Surgical Mitral Valvuloplasty Is the Standard Therapy for Severe Mitral Regurgitation

Jae Won Lee, MD PhD
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Asan Medical Center, Seoul, Korea
Case

- 67 male, NYHA Fc II-III
- HTN, COPD
- LVEF 43%, LV dilatation
- MV: MR (4+), bi-leaflet flail, annular dilatation
- Functional TR 3+, sys PAP 57mmHg
- AF

- STS score: mortality, 2.6%; +morbidity, 26.0%
- EuroSCORE II, 3.61%
Surgery and Outcomes

- Minimally invasive surgery, Alfieri stitch only
- ACC/ CPB times: 15 / 25 min
- Skin-to-skin time 60 min
- Intraop. TEE: MR 2+
- No transfusion or complication

- At 1 months, NYHA Fc II-III, MR 2-3+
- At 1 year, NYHA Fc II, MR3+
Are You OK with This Result?

This is the results from EVEREST II trial…

This is typical failure in Surgical case
Percutaneous Repair or Surgery for Mitral Regurgitation

Ted Feldman, M.D., Elyse Foster, M.D., Donald D. Glower, M.D., Saibal Kar, M.D., Michael J. Rinaldi, M.D., Peter S. Fail, M.D., Richard W. Smalling, M.D., Ph.D., Robert Siegel, M.D., Geoffrey A. Rose, M.D., Eric Engeron, M.D., Catalin Loghin, M.D., Alfredo Trento, M.D., Eric R. Skipper, M.D., Tommy Fudge, M.D., George V. Letsou, M.D., Joseph M. Massaro, Ph.D., and Laura Mauri, M.D., for the EVEREST II Investigators*
Mitral-valve clip is advanced through a catheter that is placed in the femoral vein, proceeds up the inferior vena cava into the right atrium, and crosses the atrial septum into the left atrium.

The device is steered until aligned over the origin of the regurgitant jet, and the open clip is advanced into the left ventricle.

The mitral leaflets are grasped and the clip closed to coapt the leaflets.

Reduced regurgitation with closed clip.

Mitral valve during systole and diastole.

Edge-to-edge approximation of leaflets by the clip.
<table>
<thead>
<tr>
<th>Event</th>
<th>Percutaneous Repair</th>
<th>Surgery</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freedom from death, from surgery for mitral-valve dysfunction, and from grade 3+ or 4+ mitral regurgitation†</td>
<td>100 (55)</td>
<td>65 (73)</td>
<td>0.007</td>
</tr>
<tr>
<td>Death</td>
<td>11 (6)</td>
<td>5 (6)</td>
<td>1.00</td>
</tr>
<tr>
<td>Surgery for mitral-valve dysfunction‡</td>
<td>37 (20)</td>
<td>2 (2)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Grade 3+ or 4+ mitral regurgitation</td>
<td>38 (21)</td>
<td>18 (20)</td>
<td>1.00</td>
</tr>
<tr>
<td>End Point</td>
<td>Percutaneous Repair (N = 184)</td>
<td>Surgery (N = 95)</td>
<td>P Value for Comparison between Study Groups</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>-------------------------------</td>
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<td>--------------------------------------------</td>
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<tr>
<td></td>
<td>No. of Patients</td>
<td>Value</td>
<td>No. of Patients</td>
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<tr>
<td></td>
<td></td>
<td>P Value for</td>
<td></td>
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<td></td>
<td></td>
<td>Comparison</td>
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<tr>
<td></td>
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<td>between Baseline</td>
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<td></td>
<td></td>
<td>and 12 Mo</td>
<td></td>
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<tr>
<td>Severity of mitral regurgitation at</td>
<td></td>
<td></td>
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<tr>
<td>12 mo — no. (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0+ (none)</td>
<td>153</td>
<td>9 (6)</td>
<td>69</td>
</tr>
<tr>
<td>1+ (mild)</td>
<td></td>
<td>57 (37)</td>
<td></td>
</tr>
<tr>
<td>1+ to 2+ (mild to moderate)</td>
<td></td>
<td>18 (12)</td>
<td></td>
</tr>
<tr>
<td>2+ (moderate)</td>
<td></td>
<td>41 (27)</td>
<td></td>
</tr>
<tr>
<td>3+ (moderate to severe)</td>
<td></td>
<td>21 (14)</td>
<td></td>
</tr>
<tr>
<td>4+ (severe)</td>
<td></td>
<td>7 (5)</td>
<td></td>
</tr>
<tr>
<td>Event</td>
<td>Percutaneous Repair</td>
<td>Surgery</td>
<td>P Value</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>---------------------</td>
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</tr>
<tr>
<td><strong>Major adverse event at 30 days</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any major adverse event</td>
<td>27 (15)</td>
<td>45 (48)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Any major adverse event excluding transfusion</td>
<td>9 (5)</td>
<td>9 (10)</td>
<td>0.23</td>
</tr>
<tr>
<td>Death</td>
<td>2 (1)</td>
<td>2 (2)</td>
<td>0.89</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>0</td>
<td>0</td>
<td>NA</td>
</tr>
<tr>
<td>Reoperation for failed surgical repair or replacement</td>
<td>0</td>
<td>1 (1)</td>
<td>0.74</td>
</tr>
<tr>
<td>Urgent or emergency cardiovascular surgery for adverse event</td>
<td>4 (2)</td>
<td>4 (4)</td>
<td>0.57</td>
</tr>
<tr>
<td>Major stroke</td>
<td>2 (1)</td>
<td>2 (2)</td>
<td>0.89</td>
</tr>
<tr>
<td>Renal failure</td>
<td>1 (&lt;1)</td>
<td>0</td>
<td>1.00</td>
</tr>
<tr>
<td>Deep wound infection</td>
<td>0</td>
<td>0</td>
<td>NA</td>
</tr>
<tr>
<td>Mechanical ventilation for &gt;48 hr</td>
<td>0</td>
<td>4 (4)</td>
<td>0.02</td>
</tr>
<tr>
<td>Gastrointestinal complication requiring surgery</td>
<td>2 (1)</td>
<td>0</td>
<td>0.78</td>
</tr>
<tr>
<td>New onset of permanent atrial fibrillation</td>
<td>2 (1)</td>
<td>0</td>
<td>0.78</td>
</tr>
<tr>
<td>Septicemia</td>
<td>0</td>
<td>0</td>
<td>NA</td>
</tr>
<tr>
<td>Transfusion of ≥2 units of blood</td>
<td>24 (13)</td>
<td>42 (45)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
Surgery vs. MitraClip
EVEREST II Trial

Similar results?

No!
Original, Open Mitral Clip Technique: Double-Orifice Technique (by Alfieri)
Alfieri Technique

• First introduced in 1995

Midterm results of edge-to-edge mitral valve repair without annuloplasty

Francesco Maisano, MD
Alessandro Caldarola, MD
Andrea Blasio, MD
Michele De Bonis, MD
Giovanni La Canna, MD
Ottavio Alfieri, MD

Objective: Edge-to-edge mitral valve repair is usually performed in association with annuloplasty, with rare exceptions. We retrospectively analyzed the results of ringless edge-to-edge repair, particularly in view of minimally invasive and percutaneous approaches.

Patients and Methods: 84 patients underwent edge-to-edge repair for degenerative mitral valve disease; 42 patients had secondary mitral regurgitation and 42 had primary mitral regurgitation. A double-orifice repair was done in 69 patients, and pancommissural repair was done in 12 patients. In 5 patients edge-to-edge repair was used as a rescue procedure.

Results: There were 3 hospital and 4 late deaths, for a 4-year survival of 85% ± 6.7%. At latest follow-up, 63 patients were in New York Heart Association classes I or II, and 9 patients were in classes III or IV. Nine patients required reoperation (89% ± 3.9% overall freedom from reoperation at 4 years). Annular calcification was associated with a greater reoperation rate (77% ± 22% vs 95% ± 4.6% freedom from reoperation, \( P = .03 \)). Intraoperative water testing and postrepair transesophageal echocardiography predicted late failure. Only 1 of 42 patients required reoperation in the follow-up period when annular calcification, rheumatic disease, or rescue procedure were not present as risk factors.

J Thorac Cardiovasc Surg 2003

Alfieri technique without “Ring annuloplasty”
Conclusions: Our data confirm overall suboptimal results of the edge-to-edge technique when annuloplasty is not added to the repair. Annular calcification, rheumatic cause, and edge-to-edge repair done as a rescue procedure were associated with the worst outcome. Midterm results in selected patients encourage future developments in catheter-based edge-to-edge procedures.
Very long-term results (up to 17 years) with the double-orifice mitral valve repair combined with ring annuloplasty for degenerative mitral regurgitation

Michele De Bonis, MD, Elisabetta Lapenna, MD, Roberto Lorusso, MD, PhD, Nicola Buzzati, MD, Sandro Gelsomino, MD, PhD, Maurizio Taramasso, MD, Enrico Vizzardi, MD, and Ottavio Alfieri, MD

Objective: The very long-term results of the double-orifice mitral valve repair are unknown. The aim of this study was to assess the late clinical and echocardiographic outcomes of this technique in patients with degenerative mitral regurgitation.

Methods: From 1993 to 2000, 174 patients with severe degenerative mitral regurgitation were treated with the double-orifice technique combined with ring annuloplasty. Mean age of patients was 52 ± 12.8 years, New York Heart Association class >2 in 51% and was class 3 or 4 in 45.5%.

Results: There were no hospital deaths. At hospital discharge, mitral regurgitation was absent or mild in 169 patients (97.1%) and moderate (2+/4+) in 5 patients (2.8%). Mitral stenosis requiring reoperation was detected in 1 patient (0.6%). Clinical and echocardiographic follow-up was 97.1% complete (mean length, 11.5 ± 2.53 years; median, 11.6 years; longest duration, 17.6 years). At 14 years, actuarial survival was 86.9% ± 3.37%, freedom from cardiac death was 95.8% ± 1.54%, and freedom from reoperation was 89.6 ± 2.51%. At the last echocardiographic examination, recurrence of mitral regurgitation ≥3+ was documented in 23 patients (23/169, 13.6%). Freedom from mitral regurgitation ≥3+ at 14 years was 83.8% ± 3.39%. The only predictor of recurrence of mitral regurgitation ≥3+ was residual mitral regurgitation greater than mild at hospital discharge (hazard ratio, 5.7; 95% confidence interval, 1.6-20.6; P = .007).

Conclusions: The double-orifice repair combined with ring annuloplasty provides very satisfactory long-term results in patients with degenerative mitral regurgitation in the setting of bileaflet and anterior leaflet prolapse. (J Thorac Cardiovasc Surg 2012;144:1019-26)
Reoperation

89.6 ± 2.51% at 14 years

MR 3-4+

83.8 ± 3.39 at 14 years

J Thorac Cardiovasc Surg 2013
<table>
<thead>
<tr>
<th>Predictor</th>
<th>HR</th>
<th>95% CI</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1.01</td>
<td>0.97-1.04</td>
<td>.52</td>
</tr>
<tr>
<td>Male sex</td>
<td>2</td>
<td>0.74-5.43</td>
<td>.16</td>
</tr>
<tr>
<td>LVEF</td>
<td>0.97</td>
<td>0.86-1.09</td>
<td>.68</td>
</tr>
<tr>
<td>NYHA &gt; 2</td>
<td>0.88</td>
<td>0.32-2.41</td>
<td>.81</td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>0.51</td>
<td>0.11-2.24</td>
<td>.37</td>
</tr>
<tr>
<td>Bileaflet prolapse</td>
<td>0.78</td>
<td>0.32-1.88</td>
<td>.58</td>
</tr>
<tr>
<td>Anterior leaflet prolapse</td>
<td>1.6</td>
<td>0.66-3.99</td>
<td>.28</td>
</tr>
<tr>
<td>Posterior leaflet prolapse</td>
<td>0.48</td>
<td>0.06-3.63</td>
<td>.47</td>
</tr>
<tr>
<td>Associate procedures</td>
<td>1.07</td>
<td>0.31-3.64</td>
<td>.90</td>
</tr>
<tr>
<td>MR &gt; 1+ at discharge</td>
<td>5.78</td>
<td>1.61-20.6</td>
<td>.007</td>
</tr>
</tbody>
</table>

HR, Hazard ratio; CI, confidence interval; LVEF, left ventricular ejection fraction; NYHA, New York Heart Association; MR, mitral regurgitation.
Interpretation

- Only 174 out of 710 patients who underwent MV repair for severe degenerative MR were selected
- 268 patients underwent Alfieri procedure
- Exclusion:
  - no annuloplasty: n=59
  - No ring: n=25
  - Other valve replacement: n=10

Highly selected group!
Can the edge-to-edge technique provide durable results when used to rescue patients with suboptimal conventional mitral repair?

Michele De Bonis*, Elisabetta Lapenna, Nicola Buzzatti, Maurizio Taramasso, Maria Chiara Calabrese, Teodora Nisi, Federico Pappalardo and Ottavio Alfieri

Department of Cardiac Surgery, San Raffaele Scientific Institute, Milan, Italy

Received 14 September 2012; revised 17 January 2013; accepted 18 February 2013

Abstract

OBJECTIVES: The ‘edge-to-edge’ (EE) technique can be used to rescue patients with suboptimal results of conventional mitral valve (MV) repair. This study evaluated the feasibility and results of this rescue procedure.

METHODS: From 1998 to 2011, 530 patients with mitral regurgitation (MR) underwent a rescue edge-to-edge technique. Residual MR was due to residual prolapse in 30 (69.7%) patients, systolic anterior motion in 12 (27.9%) and post-endocarditis leaflet erosion in 1 (2.3%). According to the location of the regurgitant jet, the edge-to-edge suture was performed centrally (60.5%) or in correspondence with the anterior or posterior commissure (39.5%). The original repair was left in place.

RESULTS: There were no hospital deaths. Additional cross-clamp time was 15.2 ± 5.6 min. At hospital discharge, all patients showed no or mild MR and no mitral stenosis. Clinical and echocardiographic follow-up was 97.6% complete (median length 5.7 years, up to 14.6 years). At 10 years, actuarial survival was 89 ± 7.4% and freedom from cardiac death 100%. Freedom from reoperation and freedom from MR ≥3+ at 10 years were both 96.9 ± 2.9%. At the last echocardiogram, MR was absent or mild in 37 patients (88%), moderate in 4 (9.5%) and severe in 1 (2.4%). No predictors for recurrence of MR ≥2+ were identified. The mean MV area and gradient were 2.8 ± 0.6 cm² and 2.7 ± 0.9 mmHg. NYHA I–II was documented in all cases.

CONCLUSIONS: A ‘rescue’ EE can be a rapid and effective option in case of suboptimal result of ‘conventional’ MV repair. Long-term durability of the repair is not compromised.

Keywords: Mitral regurgitation • Mitral valve repair • Edge-to-edge technique
Results

• The last follow-up TTE (MR):
  - absent or mild in 37 patients (88%),
  - moderate in 4 (9.5%)
  - severe in 1 (2.3%)

• Actuarial freedom from MR ≥3+ at 10 years was 96.9 ± 2.9%.
Alfieri Technique: Conclusions

• May be reasonable option in *highly selected patients* when combined with *ring annuloplasty*

• It is mostly an *adjuvant* MV procedure
Insights from Recent Report on Percutaneous MV Repair
Predictors for efficacy of percutaneous mitral valve repair using the MitraClip system: the results of the MitraSwiss registry

Daniel Sürder,1 Giovanni Pedrazzini,1 Oliver Gaemperli,2 Patric Biaggi,2 Christian Felix,3 Kaspar Rufibach,4,5 Christof auf der Maur,6 Raban Jeger,7 Peter Buser,7 Beat A Kaufmann,7 Marco Moccetti,1 David Hürlimann,2 Ines Bühler,2 Dominique Bettes,3 Jacques Scherman,8 Elena Pasotti,1 Francesco F Faletra,1 Michel Zuber,6 Tiziano Moccetti,1 Thomas F Lüscher,2 Paul Erne,6 Jürg Grünenfelder,8 Roberto Corti2

Design Multi-centre longitudinal cohort study.
Setting Tertiary referral centres.
Patients Here we report on the first 100 consecutive patients treated with percutaneous MVR in Switzerland between March 2009 and April 2011. All of them had moderate–severe (3+) or severe (4+) MR, and 62% had functional MR. 82% of the patients were in New York Heart Association (NYHA) class III/IV, mean left ventricular ejection fraction was 48% and the median European System for Cardiac Operative Risk Evaluation was 16.9%.
Acute Procedural Success (APS)

$p^* = 0.0069$

Overall survival (months)
Residual MR grade after MitraClip™ implantation

\[ p^* = 0.03 \]
**Table 5** Predictors for clinical efficacy

<table>
<thead>
<tr>
<th>Predictor</th>
<th>p-value (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>NS (−5.78, 4.43) *</td>
</tr>
<tr>
<td>BMI</td>
<td>0.01 (0.57, 4.27) *</td>
</tr>
<tr>
<td>Log EuroSCORE</td>
<td>NS (−9.68, 4.67) *</td>
</tr>
<tr>
<td>Mechanism of MR</td>
<td>NS†</td>
</tr>
<tr>
<td>Gender</td>
<td>NS†</td>
</tr>
<tr>
<td>Previous myocardial infarction</td>
<td>NS†</td>
</tr>
<tr>
<td>Previous CABG</td>
<td>NS†</td>
</tr>
<tr>
<td>Congestive heart failure before MitraClip</td>
<td>NS†</td>
</tr>
<tr>
<td>MR grade at discharge (1+ vs 2+ vs &gt; 2+)</td>
<td>0.0000002†</td>
</tr>
</tbody>
</table>

**Early MR determines the long-term clinical outcomes**

*Heart 2013*
A heart team’s perspective on interventional mitral valve repair: Percutaneous clip implantation as an important adjunct to a surgical mitral valve program for treatment of high-risk patients

Hendrik Treede, MD, a Johannes Schirmer, MD, a Volker Rudolph, MD, b Olaf Franzen, MD, b Malgorzata Knap, MD, b Michael Schluter, PhD, b Lenard Conradi, MD, a Moritz Seiffert, MD, a Dietmar Koschyk, MD, b Thomas Meinertz, MD, b Stephan Baldus, MD, b and Hermann Reichenspurner, MD, PhD a

Objective: Surgical mitral valve repair carries an elevated perioperative risk in the presence of severely reduced ventricular function and relevant comorbidities. We sought to assess the feasibility of catheter-based mitral valve repair using a clip-based percutaneous edge-to-edge repair system in selected patients at high surgical risk with mitral regurgitation grade 3 or worse.

Methods: Between 2002 and January 2011, 202 consecutive patients without prior mitral valve surgery (age 75 ± 9 years; 63% were male) with symptomatic functional (65%), degenerative (27%), or mixed (8%) mitral regurgitation were treated with a percutaneous clip system for approximation of the anterior and posterior mitral leaflets. Risk for mitral valve surgery was considered high in terms of a mean logistic European System for Cardiac Operative Risk Evaluation of 44% (range, 21%-54%). Preprocedural left ventricular ejection fraction was 35% or less in 36% of patients. An interdisciplinary heart team of cardiologists and cardiac surgeons discussed all patients.

Results: Percutaneous clip implantation was successful in 186 patients (92%). Patients were treated with 1 clip (n = 125; 62%), 2 clips (n = 64; 32%), or 3 or more clips (n = 7; 3%). Reduction in mitral regurgitation from pre- to postprocedure was significant (P < .0001) and remained stable within the first 12 months in the majority of patients. Thirty-day mortality was 3.5% (7/202 patients). Hospital stay was 12 ± 10 days, and median intensive care unit stay was 1 day (range, 0–45 days). Eleven patients required surgical valve repair/replacement at a median of 38 days (0–468 days) after percutaneous clip implantation.

Conclusions: Clip-based percutaneous mitral valve repair is a safe, low-risk, and effective therapeutic option in symptomatic patients with a high risk for surgery and does not exclude later surgical repair. (J Thorac Cardiovasc Surg 2012;143:78-84)
Heart Team Approach

- Successful procedure in 186/202 (92%)
- 30-day mortality: 3.5% (n=7)
- ICU stay: median 1 day (0-45 days)
- Hospital stay: median 9 days (1-73 days)
- MV surgery in 11 at a median 38 days (0-468 days)
FIGURE 2. MR at baseline, postprocedure, and 12 months after interventional MVR using the MitraClip device (Abbott Vascular, Menlo Park, Calif) ($P < .0001$, chi-square test). MR, Mitral regurgitation.
FIGURE 6. Clip-related lesions at the anterior and posterior mitral valve leaflets with chordal rupture (arrows). Both valves were repaired successfully.
MitraClip: Conclusions

• MitraClip procedure should be reserved for very high risk patients with best suitable anatomy in whom the procedural success is expected to be obvious

• Heart team approach!
Surgical Mitral Valvuloplasty as Standard Therapy for Severe Mitral Regurgitation
MV Repair Techniques for Degenerative Prolapse

- **Ring annuloplasty** (always)

- Sliding annuloplasty

- Leaflet procedures
  - Triangular- or Quadrangular resection
  - Leaflet plication

(continued)
MV Repair Techniques for Degenerative Prolapse

- Subvalvular procedures
  - Papillary muscle shortening/sliding
  - Neo-chordae formation
  - Chordae transposition / shortening
- Alfieri technique: mostly as an adjunctive procedure
- Almost no surgeon regard the Alfieri technique as an important primary procedure for MV repair…
Then Why Alfieri Technique for Percutaneous Procedure?

• Because it is “Simple” to be implemented as percutaneous procedure

• No other plausible reason…. 
Late Outcomes of Mitral Valve Repair for Mitral Regurgitation Due to Degenerative Disease

Tirone E. David, MD; Susan Armstrong, MSc; Brian W. McCrindle MD; Cedric Manlhiot, BSc

Background—The pathological spectrum of degenerative diseases of the mitral valve (MV) that causes mitral regurgitation (MR) is broad, and there is limited information on late outcomes of MV repair in various subgroups of patients and pathologies. This study examines this issue.

Methods and Results—All 840 patients who had MV repair for MR due to degenerative diseases from 1985 to 2004 were prospectively followed with clinical and echocardiographic evaluations at biennial intervals up to 26 years, median of 10.4 years. Clinical, hemodynamic, and pathological variables were evaluated for their association with outcomes. Age, left ventricular ejection fraction, and functional class were predictors of late cardiac- and valve-related deaths by multivariable analysis. MV repair failed to restore life span to normal in patients with functional class IV. Thirty-eight patients had repeat MV surgery, and the probability of reoperation at 20 years was 5.9%. During the follow-up, recurrent severe MR developed in 37 patients, and moderate MR developed in 61. Age, isolated prolapse of the anterior leaflet, the degree of myxomatous changes in the MV, lack of mitral annuloplasty, and duration of cardiopulmonary bypass were associated with increased risk of recurrent MR. At 20 years, the freedom from recurrent severe MR was 90.7%, and the freedom from moderate or severe MR was 69.2%.

Conclusions—MV repair for degenerative MR restored life span to normal except in patients with symptoms at rest and impaired left ventricular function. Advanced age and complex mitral valve pathologies increased the risk of late recurrent MR. (Circulation. 2013;127:1485-1492.)
Figure 4. Freedom from reoperation on the mitral valve. Dotted lines are the 95% confidence intervals. The dotted lines are the 95th confidence interval around the parameter estimates. MV indicates mitral valve.
Severe MR

Moderate MR

Circulation 2013
Is Open MV Repair Reproducible in Real World Practice?
Trends in Mitral Valve Surgery in the United States: Results From The Society of Thoracic Surgeons Adult Cardiac Database

James S. Gammie, MD, Shubin Sheng, PhD, Bartley P. Griffith, MD, Eric D. Peterson, MD, J. Scott Rankin, MD, Sean M. O’Brien, PhD, and James M. Brown, MD

Division of Cardiac Surgery, University of Maryland Medical Center, Baltimore, Maryland; Duke Clinical Research Institute, Durham, North Carolina; and Centennial Medical Center, Vanderbilt University, Nashville, Tennessee

Background. The purpose of this study is to examine trends in mitral valve (MV) repair and replacement surgery using The Society of Thoracic Surgeons Adult Cardiac Surgery Database (STS ACSD).

Methods. The study population included isolated mitral valve operations performed between January 2000 and December 2007 at 910 hospitals participating in the STS ACSD. Patients with endocarditis, prior cardiac operation, shock, emergency operation, and concomitant coronary artery bypass graft or aortic valve surgery were excluded.

Results. During the 8-year study period, 58,370 patients underwent isolated primary MV operations. For patients with isolated mitral regurgitation (n = 47,126), the rate of MV repair (versus replacement) increased from 51% to 69% (p < 0.0001). Among patients having replacement (n = 24,404), there has been a pronounced decline in the use of mechanical valves: 68% to 37% (p < 0.0001). The operative mortality for MV replacement was consistently higher than that for repair (3.8% versus 1.4%), a finding that persisted after risk-adjustment (adjusted odds ratio 0.52, 95% confidence interval: 0.45 to 0.59; p < 0.0001).

Among patients having elective isolated MV repair (n = 28,140), the operative mortality was 1.2%. For asymptomatic (class I) patients, operative mortality was 0.6%.

Conclusions. This study documents several important trends in MV surgery, including the progressive adoption of mitral valve repair and increasing use of bioprosthetic replacement valves. Operative risks of MV repair are significantly lower than those for MV replacement. Operative mortality for isolated elective mitral valve repair is 1% in contemporary clinical practice.

Fig 4. Mitral valve repair rates, percent repaired (gray bars), for isolated primary mitral regurgitation, for the years 2000 to 2007 (p < 0.0001).
Risk is lower with MV ‘repair’ than ‘replacement’
Reparability is affected by case volume

Long Term Survival of Patients Undergoing Mitral Valve Repair and Replacement: A Longitudinal Analysis of Medicare Fee-for-Service Beneficiaries
Christina M. Vassileva, Gregory Mishkel, Christian McNeely, Theresa Boley, Stephen Markwell, Steven Scaife and Stephen Hazelrigg

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Print ISSN: 0009-7322. Online ISSN: 1524-4539
Superior long-term survival with ‘Repair’

Circulation 2013 epub
Surgical Mitral Valvuloplasty as Standard Therapy

- Surgical MV repair is well established treatment in real world practice!
- Additional strengths of surgical MV repair
  - TV repair
  - AF ablation: 34-39% in EVEREST II trial
Surgery vs. MitraClip

• Open MV repair after percutaneous MV repair?
  • No, if the case has not been fully discussed with surgeon!
The Evolution From Surgery to Percutaneous Mitral Valve Interventions

The Role of the Edge-to-Edge Technique

Francesco Maisano, MD, Giovanni La Canna, MD, Antonio Colombo, MD, Ottavio Alfieri, MD

Milano, Italy

Table 1

Anatomical Selection Criteria for the MitraClip Device

Recommended anatomical criteria (from the EVEREST trial)

- MR originates from the A2-P2 area
- Coaptation length >2 mm
- Coaptation depth <11 mm
- Flail gap <10 mm
- Flail width <15 mm
- Mitral valve orifice area >4 cm²

Additional criteria for caution

- Short posterior leaflet (<8 mm)
- Restricted posterior leaflet prolapse/flail width >15 mm
- Calcification in the grasping area
- Cleft or subcommissures in the area of the jet
the surgical option as first choice. High-risk patients are considered for the procedure, but only a subgroup of patients can be treated by the MitraClip procedure, according to the anatomical criteria (Table 1) derived from the EVEREST inclusion protocol. We routinely use 3D TEE

In younger patients with degenerative MR without comorbidities, surgery can be carried out with minimal risk and with long-lasting results (36). The Mitraclip procedure should be considered in elderly subjects or those with comorbidities. The ideal degenerative MR candidate has a
Surgery vs. MitraClip

• Another considerations:
  - AUC (appropriate use criteria)
  - Legal issue
2012 Appropriate Use Criteria for Coronary Revascularization Focused Update


Endorsed by the American Society of Echocardiography and the Heart Rhythm Society

APPROPRIATE USE CRITERIA
<table>
<thead>
<tr>
<th>Intermediate Risk Findings on Noninvasive Study</th>
<th>CCS Class I or II Angina</th>
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<tbody>
<tr>
<td><strong>Symptoms</strong></td>
<td><strong>Med. Rx</strong></td>
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<tr>
<td>Class III or IV Max Rx</td>
<td>A</td>
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<tr>
<td>Class I or II Max Rx</td>
<td>U</td>
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<tr>
<td>Asymptomatic Max Rx</td>
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<tr>
<td>Class III or IV No/min Rx</td>
<td>U</td>
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<tr>
<td>Class I or II No/min Rx</td>
<td>U</td>
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<tr>
<td>Asymptomatic No/min Rx</td>
<td>I</td>
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<table>
<thead>
<tr>
<th><strong>Coronary Anatomy</strong></th>
<th>CTO of 1 vz.; no other disease</th>
<th>1-2 vz. disease; no Prox. LAD</th>
<th>1 vz. disease with Prox. LAD</th>
<th>2 vz. disease; no Left Main</th>
<th><strong>Coronary Anatomy</strong></th>
<th>CTO of 1 vz.; no other disease</th>
<th>1-2 vz. disease; no Prox. LAD</th>
<th>1 vz. disease of Prox. LAD</th>
<th>2 vz. disease with Prox. LAD</th>
<th>3 vz. disease; no Left Main</th>
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<td>Condition</td>
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<td>PCI</td>
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<td>Two-vessel CAD with proximal LAD stenosis</td>
<td>A</td>
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<td>Three-vessel CAD with low CAD burden (i.e., three focal stenosis, low SYNTAX score)</td>
<td>A</td>
<td>A</td>
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<tr>
<td>Three-vessel CAD with intermediate to high CAD burden (i.e., multiple diffuse lesions, presence of CTO, or high SYNTAX score)</td>
<td>A</td>
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<td>Isolated left main stenosis</td>
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<td>Left main stenosis and additional CAD with low CAD burden (i.e., one to two vessel additional involvement, low SYNTAX score)</td>
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<tr>
<td>Left main stenosis and additional CAD with intermediate to high CAD burden (i.e., three vessel involvement, presence of CTO, or high SYNTAX score)</td>
<td>A</td>
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Stent lawsuits popping up across the country

By Attorney Mark Haak posted in Unneeded Stents on Friday, January 6, 2012

unnecessary stenting are now popping up in many states. Recently lawsuits were filed in Kentucky and Tennessee against various hospitals and cardiologists who were involved in unnecessary stenting. This follows the hundreds of lawsuits filed in Pennsylvania as a result of the unnecessary stent implantation. In November 2011, and the hundreds of similar claims for inserting stents in connection with unnecessary stenting are occurring throughout the United States.

In November 2011, the state of Pennsylvania settled by paying $2.7 million to three years of suits, many of which alleged unnecessary stent implantation. State's Attorney General Tom Wolf has fallen into a 400% increase in the use of stent implants.

Unnecessary Stent Implants

Thousands of patients across the country have been implanted with unnecessary coronary stents. These unnecessary coronary stents may have caused complications, including hospitalization and even death.

Investigations have been launched in a number of hospitals, among them Pennsylvania Hospital in Philadelphia, which recently notified patients they may have undergone stent implants they did not need. The cardiologist involved resigned. (Watch TV news coverage)

If you or a loved one had an elective coronary stent implant and suffered subsequent complications or injuries, you should contact a stente attorney for a free evaluation of your case.

Kline & Specter, P.C., with more than 30 attorneys, seven of whom are also highly experienced doctors, has the expertise to litigate stent implant cases. The Philadelphia-based law firm handles cases nationwide and is a leader in obtaining large medical malpractice verdicts and settlements. (See Medical Malpractice Major Victories)
Potential Indication for Percutaneous MV repair

• Failed surgical repair

• High risk patients in whom the risk of open surgery is expected unacceptable
Percutaneous MV Repair as Primary Treatment?

- Patients will be unhappy
- Surgeons will suffer
- You will be in trouble