Transkateter mitral kapak onarımı

Alp Aydınalp

Transkateter mitral kapak onarımı

- Transkateter mitral kapak onarımı (TMKO);

- Semptomatik kronik orta-ciddi ve ciddi (+3 veya +4) mitral yetersizlik tedavisinde kullanılan minimal invasive tedavi yöntemidir.

Transkateter mitral kapak onarımı

- Primer MY; Mitral kapak yapısal olarak hasta. Gelişmiş ülkelerde en sık sebep degenerative veya myxomatous mitral kapak hastalığı

- Sekonder MY (Fonsiyonel): Mitral kapak yapısal olarak normal. KMP veya KAH bağlı istenmeyen sol ventrikül remodeling ile fonksiyonel kaçak

Kronik MY Minimal invazive

- MitraClip; (edge-to-edge mitral kapak onarım cihazı) FDA onaylı tek cihaz

- CARILLON mitral annuloplasty cihazı CE onaylı

MitraClip

- Cerrahi Alfieri edge-to-edge onarımından ilham alınarak geliştirilmiş cihaz

- Alfieri işleminde anterior ve posterior kapakların orta noktalarına sütür konularak kapakların orta kısmı yapıştırılır.

- İki açıklıklı kapak kaçak alanı oluşturulur.

Alfieri

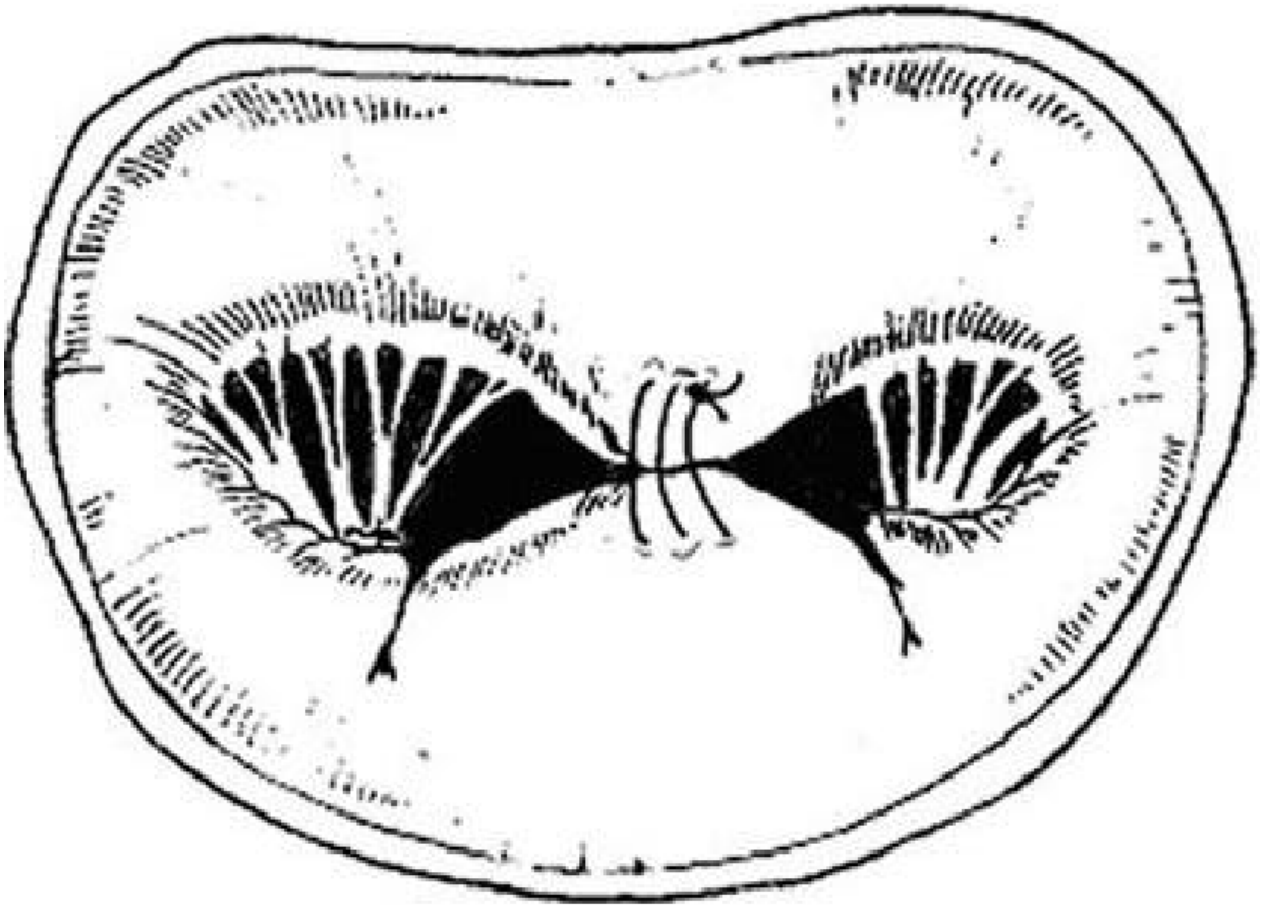


Figure 1. The "edge-to-edge" technique used as a double orifice repair

- MitraClip sistemi polypropylene fabrik ile kaplı cobalt chromium klipslerin anterior ile posterior mitral kapakları orta noktadan yakalayarak kaçak yapan kapakların koaptasyonunu arttırıp kaçağı azaltır

- Amaç kapak kaçağını ≤2+ altına indirmektir.

- Primer ve sekonder MY de kullanıla bilmesine rağmen FDA Primer orta-ciddi ve ciddi MY de kullanılmasında önermekteydi

Çalışmalar

- Primer MY de TMKO ufak kohort çalışmalar ve bir tane büyük çalışmada incelenmiş (EVEREST II çalışması)

- Cerrahi TMKO ile karşılaştırılmış

İlk çalışmalar

- İşlem başarı yüzdesi % 90 üstü (İmplant sonrası MY ≤2). Hastane içi mortalite % 0-4

JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY
© 2014 BY THE AMERICAN COLLEGE OF CARDIOLOGY FOUNDATION
PUBLISHED BY ELSEVIER INC.

VOL. 64, NO. 9, 2014
ISSN 0735-1097/$36.00
http://dx.doi.org/10.1016/j.jacc.2014.06.1166

Percutaneous Mitral Valve Edge-to-Edge Repair

In-Hospital Results and 1-Year Follow-Up of 628 Patients of the 2011–2012 Pilot European Sentinel Registry

JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY
© 2016 BY THE AMERICAN COLLEGE OF CARDIOLOGY FOUNDATION
PUBLISHED BY ELSEVIER

VOL. 67, NO. 10, 2016
ISSN 0735-1097/$36.00
http://dx.doi.org/10.1016/j.jacc.2015.12.054

ORIGINAL INVESTIGATIONS

Initial Experience With Commercial Transcatheter Mitral Valve Repair in the United States

Paul Sorajja, MD,[a] Michael Mack, MD,[b] Sreekanth Vemulapalli, MD,[c] David R. Holmes, Jr, MD,[d] Amanda Stebbins, MS,[c] Saibal Kar, MD,[e] D. Scott Lim, MD,[f] Vinod Thourani, MD,[g] Patrick McCarthy, MD,[h] Samir Kapadia, MD,[i] Paul Grayburn, MD,[j] Wesley A. Pedersen, MD,[a] Gorav Ailawadi, MD[f]

JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY
© 2016 BY THE AMERICAN COLLEGE OF CARDIOLOGY FOUNDATION
PUBLISHED BY ELSEVIER

VOL. 67, NO. 10, 2016
ISSN 0735-1097/$36.00
http://dx.doi.org/10.1016/j.jacc.2015.12.054

ORIGINAL INVESTIGATIONS

Initial Experience With Commercial Transcatheter Mitral Valve Repair in the United States

Paul Sorajja, MD,[a] Michael Mack, MD,[b] Sreekanth Vemulapalli, MD,[c] David R. Holmes, Jr, MD,[d] Amanda Stebbins, MS,[c] Saibal Kar, MD,[e] D. Scott Lim, MD,[f] Vinod Thourani, MD,[g] Patrick McCarthy, MD,[h] Samir Kapadia, MD,[i] Paul Grayburn, MD,[j] Wesley A. Pedersen, MD,[a] Gorav Ailawadi, MD[f]

- Yüksek oranda Primer dejeneratif MY
- TMKO İşlem başarısı % 90.6 (MY ≤2, ölüm ve acil cerrahi olmayan) hastane içi mortalite % 2.3
- 30 gün komplikasyonlar ; %5.8 ölüm, % 1.8 inme, % 2.6 kanama, % 1.4 cihaza bağlı
- Daha fazla çalışma lazım demişler

TKMO ile Cerrahi onarım veya kapak değişimi karşılaştırması (EVEREST II-2011)

- 279 hasta orta-ciddi veya ciddi MY (3+ veya4+)
- Bazalde kalp yetersizliği; TKMO %91 ve cerrahi % 78
- Anterior ve posterior kapak orta skalopuna bağlı MY gerekiyor
- % 73 primer (degenerative) MY.
- Cerrahiye giden; % 14 MVR, % 86 kapak onarımı

The EVEREST II (2011)

- 12 ayda hayatta kalım, cerrahi gereksinimi, 3+-4+ MY olmaması primer son nokta
- Son nokta Cerrahi lehine
- Tekrar cerrahi ihtiyacı sebebi ile %20 vs %2
- Mortalite iki guruptada eşit (%6)

The EVEREST II (2011)

- İstenmeyen komplikasyonlar TMKO gurubunda ilk 30 günde belirgin daha az (%15 vs %48).
- Bu fark İki ünite den fazla kan transfüzyon ihtiyacına bağlı (%13 vs % 45).

JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY
© 2015 BY THE AMERICAN COLLEGE OF CARDIOLOGY FOUNDATION
PUBLISHED BY ELSEVIER INC.

VOL. 66, NO. 25, 2015
ISSN 0735-1097/$36.00
http://dx.doi.org/10.1016/j.jacc.2015.10.018

Randomized Comparison of Percutaneous Repair and Surgery for Mitral Regurgitation

5-Year Results of EVEREST II

Ted Feldman, MD,* Saibal Kar, MD,† Sammy Elmariah, MD, MPH,‡§ Steven C. Smart, MD,* Alfredo Trento, MD,‖ Robert J. Siegel, MD,† Patricia Apruzzese, MS,§ Peter Fail, MD,¶ Michael J. Rinaldi, MD,# Richard W. Smalling, MD, PhD,** James B. Hermiller, MD,†† David Heimansohn, MD,†† William A. Gray, MD,§ Paul A. Grayburn, MD,‖‖ Michael J. Mack, MD,¶¶ D. Scott Lim, MD,## Gorav Ailawadi, MD,*** Howard C. Herrmann, MD,††† Michael A. Acker, MD,††† Frank E. Silvestry, MD,††† Elyse Foster, MD,§§§ Andrew Wang, MD,‖‖ Donald D. Glower, MD,¶¶¶ Laura Mauri, MD,§### for the EVEREST II Investigators

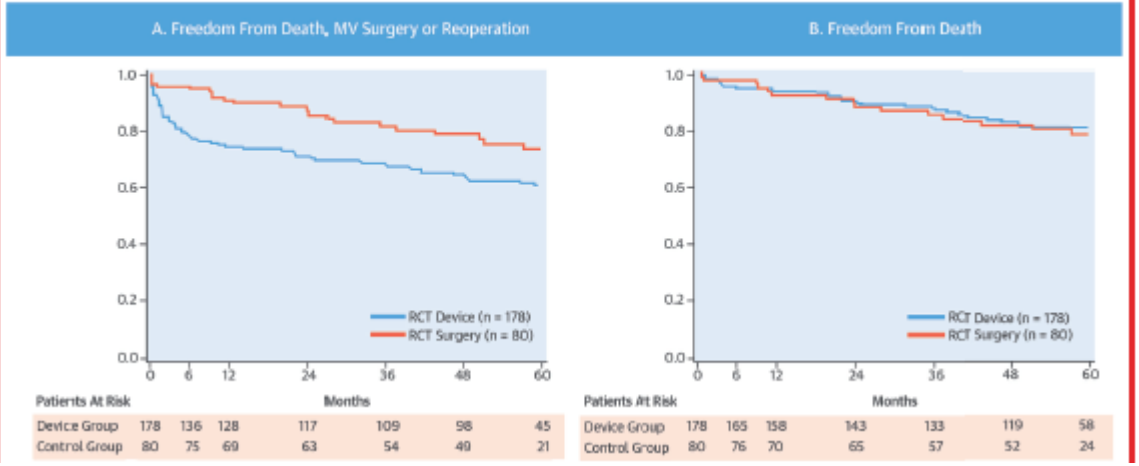
- 4 yıllık takipte mortalite eşit
- TMOK gurubu cerrahiye gitme ihtimali daha fazla

TABLE 2 All-Treated Cohort: Efficacy Endpoint and Components at 5 Years*

	5 Years			5 Years If Event-Free at 1 Year		
	Percutaneous Repair (n = 154)	Surgery (n = 56)	p Value	Percutaneous Repair (n = 87)	Surgery (n = 48)	p Value
Freedom from death, MV surgery, or reoperation, and 3+ or 4+ MR	44.2 (68)	64.3 (36)	0.01	69.0 (60)	75.0 (36)	0.55
Death	20.8 (32)	26.8 (15)	0.36	16.1 (14)	16.7 (8)	>0.99
MV surgery or reoperation	27.9 (43)	8.9 (5)	0.003	5.7 (5)	6.3 (3)	>0.99
3+ or 4+ MR	12.3 (19)	1.8 (1)	0.02	11.5 (10)	2.1 (1)	0.10

Values are % (n). *Includes patients that completed the 5-year visit and had MR grade available or died or had MV surgery before withdrawal from the study.
MR = mitral regurgitation; MV = mitral valve.

CENTRAL ILLUSTRATION 5-Year Clinical Outcomes: Percutaneous Repair and Surgery for Mitral Regurgitation



MY azalma

- Everest II çalışmasında TMKO gurubunda 4 yıllık takiplerde hastaların % 21 inde 3+-4+ MY vardı

- TMKO gurubundaki hastaların % 24.8 ‘i kapak onarımına gitti

JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY
© 2014 BY THE AMERICAN COLLEGE OF CARDIOLOGY FOUNDATION
PUBLISHED BY ELSEVIER INC.

VOL. 64, NO. 2, 2014
ISSN 0735-1097/$36.00
http://dx.doi.org/10.1016/j.jacc.2013.10.021

Improved Functional Status and Quality of Life in Prohibitive Surgical Risk Patients With Degenerative Mitral Regurgitation After Transcatheter Mitral Valve Repair

D. Scott Lim, MD,* Matthew R. Reynolds, MD, MSc,†‡ Ted Feldman, MD,§ Saibal Kar, MD,‖ Howard C. Herrmann, MD,¶ Andrew Wang, MD,# Patrick L. Whitlow, MD,** William A. Gray, MD,†† Paul Grayburn, MD,‡‡ Michael J. Mack, MD,‡‡ Donald D. Glower, MD#

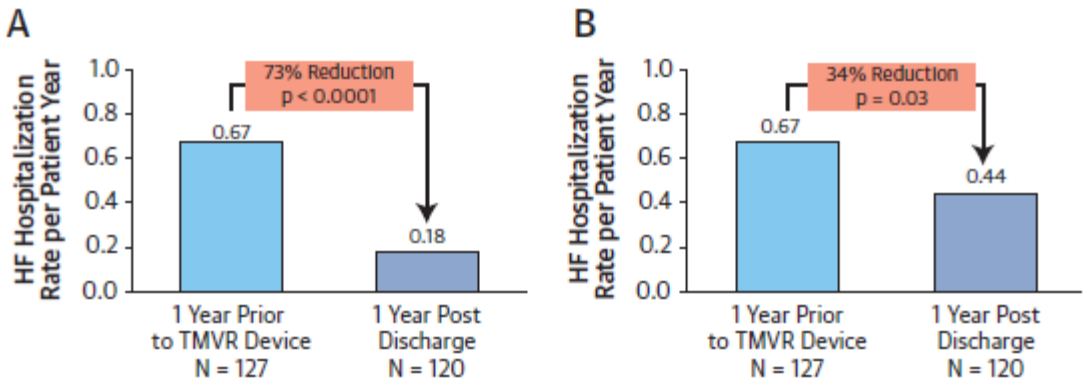


FIGURE 3 Reduction in HF Hospitalizations

(A) 1 year prior to TMVR and 1 year post-discharge, and **(B)** with deaths treated as heart failure (HF) hospitalizations.

Hayat kalitesi ve fonksiyonel kapasitede artma

- EVEREST II; TMKO bazalde NYHA Sınıf III/IV % 45.7, 4 yıl sonra % 5.7

- Dejeneratif MY'li özellikle cerrahi riski yüksek hastalarda TMKO hayat kalitesini belirgin arttırmış, kalp yetersizliği ile hastaneye yatışlar azalmış

JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY
© 2014 BY THE AMERICAN COLLEGE OF CARDIOLOGY FOUNDATION
PUBLISHED BY ELSEVIER INC.

VOL. 64, NO. 2, 2014
ISSN 0735-1097/$36.00
http://dx.doi.org/10.1016/j.jacc.2013.10.021

Improved Functional Status and Quality of Life in Prohibitive Surgical Risk Patients With Degenerative Mitral Regurgitation After Transcatheter Mitral Valve Repair

D. Scott Lim, MD,* Matthew R. Reynolds, MD, MSc,†‡ Ted Feldman, MD,§ Saibal Kar, MD,‖ Howard C. Herrmann, MD,¶ Andrew Wang, MD,# Patrick L. Whitlow, MD,** William A. Gray, MD,†† Paul Grayburn, MD,‡‡ Michael J. Mack, MD,‡‡ Donald D. Glower, MD#

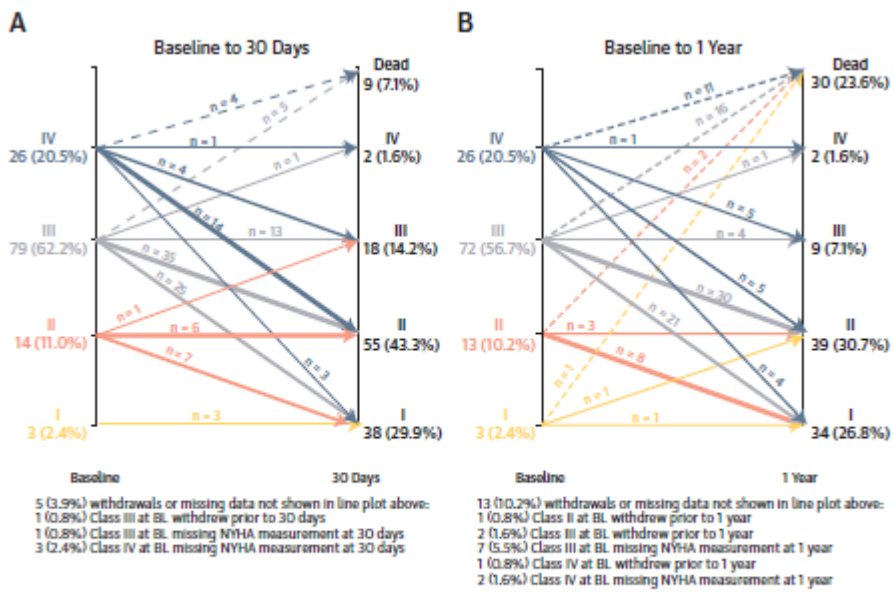


FIGURE 4 Change in NYHA Functional Class

(A) From baseline to 30 days and **(B)** from baseline to 1 year (n and % based on 127 [100%]).

İndikasyonlar

- Kronik orta-ciddi veya ciddi (3 -4+) Primer MY

- Optimal medical tedaviye rağmen ciddi semptomatik NYHA Sınıf III veya IV kalp yetersizliği

- Onarma işlemine uygun anatomi

- Makul hayat beklentisi (ör ≥2 yıl)

- Komorbitelerden dolayı yüksek cerrahi risk

*2017 'de güncellenen 2014 AHA kılavuzu yukarıdaki indikasyonları zayıf öneri olarak sunar (Etkinliği tam gösterilememiş). 2017 ESC kılavuzu benzer ancak sadece primer ciddi (4+) MY de önerir.

- AHA 2017 Kapak kılavuzu

IIb	B	Transcatheter mitral valve repair may be considered for severely symptomatic patients (NYHA class III to IV) with chronic severe primary MR (stage D) who have favorable anatomy for the repair procedure and a reasonable life expectancy but who have a prohibitive surgical risk because of severe comorbidities and remain severely symptomatic despite optimal GDMT for heart failure (HF).[124]

- ESC 2017 Kapak kılavuzu

Percutaneous edge-to-edge procedure may be considered in patients with symptomatic severe primary mitral regurgitation who fulfil the echocardiographic criteria of eligibility and are judged inoperable or at high surgical risk by the Heart Team, avoiding futility.	IIb	C

Kontraindikasyonlar

- İşlem sonrası antikoagilasyon veya antiplatelet tedaviyi tolere edemeyecek kişiler
- Mitral kapak aktif endokarditi
- Romatizmal mitral kapak hastalıkları
- Femoral ven, inferior vena kava veya intrakardiak trombus bulunması

Ekokardiyografi Kriterleri

Everest çalışması orta-ciddi (3+) ve ciddi (4+) MY tanımı (EVEREST II çalışması)

- Renkli akım jeti santral ve geniş olmalı (>6 cm^2 veya sol atriyum alanı > %30 fazlası) veya ufak ve egzentric ise sol atriyumu çevrelemeli
- Pulmoner ven akımında sistolik küntleşme veya sistolik akım reversali
- Paresternal uzun aksta ölçümde Vena contracta genişliği ≥0.5 cm
- Regurgitant volume ≥45 mL/atım
- Regurgitant fraction ≥ %40
- Regurgitant orifice alanı ≥0.30 cm^2

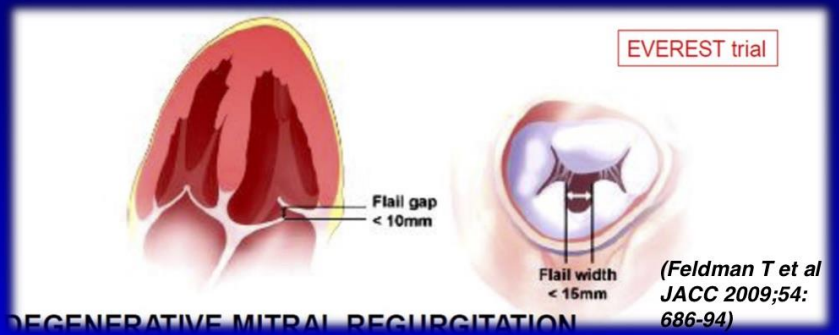
Ekokardiyografi Kriterleri

TMKO işlemi yapılabilmesi için mitral kapak uygunluk kriterleri

- Planimetered mitral kapak alanı (Mitral kapak uçları parasternal kısa aks görüntüsünde) ≥4.0 cm^2.
- Yakalma planlanan alanda minimum kapak kalsifikasyonu
- Flail kapak var ise flail segment genişliği <15 mm ve flail gap <10 mm.
- Flail segmentin ventriküler köşesi ve karşıt kapağın atrial köşesi arasındaki en uzun mesafe Flail gap olarak tarif edilir. (Dört boşluk uzun aks ve sol ventriküler outflow tract görüntülerinde ölçülür).

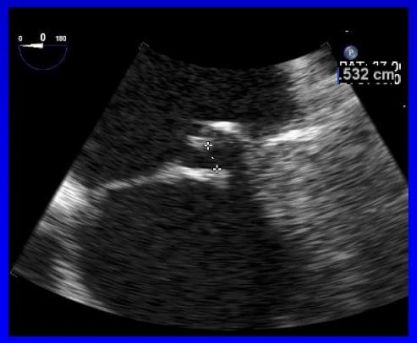
Eko kriterleri

Specific measurements

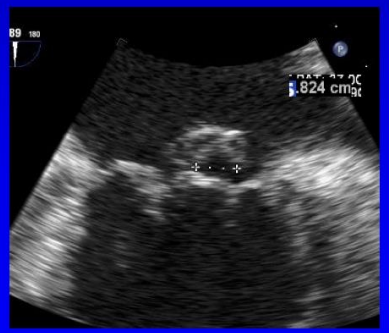


(Feldman T et al JACC 2009;54: 686-94)

DEGENERATIVE MITRAL REGURGITATION



Flail gap



Flail width

Cerrahi Riskin belirlenmesi

- Mitral kapak değişimi için Torasik cerrahi cemiyeti 30 günlük tahmini cerrahi operatif riski (STS skoru) ≥ %8 olması cerrahiye engel Kabul edilir.
- Porselen veya ciddi kalsifik aorta
- Hasta kırılganlığı (patient frailty)
- Ciddi pulmoner hipertansiyon
- Ciddi karaciğer hastalığı

Sekonder MY de Mitraklip

MITRA-FR

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Percutaneous Repair or Medical Treatment for Secondary Mitral Regurgitation

J.-F. Obadia, D. Messika-Zeitoun, G. Leurent, B. Iung, G. Bonnet, N. Piriou, T. Lefèvre, C. Piot, F. Rouleau, D. Carrié, M. Nejjari, P. Ohlmann, F. Leclercq, C. Saint Etienne, E. Teiger, L. Leroux, N. Karam, N. Michel, M. Gilard, E. Donal, J.-N. Trochu, B. Cormier, X. Armoiry, F. Boutitie, D. Maucort-Boulch, C. Barnel, G. Samson, P. Guerin, A. Vahanian, and N. Mewton, for the MITRA-FR Investigators.

Mitra-FR fransa 37 merkez

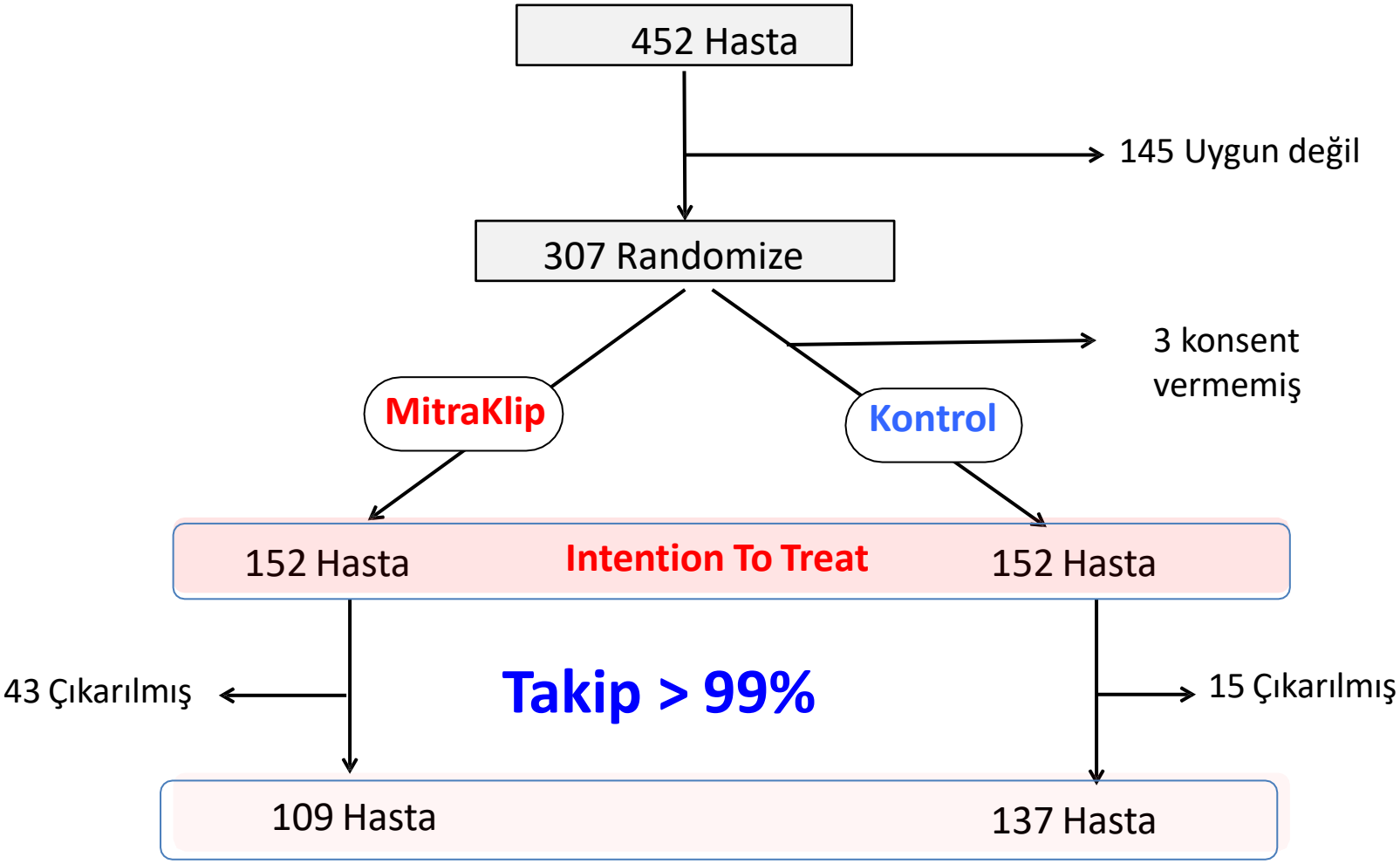
Dahil edilme kriterleri

- Optimal medikal tedaviye rağmen semptomatik (NYHA ≥II).
- Randomizasyon öncesi 12 ay içinde en az bir kere kalp yetersizliği ile hospitalizason
- Ciddi sekonder MY ➔ EROA > 20 mm^2 veya R.vol>30 mL/atım
- 15% < EF < 40%
- Cerrahiye uygun değil
- Eko kor lab MitraKlip için uygun

ESC 2017 Kapak kılavuzu

Table 4 Echocardiographic criteria for the definition of severe valve regurgitation: an integrative approach (adapted from Lancellotti et al[2,6,7])

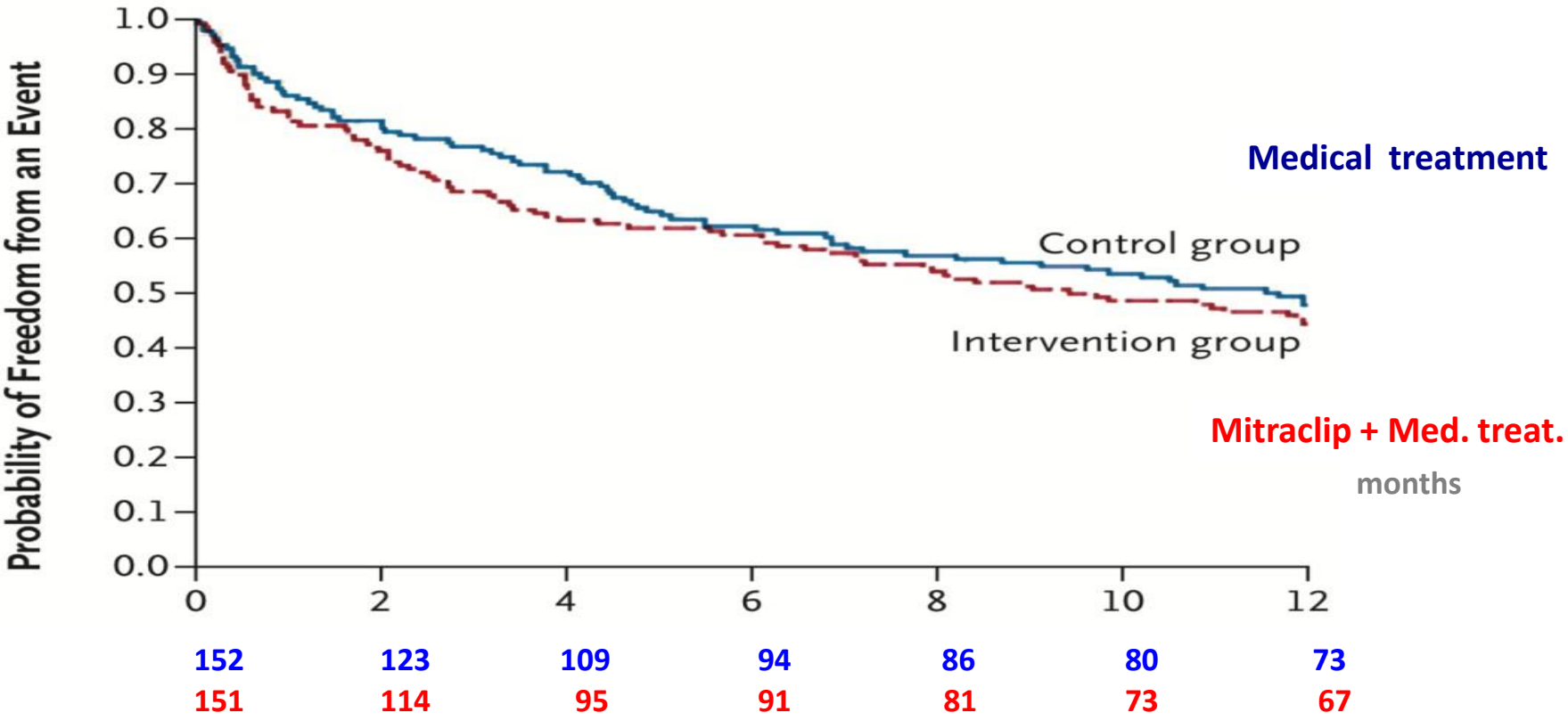
	Aortic regurgitation	Mitral regurgitation		Tricuspid regurgitation
Qualitative				
Valve morphology	Abnormal/flail/large coaptation defect	Flail leaflet/ruptured papillary muscle/ large coaptation defect		Abnormal/flail/large coaptation defect
Colour flow regurgitant jet	Large in central jets, variable in eccentric jets[a]	Very large central jet or eccentric jet adhering, swirling, and reaching the posterior wall of the LA		Very large central jet or eccentric wall impinging jet[a]
CW signal of regurgitant jet	Dense	Dense/triangular		Dense/triangular with early peaking (peak <2 m/s in massive TR)
Other	Holodiastolic flow reversal in descending aorta (EDV >20 cm/s)	Large flow convergence zone[a]		–
Semiquantitative				
Vena contracta width (mm)	>6	≥7 (>8 for biplane)[b]		≥7[b]
Upstream vein flow[c]	–	Systolic pulmonary vein flow reversal		Systolic hepatic vein flow reversal
Inflow	–	E-wave dominant ≥1.5 m/s[d]		E-wave dominant ≥1 m/s[e]
Other	Pressure half-time <200 ms[f]	TVI mitral/TVI aortic >1.4		PISA radius >9 mm[g]
Quantitative		Primary	Secondary[h]	
EROA (mm^2)	≥30	≥40	≥20	≥40
Regurgitant volume (mL/beat)	≥60	≥60	≥30	≥45
+ enlargement of cardiac chambers/vessels	LV	LV, LA		RV, RA, inferior vena cava


452 Hasta
145 Uygun değil
307 Randomize
3 konsent vermemiş
MitraKlip
Kontrol
152 Hasta
Intention To Treat
152 Hasta
43 Çıkarılmış
Takip > 99%
15 Çıkarılmış
109 Hasta
137 Hasta

Primer Komposit son nokta *(99% Takip)*

- Tüm sebeplere bağlı ölüm

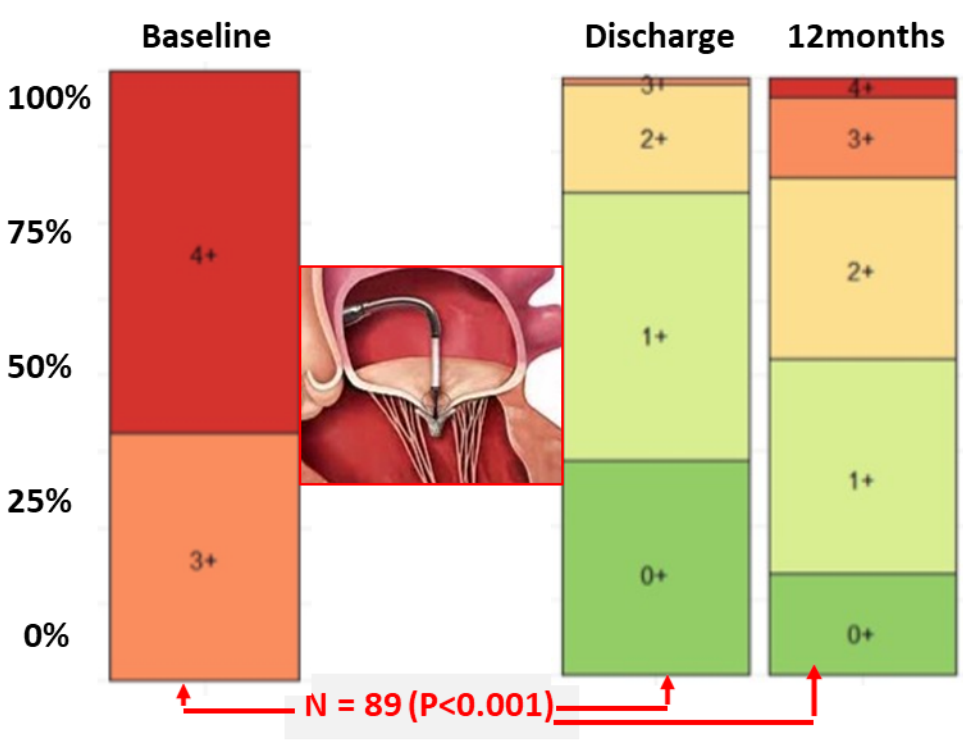
- Kalp Yetmezliği ile yatış

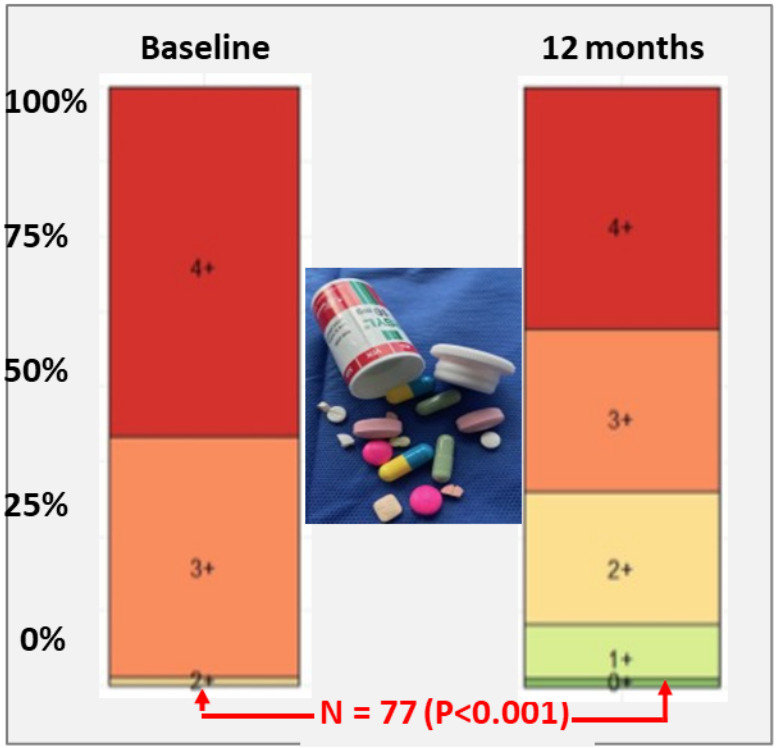


OR = 1.16 (0.73-1.84)
P = 0.53

İkincil son nokta

MR grade evolution in both groups (*paired data*)

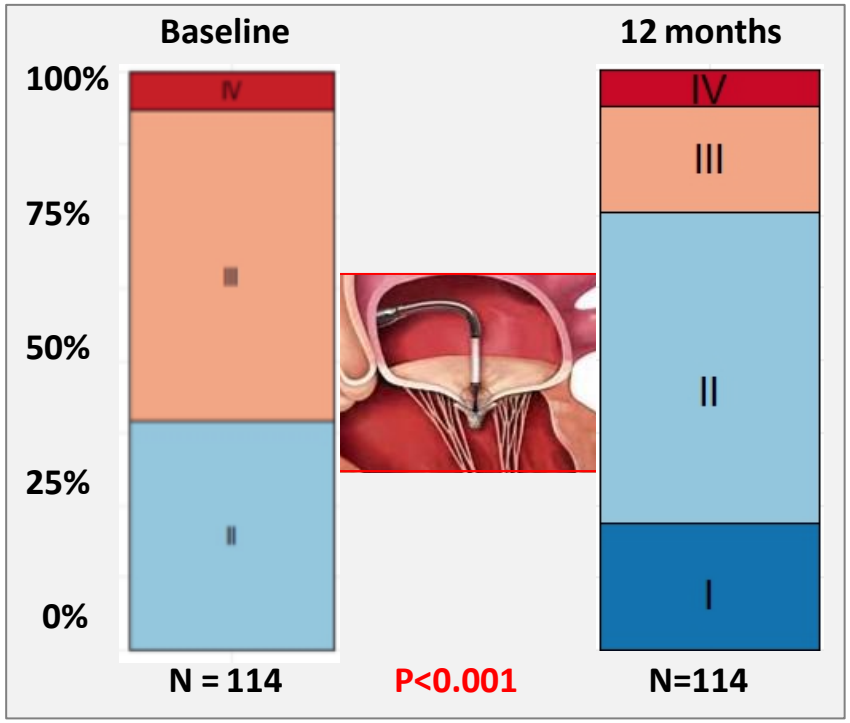


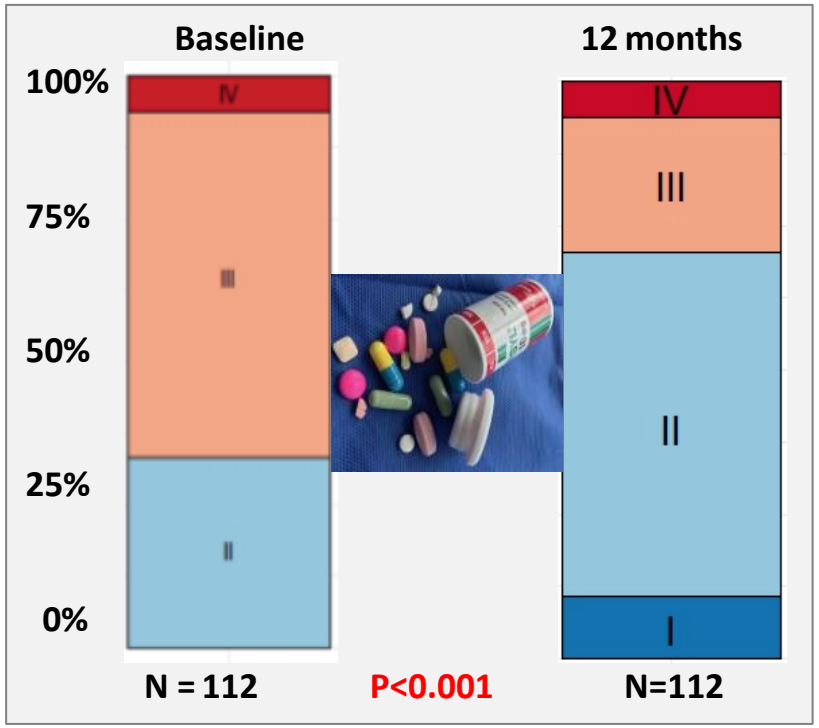


P< 0.001

İkinci Son nokta

NYHA evolution (*paired data)*





P = NS

COAPT

The NEW ENGLAND JOURNAL of MEDICINE

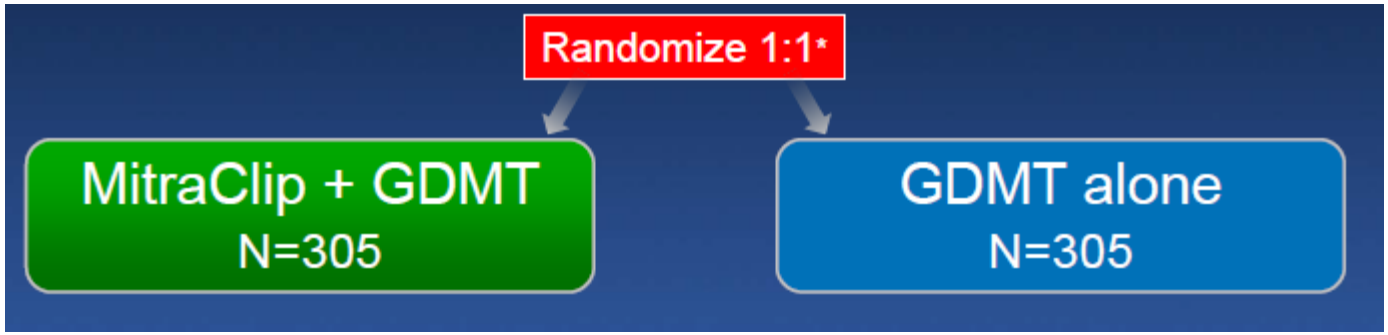
ORIGINAL ARTICLE

Transcatheter Mitral-Valve Repair in Patients with Heart Failure

G.W. Stone, J.A. Lindenfeld, W.T. Abraham, S. Kar, D.S. Lim, J.M. Mishell, B. Whisenant, P.A. Grayburn, M. Rinaldi, S.R. Kapadia, V. Rajagopal, I.J. Sarembock, A. Brieke, S.O. Marx, D.J. Cohen, N.J. Weissman, and M.J. Mack, for the COAPT Investigators*

The COAPT Trial

- 610 hasta orta-ciddi (3+) veya ciddi (4+) MY.
- Kılavuz derive medikal tedaviye rağmen (GDMT) semptomatik



Dahil edilme Kriterleri

- Ischemic veya non-ischemic cardiomyopathy LVEF 20%-50% ve LVESD ≤70 mm
- Orta ciddi-ciddi (3+) veya ciddi (4+) seconder MY bağımsız echo core lab ile onaylanmış (US ASE criteria)
- GDMT ve gerekiyorsa CRT ye rağmen semptomatik NYHA fonksiyonel sınıf III-IV
- Son 12 ayda en az bir kere kalp yetersizliği ile hastaneye yatış BNP ≥300 pg/ml* veya NT-proBNP≥1500 pg/ml
- Lokal konseyde cerrahi yüksek riskli
- Eko kore lab göre MitraKlip tedavisine uygun anatomi

AHA kılavuzuna göre Sekonder ciddi MY

- EROA > 30 mm^2

veya

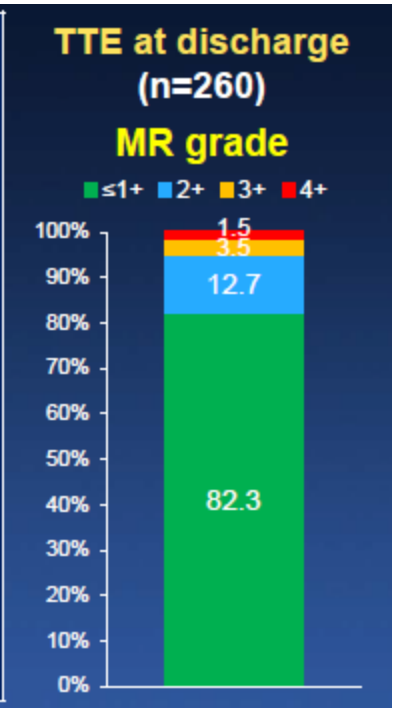
- RV > 45 mL/atım

Primer son nokta

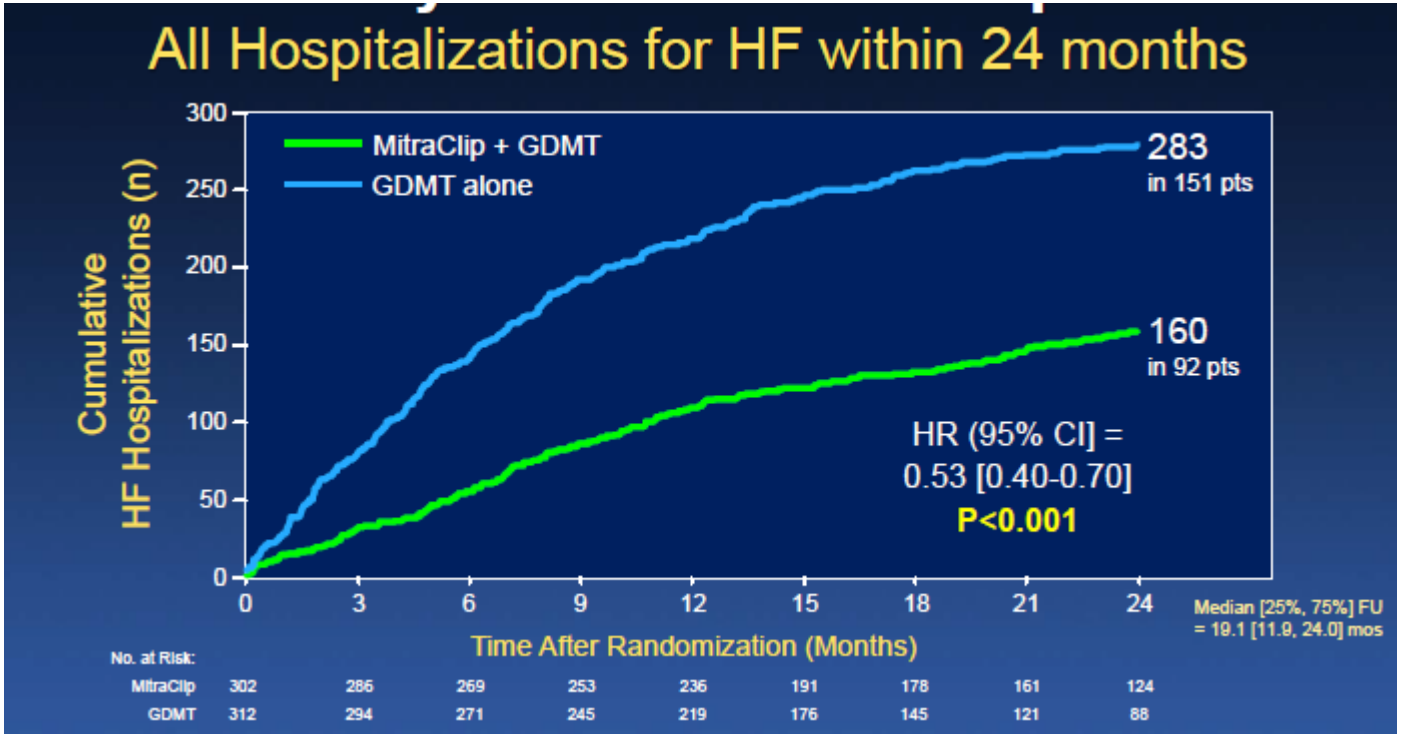
- 24 ay içinde kalp yetersizliği sebebi ile hospitalizasyon

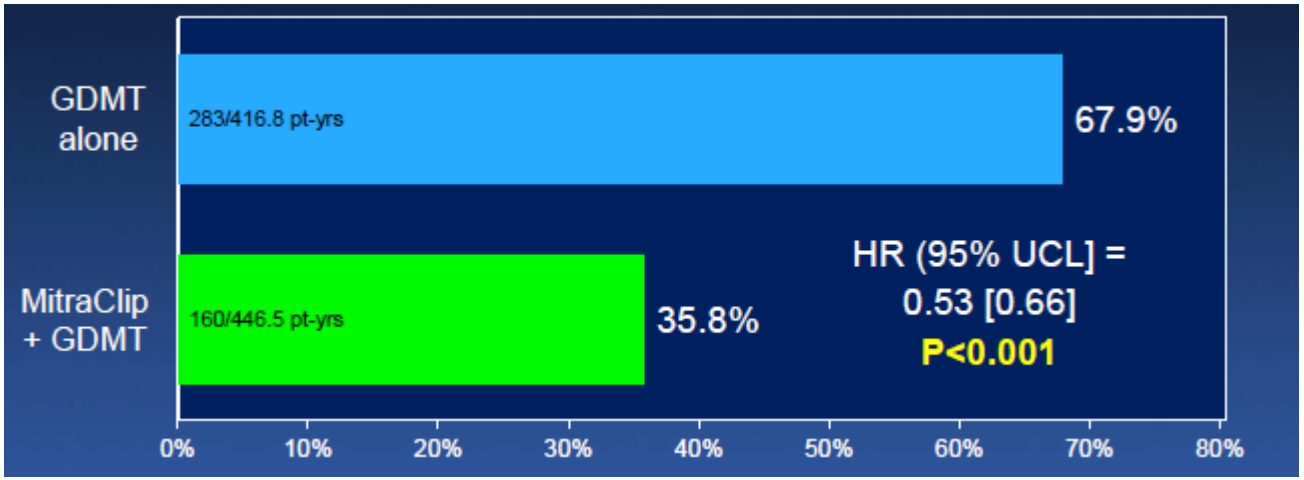
MitraKlip

MitraClip procedure attempted	293/302 (97.0%)
Clip implanted (MitraClip procedure attempted)	287/293 (98.0%)
Clip implanted (all patients)	287/302 (95.0%)
Mean # of clips implanted	1.7 ± 0.7 (n=293)
- 0 clips implanted	6 (2.0%)
- 1 clip implanted	106 (36.2%)
- 2 clips implanted	157 (53.6%)
- 3 clips implanted	23 (7.9%)
- 4 clips implanted	1 (0.3%)
Procedure duration (mins)	162.9 ± 118.1
- Device procedure time (mins)	118.9 ± 63.5
- Device time (mins)	82.7 ± 80.8
- Fluoroscopy time (mins)	33.9 ± 23.2

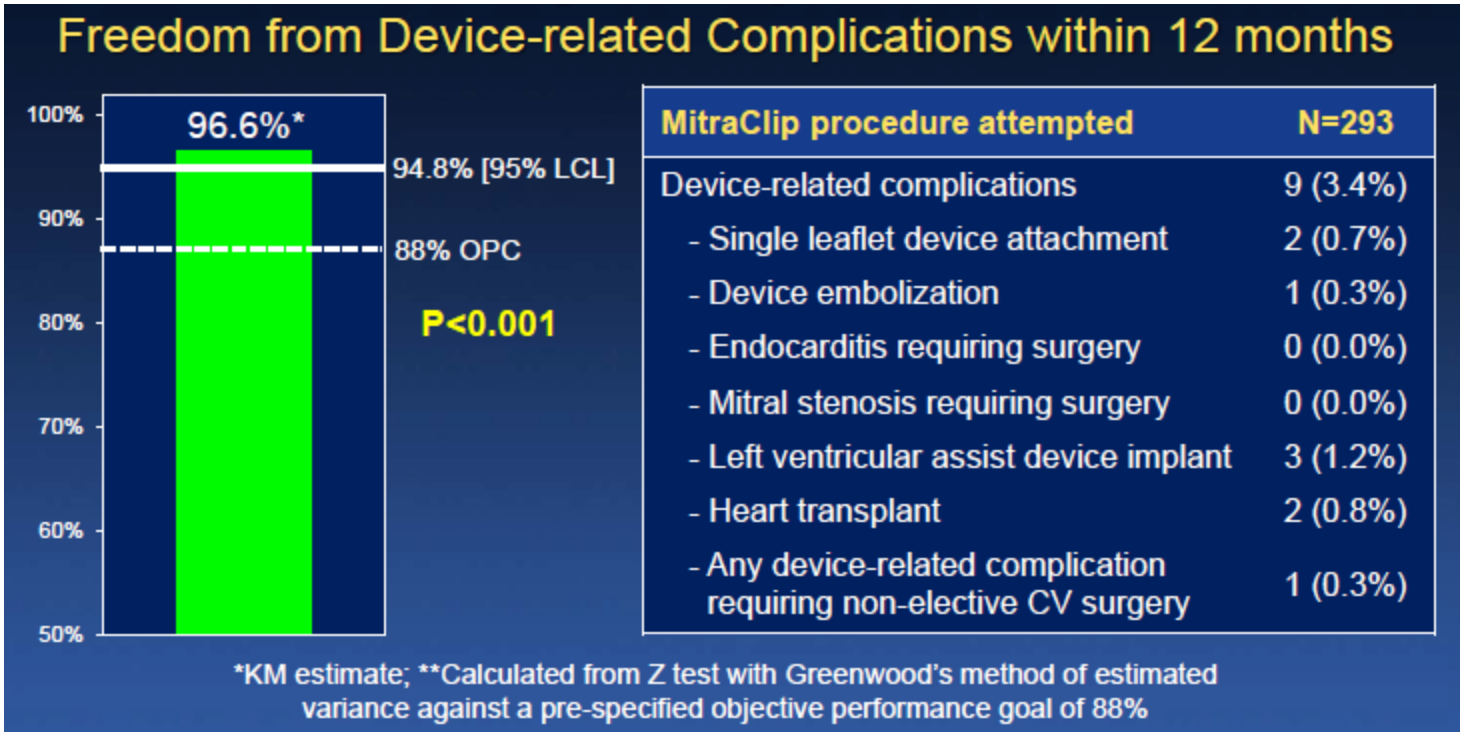


COAPT-Hastaneye yatış





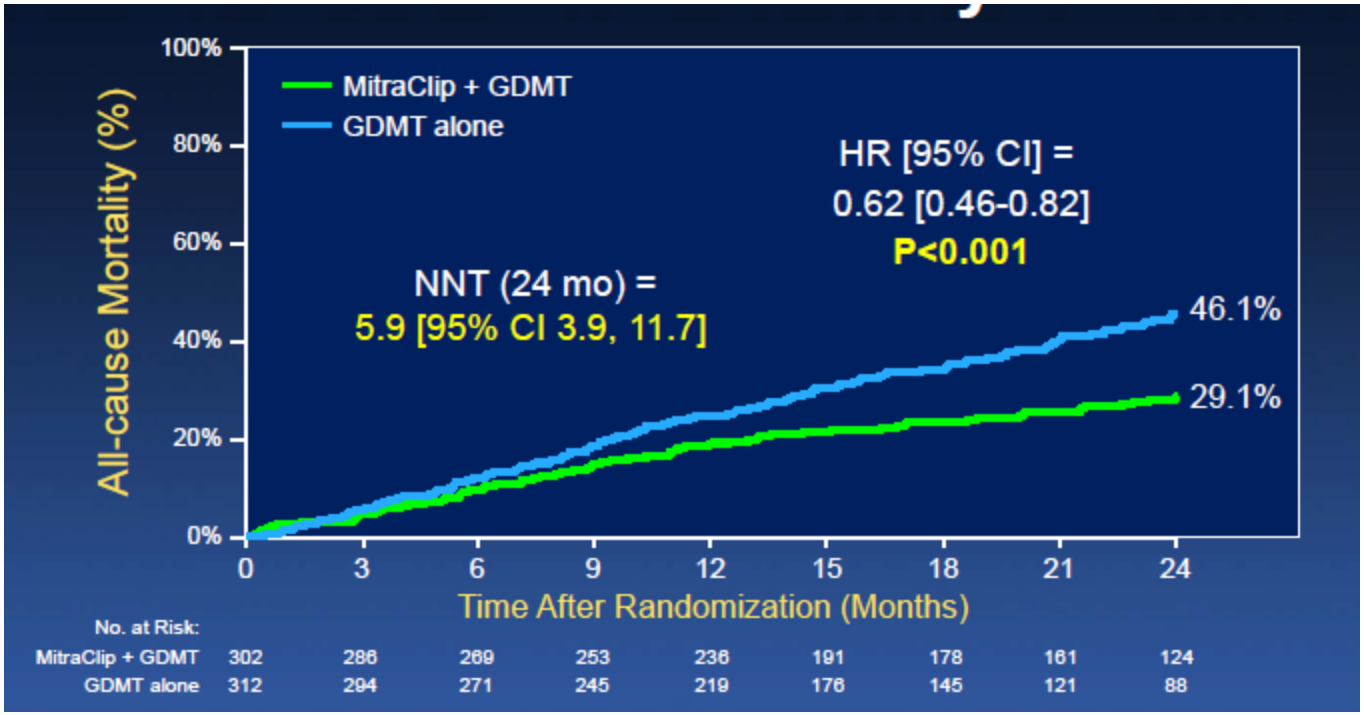
COAPT işlem komplikasyonu



İkincil son noktalar

	P-value
1. MR grade ≤2+ at 12 months	<0.001
2. All-cause mortality at 12 months[2]	<0.001
3. Death and all HF hospitalization through 24 months (Finkelstein-Schoenfeld)	<0.001
4. Change in QOL (KCCQ) from baseline to 12 months	<0.001
5. Change in 6MWD from baseline to 12 months	<0.001
6. All-cause hospitalizations through 24 months	0.03
7. NYHA class I or II at 12 months	<0.001
8. Change in LVEDV from baseline to 12 months	0.003
9. All-cause mortality at 24 months	<0.001
10. Death, stroke, MI, or non-elective CV surgery for device-related compls at 30 days[3]	<0.001

COAPT- Tüm sebeplerden ölüm



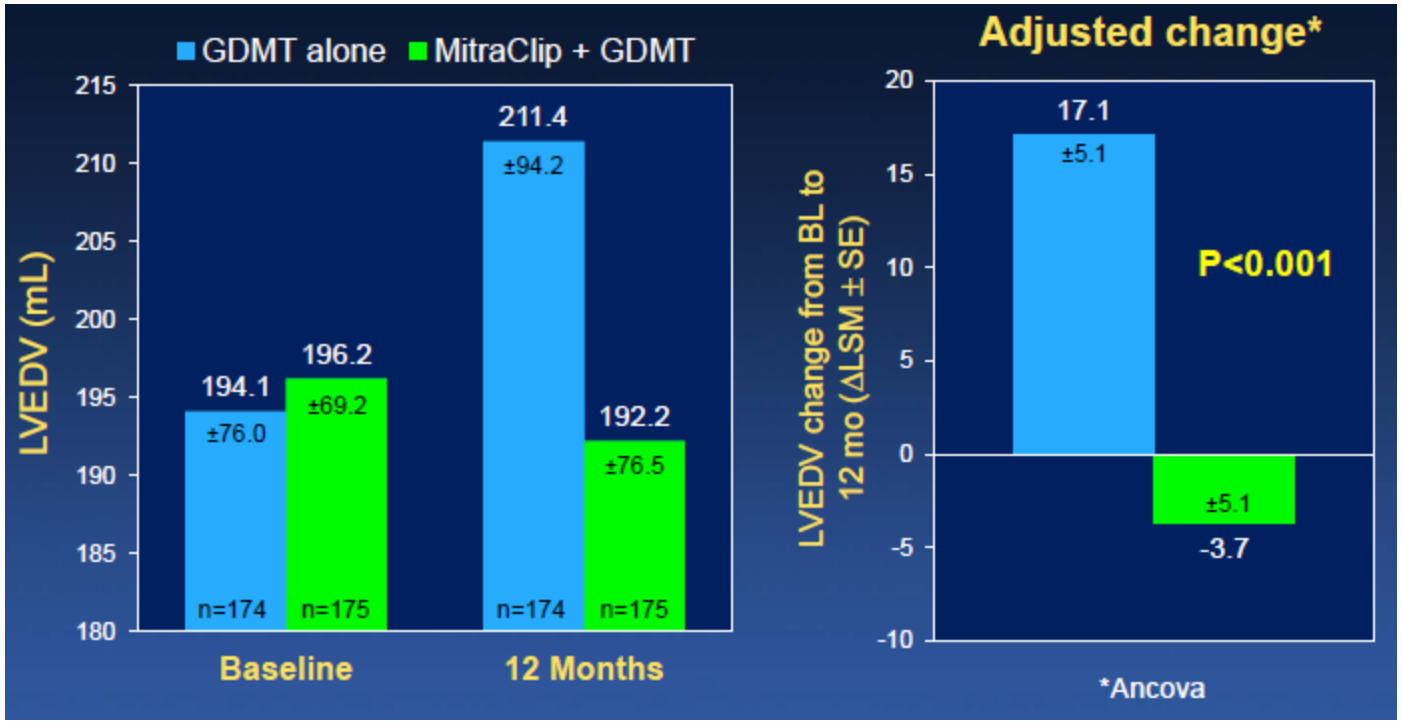
COAPT

	MitraClip + GDMT (n=302)	GDMT alone (n=312)	HR [95% CI]	P-value
MV intervention or surgery*	4.0%	9.0%	0.61 [0.27, 1.36]	0.23
- MitraClip	3.7%	6.6%	0.99 [0.38, 2.58]	0.99
- Mitral valve surgery	0.4%	2.5%	0.14 [0.02, 1.17]	0.07
PCI or CABG	2.8%	4.3%	0.62 [0.24, 1.60]	0.32
Stroke	4.4%	5.1%	0.96 [0.42, 2.22]	0.93
Myocardial infarction	4.7%	6.5%	0.82 [0.38, 1.78]	0.62
New CRT implant	2.9%	3.3%	0.85 [0.31, 2.34]	0.75
LVAD or heart transplant	4.4%	9.5%	0.37 [0.17, 0.81]	0.01
- LVAD	3.0%	7.1%	0.34 [0.13, 0.87]	0.02
- Heart transplant	1.4%	3.6%	0.35 [0.09, 1.32]	0.12

COAPT-NYHA Sınıf

NYHA class	I	II	III	IV	HF death	P_{trend}	I or II	P-value
Baseline								
MitraClip (n=302)	0.3%	42.7%	51.0%	6.0%	-	-	43.0%	-
GDMT (n=311)	0%	35.4%	54.0%	10.6%	-		35.4%	
30 days								
MitraClip (n=283)	15.5%	60.8%	19.4%	3.5%	0.7%	<0.001	76.3%	<0.001
GDMT (n=281)	5.0%	42.7%	41.6%	9.6%	1.1%		47.7%	
6 months								
MitraClip (n=263)	19.4%	52.9%	21.3%	2.7%	3.8%	<0.001	72.2%	<0.001
GDMT (n=261)	5.4%	44.8%	38.3%	2.7%	8.8%		50.2%	
12 months								
MitraClip (n=237)	16.9%	55.3%	17.7%	2.5%	7.6%	<0.001	72.2%	<0.001
GDMT (n=232)	7.8%	41.8%	28.0%	4.7%	17.7%		49.6%	
24 months								
MitraClip (n=157)	12.1%	42.7%	21.7%	5.7%	17.8%	<0.001	54.8%	<0.001
GDMT (n=153)	5.2%	28.1%	23.5%	3.3%	39.3%		33.3%	

COAPT-LVEDV


GDMT alone
MitraClip + GDMT
LVEDV (mL)
215
210
205
200
195
190
185
180
194.1
±76.0
196.2
±69.2
211.4
±94.2
192.2
±76.5
n=174
n=175
n=174
n=175
Baseline
12 Months
Adjusted change*
LVEDV change from BL to 12 mo (ΔLSM ± SE)
20
15
10
5
0
-5
-10
17.1
±5.1
P<0.001
±5.1
-3.7
*Ancova

The NEW ENGLAND JOURNAL of MEDICINE

EDITORIAL

Percutaneous Repair of Secondary Mitral Regurgitation — A Tale of Two Trials

N ENGL J MED 379;24 NEJM.ORG DECEMBER 13, 2018

Secondary Mitral Regurgitation (Mitraclip)

	MITRA-FR (n=304)	COAPT (n=614)
Severe MR entry criteria	Severe FMR by EU guidelines: EROA >20 mm^2 or RV >30 mL/beat	Severe FMR by US guidelines: EROA >30 mm^2 or RV >45 mL/beat
EROA (mean ± SD)	31 ± 10 mm^2	41 ± 15 mm^2
LVEDV (mean ± SD)	135 ± 35 mL/m^2	101 ± 34 mL/m^2
GDMT at baseline and FU	Receiving HF meds at baseline – allowed variable adjustment in each group during follow-up per "real-world" practice	CEC confirmed pts were failing maximally-tolerated GDMT at baseline – few major changes during follow-up
Acute results: No clip / ≥3+ MR	9% / 9%	5% / 5%
Procedural complications*	14.6%	8.5%
12-mo MitraClip ≥3+ MR	17%	5%

*MITRA-FR defn: device implant failure, transf or vasc compl req surg, ASD, card shock, cardiac embolism/stroke, tamponade, urg card surg

- İki çalışmanın Hikayesi

Medikal Tedavi

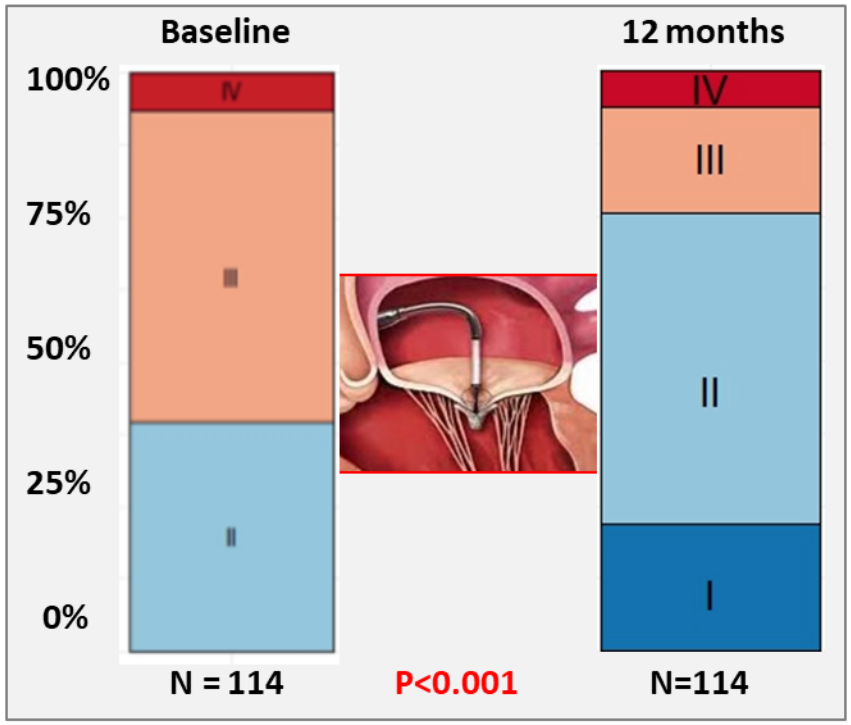
- Hastaların çalışmaya alınışları öncesi ve sonrası optimal medikal tedavide oluş farkları

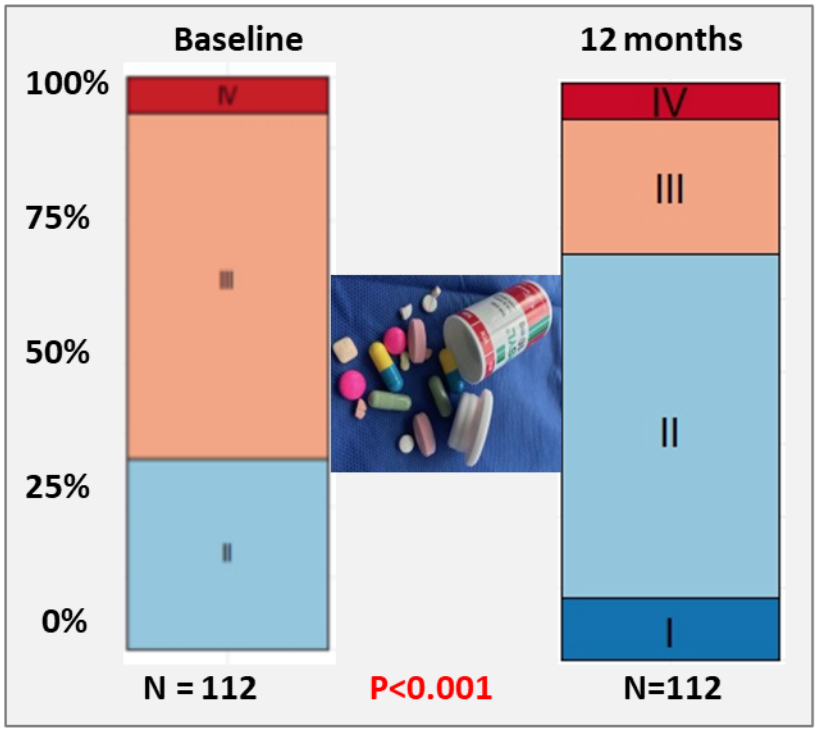
- COAPT da kalp yetersizliği uzmanları hasta OMT den fayda görmüyor ise hastaları yönlendirmiş.

MITRA-FR

İkinci Son nokta

NYHA evolution (*paired data*)





P = NS

COAPT hastaları medikal tedavi kolu farklılıkları

- COAPT bazal N-terminal pro–B-type natriuretic peptide seviyeleri MITRA-FR ye göre daha yüksek
- COAPT OMT gurubu yıllık hastaneye yatış oranları daha fazla (%68 vs. %47)
- COAPT da daha az hasta OMT ile 1 yılda NYHA I-II oluyor
- COAPT OMT gurubunda MITRA-FR ye göre 1 yıl sonrası LVEDD artışı daha fazla

Kaçak miktarı

- COAPT çalışması daha ciddi MY li hastaları almış temelde EROA ; COAPT 41 mm^2 vs MITRA-FR 31 mm^2

- ESC ciddi MY EROA > 20 mm^2, RV >30 mL/atım
- AHA ciddi MY EROA > 30 mm^2, RV >45 mL/atım

Klip Sayısı

- COAPT çalışmasında MITR-FR ile karşılaştırıldığında daha çok hasta birden fazla Klip ile tedavi edilmiş

- MITRA-FR de daha çok hastada COAPT a oranla 1 yılın sonunda orta ciddi veya ciddi MY var.

- Mitraklip işlemi sonrası MY ciddiyetine EKO ile karar vermenin zorluğunun arttığı bir gerçek

Sekonder MY tedavi önerileri

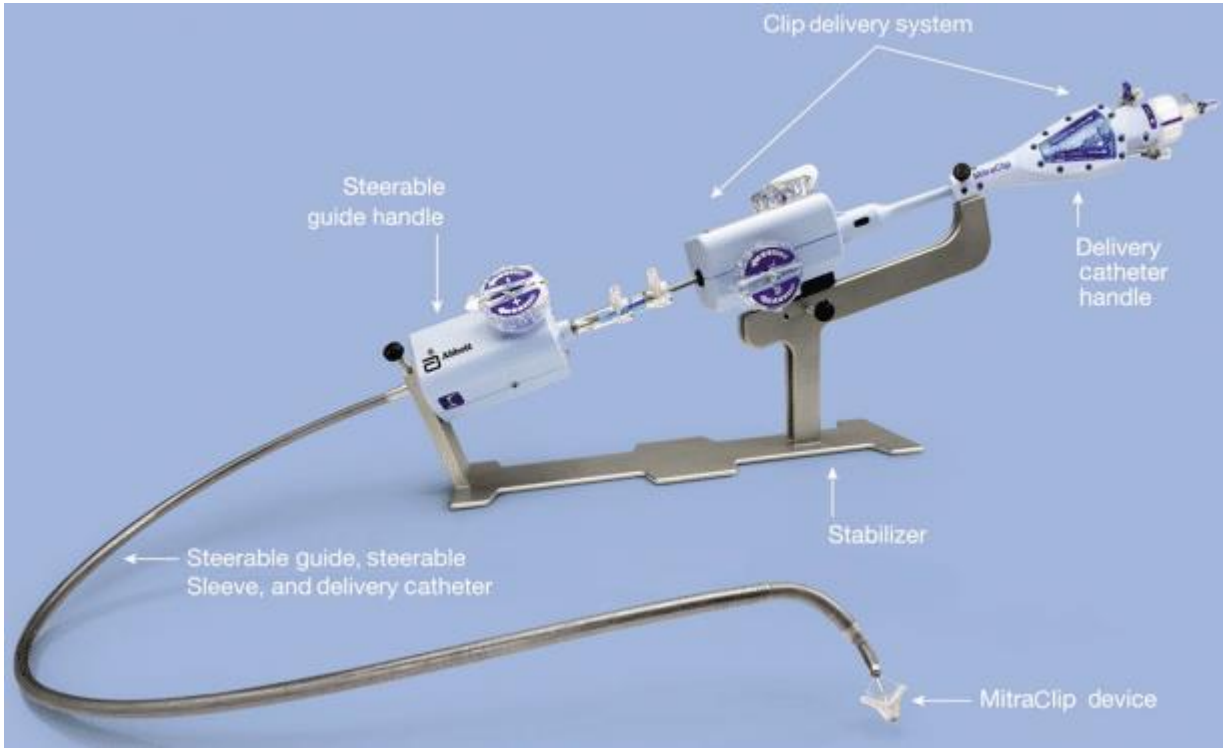
- Optimal Medikal tedavi
- İndikasyon var ise Resenkronizasyon tedavisi
- Bunlar başarısız kalıyorsa girişim düşünülmeli

İşlem

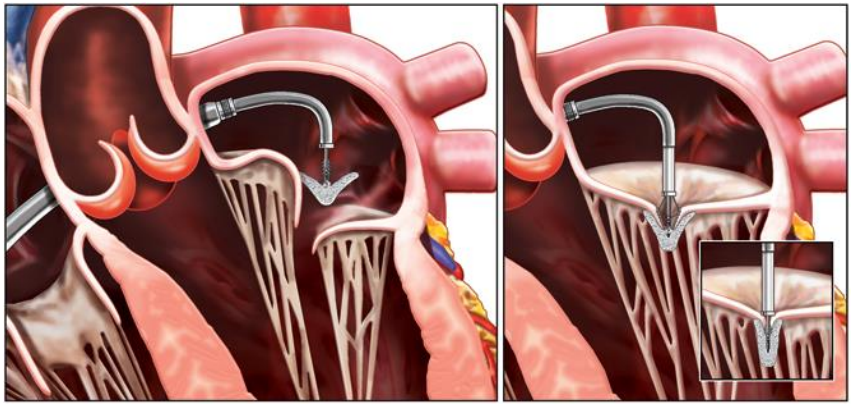
- MitraKlip ileTMKO kateter lab., TEE ve floroskopi eşliğinde yapılır

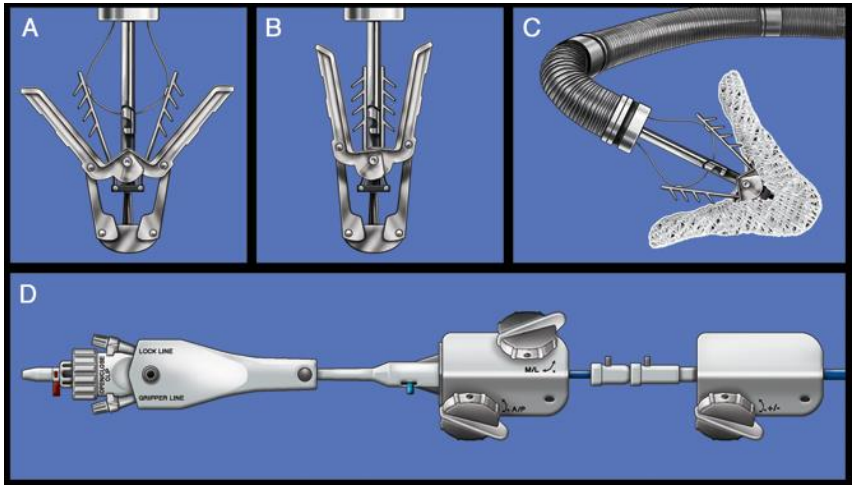
- TEE kılavuzluğu ile dikkatlice cihazı yerleştirmek gerekli. Bu sebeple genel anestezi şart

MitraKlip cihazı



www.dicardiology.com/videos/video-how-implant-mitraclip-transcatheter-mitral-valve-repair-device

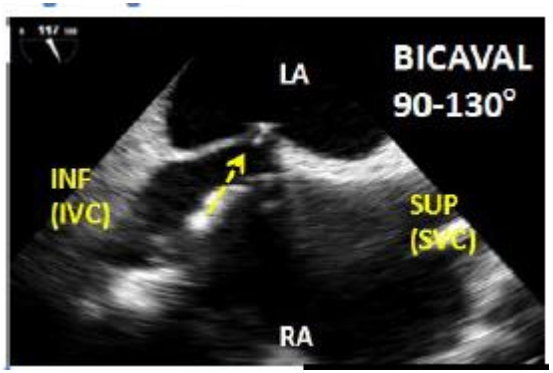


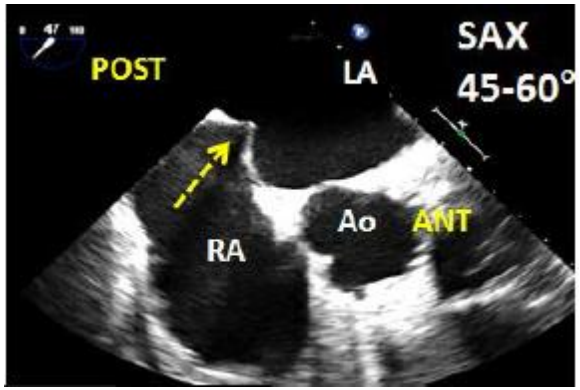


1) TEE ileTransseptal puncture

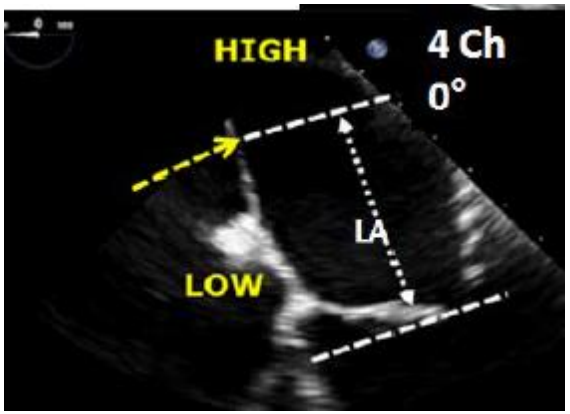
Superior ve posterior mid fossa dan puncture

1) Bikaval görüntüde çadırlaşma



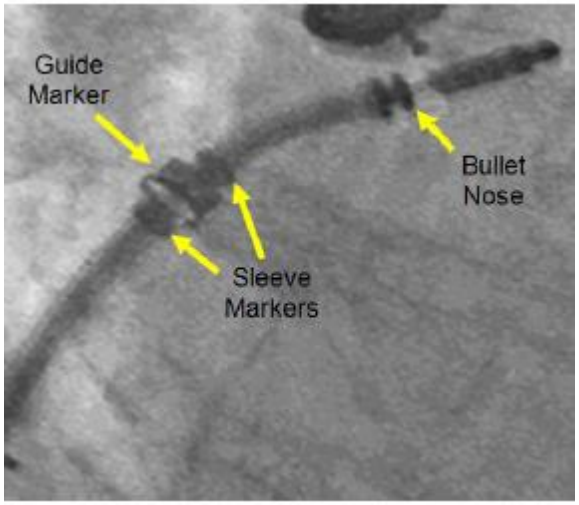


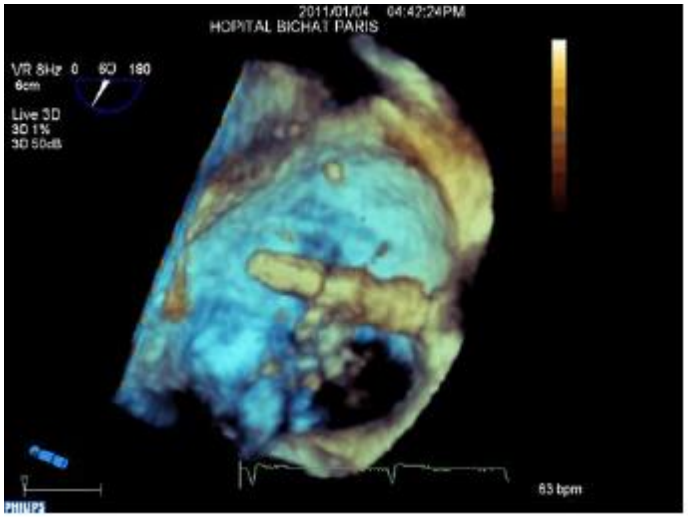
2) SAX (Short aks)bazal görüntüde çadırlaşma Aorta emniyetli



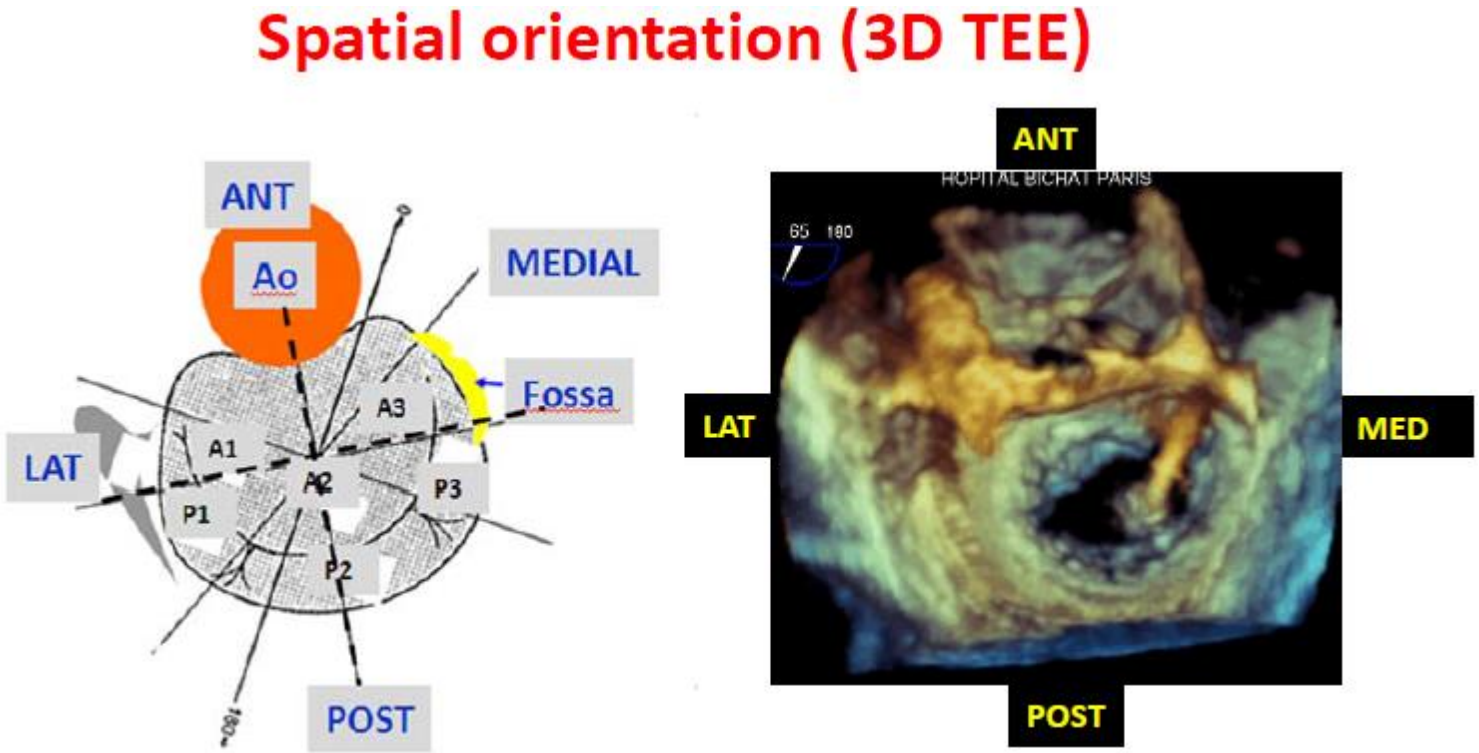
3) Dört boşluk görüntüde manipulasyon için
Yeterli mesafe olduğu görülmeli

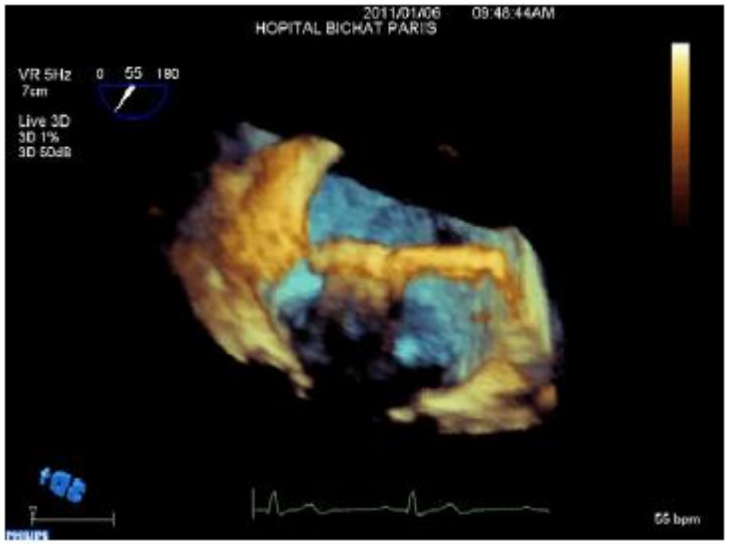
2) Direksiyonlu kılavuz kateterin sol atriyuma ilerletilmesi

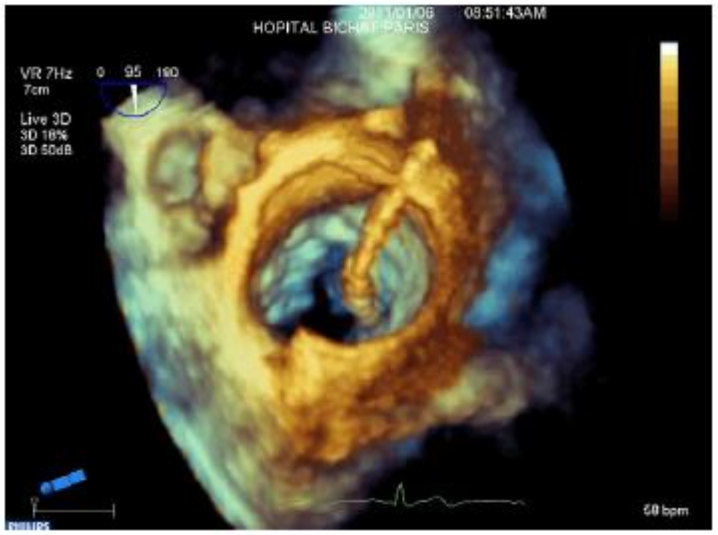




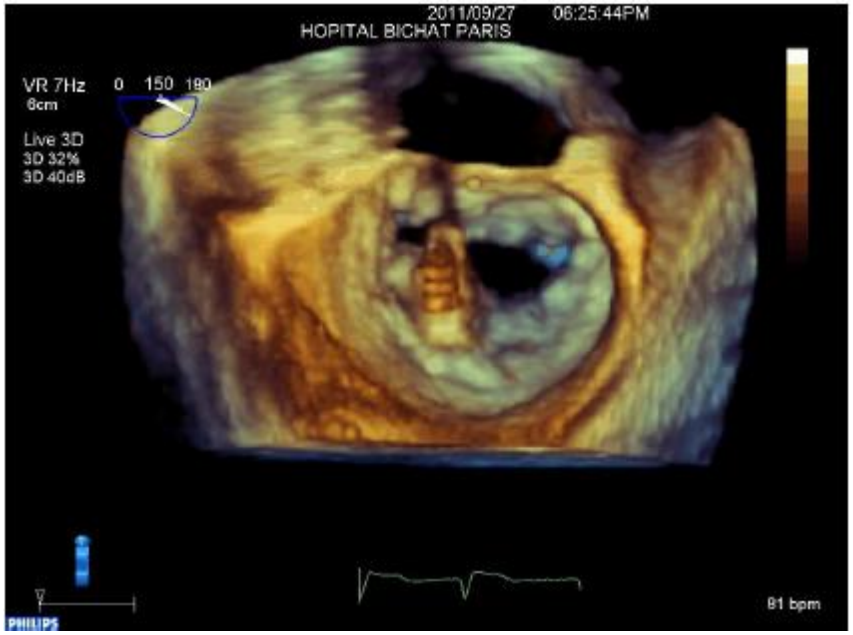
3) Mitraklipin direksiyonla mitral kapağa yönlendirilmesi (3D)



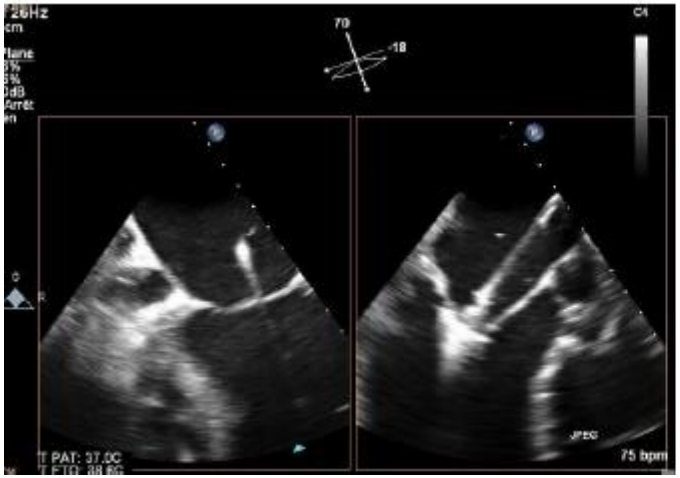

2011/01/06 09:46:44AM
HOPITAL BICHAT PARIS
VR 5Hz
7cm
0 55 180
Live 3D
3D 1%
3D 50dB
55 bpm

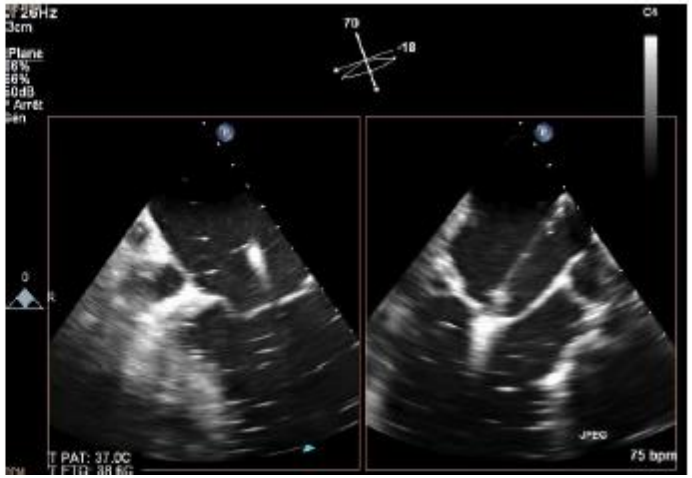

2011/01/06 09:51:43AM
HOPITAL BICHAT PARIS
VR 7Hz
7cm
0 95 180
Live 3D
3D 16%
3D 50dB
60 bpm

4) Mitraklipin dik pozisyonda kapağa yerleştirilmesi

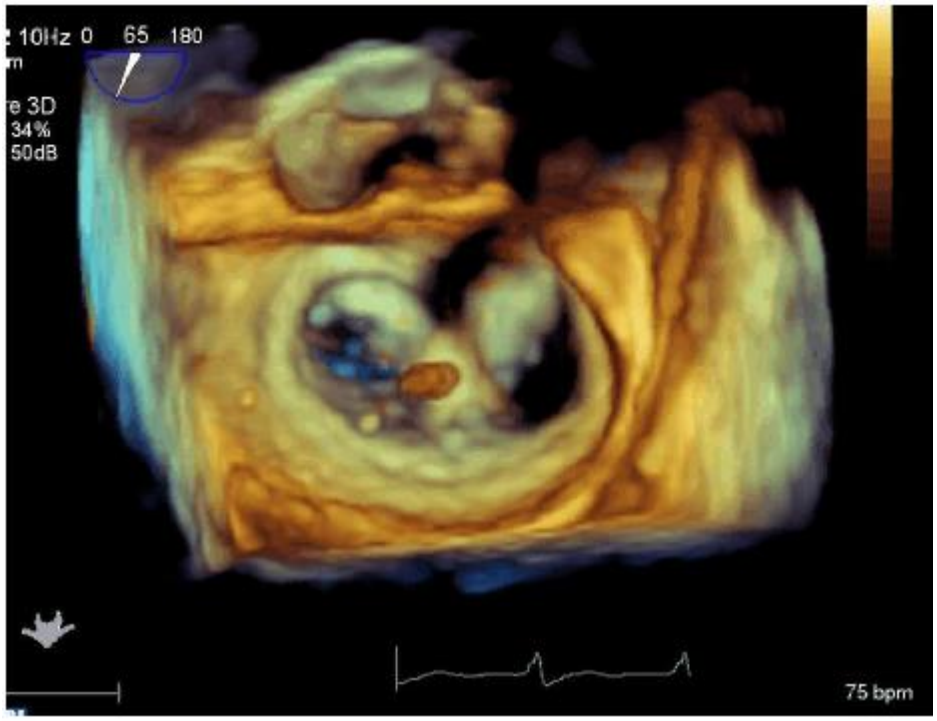


5) Kapak yaprakçıklarının yakalanması

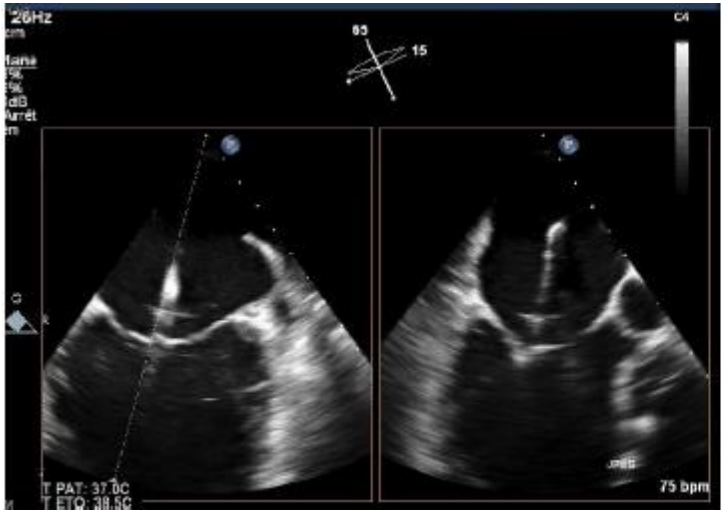


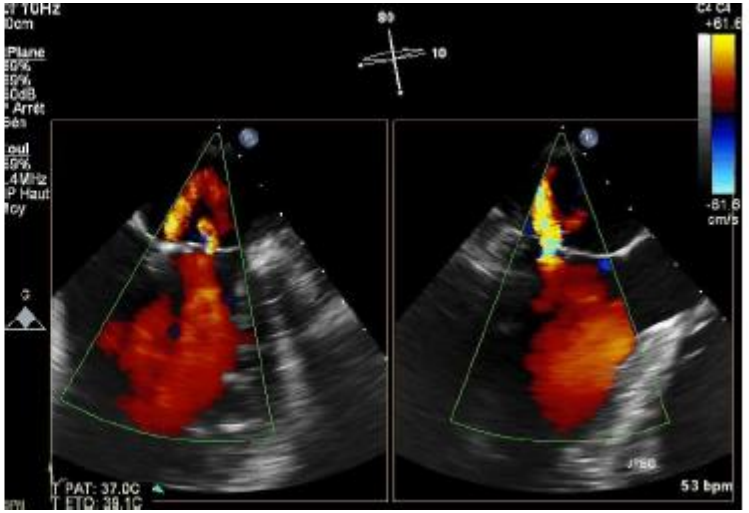


7) Kapakçık tam yakalandığının gösterilmesi



8) MY azaldı ise klip bırakılması





İşlem

- MY de azalma yeterli değil ise Klip kolları açılıp cihaz geri alına bilir

- Vakalıarın % 40. da MY de yeterli azalma görülmemiş ve 2. Klip yerleştirilmiştir.

Antikoagilasyon

- İşlem sırası ACT >250 sn olacak şekilde trans septal puncture sonrası heparin verilmeli
- İşlem 24 saat öncesi veya hemen sonrası 300 mg Klopidrogel yükleme
- Çalışmalarda; ASA 300 + Klopidrogel 75 mg 6-12 ay devam edilmiş.

Komplikasyonlar

- TMKO 30 günlük işlem komplikasyonu % 15-19 arasında bildirilmiş

- Bu komplikasyonların çoğunluğu işlem sonrası kan transfüzyon ihtiyacından kaynaklanıyor

- Diğer komplikasyonların çoğu ise kalp yetersizliği ve hastanın komobitelerine bağlı

Komplikasyonlar

- İşlem yeri kanama
- Kısmi Klip ayrışması
- Cihaz embolisi (Nadir görülür)
- Mitral Darlık gelişmesi

Kanama

- Damar kılıfı çapına bağlı kanama. (Kanama riski Cerrahi ye göre az)
- EVEREST II , 2 ünite üstü kan transfüzyon ihtiyacı TMKO %13, Cerrahi % 45
- EVEREST yüksek riskli hastalarda bu oran % 17.9
- Registiry lerde TMKO ≥2 unit üstü kan transfüzyon ihtiyacı % 0.9 to 3.9

Cihaz Embolizasyonu ve Kısmi Klip ayrışması

- Emboli çok nadir
- Daha sıkça olan Klipin kısmi gevşemesi veya ayrılması.
- EVEREST II 12 ayda 9 hastada kısmi cihaz ayrışması, sonraki 4 yılda bir hastada daha ayrışma izlenmiş
- Bu hastaların tedavisi cerrahi

Mitral Darlık

- Bekleneceği gibi TMKO mitral kapakta diyastolik bir gradient oluşturacaktır
- Ciddi MD nadir görülür
- 12 ay takiplerde MD gradient artışı görülmemiştir.
- Bir veya fazla Klip takılması MD miktarında farklılık yapmamıştır

Enfektif Endokardit

- Şimdilik data kısıtlı
- Hastalar diş hijeni ve uzun süren ateş belirtileri için bilgilendirilmeli
- Antibiyotik proflaksisi ?
- Diğer Protez kalp kapakları gibi proflaksi verilmesini önerenler var
- 2015 ESC kılavuzu Protez materyaller diye kılavuza eklerken 2014 AHA Endokardit kılavuzunda cihazlar için öneri yok

Kronik Primer MY Öneriler

- Kronik Primer MY aşağıdaki özellikler var ise TMKO (Grade2C)
- Kronik orta-ciddi, Ciddi MY (3+ to 4+)
- OMT rağmen NYHA Sınıf III veya IV
- İşlem için uygun anatomi
- Yeterli hayat beklentisi
- Komorbiteler sebebi ile yüksek riskli cerrahi

Grade 2C Öneri

- Grade 2;
- Bizim önerimiz ancak siz karar verin

- Tüm hastalarınıza yapmanız gerekmez alternatifler de uygundur

- Fayda ve riskler dengelidir. Hasta ile tartışarak karar ver

- C; Gözlemsel ve nonrandomize çalışmalar

ESC 2017 kılavuz

Percutaneous edge-to-edge procedure may be considered in patients with symptomatic severe primary mitral regurgitation who fulfil the echocardiographic criteria of eligibility and are judged inoperable or at high surgical risk by the Heart Team, avoiding futility.	IIb	C

AHA 2017 kılavuz

IIb	B	Transcatheter mitral valve repair may be considered for severely symptomatic patients (NYHA class III to IV) with chronic severe primary MR (stage D) who have favorable anatomy for the repair procedure and a reasonable life expectancy but who have a prohibitive surgical risk because of severe comorbidities and remain severely symptomatic despite optimal GDMT for heart failure (HF).[124]	2014 recommendation remains current.

Kronik Sekonder MY; Öneriler

- TMKO; Deneyimli merkezlerde yapılmalı
- Hasta seçimi; Fayda görecek hastaları belirlemede çok önemli
- COAPT ; OMT ye rağmen ciddi semptomatik, Ciddi MY
- Mitra-FR ; Sol vent fonksiyonu çok düşük olmayan hastalar

Öneriler

- OMT ve Resenkronizasyon tedavisine rağmen fayda görmeyen hastalar

- Bu öneriler göz önüne alınarak randomize çalışmalar yapılmalıdır.

Öneriler

- Unutmamak gerekir ki Klip tedavisi gören her iki çalışmada da hastaların 1/2 – 1/3 ü kalp yetersizliği ile hospitalize edilmiş veya kaybedilmiştir.

- Komorbite, hastanın kırılganlığı, hayat beklentisi yönünden incelenmelidir.

Grade 2B öneri

- Kronik Sekonder Orta-ciddi veya Ciddi MY
- LVEF ≤ %50
- OMT + indike ise CRT rağmen NYHA Sınıf III veya IV kalp yetersizliği
- Teknik olarak Klip için uygun
- Yeterli hayat beklentisi olan hastalar

Grade 2B Öneri

- Grade 2;
- Bizim önerimiz ancak siz karar verin

- Tüm hastalarınıza yapmanız gerekmez alternatifler de uygundur

- Fayda ve riskler dengelidir. Hasta ile tartışarak karar ver

- B; Limitasyonu olan randomize çalışma

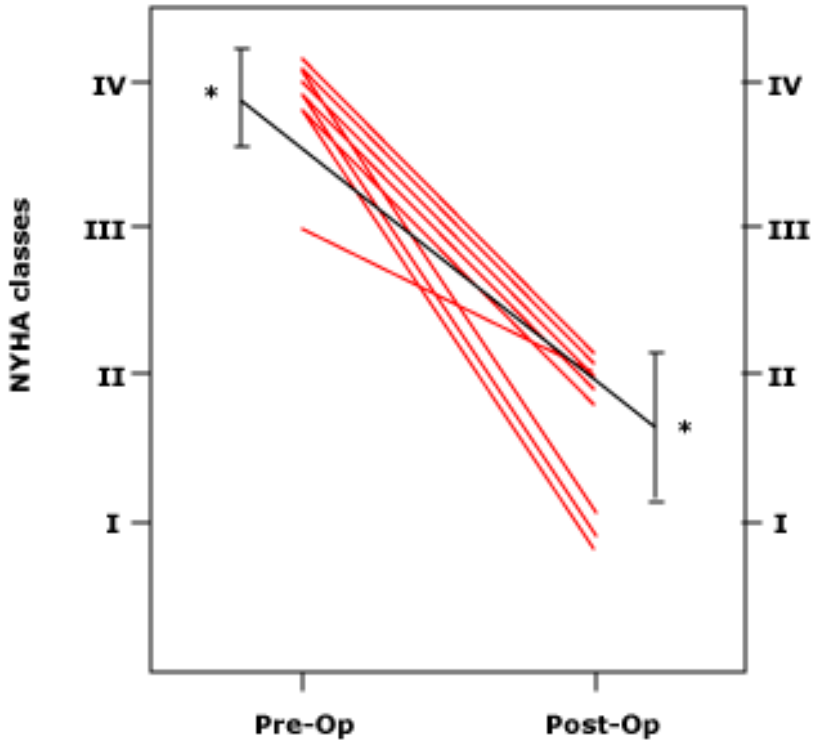
ESC 2017 Kılavuz

When revascularization is not indicated and surgical risk is not low, a percutaneous edge-to-edge procedure may be considered in patients with severe secondary mitral regurgitation and LVEF >30% who remain symptomatic despite optimal medical management (including CRT if indicated) and who have a suitable valve morphology by echocardiography, avoiding futility.	IIb	C
In patients with severe secondary mitral regurgitation and LVEF <30% who remain symptomatic despite optimal medical management (including CRT if indicated) and who have no option for revascularization, the Heart Team may consider a percutaneous edge-to-edge procedure or valve surgery after careful evaluation for a ventricular assist device or heart transplant according to individual patient characteristics.	IIb	C

Sekonder MY izole Mitral kapak cerrahisi

- Limitli Data
- Randomize çalışma yok
- Küçük çaplı çalışmalarda EF ve kardiak output artmış

Mitral valve repair for mitral regurgitation in heart failure improves symptoms



In patients with mitral regurgitation due to a congestive cardiomyopathy, mitral annuloplasty resulted in a significant improvement in symptoms and functional status at 17 weeks; NYHA functional class fell significantly from an average of 3.9 to 1.7 ($p < 0.001$*).

Data from Bach DS, Bolling SF. Am Heart J 1995; 129:1165.

Journal of the American College of Cardiology
© 2005 by the American College of Cardiology Foundation
Published by Elsevier Inc.

Vol. 45, No. 3, 2005
ISSN 0735-1097/05/$30.00
doi:10.1016/j.jacc.2004.09.073

Impact of Mitral Valve Annuloplasty on Mortality Risk in Patients With Mitral Regurgitation and Left Ventricular Systolic Dysfunction

Audrey H. Wu, MD, MPH,* Keith D. Aaronson, MD, MS,* Steven F. Bolling, MD, FACC,†
Francis D. Pagani, MD, PHD, FACC,† Kathy Welch, MS, MPH,‡ Todd M. Koelling, MD, FACC*
Ann Arbor, Michigan

- 419 hasta , LVEF ≤30, Orta-ciddi MY, 126 kapak onarımı
- 30- Gün post op mortalite % 4.8

- Takip >2000 gün mortalite kapak ameliyatı olan %48, olmayan %38

Sekonder MY; CABG + Kapak Cerrahi

- İlk çalışmalar Egzersiz süresi artıyor ama mortalite farklı değil

- Orta derecede Sekonder MY olan 301 hastalık randomize çalışmada mortalite, hayat kalitesi arasında fark yok

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Surgical Treatment of Moderate Ischemic Mitral Regurgitation

P.K. Smith, J.D. Puskas, D.D. Ascheim, P. Voisine, A.C. Gelijns, A.J. Moskowitz, J.W. Hung, M.K. Parides, G. Ailawadi, L.P. Perrault, M.A. Acker, M. Argenziano, V. Thourani, J.S. Gammie, M.A. Miller, P. Pagé, J.R. Overbey, E. Bagiella, F. Dagenais, E.H. Blackstone, I.L. Kron, D.J., E.A. Rose, E.G. Moquete, N. Jeffries, T.J. Gardner, P.T. O'Gara, J.H. Alexander, and R.E. Michler, for the Cardiothoracic Surgical Trials Network Investigators*

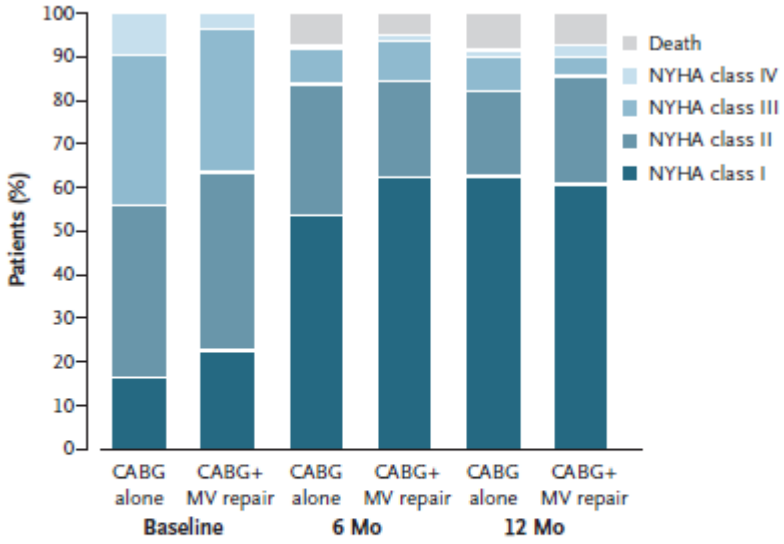
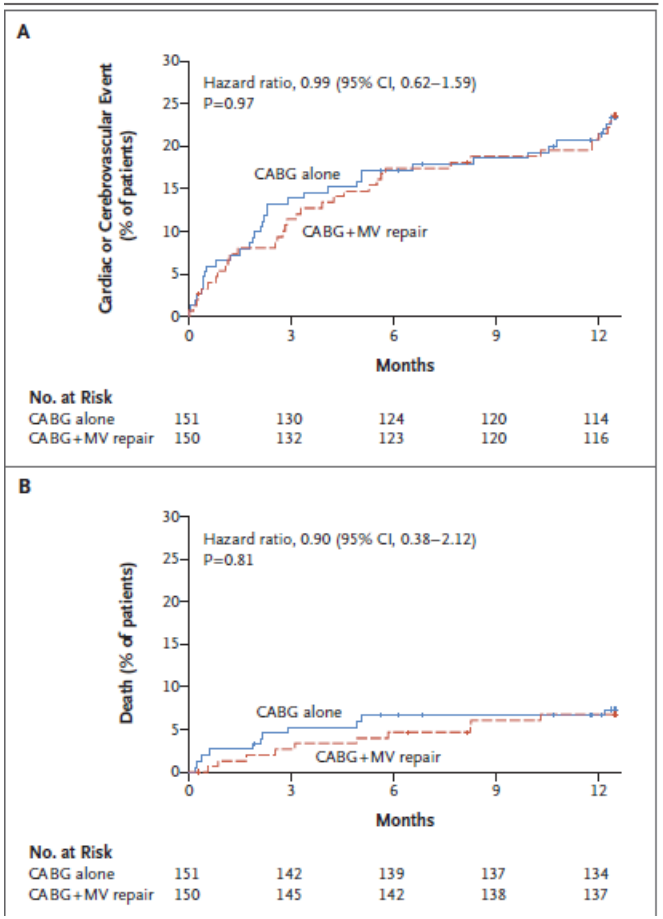


Figure 2. NYHA Class and Death, According to Treatment Group.

The proportions of patients in each NYHA class are shown at baseline and at 6 and 12 months; the proportions of patients who died are shown at 6 and 12 months.



(*Circulation*. 2012;126:2502-2510.)

Coronary Artery Bypass Surgery With or Without Mitral Valve Annuloplasty in Moderate Functional Ischemic Mitral Regurgitation

Final Results of the Randomized Ischemic Mitral Evaluation (RIME) Trial

K.M. John Chan, FRCS CTh; Prakash P. Punjabi, FRCS CTh; Marcus Flather, MD, FRCP; Riccardo Wage, DCR (R); Karen Symmonds, DCR (R); Isabelle Roussin, MD; Shelley Rahman-Haley, MD, FRCP; Dudley J. Pennell, MD, FRCP; Philip J. Kilner, MD, PhD; Gilles D. Dreyfus, MD; John R. Pepper, MChir, FRCS; for the RIME Investigators

Table 3. Study End Points at 1 Year

	CABG (n=32)			CABG+MVR (n=27)			
End Points	Baseline	1 Year	Δ	Baseline	1 Year	Δ	*P* Value*
Primary end point							
Peak VO_2, ml/kg/min	15.1±3.3	15.9±2.5	0.8±2.9	14.8±3.2	18.1±2.9	3.3±2.3	<0.001
Secondary end points							
LV ESVI, ml/m²†	71.8±16.1	67.4±20.4	−4.4±17.4	78.4±26.5	56.2±14.9	−22.2±25.6	0.002
MR volume, ml/beat†	31.9±14.8	22.7±14.6	−9.2±19.1	35.4±24.0	7.2±3.5	−28.2±24.6	0.001
BNP (pg/ml)	681.4±197.3	286.7±132.0	−394.7±213.6	748.1±158.3	190.7±117.8	−557.4±182.9	0.003

Data are presented as mean±SD. CABG indicates coronary artery bypass grafting; MVR, mitral valve repair; VO_2, oxygen consumption; LV ESVI, left ventricular end-systolic volume index; MR, mitral regurgitant; BNP, B-type natriuretic peptide; and Δ, mean change at 1 year from baseline.

**P* value is of mean change in values at 1 year from baseline (Δ) in the CABG+MVR group vs the CABG group.

†Values shown were measured by cardiovascular magnetic resonance.

Orta derecede MY + CABG mortalite farkı yok ancak Efor kapasitesi artmış.

Sekonder MY; Kapak onarımı vs Kapak Replasmanı

- İskemik mitral yetersizlikte papiller adele korumalı MVR, onarıma göre avantajlı gözüküyor

- Non iskemik operasyonda öncelikle onarım yapılamıyor ise papiller adele korumalı MVR

ORIGINAL ARTICLE

N ENGL J MED 370;1 NEJM.ORG JANUARY 2, 2014

Mitral-Valve Repair versus Replacement for Severe Ischemic Mitral Regurgitation

Michael A. Acker, M.D., Michael K. Parides, Ph.D., Louis P. Perrault, M.D., Alan J. Moskowitz, M.D., Annetine C. Gelijns, Ph.D., Pierre Voisine, M.D., Peter K. Smith, M.D., Judy W. Hung, M.D., Eugene H. Blackstone, M.D., John D. Puskas, M.D., Michael Argenziano, M.D., James S. Gammie, M.D., Michael Mack, M.D., Deborah D. Ascheim, M.D., Emilia Bagiella, Ph.D., Ellen G. Moquete, R.N., T. Bruce Ferguson, M.D., Keith A. Horvath, M.D., Nancy L. Geller, Ph.D., Marissa A. Miller, D.V.M., Y. Joseph Woo, M.D., David A. D'Alessandro, M.D., Gorav Ailawadi, M.D., Francois Dagenais, M.D., Timothy J. Gardner, M.D., Patrick T. O'Gara, M.D., Robert E. Michler, M.D., and Irving L. Kron, M.D., for the CTSN*

Onarıma gidenlerde takiplerde MY gelişmesi belirgin olarak daha fazla

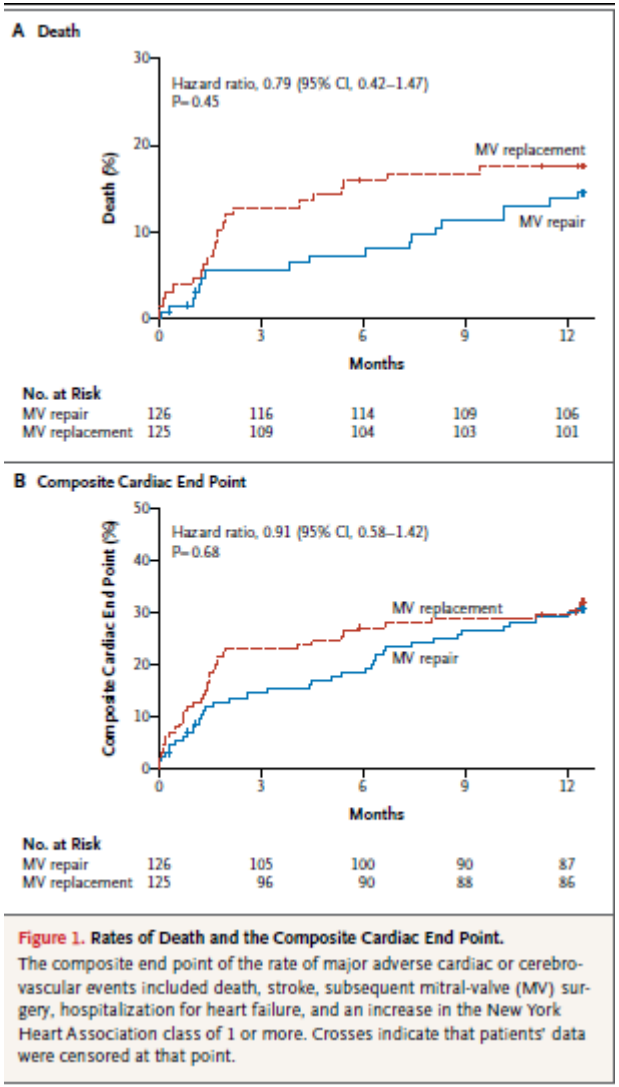


Figure 1. Rates of Death and the Composite Cardiac End Point.
The composite end point of the rate of major adverse cardiac or cerebrovascular events included death, stroke, subsequent mitral-valve (MV) surgery, hospitalization for heart failure, and an increase in the New York Heart Association class of 1 or more. Crosses indicate that patients' data were censored at that point.

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Two-Year Outcomes of Surgical Treatment of Moderate Ischemic Mitral Regurgitation

R.E. Michler, P.K. Smith, M.K. Parides, G. Ailawadi, V. Thourani, A.J. Moskowitz, M.A. Acker, J.W. Hung, H.L. Chang, L.P. Perrault, A.M. Gillinov, M. Argenziano, E. Bagiella, J.R. Overbey, E.G. Moquete, L.N. Gupta, M.A. Miller, W.C. Taddei-Peters, N. Jeffries, R.D. Weisel, E.A. Rose, J.S. Gammie, J.J. DeRose, Jr., J.D. Puskas, F. Dagenais, S.G. Burks, I. El-Hamamsy, C.A. Milano, P. Atluri, P. Voisine, P.T. O'Gara, and A.C. Gelijns, for the CTSN*

N ENGL J MED 374;20 NEJM.ORG MAY 19, 2016

- Onarımda geç dönemde MY % 58 'e kadar çıkabiliyor

Kapak türü seçimi

- Kılavuz önerileri göz önüne alınır
- Bu hastalarda hayat beklentisi düşük olması sebebi ile Biyoprotez seçile bilir.
- Subvalvular aparatın korunması bioprotez amelyatlarında daha kolay

Öneriler

- İskemik ciddi Sekonder MY CABG olacaksa papiller adele korunarak MVR önerilir (Grade 2C).
- İskemik ciddi sekonder MY CABG gerekli değil ise mitral kapak cerrahisi önerilmez (Grade 2C).
- Ciddi iskemik MY kapak replasmanı yapılacak ise papiller adele korunarak biyoprotez mitral kapak tercih edile bilir.
- Ciddi iskemik olmayan sekonder MY de mitral kapak ameliyata gidecek ise kapak onarıma uygun değil ise veya onarım sonrası rezidüel MY var ise papiller adele korunarak mitral kapak replasmanı (Grade 2C)

AHA kapak kılavuzu

Recommendations for Secondary MR Intervention			
COR	**LOE**	**Recommendations**	**Comment/Rationale**
IIa	C	Mitral valve surgery is reasonable for patients with chronic severe secondary MR (stages C and D) who are undergoing CABG or AVR.	2014 recommendation remains current.
IIa	B-R	It is reasonable to choose chordal-sparing MVR over downsized annuloplasty repair if operation is considered for severely symptomatic patients (NYHA class III to IV) with chronic severe ischemic MR (stage D) and persistent symptoms despite GDMT for HF.[69,70,125,127,130–139]	**NEW:** An RCT has shown that mitral valve repair is associated with a higher rate of recurrence of moderate or severe MR than that associated with mitral valve replacement (MVR) in patients with severe, symptomatic, ischemic MR, without a difference in mortality rate at 2 years' follow-up.
See Online Data Supplement 18 (Updated From 2014 VHD Guideline)			
IIb	B	Mitral valve repair or replacement may be considered for severely symptomatic patients (NYHA class III to IV) with chronic severe secondary MR (stage D) who have persistent symptoms despite optimal GDMT for HF.[125,127,130–140]	2014 recommendation remains current.
IIb	B-R	In patients with chronic, moderate, ischemic MR (stage B) undergoing CABG, the usefulness of mitral valve repair is uncertain.[71,72]	**MODIFIED: LOE updated from C to B-R.** The 2014 recommendation supported mitral valve repair in this group of patients. An RCT showed no clinical benefit of mitral repair in this population of patients, with increased risk of postoperative complications.
See Online Data Supplement 18 (Updated From 2014 VHD Guideline)			

ESC kapak kılavuzu

Indications for mitral valve intervention in chronic secondary mitral regurgitation[a]

Recommendations	Class[b]	Level[c]
Surgery is indicated in patients with severe secondary mitral regurgitation undergoing CABG and LVEF >30%.	I	C
Surgery should be considered in symptomatic patients with severe secondary mitral regurgitation, LVEF <30% but with an option for revascularization and evidence of myocardial viability.	IIa	C
When revascularization is not indicated, surgery may be considered in patients with severe secondary mitral regurgitation and LVEF >30% who remain symptomatic despite optimal medical management (including CRT if indicated) and have a low surgical risk.	IIb	C

FDA NEWS RELEASE

FDA approves new indication for valve repair device to treat certain heart failure patients with mitral regurgitation

For Immediate Release: March 14, 2019

The U.S. Food and Drug Administration today approved a new indication for a heart valve repair device that is intended to reduce moderate-to-severe or severe mitral regurgitation, a leakage of blood backward through the mitral valve into the heart's left atrium that can cause heart failure symptoms such as shortness of breath, fatigue and swelling in the legs. When first approved in 2013, the MitraClip Clip Delivery System (MitraClip) was indicated to reduce mitral regurgitation in certain patients whose significant mitral regurgitation and heart failure symptoms result from abnormalities of the mitral valve (commonly known as primary or degenerative mitral regurgitation) and whose risks for mitral valve surgery are prohibitive. The new indication, approved today, is for treatment of patients with normal mitral valves who develop heart failure symptoms and moderate-to-severe or severe mitral regurgitation because of diminished left heart function (commonly known as secondary or functional mitral regurgitation) despite being treated with optimal medical therapy. Optimal medical therapy includes combinations of different heart failure medications along with, in certain patients, cardiac resynchronization therapy and implantation of cardioverter defibrillators.

"Expanding the approval of this device to heart failure patients with significant secondary mitral regurgitation, who have failed to get symptom relief from other therapies, provides an important new treatment option," said Bram D. Zuckerman, M.D., director of the