Ισχαιμική Ανεπάρκεια της Μιτροειδούς Βαλβίδας
Διακαθετηριακές προσπελάσεις: τα δεδομένα μετά την COAPT άλλαξαν

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I have no conflict of interest to declare
Ischemic Mitral Regurgitation

- Ischemic LV Distortion
- Papillary Muscle Displacement
- Mitral Valve Tethering

Myocardial Injury

- Ventricular Remodeling
- Mitral Apparatus Remodeling
- Mitral Valve Dysfunction
Prognostic Implications

• Independent prognostic factor or marker of disease severity?
• Until recently it was unknown whether interventions to reduce secondary MR improve prognosis

Figure 2. Survival (±SE) after diagnosis according to degree of MR as graded by RVol ≥30 mL/beat or <30 mL/beat. Numbers at bottom indicate patients at risk for each interval.

Figure 3. Survival (±SE) after diagnosis according to degree of MR as graded by ERO ≥20 mm² or <20 mm². Numbers at bottom indicate patients at risk for each interval.

_Circulation_. 2001;103:1759-1764.
Severe MR can improve to moderate with guideline in 38% of patients with guideline directed HF therapy.
Indications for mitral valve intervention in chronic secondary mitral regurgitation

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Evidence</th>
</tr>
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<tbody>
<tr>
<td>IIb</td>
<td>C</td>
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</table>

When revascularization is not indicated, surgery may be considered in patients with severe secondary mitral regurgitation and LVEF >30% who remain symptomatic despite optimal medical management (including CRT if indicated) and have a low surgical risk.

In patients with severe secondary mitral regurgitation and LVEF <30% who remain symptomatic despite optimal medical management (including CRT if indicated) and who have no option for revascularization, the Heart Team may consider a percutaneous edge-to-edge procedure or valve surgery after careful evaluation for a ventricular assist device or heart transplant according to individual patient characteristics.

European Heart Journal (2017) 38, 2739–2791
TRANSCATHETER MV THERAPIES

- **LEAFLET REPAIR**
  - MitraClip
  - NeoChord
  - Harpoon
  - ChordArt

- **ANNULOPLASTY**
  - Cardioband
  - Carillon
  - Millipede
  - AMEND

- **LV REMODELLING**
  - AccuCinch
  - VenTouch

- **TMVI**
  - Tendyne
  - Tiara
  - CardiaQ
  - Intrepid

*EuroIntervention* 2018;14:AB91-AB100
Percutaneous MV Leaflet Approximation

- By approximating the anterior and posterior mitral leaflets and forming a double-orifice valve, the MitraClip device reduces MR.
- Has been used in over 70,000 patients worldwide, 2/3 having secondary MR.
- Until recently evidence was based on registries showing that in experienced centers MitraClip (1) is a safe procedure, (2) it is effective in reducing MR with a high procedural success and (3) it improves symptoms and quality of life.
Randomized Controlled Trials on Secondary MR

Percutaneous Repair or Medical Treatment for Secondary Mitral Regurgitation


Death of any cause or unplanned hospitalization for HF

Transcatheter Mitral-Valve Repair in Patients with Heart Failure


Hospitalization for HF


Primary Effectiveness Endpoint
All Hospitalizations for HF within 24 months

Cumulative HF Hospitalizations (n)

- MitraClip + GDMT
- GDMT alone

NNT (24 mo) = 3.1 [95% CI 1.9, 8.2]
HR (95% CI) = 0.53 [0.40-0.70]
P<0.001

No. at Risk:
- MitraClip: 302, 286, 269, 253, 236, 191, 178, 161, 124
- GDMT: 312, 294, 271, 245, 219, 176, 145, 121, 88

Time After Randomization (Months)

Stone GW et al. NEJM. 2018 Sept 23.
**All-cause Mortality**

- **MitraClip + GDMT**
- **GDMT alone**

**HR [95% CI]** = 0.62 [0.46-0.82]  \( P<0.001 \)

**NNT (24 mo)** = 5.9 [95% CI 3.9, 11.7]

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**Time After Randomization (Months)**

- No. at Risk:
  - MitraClip + GDMT: 302, 286, 269, 253, 236, 191, 178, 161, 124
  - GDMT alone: 312, 294, 271, 245, 219, 176, 145, 121, 88

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Stone GW et al. NEJM. 2018 Sept 23.
The Mortality Benefit of Therapies for HFrEF
When Cardiovascular Trials Collide

Wait for a tiebreaker?
Reshape-HF2
Possible explanations for the contradictory results of COAPT and MITRA-FR

- Differences in trial design: endpoints, number of patients, duration of follow-up.
- COAPT made a specific effort to optimize medical therapy for HF prior to randomization.
- Procedural success was more common in COAPT.
- Different patient populations

  **COAPT:** EROA 0.41 cm²  
  LVEDV 192 ml

  **MITRA-FR:** EROA 0.31 cm²  
  LVEDV 252 ml

more severe MR, less LV dilation
Reasons for smaller LV volumes in COAPT vs MITRA-FR

• LVEF: 20-50% in COAPT, 15-40% in MITRA-FR, but mean LVEF approximately the same in the 2 studies
• Patients with LVESD>70 mm were excluded from COAPT
• Stage D HF, hemodynamic instability, cardiogenic shock, severe pulmonary hypertension, moderate or severe right ventricular dysfunction
Thresholds for moderate to severe & severe MR

**Quantitative**

<table>
<thead>
<tr>
<th></th>
<th>Primary</th>
<th>Secondary$^b$</th>
</tr>
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<tbody>
<tr>
<td>EROA (mm$^2$)</td>
<td>≥40</td>
<td>≥20</td>
</tr>
<tr>
<td>Regurgitant volume (mL/beat)</td>
<td>≥60</td>
<td>≥30</td>
</tr>
<tr>
<td>+ enlargement of cardiac chambers/vessels</td>
<td>LV, LA</td>
<td></td>
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**American Society of Echocardiography**

<table>
<thead>
<tr>
<th></th>
<th>Moderate to Severe</th>
<th>Severe</th>
</tr>
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<tbody>
<tr>
<td>EROA, 2D PISA (cm$^2$)</td>
<td>0.30-0.39</td>
<td>≥0.40</td>
</tr>
<tr>
<td>(may be lower in secondary MR with elliptical ROA)</td>
<td></td>
<td></td>
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<tr>
<td>RVol (mL)</td>
<td>45-59$^{**}$</td>
<td>≥60</td>
</tr>
<tr>
<td>(may be lower in low flow conditions)</td>
<td></td>
<td></td>
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<tr>
<td>RF (%)</td>
<td>40-49</td>
<td>≥50</td>
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</table>
Hemodynamic determinants of MR

\[ RgV = ROA \times C_d \times \sqrt{MPG \times T} \]

MPG = LV systolic pressure - LA systolic pressure

ROA in FMR is load dependent and dynamic (tends to decrease during midsystole)

J Am Coll Cardiol 1996;28:1083-91
EROA vs LVEDV

EROA vs LVEDV at LVEF 30%, RF 50%

COAPT
EROA=0.41cm²

MITRA-FR EROA=0.31cm²
52% had EROA<0.3 cm²
Proportionate and Disproportionate Functional Mitral Regurgitation

A New Conceptual Framework That Reconciles the Results of the MITRA-FR and COAPT Trials

[Graph showing EROA vs LVEDV at LVEF 30%, RF 50%]

JACC Cardiovasc Imaging 2019;12:353-362
Secondary MR is an independent prognostic variable in patients with an “intermediate-HF severity-phenotype”. Among patients with more advanced HF, myocardial dysfunction is largely dominant and MR seems no longer to have a prognostic impact. Possible window of opportunity to reduce the impact of FMR on survival

Ischemic Mitral Regurgitation
Therapeutic Considerations

Early detection of 3+, 4+ Ischemic MR
EROA>0,3 cm²
RV>45 ml

Yes

Surg. Revascularization option

CABG+MV Surgery

No

GDMT CRT

Still symptomatic

Referral to Heart Valve Center for MitraClip implantation

No

Advanced cardiomyopathy
NYHA 4, severe LV dilatation, very low LVEF, RV dysfunction, severe TR

Yes

LVAD, Transplantation Palliative care
Thank You
## Suitable morphology for MitraClip

<table>
<thead>
<tr>
<th>Optimal valve morphology</th>
<th>Conditionally suitable valve morphology</th>
<th>Unsuitable valve morphology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central pathology in Segment 2</td>
<td>Pathology in Segment 1 oder 3</td>
<td>Perforated mitral valve leaflet or cleft</td>
</tr>
<tr>
<td>No leaflet calcification</td>
<td>Mild calcification outside of the grip-zone of the clip system; ring calcification, post annuloplasty</td>
<td>Severe calcification in the grip-zone</td>
</tr>
<tr>
<td>Mitral valve opening area &gt;4 cm²</td>
<td>Mitral valve opening area &gt;3 cm² with good residual mobility</td>
<td>Haemodynamically significant mitral stenosis (valve opening area &lt;3 cm²; MPG ≥ 5 mmHg)</td>
</tr>
<tr>
<td>Mobile length of the posterior leaflet ≥10 mm</td>
<td>Mobile length of the posterior leaflet 7–&lt;10 mm</td>
<td>Mobile length of the posterior leaflet &lt;7 mm</td>
</tr>
<tr>
<td>Coaption depth &lt;11 mm</td>
<td>Coaption depth ≥11 mm</td>
<td>Rheumatic leaflet thickening and restriction in systole and diastole(Carpentier IIIA)</td>
</tr>
<tr>
<td>Normal leaflet strength and mobility</td>
<td>Leaflet restriction in systole (Carpentier IIIB)</td>
<td>Barlow’s syndrome with multisegment flail leaflets</td>
</tr>
<tr>
<td>Flail-width &lt;15 mmFlail-Gap &lt;10 mm</td>
<td>Flail-width &gt;15 mm only with a large ring width and the option for multiple clips</td>
<td></td>
</tr>
</tbody>
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