Moving from the surgical treatment of left ventricular aneurysm to ventriculoplasty: the point of view of the heart failure clinician

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Erice 2011
Conflict of Interest
to be a cardiologist
Definition di “Remodeling”

It is a post-MI process characterized by:

1. Gradual increase of LVEDV and LVESV
2. Decrease of necrotic wall thinning
3. Changes in left ventricular geometry (sferic).
Remodeling

- Lymphatic
- Tissue fluid
- Endothelial cells
- Adrenergic nerves
- Pericyte
- Fibroblast
- Macrophage
- Collagen scaffolding
- CARDIAC MYOCYTE
Remodeling

Neutrophil Infiltration

Sympathetic Activation

RAAS Activation

Myocyte Death

Cytokine release

LV dilatation
Wall thinning

Hypertrofy

Fibrosis

1 – Acute (in the first hours)

2 – Late (weeks and months)
Acute MI

Golden hour: Time is Muscle
Phase I: necrosis

Phase II: MI expansion

Phase III: progressive deterioration

Normal

Necrosis MI

Slimming

Cicatrization Dilatation

Hypertrophy of sound myocardium Compensation

LV global dilatation
Relation Between Post-MI End Systolic Volume and Natural History Outcomes
(White HD et al Circulation 1987)
Relation Between Post-MI End Systolic Volume and Natural History Outcomes

REMODELING AND ENALAPRIL

Konstam et al for SOLD Investigators  Circulation 1992
CAPRICORN

Effect of Carvedilol on LV Function on Top of ACE Inhibition

Doughty RN et al. Circulation. 2001
EPHESUS: Eplerenone Post-Acute Myocardial Infarction Heart Failure Efficacy and Survival Study

All-cause mortality

Cumulative incidence (%)

- Placebo
- Eplerenone

RR=0.85
(95% CI=0.75 0.96)

P=0.008

Attenuation of Unfavorable Remodeling by Exercise Training in Postinfarction Patients With Left Ventricular Dysfunction.
Results of the Exercise in Left Ventricular Dysfunction (ELVD) Trial*

Pantaleo Giannuzzi, MD; Pier Luigi Temporelli, MD; Ugo Corrà, MD; Marinella Gattone, MD; Amerigo Giordano, MD; Luigi Tavazzi, MD; ; for the ELVD Study Group†

From the "Salvatore Maugeri" Foundation, Clinica del Lavoro e della Riabilitazione, IRCCS, Division of Cardiology, Rehabilitation Institute of Veruno, Italy.

Circulation. 1997;96:1790-1797
CRT by Biventricular pacing

LV End Systolic and Diastolic Volumes

MR area

CARDIOLOGICAL POINT OF VIEW
- Post-MI patients with LVD -

• Optimized pharmacological treatment
  - Ace-Inhibitor (maximal tolerated dose)
  - Beta-Blocker (maximal tolerated dose)
  - Anti-aldosteron (low dose)

• CRT-D whenever applicable

• Individualization of the risk (use of the score)
LEFT VENTRICULAR REMODELING

White et al. Circulation 1987

Diagram showing relative risk for death post-MI against end systolic volume in mL.
Surgical Ventricular Reconstruction

1) Reduce the size
2) Reduce the volume
3) Reshape the ventricle

Intracavitary Repair of Ventricular Aneurysm and Regional Dyskinesia

Ann. Surg. • May 1992

Efficacy of endoventricular patch plasty in large postinfarction akinetic scar and severe left ventricular dysfunction: comparison with a series of large dyskinetic scars

V. Dor, MD, M. Sabatier, MD, M. Di Donato, MD, F. Montiglio, MD, A. Toso, MD, M. Maioli, MD

Fig. 1. Technique of intracavitary repair of a left ventricular aneurysm using a patch of woven Dacron fabric.
**Surgical Ventricular Reconstruction**

Different techniques has been proposed

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>EVCPP (Endoventricular circular patch-plasty)</td>
</tr>
<tr>
<td>2</td>
<td>SAVE (Septal anterior ventricular exclusion)</td>
</tr>
<tr>
<td>3</td>
<td>PRP (Posterior restoration procedure)</td>
</tr>
<tr>
<td>4</td>
<td>PLV (Partial resection of the left ventricle)</td>
</tr>
</tbody>
</table>
SVR and incision line

Location of patch in EVCPP and SAVE

1. EVCPP (Dor), 2. SAVE, 3. PRP (Posterior restoration procedure)

Isomura T, Gen Thorac Cardiovasc Surg 2011
Mid-term changes of left ventricular geometry and function after Dor, SAVE, and Overlapping procedures

Tetsuya Ueno*, Ryuzo Sakata, Yoshifumi Ighiro, Hiroyuki Yamamoto, Masahiro Ueno, Takayuki Ueno, Kazuhisa Matsumoto

Department of Thoracic and Cardiovascular Surgery, Kagoshima University Graduate School of Medical and Dental Sciences, 8-35-1 Sakuragaoka, Kagoshima City, Kagoshima 890-8520, Japan

Received 18 December 2006; received in revised form 5 February 2007; accepted 28 February 2007; Available online 29 March 2007
Best evidence topic - Cardiac general

Is it worth performing surgical ventricular restoration in patients with ischemic cardiomyopathy and akinetic but non-aneurysmal segments in the left ventricle?

Hariharan Subramanian\textsuperscript{a,*}, Babu Kunadian\textsuperscript{b}, Joel Dunning\textsuperscript{b}

\textsuperscript{a}Cardiology Department, Drexel University College of Medicine, Philadelphia, PA, USA
\textsuperscript{b}James Cook University Hospital, Middlesbrough, UK
LEFT VENTRICULAR REMODELING

It is not an homogeneous process

Dyskinetic  

Akinetic

MI can initiate a myopathic process which can spread beyond the immediate peri-infarct region and may involve the entire ventricle.
Surgical Ventricular Reconstruction

Dor V et al, J.Thorac Cardiovasc Surgert 1998
P < 0.001
Surgical Ventricular Reconstruction

CLINICAL DATA
Surgical Ventricular Restoration in the Treatment of Congestive Heart Failure Due to Post-Infarction Ventricular Dilation

Constantine L. Athanasuleas, MD, Gerald D. Buckberg, MD, Alfred W. H. Stanley, MD, William Siler, PHD, Vincent Dor, MD, Marisa Di Donato, MD, Lorenzo Menicanti, MD, Sergio Almeida de Oliveira, MD, Friedhelm Beyersdorf, MD, Irving L. Kron, MD, Hisayoshi Suma, MD, Nicholas T. Kouchoukos, MD, Wistar Moore, MD, Patrick M. McCarthy, MD, Mehmet C. Oz, MD, Francis Fontan, MD, Meredith L. Scott, MD, Kevin A. Accola, MD, and the RESTORE Group

Birmingham, Alabama; Los Angeles, California; Monte Carlo, Monaco; Florence and Milan, Italy; Sao Paulo, Brazil; Freiburg, Germany; Charlottesville, Virginia; Kanagawa, Japan; St. Louis, Missouri; Orlando, Florida; Cleveland, Ohio; New York, New York; and Bordeaux, France
Athanasuleas et al., (2004), J Am Coll Cardiol, USA, Monaco, Italy, France, Germany, Japan, Brazil, [3]

Observational study (level 2b)

Surgical ventricular restoration performed in 1198 post-infarction patients between 1998 and 2003. Patients with previous anterior myocardial infarction, significant ventricular dilatation (LVEDV) ≥60 ml/m², and a regional asynergic left ventricular (LV) circumference of ≥35% were included. Follow-up ejection fraction (EF) and volumes obtained before hospital discharge and NYHA functional class obtained on follow-up

Early outcome

- Improvement in EF from 29.6 ± 11% to 39.5 ± 12.3% (P < 0.001)
- Improvement in LVEDVI from 80.4 ± 51.4 ml/m² to 56.3 ± 34.3 ml/m² (P < 0.001)
- 30 day mortality of 5.3% after SRV and 8.7% in those with concomitant mitral valve repair vs. patients in whom no mitral valve procedure was required (4%, P < 0.001)

Late outcome

- Overall 5 year survival of 68.6 ± 2.8%
- Survival at 5 years better in the group with dyskinetic as compared with akinetic morphology (80% vs. 65%; P < 0.001)
- Freedom from rehospitalisation for CHF of 78%
- Improvement of NYHA class from a mean of 2.9 - 1.7 after surgery

No control group

No randomisation to medical therapy, CABG alone, CABG + SVR, CABG + SVR + mitral procedures or a combination of these

Non-uniform surgical procedure

No standardisation of drug regimes used
Surgical therapy for ischemic heart failure: Single-center experience with surgical anterior ventricular restoration

Lorenzo Menicanti, MD, a Serenella Castelvecchio, MD, a Marco Ranucci, MD, a Alessandro Frigiola, MD, a Carlo Santambrogio, MD, a Carlo de Vincentiis, MD, a Jelena Brankovic, MD, a and Marisa Di Donato, MD b


<table>
<thead>
<tr>
<th>Late postop (n = 300)</th>
</tr>
</thead>
<tbody>
<tr>
<td>167 ± 60 (153)*†</td>
</tr>
<tr>
<td>104 ± 50 (94)*†</td>
</tr>
<tr>
<td>39 ± 10 (39)*</td>
</tr>
<tr>
<td>1.3 ± 1.0 (1)</td>
</tr>
<tr>
<td>1.5 ± 1.2 (1.5)*†</td>
</tr>
<tr>
<td>34 ± 13 (30)</td>
</tr>
<tr>
<td>1.6 ± 0.7 (1)*</td>
</tr>
</tbody>
</table>

*P < .05 vs early postoperatively.
†P < .01 vs early postoperatively.

EDV (mL)
ESV (mL)
EF (%)
MR grade (not repaired)
MR grade (repaired)
PAP (mm Hg)
NYHA class

Values are mean ± standard deviation; systolic pulmonary artery pressure;

Randomised controlled trial (level 1b)

<table>
<thead>
<tr>
<th></th>
<th>Long-term mortality (2 years)</th>
<th>Improvement in LVESVI (ml/m²)</th>
<th>Improvement in functional class (NYHA)</th>
<th>Recurrent heart failure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The viable group underwent CABG and was randomised into two groups for additional ventricular reconstruction. Group 1a comprised 35 patients with viable anterior wall who underwent SVR. Group 1b comprised 39 patients with viable anterior wall who underwent CABG and SVR. Group 2 comprised 69 patients with non-viable anterior wall who underwent CABG and SVR.</strong></td>
<td>Group 1a – 2.8% (P=0.98)</td>
<td>Group 1a – from 32.6±7.6% to 41±6.3% (P=0.02)</td>
<td>Group 1a – from 3.2±0.6 to 2.3±0.4 (P=0.18)</td>
<td>Group 1a – 25% (P=1.0)</td>
</tr>
<tr>
<td></td>
<td>Group 2 – 4.7% (P=0.70)</td>
<td>Group 2 – from 29.2±4.3% to 41.2±5.1% (P&lt;0.001)</td>
<td>Group 2 – from 3.2±0.3 to 2.4±0.3 (P&lt;0.001)</td>
<td>Group 2 – 22% (P=0.11)</td>
</tr>
<tr>
<td></td>
<td>Group 1b – 5.1% (P=0.91)</td>
<td>Group 1b – from 34.5±6.3% to 49.5±4.3% (P&lt;0.001)</td>
<td>Group 1b – from 3.1±0.2 to 1.4±0.4 (P&lt;0.001)</td>
<td>Group 1b – 2.7% (P=0.08)</td>
</tr>
</tbody>
</table>
Left ventricular reconstruction benefits patients with ischemic cardiomyopathy and non-viable myocardium


Clinic of Cardio-Surgery at Campinas, Rua Jose Teodoro de Lima 77, ap 62, Campub, 130150-150 Campinas, Brazil

Received 1 August 2005; received in revised form 16 November 2005; accepted 22 November 2005

Abstract

Objective: There are subsets of patients with ischemic cardiomyopathy for whom the optimal treatment strategies are not clear. The objective of this study was to delineate the relationship between clinical outcomes and surgical procedure in patients who were treated either with a coronary artery bypass graft or with a coronary artery bypass graft and additional ventricular restoration. Methods: The study population comprised 137 consecutive patients with anterior myocardial infarction. All patients had an ejection fraction <50% and left ventricle end-systolic volume index >80 ml/m². The patients were divided into a viable and a non-viable group according to anterior myocardium viability, which was determined by a thallium-201 test. The viable group underwent a revascularization and was randomized into two groups for additional ventricular reconstruction. Group 1a comprised 35 patients with viable anterior wall who underwent surgical revascularization. Group 1b comprised 39 patients with viable anterior wall who underwent surgical revascularization and ventricular restoration. Group 2 comprised 69 patients with non-viable anterior wall who underwent revascularization and ventricular reconstruction. The preoperative and postoperative ejection fractions, end-systolic volume, mitral regurgitation, mortality, and heart failure symptoms were compared among groups. Results: Complete 2-year follow-up was achieved in 127 (92.7%) patients. Ejection fraction improved in all groups compared with preoperative values and it was greater in group 1b than in group 1a (p < 0.001) at 2 years. There were no postoperative deaths in group 1a, one in group 1b, and two in group 2. After 2 years, group 1b was significantly smaller than group 1a (p < 0.01) in relation to mitral regurgitation of grades 1 to 2+. End-systolic volume was significantly smaller in group 1b than in group 1a (p < 0.001), it was smaller in group 1a than in group 2 (p < 0.001), and it was smaller in group 1b than in group 2 (p < 0.001). Heart failure class (NYHA) was reduced in all groups and events were significantly smaller in patients with end-systolic

Conclusion: We have demonstrated that the short-term and mid-term outcomes of coronary artery surgery alone in patients with a large left ventricle are inferior to coronary artery surgery plus ventricular restoration.

Keywords: myocardial viability, ventricular reconstruction, Surgical revascularisation

Multicentre registry (level 2b)

<table>
<thead>
<tr>
<th>Event</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operative mortality</td>
<td>9.4%</td>
</tr>
<tr>
<td>Reoperation</td>
<td>14%</td>
</tr>
<tr>
<td>Prolonged ventilation</td>
<td>22.5%</td>
</tr>
<tr>
<td>Stroke</td>
<td>3.3%</td>
</tr>
<tr>
<td>Renal failure</td>
<td>8.1%</td>
</tr>
<tr>
<td>Any mortality or morbidity (prolonged ventilation, renal failure, stroke, reoperation)</td>
<td>33.5%</td>
</tr>
<tr>
<td>Length of stay</td>
<td>10.5 days (IQR 7–16)</td>
</tr>
</tbody>
</table>

Mean EF 25%
Recent MI < 1 week 15%
Emergency/salvage surgery 5%

731 patients who underwent surgical ventricular restoration in 141 US hospitals (25% of all sites) and were entered into the STS National Cardiac Database January 2002–2004

20 centres performed more than 10 SVR procedures

SVR defined as ‘a procedure that restores the geometry of the heart after an anterior myocardial infarction’, including Dor and SAVER but is distinct from anterior left ventricular aneurysmectomy or Batista procedure

The database also contains 2436 left ventricular aneurysm repairs
<table>
<thead>
<tr>
<th>Outcome</th>
<th>Overall (n = 731)</th>
<th>Excluding emergent/salvage (n = 694)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operative mortality</td>
<td>9.3</td>
<td>7.5</td>
</tr>
<tr>
<td>Readmission (30 d)</td>
<td>7.7</td>
<td>7.0</td>
</tr>
<tr>
<td>Morbidity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reoperation</td>
<td>14.1</td>
<td></td>
</tr>
<tr>
<td>Stroke</td>
<td>3.3</td>
<td></td>
</tr>
<tr>
<td>Renal Failure</td>
<td>8.1</td>
<td></td>
</tr>
<tr>
<td>Prolonged Ventilation</td>
<td>21.5</td>
<td></td>
</tr>
<tr>
<td>Operative mortality or morbidity*</td>
<td>33.6</td>
<td></td>
</tr>
</tbody>
</table>

![Graph showing mortality](chart.png)
Coronary Bypass Surgery with or without Surgical Ventricular Reconstruction

Robert H. Jones, M.D., Eric J. Velazquez, M.D., Robert E. Michler, M.D., George Sopko, M.D., Jae K. Oh, M.D., Christopher M. O’Connor, M.D., James A. Hill, M.D., Lorenzo Menicanti, M.D., Zygmunt Sadowski, M.D., Patrice Desvigne-Nickens, M.D., Jean-Lucien Rouleau, M.D., and Kerry L. Lee, Ph.D., for the STICH Hypothesis 2 Investigators*
Patients were eligible for enrollment if they had coronary artery disease that was amenable to CABG and if they had a left ventricular ejection fraction (EF) of 35% or less (Figs.) was appropriate for them on the basis of suitable recent myocardial ischemic therapeutic options for that patient (medical therapy-replacement, a percutaneous coronary intervention only, CABG alone, or CABG plus surgical intervention (PCI), or a ventricular reconstruction) (Fig. 1). Patients who had stenosis of the left main coronary artery of 3 years. All patients had angina of Canadian Cardiovascular Society (CCS) class III or IV while receiving medical therapy were not eligible for medical therapy alone.
127 clinical sites in 26 countries.
<table>
<thead>
<tr>
<th>Variable</th>
<th>CABG Alone (N = 499)</th>
<th>CABG with Surgical Ventricular Reconstruction (N = 501)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographic characteristics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age — yr</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>62</td>
<td>62</td>
</tr>
<tr>
<td>Interquartile range</td>
<td>54–69</td>
<td>55–69</td>
</tr>
<tr>
<td>Female sex — no. (%)</td>
<td>78 (16)</td>
<td>69 (14)</td>
</tr>
<tr>
<td>Race — no. (%)†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>451 (90)</td>
<td>460 (92)</td>
</tr>
<tr>
<td>Black or other</td>
<td>48 (10)</td>
<td>41 (8)</td>
</tr>
<tr>
<td>Body-mass index</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>27</td>
<td>27</td>
</tr>
<tr>
<td>Interquartile range</td>
<td>25–30</td>
<td>24–30</td>
</tr>
<tr>
<td><strong>Medical history</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Myocardial infarction — no. (%)</td>
<td>435 (87)</td>
<td>437 (87)</td>
</tr>
<tr>
<td>Hyperlipidemia — no. (%)</td>
<td>367 (74)</td>
<td>351 (70)</td>
</tr>
<tr>
<td>Hypertension — no. (%)</td>
<td>289 (58)</td>
<td>296 (59)</td>
</tr>
<tr>
<td>Diabetes — no. (%)</td>
<td>173 (35)</td>
<td>171 (34)</td>
</tr>
<tr>
<td>Current smoker — no. (%)</td>
<td>117 (23)</td>
<td>100 (20)</td>
</tr>
<tr>
<td>Previous percutaneous coronary intervention — no. (%)</td>
<td>100 (20)</td>
<td></td>
</tr>
<tr>
<td>Chronic renal insufficiency — no. (%)</td>
<td>42 (8)</td>
<td>43 (9)</td>
</tr>
<tr>
<td>Stroke — no. (%)</td>
<td>28 (6)</td>
<td>28 (6)</td>
</tr>
<tr>
<td>Previous CABG — no. (%)</td>
<td>15 (3)</td>
<td>9 (2)</td>
</tr>
<tr>
<td><strong>Current Canadian Cardiovascular Society angina class — no. (%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No angina</td>
<td>121 (24)</td>
<td>128 (26)</td>
</tr>
<tr>
<td>I</td>
<td>36 (7)</td>
<td>35 (7)</td>
</tr>
<tr>
<td>II</td>
<td>94 (19)</td>
<td>94 (19)</td>
</tr>
<tr>
<td>III</td>
<td>203 (41)</td>
<td>205 (41)</td>
</tr>
<tr>
<td>IV</td>
<td>45 (9)</td>
<td>39 (8)</td>
</tr>
<tr>
<td><strong>Current New York Heart Association heart failure class — no. (%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>16 (7)</td>
<td>50 (20)</td>
</tr>
<tr>
<td>II</td>
<td>222 (44)</td>
<td>207 (41)</td>
</tr>
<tr>
<td>III</td>
<td>210 (42)</td>
<td>218 (44)</td>
</tr>
<tr>
<td>IV</td>
<td>31 (6)</td>
<td>26 (5)</td>
</tr>
<tr>
<td><strong>Blood pressure — mm Hg</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systolic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>Interquartile range</td>
<td>110–130</td>
<td>110–130</td>
</tr>
<tr>
<td>Diastolic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>71</td>
<td>74</td>
</tr>
<tr>
<td>Interquartile range</td>
<td>65–80</td>
<td>66–80</td>
</tr>
<tr>
<td>Pulse — beats/min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>70</td>
<td>72</td>
</tr>
<tr>
<td>Interquartile range</td>
<td>64–80</td>
<td>64–80</td>
</tr>
</tbody>
</table>
Death from Any Cause or Hospitalization for Cardiac Cause

Death from Any Cause

P = 0.98

Probability

Years since Randomization

CABG plus SVR

CABG
CONCLUSIONS

Adding surgical ventricular reconstruction to CABG reduced the left ventricular volume, as compared with CABG alone. However, this anatomical change was not associated with a greater improvement in symptoms or exercise tolerance or with a reduction in the rate of death or hospitalization for cardiac causes. (ClinicalTrials.gov number, NCT00023595.)
The STICH trial unravelled

Gerald Friedel

The Left Ventricular Surgical Remodeling after the STICH Trial

Thorac Cardiov Surg 2011; 59: 195–200

Authors

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Affiliations

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² Division of Cardiac Surgery, King Fahd Military Hospital, Jeddah, Saudi Arabia
³ Institute of Cardiology, University of L’Aquila, L’Aquila, Italy
Main criticisms to the STICH Trial

- Only half of the patients had akinesia or dyskinesia and 13% had not previous MI

- LVESI measured only in 373 out of 980 pts. Averaged reduction of LVESI = 19%
<table>
<thead>
<tr>
<th>Authors (year)</th>
<th>Patientsa</th>
<th>ESVI (mL/m²)</th>
<th></th>
<th>Reduction (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Presop.</td>
<td>Postop.</td>
<td></td>
</tr>
<tr>
<td>LV volume change after SVR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Di Donato et al. (2009)¹²</td>
<td>56 (Type 1)</td>
<td>83</td>
<td>35</td>
<td>48 (58)</td>
</tr>
<tr>
<td></td>
<td>55 (Type 2)</td>
<td>87</td>
<td>39</td>
<td>48 (55)</td>
</tr>
<tr>
<td></td>
<td>67 (Type 3)</td>
<td>96</td>
<td>57</td>
<td>39 (41)</td>
</tr>
<tr>
<td>Suma et al. (2009)¹³</td>
<td>76</td>
<td>123</td>
<td>74</td>
<td>49 (40)</td>
</tr>
<tr>
<td>Dor et al. (2008)¹⁴</td>
<td>104</td>
<td>93</td>
<td>51</td>
<td>42 (45)</td>
</tr>
<tr>
<td>Menicanti et al. (2007)¹⁵</td>
<td>301</td>
<td>173a</td>
<td>100a</td>
<td>73a (42)</td>
</tr>
<tr>
<td>O'Neil et al. (2006)¹⁶</td>
<td>135</td>
<td>120</td>
<td>77</td>
<td>43 (36)</td>
</tr>
<tr>
<td>Adams et al. (2006)¹⁷</td>
<td>8</td>
<td>92</td>
<td>59</td>
<td>33 (36)</td>
</tr>
<tr>
<td>Schreuder et al. (2005)¹⁸</td>
<td>9</td>
<td>92</td>
<td>45</td>
<td>47 (51)</td>
</tr>
<tr>
<td>Tulner et al. (2006)¹⁹</td>
<td>21</td>
<td>186a</td>
<td>101a</td>
<td>85a (46)</td>
</tr>
<tr>
<td>Yamaguchi et al. (2005)²⁰</td>
<td>20</td>
<td>137</td>
<td>65</td>
<td>72 (33)</td>
</tr>
<tr>
<td>Mickleborough et al. (2004)²¹</td>
<td>41</td>
<td>97</td>
<td>65</td>
<td>32 (33)</td>
</tr>
<tr>
<td>RESTORE (2004)⁵</td>
<td>671</td>
<td>80.4</td>
<td>56.6</td>
<td>24 (30)</td>
</tr>
<tr>
<td>STICH (2009)¹</td>
<td>161</td>
<td>83</td>
<td>67</td>
<td>16 (19)</td>
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</table>
Main criticisms to the STICH Trial

- Only half of the patients had akinesia or dyskinesia and 13% had not previous MI

- LVESI measured only in 373 out of 980 pts. Averaged reduction of LVESI = 19%

- Patients underwent SVR based on qualitative rather than quantitative assessment (i.e. extension of scar, presence of hybernating myocardium or viable area)
Patients With Hibernating Myocardium Show Altered Left Ventricular Volumes and Shape, Which Revert After Revascularization

Evidence That Dyssnergy Might Directly Induce Cardiac Remodeling

Erberto Carluccio, MD,* Paolo Biagioli, MD,* Gianfranco Alunni, MD,* Adriano Murrone, MD,* Claudio Giombolini, MD,* Temistocle Ragni, MD,† Paolo N. Marino, MD,§ Gianpaolo Reboldi, MD, PhD, MSC;‡ Giuseppe Ambrosio, MD, PhD, FACC*

Perugia and Novara, Italy
Myocardial Viability and Survival in Ischemic Left Ventricular Dysfunction

A Without Myocardial Viability

- Medical therapy (33 deaths)
- CABG (25 deaths)

B With Myocardial Viability

- Medical therapy (95 deaths)
- CABG (83 deaths)

No. at Risk

<table>
<thead>
<tr>
<th></th>
<th>Medical therapy</th>
<th>CABG</th>
</tr>
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<tr>
<td>No. at Risk</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>54</td>
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<td>12</td>
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<td>4</td>
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</tbody>
</table>

Years since Randomization

Probability of Death
Main criticisms to the STICH Trial

- Only half of the patients had akinesia or dyskinesia and 13% had not previous MI

- LVESI measured only in 373 out of 980 pts.  Averaged reduction of LVESI = 19%

- Patients underwent SVR based on qualitative rather than quantitative assessment (i.e. presence of hybernation or ischemic area)

- Participating Centers expanded during the trial with not enough experience in this operation

- Enrolled patients for SVR Hypothesis have a surgical indication mainly to CABG. (i.e. lesion of LMCA stenosis > 20% and CCs III and IV > 50%)

- Surgical technique for SVR not homogeneous
Main criticisms to the STICH Trial - Rebuttal -

- Only half of the patients had akinesia or dyskinesia and 13% had not previous MI. Table reports median of 50% (interquartile range 40-60). It means that 75% had 40% of the anterior wall affected. 13% had possible silent MI.

- LVESI measured only in 373 out of 980 pts. Averaged reduction of LVESI = 19%. Now they have data on 600 pts and results confirm the previous one. No response for 19% reduction.

- Patients underwent SVR based on qualitative rather than quantitative assessment (i.e. extension of scar, hybernation or ischemic area). No enough data to respond.

- Participating Centers expanded during the trial with not enough experience in this operation. Amendment approved by steering committee. Arbitrary issue.

- Enrolled patients for SVR Hypothesis have a surgical indication mainly to CABG. (i.e. lesion of LMCA stenosis > 20% and CCs III and IV > 50%). Mortality in STICH with only CABG similar to that of RESTORE and possibly even in this group the main effect could have been of CABG.

- Surgical technique for SVR not homogeneous.
Favorable effects of left ventricular reconstruction in patients excluded from the Surgical Treatments for Ischemic Heart Failure

European Journal of Heart Failure (2011) 13, 423–431
doi:10.1093/eurjhf/hfq227

End-systolic volume following surgical ventricular reconstruction impacts survival in patients with ischaemic dilated cardiomyopathy

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European Journal of Heart Failure (2010) 12, 375–381
doi:10.1093/eurjhf/hfq020

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Institutional report - Coronary

Results of the coronary artery bypass grafting alone and combined with surgical ventricular reconstruction for ischemic heart failure

Andrey Marchenko*, Alexander Chernyavsky, Vidady Efendiev, Tanya Volokitina, Alexander Karaskov

Department of Aortic and Coronary Artery Surgery, Research Institute of Circulation Pathology, Novosibirsk, Russia

Received 7 September 2010; received in revised form 3 February 2011; accepted 10 February 2011
Tipe 1 LF Dysfunction

Tipe 2 LF Dysfunction
Despite the more aggressive surgical strategy, SVR did not increase operative mortality and early results were significantly effective compared with CABG alone. Precise evaluation of LV function, particularly the remote contractile myocardium, as well as preoperative modeling of ‘new’ LV allows to select the candidates for SVR combined with CABG.
IN SUMMARY - 1

The efficiency of SVR for classical left ventricular aneurysms (dyskinetic areas) is confirmed by numerous studies.

The results of CABG alone and combined with SVR in patients with ischemic CMP and Akinetic areas are still debated.

The STICH trial is the first important randomized trial but due to its important limitations, it does not exclude further new studies.

Probably a pre-operative clinical study remains the key-point for a correct patient selection for SVR: i.e. analysis of LVESI/LVEDI, remote contractile myocardium, extension and distribution of the scar, plus calculation of the OPTIMAL EDV.
We do not have data from randomized studies that SVR improves survival, we have answers by consolidated groups that it is effective and with a low intra-operative mortality (5-6%).

Post anterior MI patient
Well treated with recommended therapy including CRT

Surgical indication for CABG

No Surgical indication for CABG

Surgical indication for SVR

NO

SI

??

↓ Mortality/Morbidity ???

↓ ESV, ↑ EF, low O.M.

?? (PTCA?)
Overall Survival

Intermacs: June 2006 – September 2010
Adult Primary LVADs: n=2506

Continuous Flow Pump, n=1936, deaths=272

By Pump Type

Pulsatile Flow Pump, n=570, deaths=177

% Survival

<table>
<thead>
<tr>
<th>Month</th>
<th>CFP</th>
<th>PFP</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 mo</td>
<td>91%</td>
<td>83%</td>
</tr>
<tr>
<td>6 mo</td>
<td>88%</td>
<td>76%</td>
</tr>
<tr>
<td>12 mo</td>
<td>83%</td>
<td>67%</td>
</tr>
<tr>
<td>24 mo</td>
<td>75%</td>
<td>45%</td>
</tr>
</tbody>
</table>

Event: Death (censored at transplant or explant recovery)

p < .0001

Months after Device Implant