59-year-old male

- Smoker
- No prior cardiac history
- Acute attack of severe gastric pain, nausea, vomiting
- Found to have incarcerated gastric hernia
- Pre-op noted ‘loud systolic murmur’
- Underwent fundoplasty
- Echocardiogram ordered immediately post-op
Degree of Mitral Regurgitation?

1. Mild
2. Moderate
3. Severe
4. Need more imaging
More imaging with?

1. Continue transthoracic echocardiogram
2. Transesophageal echocardiogram
3. Left ventriculogram
4. Cardiac MRI
Degree of Mitral Regurgitation?

1. Mild
2. Moderate
3. Severe
4. Cannot tell
# Mitral Regurgitation

## Grading of Severity

<table>
<thead>
<tr>
<th>ASE Grade</th>
<th>Grade</th>
<th>RVol (mL)</th>
<th>ERO (cm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>Grade I</td>
<td>&lt;30</td>
<td>&lt;0.2</td>
</tr>
<tr>
<td></td>
<td>Grade II</td>
<td>30-44</td>
<td>0.2-0.29</td>
</tr>
<tr>
<td>Moderate</td>
<td>Grade III</td>
<td>45-59</td>
<td>0.3-0.39</td>
</tr>
<tr>
<td>Severe</td>
<td>Grade IV</td>
<td>≥60</td>
<td>≥0.4</td>
</tr>
</tbody>
</table>
PISA radius 1 cm
Aliasing velocity 45 cm/s

\[ \text{Flow}_1 = \text{Flow}_2 \]

\[ \text{Flow}_1 = 2\pi \times (R^2) \times V_{\text{alias}} \]
\[ \text{Flow}_1 = 6.28 \times 1 \times 45 \]
\[ \text{Flow}_1 = 283 \text{ ml/sec} \]

\[ \text{Flow}_2 = \text{ERO} \times V_{\text{MR}} \]
\[ \text{ERO} = \frac{\text{Flow}_1}{V_{\text{MR}}} \]
\[ \text{ERO} = \frac{283}{453} \]
\[ \text{ERO} = 0.6 \text{ cm}^2 \]

\[ \text{RV} = \text{ERO} \times \text{TVI}_{\text{MR}} \]
\[ \text{RV} = 0.6 \times 111 \]
\[ \text{RV} = 67 \text{ ml} \]
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

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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
Recommendations?

- Surgical mitral valve repair
- Percutaneous mitral valve repair with MitraClip
- Continued observation with follow up in 6 months-1 year
- Continued observation with follow up in 2-3 years
- Continued observation with follow up in 4-5 years
What Defines Severe MR

- Valve anatomy
- Quantitative Doppler
- Degree of regurgitation associated with poor survivorship
- Degree of regurgitation causing symptoms
- Consequences of MR
  - Left ventricular size
  - Left ventricular systolic function
  - Pulmonary hypertension
  - Atrial fibrillation

ACC/AHA 2014 Valve Guideline
MR due to Flail Leaflets
Natural History

Excess mortality

Survival (%)

Expected
Observed
P=0.016

Years

0 40 60 80 100

57% 65%

P=0.016
MR Natural History

NYHA Class

Survival (%)

Years

Class I-II

Class III-IV

21±11%

67±7%

P<0.0001
MR Postop. Outcome
Long-term Survival

Persistent consequences

Disease suppressed

P<0.0001

P=0.18

NYHA III-IV

NYHA I-II

Observed

Expected

%
Asymptomatic MR
Natural History

Survival, %

P<0.01

ERO 0.1-0.19 cm²
ERO 0.2-0.39 cm²
ERO ≥ 0.4 cm²

P =0.03 vs. Expected

91±3 %
66±6 %
58±9 %

Years

0 1 2 3 4 5

Survival, %

P<0.01

ERO 0.1-0.19 cm²
ERO 0.2-0.39 cm²
ERO ≥ 0.4 cm²

P =0.03 vs. Expected

91±3 %
66±6 %
58±9 %
MR Natural History

LV Function

Survival (%)

Years

P=0.0001

EF ≥60%

61±8%

EF <60%

40±12%
MR Postop. Outcome

LV Function: Survival

Survival (%)

- EF ≥60%
- EF 50-60%
- EF <50%

P=0.0001

73%
53%
32%
Valvular Heart Disease

Survival Implication of Left Ventricular End-Systolic Diameter in Mitral Regurgitation Due to Flail Leaflets

A Long-Term Follow-Up Multicenter Study

Christophe Tribouilloy, MD, PiitD,* Francesco Grigioni, MD, PiitD,† Jean François Avierinos, MD,‡ Andrea Barbieri, MD,§ Dan Rusinaru, MD,* Catherine Szymanski, MD,* Marinella Ferlito, MD,† Laurence Tafanelli, MD,* Francesca Bursi, MD,§ Faouzi Trojette, MD,* Angelo Branzi, MD,† Gilbert Habib, MD,¶ Maria G. Modena, MD,§ Maurice Enriquez-Sarano, MD,¶ on behalf of the MIDA Investigators

Amiens and Marseille, France; Bologna and Modena, Italy; and Rochester, Minnesota

Objectives

This study analyzed the association of left ventricular end-systolic diameter (LVESD) with survival after diagnosis in organic mitral regurgitation (MR) due to flail leaflets.

Background

LVESD is a marker of left ventricular function in patients with organic MR but its association to survival after diagnosis is unknown.

Methods

The MIDA (Mitral Regurgitation International Database) registry is a multicenter registry of echocardiographically diagnosed organic MR due to flail leaflets. We enrolled 739 patients with MR due to flail leaflets (age 65 ± 12 years; ejection fraction: 65 ± 10% in whom LVESD was measured (36 ± 7 mm).

Results

Under conservative management, 10-year survival and survival free of cardiac death were higher with LVESD < 40 mm (64 ± 5% vs. 46 ± 10%; p = 0.001) and 73 ± 5% vs. 63 ± 10% p = 0.001). LVESD > 40 mm independently predicted overall mortality (hazard ratio [HR]: 1.95; 95% confidence interval [CI]: 1.01 to 3.83) and cardiac mortality (HR: 3.09; 95% CI: 1.35 to 7.00) under conservative management. Mortality risk increased linearly with LVESD > 40 mm (HR: 1.15; 95% CI: 1.04 to 1.27 per 1 mm increase). During the entire follow-up (including post-surgical), LVESD > 40 mm independently predicted overall mortality (HR: 1.86; 95% CI: 1.24 to 2.80) and cardiac mortality (HR: 2.14; 95% CI: 1.29 to 3.56), due to persistence of excess mortality in patients with LVESD > 40 mm after surgery (HR: 1.86; 95% CI: 1.11 to 3.15 for overall death, and HR: 1.81; 95% CI: 1.05 to 3.54 for cardiac death).

Conclusions

In MR due to flail leaflets, LVESD > 40 mm is independently associated with increased mortality under medical management but also after mitral surgery. These findings support prompt surgical rescue in patients with LVESD > 40 mm but also suggest that best preservation of survival is achieved in patients operated before LVESD reaches 40 mm. (J Am Coll Cardiol 2009;64:1061–8) © 2009 by the American College of Cardiology Foundation

LVESD ≥ 40mm

Independent predictor of:

1. Overall mortality
2. Cardiac mortality
3. Excess mortality post-op
When is Mitral Regurgitation Severe and When to Intervene?

- Valve pathology
- ERO \( \geq 0.4 \text{ cm}^2 \) and RV \( \geq 60 \text{ ml/beat} \)
- Symptoms
- LVESD \( \geq 40 \text{ mm} \)
- LVEF <60%
- RVSP \( \geq 50 \text{ mmHg} \)
- Atrial fibrillation

2017 ASE Guidelines
2014 ACC/AHA Valve Guideline
Questions & Discussion