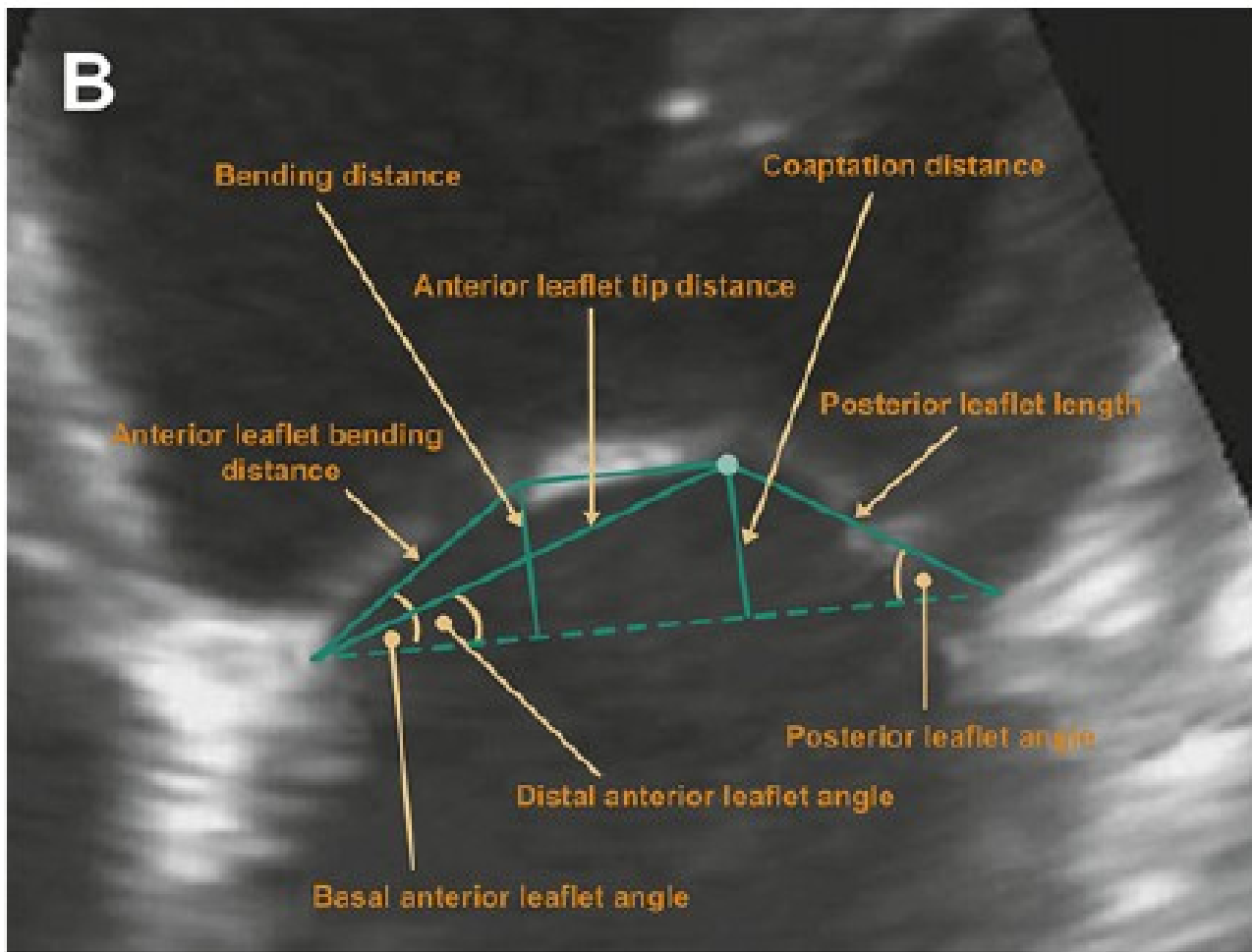


# Leaflet Deformasyon İndeksleri

Tenting alanı  
Koaptasyon uzunluğu



# Leaflet Deformasyon İndeksleri



**Table 2 Unfavourable TTE characteristics for mitral valve repair in functional mitral regurgitation<sup>11</sup>**

Mitral valve deformation

Coaptation distance  $\geq 1$  cm

Tenting area  $> 2.5\text{--}3$  cm<sup>2</sup>

Complex jets

Posterolateral angle  $> 45^\circ$

Local LV remodelling

Interpapillary muscle distance  $> 20$  mm

Posterior papillary-fibrosa distance  $> 40$  mm

Lateral wall motion abnormality

Global LV remodelling

EDD  $> 65$  mm, ESD  $> 51$  mm (ESV  $> 140$  mL)

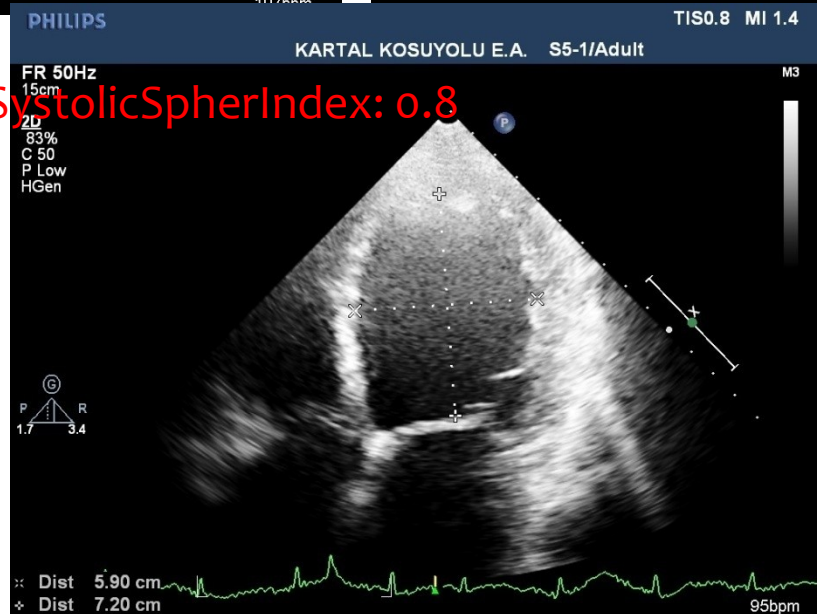
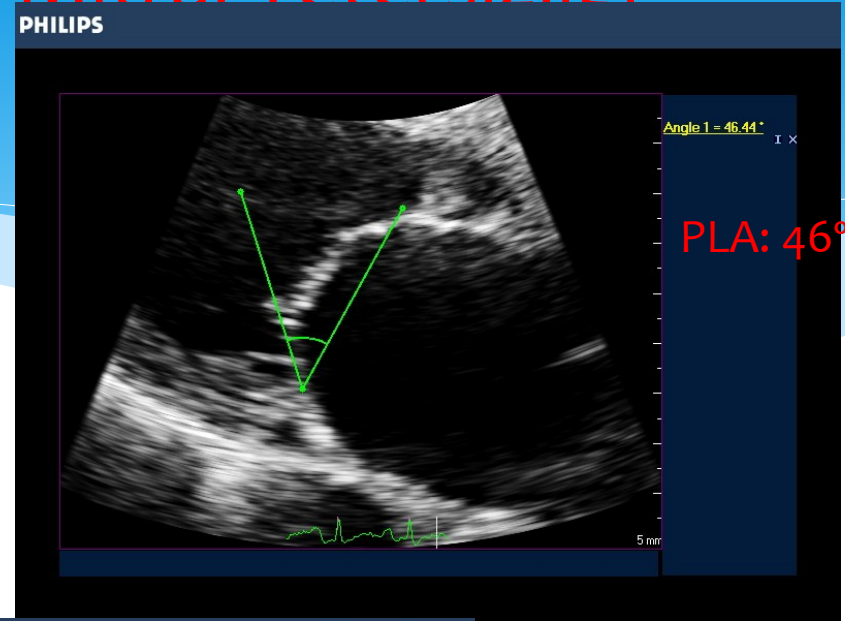
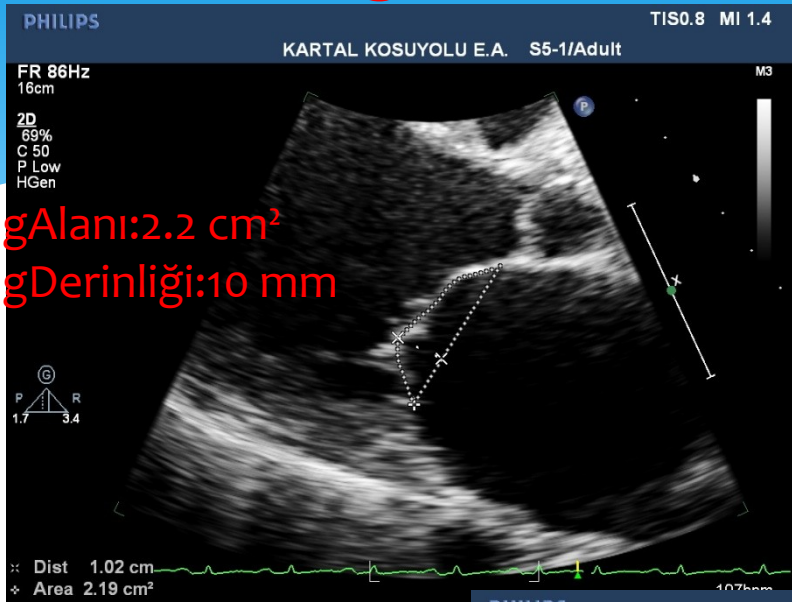
Systolic sphericity index  $> 0.7$



Parameter [reference]	TTE/TEE	Cutoff value	Sensitivity/specificity, %
Mitral annulus diameter [76]	TEE	$\geq 37$ mm	84/76
Tenting area [72]	TTE	$\geq 2.5$ cm <sup>2</sup>	64/95
Tenting area [76]	TEE	$\geq 1.6$ cm <sup>2</sup>	80/54
Coaptation distance [72]	TTE	$\geq 10$ mm	64/90
Coaptation distance [77]	TEE	$\geq 10$ mm	NA
Posterior leaflet angle [72]	TTE	$\geq 45^\circ$	100/95
Posterior leaflet tethering distance [75]	TTE	$\geq 40$ mm	NA
Distal mitral anterior leaflet angle [78]	TTE	$> 25^\circ$	88/94
Anterior mitral leaflet tethering angle [79••]	TTE	$\geq 39.5^\circ$	NA
MR grade [76]	TEE	$\geq 3.5$	42/81
MR jet [81]	TTE	Central or complex	NA
LV end-systolic volume [82]	TTE	$\geq 145$ mL	90/90
Systolic sphericity index [82]	TTE	$\geq 0.7$	100/100
Myocardial performance index [82]	TTE	$\geq 0.9$	85/84
Wall motion score index [82]	TTE	$\geq 1.5$	80/82
Interpapillary muscle distance [80]	TTE	$> 20$ mm	96/97

İskemik MY de ring anuloplasti başarısızlığının öngördürücüleri

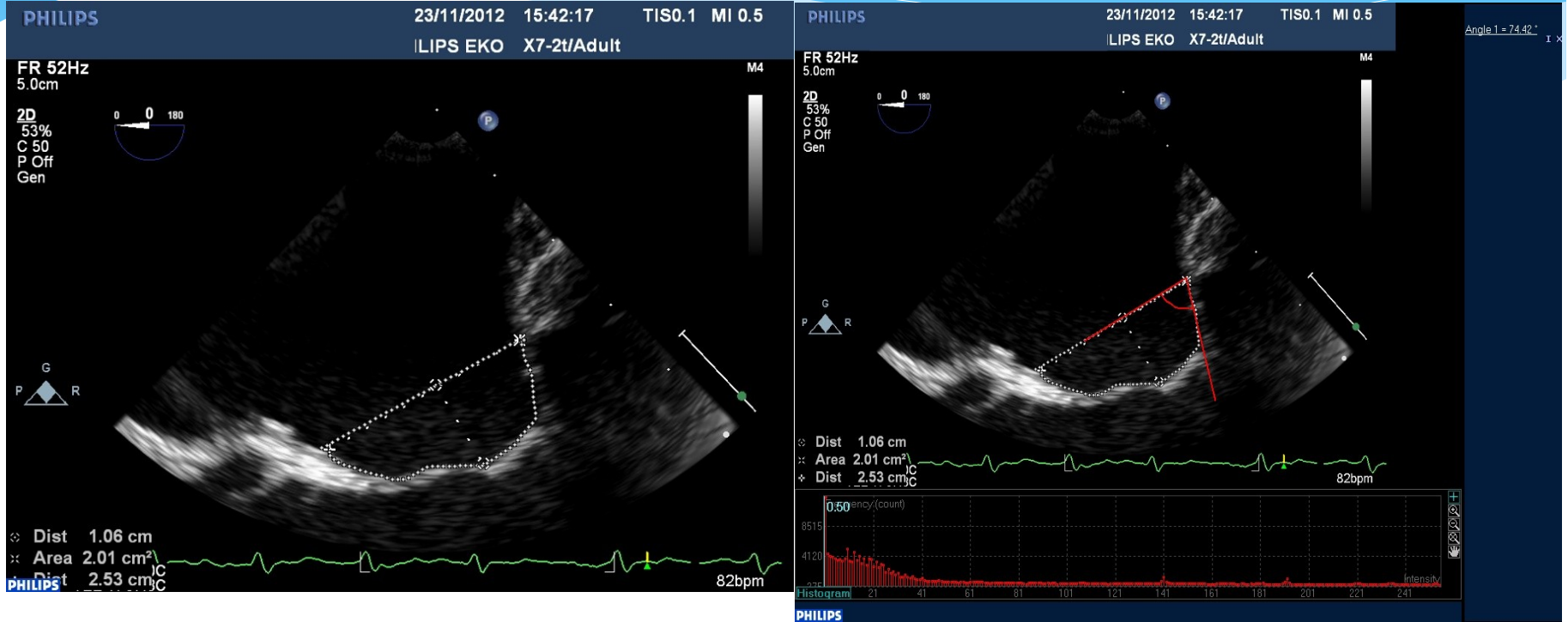
# Olgu-Sekonder Mitral Yetersizliği



Tenting Alanı: 2.2 cm<sup>2</sup>  
Tenting Derinliği: 10 mm

Systolic Spheroid Index: 0.8

# Olgu-Sekonder Mitral Yetersizliği



Tenting Alanı: 2,1 cm<sup>2</sup>  
Koaptasyon derinliği: 11 mm  
PLA: 74°

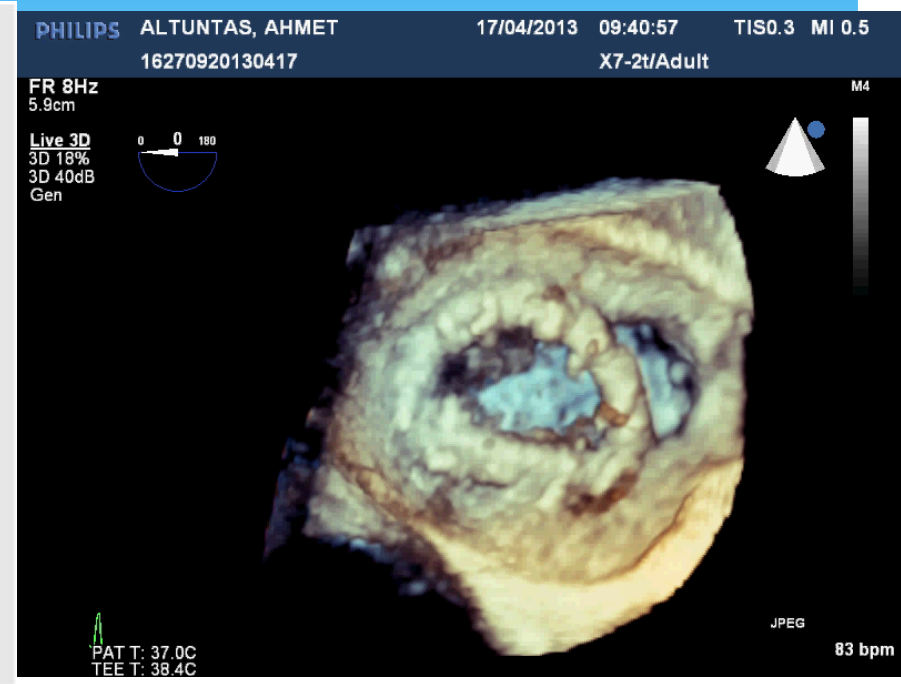
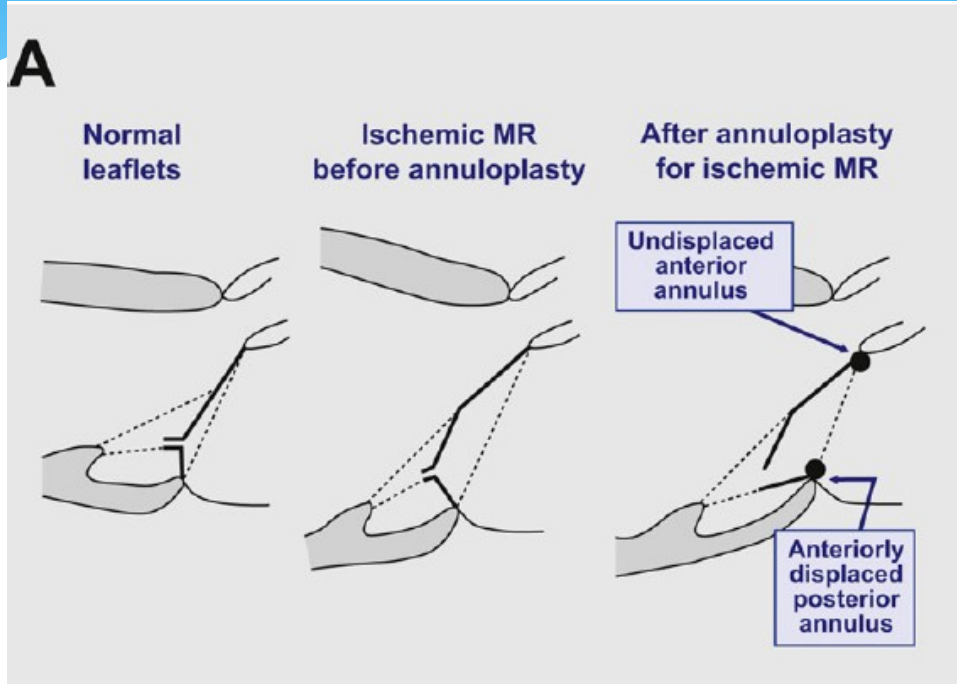
**Tablo 1. İskemik mitral yetersizliğinde ring anuloplasti başarısızlığını öngören parametreler (mitral yetersizliği rekürrensisi)<sup>1</sup>**



Parametre	TTE/TOE	Pencere	Kestirim Değeri	Duyarlılık/Ozgüllük, %
Mitral Anulus*	TOE	0°-4-boşluk	≥37 mm	84/76
Tenting Alanı™	TTE	Apikal-4boşluk	>2.5 cm <sup>4</sup>	64/95
Tenting Alanı*	TOE	120-140 - SVCY	>1.6 cm <sup>4</sup>	80/54
Tenting Uzunluğu™	TTE	Apikal-4boşluk	>10 mm	64/90
Tenting Uzunluğu	TOE	120-140 - SVCY	>10 mm	--
Posteriyör Yaprakçık Açısı™	TTE	Apikal-4boşluk	>45°	100/95
Distal Anteriyör Yaprakçık Açısı™	TTE	Parasternal Uzun Eksen	>25°	88/94
Anteriyör Yaprakçık Açısı™	TTE	Parasternal Uzun Eksen	>39.5°	--
Posteriyör Papiller-Fibroza Uzaklığı	TTE	Apikal-3 Boşluk	>40 mm	
MY Derecesi*	TOE	--	>3.5 (kalitatif)	42/81
MY Jeti	TTE	--	Santral veya Kompleks	--
SVSSV	TTE		≥145 mL	90/90
Sistolik Sferisite İndeksi™	TTE	Apikal-4boşluk	≥0.7	90/90
Duvar Hareket İndeksi™	TTE	--	≥1.5	80/82
Papiller Kaslar Arası Mesafe™	TTE	Parasternal Kısa Eksen	>20 mm	96/97
SVDSÇ™	TTE	Parasternal Uzun Eksen	≥65mm (≥34 mm/m <sup>2</sup> )	--
SVSSÇ	TTE	Parasternal Uzun Eksen	≥51mm	--

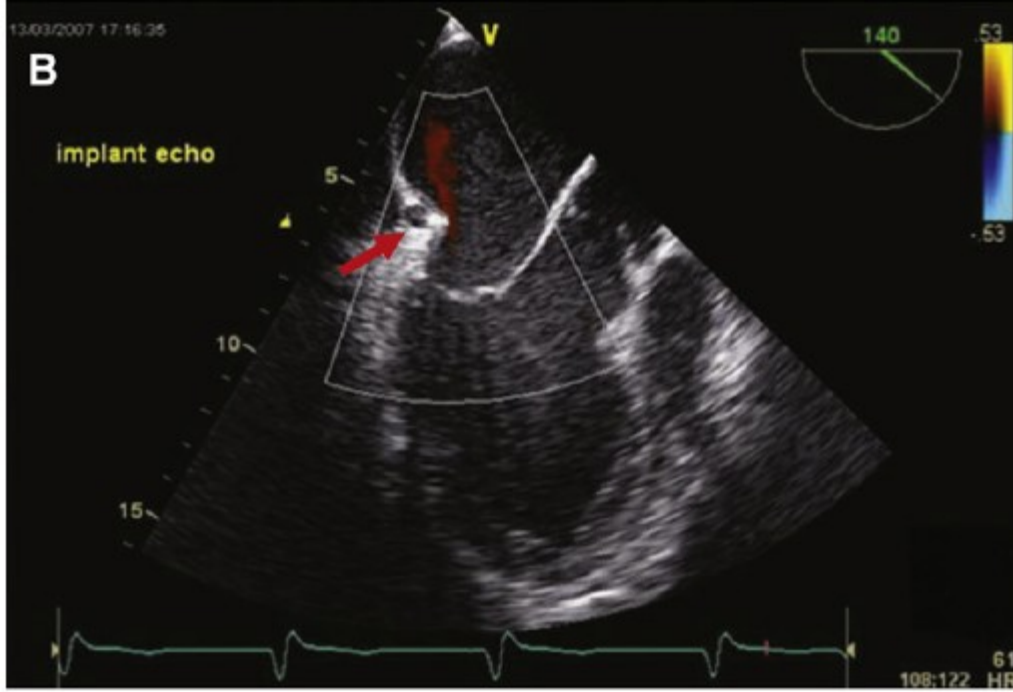
# Ventrikül Hastalığı İçin Anulusa Girişim??

A



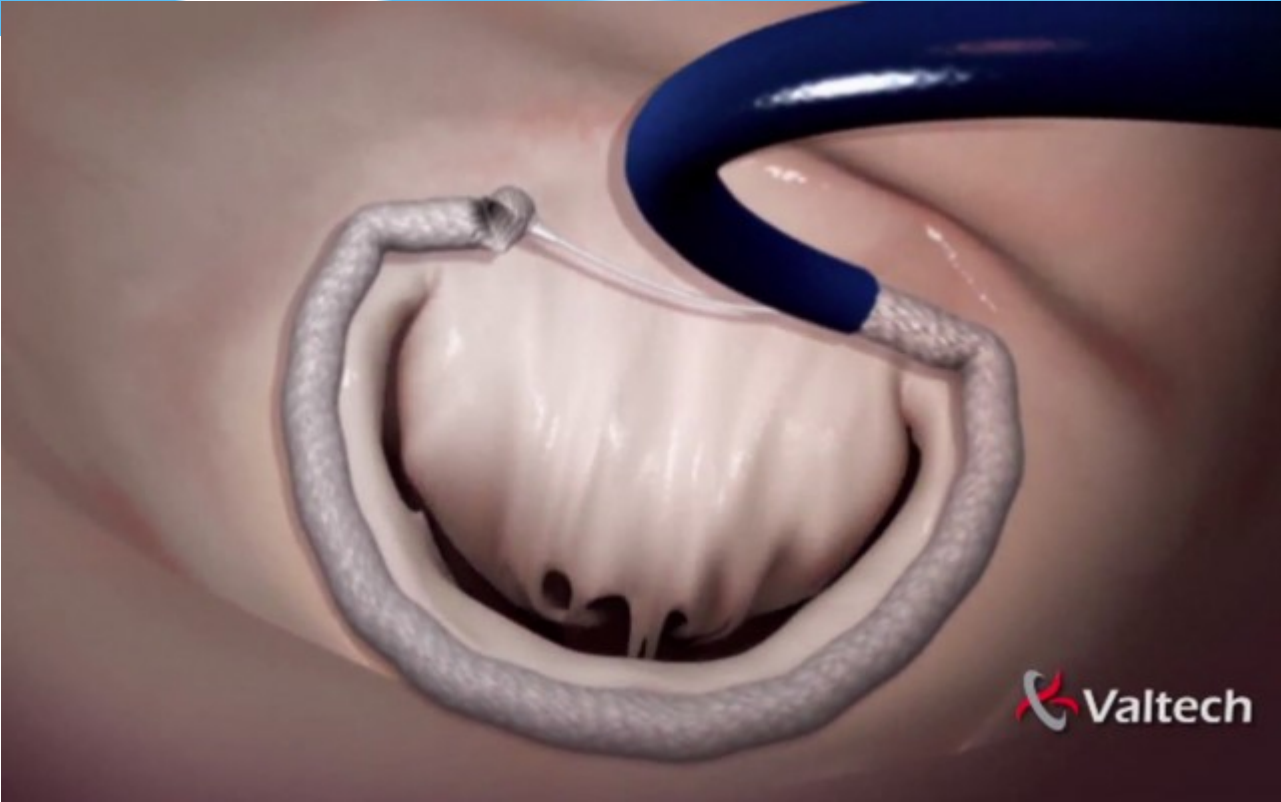
Cerrahi Ring Anüloplasti

# Ventrikül Hastalığı İçin Anulusa Girişim??



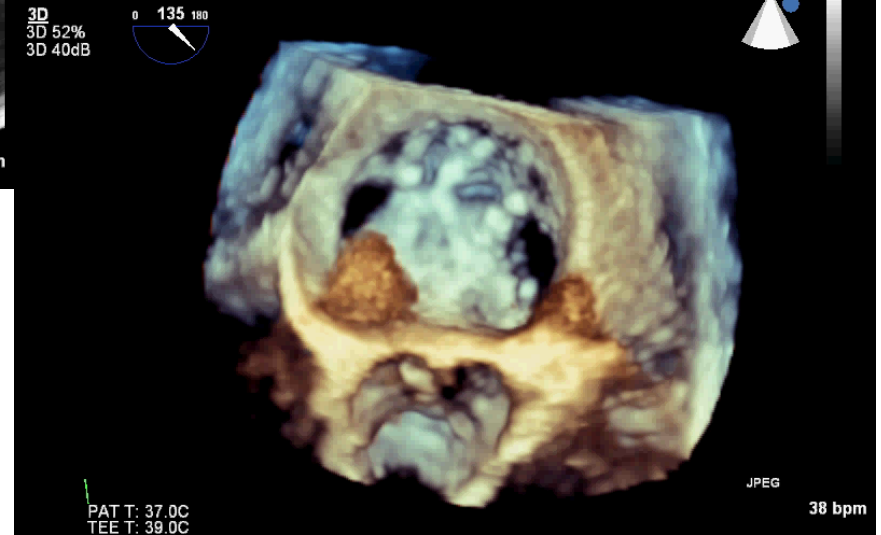
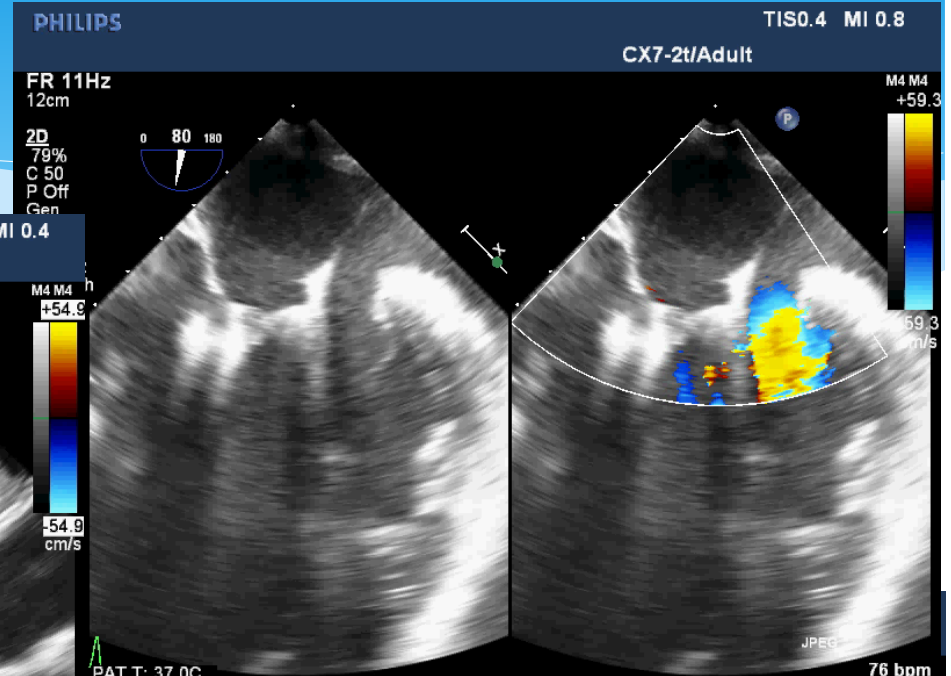
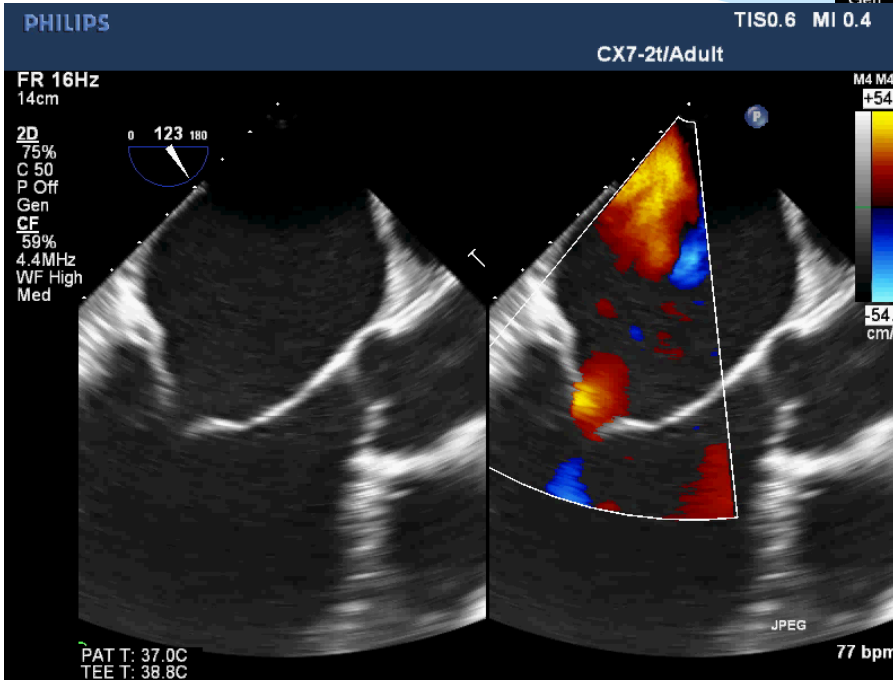
Perkutanöz Koroner Sinüs Anüloplasti

# Ventrikül Hastalığı İin Anulusa Giriřim??



Perkutanöz Direk Anüloplasti

# Ventrikül Hastalığı İçin Leaflete Girişim??



Mitraklip



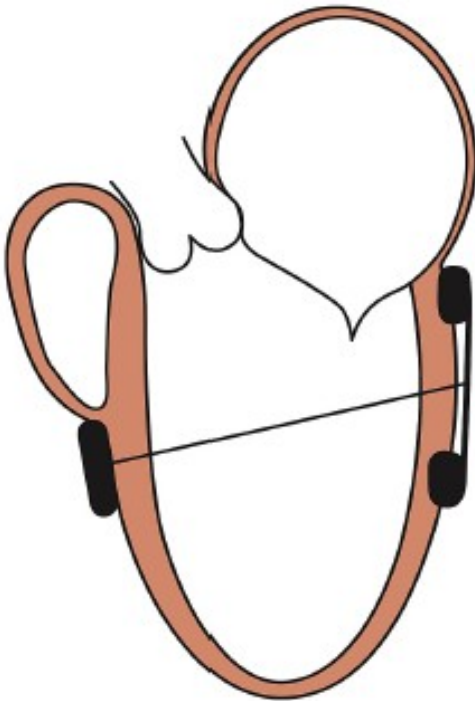
# Ventriküle Yönelik Girişim

Bhatt et al

Acquired Cardiovascular Disease



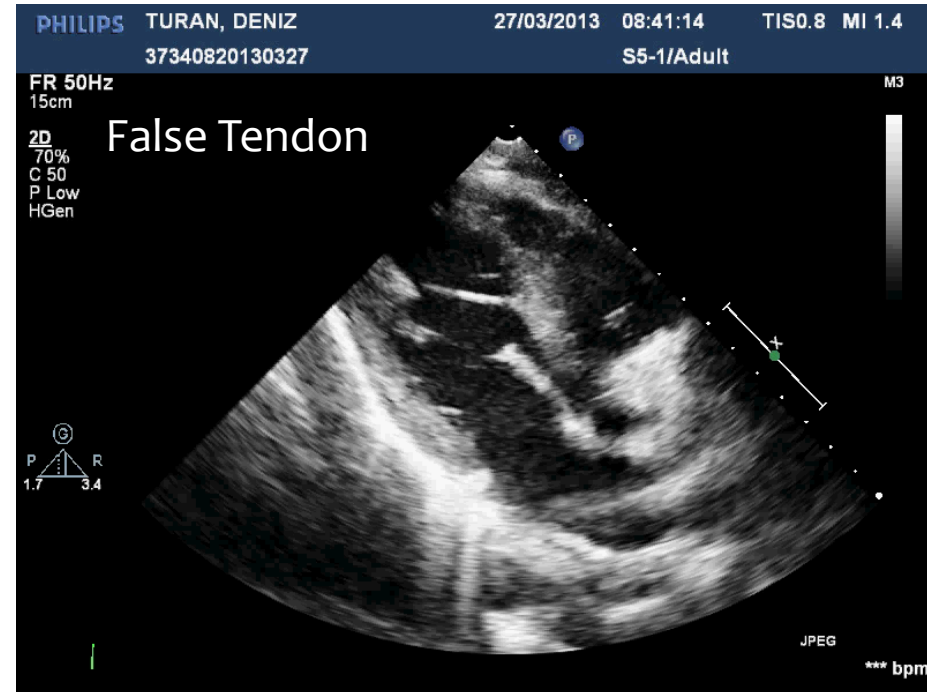
B



Coapsys Cihazı-RESTORE MV Trial  
TRACE trial

## Effects and mechanisms of left ventricular false tendons on functional mitral regurgitation in patients with severe cardiomyopathy

Mehul R. Bhatt, MD, Carlos E. Alfonso, MD, Amar M. Bhatt, BS, Sangmin Lee, MD, Alexandre C. Ferreira, MD, Tomas A. Salerno, MD, and Eduardo de Marchena, MD



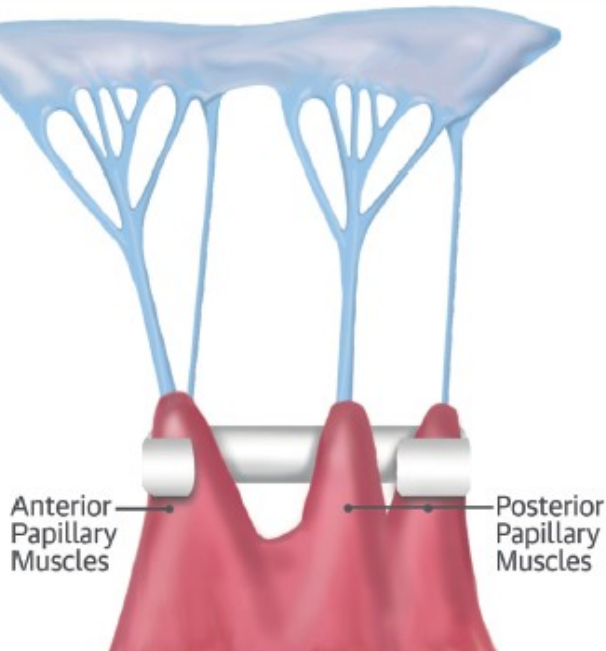
# Papiller Kasları Yakınlaştırma

## Papillary Muscle Approximation Versus Restrictive Annuloplasty Alone for Severe Ischemic Mitral Regurgitation

Francesco Nappi, MD,<sup>a,b</sup> Mario Lusini, MD, PhD,<sup>a</sup> Cristiano Spadaccio, MD, PhD,<sup>a,c</sup> Antonio Nenna, MD,<sup>a</sup> Elvio Covino, MD,<sup>a</sup> Christophe Acar, MD, PhD,<sup>d</sup> Massimo Chello, MD<sup>a</sup>

Papillary Muscle Approximation

(J Am Coll Cardiol 2016;67:2334-46)



# SONUÇ

- \* İskemik mitral yetersizliği ventrikülün hastalığıdır. Mortalitesi yüksektir (Hafif mitral yetersizliğinde bile)
- \* Dinamiktir-Afterload, Egzersiz, Rekürren İskemiden etkilenir
- \* Görüntülemesi ve tedaviye karar vermesi zordur
- \* Cerrahi ve perkütan girişimler LV remodelling ten ziyade anulus ve leaflete yöneliktir ve palyatiftir
- \* Ventriküle yönelik girişimler ümit vaat edici olabilir
- \* Bazı hastalarda tek seçenek mitral kapak replasmanı olabilir