Ischemci Mitral Regurgitation: Repair or Replacement

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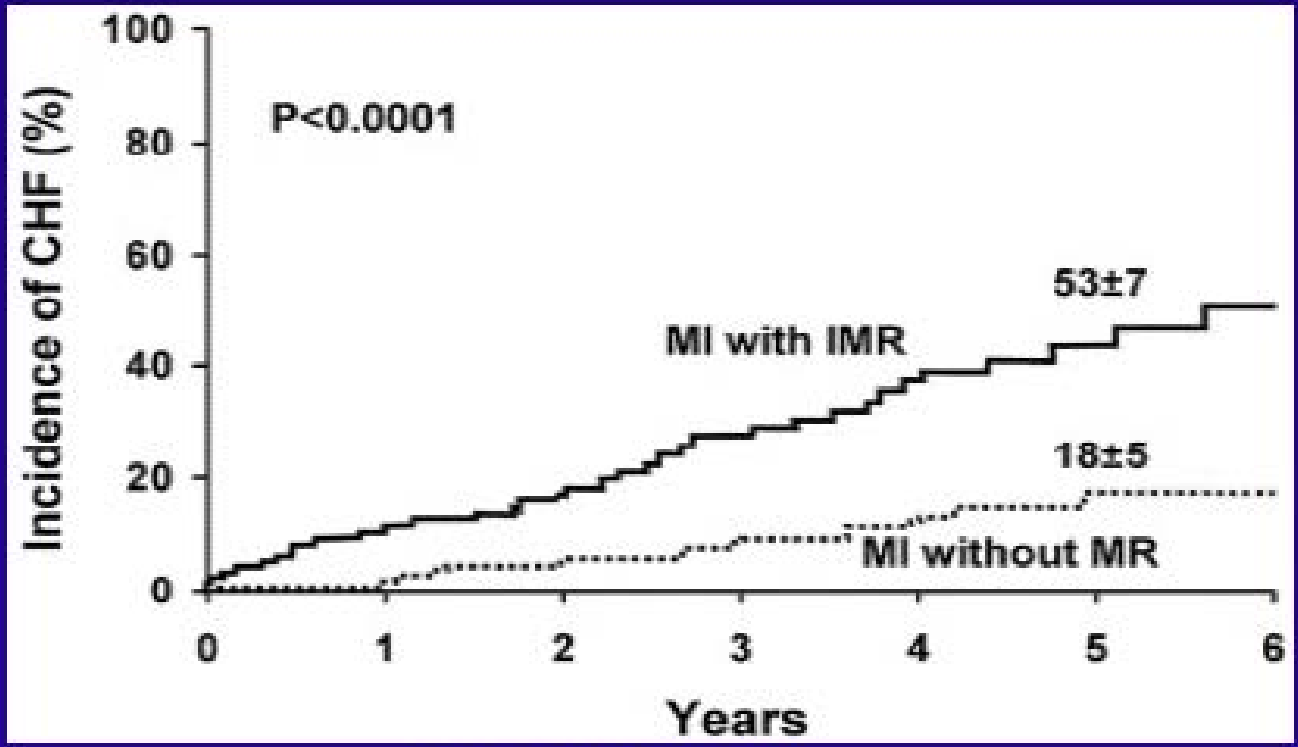
Disclosures

- **Abbott Medical/St. Jude Medical**
  - **Structural Heart Advisory board**
  - **Executive Committee: Portico trial**
- **Boston Scientific**
  - **Advisory Board, Executive Committee (Lotus Valve Trial)**
- **Cryolife**
  - **Advisor**
- **Edwards Lifesciences**
  - **National Co-PI: PARTNER 2 (SAPIEN 3 Trial)**
  - **Executive Committee: PARTNER 3 trial**
  - **Advisor**
- **Gore**
  - **Advisor**
- **Jenavalve**
  - **National Co-PI**

Ischemic Mitral Regurgitation

- Ischemic mitral regurgitation (IMR) develops 2° to a MI.
- It imposes a volume overload on the LV, increases wall stress, and causes adverse LV remodeling and heart failure



Grigioni, JACC, 2005

Ischemic Mitral Regurgitation

Ischemic Cardiomyopathy

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Post-MI Ventricular Remodeling

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PM Displacement
Annular Dilatation

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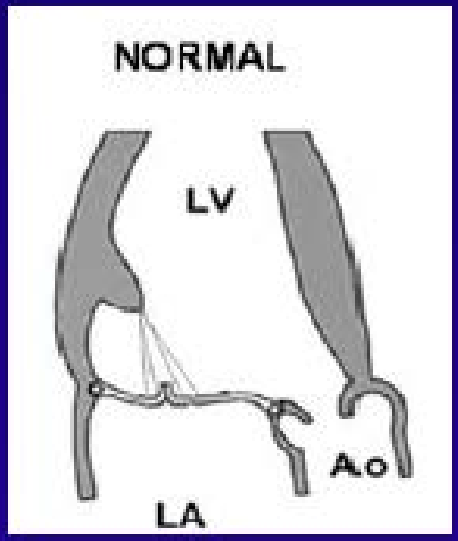
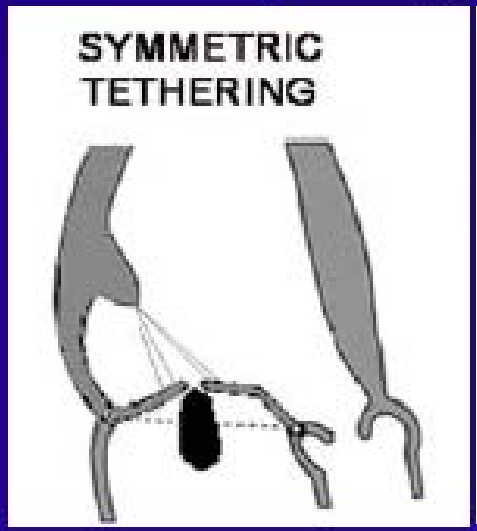
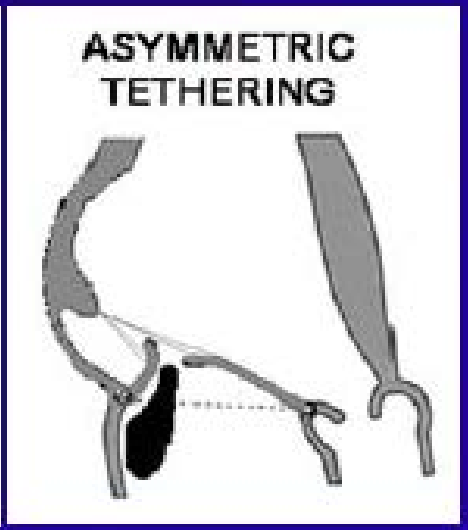
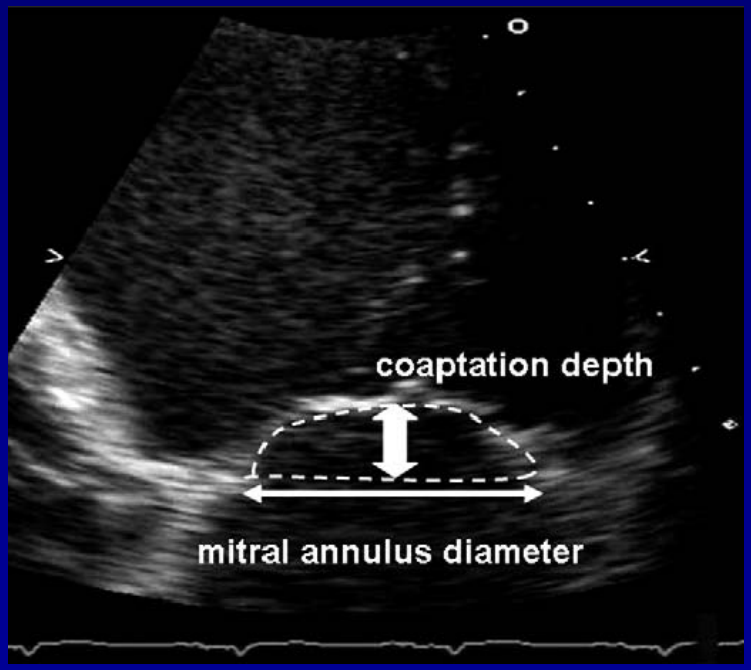
Mitral Regurgitation

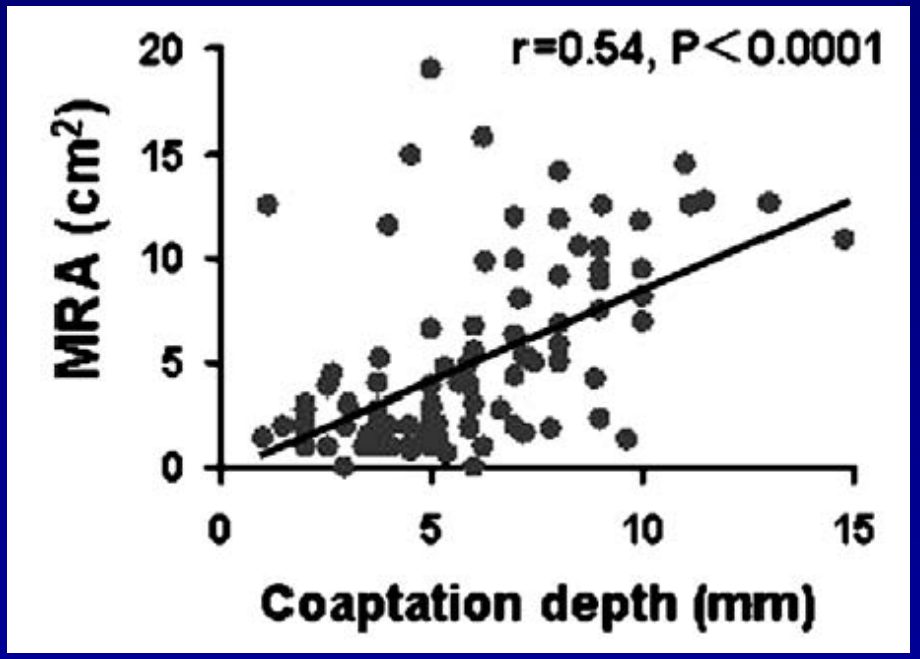






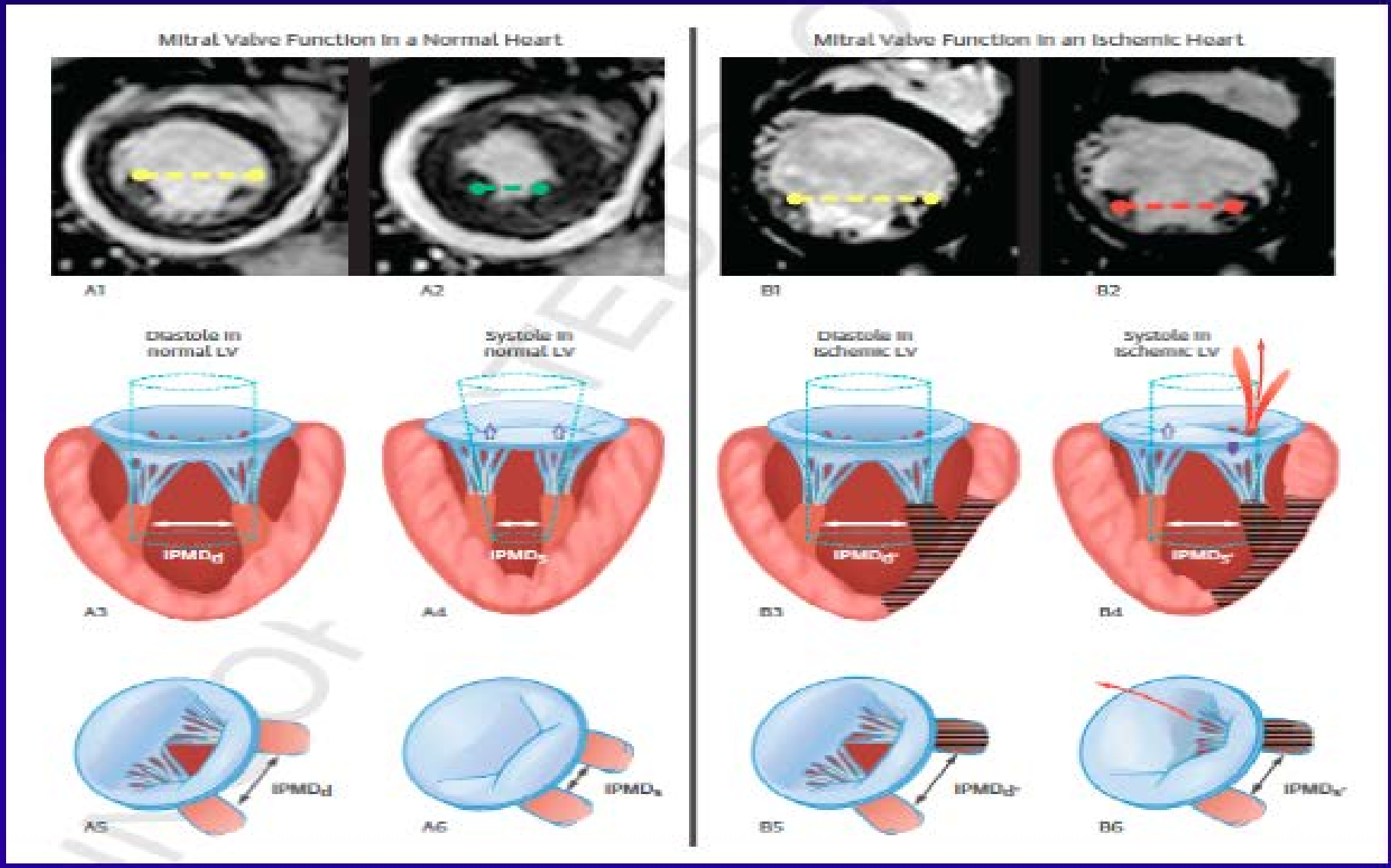
Coaptation Depth Correlates with Ischemic MR





Nagasaki M, et al. Int J Cardiol. 2006 Apr 4;108(2):171-6

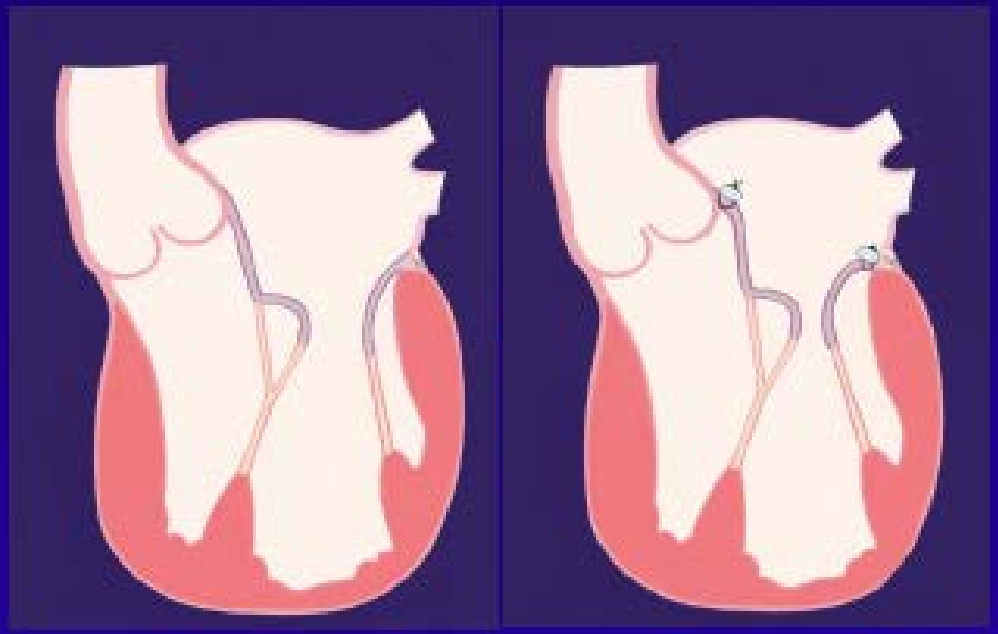
Inter-papillary muscle: Dynamics and IMR

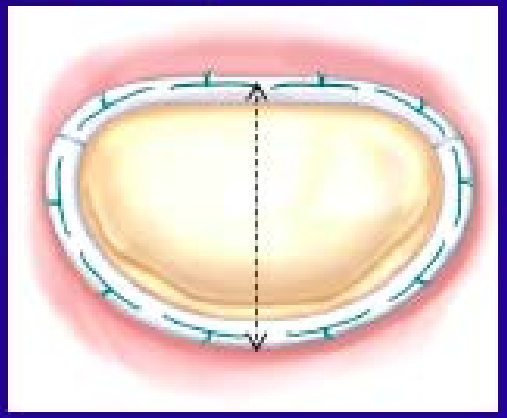


Karla…Thourani, JACC 2015

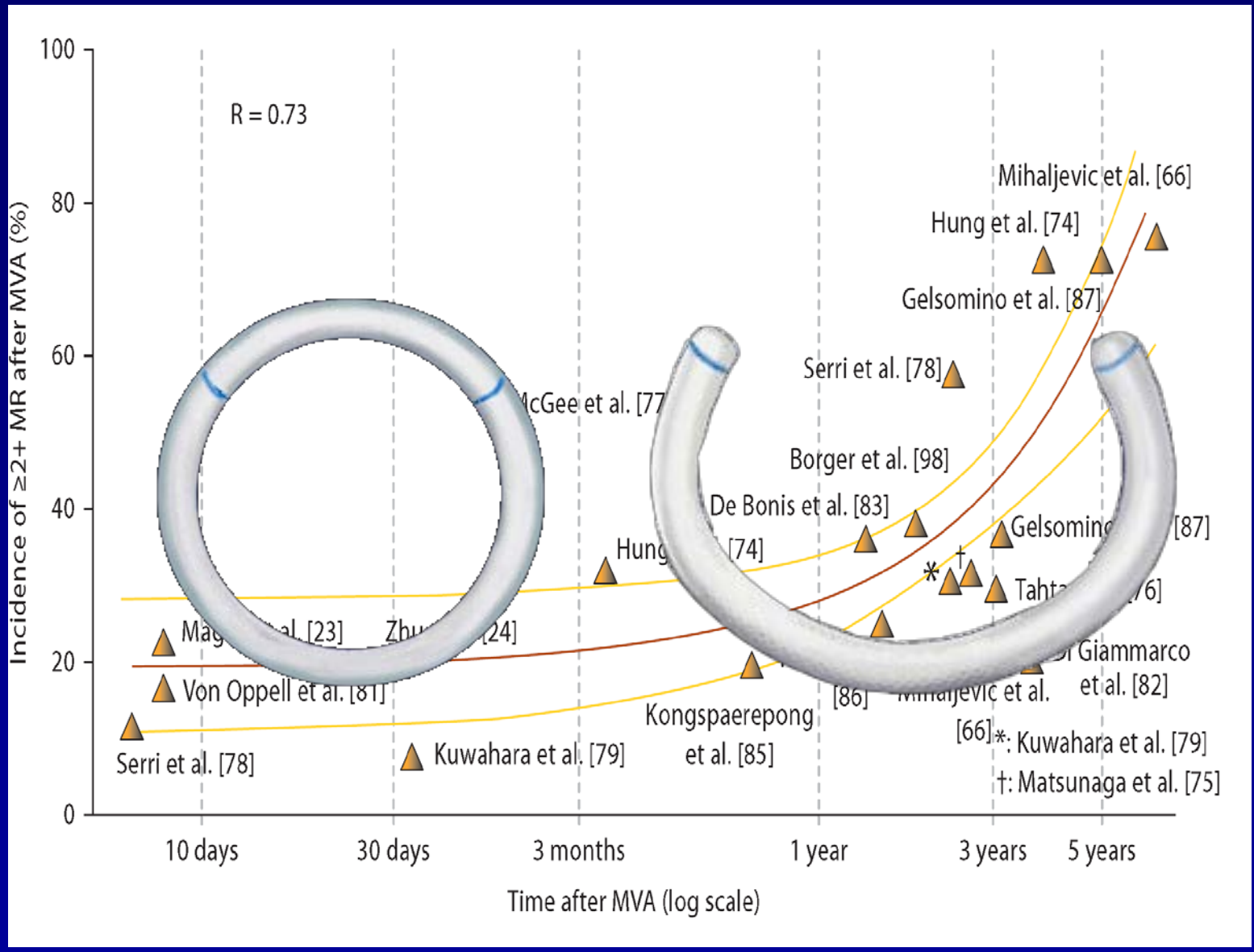
Mitral Annuloplasty for IMR

Current Standard of Care



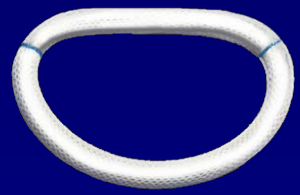


- Annular approach to restoring valve competence
- Sub-valvular tethering or leaflet tenting persist even after annuloplasty
- 40% patients develop recurrent IMR within 3 years of surgery



Magne J, et al. Cardiology 2009;112:244-259

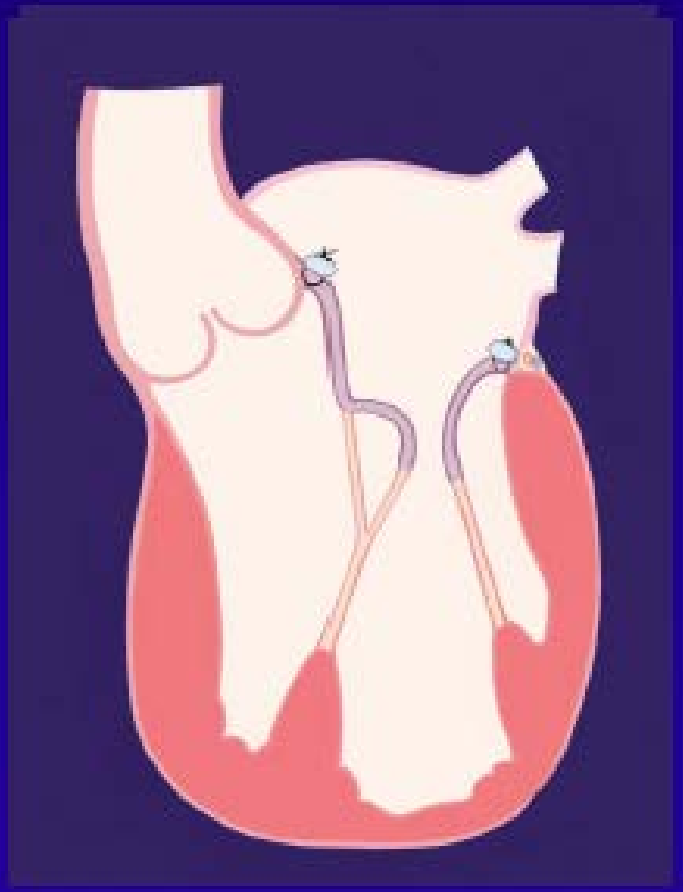
Restrictive Annuloplasty in Ischemic MR



	Baseline TTE (51 pts)	Intraoperative TEE (51 pts)	3 mo TTE (48 pts)	1.5 y TTE (45 pts)	*P*
MR, grade	3.4±0.6	0.2±0.4	0.4±0.3	0.8±0.8	<0.001
LA, mm	53±8	—	51±8	47±7	<0.001
LVEDD, mm	64±8	—	61±9	58±11	<0.001
LVESD, mm	51±10	—	48±10	43±12	<0.001
Coaptation, cm	—	0.8±0.2	0.8±0.1	0.8±0.2	NS
Transmitral grade (mm Hg)	—	2.7±0.6	2.5±0.4	2.4±0.6	NS
MVA (cm2)	—	2.6±0.8	—	—	—

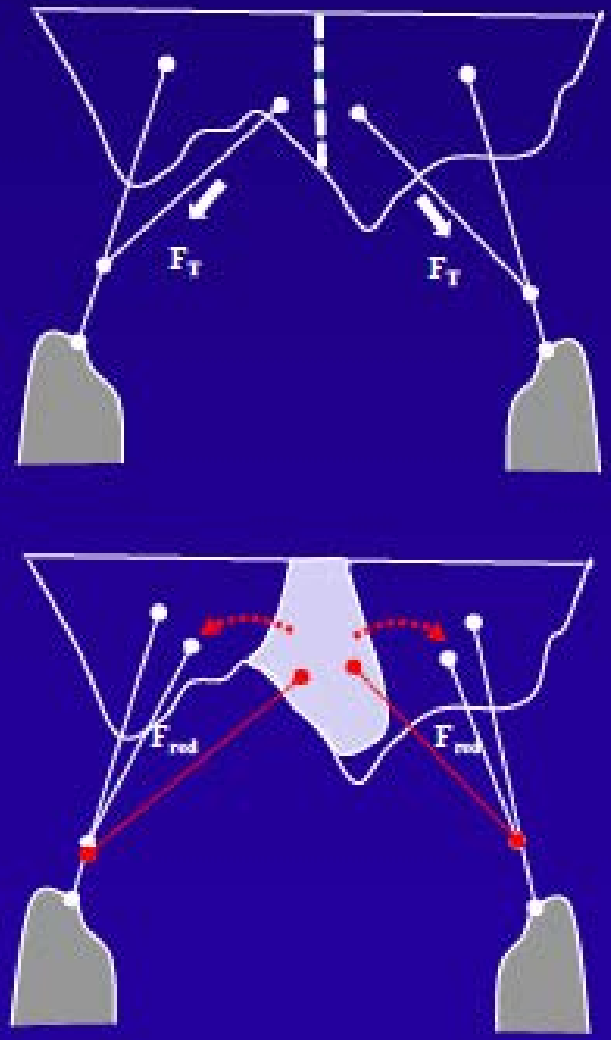
Bax JJ, et al. Circulation 2004;110[suppl II]II-103-II-108

Secondary Chordal Cutting for IMR



- Addresses sub-valvular tethering
- Transect strut chordae to restore leaflet coaptation and valve closure
- Does chordal cutting relieve tethering over entire leaflet or is it anatomy dependent?
- How do the chordal forces redistribute after chordal cutting?

Patch Augmentation to Improve Leaflet Kinematics



Tethered Leaflet

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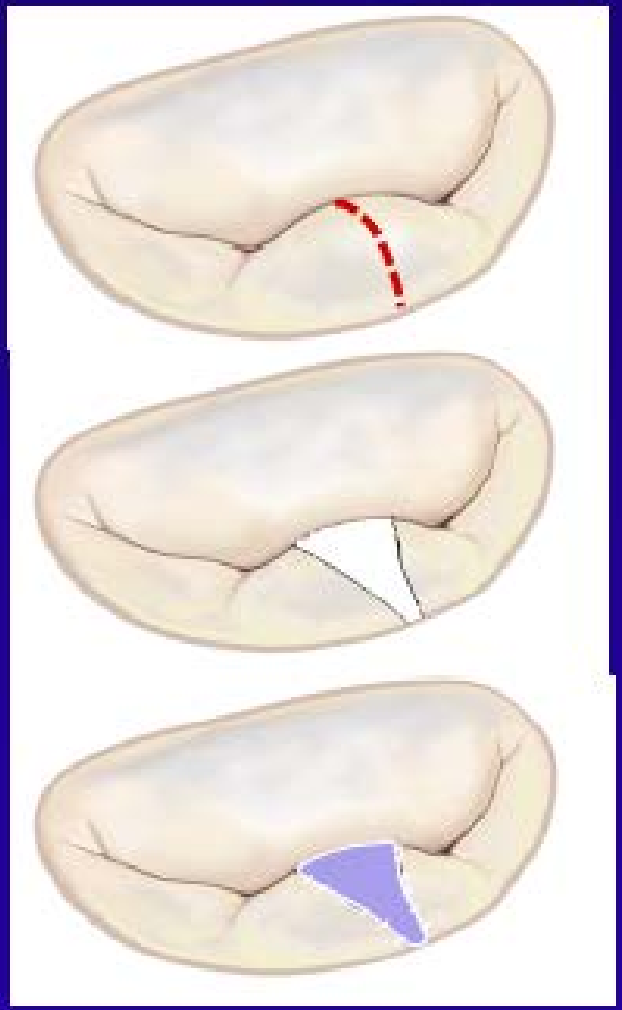
Central Incision to Allow Leaflet to Attain "Stress Free" State

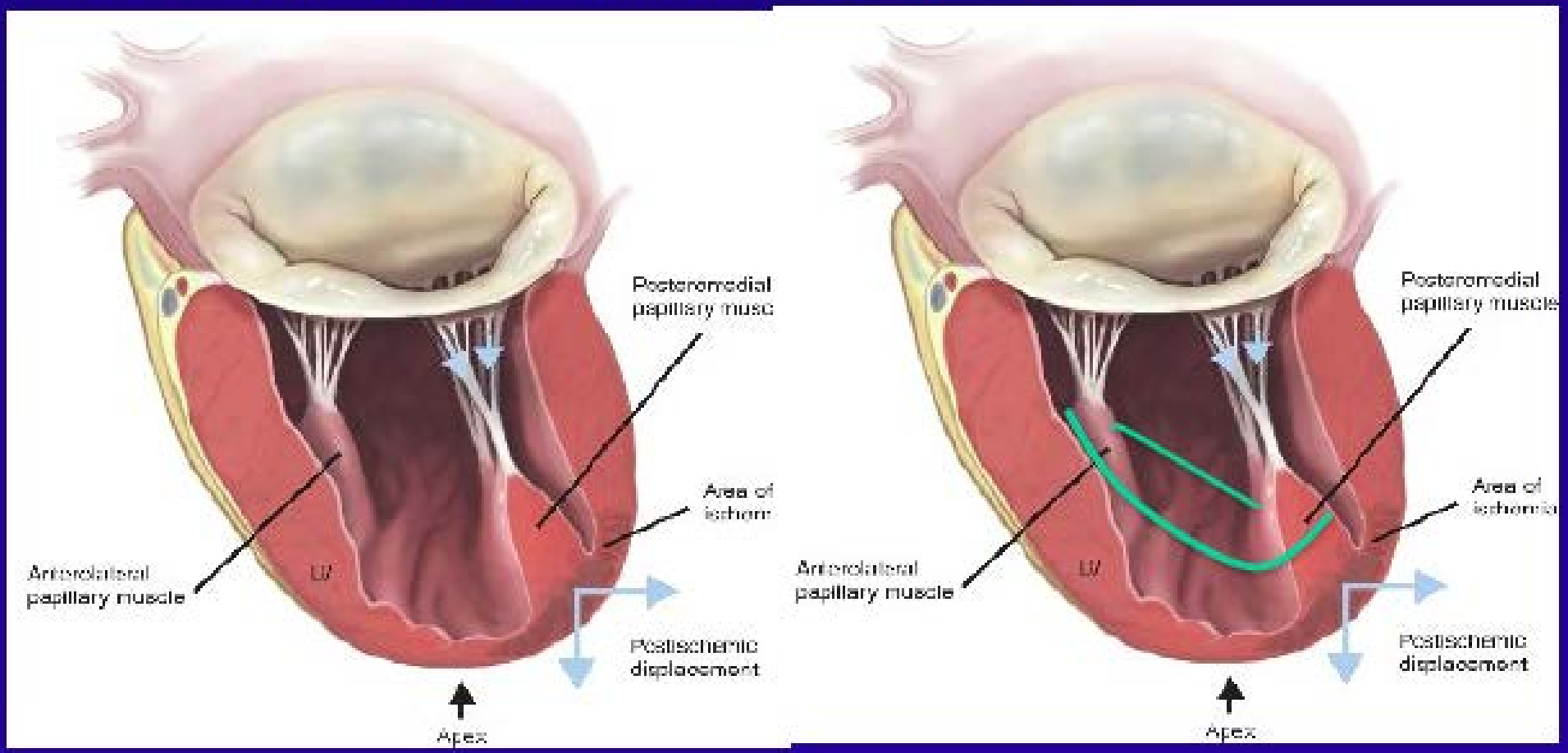
↓

Patch Augmentation to the Shape of the Opening

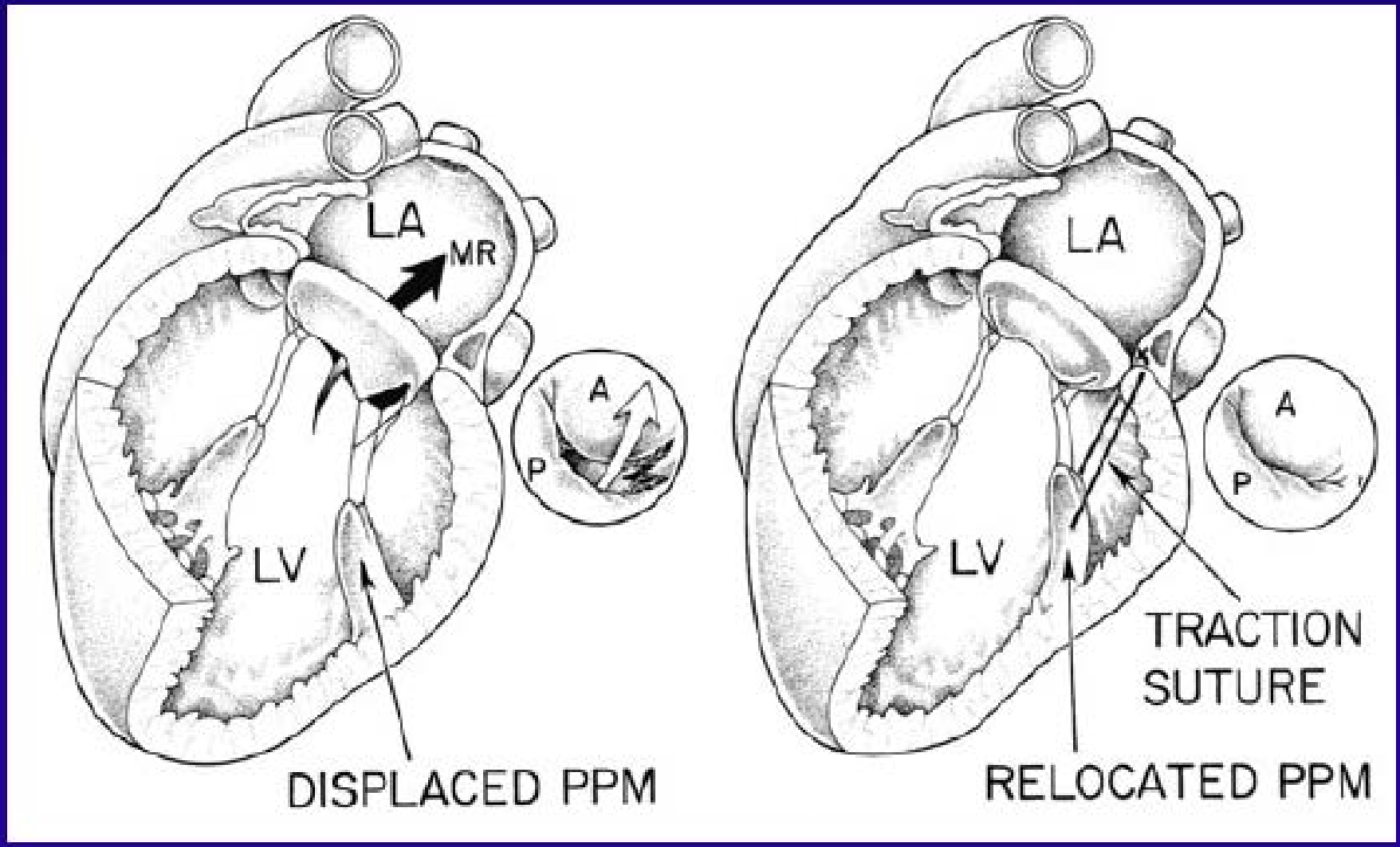


Papillary muscle sling to treat IMR

A papillary muscle sling that reduces inter-papillary muscle distance could restore leaflet motion and coaptation, and eliminate mitral regurgitation



Posterior papillary stitch

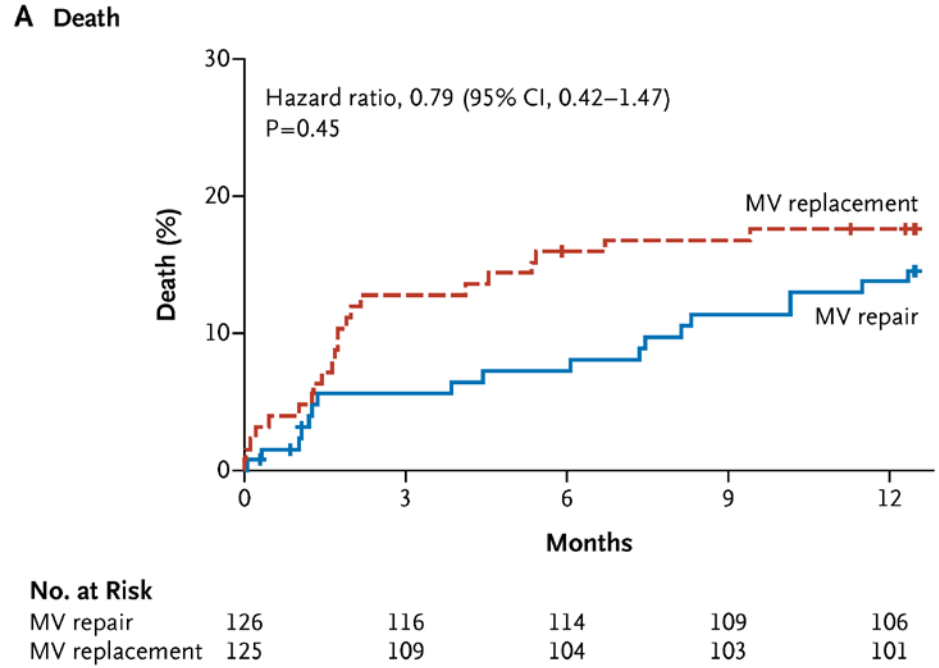


Kron IL, et al ATS 2002; 4:600-1.

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Mitral-Valve Repair versus Replacement for Severe Ischemic Mitral Regurgitation



Acker MA, et al. N Engl J Med 2014;370:23-32

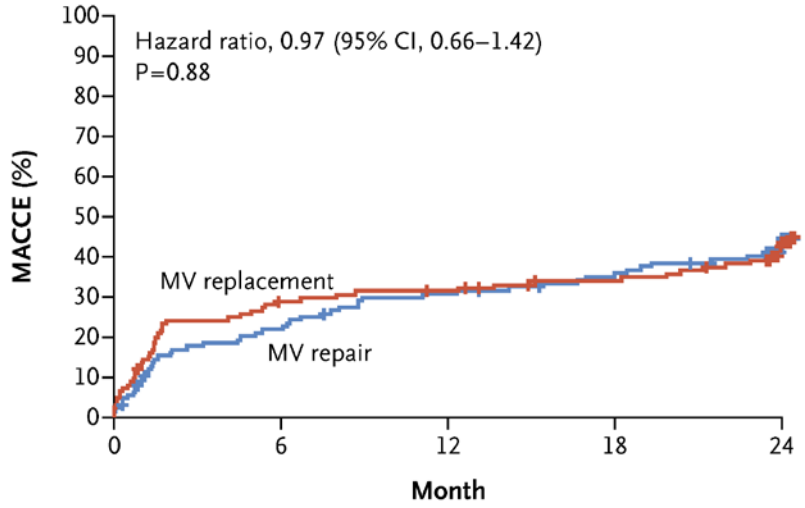
GEORGETOWN UNIVERSITY

MedStar Heart & Vascular Institute

ORIGINAL ARTICLE

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

D. Goldstein, A.J. Moskowitz, A.C. Gelijns, G. Ailawadi, M.K. Parides, L.P. Perrault, J.W. Hung, P. Voisine, F. Dagenais, A.M. Gillinov, V. Thourani, M. Argenziano, J.S. Gammie, M. Mack, P. Demers, P. Atluri, E.A. Rose, K. O'Sullivan, D.L. Williams, E. Bagiella, R.E. Michler, R.D. Weisel, M.A. Miller, N.L. Geller, W.C. Taddei-Peters, P.K. Smith, E. Moquete, J.R. Overbey, I.L. Kron, P.T. O'Gara, and M.A. Acker, for the CTSN*



No. at Risk					
MV repair	126	96	84	77	48
MV replacement	125	87	83	76	50

Goldstein D, et al. N Engl J Med 2016;374:344-53

GEORGETOWN UNIVERSITY

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ORIGINAL ARTICLE

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Variable	Repair (N=126)	Replacement (N=125)	P Value*
Clinical end point			
Death	24/126 (19.0)	29/125 (23.2)	0.42
Stroke	10/126 (7.9)	7/125 (5.6)	0.46
Worsening New York Heart Association class†	5/85 (5.9)	5/84 (6.0)	1.0
Rehospitalization for heart failure	27/126 (21.4)	22/125 (17.6)	0.44
Failed index mitral-valve procedure	6/126 (4.8)	0	0.03
Mitral-valve reoperation	4/126 (3.2)	1/125 (0.8)	0.37
Moderate or severe recurrent mitral regurgitation	57/97 (58.8)	3/79 (3.8)	<0.001
MACCE‡	53/126 (42.1)	53/125 (42.4)	0.96
Canadian Cardiovascular Society class III or IV	4/82 (4.9)	0/80	0.19
	no. of events (rate/100 patient-yr)		

Goldstein D, et al. N Engl J Med 2016;374:344-53

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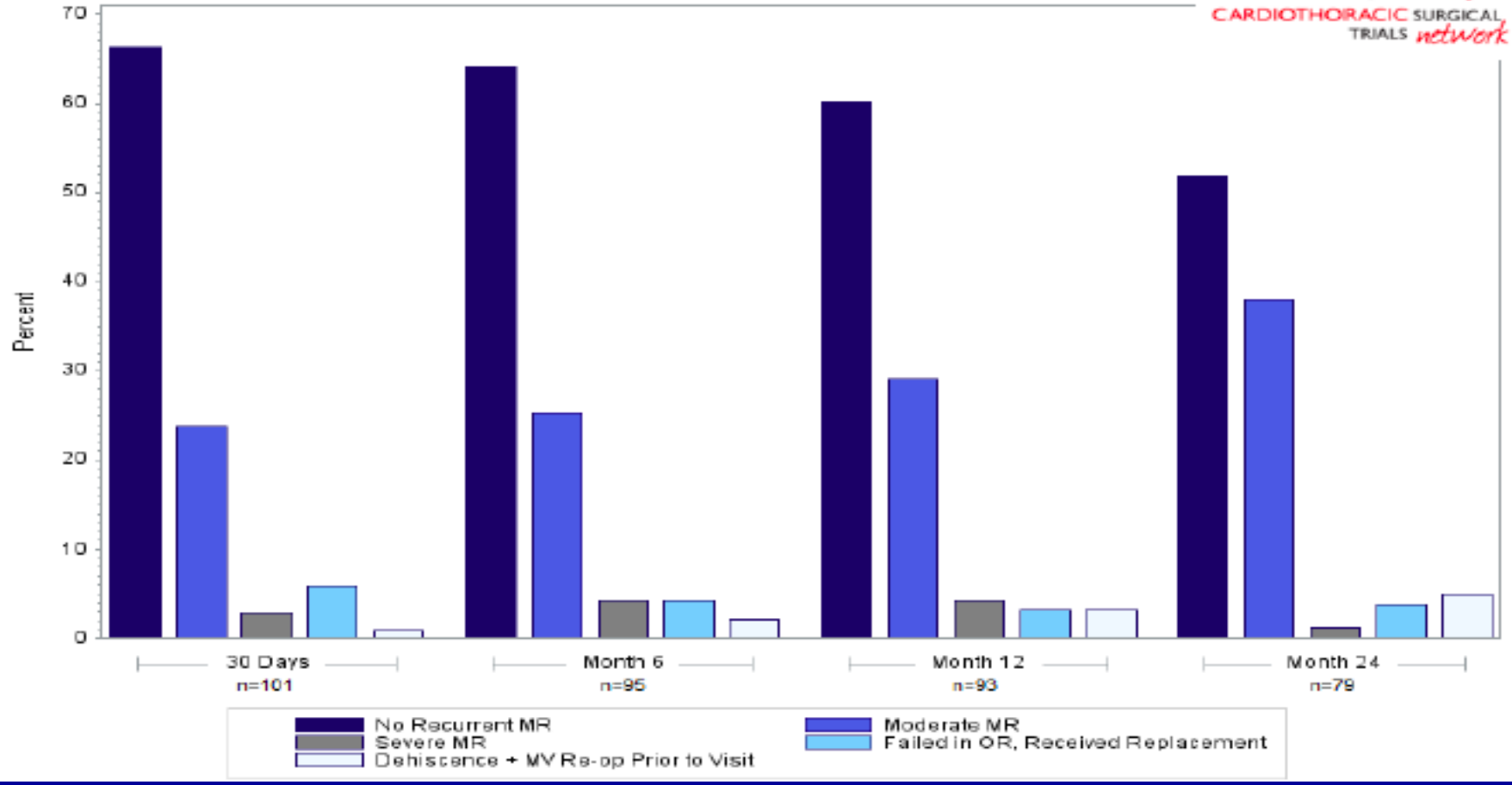
Moderate/severe MR by TTE assessment in surviving pts at 30 days, 6, 12 and 24 months

CTSN CARDIOTHORACIC SURGICAL TRIALS network



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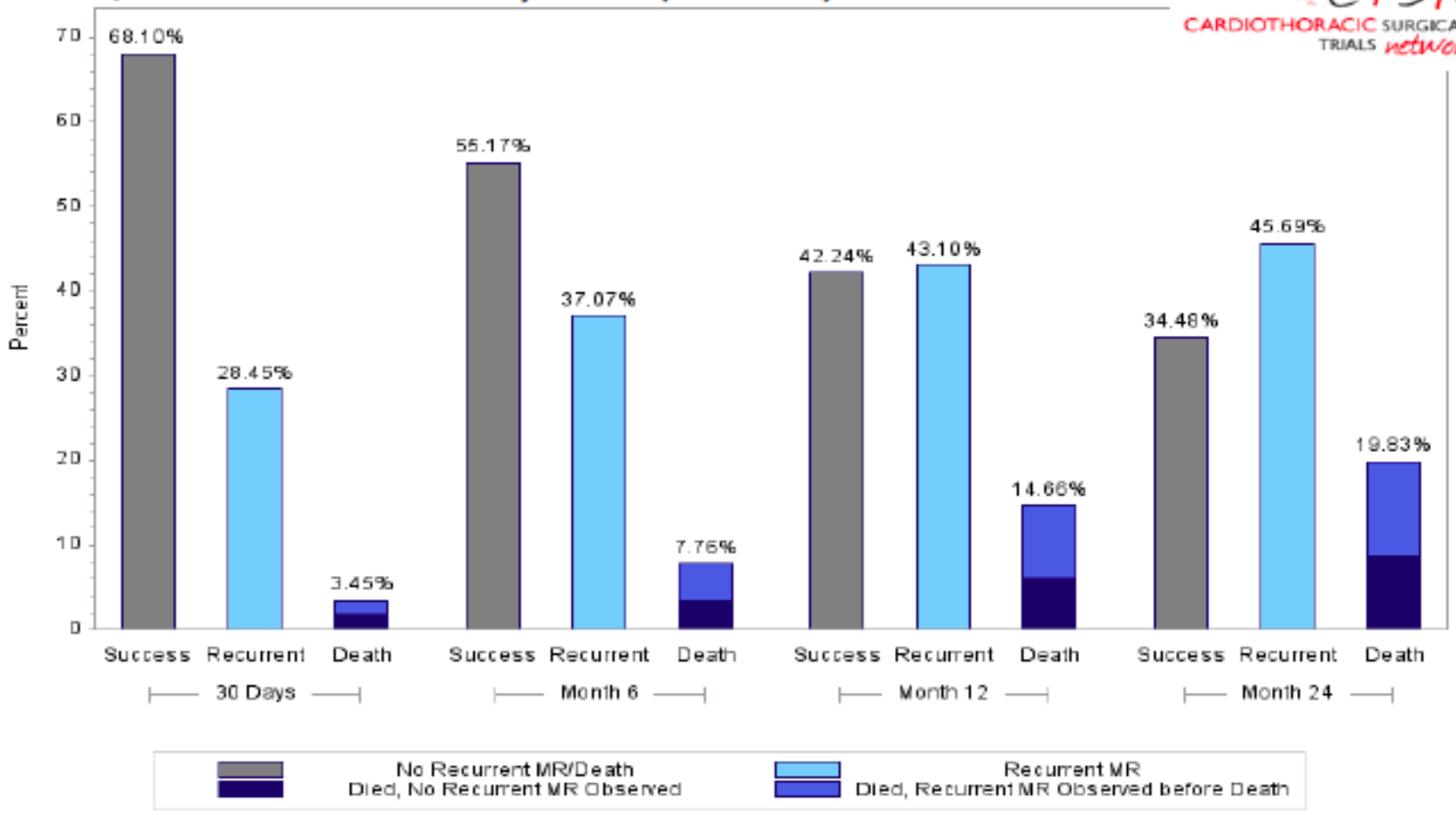
Cumulative incidence of MR recurrence and/or death over 2 years (n=116)

CTSN CARDIOTHORACIC SURGICAL TRIALS network



Conclusions

- About 30% of patients had moderate/severe at 1 month post-op
- By 24 months 46% of surviving patients experience moderate or severe MR
- Little progression of mod MR to severe
- Progression to mod MR and even severe is dynamic and in about 10% pts is reversible at different time points
- Basal aneurysm/dyskinesis is strongly associated with MR recurrence
- Model needs validation but appears promising for predicting pts at high risk
- These pts better treated with replacement or more complex repair techniques

Predicting recurrent mitral regurgitation after mitral valve repair for severe ischemic mitral regurgitation

Irving L. Kron, MD,[a] Judy Hung, MD,[b] Jessica R. Overbey, MS,[c] Denis Bouchard, MD,[d] Annetine C. Gelijns, PhD,[c] Alan J. Moskowitz, MD,[c] Pierre Voisine, MD,[e] Patrick T. O'Gara, MD,[f] Michael Argenziano, MD,[g] Robert E. Michler, MD,[h] Marc Gillinov, MD,[i] John D. Puskas, MD,[j] James S. Gammie, MD,[k] Michael J. Mack, MD,[l] Peter K. Smith, MD,[m] Chittoor Sai-Sudhakar, MD,[n] Timothy J. Gardner, MD,[o] Gorav Ailawadi, MD,[a] Xin Zeng, MD,[b] Karen O'Sullivan, MPH,[c] Michael K. Parides, PhD,[c] Roger Swayze, RN, BSN,[h] Vinod Thourani, MD,[j] Eric A. Ros[illegible], Louis P. Perrault, MD,[d] and Michael A. Acker, MD,[p] for the CTSN Investigators

ABSTRACT

Objectives: The Cardiothoracic Surgical Trials Network recently reported no difference in the primary end point of left ventricular end-systolic volume index at 1 year postsurgery in patients randomized to repair (n = 126) or replacement (n = 125) for severe ischemic mitral regurgitation. However, patients undergoing repair experienced significantly more recurrent mitral regurgitation than patients undergoing replacement (32.6% vs 2.3%). We examined whether baseline echocardiographic and clinical characteristics could identify those who will develop moderate/severe recurrent mitral regurgitation or die.

Methods: Our analysis includes 116 patients who were randomized to and received mitral valve repair. Logistic regression was used to estimate a model-based probability of recurrence or death from baseline factors. Receiver operating characteristic curves were constructed from these estimated probabilities to determine classification cut-points maximizing accuracy of prediction based on sensitivity and specificity.

Results: Of the 116 patients, 6 received a replacement before leaving the operating room; all other patients had mild or less mitral regurgitation on intraoperative echocardiogram after repair. During the 2-year follow-up period, 76 patients developed moderate/severe mitral regurgitation or died (53 mitral regurgitation recurrences,

Basal aneurysm/dyskinesis is an important predictor of recurrent MR after ischemic MR repair.

Central Message

Using data from the CTSN severe ischemic MR trial, we developed a model to predict MR recurrence in MV repair patients. This exploratory model, based on baseline clinical and echocardiographic characteristics, showed good discrimination (area under ROC = 0.82) in identifying those patients who survived 2 years without recurrent ischemic MR.

ACD

Kron IL, et al. J Thorac Cardiovasc Surg 2015;149:752-

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Author Perspective

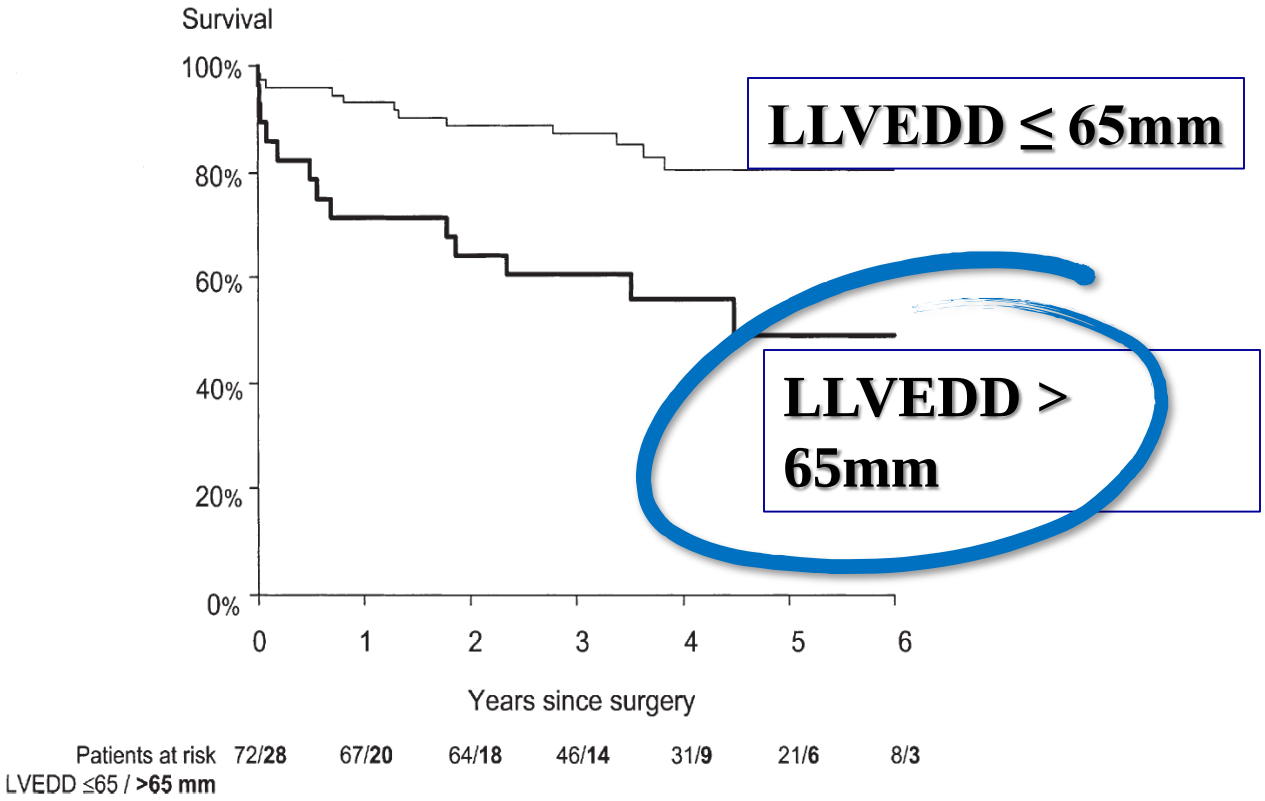
The severe ischemic MR trial showed equivalent clinical outcomes for patients undergoing mitral-valve replacement and repair. One distinction between the groups was that a third of the repair patients developed moderate/severe MR within a few months of the surgery. Among survivors, those with most improved ventricular dimensions were repair patients, who did not experience recurrence. We analyzed factors that led to recurrence and developed a 10-factor exploratory model that predicted this outcome. Our results offer a better understanding of when repair will be successful and of mechanisms of failure that may lead to more innovative repair techniques.

ACD

Kron IL, et al. J Thorac Cardiovasc Surg 2015;149:752-

Restrictive Mitral Annuloplasty Cures Ischemic Mitral Regurgitation and Heart Failure

Jerry Braun, MD, Nico R. van de Veire, MD, Robert J. M. Klautz, MD, PhD, Michel I. M. Versteegh, MD, Eduard R. Holman, MD, PhD, Jos J. M. Westenberg, PhD, Eric Boersma, PhD, Ernst E. van der Wall, MD, PhD, Jeroen J. Bax, MD, PhD, and Robert A. E. Dion, MD, PhD



Braun J, et al. Ann Thorac Surg 2008;85

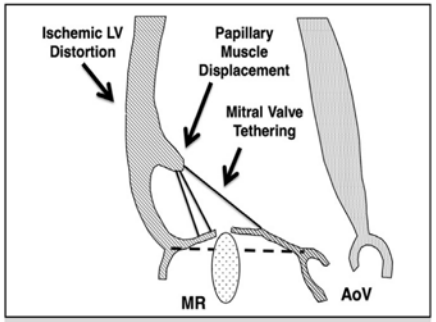
Ischemic MR: Repair or Replace?

- Complete MV ring for repair in IMR
- Caution: basilar aneurysm
- Caution: large ventricular dimension
- Caution: severe leaflet tethering

ACQ

2016 update to The American Association for Thoracic Surgery (AATS) consensus guidelines: Ischemic mitral valve regurgitation

AATS Ischemic Mitral Regurgitation Consensus Guidelines Writing Committee: Irving L. Kron, MD,[a] Damien J. LaPar, MD, MSc,[a] Michael A. Acker, MD,[b] David H. Adams, MD,[c] Gorav Ailawadi, MD,[a] Steven F. Bolling, MD,[d] Judy W. Hung, MD,[e] D. Scott Lim, MD,[f] Michael J. Mack, MD,[g] Patrick T. O'Gara, MD,[h] Michael K. Parides, PhD,[i] and John D. Puskas, MD[c]



Illustrated mechanism of ischemic mitral regurgitation. Apically displaced leaflet coaptation with restricted leaflet closure results in mitral regurgitation.

Central Message

This contribution provides an update to the 2015 AATS evidence-based guidelines for the management of ischemic mitral regurgitation.

See Editorial Commentary page 1080.

Kron IL et al. J Thorac Cardiovasc Surg 2017;153:e97-

2016 AATS Guidelines

Severe Ischemic MR

A. MV replacement is reasonable in patients with severe IMR who remain symptomatic despite guideline directed medical and cardiac device therapy, and who *have* a basal aneurysm/dyskinesis, significant leaflet tethering, and/or severe LV dilation (LVEDD >6.5 cm) (COR IIa, LOE B).

B. MV repair with an undersized complete rigid annuloplasty ring may be considered in patients with severe IMR who remain symptomatic despite guideline directed medical and cardiac device therapy and who *do not have* a basal aneurysm/dyskinesis, significant leaflet tethering, or severe LV enlargement (COR IIb, LOE B).

Mitral Valve Replacement (MVR) vs Repair

A. MVR for IMR is performed with complete preservation of both anterior and posterior leaflet chords (COR I, LOE B).

B. MV repair for IMR is performed with small undersized complete rigid annuloplasty ring (COR IIa, LOE B).

Kron IL et al. J Thorac Cardiovasc Surg 2017

Conclusions

- IMR is a complex medical/surgical phenomenon which is incompletely understood
- There remains a multitude of available treatment strategies including:
  - medical/heart failure therapy
  - Surgical ring or replacement
  - Subannular therapy with papillary approximation therapies
- It is probable that MV Replacement provides a more durable correction of severe IMR compared to MV repair
- The most optimal therapy will be a multi-disciplinary heart team approach

Thank You

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