Minimally invasive mitral valve surgery – Standard of Care
What is the status and rate of implementation?
MVR repair rate 2004-2011

DGTHG 2011
Isolated MV surgery – MIC vs sternotomy 2004-2011

DGTHG 2011
Isolated MVR for MR – MIC vs sternotomy 2004-2011

DGTHG 2011

2011: MIC exceeds sternotomy!
Repair rate in MIC exceeds sternotomy

Germany:
MIC repair rate better than national databases (DGTHG 2011 65.1%)
MIC MVR >90% for PML, AML and bileaflet prolapse

US:
Higher MV-repair rates with minimally invasive technique (89% vs 67%, STS database 2008)
Advantages of MIC MVR

- No Sternotomy
- Excellent visualization
- Fast Recovery
Small thoracotomy approach

Muscle sparing incision

Femoral cannulation for CPB
Operative Technique

Direct antegrade cardioplegia (one shot crystalloid)

Transthoracic Aortic clamp

Venous cannula
Repair-Techniques

• Enables every known repair technique
• Allows for complete ring implantation
• Enables replacement
Principles of repair II

After a good repair…
After a good repair...

...the valve should smile at you!
Mitral Clips don‘t smile!
Treat the whole spectrum of degenerative MR
Cleft 3 D
Classic P2 resection
Classic P2 Resection
MVR Loop Technique
Chordal replacement PML
Chordal replacement AML
Commisural prolapse A1/P1
Commisural prolapse A1/P1
M. Barlow (excessive bileaflet prolapse) (II)
Ablation Concept

Mitral valve

LAA
LLPV
Mitral annulus (P3)

LUPV
RLPV
Atriotomy

RUPV
Surgical Plan

1. Quadrangular resection P2
Surgical Plan

1. Quadrangular resection P2
2. Decalcification posterior annulus
Surgical Plan

1. Quadrangular resection P2
2. Decalcification posterior annulus
3. Triangular resection A2
Surgical Plan

1. Quadrangular resection P2
2. Decalcification posterior annulus
3. Triangular resection A2
4. Chordae replacement A2
Surgical Plan

1. Quadrangular resection P2
2. Decalcification posterior annulus
3. Triangular resection A2
4. Chordae replacement A2
5. Ring implantation
Post repair result – excellent coaptation
Repair in endocarditis
Added procedures

- Tricuspid repair easy to accomplish (beating heart)
- Atral ablation and LAA closure
- No restrictions by access
Results match standard sternotomy
Reoperation for Bleeding

- Fewer reexplorations for bleeding
- Similar need for transfusion
Neurological events

- 6 studies (1801 patients)
- No difference

<table>
<thead>
<tr>
<th></th>
<th>No. of patients</th>
<th>No. of studies</th>
<th>Summary data (%)</th>
<th>STS data (%)</th>
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<tbody>
<tr>
<td>Mortality</td>
<td></td>
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<tr>
<td>Repair</td>
<td>2176</td>
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<td>1.1</td>
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<td>Replacement</td>
<td>979</td>
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<td>Overall</td>
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<td>10</td>
<td>2.0</td>
<td>3.3</td>
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<tr>
<td>Stroke</td>
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<tr>
<td>Repair</td>
<td>1226</td>
<td>4</td>
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<td>1.9</td>
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<tr>
<td>Replacement</td>
<td>778</td>
<td>3</td>
<td>2.3</td>
<td>3.2</td>
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<tr>
<td>Overall</td>
<td>6290</td>
<td>10</td>
<td>2.2</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Stroke rate MVR 1.6%

Modi P EJCTS 2008
Hospitalization

- LOS less with minimally invasive approach (US)
Mortality

- 6 studies (1641 patients)

**No difference**
Pain and Speed of Recovery

- 4 studies
- Less postoperative pain
- Faster return to normal activity
- Fewer requirements for post-hospital rehabilitation
Isolated PML, AML, und Bileaflet Prolapse HCL (n=989) 2000-2007

Repair rate 91.5% – 97.3%
Comparison of outcomes of minimally invasive mitral valve surgery for posterior, anterior and bileaflet prolapse

Joerg Seeburger *, Michael A. Borger, Nicolas Doll, Thomas Walther, Jurgen Passage, Volkmar Falk, Friedrich W. Mohr

Survival

- PML 86.9\% (95\% CI: 82-90.5)
- AML 80.9\% (95\% CI: 67.4-89.7)
- BL 90.7\% (95\% CI: 84.9-94.4)

Log-rank: p=.4

Patients at risk

- PML 527 376 289 194 144
- AML 119 91 58 43 25
- BL 310 213 155 107 69

Years postoperatively

Freedom from reoperation

- PML 96.1\% (95\% CI: 94.3-97.4)
- AML 92.4\% (95\% CI: 84-96.6)
- BL 95.9 (95\% CI: 93.2-97.5)

Log-rank: p=.5

Patients at risk

- PML 527 376 289 194 144
- AML 119 91 58 43 25
- BL 310 213 155 107 69

Years postoperatively
Long-term results MIC

Similar survival and freedom from reoperation

<table>
<thead>
<tr>
<th>Study, year, reference</th>
<th>Institution</th>
<th>Survival</th>
<th>Freedom from re-operation</th>
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</thead>
<tbody>
<tr>
<td>Gulielmos et al. (2000) [43]</td>
<td>Dresden</td>
<td>93.5% at 3.3 years</td>
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<tr>
<td>Casselman et al. (2003) [34]</td>
<td>Aalst</td>
<td>95.4 ± 1.7% at 4 years</td>
<td>91 ± 3.5% at 4 years</td>
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<td>Greelish et al. (2003) [44]</td>
<td>Brigham</td>
<td>95% at 5 years</td>
<td>92% at 5 years</td>
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<td>Walther et al. (2004) [39]</td>
<td>Leipzig</td>
<td>83% at 6.8 years</td>
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<td>Mishra et al. (2005) [40]</td>
<td>New Delhi</td>
<td>99% at 3.2 years</td>
<td>99.3% at 3.2 years</td>
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<td>Aybek et al. (2006) [41]</td>
<td>Frankfurt</td>
<td>90.7% at 6.3 years</td>
<td>96.2% at 6.3 years</td>
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<td>Torracca et al. (2006) [42]</td>
<td>Milan</td>
<td>100% at 2.3 years</td>
<td>95.2% at 4 years</td>
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</tbody>
</table>
Minimally invasive versus conventional mitral valve surgery: A propensity-matched comparison
Residual MI

Propensity matched comparison

Percent in MR Grade 3+ or 4+

Years

Svenson LG JTCVS 2009
A Decade of Minimally Invasive Mitral Repair: Long-Term Outcomes

Aubrey C. Galloway, MD, Charles F. Schwartz, MD, Greg H. Ribakove, MD, Gregory A. Crooke, MD, George Gogoladze, MD, Patricia Ursomanno, PhD, Margaret Mirabella, MSN, Alfred T. Culliford, MD, and Eugene A. Grossi, MD

Department of Cardiothoracic Surgery, New York University Medical Center, New York, New York

8y freedom from Re-OP
Sternotomy 91%
MIC 95%

8y freedom from all valve related complications
Sternotomy 86%
MIC 90%
MIC MVR for bileaflet repair?

Randomized trial (MIC vs Conv. MVR in Barlows disease)
140 patients mean FU 12.4 months

<table>
<thead>
<tr>
<th></th>
<th>MIC</th>
<th>Sternotomy</th>
<th>p</th>
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<tr>
<td>Repair rate (%)</td>
<td>98.5</td>
<td>100</td>
<td>ns</td>
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<tr>
<td>Mortality (%)</td>
<td>2.8</td>
<td>1.3</td>
<td>ns</td>
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<tr>
<td>ICU (d)</td>
<td>1.2</td>
<td>2.3</td>
<td>0.02</td>
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<tr>
<td>LOS (d)</td>
<td>8.6</td>
<td>11.8</td>
<td>0.03</td>
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<tr>
<td>FU freedom from MI&gt; 2+ (%)</td>
<td>97</td>
<td>98</td>
<td>ns</td>
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</table>
MIC MVR for bileaflet repair?

**Graph: Mitral Event-free Survival**

- **Groups**: MI Group and MS Group
- **Survival Data**
  - MI Group: Patients at risk from 68 to 66
  - MS Group: Patients at risk from 69 to 67
- **Statistical Test**: p = 0.74

**Legend**
- □: Median Sternotomy
- +: Median Sternotomy - censored
- - -: Minimally Invasive
- +: Minimally Invasive - censored

**Reference**
Speziale G JTCVS 2011
2012 reference: MVR - Sternotomy

Repair rate 99%
Mortality 0.9%

Freedom from MR>2+

<table>
<thead>
<tr>
<th>Follow Up Echocardiography (Years)</th>
<th>1 Year</th>
<th>4 Years</th>
<th>7 Years</th>
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<td>Freedom from recurrent ≥2+ MR</td>
<td>99%</td>
<td>95%</td>
<td>91%</td>
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</table>

Castillo JG JTCVS 2012
2012 reference: MVR – Sternotomy MIC MVR

Repair rate 99%
Mortality 0.9%

98.6%
0.15%

Freedom from MR>2+

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Castillo JG JTCVS 2012
Perrier P PC 2012
MIC MVR for reoperation

- 5 studies
- Less bleeding
- Less reoperation
- Fewer wound infections
- Decreased LOS
- Similar or better mortality (Non randomized)
- Patients with sternotomy experience prefer lateral approach (2 studies)
Redo Case

- 55 yo male s/p AVR (Mechanical Conduit)
- Perforation of AML
Redo Case
repair of AML perforation
Minimally invasive MVR USZ

Repair rate in MR USZ: 85-90%
Obstacles for implementation
Low average case load

Median = 3 (IQR 1-7)
Likelihood of mitral valve repair and surgeon volume

![Graph showing the likelihood of mitral valve repair and surgeon volume]

Bolling SF ATS 2010
The mitral repair lottery
Repair vs. Replacement in the UK

Variability – 20-90% between different hospitals (n = 46)
National repair rate UK 51% (Ger 60%)
Operative outcomes in mitral valve surgery: Combined effect of surgeon and hospital volume in a population-based analysis

Arman Kilic, MD, Ashish S. Shah, MD, John V. Conte, MD, William A. Baumgartner, MD, and David D. Yuh, MD

- 50152 patients
- Isolated MVR for MR
Thank you!