MINIMALLY INVASIVE MITRAL VALVE SURGERY

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OVERVIEW

• History
• Anatomy
• Indications
• Techniques
  • Variants
• Outcomes & Results
HISTORY

• Mitral stenosis – 1st valve to be addressed (Bailey, Harken)

• Gibbon -1953

• Mitral regurgitation – valve replacement was choice until ... French Correction -1983 (Carpentier)
MIN INV HISTORY

• 1990’s laparoscopic operations had a boom
• 1996 – 1st MVRepair w video assist – Carpentier (fibrillated)
• 1997-8 parastemal and trans-stemal approaches by Navia and Cohn
• Eventual port access and robotic assist by multiple sites
MIN INV ADVANCES

- Improved perfusion technology – tubing, vacuum assist, cardiac protection mechanisms (transjugular CS cannulation), aortic endo-occlusion
MIN INV ADVANCES

• Improved equipment – instrumentation, delivery devices, retraction
MIN INV ADVANCES

- Intraoperative TEE replaces fluoroscopic guidance - real-time assessment
ANATOMY

• Regurgitation creates a volume overload
• Enlargement of the LA – leading to morbidity of Atrial arrhythmias, clot formation, adjacent organ pressure, pulmonary hypertension
• Dilatation of LV – vicious circle
INDICATIONS - MV SURGERY

1. Chronic, severe primary MR & LVEF > 30%
2. Any asymptomatic pt with severe MR & EF 30-60%
3. Concomitant to other cardiac surgery

*Level of evidence – B

For EF < 30%, level of evidence is C…
INDICATIONS - MIN INVASIVE

- Isolated mitral disease
  - Tricuspid disease, or aortic disease is relative
- Reoperative MV surgery
- Previous surgery with patent grafts
- Elderly patients
- Patient choice
- Calcified aortic disease
CONTRA-INDICATIONS

- Previous lung surgery
- Severe PVD
- Pulmonary Hypertension
- Untreated Coronary Artery disease
- Body habitus
- Aortic insufficiency - relative
TECHNIQUES – MAINSTAYS OF MIN INV

- Peripheral Cannulation – MC groin vessels
- 4th ICS minithoracotomy
  - Partial lower sternotomy
- Endovascular or Percutaneous Crossclamp
  - Beating heart/fibrillation w/out crossclamp
- Antegrade/Retrograde cardioplegia
- De-airing vent
Peripheral Groin Cannulation
  - Can be percutaneous
  - Size matched to BSA - Must be able to flow to CI of >2.2 lpm
  - Seldinger technique
  - ECHO guidance - expert teamwork
Minithoracotomy

- Usually 4th ICS - visualize Mitral valve, but able to reach ascending aorta

Endovascular clamping - Balloon occlusion
TECHNICAL MAINSTAYS

- Chitwood Direct Clamp
- Separate stab wound to keep out of incision
- Must separate pulmonary artery posteriorly
MINIMALLY INVASIVE APPROACHES - MVR
INTRA-OPERATIVE VIEW
TECHNIQUES
POST-OPERATIVE SMILE.
ADVANTAGES

- Faster recovery
- Stable sternum, adv for re-operations
- Decreased incid of AF
- Lesser cost
- Cosmesis
- Patient satisfaction
COMPLICATIONS

• Exposure related
  • Cardiac injury, inadequate result

• Technique related
  • Vasc injury, air or debris embolization, dissection

• Incision related
  • Herniation, instability, muscular pain, ITA ligation
OUTCOMES

• Most series report >90% freedom from MR and reoperation – selected patients

• Mortality in early series was as high as 8-10% (mostly due to vascular complications)

• Current mortality is 2-4%. No differences in comparative series.

• AXC and CPB times are longer, but no difference in all-cause mortality or morbidity
OUTCOMES & RESULTS

- Adding a tricuspid valve repair does not change long-term mortality
OUTCOMES – REPAIR VS REPLACEMENT

• NEJM – Acker et al (2014;370:23-32)

Prospective randomized study across 22 centers/CTSN.

Functional MR. 1:1 ratio

Challenging tenet that repair is safer/desirable.
Slightly higher hazard ratio for MV replacement in the first six months, but equalized over the next six months.
No significant differences between the two groups in serious adverse events
REPAIR VS REPLACEMENT - CONCLUSIONS

- QOL had no significant differences as well.

- Mvrepair had a higher incidence of rehospitalization and reintervention.

Table 3. Quality of Life and Functional Status of Patients at 1 Year.*

<table>
<thead>
<tr>
<th>Scale</th>
<th>Repair Group</th>
<th>Replacement Group</th>
<th>P Value</th>
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<tbody>
<tr>
<td>SF-12†</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Physical function</td>
<td>43.6±8.1</td>
<td>44.2±7.1</td>
<td>0.63</td>
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<tr>
<td>Score</td>
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<tr>
<td>Patients evaluated — no./total no. (%)</td>
<td>93/105 (88.6)</td>
<td>85/102 (83.3)</td>
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<tr>
<td>Mental function</td>
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<tr>
<td>Score</td>
<td>46.8±7.1</td>
<td>46.9±6.4</td>
<td>0.92</td>
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<tr>
<td>Patients evaluated — no./total no. (%)</td>
<td>93/105 (88.6)</td>
<td>85/102 (83.3)</td>
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<tr>
<td>Minnesota Living with Heart Failure questionaire</td>
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<tr>
<td>Score</td>
<td>24.5±23.1</td>
<td>19.6±19.4</td>
<td>0.12</td>
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<tr>
<td>Patients evaluated — no./total no. (%)</td>
<td>95/105 (90.5)</td>
<td>85/102 (83.3)</td>
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</tr>
<tr>
<td>EQ-5D‡</td>
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<tr>
<td>Score</td>
<td>73.7±16.3</td>
<td>73.9±20.1</td>
<td>0.97</td>
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<td>Patients evaluated — no./total no. (%)</td>
<td>91/105 (86.7)</td>
<td>80/102 (78.4)</td>
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<td>NYHA class — no./total no. (%)</td>
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<tr>
<td>All classes</td>
<td>100/105 (95.2)</td>
<td>93/102 (91.2)</td>
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<td>Class III or IV</td>
<td>9/100 (9.0)</td>
<td>13/93 (14.0)</td>
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<td>CCS classification — no./total no. (%)</td>
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<tr>
<td>All classes</td>
<td>96/105 (91.4)</td>
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<tr>
<td>Class III or IV</td>
<td>3/96 (3.1)</td>
<td>2/89 (2.2)</td>
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</tbody>
</table>

* Plus–minus values are means ±SD.
† Scores on the Medical Outcomes Study 12-Item Short Form Health Survey (SF-12) range from 0 to 100, with higher scores indicating a better outcome.
‡ Scores on the EuroQol Group 5-Dimension Self-Report Questionnaire (EQ-5D) range from 0 to 100, with higher scores indicating a better quality of life.
THE FUTURE

- Transcatheter MVR
  - Transapical
  - Transseptal
  - Transaortic
TRANSCATHETER MVR - ISSUES

- Atrial tissue flange
- Lack of calcium abutment
- Adjacent outflow tract/ aortic obstruction
TRANSCATHETER MVR

- Atrial skirt
- Posterior anchor
- Anterior anchors

CardiaQ

- Inflow ("atrial portion")
- Outflow ("ventricular portion")

Tiara

Medtronic device

Edwards FORTIS

Outflow ("ventricular portion")
THE FUTURE....

• Least invasive .... telerobotic repair...
QUESTIONS