The New ASE Guidelines for Native Valvular Regurgitation

William A. Zoghbi MD, FASE, MACC
Professor and Chairman, Department of Cardiology
Elkins Family Distinguished Chair in Cardiac Health

HOUSTON Methodist℠
DEBAKEY HEART & VASCULAR CENTER

Relation with Industry

HOUSTON Methodist DEBAKEY HEART & VASCULAR CENTER

- Licensing agreement with GE Healthcare
- Advisory board for Abbott Vascular

HOUSTON Methodist DEBAKEY HEART & VASCULAR CENTER

ASE GUIDELINES AND STANDARDS

Recommendations for Noninvasive Evaluation of Native Valvular Regurgitation

A Report from the American Society of Echocardiography Developed in Collaboration with the Society for Cardiovascular Magnetic Resonance

William A. Zoghbi, MD, FASE (Chair), David Adams, RCS, RDCS, FASE, Robert O. Bonow, MD, Maurice Enriquez-Sarano, MD, Elyse Foster, MD, FASE, Paul A. Grayburn, MD, FASE, Rebecca T. Hahn, MD, FASE, Yuchi Han, MD, MMSc,* Judy Hung, MD, FASE, Roberto M. Lang, MD, FASE, Stephen H. Little, MD, FASE, Dipan J. Shah, MD, MMSc,* Stanton Shernan, MD, FASE, Paaladinesh Thavendiranathan, MD, MSc, FASE,* James D. Thomas, MD, FASE, and Neil J. Weissman, MD, FASE, *Houston and Dallas, Texas; Durham, North Carolina; Chicago, Illinois; Rochester, Minnesota; San Francisco, California; New York, New York; Philadelphia, Pennsylvania; Boston Massachusetts; Toronto, Ontario, Canada; and Washington, DC*

J Am Soc Echocardiogr. 2017 Apr;30(4):303-371

New ASE Valvular Regurgitation Guidelines- *Endorsed by SCMR*

HOUSTON Methodist DEBAKEY HEART & VASCULAR CENTER

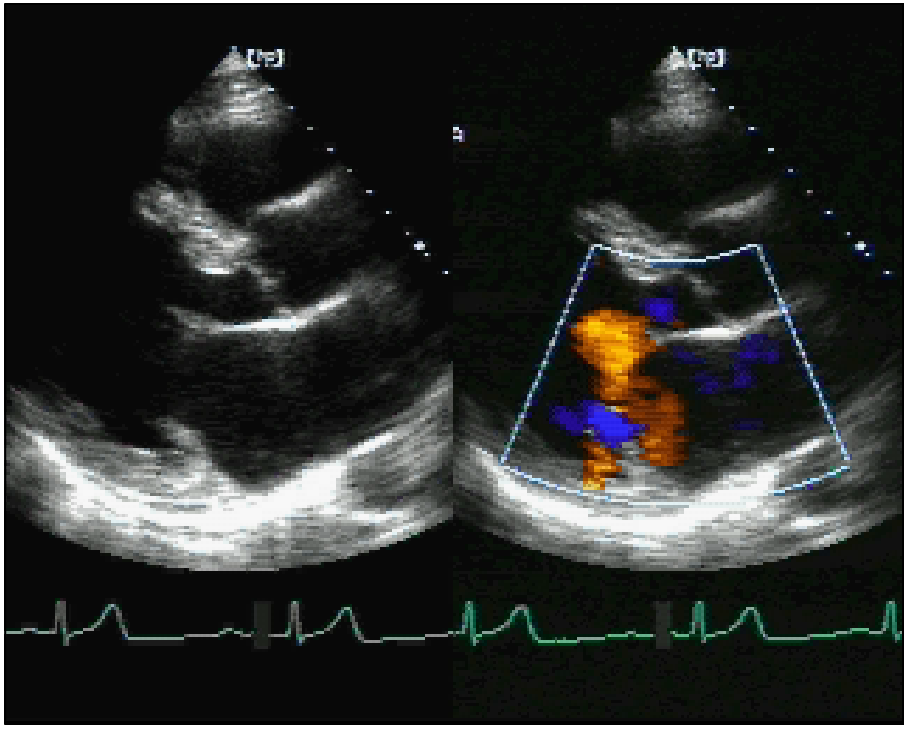
What is New?

- Emphasis on identification of Etiology/Mechanism of regurgitation
- 2D/3D TTE--an integrative approach & algorithms to assess severity
- When is TEE needed
- Important role of CMR & CMR methodology
- The challenge of co-existing valvular lesions
- A clinical perspective…
- Library of case studies on the web

Mitral Valve Regurgitation

HOUSTON Methodist DEBAKEY HEART & VASCULAR CENTER



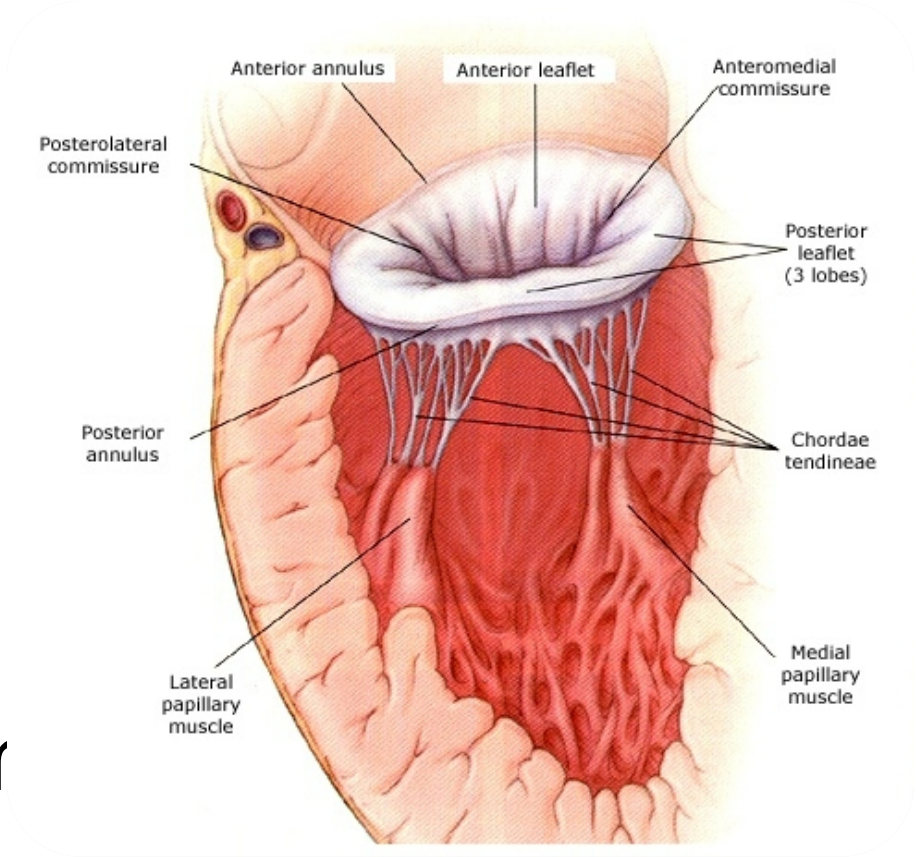


Mitral Valve Anatomy

A Complex Apparatus

HOUSTON Methodist DEBAKEY HEART & VASCULAR CENTER

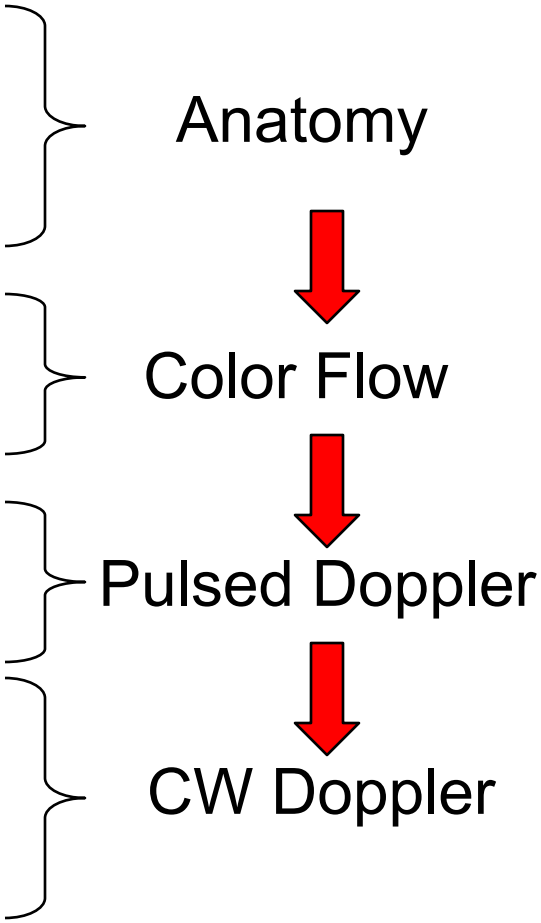
- Annulus
- Leaflets
- Chords
  - Primary, secondary& tertiary
- Papillary muscles
- Ventricular functior geometry



Mitral Regurgitation
Indicators of Severity

HOUSTON Methodist DEBAKEY HEART & VASCULAR CENTER

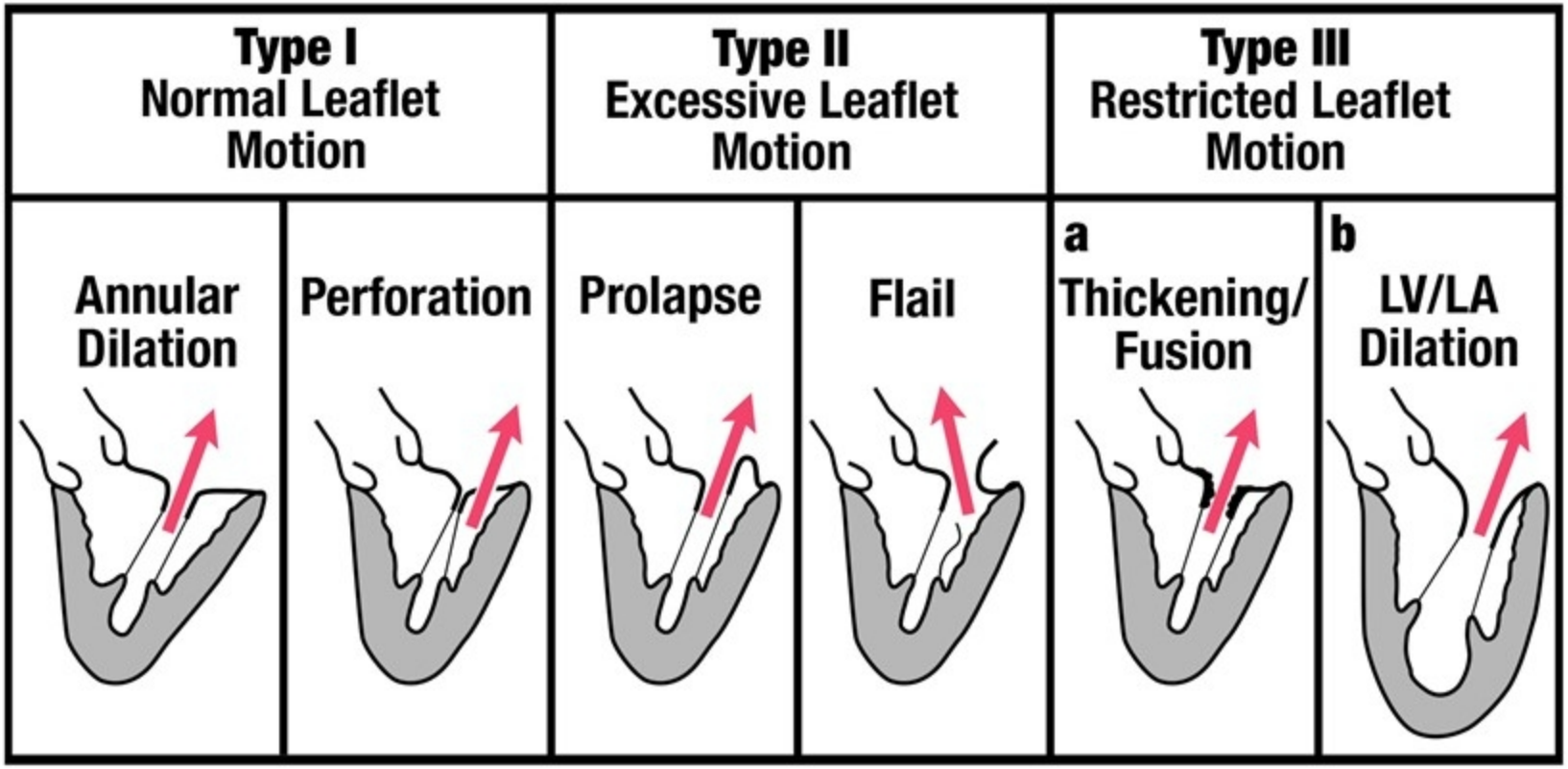
- Mitral valve pathology
- LV/ LA size
- Color Doppler:
  Vena contracta, Jet Area, Flow convergence
- Mitral E; Pulmonary vein pattern
- Regurgitant flow/fraction
- CW density and contour



Carpentier Classification of Mechanisms of MV Regurgitation

HOUSTON Methodist DEBAKEY HEART & VASCULAR CENTER

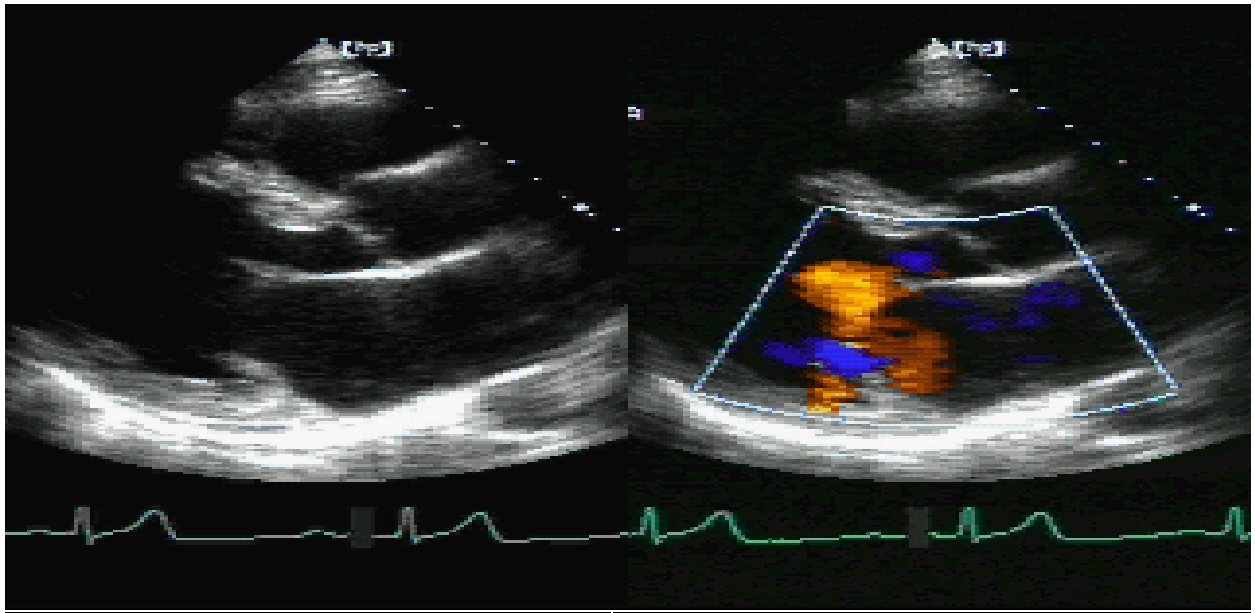
Mitral Regurgitation



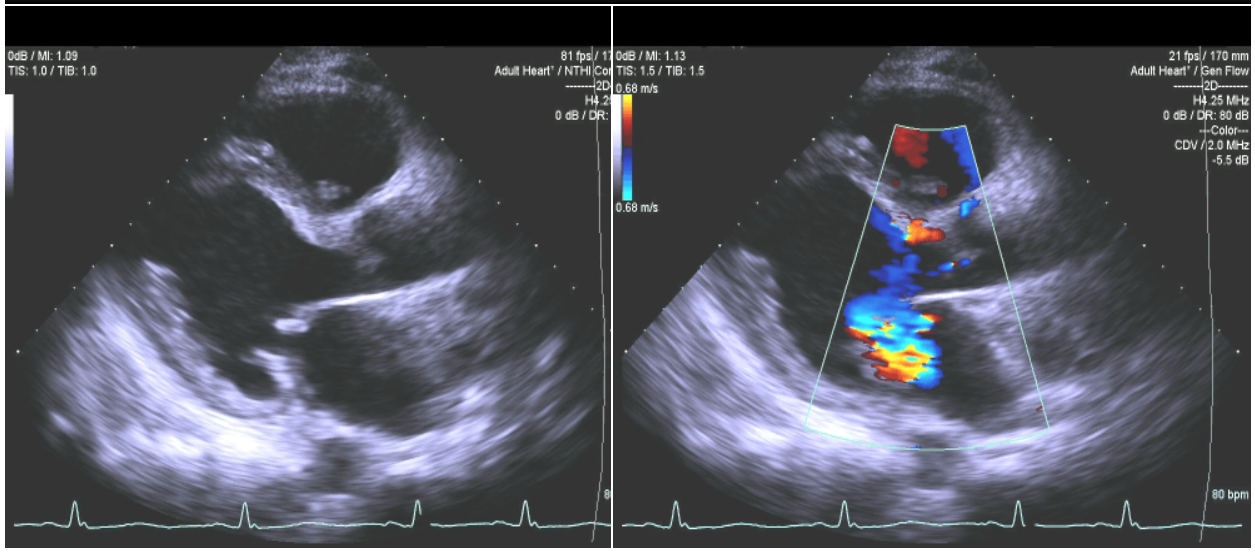
Zoghbi W et al JASE March 2017

Valve Structure & MR Jet Characteristics

HOUSTON Methodist
DEBAKEY HEART & VASCULAR CENTER



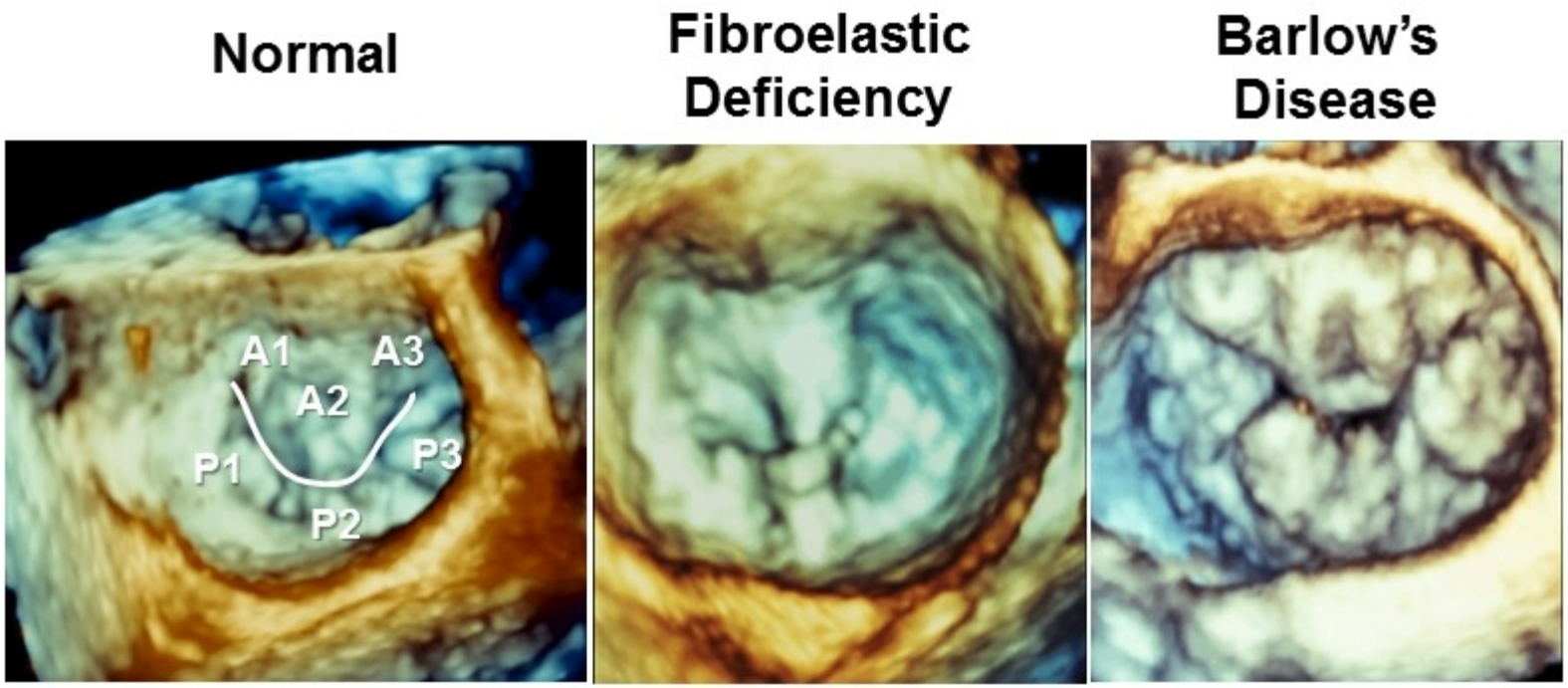
Primary



Secondary

3D Echocardiography- MV

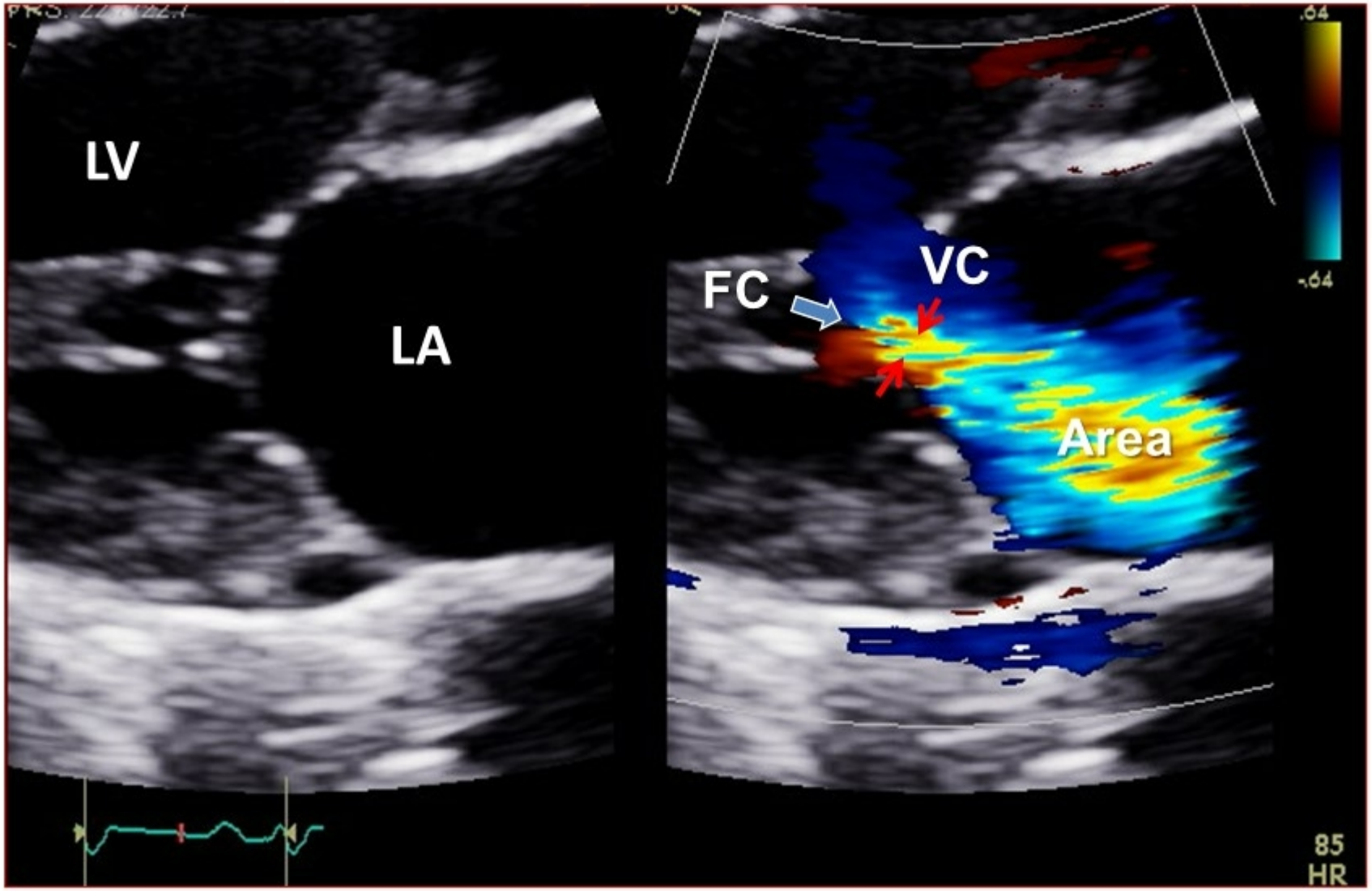
HOUSTON Methodist DEBAKEY HEART & VASCULAR CENTER



Zoghbi W et al JASE March 2017

Mitral Regurgitation- Color Doppler

HOUSTON Methodist
DEBAKEY HEART & VASCULAR CENTER



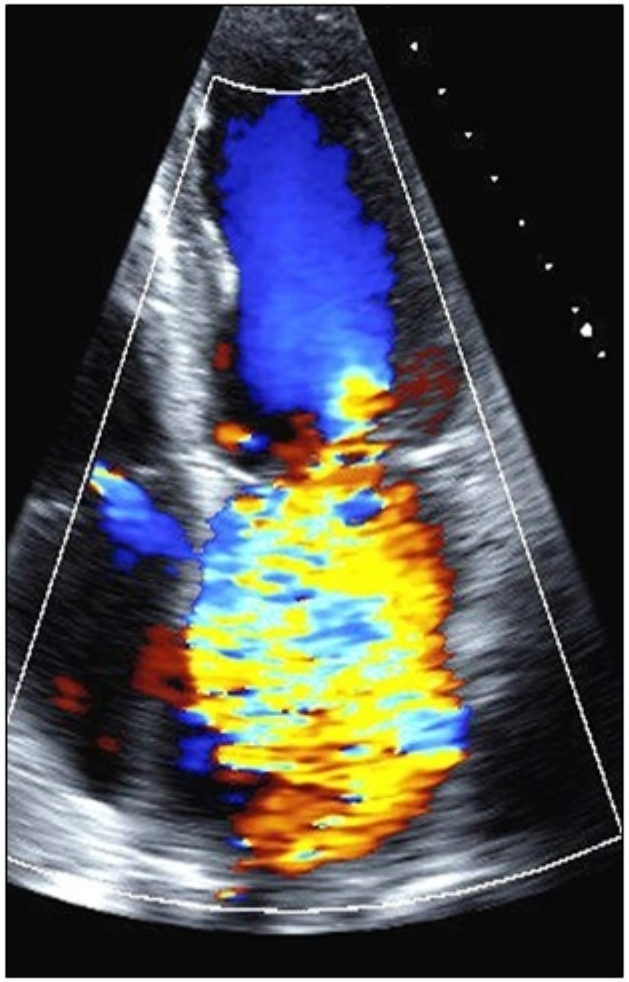
Mitral Regurgitation

HOUSTON Methodist DEBAKEY HEART & VASCULAR CENTER

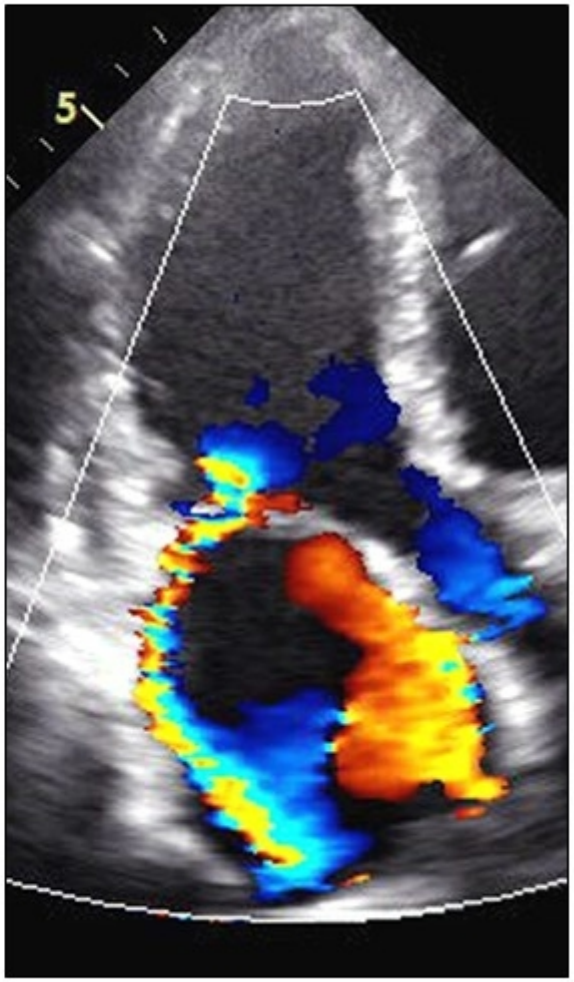
Mild Central



Severe Central



Severe Eccentric



Vena Contracta
Proximal Jet Width

HOUSTON Methodist DEBAKEY HEART & VASCULAR CENTER

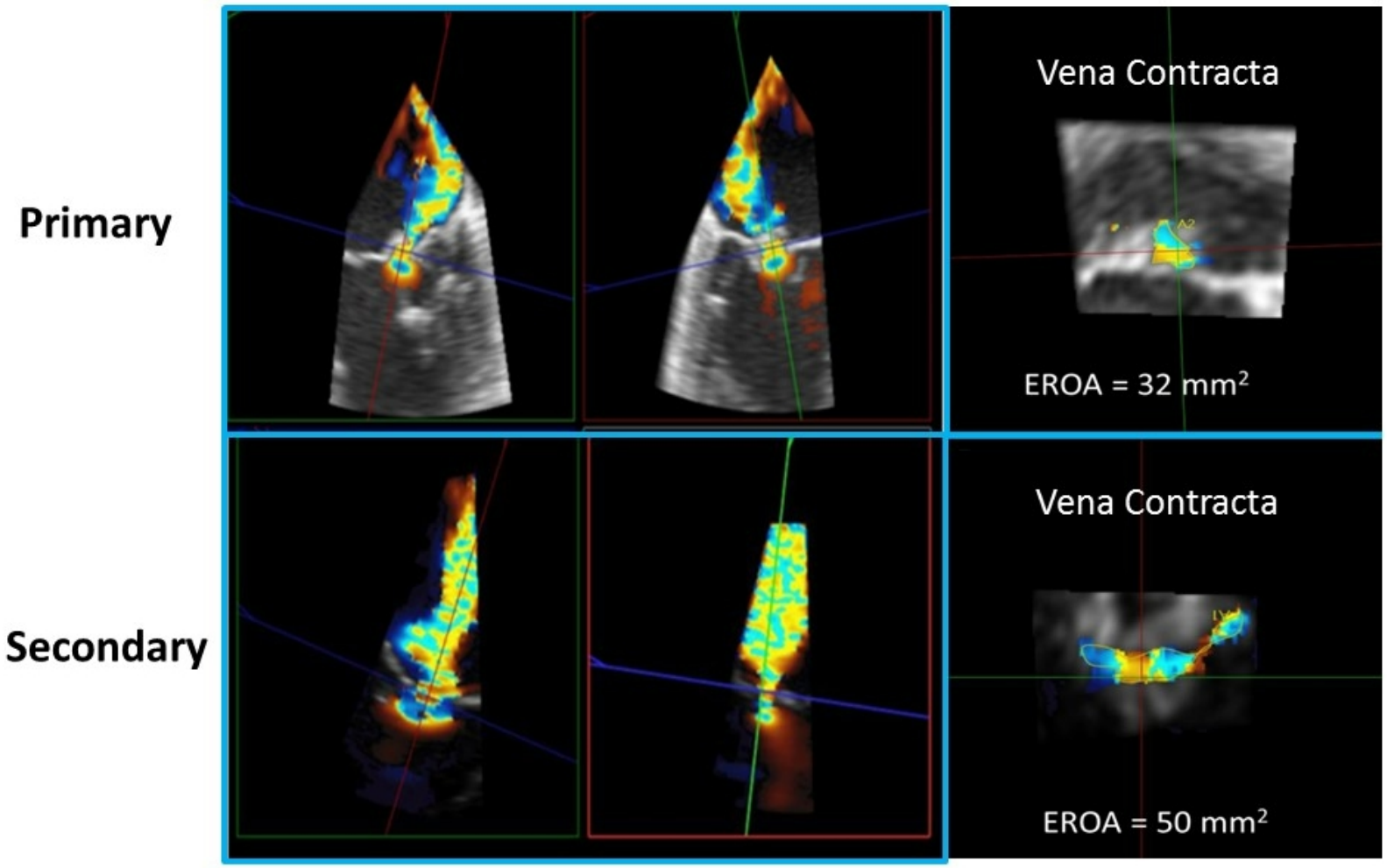


VC width (cm)	
Mild	< 0.3
Moderate	0.3-0.7
Severe	> 0.7

3D Echocardiography in MR Assessing VC Area

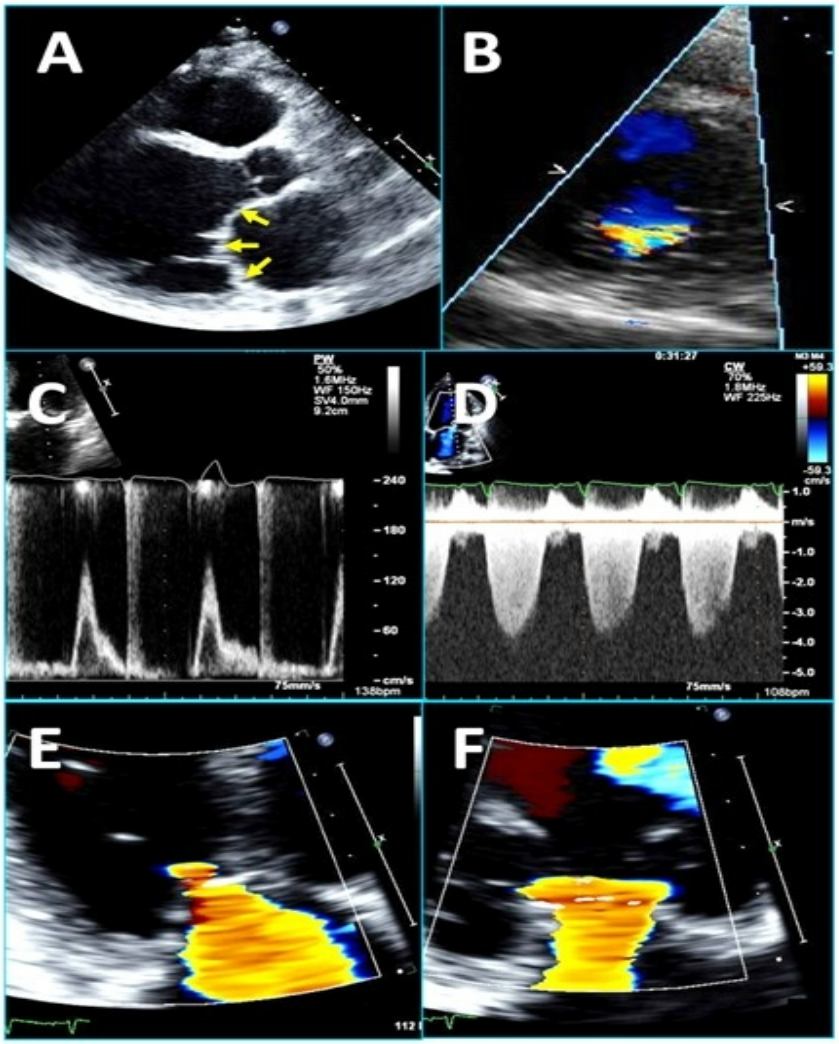
HOUSTON Methodist DEBAKEY HEART & VASCULAR CENTER

VC Area is often not circular in Secondary MR



Secondary Mitral Regurgitation

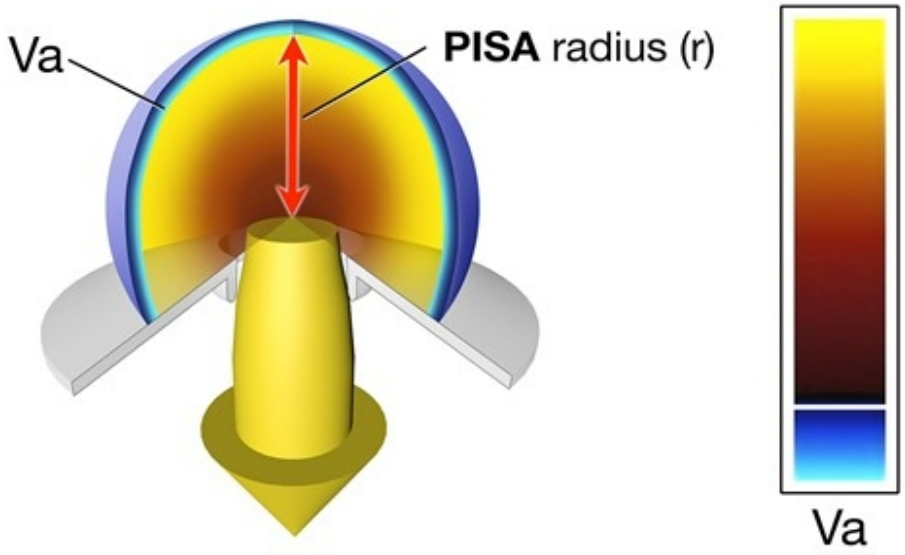
HOUSTON Methodist DEBAKEY HEART & VASCULAR CENTER



Flow Convergence (PISA)

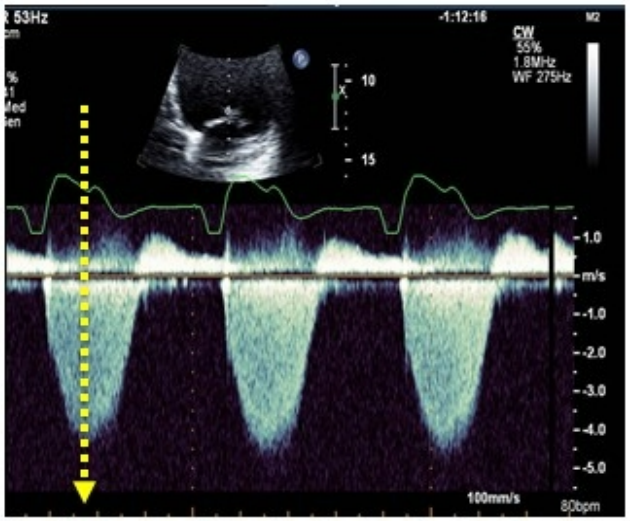
HOUSTON Methodist DEBAKEY HEART & VASCULAR CENTER

Flow Convergence Method



$$\text{Reg Flow} = 2\pi r^2 \times Va$$
$$\text{EROA} = \text{Reg Flow}/PKV_{Reg}$$
$$\text{R Vol} = \text{EROA} \times VTI_{Reg}$$



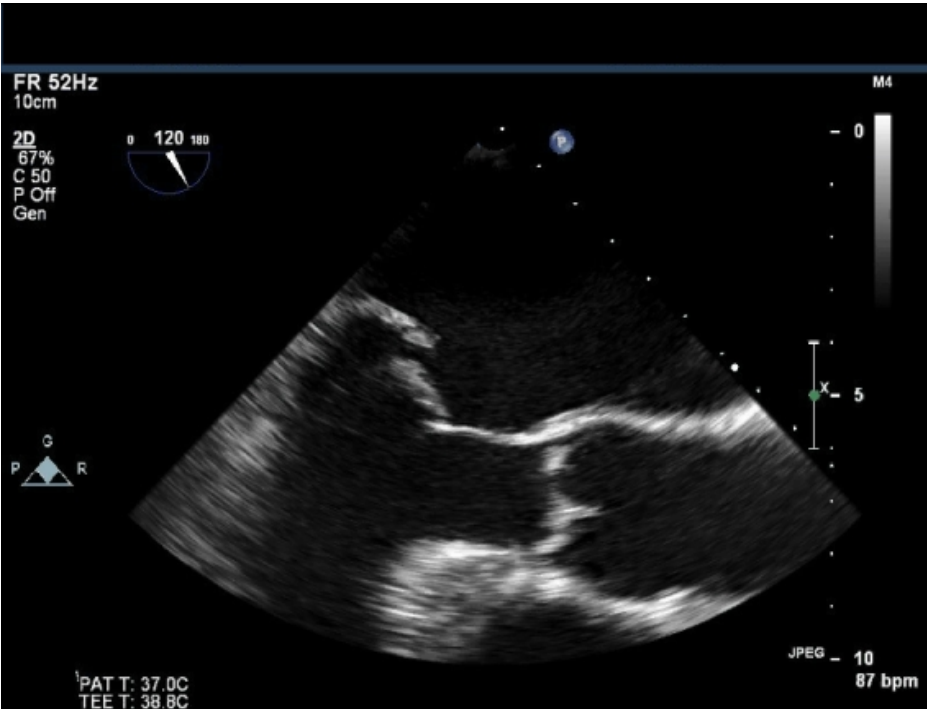


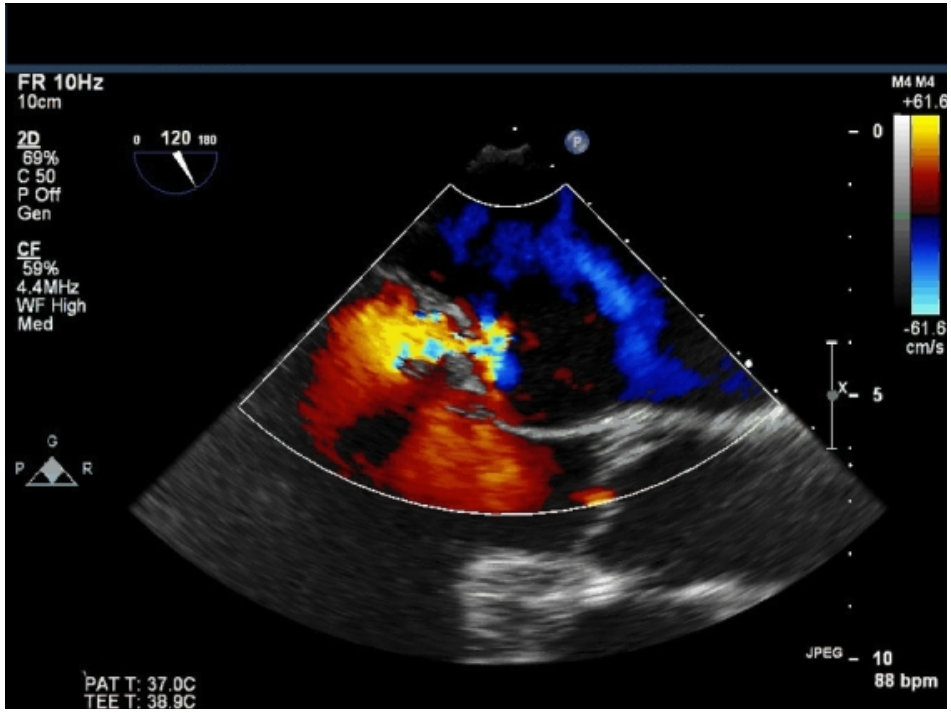
Effective Orifice Regurgitant Area & Regurgitant Volume

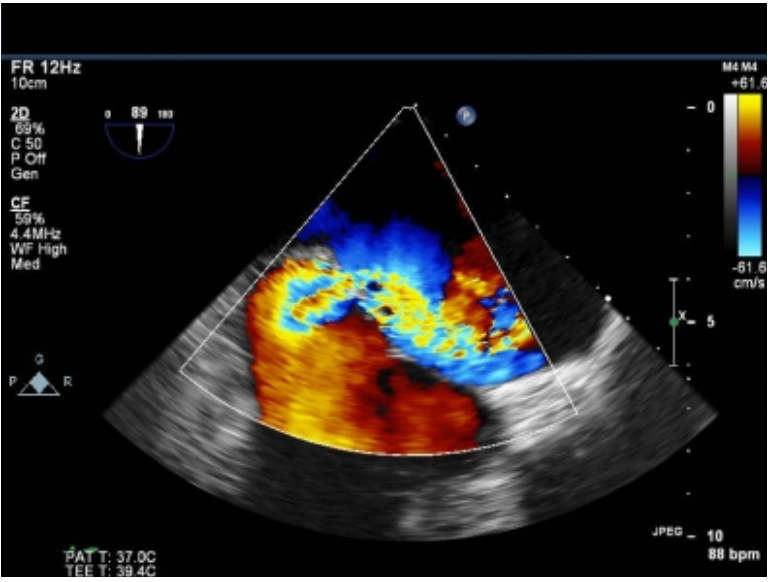
HOUSTON Methodist DEBAKEY HEART & VASCULAR CENTER

	Mild	Moderate		Severe
EROA (cm^2)	< 0.2	0.20-0.29	0.30-0.39	□ 0.4
RVol (mL/beat)	< 30	30-44	45-59	□ 60

EROA cut-offs in 1^{ary} and 2nd MR are similar
RVol may be lower in 2nd MR







Flow Convergence

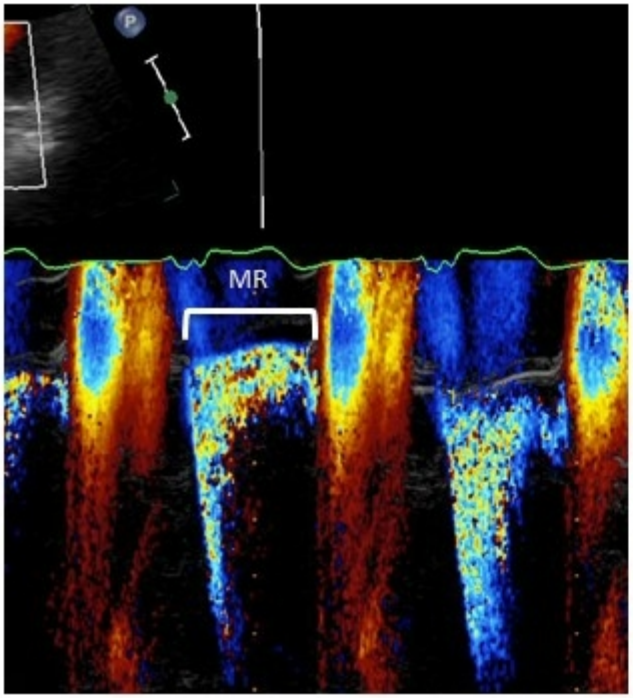
- Can be used semi-quantitatively
- Assumptions of hemispheric geometry
- Less accurate in eccentric jets
- Variability during the cardiac cycle and limitations in non-holosystolic MR

MR is not always Holosystolic

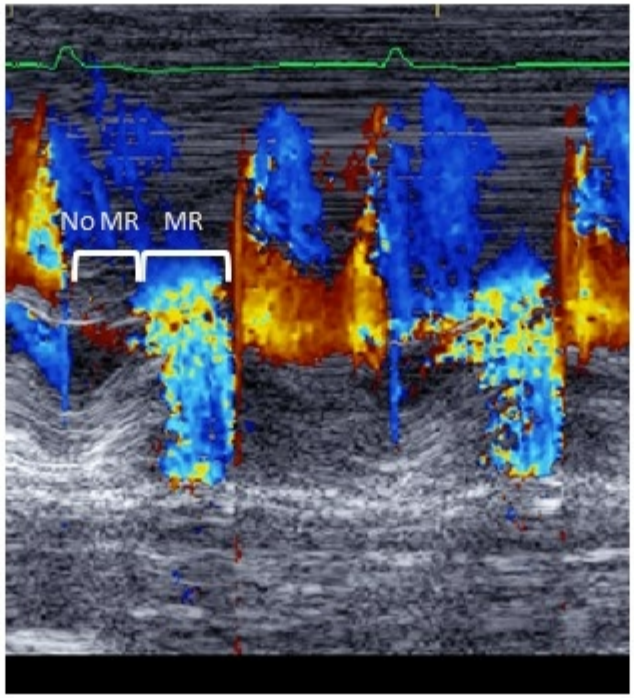
MR Duration Needs to be Accounted for

HOUSTON Methodist DEBAKEY HEART & VASCULAR CENTER

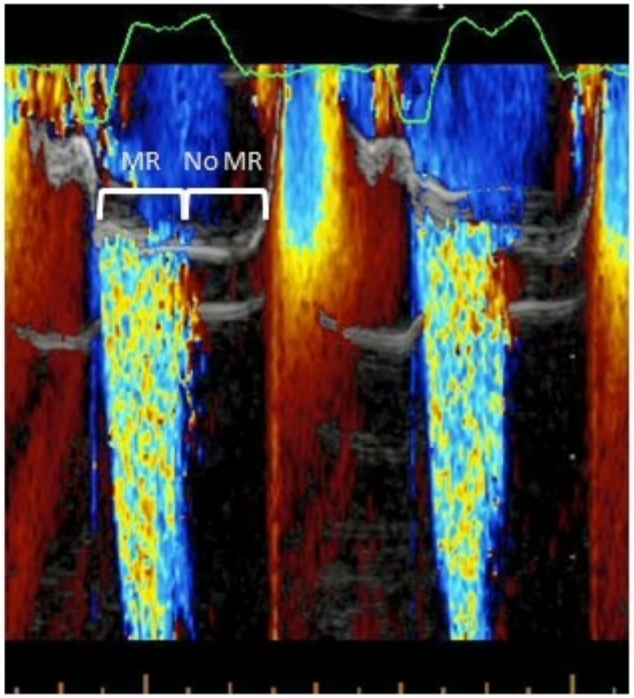
Holosystolic MR



Late Systolic MR

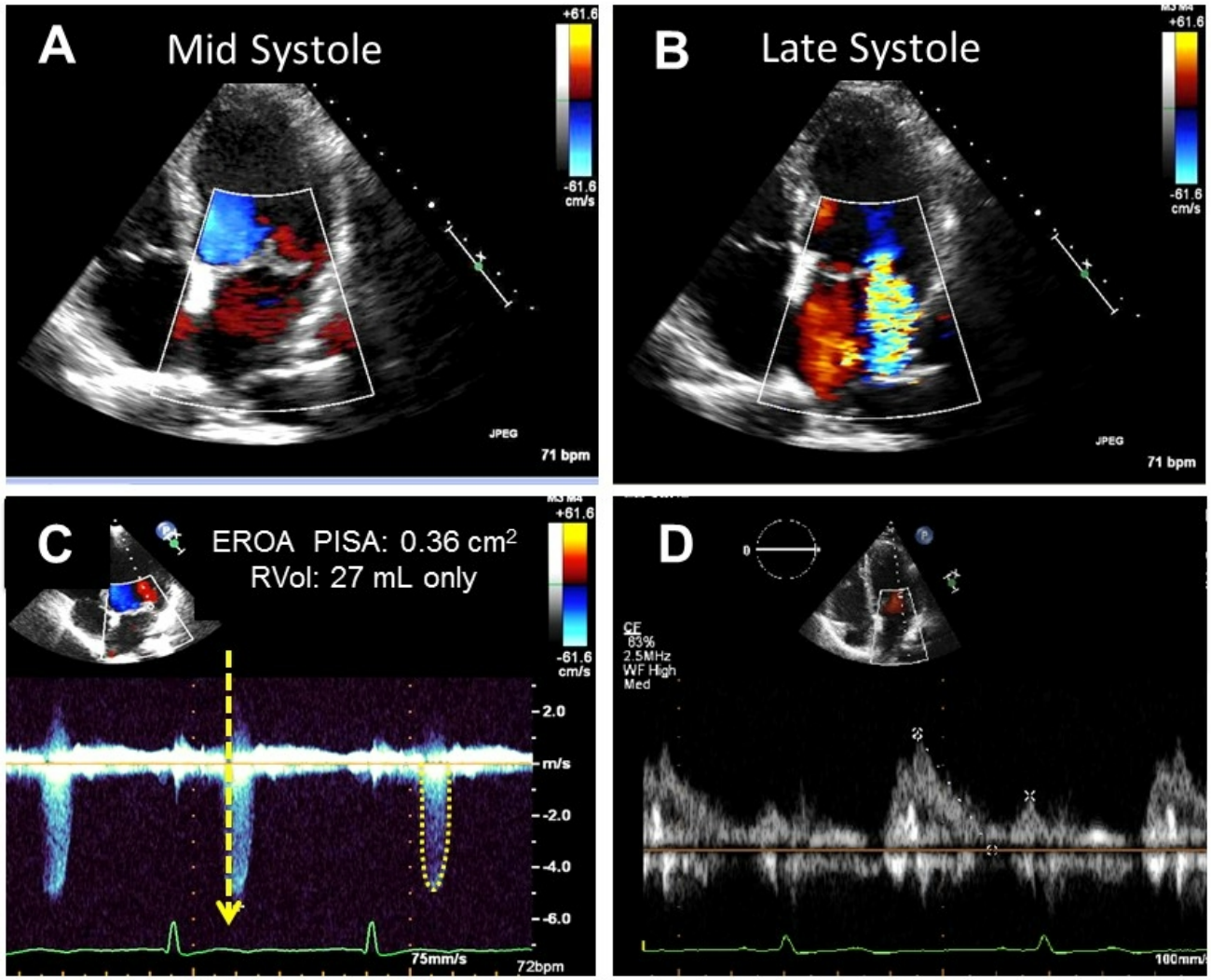


Early Systolic MR



Late Systolic MR

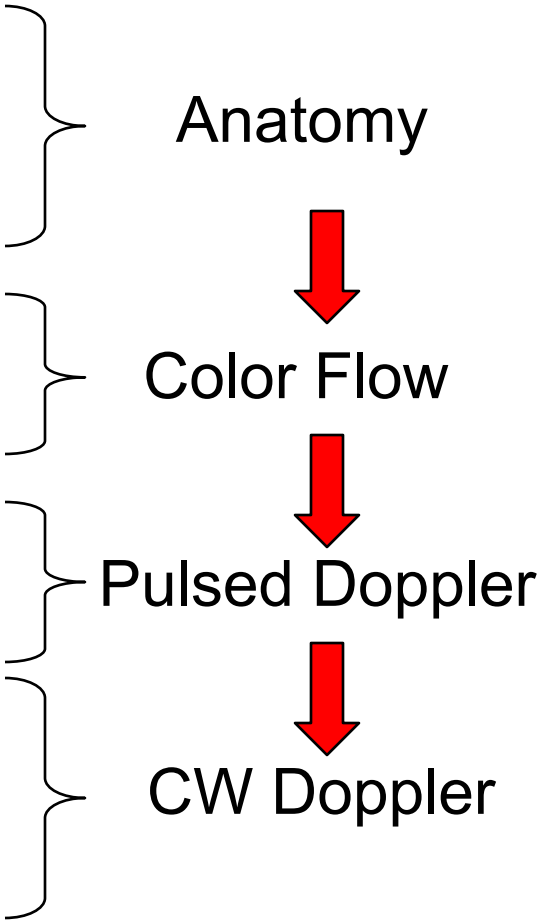
HOUSTON Methodist DEBAKEY HEART & VASCULAR CENTER



Mitral Regurgitation
Indicators of Severity

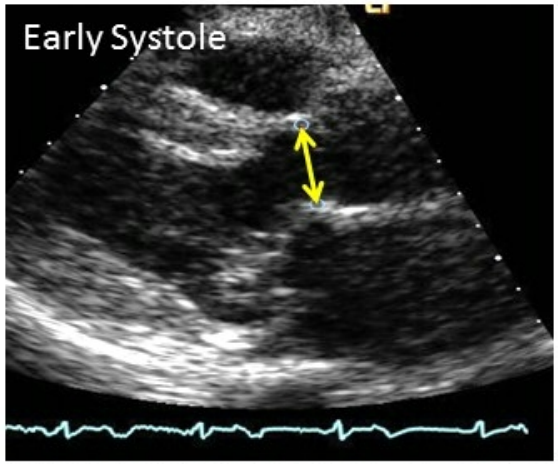
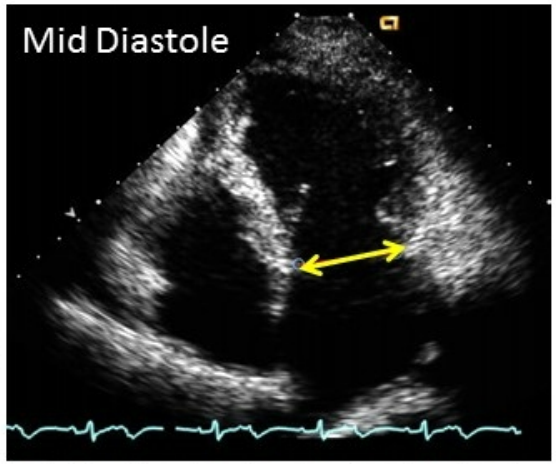
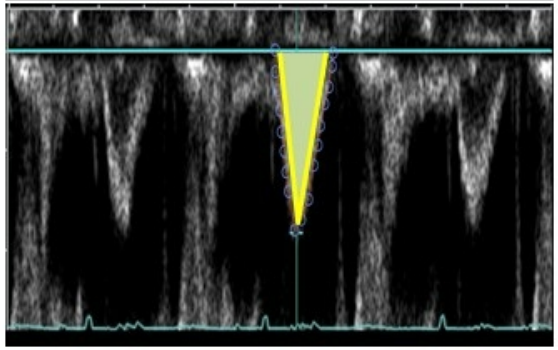
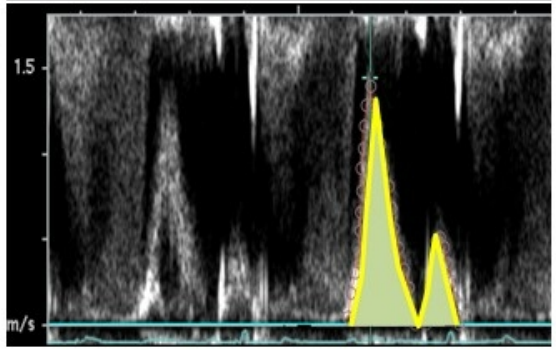
HOUSTON Methodist DEBAKEY HEART & VASCULAR CENTER

- Mitral valve pathology
- LV/ LA size
- Color Doppler:
  Vena contracta, Jet Area, Flow convergence
- Mitral E; Pulmonary vein pattern
- Regurgitant flow/fraction
- CW density and contour



Pulsed Doppler Volumetric Quantitation

HOUSTON Methodist DEBAKEY HEART & VASCULAR CENTER

	LV Outflow	Mitral Annulus
Annular Diameter		
Velocity- PW		
$SV_{LVOT} = CSA_{LVOT} * VTI_{LVOT}$ $= 0.785 * d^2_{LVOT} * VTI_{LVOT}$		$SV_{MV} = CSA_{MV} * VTI_{MV}$ $= 0.785 * d^2_{MV} * VTI_{MV}$

Assessment of MR Severity
Regurgitant Fraction

HOUSTON Methodist DEBAKEY HEART & VASCULAR CENTER

MR Severity	Reg Fraction
Mild	< 30%
Moderate	30- 49%
Severe	$\geq$ 50%

Regurgitant Volume & Fraction

HOUSTON Methodist DEBAKEY HEART & VASCULAR CENTER

Advantages

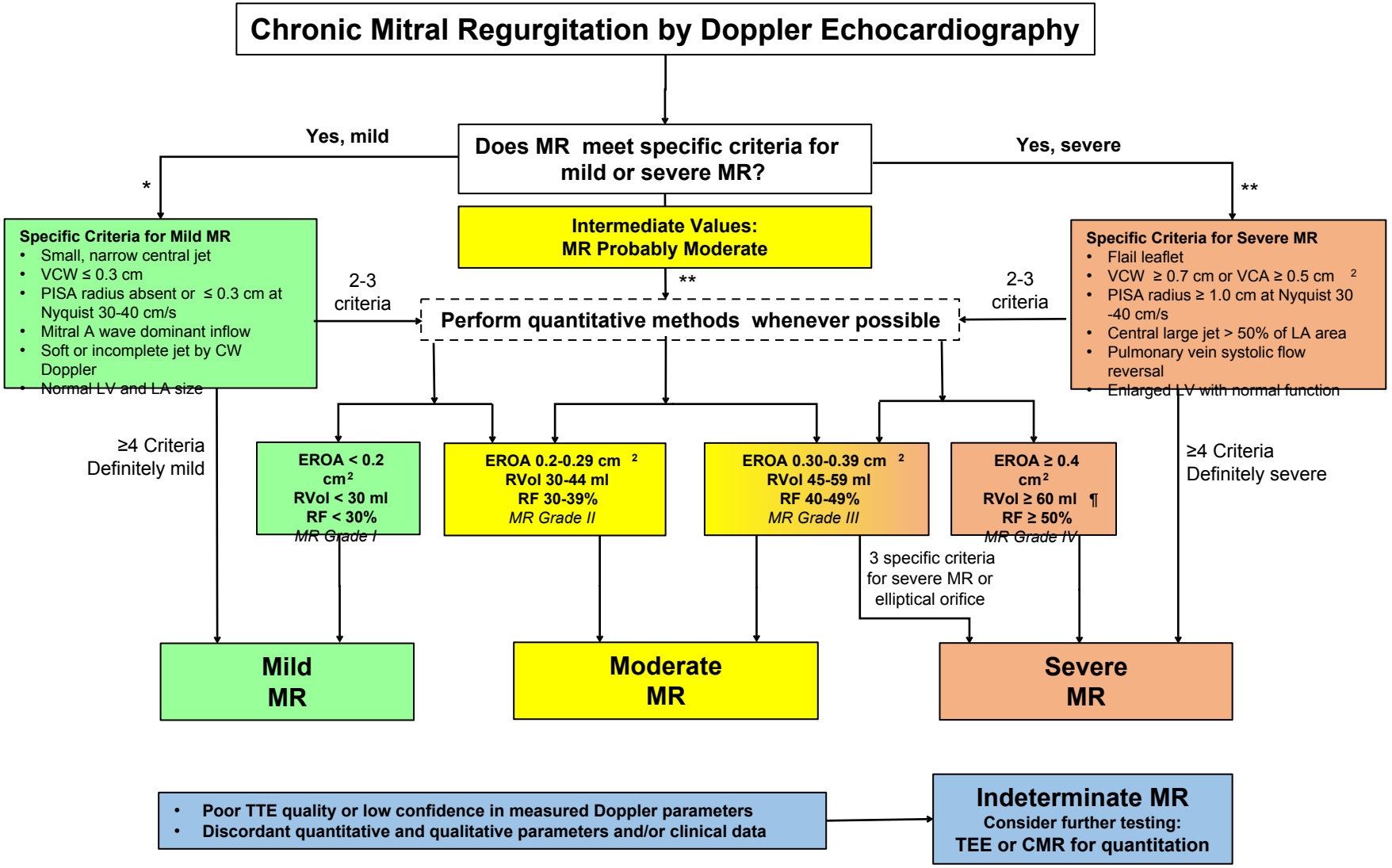
- Quantitative, valid in multiple jets and eccentric jets

- Provides both lesion severity and volume overload

Limitations

- Needs training; Cumbersome; wide (20%) confidence limits

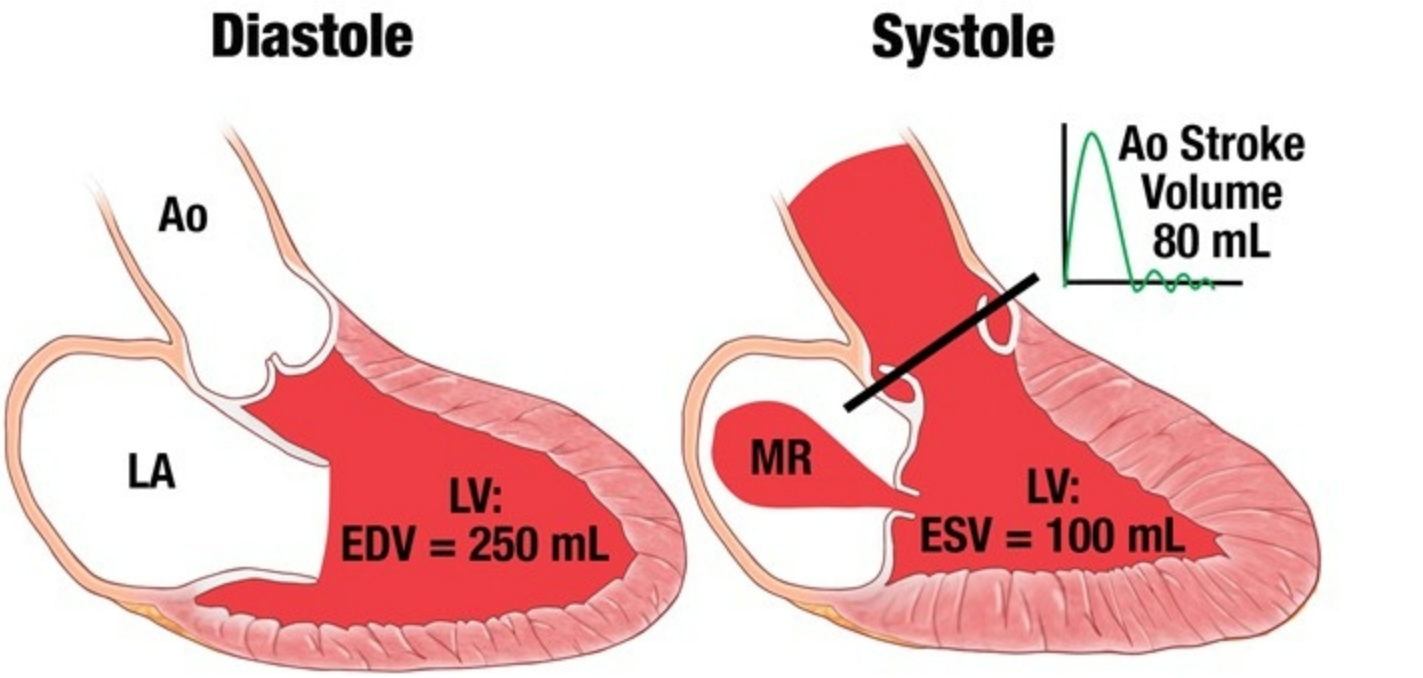
- Measurement of flow at MV annulus is less reliable in calcific MV and/or annulus



*	Beware of underestimation of MR severity in eccentric, wall impinging jets; quantitation is advised
**	All values for EROA by PISA assume holosystolic MR; single frame EROA by PISA, VCW, and VCA overestimate non-
¶	Regurgitant volume for severe MR may be lower in low flow conditions.

Quantitation of MR with CMR

HOUSTON Methodist DEBAKEY HEART & VASCULAR CENTER



LV Stroke Volume (LVSV):

LVSV = LVEDV-LVESV
LVSV = 250 mL - 100 mL
LVSV = 150 mL

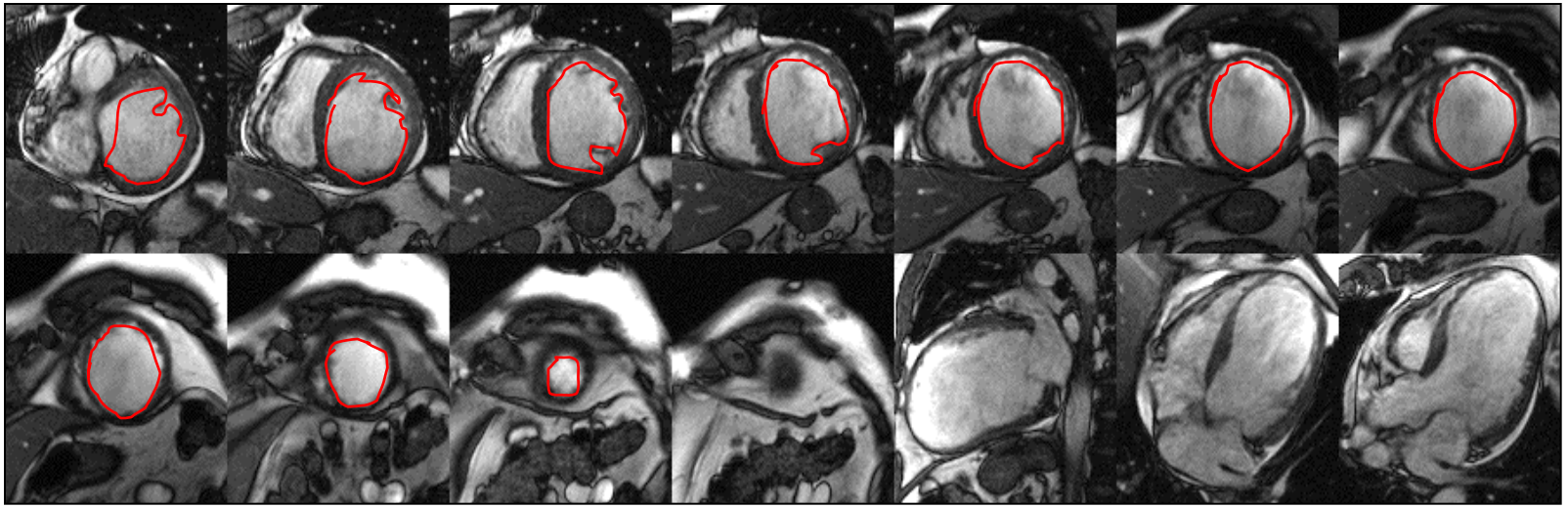
Mitral Regurgitant Volume (M RVol):

M RVol = LVSV - Ao Stroke Volume
M RVol = 150 mL - 80 mL
M RVol = 70 mL

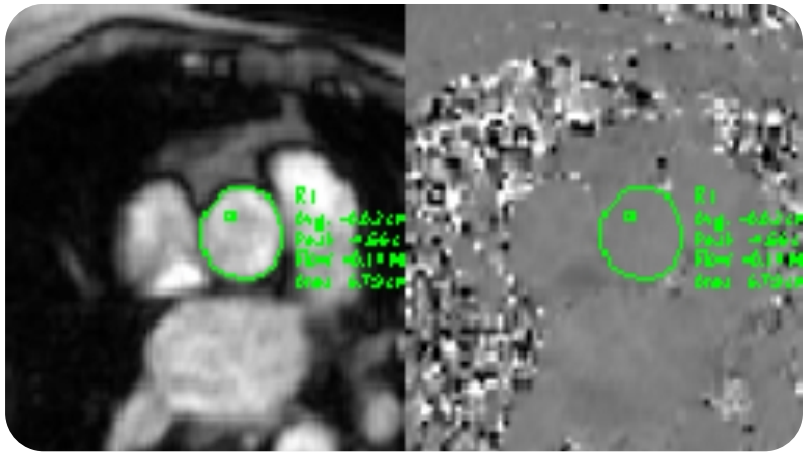
Quantification of MR with CMR

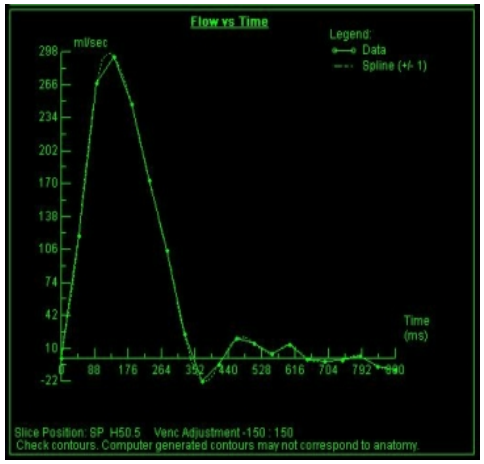
HOUSTON Methodist DEBAKEY HEART & VASCULAR CENTER

LV stroke volume



Aortic Stroke Volume

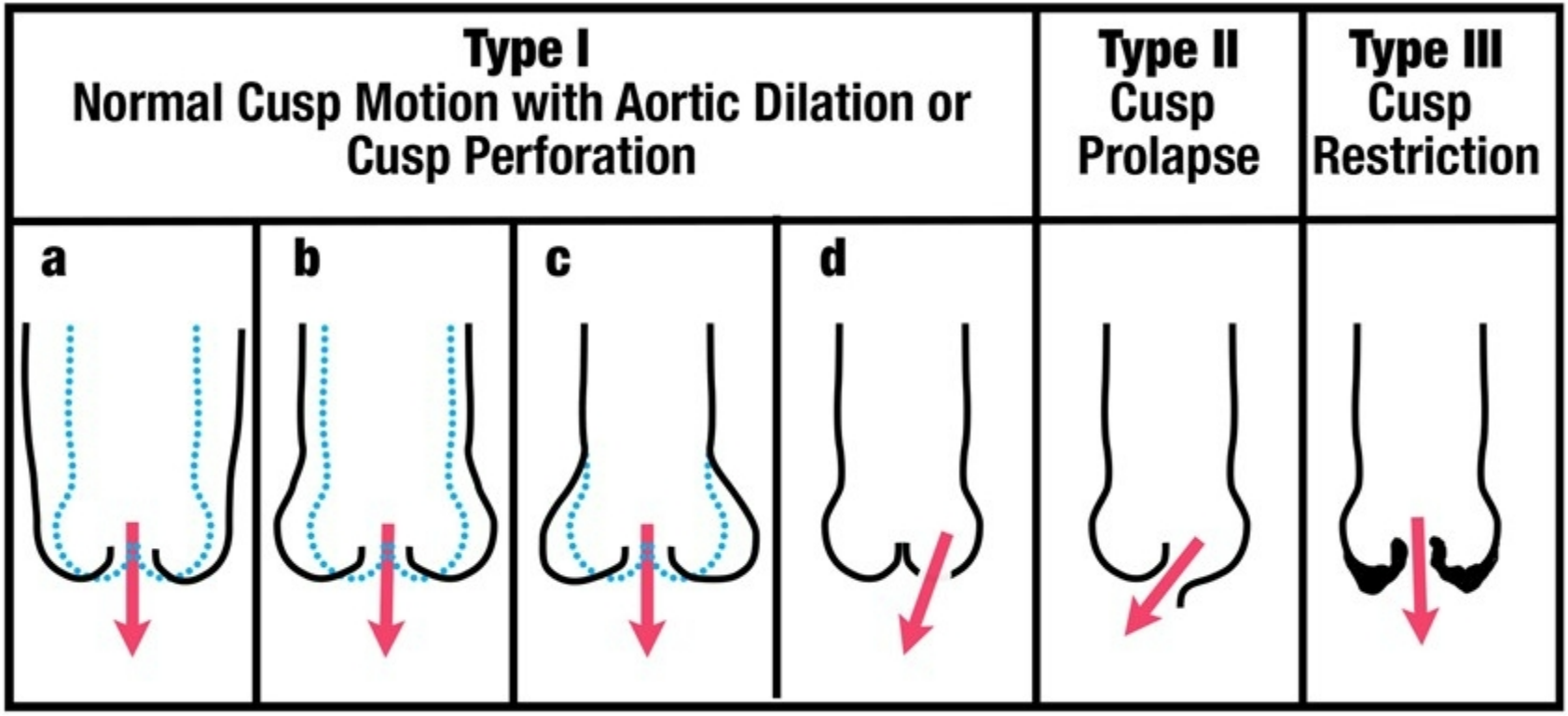




Reg Volume = LV SV- Ao SV

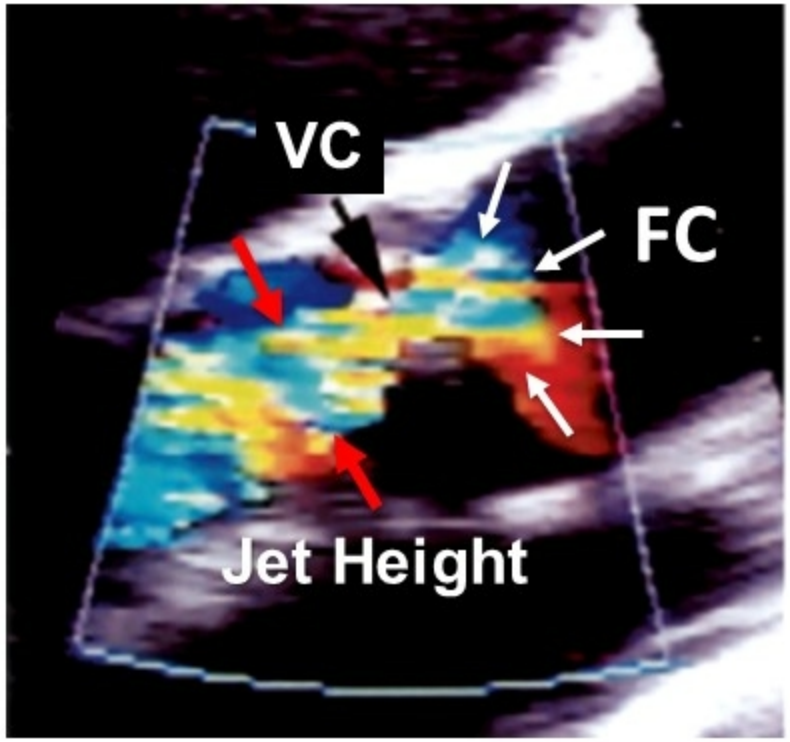
Aortic Regurgitation

HOUSTON Methodist DEBAKEY HEART & VASCULAR CENTER



Aortic Regurgitation- Color Doppler

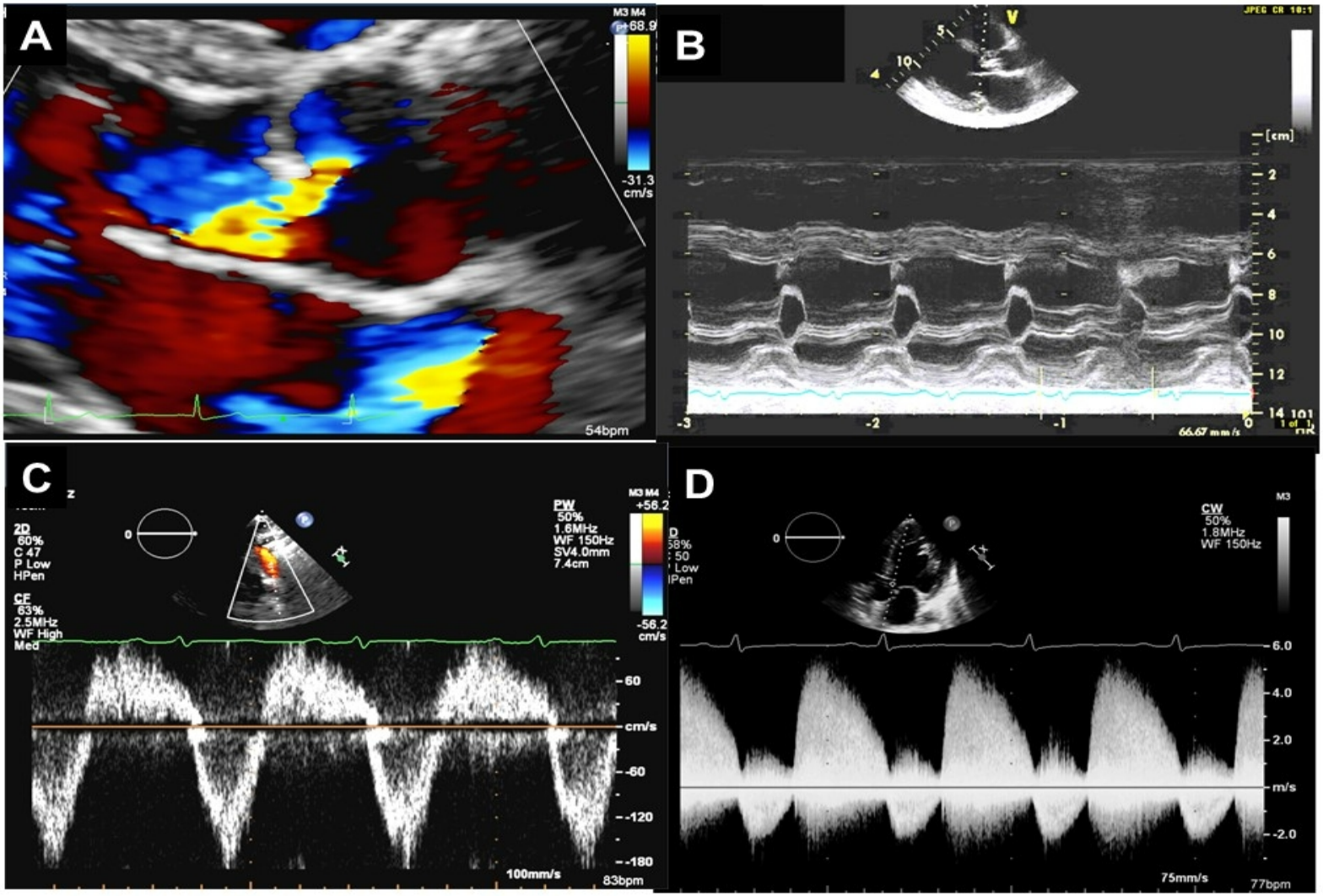
HOUSTON Methodist DEBAKEY HEART & VASCULAR CENTER

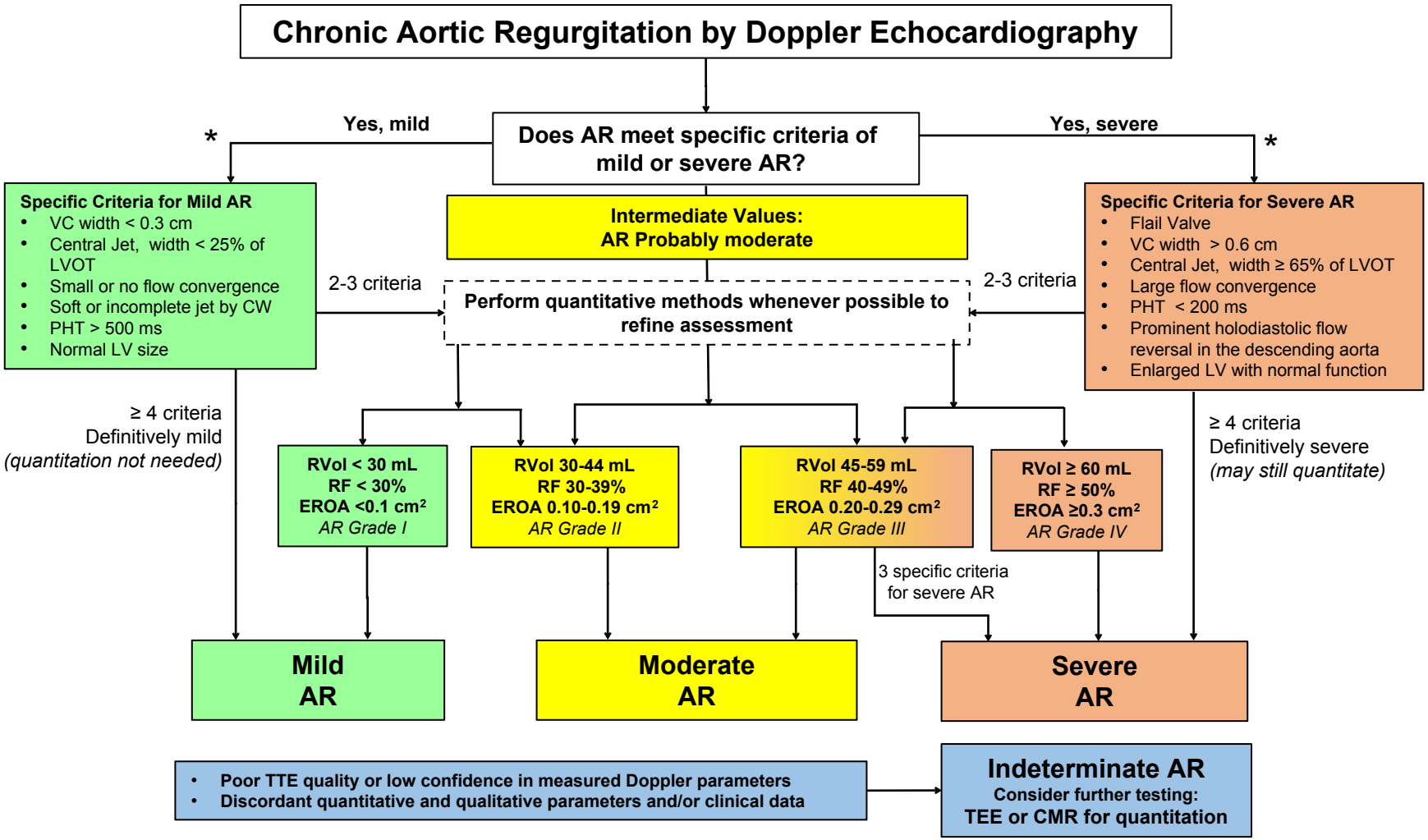




Aortic Regurgitation

HOUSTON Methodist
DEBAKEY HEART & VASCULAR CENTER

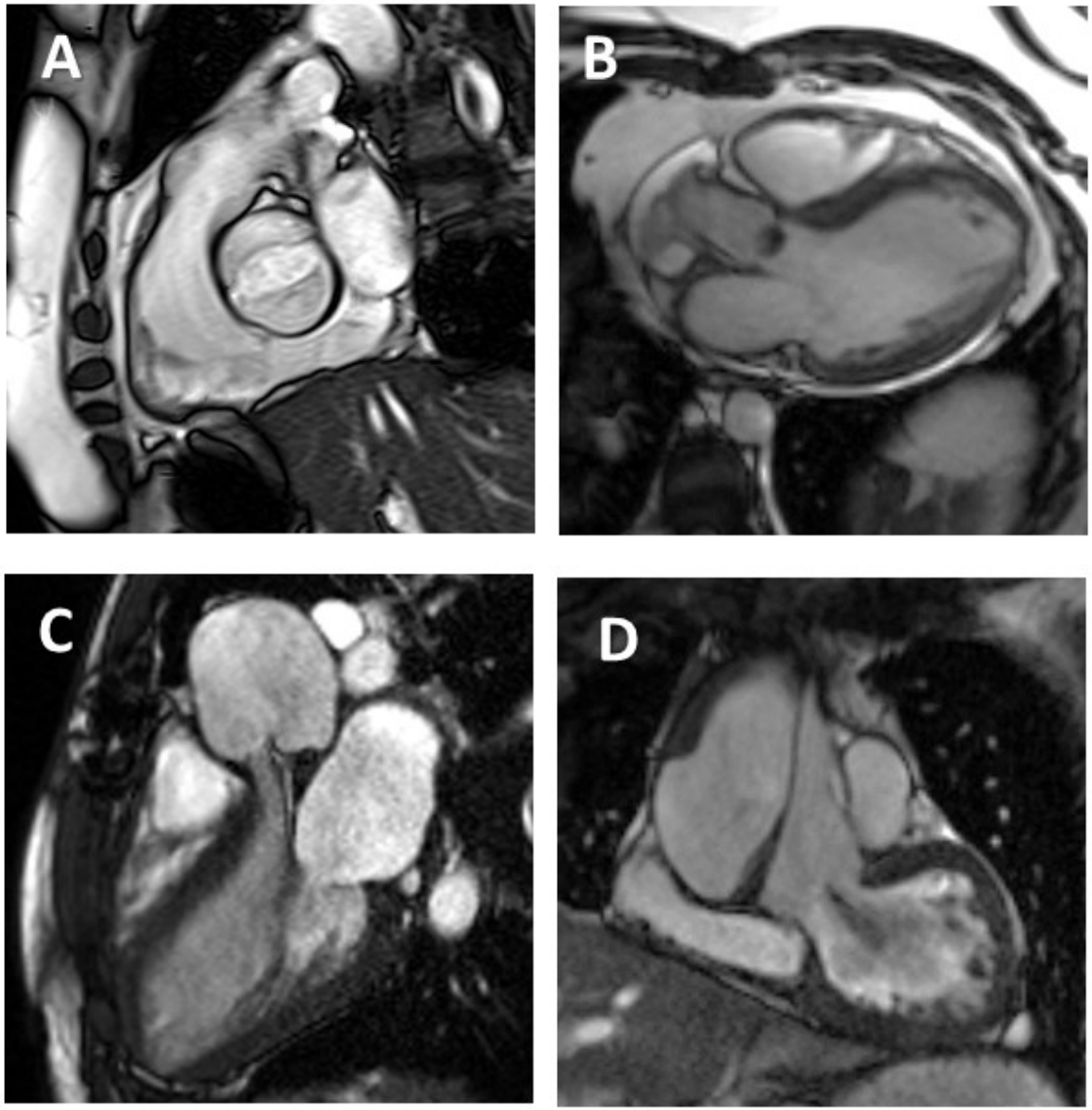




*	Beware of limitations of color flow assessment in eccentric AR jets; volumetric quantitation and integration of other parameters is advised

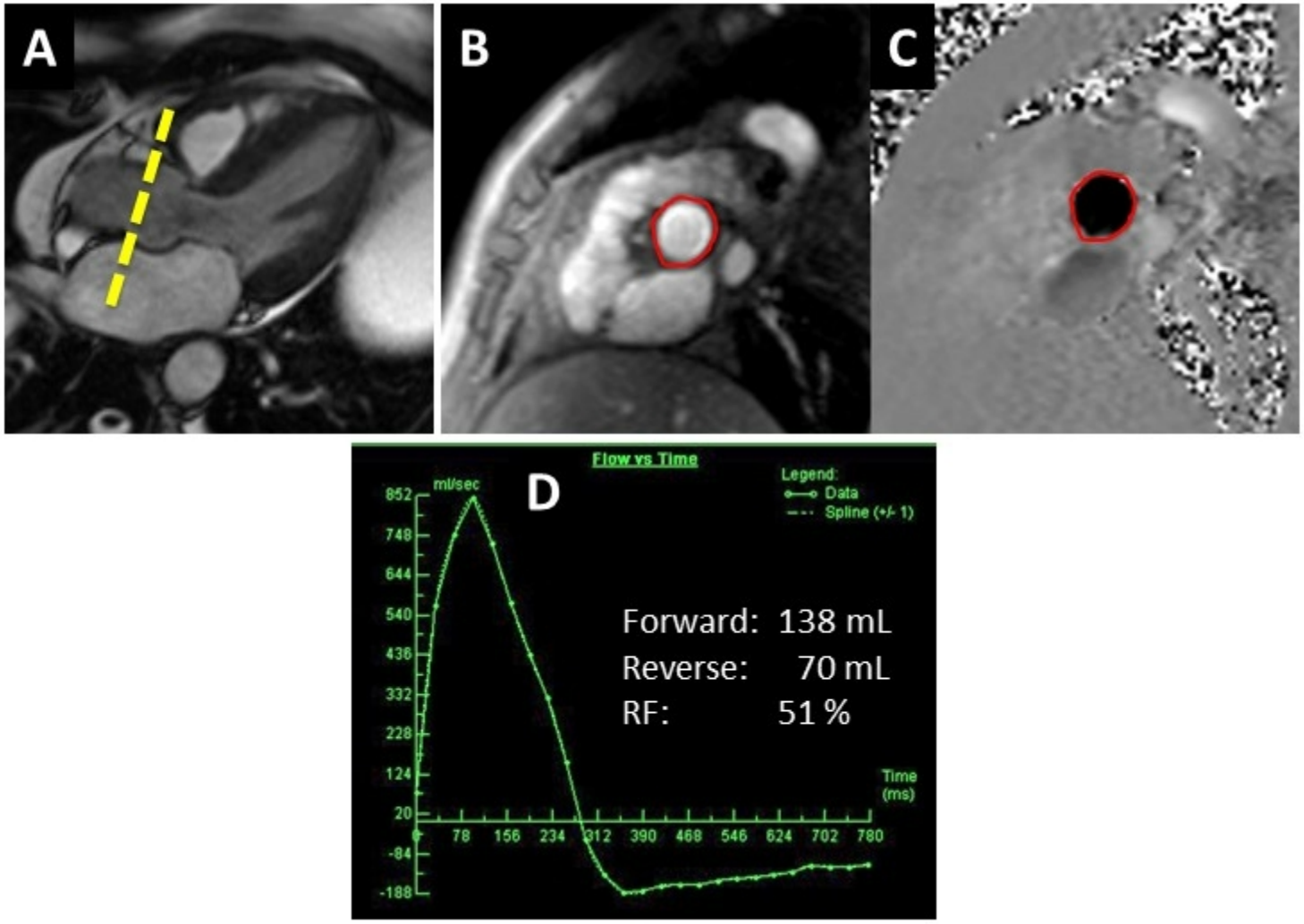
CMR in Aortic Regurgitation

HOUSTON Methodist DEBAKEY HEART & VASCULAR CENTER



Quantitation of AR with CMR

HOUSTON Methodist DEBAKEY HEART & VASCULAR CENTER



New ASE Valvular Regurgitation Guidelines- *Endorsed by SCMR*

HOUSTON Methodist DEBAKEY HEART & VASCULAR CENTER

What is New?

- Emphasis on identification of Etiology/Mechanism of regurgitation
- 2D/3D TTE--an integrative approach & algorithms to assess severity
- When is TEE needed
- Important role of CMR & CMR methodology
- The challenge of co-existing valvular lesions
- A clinical perspective
- Library of case studies on the web: www.asecho.org/vrcases