

MHIF Research Highlights: APRIL 2020

Shout Out to Dr. Santiago Garcia

... for contributions to research related to STEMI and COVID-19

PI for North American COVID-19 ST-Segment Elevation Myocardial Infarction Registry (NACMI)

- Established to characterize this population demographically and clinically with the goal of developing data-driven treatment plans, guidelines and diagnostic acumen; MHIF is international coordinating center for SCAI/CAIC collaborative effort

Published in JACC: Preliminary data from analysis for regional STEMI programs (data from nine participating US Centers)

- Preliminary analysis during COVID-19 pandemic shows 38% reduction in US cath lab STEMI activations; consistent with reduction reported in Spain

WAY TO COLLABORATE...

Dr. Steven Bradley is on National Steering Committee for American Heart Association COVID-19 Registry and is MHI site PI

- Gathering US patient data to understand cardiovascular impact of COVID-19; MHIF will be helping with data abstraction

Thanks for your support...

MHIF International Scholar Dr. Yu Du presented at 4/6 Grand Rounds sharing knowledge and experience with COVID-19 from his home province in China

Dr. Christina Thaler shared her ACC 2020 presentation from the MHIF SCAD registry on treatment strategies as we work to close the gap on women's heart health research!

MHIF Research Tiger Team (Carina Benson, Jake Jensen, Andrew Nauertz, Alyssa Taffe, Lisa Tindell, Kari Williams) is ready to support the Hemolung study with 24/7 onsite research team coverage!

Dr. Courtney Baechler shared perspective on the importance of mind, body and heart health as we stay connected with friends of MHIF with our heart gram communication effort!



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MHIF FEATURE:

Emergency Use of the Hemolung Device

CONDITION: Emergency Use of ECCO2R	MD: Romiro Saavedra-Romero, MD	RESEARCH CONTACT: Kari Williams kari.Williams@allina.com Carina Benson carina.benson@allina.com	MANUFACTURER: ALung Technologies, Inc.
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DESCRIPTION:

As we are preparing for a potential surge in ICU patients as COVID-19 penetrates the community, it is our hope that extracorporeal carbon dioxide removal (ECCO2R) could be use in any hypercapnic respiratory failure syndrome and in patients with acute respiratory distress syndrome (ARDS) to facilitate instituting lung protective ventilation.

CONSIDERATION TO USE ECCO2R MAY BE:

- pH <7.20 from hypercapnia, and/or
- Plateau pressure >30 cm H20 or driving pressure >15 cm H2) despite optimization of mechanical ventilation.

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Mitral Valve Surgery

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April 13, 2020



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- No financial disclosures



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Outline

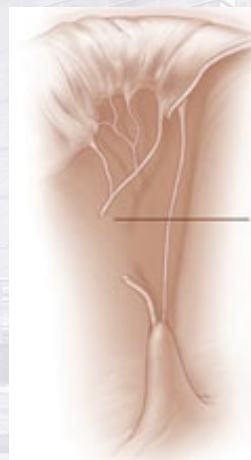
- What is the natural history of medically-treated, asymptomatic, severe degenerative mitral regurgitation?
- What should the mitral valve repair rate be for degenerative mitral regurgitation at MHI?
- What value does alternate access add to a valve surgery program?



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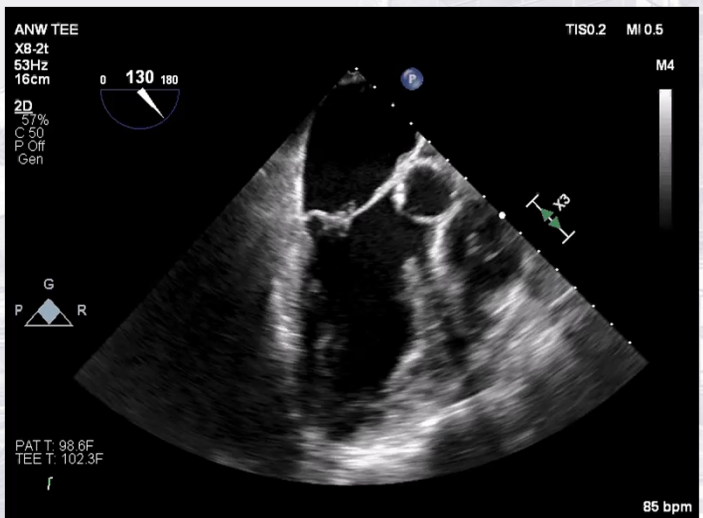
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Posterior Leaflet Prolapse/ Flail

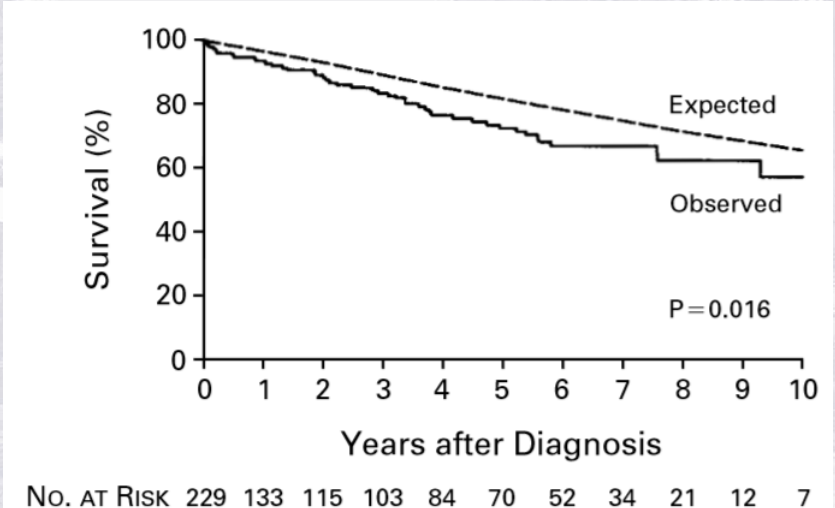


Verma, et al. NEJM 2019

Degenerative/ Primary MR



Medically-treated flail MR



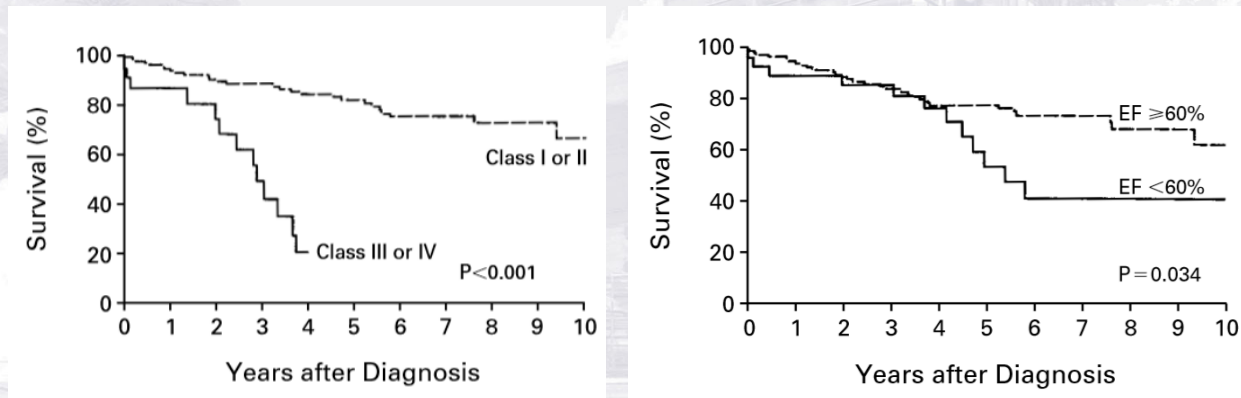
Ling L, Sarano M, et al. NEJM 1996



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Medically-treated flail MR



Ling L, Sarano M, et al. NEJM 1996



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Medically-treated flail MR

- Mortality
 - 6.3%/year
 - 4.1%/year for NYHA I/II

Ling L, Sarano M, et al. NEJM 1996



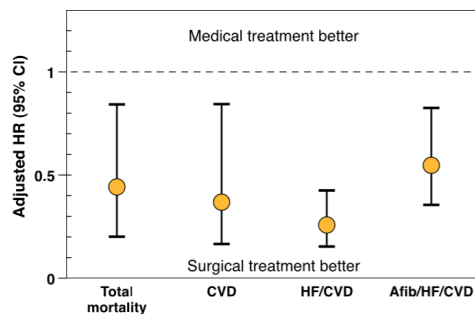
MIDA Registry- Medical Treatment

- New-onset AF 5.4%/yr
- HF 8.0%/yr
- Mortality 2.6%/yr
- AF/HF/CV mortality 12.4%/yr

Grigioni, Sarano, et al. JACC 2008



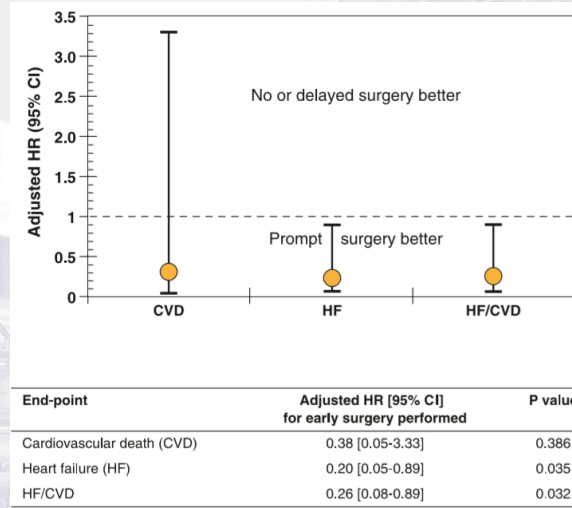
MIDA Registry



End-point	Adjusted HR [95% CI] for MV surgery performed	P value
Total mortality	0.42 [0.21-0.84]	0.014
CVD	0.37 [0.17-0.84]	0.018
Heart failure (HF)/CVD	0.26 [0.16-0.42]	<0.001
Atrial fibrillation (Afib)/HF/CVD	0.54 [0.36-0.82]	0.003

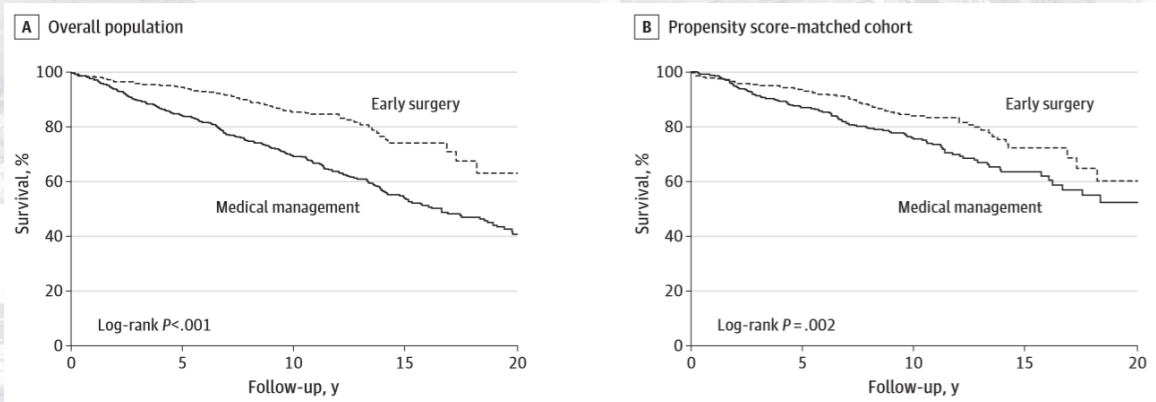
Grigioni, Sarano, et al. JACC 2008

MIDA Registry- Asymptomatic



Grigioni, Sarano, et al. JACC 2008

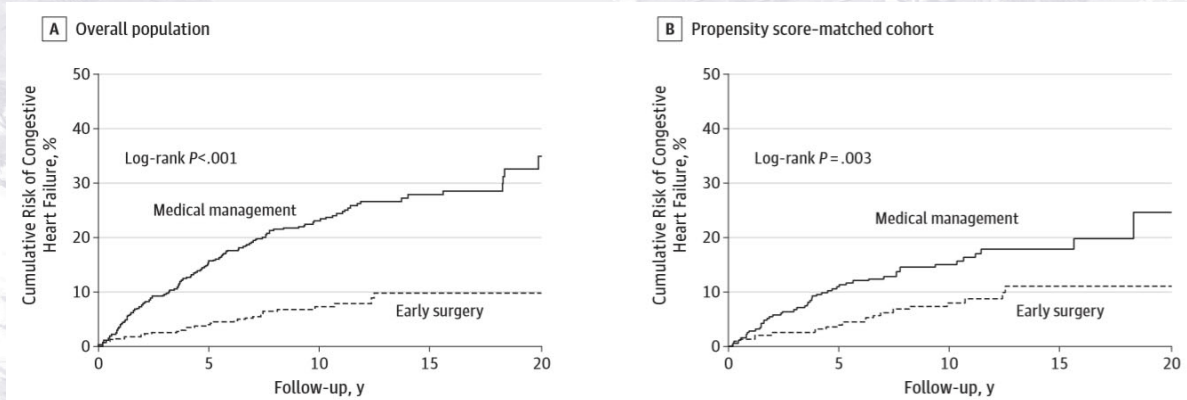
Asymptomatic, Normal LV Function



Suri, Sarano et al. JACC 2013



Asymptomatic, Normal LV Function

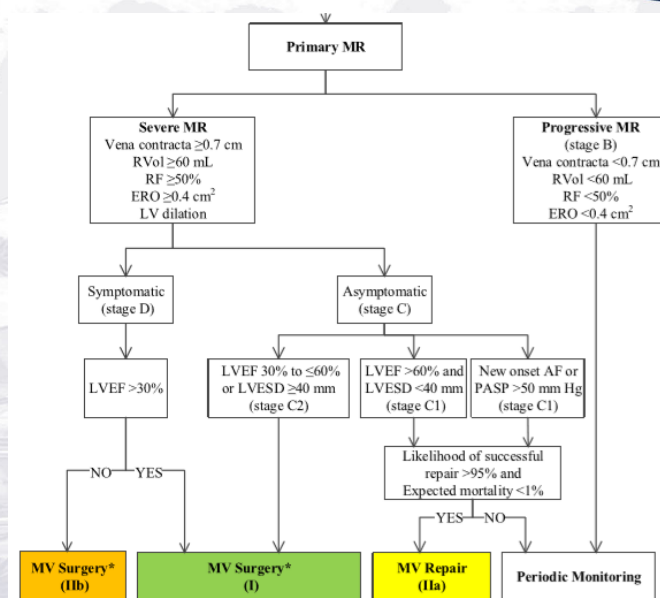


Suri, et al. JACC 2013



Medically-treated, Asymptomatic, Severe Degenerative MR

- Lethal
- Causes heart failure
- Early surgery improves survival, preserves ventricular function



Nishimura, et al. JACC 2014



Repairable valves

- Preserve leaflet mobility
- Establish long areas of coaptation
- Remodel the annulus
- What is your desired post-operative result?
 - No more than moderate MR
 - No more than moderate MS
 - No more than trace/mild MR/MS

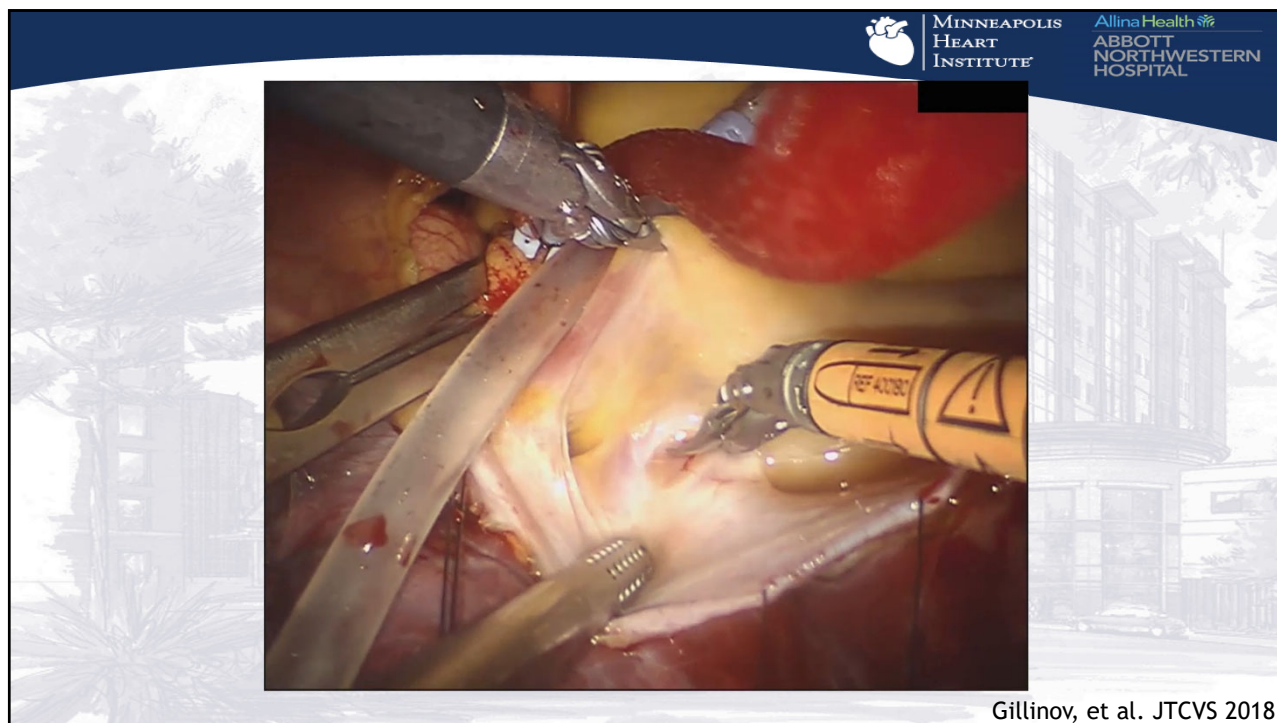


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5 Techniques

- Leaflet resection
- Sliding repair
- Artificial Neochord
- Annuloplasty
- Close commissures

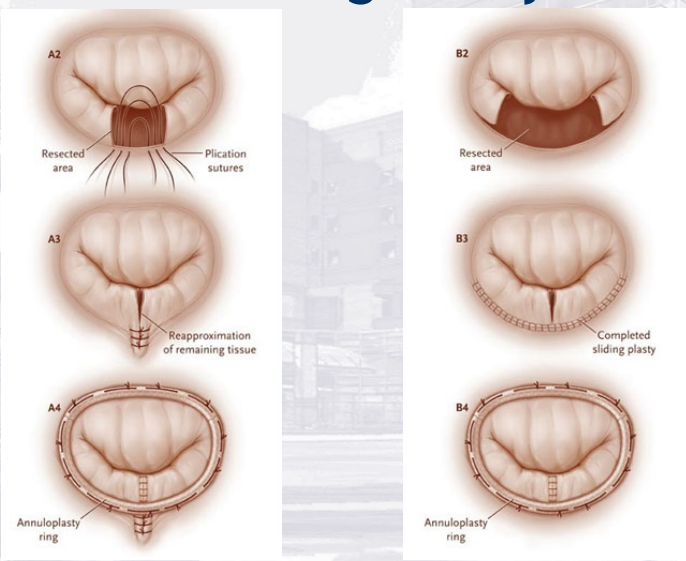


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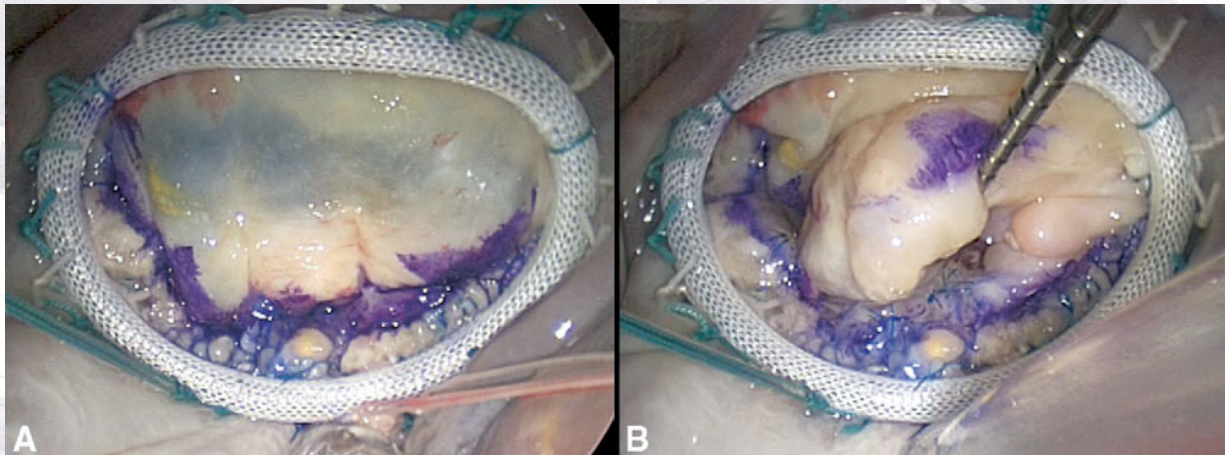
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Gillinov, et al. JTCVS 2018

Sliding Plasty

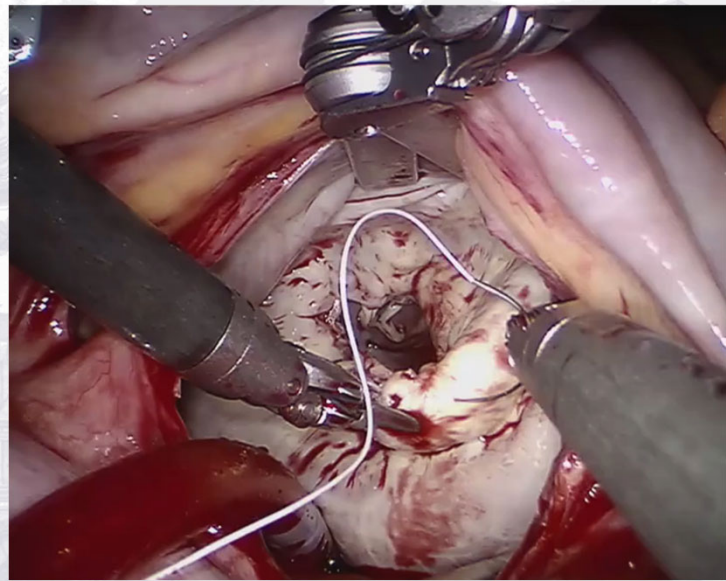


Leaflet Coaptation



Annuloplasty

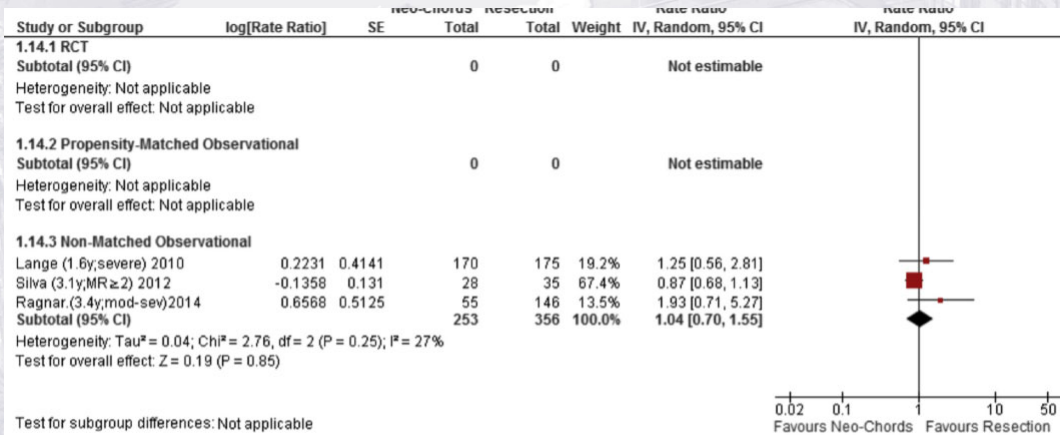
- Partial Band
- Semi Rigid Band
- Complete Rigid Band



Gillinov, et al. JTCVS 2018



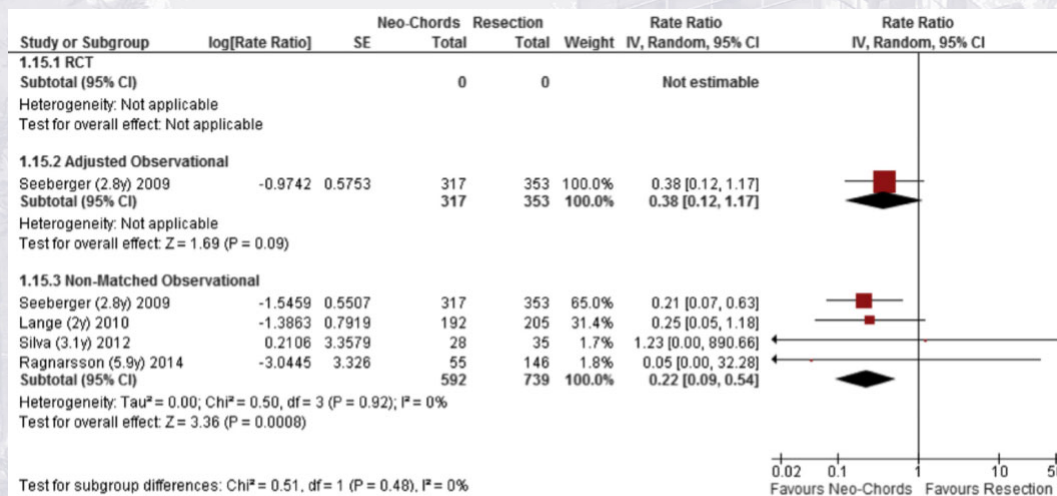
Resection vs Neochord Freedom from mod/severe MR



Mazine, et al. JTCVS 2018



Freedom from MV reintervention



Mazine, et al. JTCVS 2018



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Early rupture of an expanded polytetrafluoroethylene neochord after complex mitral valve repair: An electron microscopic analysis

[Javier G. Castillo, MD^a](#), [Anelechi C. Anyanwu, MD^a](#), [Ahmed El-Eshwaj, MD^a](#), [Ronald E. Gordon, PhD^b](#), [David H. Adams, MD^{a,1}](#)



Adams, et al. JTCVS 2013



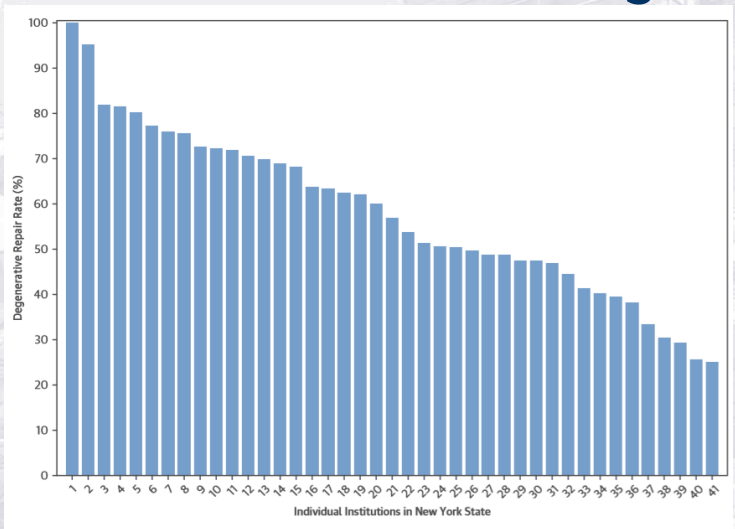
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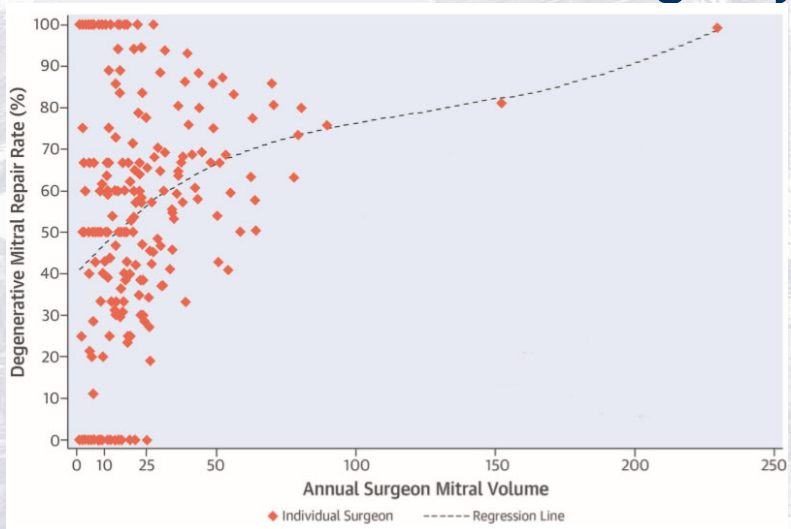
- Chords v Resection
 - Post-op gradient
 - Freedom from moderate MR/ MS
 - Freedom from reintervention

New York State Mitral Registry



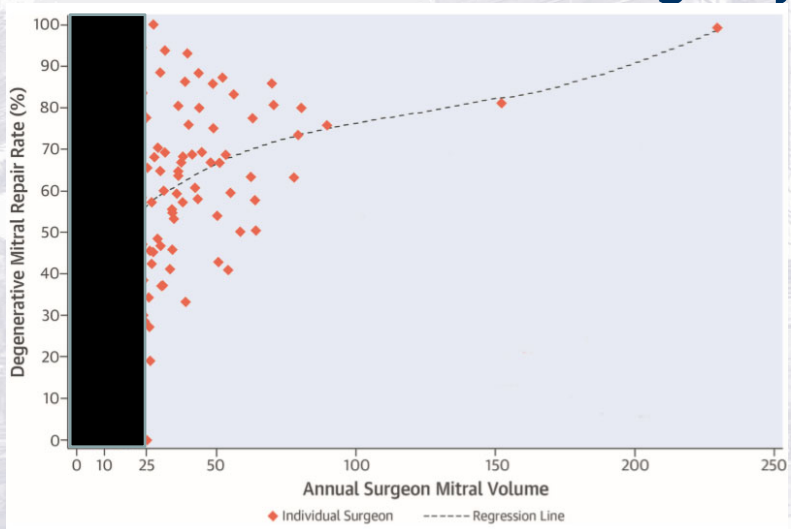
Chikwe, et al. JACC 2017

New York State Mitral Registry



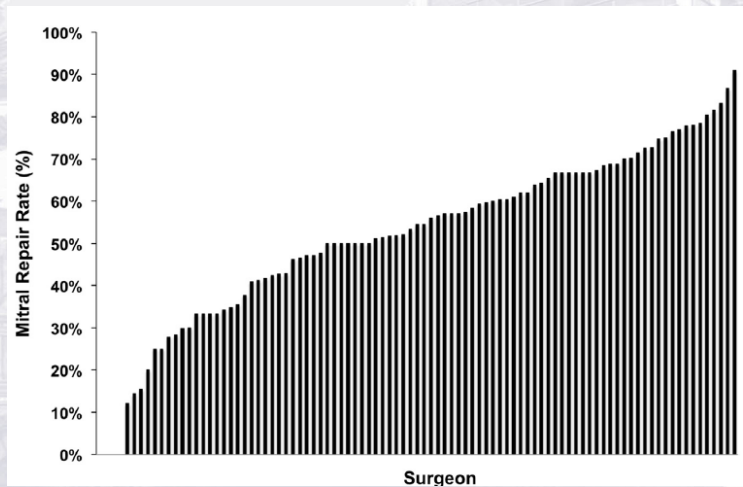
Chikwe, et al. JACC 2017

New York State Mitral Registry



Chikwe, et al. JACC 2017

Virginia Mitral Valve Registry

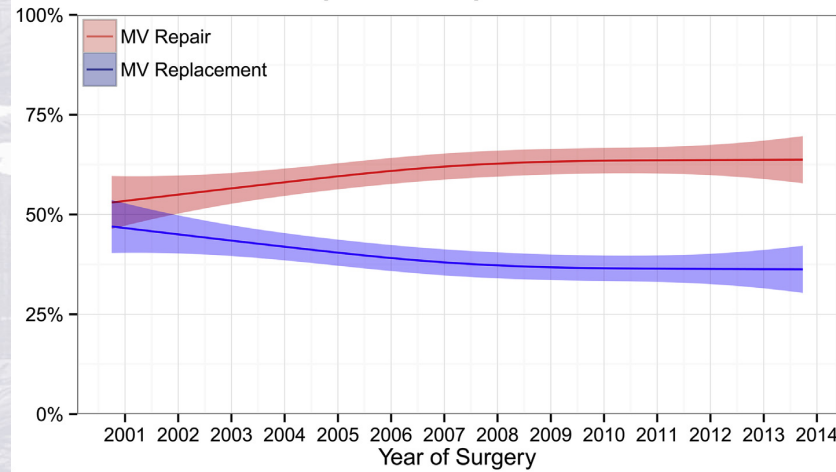


LaPar, et al. JTCVS 2014



VA Mitral Surgery Registry

Secular Trends in MV Repair And Replacement



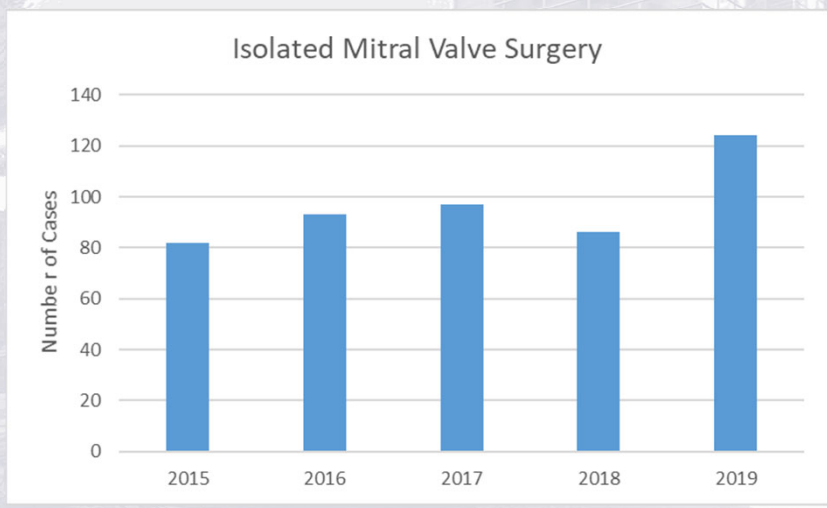
Bakaeen, et al. J Thorac Cardiovasc Surg 2018;155:105-17



What should the MHI Mitral Valve repair rate be?

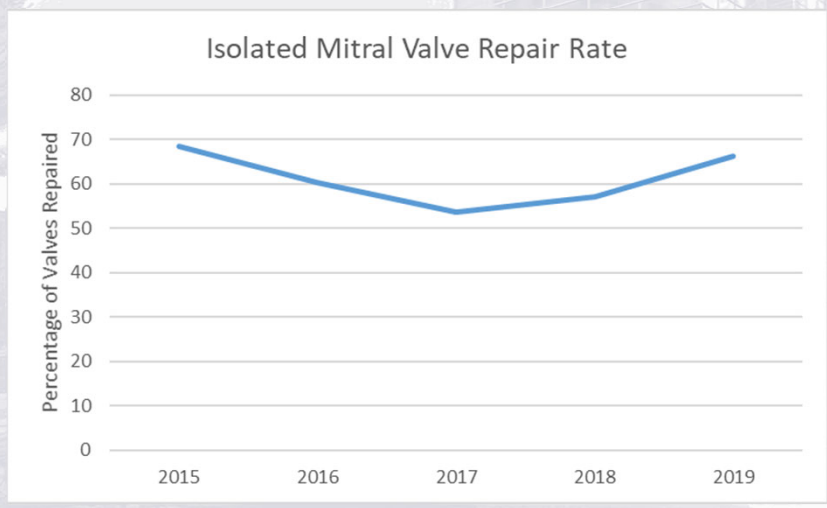
- 50th percentile: 55%
- 75th percentile: 70%
- 90-95th percentile: 80%

MHI Mitral Valve Surgery



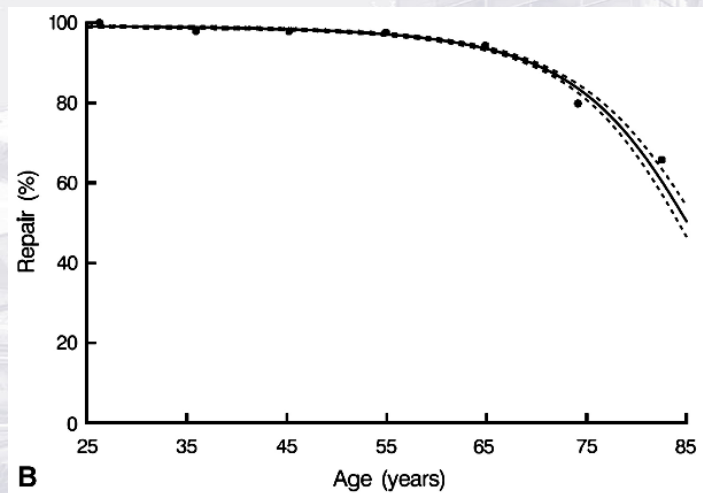
STS Data as of April, 2020

MHI Mitral Repair Rate



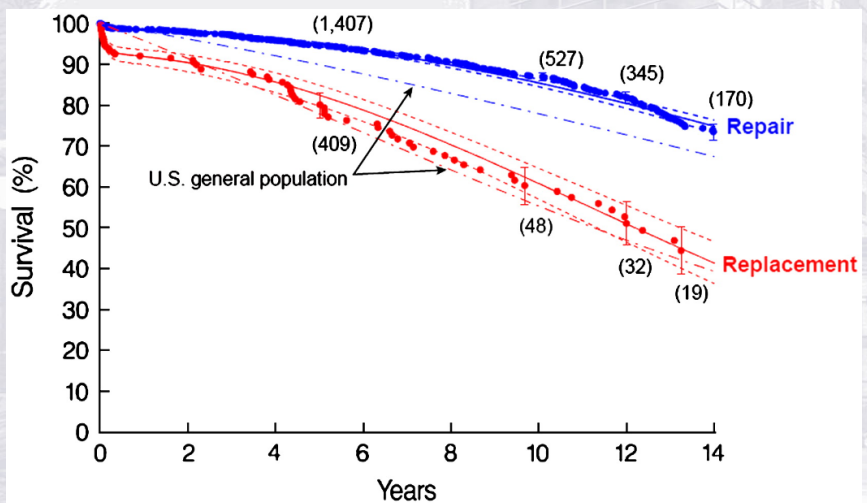
STS Data as of April, 2020

Repair rate for Degenerative MR



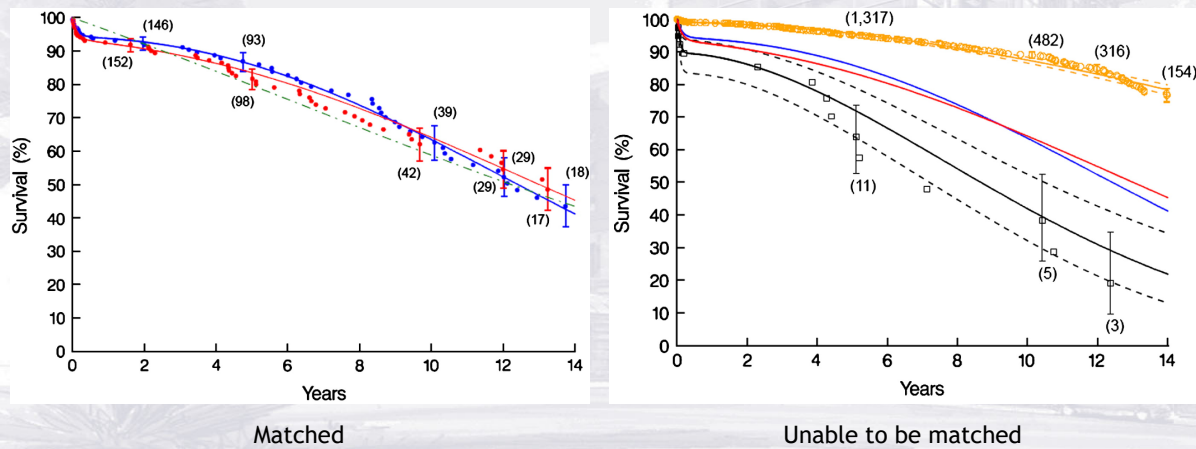
Gillinov, et al. JTCVS 2008

Unadjusted Survival



Gillinov, et al. JTCVS 2008

Propensity Matched



Gillinov, et al. JTCVS 2008

Mitral Repair Rates

- Grignioni (all comers)- Repair rate 82%
- Suri (asymptomatic)- Repair rate 93%
- Gillinov (robotic)- Repair rate 97%



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Who is >95%, can we predict?

- Preoperative imaging (TEE +/- CT)
- Surgical outcome tracking and transparency



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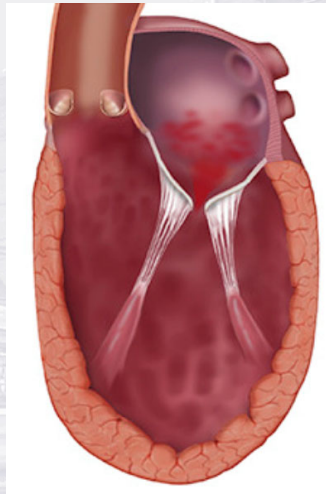
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Special Topics

- Secondary/ Ischemic MR
- Mitral Annular Calcification
- Atrial Fibrillation
- Concomitant Tricuspid Regurgitation



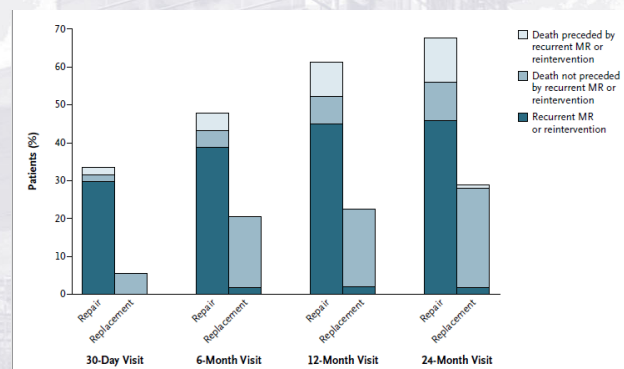
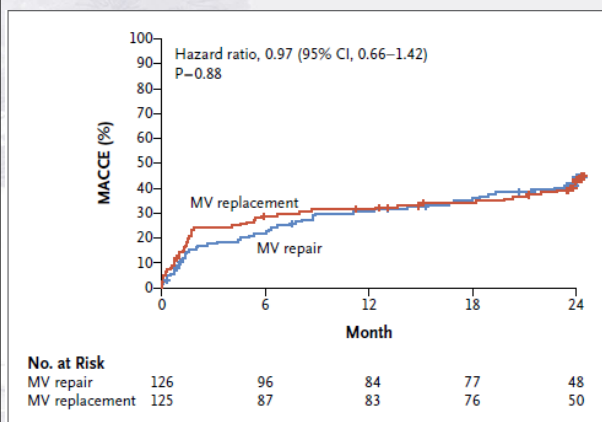
Functional MR



Badhwar, et al. JTCVS 2019

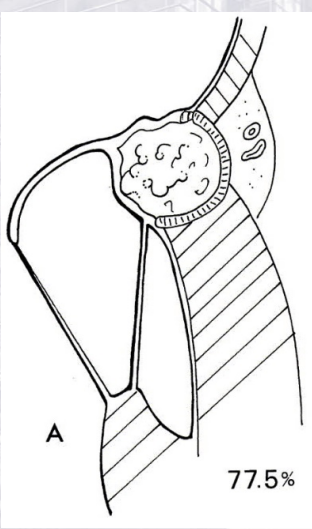
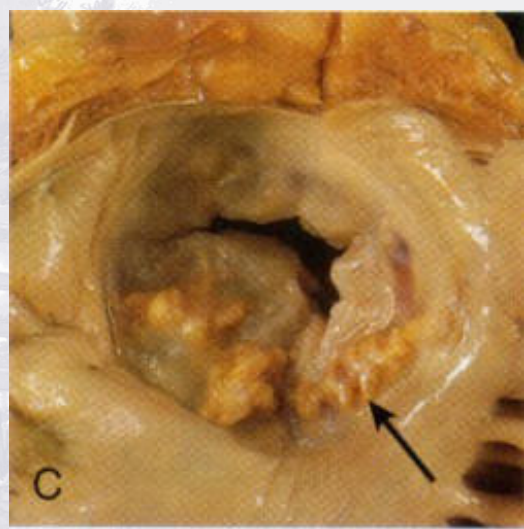


Surgery for Ischemic MR



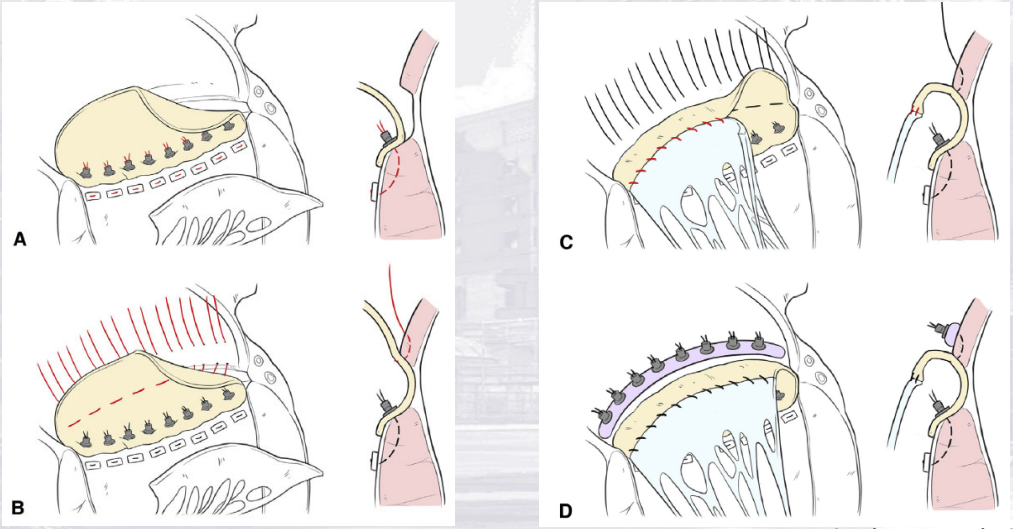
Goldstein, et al. NEJM 2018

Mitral Annular Calcification



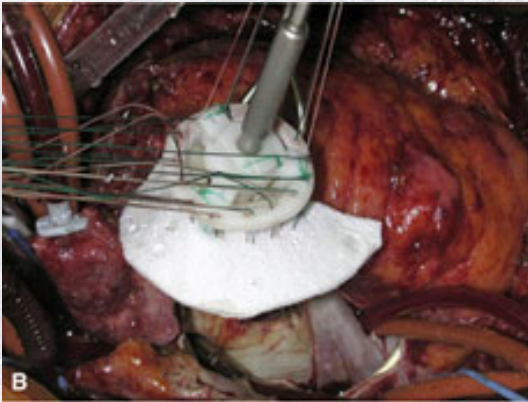
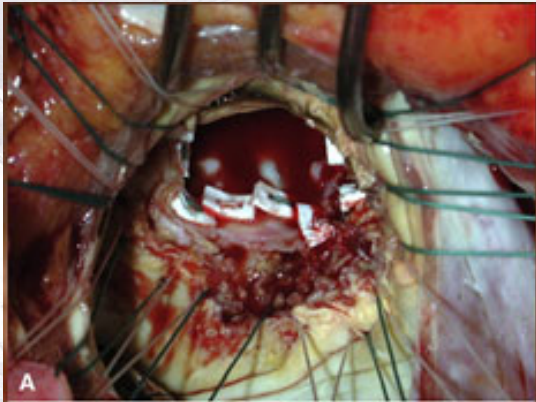
Carpentier, et al. JTCVS 1996

Ways of dealing with MAC



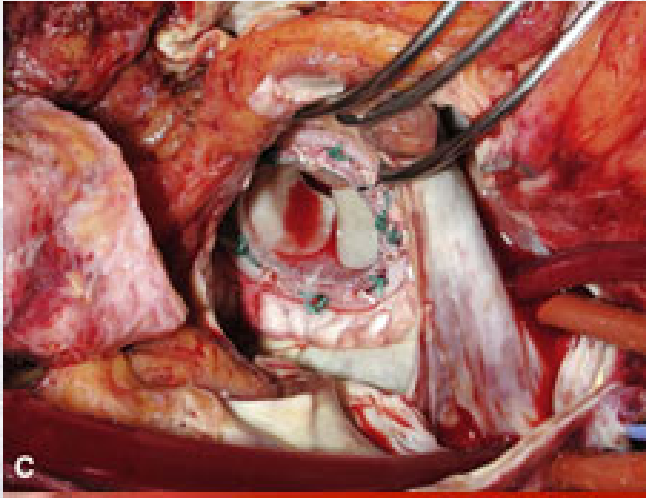
Loulmet, et al. JTCVS 2019

Ways of Dealing with MAC



Hussain, et al. JTCVS 2013

Ways of Dealing with MAC



Hussain, et al. JTCVS 2013

MV Surgery with Atrial Fibrillation

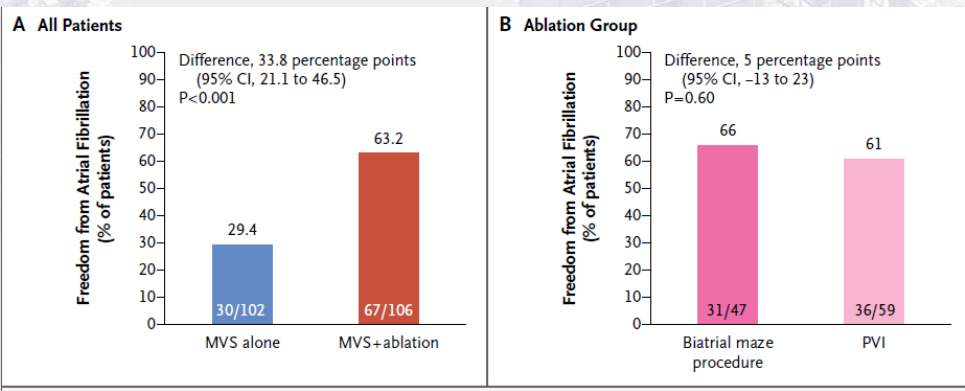


Figure 1. Freedom from Atrial Fibrillation. Freedom from atrial fibrillation was defined as the absence of the condition at both 6 months and 12 months, as assessed by means of 3-day Holter monitoring. MVS denotes mitral-valve surgery, and PVI pulmonary-vein isolation.

Gillinov, et al. NEJM 2016

Concomitant Tricuspid Regurgitation



- Patients undergoing MV surgery w/ mild-moderate TR
- Randomized to TVr vs. none
- Freedom from death, reoperation, or severe TR at 24 months



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Minithoracotomy for mitral valve repair improves inpatient and postdischarge economic savings

Minimally invasive technology for mitral valve surgery via left thoracotomy: experience with forty cases

Beating heart surgery via right thoracotomy for reoperative mitral valve surgery: A safe and effective operative alternative

Robotic mitral valve surgery: Additive benefits without additive cost

Minimally Invasive, Robotic, and Off-Pump Mitral Valve Surgery

Goals for Any Operation

1. Safety

2. Quality

3. Cosmesis, length of stay, return to work



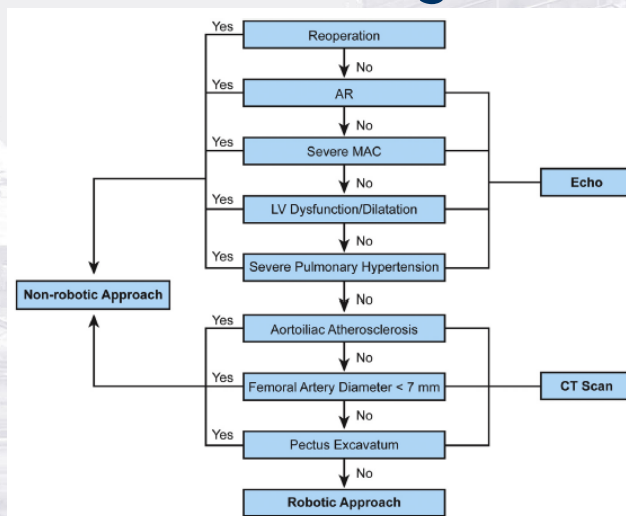
CCF Robotic MVR Results

Variable	No. (%)
Death	1 (0.10)
Stroke	14 (1.4)
Surgical site infection	0 (0)
New-onset atrial fibrillation*	189 (21)
Reoperation for bleeding	25 (2.5)
Prolonged ventilation (>24 h)	21 (2.1)
Renal failure	1 (0.10)
Aortic dissection	1 (0.10)
ICD implantation	4 (0.40)

Gillinov, et al. JTCVS 2018



Robotic MVR Algorithm



Gillinov, et al. JTCVS 2018

Post-op MV Function

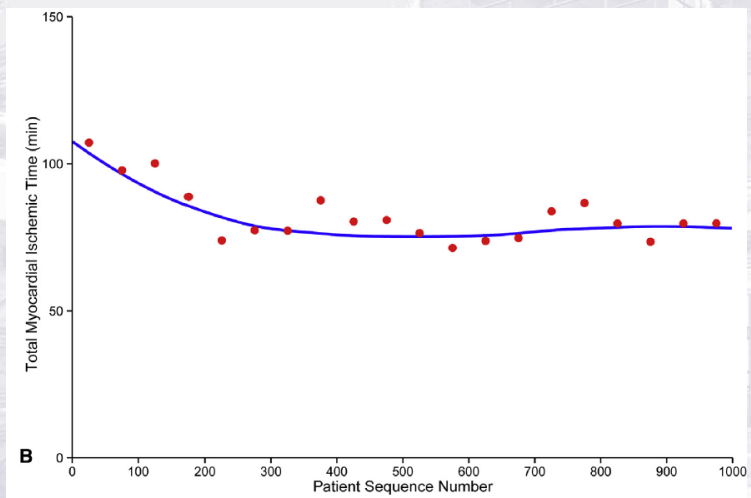
TABLE E2. Predischarge echocardiography evaluation of patients

Variable	n*	No. (%) or Mean ± SD
MR grade	935	
None		832 (89)
Mild		83 (8.9)
Moderate		18 (1.9)
Moderate to severe		2 (0.21)
TR grade	887	
None		457 (52)
Mild		301 (34)
Moderate		111 (13)
Moderate to severe		14 (1.6)
Severe		4 (0.45)
AR grade	685	
None		615 (90)
Mild		53 (7.7)
Moderate		16 (2.3)
Moderate to severe		1 (0.15)
Left ventricular ejection fraction (%)	965	53 ± 7.0
Right ventricular systolic pressure (mm Hg)	679	34 ± 7.7

SD, Standard deviation; MR, mitral regurgitation; TR, tricuspid regurgitation; AR, aortic regurgitation. *Patients with data available.

Gillinov, et al. JTCVS 2018

Cross Clamp Times



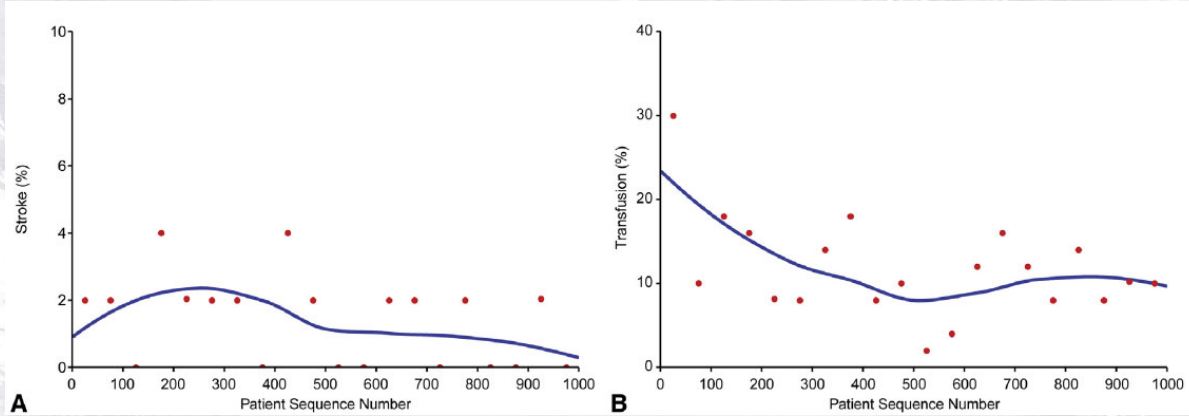
Gillinov, et al. JTCVS 2018



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Complication Rates



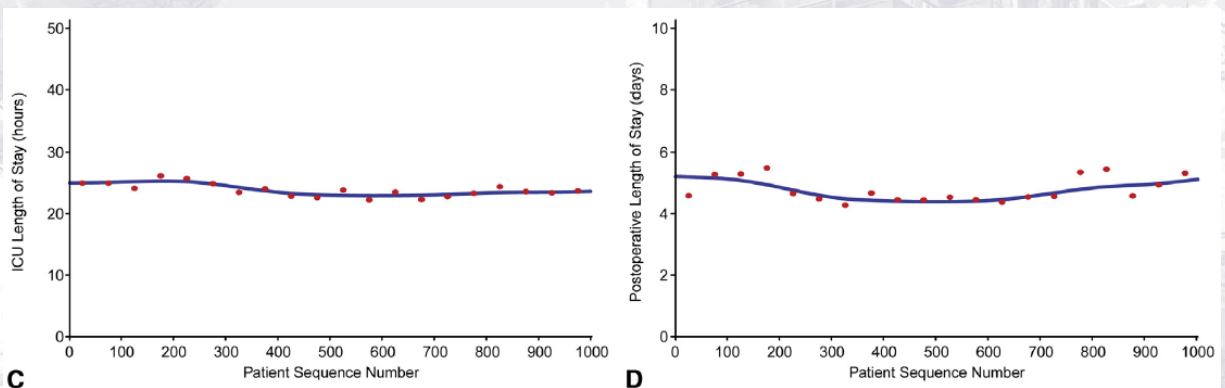
Gillinov, et al. JTCVS 2018



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Length of Stay



Gillinov, et al. JTCVS 2018



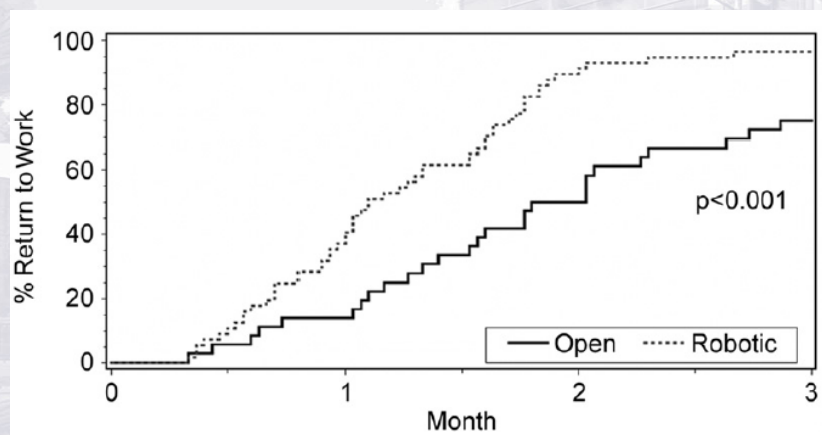
QOL after Robotic MVR

Measure ^a	0-12 Months			12-24 Months		
	Open (n = 28)	Robotic (n = 36)	<i>p</i> Value	Open (n = 44)	Robotic (n = 33)	<i>p</i> Value
DASI ^b	45.1 ± 2.5	55.1 ± 2.1	0.003 ^c	53.4 ± 1.6	51.8 ± 1.9	0.558
SF-12 ^d						
Physical function	48.0 ± 1.4	55.4 ± 1.2	<0.001 ^c	51.6 ± 1.4	52.9 ± 1.6	0.565
Mental function	52.8 ± 1.9	53.1 ± 1.6	0.839	53.9 ± 1.0	56.9 ± 1.2	0.073
LASA						
Quality of life	8.1 ± 0.3	8.9 ± 0.3	0.062	8.6 ± 0.2	9.3 ± 0.2	0.034 ^c
Chest pain						
Frequency	1.7 ± 0.3	0.6 ± 0.3	0.014 ^c	0.6 ± 0.2	0.6 ± 0.3	0.935
Severity	1.7 ± 0.3	0.4 ± 0.3	0.006 ^c	0.5 ± 0.2	0.6 ± 0.2	0.842
Fatigue	4.3 ± 0.5	2.3 ± 0.4	0.003 ^c	2.5 ± 0.4	2.6 ± 0.4	0.946

Suri, et al. ATS 2012



Return to Work after Robotic MVR



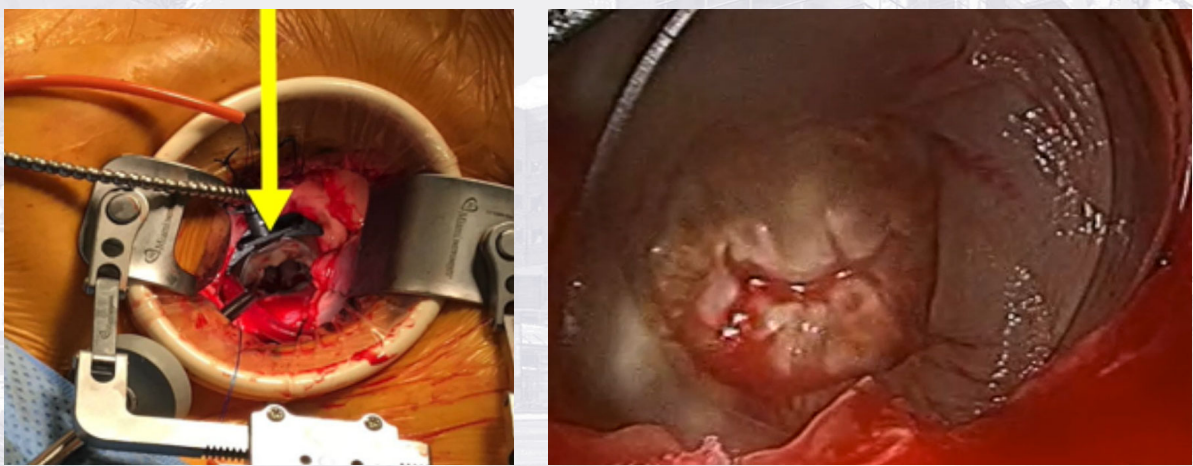
Suri, et al. ATS 2012

Aorta Adherent to Sternum



Mehta, et al. JTCVS 2019

Alternate Access to Mitral Valve



Nguyen, et al. Semin TCVS 2018



Conclusions

- Asymptomatic, severe degenerative MR is lethal and should be evaluated for surgery
- 70% repair rate would place a surgeon/ program in the 75th percentile; 80% in the 90th percentile
- Alternate access can improve early QOL outcomes and provide access to valve in hostile chest



Future Projects

- MHI mitral valve surgery database
- Partner with MHIF and Dr. Sarano for mitral surgery research
 - Neochords vs Resection for posterior leaflet dysfunction
 - Durability of bioprosthetic and mechanical valves
- Educate scientific partners, surgeons, and public
- Alternate access valve surgery



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Mitral Valve Surgery

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