@CNCHcollege @CNCHcollege

Collège National des Cardiologues des Hôpitaux

# / Les WEBINARS du CNCH /

## Best of Imagerie de l'ACC 2021

Benjamin Essayagh
Cardiologue, Echocardiographie Valvulopathies
Hôpital de Cannes, Mayo Clinic Etats-Unis

Compte Twitter Orateur
@EssayaghBen

MAYO CLINIC

HÔPITAL DE CANNES


The Year in Imaging
ACC.21
Y. Chandrashekhar MD
Editor in Chief
JACC: Cardiovascular Imaging
AMERICAN COLLEGE of CARDIOLOGY
#ACC21

# Publications Dominated by Covid

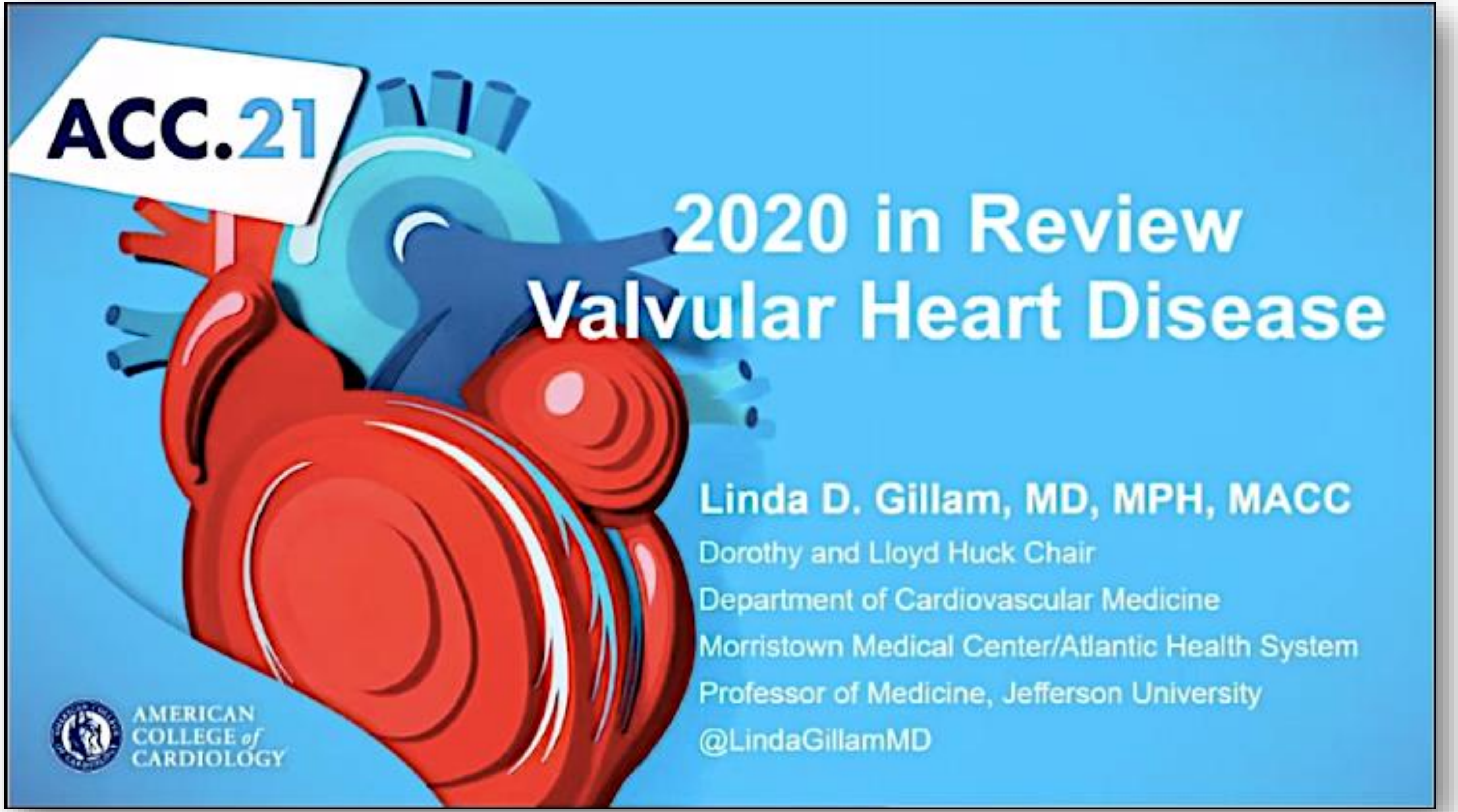
Anything COVID Related was Hot:

- Case Reports Garnered Hundreds of Citations
- Top COVID Papers had >10,000 Citations in <1 Year!

Cardiac Imaging: No Single Modality Dominated

No Major RCT in Imaging

High Interest Areas: Machine Learning, Coronary Plaque/Physiology and Cardiotoxicity


ACC.21
2020 in Review
Valvular Heart Disease
Linda D. Gillam, MD, MPH, MACC
Dorothy and Lloyd Huck Chair
Department of Cardiovascular Medicine
Morristown Medical Center/Atlantic Health System
Professor of Medicine, Jefferson University
@LindaGillamMD
AMERICAN
COLLEGE of
CARDIOLOGY

# / AORTIC VALVE /

The NEW ENGLAND JOURNAL of MEDICINE

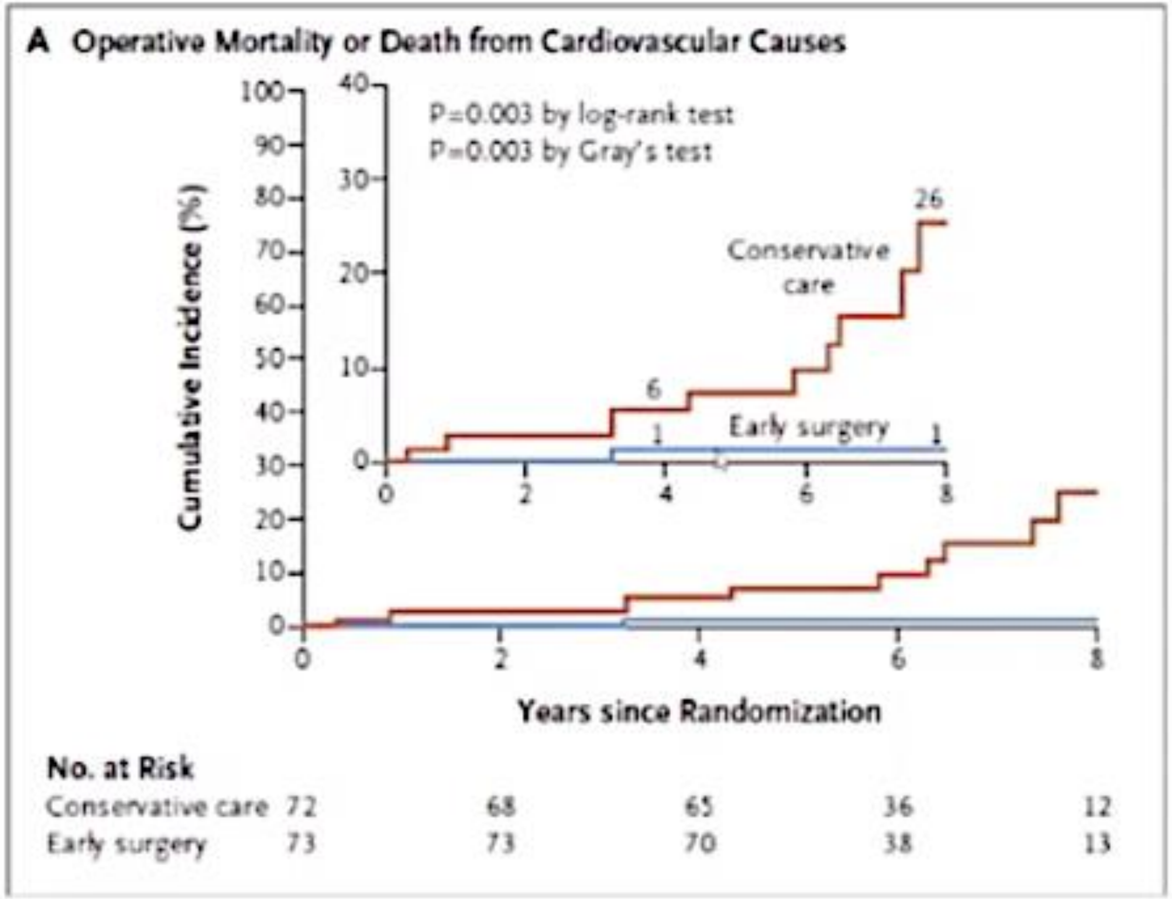
ESTABLISHED IN 1812 JANUARY 9, 2020 VOL. 382 NO. 2

# Early Surgery or Conservative Care for Asymptomatic Aortic Stenosis

Duk-Hyun Kang, M.D., Ph.D., Sung-Ji Park, M.D., Ph.D., Seung-Ah Lee, M.D., Sahmin Lee, M.D., Ph.D., Dae-Hee Kim, M.D., Ph.D., Hyung-Kwan Kim, M.D., Ph.D., Sung-Cheol Yun, Ph.D., Geu-Ru Hong, M.D., Ph.D., Jong-Min Song, M.D., Ph.D., Cheol-Hyun Chung, M.D., Ph.D., Jae-Kwan Song, M.D., Ph.D., Jae-Won Lee, M.D., Ph.D., and Seung-Woo Park, M.D., Ph.D.

RECOVERY trial: randomized prospective
- n= 145 with very severe AS
- SAVR vs medical management
- Severe asymptomatic AS (no stress test)
  - AVA ≤0.75 cm2 peak velocity ≥4.5mps, mean ≥50mmHg
- Intention to treat

ACC.21



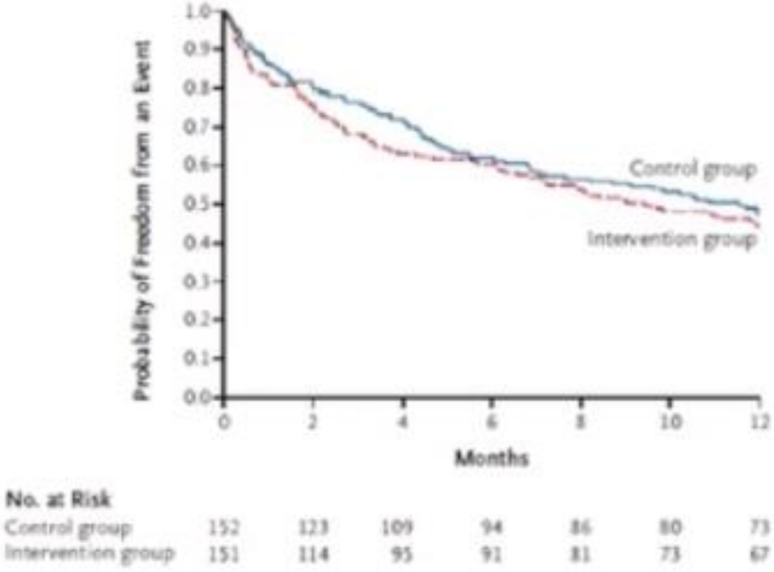

## Severe AS No Symptoms:
## Ongoing Randomized Trials

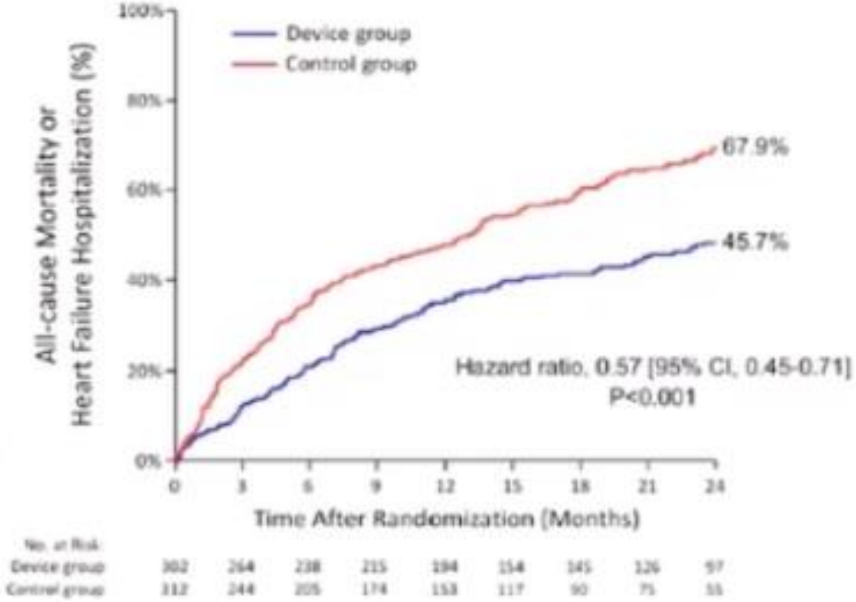
- EARLY-TAVR trial
- EVOLVED trial (fibrosis, TAVR or SAVR)
- AVATAR trial (Serbia SAVR)
- ESTIMATE trial (SAVR)

# / MITRAL VALVE /


ACC.21
Proportionate vs Disproportionate MR:
Implications on Case Selection for Percutaneous Mitral Leaflet Repair
#ACC21
AMERICAN COLLEGE of CARDIOLOGY
Patrick Gleason, MD, FACC
Assistant Professor, Emory University

# MITRA-FR vs COAPT




Obadia et al. NEJM 2018;379:2297-306

Stone et al. NEJM 2018;379:2307-18

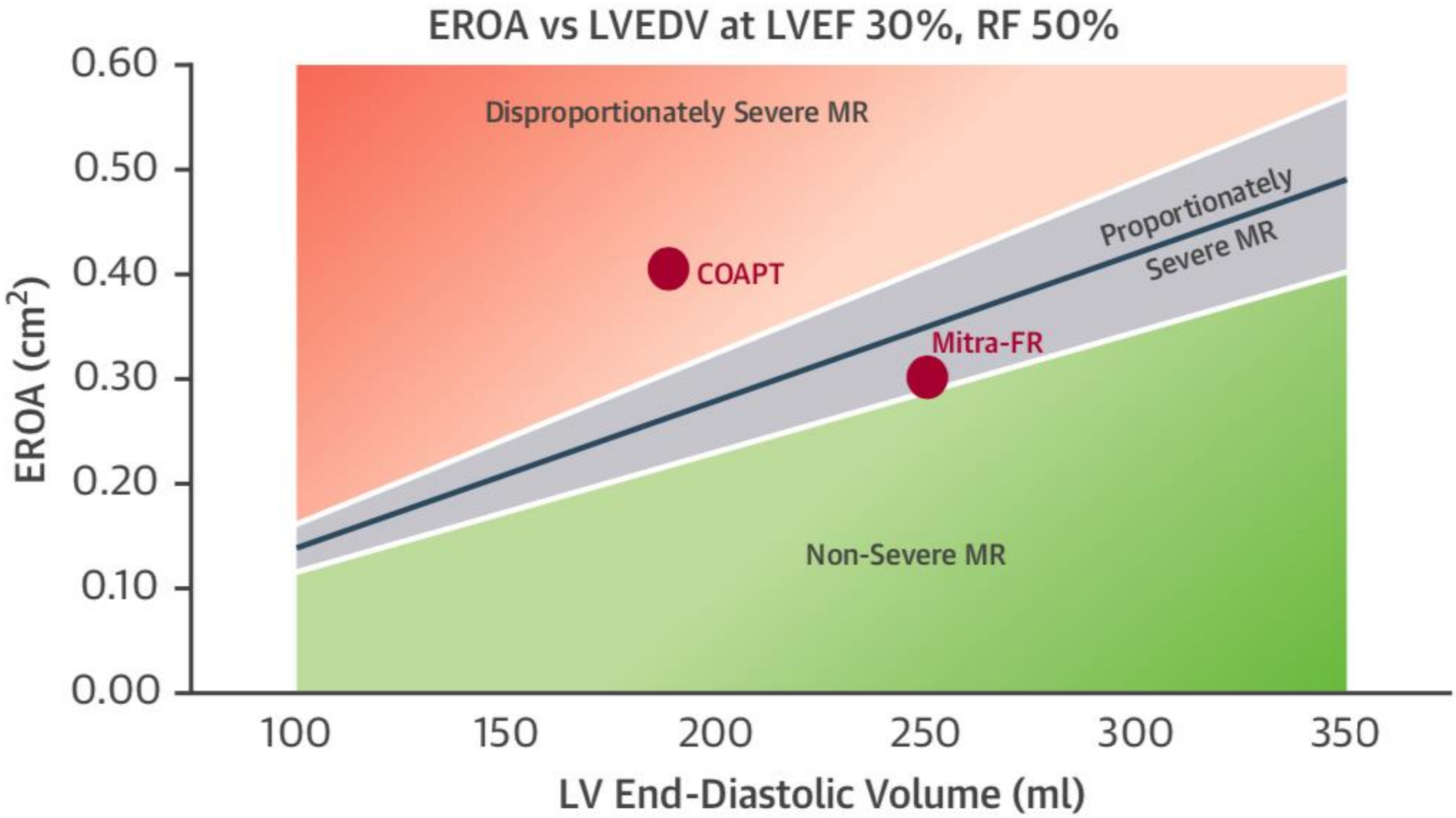

EROA vs LVEDV at LVEF 30%, RF 50%
0.60
0.50
0.40
0.30
0.20
0.10
0.00
EROA (cm²)
Disproportionately Severe MR
COAPT
Proportionately Severe MR
Mitra-FR
Non-Severe MR
100
150
200
250
300
350
LV End-Diastolic Volume (ml)

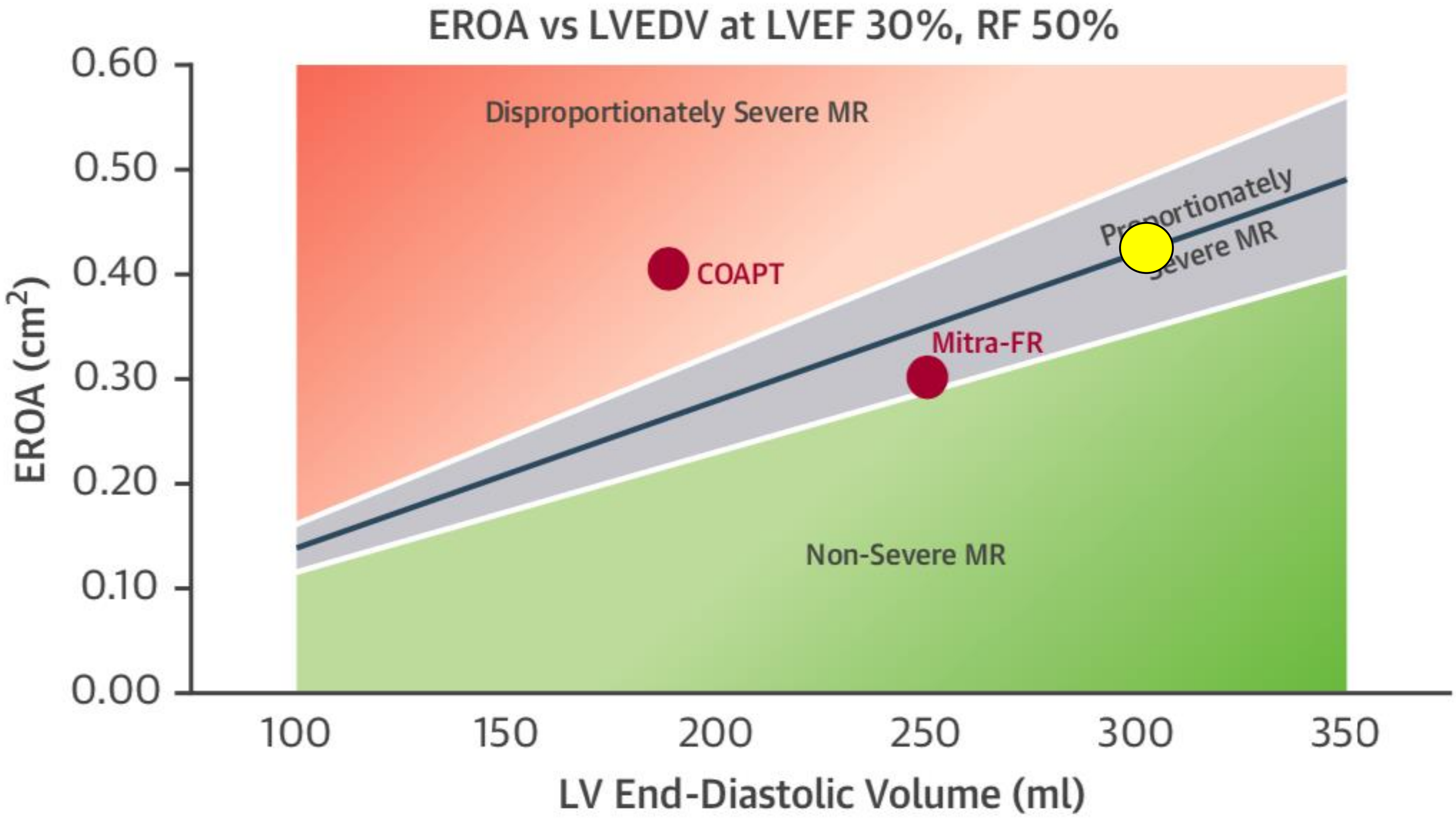
**Table 1.** (Continued.)

| Characteristic | Device Group (N=302) | Control Group (N=312) |
|---|---|---|
| Left ventricular end-diastolic dimension — cm | 6.2±0.7 | 6.2±0.8 |
| Left ventricular end-systolic volume — ml | 135.5±56.1 | 134.3±60.3 |
| Left ventricular end-diastolic volume — ml | 194.4±69.2 | 191.0±72.9 |
| Left ventricular ejection fraction | | |
| Mean — % | 31.3±9.1 | 31.3±9.6 |
| ≤40% — no./total no. (%) | 231/281 (82.2) | 241/294 (82.0) |
| Right ventricular systolic pressure — mm Hg | 44.0±13.4 (253) | 44.6±14.0 (275) |

EDV 192 mL
ESV 135 mL
**Total SV= 57mL**
**RVol = 60mL**

Congratulation all the patients in COAPT are dead !

**Or…LV volumes severely underestimated**


EROA vs LVEDV at LVEF 30%, RF 50%
0.60
0.50
0.40
0.30
0.20
0.10
0.00
EROA (cm²)
Disproportionately Severe MR
COAPT
Proportionately
Severe MR
Mitra-FR
Non-Severe MR
100
150
200
250
300
350
LV End-Diastolic Volume (ml)

ACC.21 VIRTUAL May 15 – 17
AMERICAN COLLEGE of CARDIOLOGY

# Mitral / Tricuspid Regurgitation: 4 Diagnostic and Therapeutic Challenges

**Robert O. Bonow, MD, MS, MACC**

Northwestern University Feinberg School of Medicine
Bluhm Cardiovascular Institute
Northwestern Memorial Hospital

**Dr. Purvi Parwani**
@purviparwani

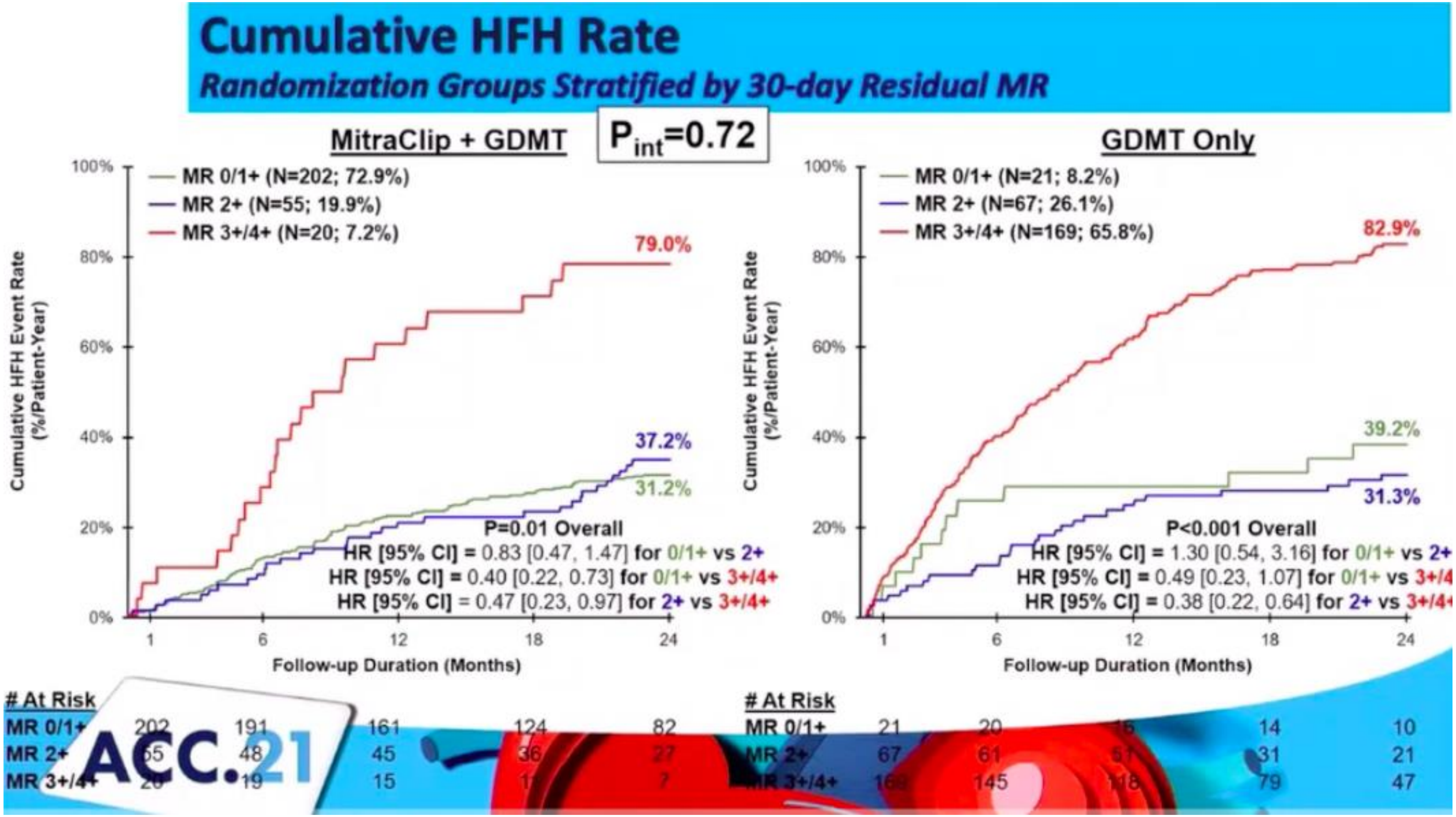
Excellent review of #Secondary MR by Dr.Bonow.
- proportionate/ Disproportionate MR does not make all the sense
- COAPT eligible patients from MITRAFR with insignificant results
- Operator experience and GDMT matters!
#ACC21

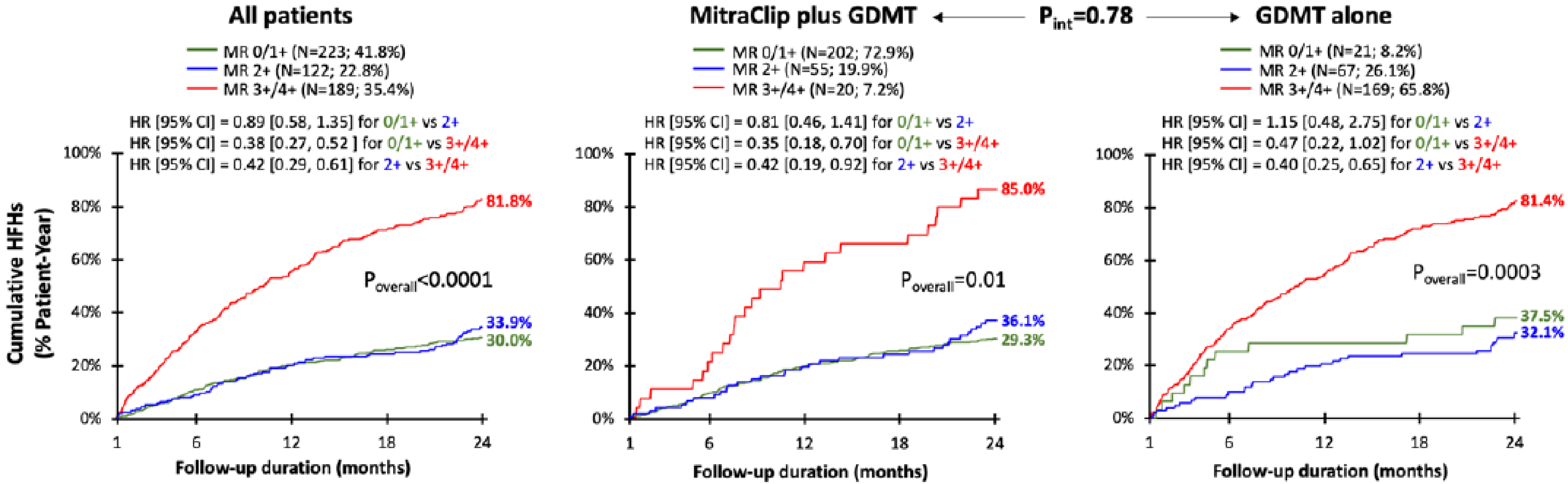
@mmamas1973 @DBelardoMD @iamritu @mirvatalasnag

JAMA Cardiol. 2021;6(4):427-436.

**Further subgroup analyses with 24 month follow-up suggest that the benefit of TMVr is not fully supported by the proportionate-disproportionate hypothesis**


ACC.21
Debate:
Transcatheter Mitral Leaflet Repair Is The Repair Technique of Choice For FMR
#ACC21
Saibal Kar, MD, FACC
Director of Structural Heart Disease Interventions, Los Robles Regional Medical Center, Thousand Oak, CA
Physician Director, Interventional Cardiology, HCA
AMERICAN COLLEGE of CARDIOLOGY


Cumulative HFH Rate
Randomization Groups Stratified by 30-day Residual MR
$P_{int}$=0.72
MitraClip + GDMT
MR 0/1+ (N=202; 72.9%)
MR 2+ (N=55; 19.9%)
MR 3+/4+ (N=20; 7.2%)
79.0%
37.2%
31.2%
P=0.01 Overall
HR [95% CI] = 0.83 [0.47, 1.47] for 0/1+ vs 2+
HR [95% CI] = 0.40 [0.22, 0.73] for 0/1+ vs 3+/4+
HR [95% CI] = 0.47 [0.23, 0.97] for 2+ vs 3+/4+
Cumulative HFH Event Rate (%/Patient-Year)
Follow-up Duration (Months)
GDMT Only
MR 0/1+ (N=21; 8.2%)
MR 2+ (N=67; 26.1%)
MR 3+/4+ (N=169; 65.8%)
82.9%
39.2%
31.3%
P<0.001 Overall
HR [95% CI] = 1.30 [0.54, 3.16] for 0/1+ vs 2+
HR [95% CI] = 0.49 [0.23, 1.07] for 0/1+ vs 3+/4
HR [95% CI] = 0.38 [0.22, 0.64] for 2+ vs 3+/4+
# At Risk
MR 0/1+
MR 2+
MR 3+/4+
ACC.21




Number at risk

| | | | | | |
|---|---|---|---|---|---|
| MR 0/1+ | 223 | 211 | 188 | 173 | 142 |
| MR 2+ | 122 | 110 | 99 | 87 | 64 |
| MR 3+/4+ | 189 | 164 | 138 | 111 | 83 |

Number at risk

| | | | | | |
|---|---|---|---|---|---|
| MR 0/1+ | 202 | 191 | 172 | 158 | 128 |
| MR 2+ | 55 | 48 | 45 | 41 | 33 |
| MR 3+/4+ | 20 | 19 | 15 | 13 | 9 |

Number at risk

| | | | | | |
|---|---|---|---|---|---|
| MR 0/1+ | 21 | 20 | 16 | 15 | 14 |
| MR 2+ | 67 | 62 | 54 | 46 | 31 |
| MR 3+/4+ | 169 | 145 | 123 | 98 | 74 |

# Transcatheter MV Repair: Device Landscape 2021

**Edge-to-edge**
- MitraClip***
- MitraFlex
- PASCAL**
- CoAp Pro**
- Valve Clamp*
- DragonFly*

**Coronary sinus annuloplasty**
- Cardiac Dimensions Carillon**
- Cerclage annuloplasty*
- MVRx ARTO*

**Direct annuloplasty and basal ventriculoplasty**
- Mitralign TAMR**
- Edwards Cardioband**
- Ancora Accucinch*
- Millipede IRIS*
- Valcare Amend*
- Mardil BACE*
- Mitraspan*
- Valfix*
- Micardia enCor
- Cardiac Implants RDS
- QuantumCor (RF)

**MV replacement**
- Edwards CardiAQ*
- Edwards Fortis*
- Edwards M3*
- Neovasc Tiara*
- Abbott Tendyne*
- Medtronic Intrepid*
- HighLife*
- MValve*
- Cephea
- NCSI NaviGate*
- St. Jude
- Micro Interventional
- CardioValve*
- ValveXchange
- MitrAssist
- Braile Quattuor
- Caisson*
- Direct Flow
- Sinomed Accufit
- Gore

**MV replacement (cont)**
- MitralHeal
- Innova Saturn
- Lutter valve
- Transcatheter Technologies Tresillo
- Venus
- Verso
- Transmural Systems
- Microport
- Valcare Corona

**Artificial Chords**
- NeoChord DS 1000*
- Harpoon neochords*
- Babic chords*
- Pipeline Technlogies
- Chordart
- CardioMech

**Posterior leaflet repair/replacement**
- Polares
- St. Jude leaflet plication*
- Sutra
- Half Moon Medical
- Angel Valve Butterfly

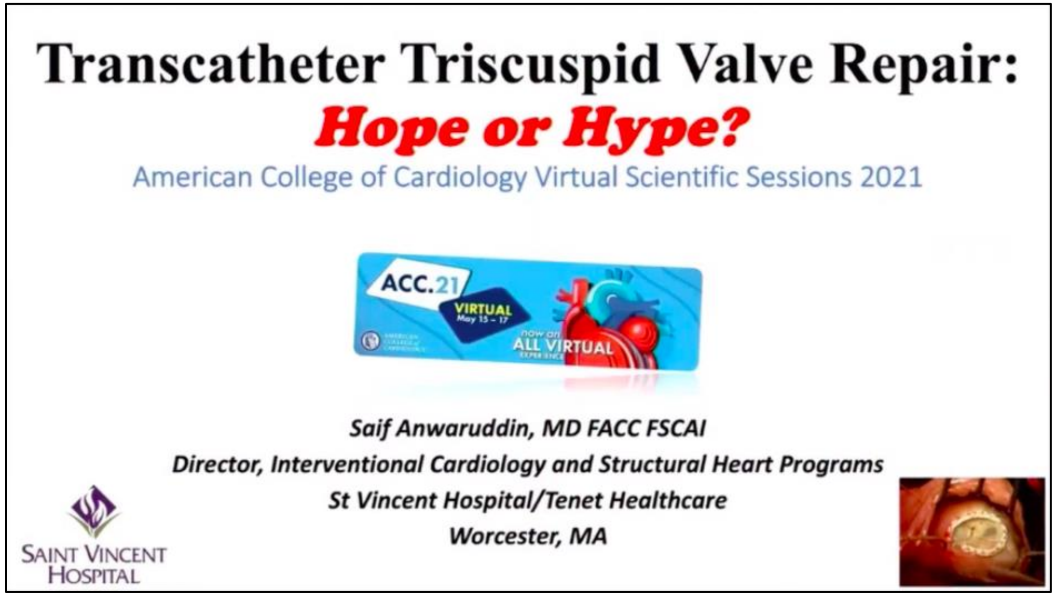
**Other approaches**
- Cardiosolutions Mitra-Spacer*
- Valtech Vchordal
- Mitralix

*In patients *CE mark *FDA approved

Montefiore

# / TRICUSPID VALVE /

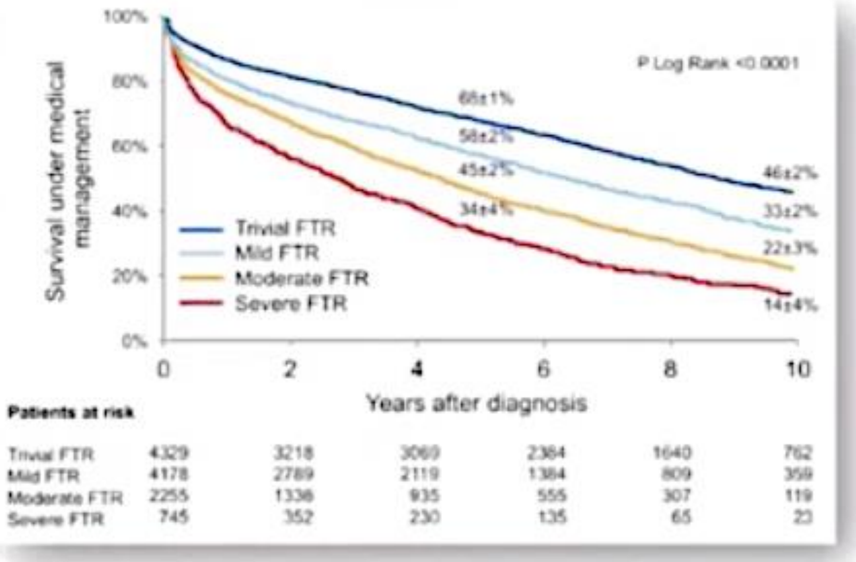
ACC.21
2020 in Review
Valvular Heart Disease
Linda D. Gillam, MD, MPH, MACC
Dorothy and Lloyd Huck Chair
Department of Cardiovascular Medicine
Morristown Medical Center/Atlantic Health System
Professor of Medicine, Jefferson University
@LindaGillamMD
AMERICAN COLLEGE of CARDIOLOGY

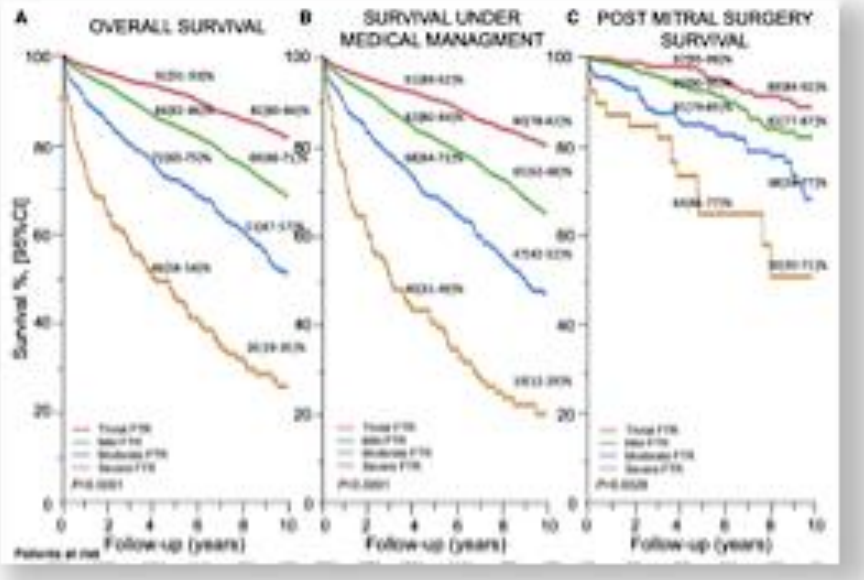
Transcatheter Triscuspid Valve Repair:
Hope or Hype?
American College of Cardiology Virtual Scientific Sessions 2021
ACC.21
VIRTUAL
ALL VIRTUAL
Saif Anwaruddin, MD FACC FSCAI
Director, Interventional Cardiology and Structural Heart Programs
St Vincent Hospital/Tenet Healthcare
Worcester, MA
SAINT VINCENT HOSPITAL

# *Tricuspid Regurgitation: Scope of the Problem*

- Highly prevalent problem with millions of patients with clinically significant disease
- Tricuspid regurgitation itself has been shown to be independently associated with poorer survival




Benfari, et al, Circulation 2019




Essayagh, et al, EHJ 2020

# Proposed Additional TR Severity Grades

**Table 1** Proposed expansion of the 'Severe' grade

| Variable | Mild | Moderate | Severe | Massive | Torrential |
|---|---|---|---|---|---|
| VC (biplane) | <3 mm | 3-6.9 mm | 7–13 mm | 14–20 mm | ≥21 mm |
| EROA (PISA) | <20 mm$^2$ | 20–39 mm$^2$ | 40–59 mm$^2$ | 60–79 mm$^2$ | ≥80 mm$^2$ |
| 3D VCA or quantitative EROA[a] | | | 75–94 mm$^2$ | 95–114 mm$^2$ | ≥115 mm$^2$ |

VC, vena contracta; EROA, effective regurgitant orifice area; 3D VCA, three-dimensional vena contracta area.
[a]3D VCA and quantitative Doppler EROA cut-offs may be larger than PISA EROA.


RT Hahn and JL Zamorano. European Heart Journal - Cardiovascular Imaging (2017) 00, 1–2. doi:10.1093/ehjci/je

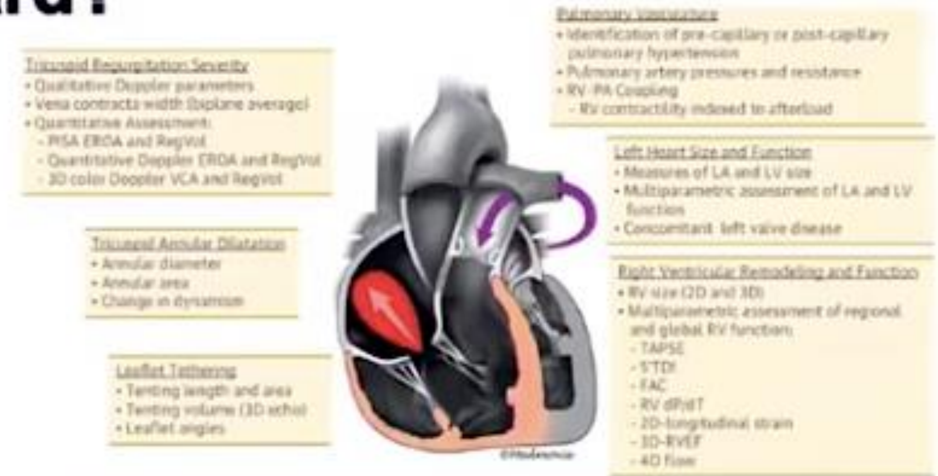
Range of TR Severity with signs and symptoms of "right heart failure"

ACC.21

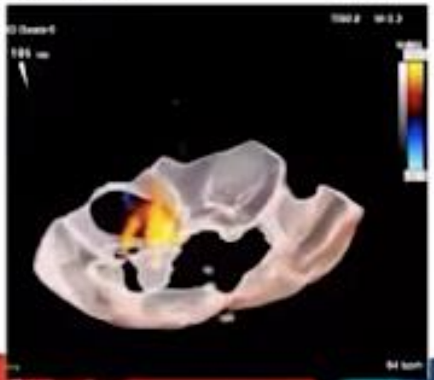
# Imaging of the Tricuspid Valve: What is the Gold Standard?

New Roles for Imaging are complex:

1. Patient Selection:
   - Understanding Pathophysiology of the Disease
2. Pre-procedural Planning
   - Choosing the right device
3. Procedural Guidance and Follow-up







ACC.21

@hahn_rt

# Multimodality Imaging Is the GOLD STANDARD!

| | Pre-procedural | Intra-procedural | Follow-up |
|---|---|---|---|
| **CT scan** | TV apparatus (annulus/subvalvular)<br>Access and Landing Zone<br>3D printing, simulation | Currently limited application | Quantification of TR severity<br>Assessment of RV size/function |
| **CMR** | TV apparatus (annulus/subvalvular)<br>Quantification of TR severity<br>Assessment of RV size/function | Currently no application | Quantification of TR severity<br>Assessment of RV size/function |
| **TTE/2D echo** | TV Apparatus (TR etiology)<br>Quantification of TR severity<br>Assessment of RV function<br>Estimation of PA pressures | Visualization of catheters<br>Identification of target lesion<br>Assessment of the immediate result | Serial follow-up of device function<br>LV and RV size and function<br>Estimation of PA pressures |
| **TEE/3D echo** | Same as TTE AND<br>Localization of target lesion<br>Annulus measurement | Visualization of catheters<br>3D Orientation<br>Assessment of the immediate result | If TTE limited, TEE used for follow-up |
| **Fluoro** | No application | Navigation and Device Deployment | |

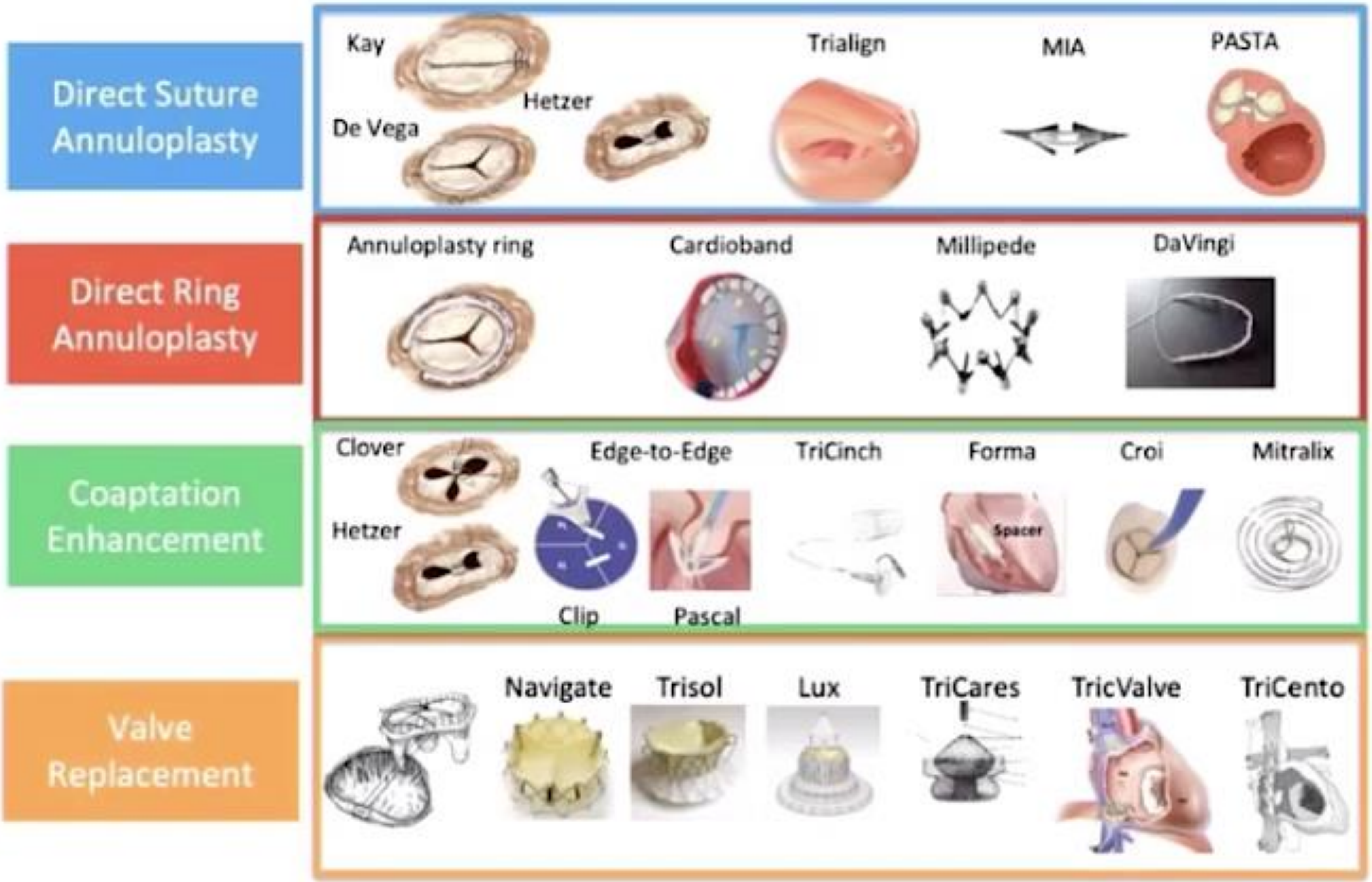
@hahn_rt

# Transcatheter Tricuspid Repair: Hope vs Hype

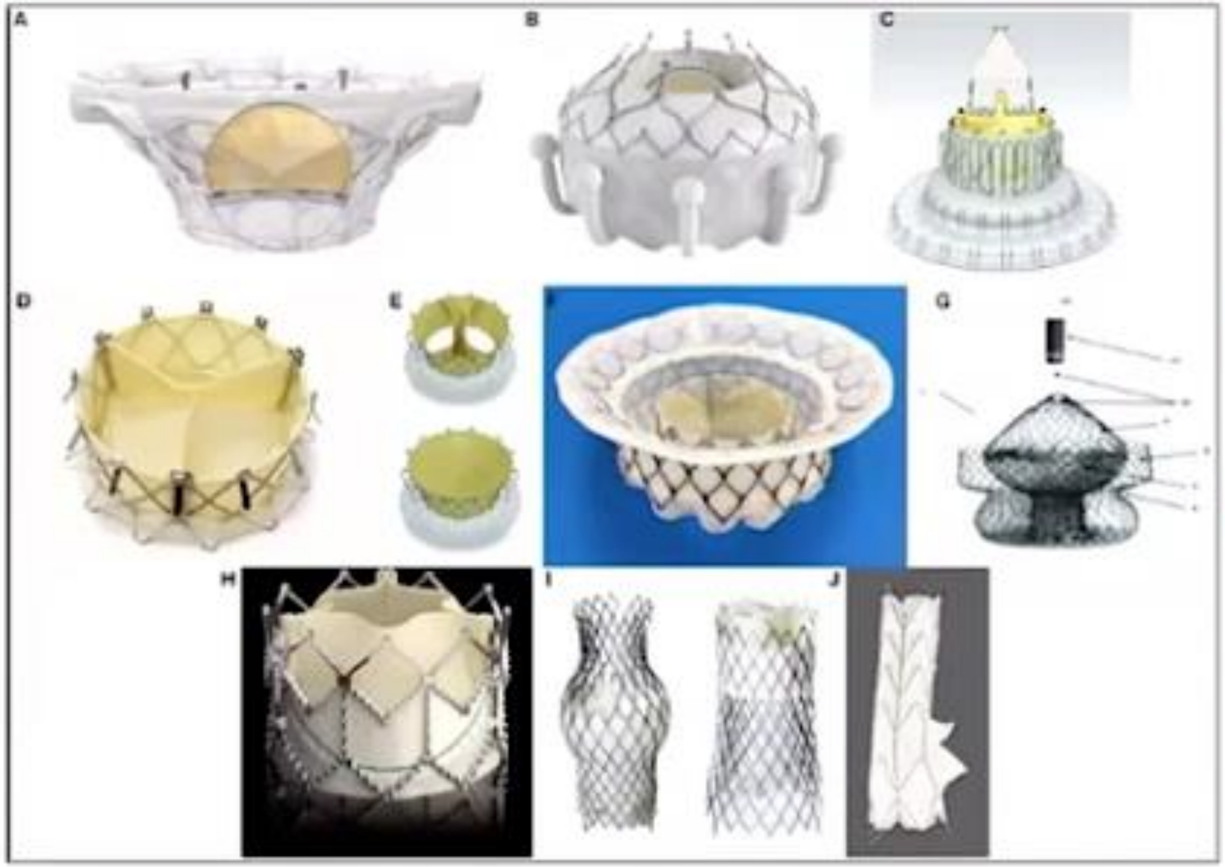
**How Do We Ensure that the Hope of TTVr is Not Overshadowed by Hype?**

- Randomized clinical trial data
- What Is Procedural Success: How much residual TR is considered a good result?
- Timing of Intervention
- Understanding how anatomy informs device selection and recognizing favorable vs unfavorable anatomy to ensure durable results
- Patient selection: torrential< severe / tethering

# Transcatheter Tricuspid Landscape



# Tricuspid Valve Replacement




**(A) Cardiovalve**
*(Boston Medical, Shrewsbury, MA, USA)*
**(B) Evoque**
*(Edwards Lifescience, Irvine, CA, USA)*
**(C) LUX-Valve**
*(Jenscare Biotechnology, Ningbo, China).*
**(D) NaviGate**
*(NaviGate Cardiac Structures Inc., CA, USA).*
**(E)** Trisol
*(Trisol Medical, Yokneam, Israel).*
**(F) Intrepid**
*(Medtronic Plc, Minneapolis, MN, USA).*
**(G)** Tricares *(TRiCares SAS, Paris, France).*
**(H)** Sapien XT
*(Edwards Lifescience, Irvine, CA, USA).*
**(I)**. TricValve
*(P+F Products + Features, Vienna, Austria)*
**(J)**. Tricento
*(New Valve Technology, Hechingen, Germany).*

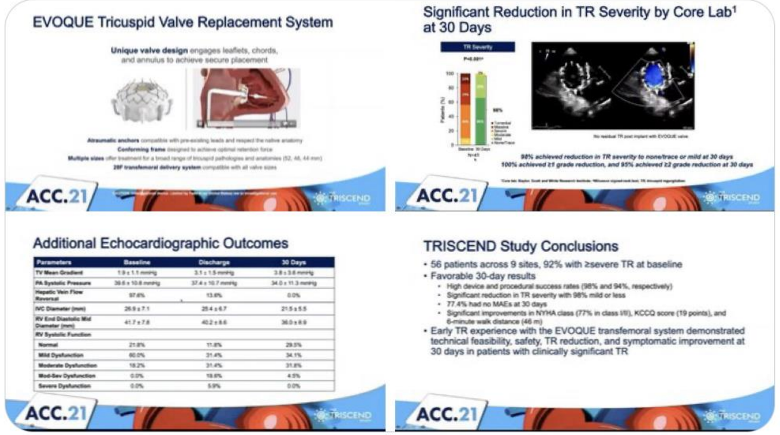
Front. Cardiovasc. Med., 15 February 2021


ACC.21
Transfemoral Tricuspid Valve Replacement in Patients with Tricuspid Regurgitation: 30-Day Results of the TRISCEND Study
Susheel Kodali, MD
Columbia University Medical Center, New York
On behalf of the TRISCEND study investigators
AMERICAN COLLEGE of CARDIOLOGY
THE TRISCEND STUDY

Echocardiography sbs et 3 autres ont aimé

**Julia Grapsa** @JGrapsa · 52 m

#ACC21 TRISCEND study : favourable 30-days results in pts with severe TR - important applications in clinical practice for high risk surgical pts - also important accurate assessment of TR/RV function @ACCinTouch @ACCmediacenter @JACCJournals @MinnowWalsh @m_taramasso




RTHahnMD et 9 autres

16 28

Julia Grapsa et Philipp Lurz ont aimé

**RTHahnMD** @hahn_rt · 3 h

#TRISCEND EFS first 56 patients reported at #ACC21. Great technical success, acceptable MACE, excellent efficacy and significant QoL and Fx improvement. There is hope for TR! @ACCinTouch @escardio @PhilippLurz @azeemlatib @vonBardelebenRS @HeartValveCntr @m_taramasso

# Right-Heart Catheterization of Severe Functional Tricuspid Regurgitation

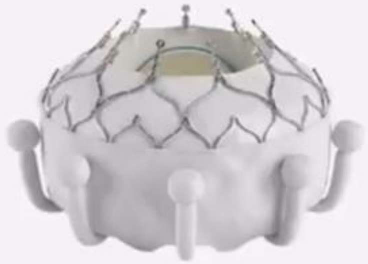
## A Step Forward in Reducing its Pervasive Undertreatment?*

Gilles D. Dreyfus, MD, PhD,[a] Benjamin Essayagh, MD[b]

JACC Cardiovascular Interventions

# EVOQUE Tricuspid Valve Replacement System

**Unique valve design** engages leaflets, chords, and annulus to achieve secure placement



**Anchors** compatible with pre-existing leads engage leaflets to provide retention support

**Conforming outer frame** designed to achieve retention force in the annulus

**Multiple sizes** of outer frame to accommodate large range of annular size(52, 48, 44 mm)

**27mm Bovine Pericardial Valve** for all outer frame sizes

**28F transfemoral delivery system** compatible with all valve sizes

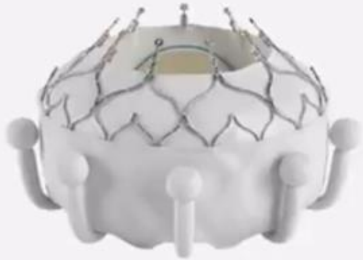
ACC.21

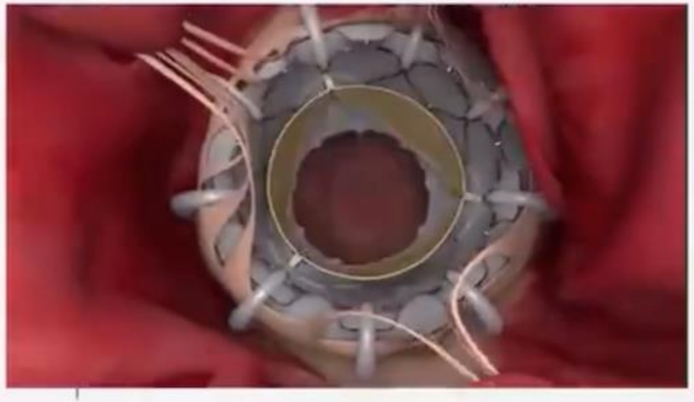
CAUTION: Investigational device. Limited by Federal (or United States) law to investigational use.

THE TRISCEND STUDY

# EVOQUE Tricuspid Valve Replacement System

**Unique valve design** engages leaflets, chords, and annulus to achieve secure placement





**Anchors** compatible with pre-existing leads engage leaflets to provide retention support

**Conforming outer frame** designed to achieve retention force in the annulus

**Multiple sizes** of outer frame to accommodate large range of annular size(52, 48, 44 mm)

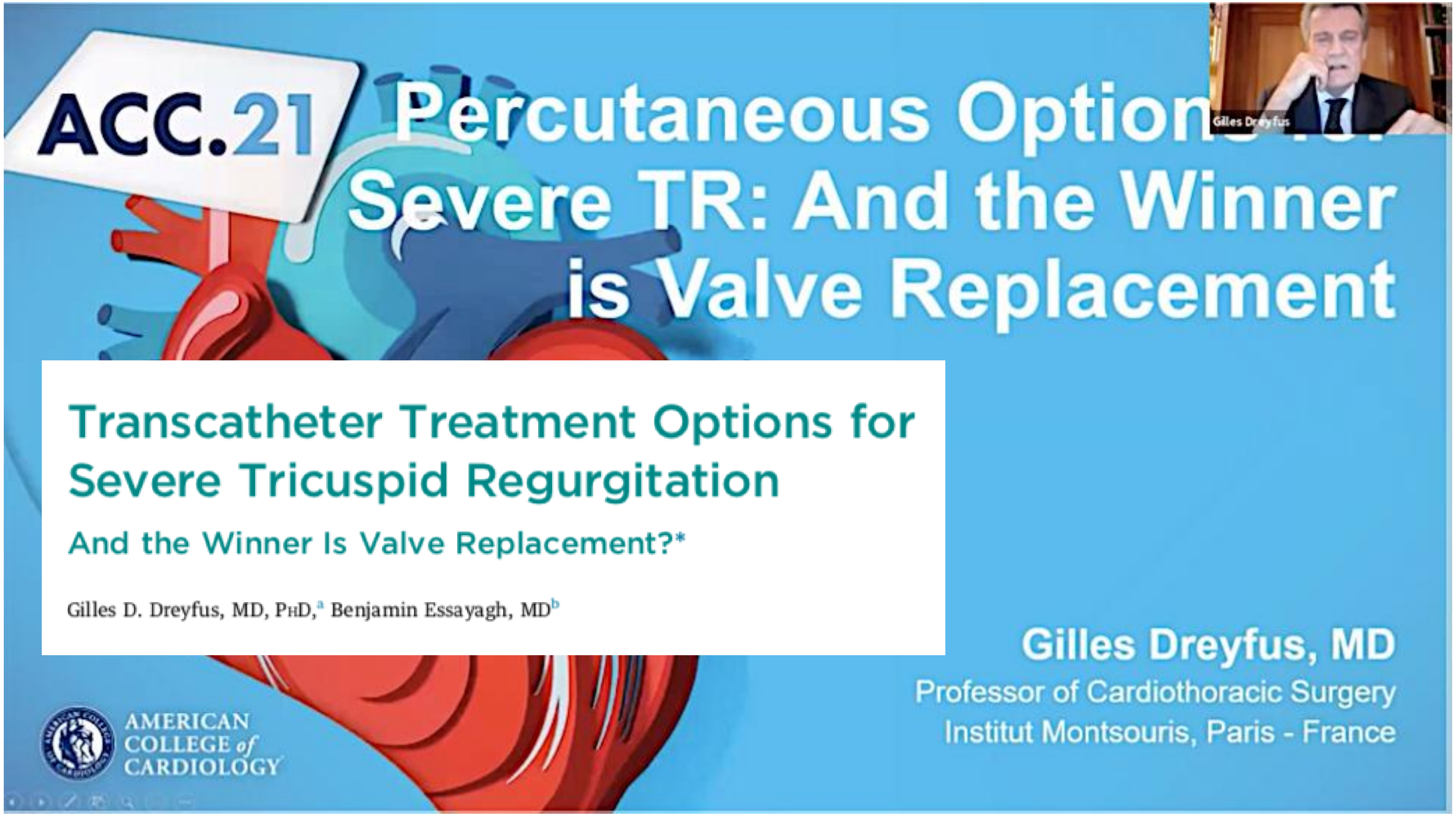
**27mm Bovine Pericardial Valve** for all outer frame sizes

**28F transfemoral delivery system** compatible with all valve sizes

ACC.21

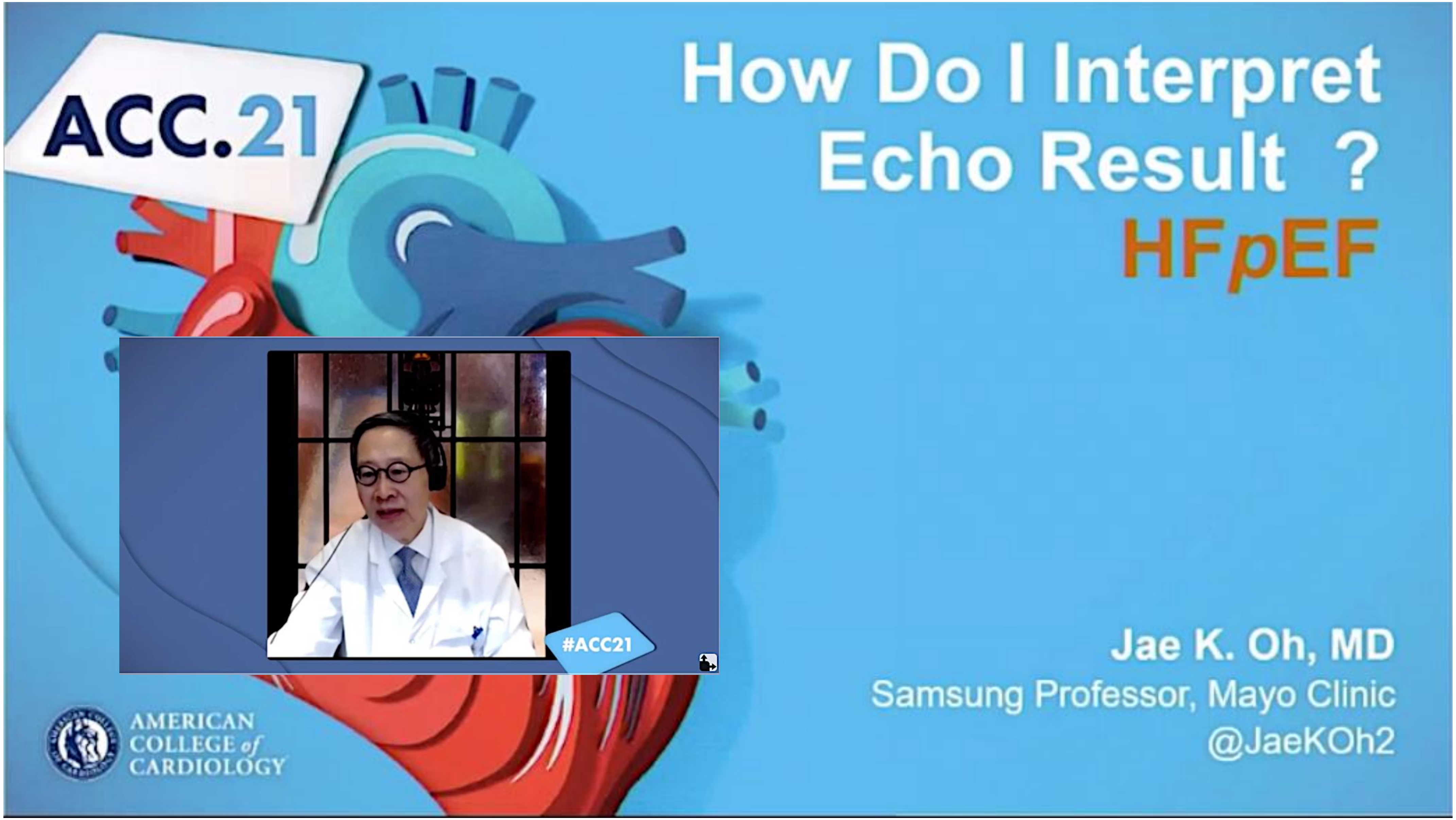
CAUTION: Investigational device. Limited by Federal (or United States) law to investigational use.

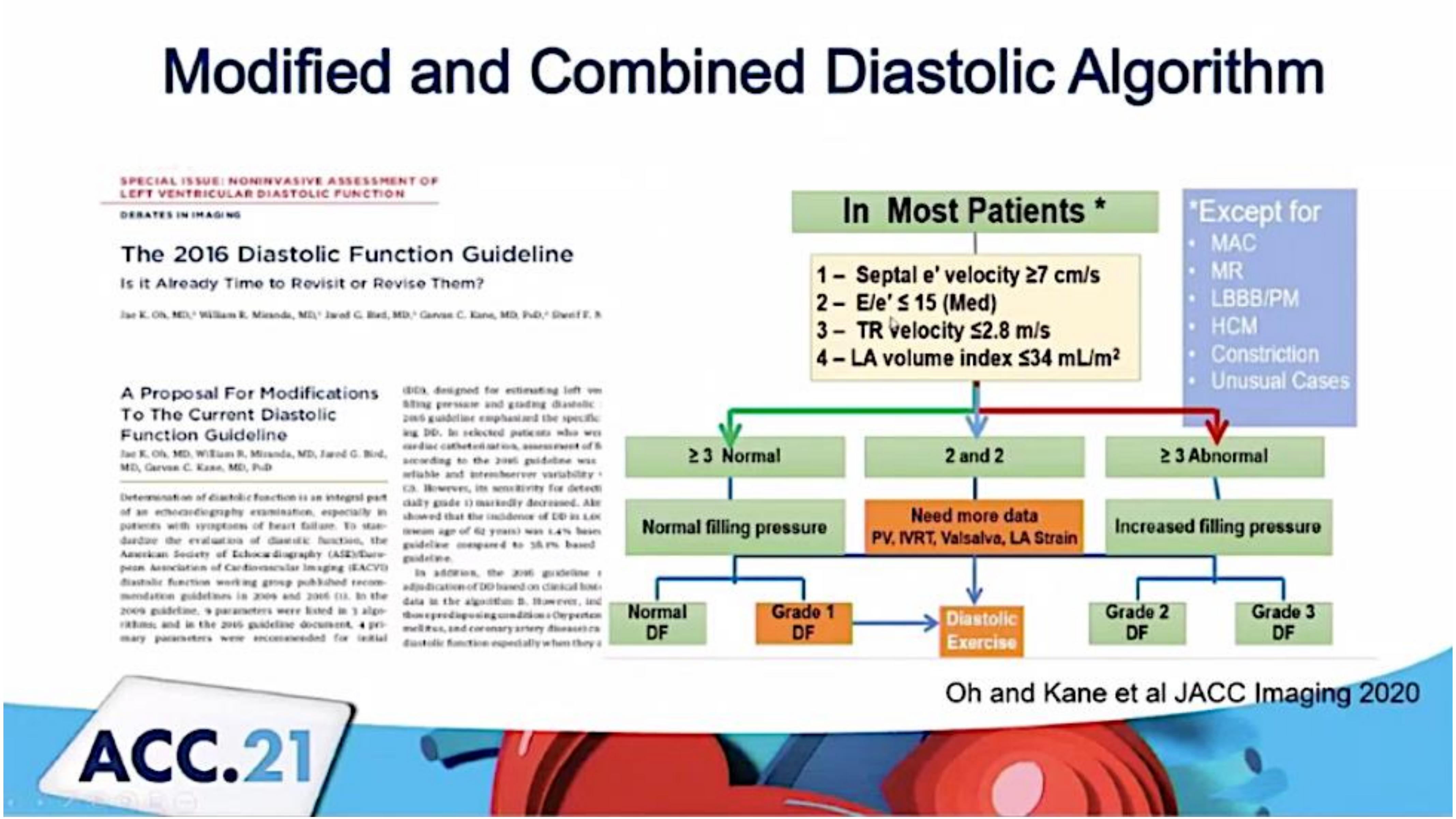
THE TRISCEND STUDY


ACC.21
Percutaneous Options for Severe TR: And the Winner is Valve Replacement
Gilles Dreyfus
Transcatheter Treatment Options for Severe Tricuspid Regurgitation
And the Winner Is Valve Replacement?*
Gilles D. Dreyfus, MD, PhD,[a] Benjamin Essayagh, MD[b]
Gilles Dreyfus, MD
Professor of Cardiothoracic Surgery
Institut Montsouris, Paris - France
AMERICAN COLLEGE of CARDIOLOGY

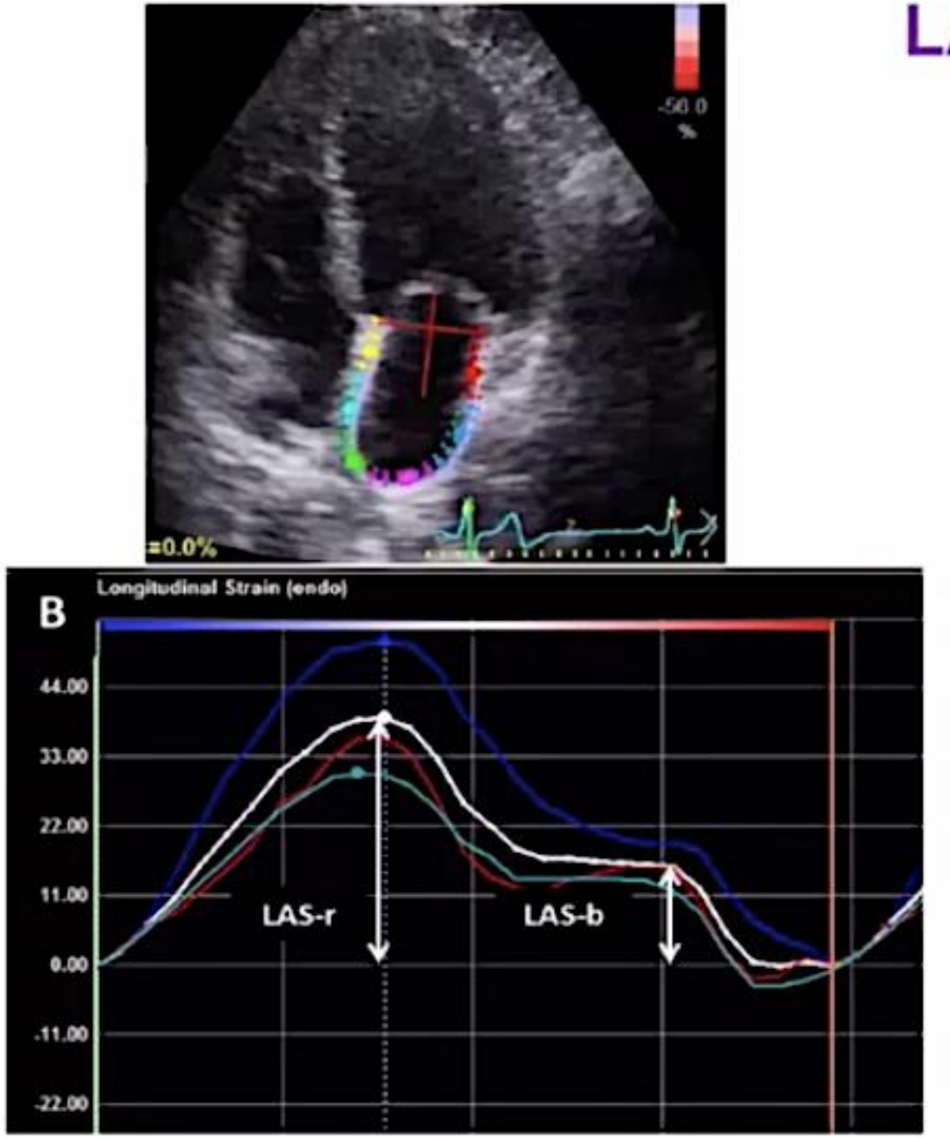

- If surgery would consider addressing TR at the time of left sided, there would be no such debate
- Secondary isolated TR is a very severe disease that is always considered too late: good surgical indications are rare
- Interventional cardiology should play a major and increasing role in such patients
- Clipping leaflets together may decrease TR and improve symptoms but, in most cases, will remain a surrogate approach with too many contraindications
- In TRILUMINATE study, only 57% of patients had < 2+TR at 30 days
- In this series using transcatheter valve 88% of patients had < 1+ TR and no mortality at 30 days
- It is a milestone publication. Percutaneous therapies for TR may be tailored for each patients but TTVR seems in good position to become the winner

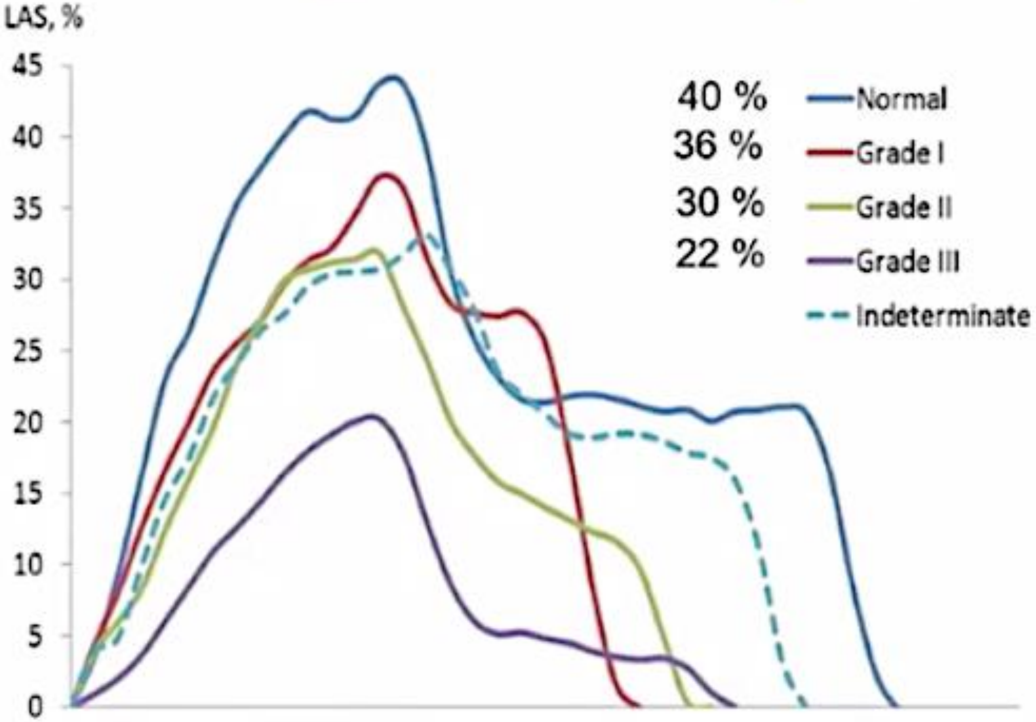
# / HFpEF /


ACC.21
How Do I Interpret
Echo Result ?
HFpEF
#ACC21
AMERICAN
COLLEGE of
CARDIOLOGY
Jae K. Oh, MD
Samsung Professor, Mayo Clinic
@JaeKOh2


Modified and Combined Diastolic Algorithm
SPECIAL ISSUE: NONINVASIVE ASSESSMENT OF LEFT VENTRICULAR DIASTOLIC FUNCTION
DEBATES IN IMAGING
The 2016 Diastolic Function Guideline
Is it Already Time to Revisit or Revise Them?
A Proposal For Modifications To The Current Diastolic Function Guideline
In Most Patients *
1 – Septal e' velocity ≥7 cm/s
2 – E/e' ≤ 15 (Med)
3 – TR velocity ≤2.8 m/s
4 – LA volume index ≤34 mL/m²
*Except for
MAC
MR
LBBB/PM
HCM
Constriction
Unusual Cases
≥ 3 Normal
2 and 2
≥ 3 Abnormal
Normal filling pressure
Need more data
PV, IVRT, Valsalva, LA Strain
Increased filling pressure
Normal DF
Grade 1 DF
Diastolic Exercise
Grade 2 DF
Grade 3 DF
Oh and Kane et al JACC Imaging 2020
ACC.21

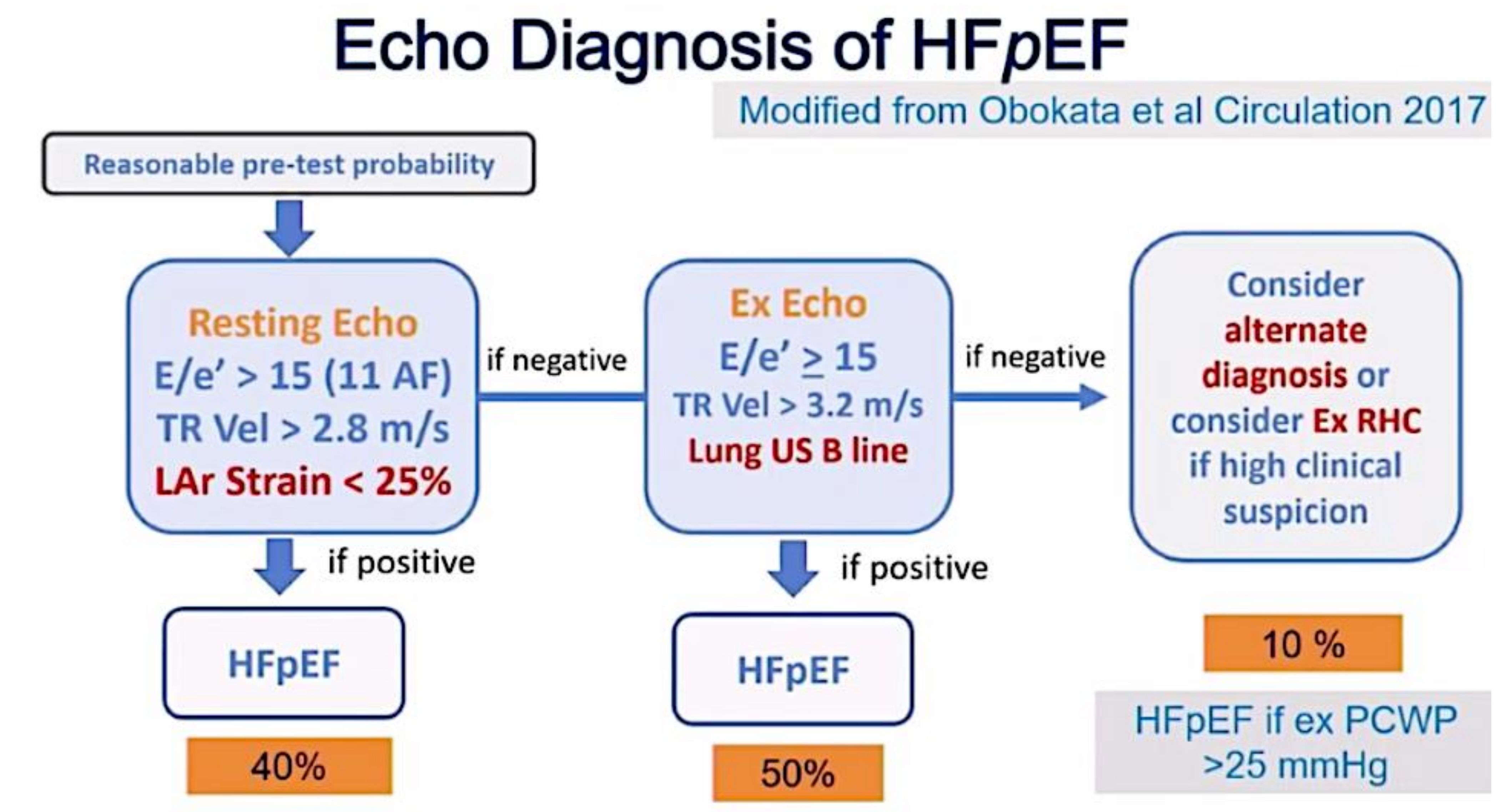
# LA Systolic (Reservoir) Strain from 669 patients at Mayo



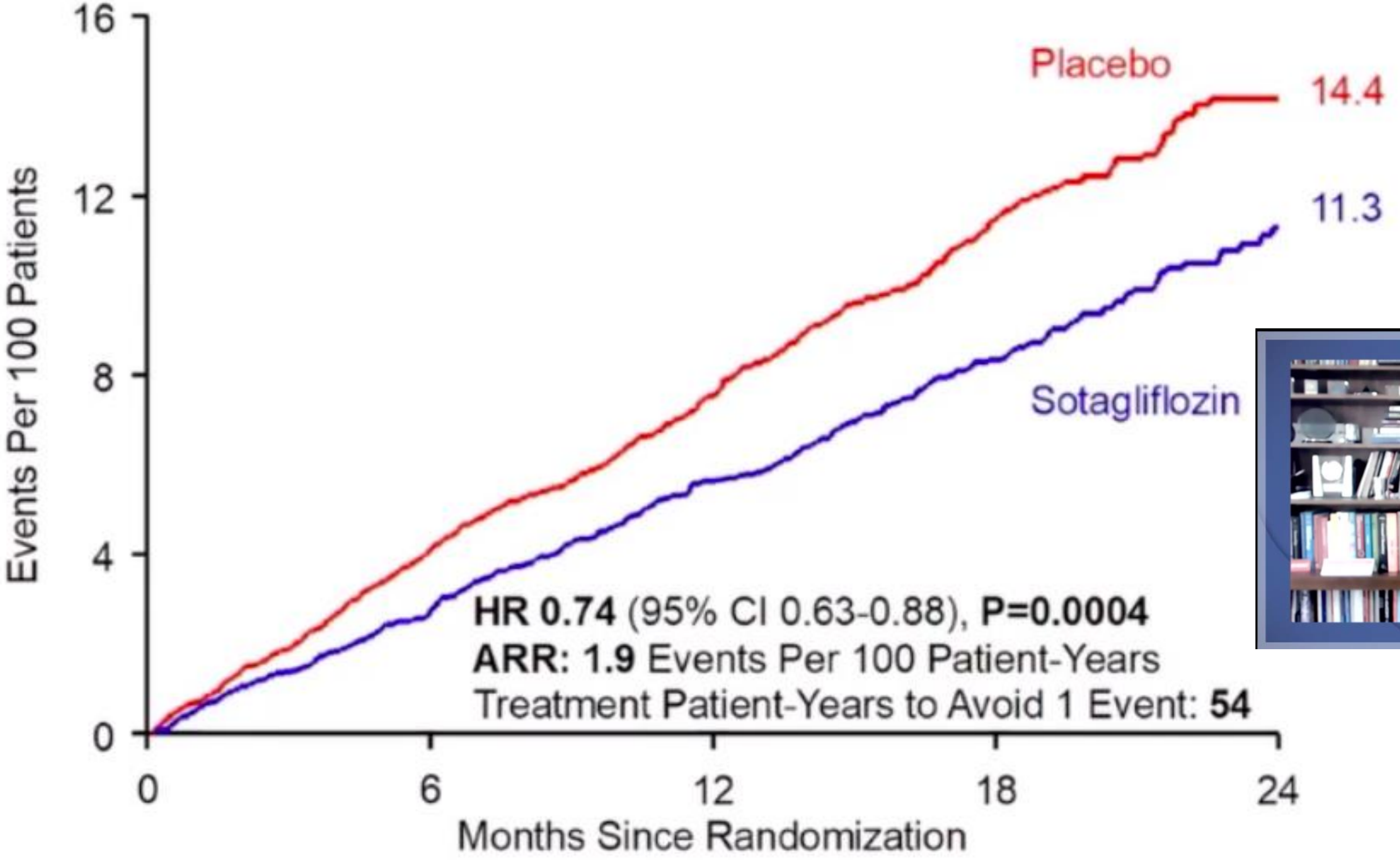

| | Normal N=358 | Grade I N=156 | Grade II N=56 | Grade III N=7 | Indeterminate N=50 |
|---|---|---|---|---|---|
| LAS-R | 40.0 ± 5.0 | 36.0 ± 5.2 | 29.8 ± 4.9 | 22.4 ± 4.9 | 33.2 ± 5.7 |
| LAS-B | 15.7 ± 4.1 | 17.3 ± 4.3 | 14.2 ± 4.8 | 5.1 ± 2.8 | 15.6 ± 5.4 |

Data from Ye et al, JASE 2021


Echo Diagnosis of HFpEF
Modified from Obokata et al Circulation 2017
Reasonable pre-test probability
Resting Echo
E/e' > 15 (11 AF)
TR Vel > 2.8 m/s
LAr Strain < 25%
if negative
Ex Echo
E/e' ≥ 15
TR Vel > 3.2 m/s
Lung US B line
if negative
Consider alternate diagnosis or consider Ex RHC if high clinical suspicion
if positive
HFpEF
40%
if positive
HFpEF
50%
10 %
HFpEF if ex PCWP >25 mmHg

# Primary Efficacy: Total CV Death, HHF, and Urgent HF Visit

SCORED





Bhatt DL, Szarek M, Pitt B, et al., and Steg PG. *N Engl J Med*. 2020. Bhatt DL. AHA 2020, virtual.

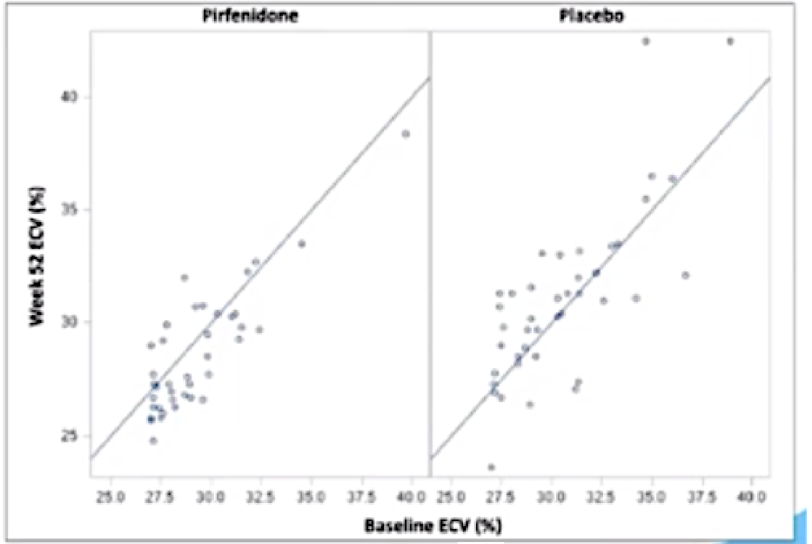

ACC.21
Pirfenidone in heart failure with preserved ejection fraction
The PIROUETTE Trial
#ACC21
AMERICAN COLLEGE of CARDIOLOGY
Chris Miller
NIHR Clinician Scientist and Cardiologist
Manchester, UK

# Conclusion

- In patients with HFpEF and myocardial fibrosis, pirfenidone reduced myocardial fibrosis
- Findings suggest pirfenidone could have favourable clinical effects in HFpEF
- Further trials are necessary to determine the clinical effectiveness and safety of pirfenidone in HFpEF

| Between-group difference (95% CI) | p-value |
|---|---|
| -1.21 (-2.12 to -0.31) | 0.009 |

ACC.21



# / ARTIFICIAL INTELLIGENCE /

# LV LS was associated with in-hospital death, LVEF was not

## (forward stepwise linear regression)

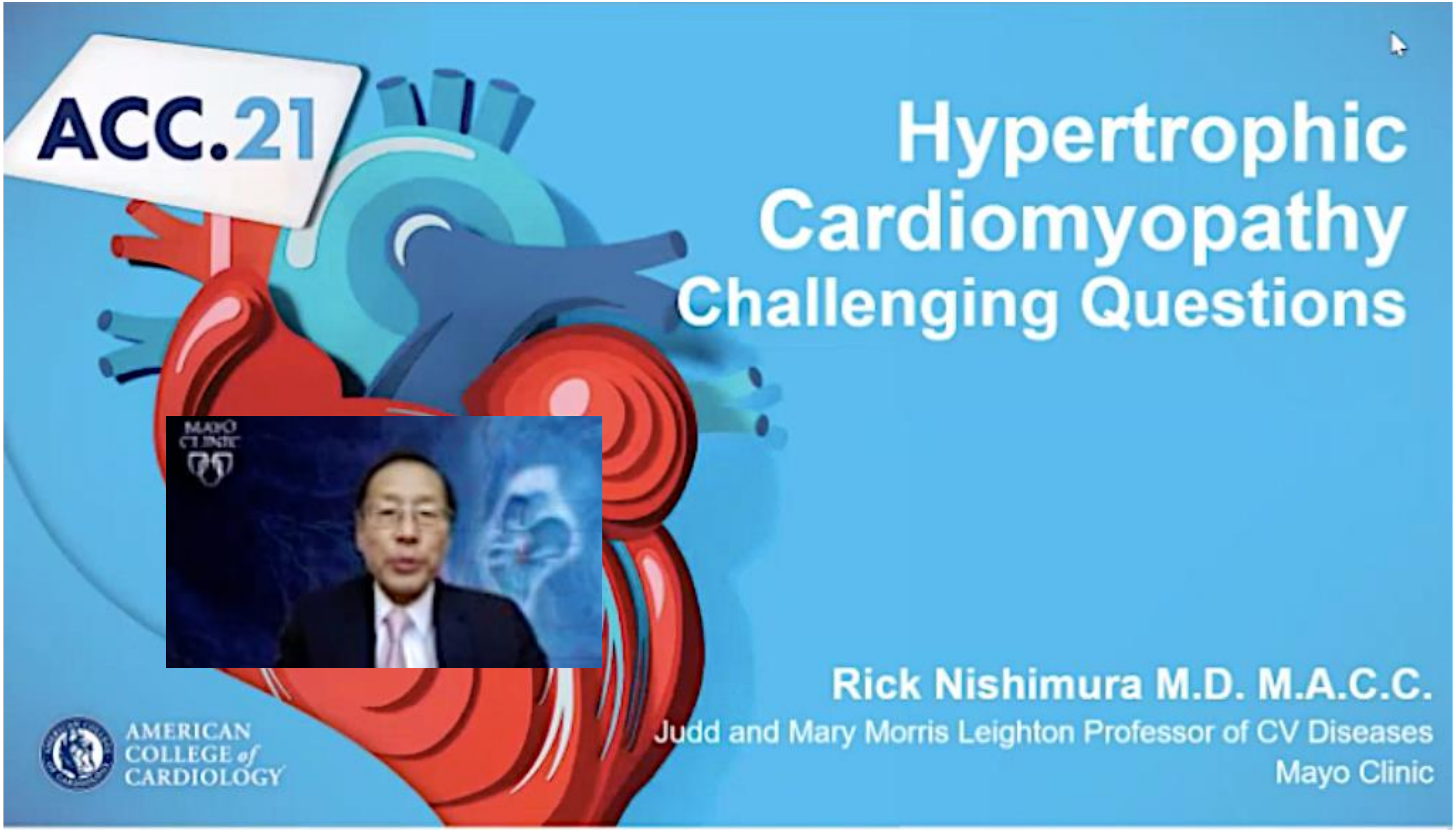
| Multivariate Analysis | | |
|---|---|---|
| **Model 1 (LV)** | | |
| Age | 1.118 [1.051, 1.219] | 0.003 |
| **LV LS** | **1.179 [1.045, 1.358]** | **0.012** |
| LDH (log) | 6.17 [1.744, 28.734] | 0.009 |
| Previous lung disease | 7.322 {1.561, 42.152] | 0.015 |
| **Model 2 (RV)** | | |
| LDH (log) | 5.691 [1.898, 20.844] | 0.003 |
| Age | 1.080 [1.034, 1.141] | 0.002 |
| **RVFWS** | **1.136 [1.037, 1.256]** | **0.007** |

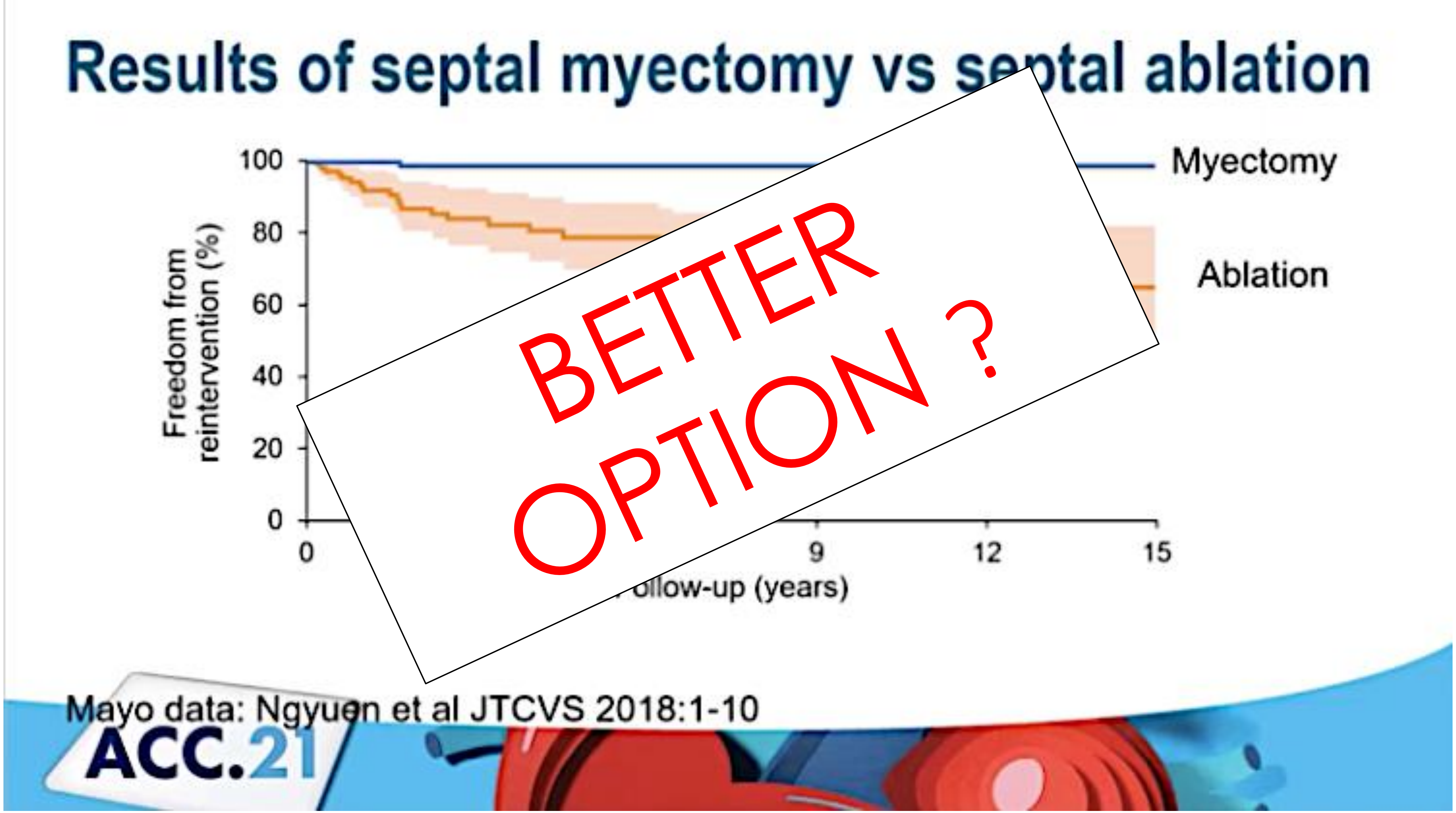
# Prediction of mortality

## Univariable Logistical Regression

| Parameter | Mortality | | | |
|---|---|---|---|---|
| | In-Hospital | | Follow-up | |
| | Odd Ratio [95% CI] | p-value | Odd Ratio [95% CI] | p-value |
| **Echocardiographic parameters (Continuous)** | | | | |
| **LVEF manual** | 0.985 [0.969, 1.003] | 0.083 | 0.990 [0.975, 1.005] | 0.187 |
| **LVEF AI** | 0.970 [0.952, 0.988] | 0.001 | 0.974 [0.956, 0.991] | 0.003 |
| **LVGLS manual** | 1.035 [0.999, 1.074] | 0.058 | 1.024 [0.991, 1.059] | 0.155 |
| **LVGLS AI** | 1.082 [1.035, 1.132] | <0.001 | 1.060 [1.019, 1.105] | 0.004 |

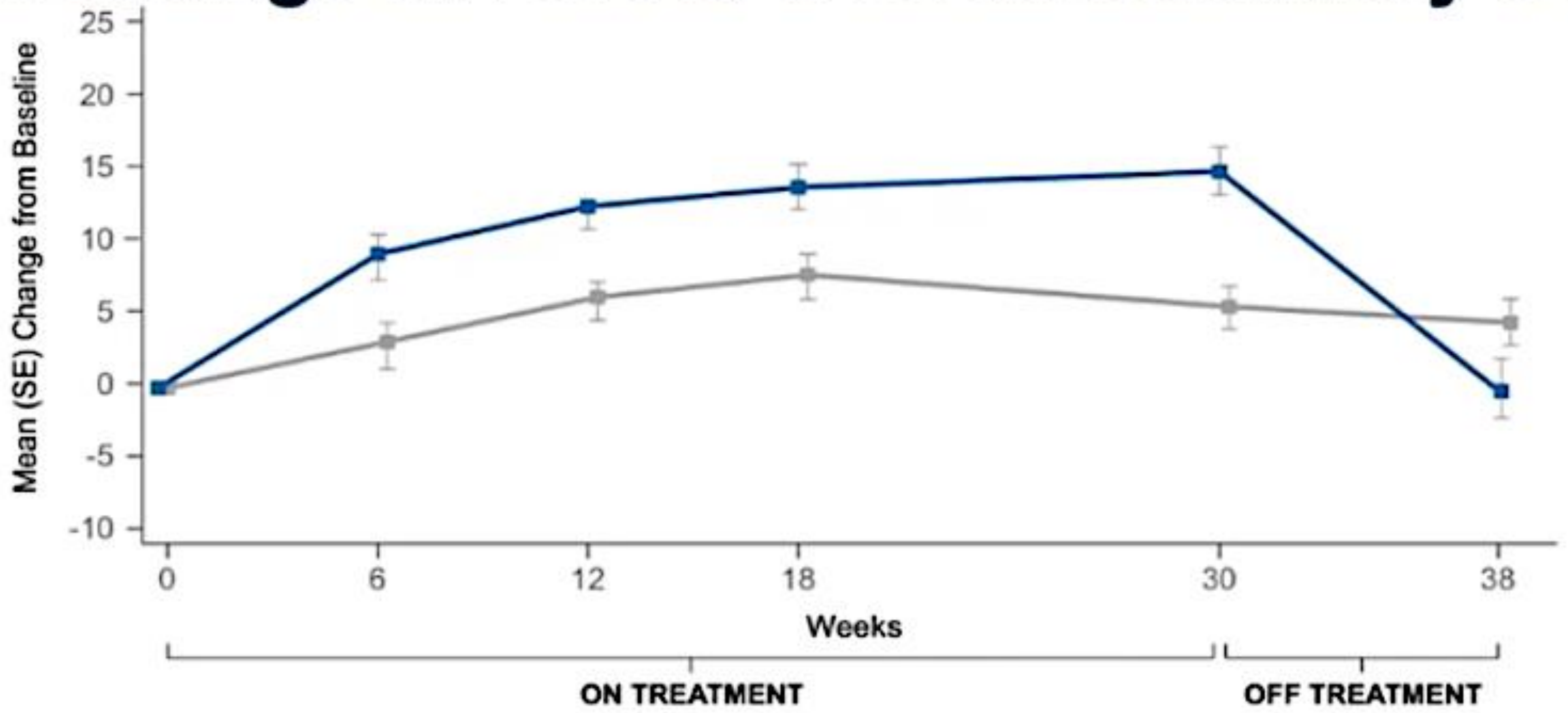
# / HYPERTROPHIC CARDIOMYOPATHY /


ACC.21
Hypertrophic Cardiomyopathy
Challenging Questions
Rick Nishimura M.D. M.A.C.C.
Judd and Mary Morris Leighton Professor of CV Diseases
Mayo Clinic
AMERICAN COLLEGE of CARDIOLOGY


Results of septal myectomy vs septal ablation
Myectomy
Ablation
Freedom from reintervention (%)
100
80
60
40
20
0
0
9
12
15
ollow-up (years)
BETTER OPTION ?
Mayo data: Ngyuen et al JTCVS 2018:1-10
ACC.21


ACC.21
Health Status Benefits of Mavacamten in Patients with Symptomatic Obstructive Hypertrophic Cardiomyopathy: Results from the Explorer-HCM Randomized Clinical Trial
John Spertus, MD MPH
Lauer/Missouri Endowed Chair and Professor, UMKC and Saint Luke's Mid America Heart Institute
@jspertus
On behalf of the EXPLORER-HCM investigators
Saint Luke's
#ACC21
AMERICAN COLLEGE of CARDIOLOGY

# Mean change in KCCQ-Overall Summary Score



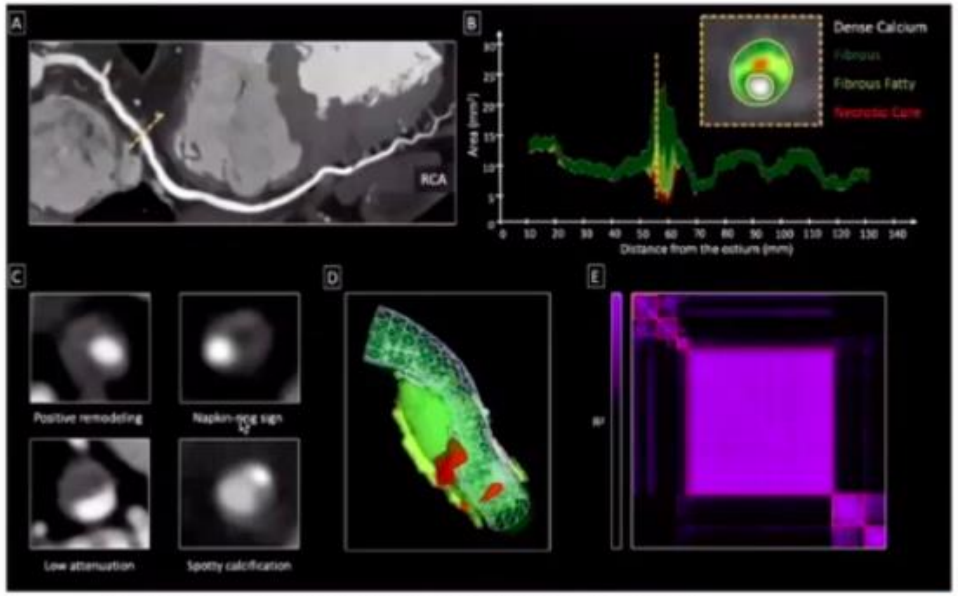

Number of Subjects with Non-Missing Data per Week

| | 0 | 6 | 12 | 18 | 30 | 38 |
|---|---|---|---|---|---|---|
| Mavacamten | 98 | 89 | 90 | 90 | 92 | 63 |
| Placebo | 96 | 82 | 91 | 93 | 88 | 62 |

# / CARDIAC CT /

# What matters most for risk assessment?

- Overall amount of plaque
- Coronary stenosis
- High risk plaque
- Peri-coronary fat attenuation
- Hemodynamic significance
- Shear stress
- Underlying risk factors, including PRS



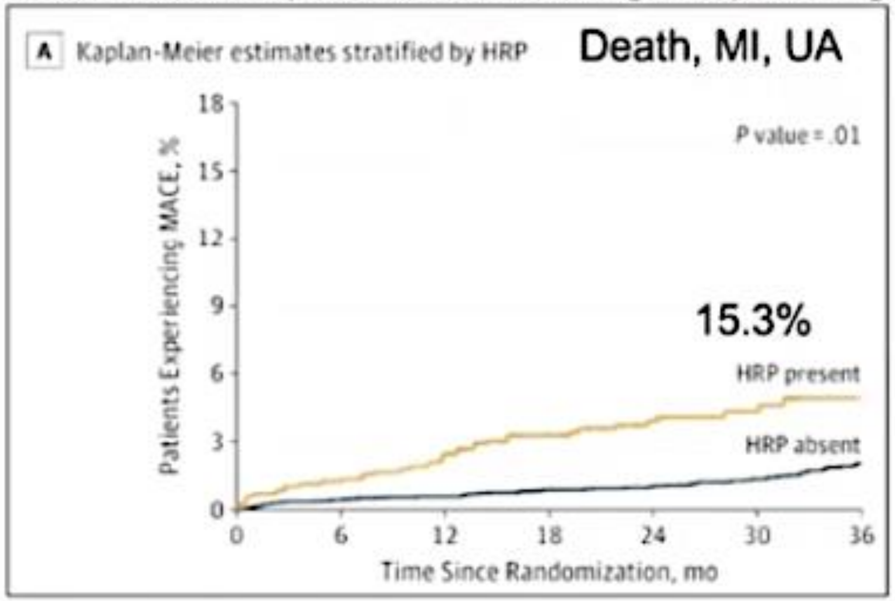

Source: Braunwald's Heart Disease (Chapter 20: Cardiac CT, in press)
Image courtesy: Dr. Pál Maurovich Horvat

ACC.21

# Adverse Plaque Characteristics → Higher Event Rates

## PROMISE

Low attenuation / positive remodeling / napkin ring

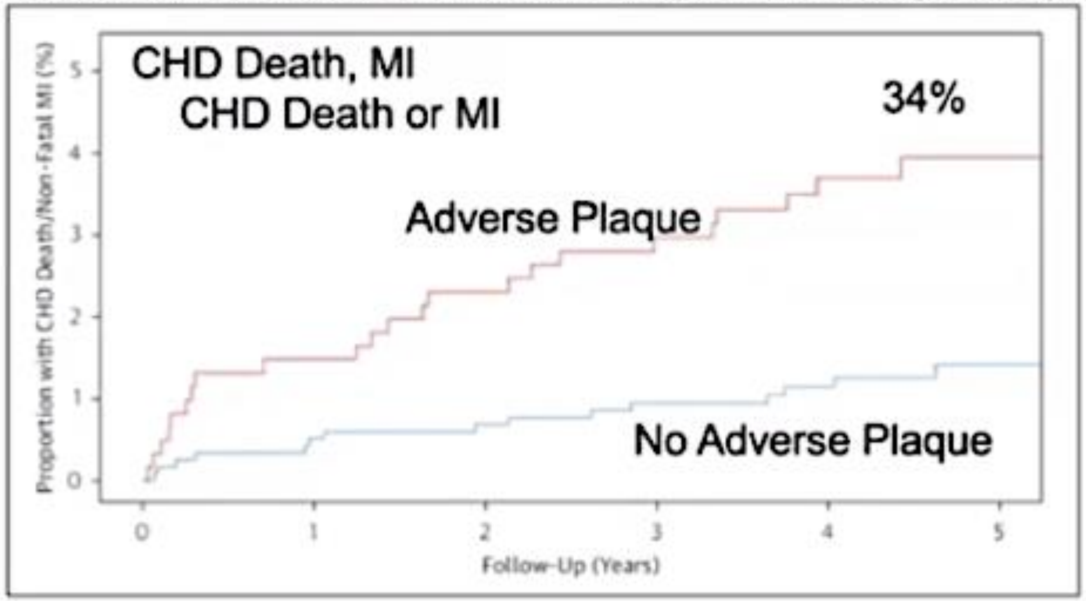



Higher risk of MACE → for non-obstructive CAD

Ferencik et al, JAMA Cardiol 2018

## SCOT HEART

Low attenuation / positive remodeling / napkin ring / spoty ca

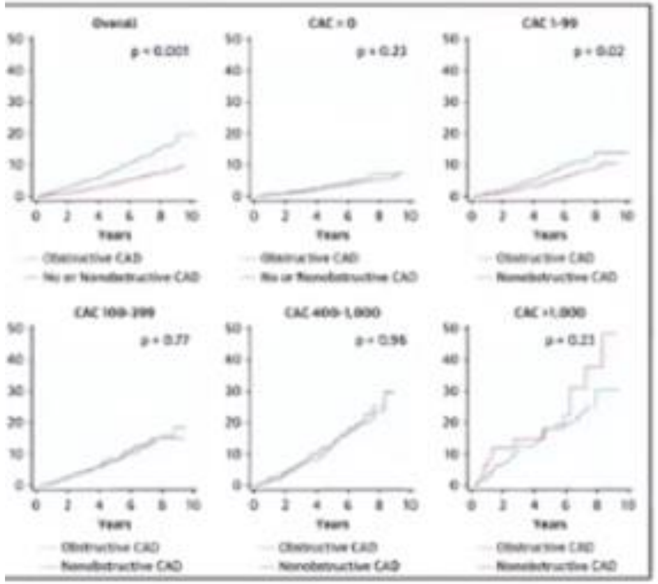


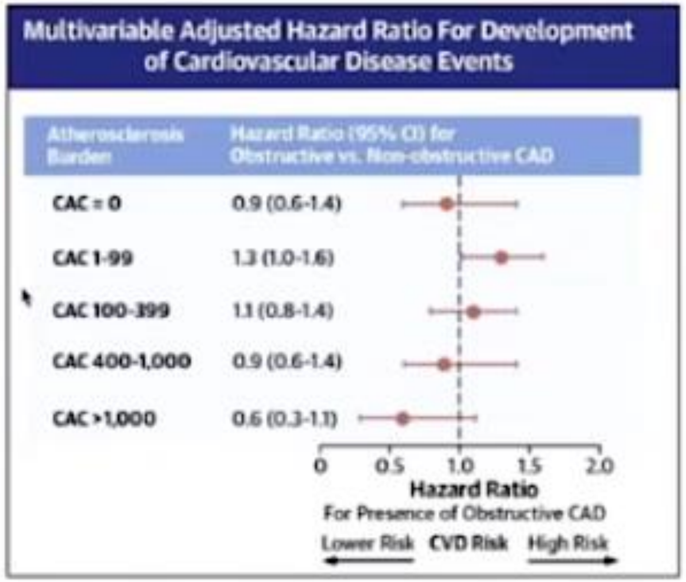

Higher risk of MI / CHD death →
**Not significant once adjusted for CAC**

Williams et al, JACC 2019

# Plaque burden, not stenosis, is the main predictor of CV risk

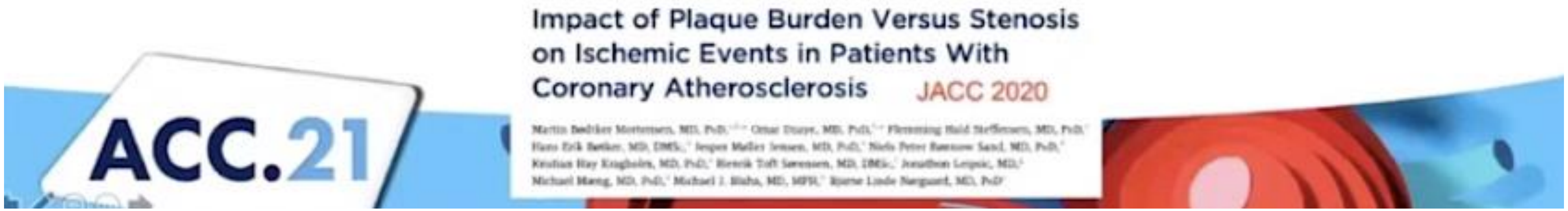
23,759 symptomatic patients from the Western Denmark Heart Registry







Patients with equal CAC burden share similar CVD risk independent of vessel obstruction





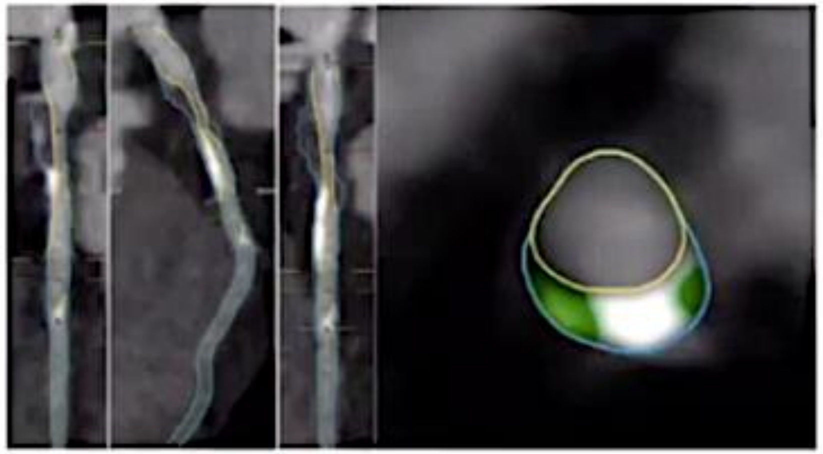
Tweet
JACC Journals
@JACCJournals

Coronary inflammation by #YesCCT – next step for identifying the vulnerable patient?

This #JACCIMG #ACC21 SimPub demonstrates the prognostic significance of RCA pericoronary adipose tissue attenuation beyond quantitative plaque and ischemia: bit.ly/3vXlgbU #cvImaging

# Take Home Point: Amount of Plaque Matters!

"For patients with evidence of coronary atherosclerotic plaque, the conclusion of the report should include a statement regarding the overall amount or extent of atherosclerotic plaque. This can be based on a visual assessment; the CAC score; or a semi-quantitative assessment of the number of coronary segments with plaque using the SIS."



ACC.21

L.J. Shaw, R. Blankstein, J.J. Bax et al. Journal of Cardiovascular Computed Tomography 15 (2021) 93e109 103

# Final Thoughts…

1. CAC Testing – improves risk assessment ; can help decide on role of various preventive therapies ; most helpful if uncertainty / reluctance

2. Coronary CTA – overall amount (and type) of plaque directly relates to risk and should impact intensity of preventive therapies

3. Boundary between $1^0$ and $2^0$ prevention often arbitrary

4. Plaque imaging – whether in asymptomatic or symptomatic patients – has the potential to improve outcomes beyond traditional approaches

ACC.21

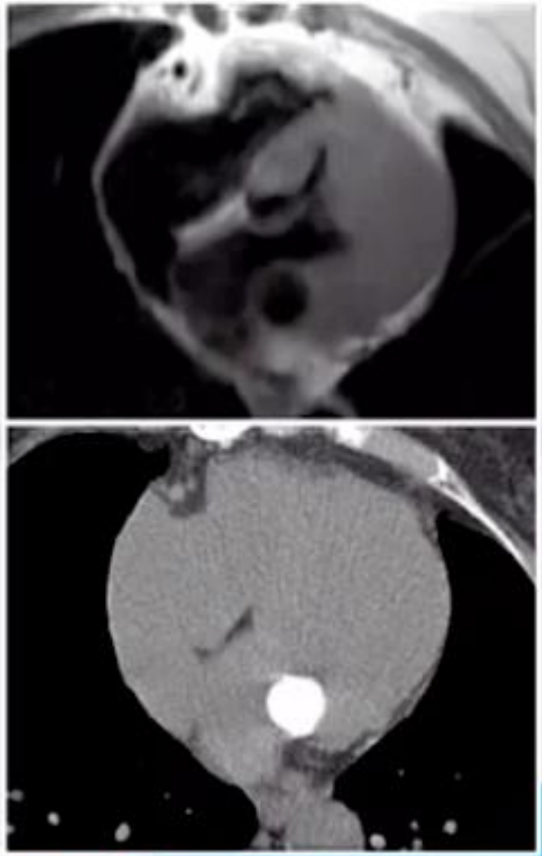
L.J. Shaw, R. Blankstein, J.J. Bax et al. Journal of Cardiovascular Computed Tomography 15 (2021) 93e109 103


ACC.21
How to use Cardiac CT
...when it wasn't really
your first choice
#ACC21
Eric Williamson, MD, FSCCT
Professor of Radiology, Mayo Clinic Rochester
Incoming President, Society of Cardiovascular CT
@EricWillMD
AMERICAN
COLLEGE of
CARDIOLOGY

# Multimodality Imaging Comparison

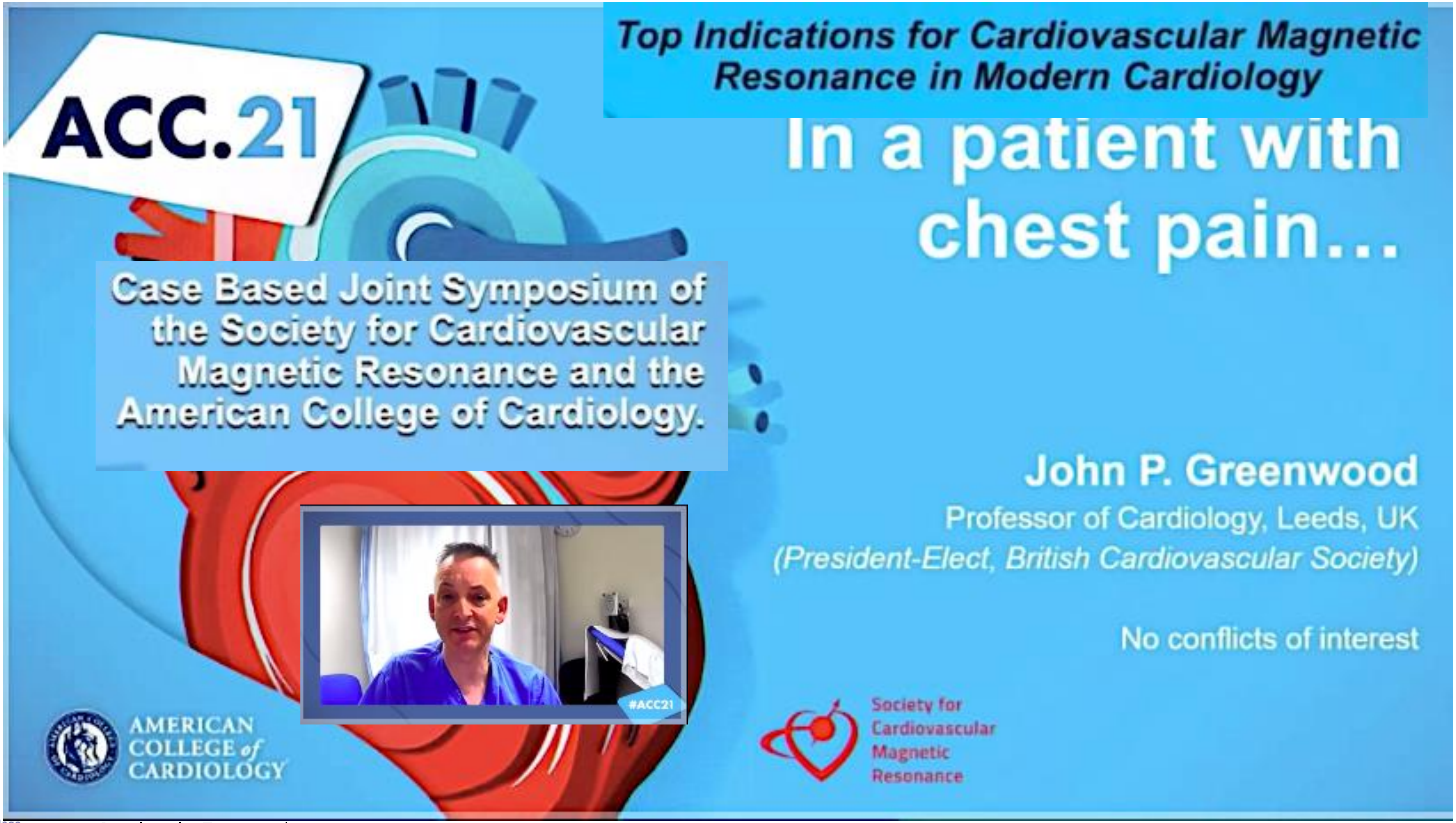
# CT in Tough Situations: Clinical Scenarios

- When Echo is challenging
  - Poor sonographic windows
  - Complex PO changes
- When MRI is limited / contraindicated
  - Sick patients
  - Claustrophobia
- When more information is needed



ACC.21

# / CARDIAC MRI/


Top Indications for Cardiovascular Magnetic Resonance in Modern Cardiology
ACC.21
In a patient with chest pain...
Case Based Joint Symposium of the Society for Cardiovascular Magnetic Resonance and the American College of Cardiology.
John P. Greenwood
Professor of Cardiology, Leeds, UK
(President-Elect, British Cardiovascular Society)
No conflicts of interest
#ACC21
AMERICAN COLLEGE of CARDIOLOGY
Society for Cardiovascular Magnetic Resonance

# Management/prognostic impact


The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

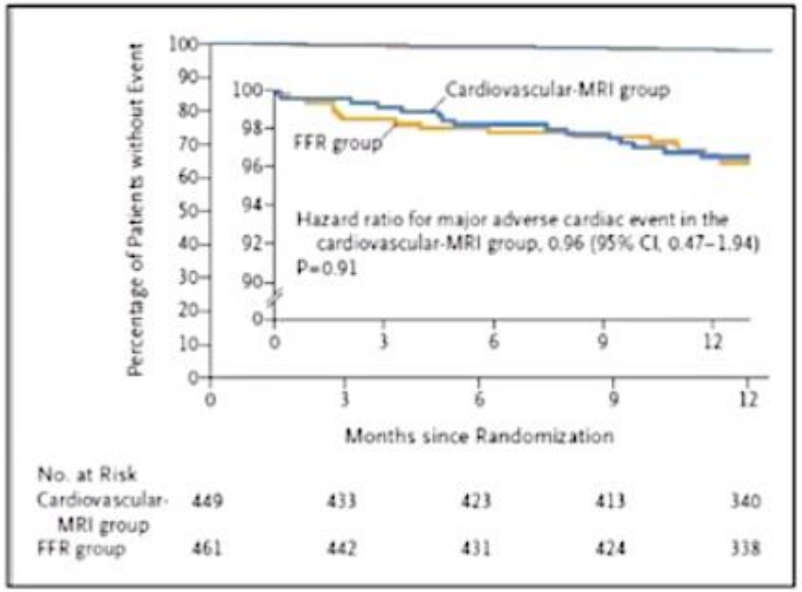
Magnetic Resonance Perfusion or Fractional Flow Reserve in Coronary Disease

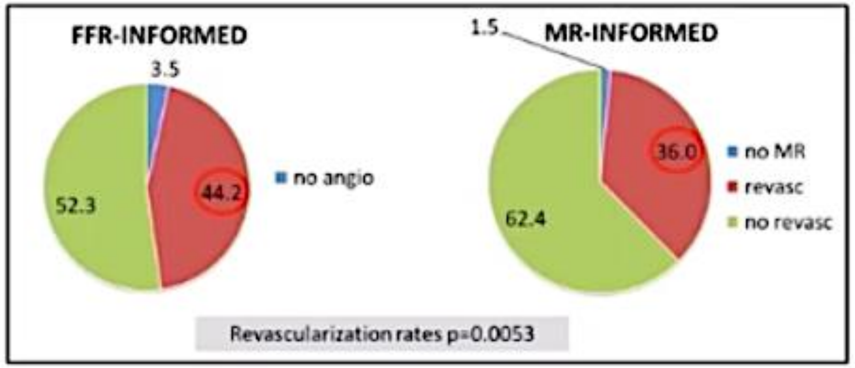
Eike Nagel, M.D., John P. Greenwood, M.D., Gerry P. McCann, M.D., Nuno Bettencourt, M.D., Ajay M. Shah, M.D., Shazia T. Hussain, M.D., Divaka Perera, M.D., Sven Plein, M.D., Chiara Bucciarelli-Ducci, M.D., Matthias Paul, M.D., Mark A. Westwood, M.D., Michael Marber, M.D., Wolf Stefan Richter, M.D., Valentina O. Puntmann, M.D., Carsten Schwenke, Ph.D., Jeanette Schulz-Menger, M.D., Rajiv Das, M.D., Joyce Wong, M.D., Derek J. Hausenloy, M.D., Henning Steen, M.D., and Colin Berry, M.D., for the MR-INFORM Investigators*


918 patients, randomised 1:1 CMR vs Angio/FFR-guided revasc$^{n}$

16 sites (EU & AUS)

1EP: Death / MI / repeat revascularisation




- In stable angina at 12m follow-up, management guided by CMR is non-inferior to a strategy of invasive angiography supported by FFR.
- Both strategies are safe and result in a low total MACE rate
- The number of revascularization procedures is significantly lower when guided by CMR, compared to invasive angiography supported by FFR

# Cardiac Magnetic Resonance Stress Perfusion Imaging for Evaluation of Patients With Chest Pain

Raymond Y. Kwong, MD, MPH, Yin Ge, MD, Kevin Steel, DO, Scott Bingham, MD, Shuaib Abdullah, MD, Kana Fujikura, MD, PhD, Wei Wang, PhD, Ankur Pandya, PhD, Yi-Yun Chen, MD, MPH, J. Ronald Mikolich, MD, Sebastian Boland, BS, MBA, Andrew E. Arai, MD, W. Patricia Bandettini, MD, Sujata M. Shanbhag, MD, MPH, Amit R. Patel, MD, Akhil Narang, MD, Afshin Farzaneh-Far, MD, PhD, Benjamin Romer, MD, John F. Heitner, MD, Jean Y. Ho, BA, Jaspal Singh, BA, Chetan Shenoy, MD, Andrew Hughes, BS, Steve W. Leung, MD, Meera Marji, MD, MPH, Jorge A. Gonzalez, MD, Sandeep Mehta, MD, Dipan J. Shah, MD, Dany Debs, MD, Subha V. Raman, MD, Avirup Guha, MD, Victor A. Ferrari, MD, Jeanette Schulz-Menger, MD, Rory Hachamovitch, MD, PhD, Matthias Stuber, PhD, Orlando P. Simonetti, PhD

(J Am Coll Cardiol 2019;74:1741-55)

Retrospective SCMR registry:

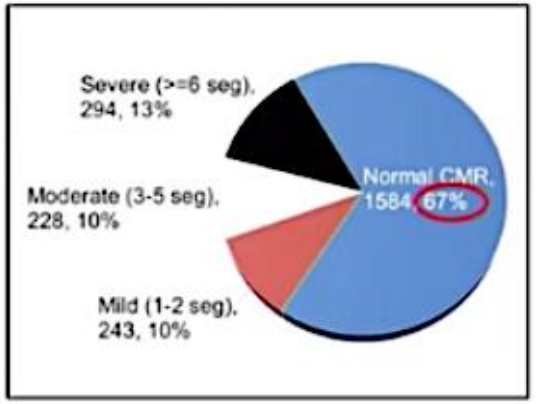
- 13 US centres
- 2,349 patients (63+/-11 years, 47% female)
- median 5.4year FU

**Inclusion Criteria (all of)**

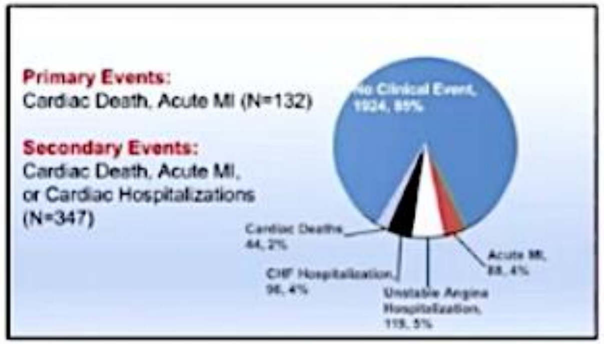
1. Age 35-85
2. Symptoms or ECG changes suspicious of myocardial ischemia
3. At least 2 coronary risk factors

**Exclusion Criteria (any of)**

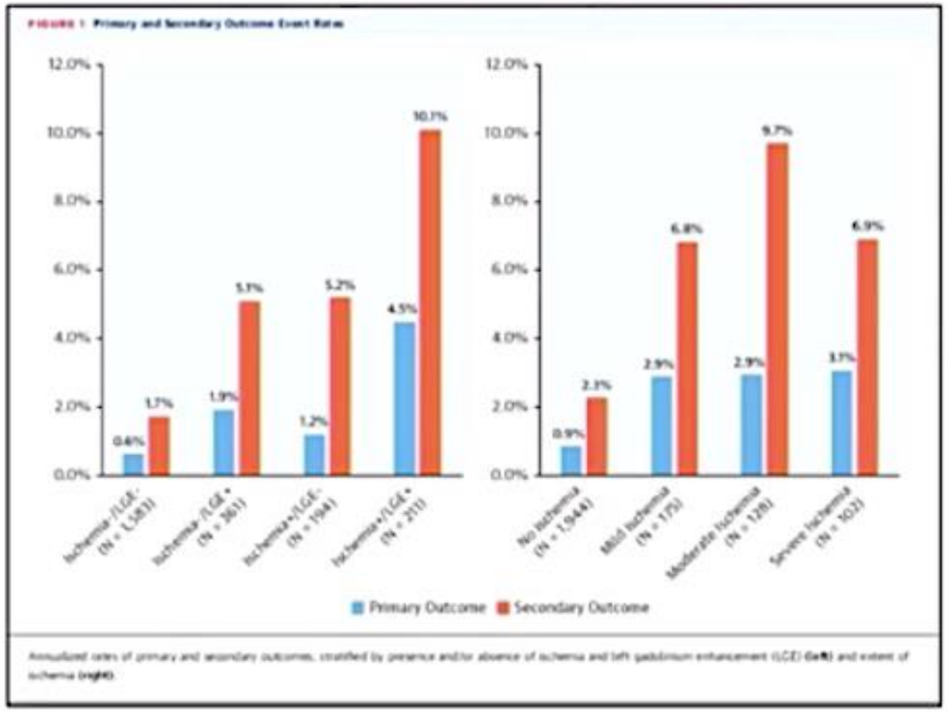
1. Hx of CABG
2. MI within 30 days before CMR
3. Any evidence of
   - severe valvular disease,
   - non-ischemic CMP LVEF<40%,
   - Infiltrative CMP,
   - HCM,
   - Pericardial disease
4. Inability to perform follow-up




Abnormal Stress CMR: ≥1 Segment with Ischemia or LGE




First Clinical Event (97% followed for >4y)



# Cost effective

**Adenosine-stress cardiac magnetic resonance imaging in suspected coronary artery disease: a net cost analysis and reimbursement implications**

Comparative cost-effectiveness analyses of cardiovascular magnetic resonance and coronary angiography combined with fractional flow reserve for the diagnosis of coronary artery disease

Cost-effectiveness of cardiovascular magnetic resonance and single-photon emission computed tomography for diagnosis of coronary artery disease in Germany

Cost-Effectiveness of Cardiovascular Magnetic Resonance in Diagnosing Coronary Artery Disease in the Australian Health Care System

Rebecca Kozor, PhD, Simon Walker, PhD, Bonny Parkinson, PhD, John Younger, FRACP, Christian Hamilton-Craig, PhD, Joseph B. Selvanayagam, PhD, John P. Greenwood, PhD, Andrew J. Taylor, PhD

Cost-effectiveness of cardiovascular magnetic resonance in the diagnosis of coronary heart disease: an economic evaluation using data from the CE-MARC study

Simon Walker,[1] François Girardin,[1,2,3] Claire McKenna,[1] Stephen G Ball,[4] Jane Nixon,[5] Sven Plein,[4] John P Greenwood,[4] Mark Sculpher[1]

Cost-effectiveness analysis for imaging techniques with a focus on cardiovascular magnetic resonance

Cost-effectiveness of cardiovascular imaging for stable coronary heart disease

Simon Walker, Edward Cox, Ben Rothwell, Colin Berry, Gerry P McCann, Chiara Bucciarelli-Ducci, Erica Dall'Armellina, Abhiram Prasad, James Robert John Foley, Kenneth Mangion, Petra Bijsterveld, Colin Everett, Deborah Stocken, Sven Plein, John Greenwood, Mark Sculpher

Cost evaluation of cardiovascular magnetic resonance versus coronary angiography for the diagnostic work-up of coronary artery disease: Application of the European Cardiovascular Magnetic Resonance registry data to the German, United Kingdom, Swiss, and United States health care systems

**Cost-effectiveness of functional cardiac imaging in the diagnostic work-up of coronary heart disease**

Mark Pletscher, Simon Walker, Karine Moschetti, Christophe Pinget, Jean-Blaise Wasserfallen, John P. Greenwood, Juerg Schwitter, and François R. Girardin

Cost-Effectiveness Analysis of Stress Cardiovascular Magnetic Resonance Imaging for Stable Chest Pain Syndromes

Yin Ge, MD, Ankur Pandya, PhD, Kevin Steel, DO, Scott Bingham, MD, Michael Jerosch-Herold, PhD, Yi-Yun Chen, MD, MPH, J. Ronald Mikolich, MD, Andrew E. Arai, MD, W. Patricia Bandettini, MD, Amit R. Patel, MD, Afshin Farzaneh-Far, MD, PhD, John F. Heitner, MD, Chetan Shenoy, MD, Steve W. Leung, MD, Jorge A. Gonzalez, MD, Dipan J. Shah, MD, Subha V. Raman, MD, Victor A. Ferrari, MD, Jeanette Schulz-Menger, MD, Rory Hachamovitch, MD, PhD, Matthias Stuber, PhD, Orlando P. Simonetti, PhD, Raymond Y. Kwong, MD, MPH

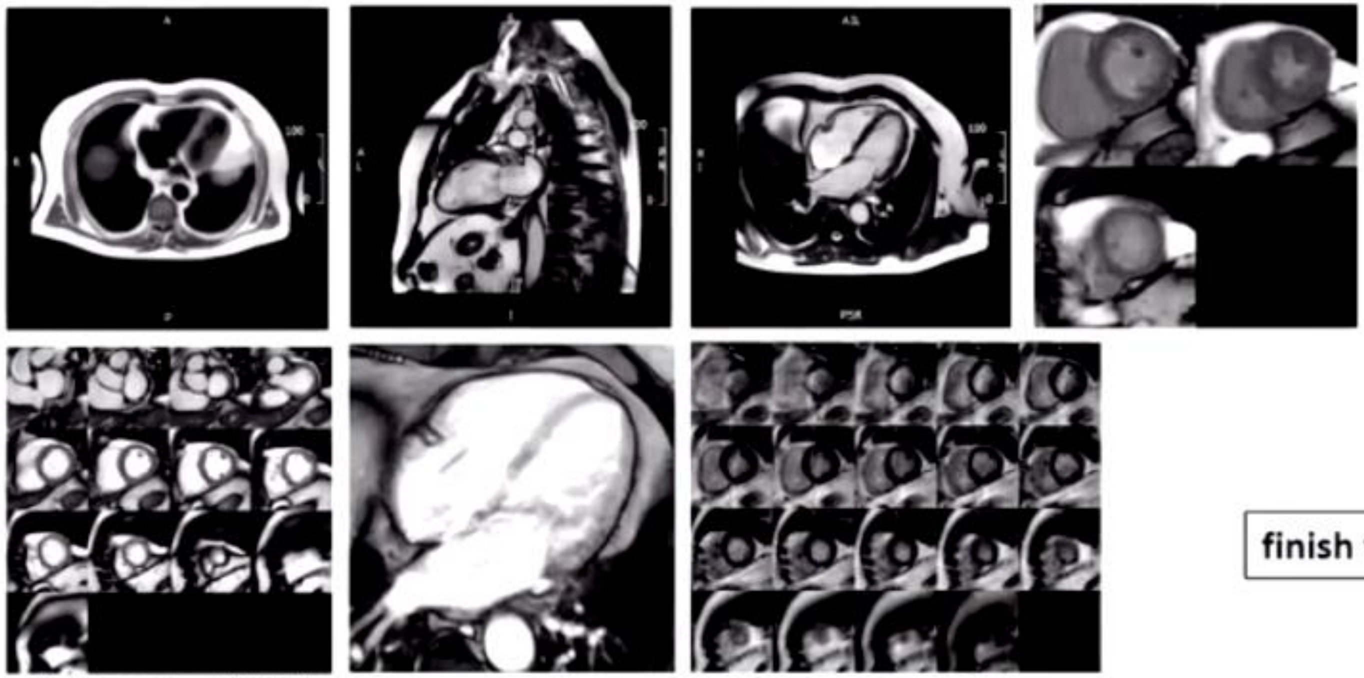
- 10 studies
- Multiple, global healthcare systems
- Same result....

# Efficient workflow – stress CMR in <20min

Rapid Cardiovascular Magnetic Resonance for Ischemic Heart Disease Investigation (RAPID-IHD)

Foley J, et al. *JACCi* 2020; 7:1632-4.

Philips Ingenia 1.5T; **start time 8.04 am**



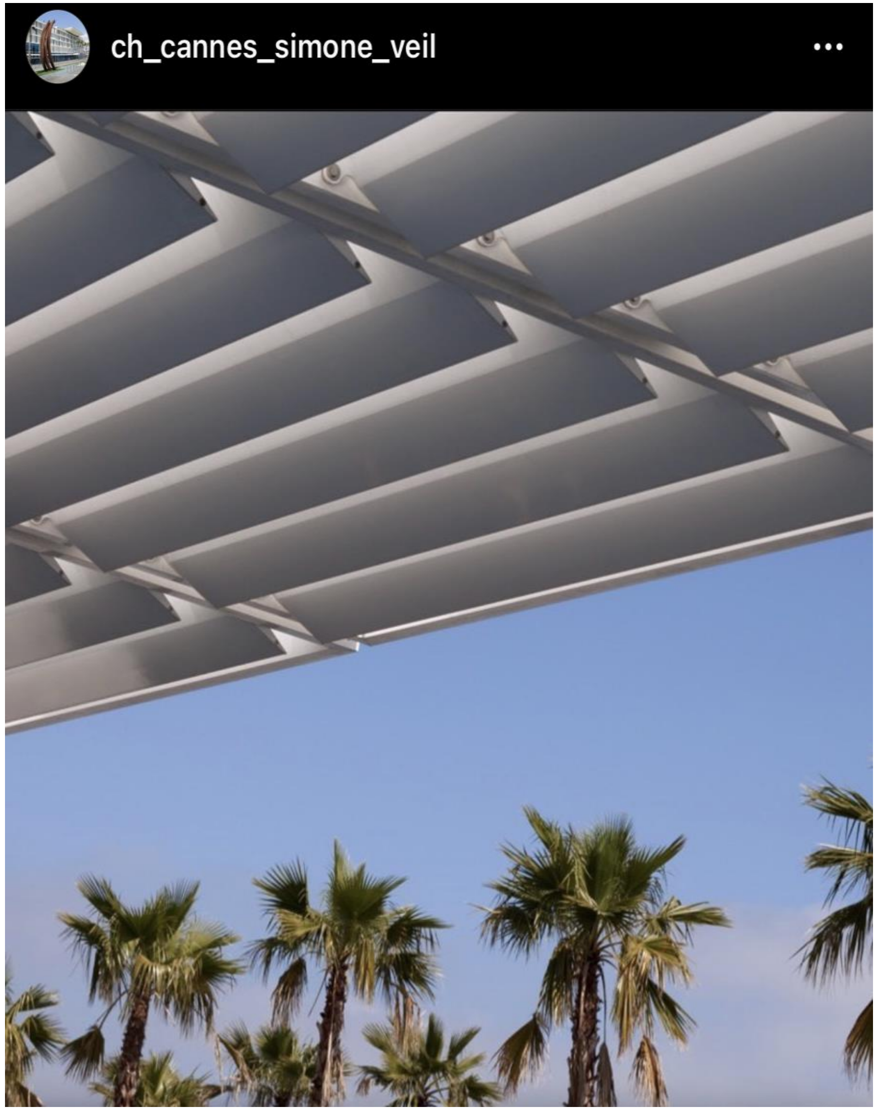
30 phase cines (bSSFP)

3D mDixon LGE
20 slices, 12s BH

finish time 8.19am

# Take-home messages…

- In terms of functional imaging, CMR has one of the highest diagnostic accuracies
- Is diagnostically effective even in multi-vessel disease
- Is highly concordant with FFR
- Currently, no proven advantage from complex quantitation *vs* visual-read in experienced hands
- Is the fastest ischaemia imaging test
- Is cost-effective as demonstrated in multiple healthcare systems (including US)
- Has excellent prognostic discrimination
- Is a proven and excellent gate-keeper to invasive angiography and to guide revascularisation


/ THANK YOU/

Collège
National des
Cardiologues des
Hôpitaux

# Suivez le CNCH sur le Social Média!

## #CNCHcongres

**@CNCHcollege**



**@CNCHcollege**

Si vous voulez devenir Ambassadeur social média CNCH adressez-nous un email à cnch@sfcardio.fr

# / SUGGESTION QUESTIONS MODERATEURS /

# / IM PROPORTIONEE – DISPROPORTIONEE /

Plus explications…

REVIEW TOPIC OF THE WEEK

# Defining "Severe" Secondary Mitral Regurgitation

## Emphasizing an Integrated Approach

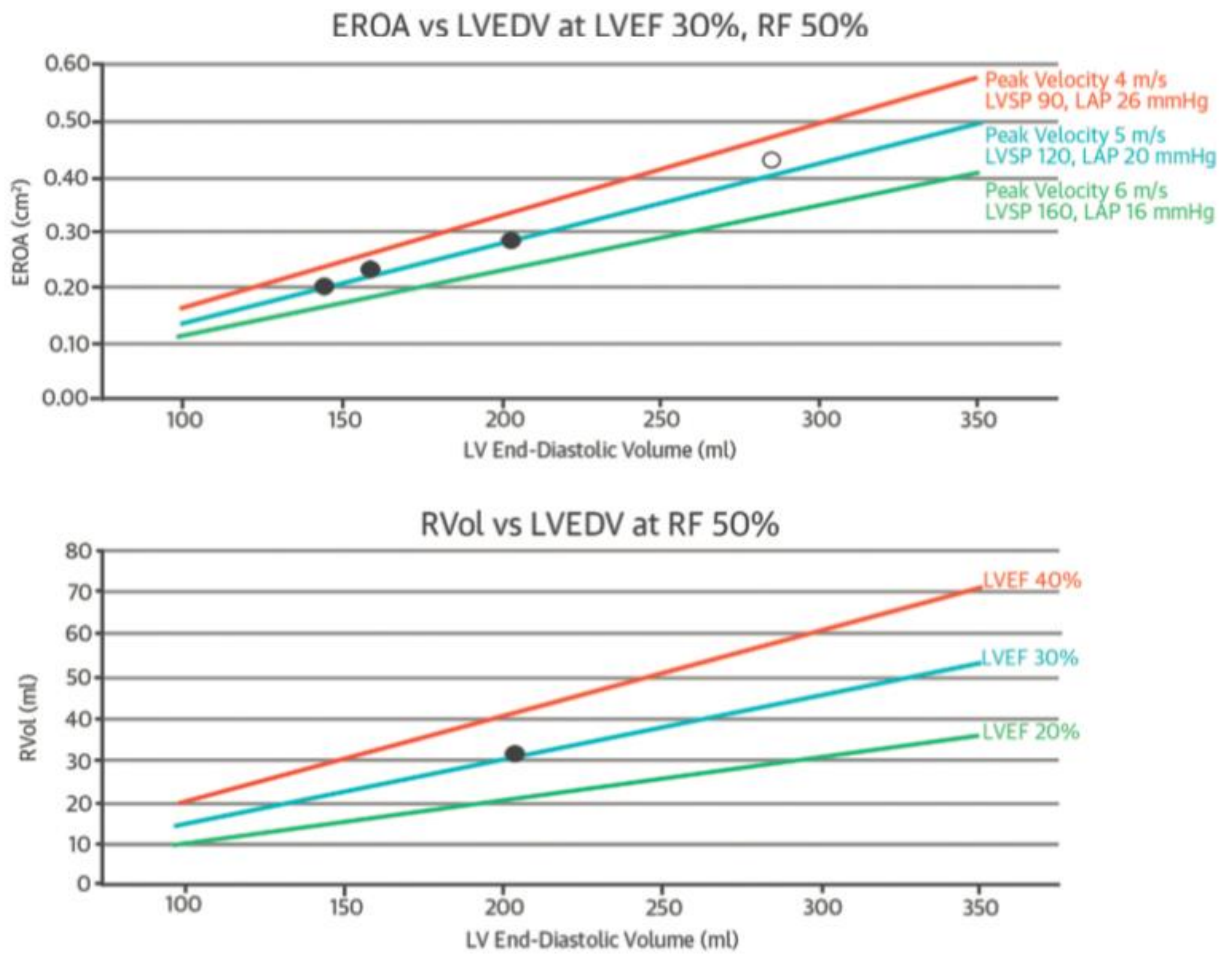
Paul A. Grayburn, MD,*† Blasé Carabello, MD,‡ Judy Hung, MD,§ Linda D. Gillam, MD,||
Michael J. Mack, MD,# Patrick M. McCarthy, MD,** D. Craig Miller, MD,†† Alfredo Trento, I

patient 1 SV 40cc RVol 20cc - RF 0.33%
patient 2 SV 25cc RVol 20cc - RF 0.44%

For ***fixed*** FR (50%)
Different ERO & EDV LV

**But…..**
**RF is a ratio = RVol/ RVol + SV**
**RVol = ERO x mitral VTI**
**and VTI dependent of LA compliance**
**LA compliance ↑= ↑ VTI**
**LA compliance ↓= ↓ VTI**
**RF is a *consequence* of HD and HF**

CENTRAL ILLUSTRATION Relationship Between EROA and RVol and LVEDV




Grayburn, P.A. et al. J Am Coll Cardiol. 2014; 64(25):2792-801.

# / QUEL HORIZON POUR L'IM A ACC 2022 ? /

# / DMR vs. FMR OUTCOME

# / ARRHYTHMIC MVP

# / MITRAL ANNULAR DISJUNCTION

# / SELECTION DES PATIENTS POUR LE TRAITEMENT PERCUTANE DE L'IT /

# / PRONOSTIQUE DE L'IT DANS IM /