Results of surgical ventricular restoration

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The STICH trial definitively shows that adding SVR to CABG provides no clinical benefit beyond that of CABG alone in the study population.
The STICH trial definitively shows that adding SVR to CABG provides no clinical benefit beyond that of CABG alone in the study population. Both operative strategies provided similar short- and long-term relief of angina and HF and improvement in 6-minute walk test performance.
Criticisms

The eligibility criteria were changed during the study and in 2003 the heart failure symptoms were abolished.
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The LV volume was not anymore an eligibility criterion. Only the $\text{EF} \leq 35\%$ was kept. The study then switched from heart failure patients to ischemic patients.
Carluccio E et al. Patients with hibernating volumes and shape, which revert after revascularization, evidence that dyssnergy might directly induce cardiac remodeling. J Am Coll Cardiol 2006;47:969-77.

Chronic dyssynergy per se is sufficient to induce ischemic LV remodeling in patients.
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Carluccio E et al. Patients with hibernating myocardium show altered left ventricular volumes and shape, which revert after revascularization: evidence that dyssynergy might directly induce cardiac remodeling. J Am Coll Cardiol 2006;47:969-77
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Carluccio E et al. Patients with hibernating myocardium show altered left ventricular volumes and shape, which revert after revascularization: evidence that dyssynergy might directly induce cardiac remodeling. J Am Coll Cardiol 2006;47:969-77
The dilemma of surgery for left ventricular scars is still not solved.
The dilemma of surgery for left ventricular scars is still not solved. What is more important, the volume or the shape?
The STICH trial had, as basic surgical technique, the Dor procedure, volume-related and not shape-related.
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When the purse string and the patch insertion are limited to the scar rim, the result is surely a smaller cavity, but the heart can become more spherical than the baseline.
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<table>
<thead>
<tr>
<th></th>
<th>pre</th>
<th>post</th>
</tr>
</thead>
<tbody>
<tr>
<td>HR (b/min)</td>
<td>66</td>
<td>80</td>
</tr>
<tr>
<td>EDV (ml)</td>
<td>175</td>
<td>128</td>
</tr>
<tr>
<td>ESV (ml)</td>
<td>148</td>
<td>106</td>
</tr>
<tr>
<td>EF (%)</td>
<td>15</td>
<td>18</td>
</tr>
<tr>
<td>CO (l/min)</td>
<td>1.78</td>
<td>1.79</td>
</tr>
</tbody>
</table>

Sallin EA. Fiber orientation and ejection fraction in the human left ventricle. *Biophys J* 1969;9:954-64
In the most recent years, the morphology of the anteroseptal scars has changed in many patients.
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This anatomic aspect prevents the involved region to be dyskinetic and to collapse after cardiac decompression in the OR.
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As a consequence, nowadays volumes are not as large as before.
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The septum is often more involved than the free wall and bulges toward the right ventricle, minimizing the external dilation.
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In such cases purpose of surgery is to address the correction mainly to the septum, that is rebuilt and moved anteriorly.
In such cases purpose of surgery is to address the correction mainly to the septum, that is rebuilt and moved anteriorly. The longitudinal axis is maintained similar to the preoperative one, to avoid any change in sphericity, even if some apical scar has to be included in the correction.
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Calafiore et al

Left ventricular restoration for anteroseptal scars: volume versus shape

J Thorac Cardiovasc Surg 2010;139:1123-30
population
January 1988 to February 2008
308 patients underwent LVR for anteroseptal scars
population

January 1988 to February 2008

308 patients underwent LVR for anteroseptal scars

Dor procedure
n=107 (34.7%)
1988-2001
308 patients underwent LVR for anteroseptal scars

**Guilmet procedure**
- n=32 (10.4%)
- 1998-2001

**Dor procedure**
- n=107 (34.7%)
- 1988-2001
population

January 1988 to February 2008

308 patients underwent LVR for anteroseptal scars

Guilmet procedure
n=32 (10.4%)
1998-2001

Dor procedure
n=107 (34.7%)
1988-2001

septal reshaping
n=140 (45.6%)
2002-2008
population

January 1988 to February 2008

308 patients underwent LVR for anteroseptal scars

- Guilmet procedure
  - n=32 (10.4%)
  - 1998-2001

- Dor procedure
  - n=107 (34.7%)
  - 1988-2001

- Septoapical Dor procedure
  - n=29 (9.3%)
  - 2002-2008

- Septal reshaping
  - n=140 (45.6%)
  - 2002-2008
population
January 1988 to February 2008
308 patients underwent LVR for anteroseptal scars

Target of the procedure was:
LV volume n=107 (34.7%)
LV shape n=201 (65.3%)
current surgical indication to septoapical Dor procedure 2002-2008, n=29
current surgical indication to septal reshaping 2002-2008, n=140
The patch is as long as necessary (median 6 cm). Its height varies according to the ED volumes.
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If $<80 \text{ ml/m}^2$, the ratio length/height is 2:1

If $\geq 80 \text{ ml/m}^2$, the ratio is 3:1
The patch is as long as necessary (median 6 cm). Its height varies according to the ED volumes.

If <80 ml/m², the ratio length/height is 2:1
If ≥80 ml/m², the ratio is 3:1

In case of severe diastolic dysfunction, the ratio is always 2:1.
late results

Mean follow up was

77±50 months
Survival probability (%)

82.5±2.3
73.2±3.6

0 10 20 30 40 50 60 70 80 90 100

Survival probability (%)

Freedom from cardiac death
Freedom from death any cause

0 12 24 36 48 60 72 84 96 108 120

months

Number at risk
Group: 1
308 254 226 204 177 148 107 90 80 66 43
Group: 2
308 254 226 204 177 148 107 90 80 66 43
72.3±2.8

54.3±4.1

Freedom from cardiac death
Freedom from death any cause
Freedom from cardiac event

Number at risk
Group: 1
308 254 226 204 177 148 107 90 80 66 43
Group: 2
308 254 226 204 177 148 107 90 80 66 43
Group: 3
308 243 215 186 154 129 89 81 73 56 36
Survival probability (%) vs months

- Blue line: Freedom from cardiac death
- Red line: Freedom from death any cause
- Green line: Freedom from cardiac event
- Black line: Freedom from any event

Number at risk

<table>
<thead>
<tr>
<th>Group</th>
<th>0</th>
<th>12</th>
<th>24</th>
<th>36</th>
<th>48</th>
<th>60</th>
<th>72</th>
<th>84</th>
<th>96</th>
<th>108</th>
<th>120</th>
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<tr>
<td>Group: 1</td>
<td>308</td>
<td>254</td>
<td>226</td>
<td>204</td>
<td>177</td>
<td>148</td>
<td>107</td>
<td>90</td>
<td>80</td>
<td>66</td>
<td>43</td>
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<tr>
<td>Group: 2</td>
<td>308</td>
<td>254</td>
<td>226</td>
<td>204</td>
<td>177</td>
<td>148</td>
<td>107</td>
<td>90</td>
<td>80</td>
<td>66</td>
<td>43</td>
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<tr>
<td>Group: 3</td>
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<td>243</td>
<td>215</td>
<td>186</td>
<td>154</td>
<td>129</td>
<td>89</td>
<td>81</td>
<td>73</td>
<td>56</td>
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<tr>
<td>Group: 4</td>
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<td>243</td>
<td>215</td>
<td>186</td>
<td>154</td>
<td>129</td>
<td>89</td>
<td>81</td>
<td>73</td>
<td>56</td>
<td>36</td>
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</tbody>
</table>

68.3±2.8

50.0±4.0
late results

Curves were cut at 5 years to allow groups comparison.
freedom from cardiac death

Group S 86.6±2.6
Group V 76.3±4.1

Number at risk
Group: S
201 164 141 121 96 72
Group: V
107 90 85 83 81 79
freedom from cardiac death

Group S 86.6±2.6
Group V 76.3±4.1

p=0.032

Number at risk
Group: S
201 164 141 121 96 72
Group: V
107 90 85 83 81 79
freedom from cardiac death

Survival probability (%)

Number at risk
Group: S
201 164 141 121 96 72
Group: V
107 90 85 83 81 79

HR=2.4 95CI=1.2-4.6  
p=0.011

Group S 86.6±2.6

Group V 76.3±4.1

p=0.032
freedom from cardiac events

Survival probability (%)

months

0  12  24  36  48  60

Number at risk

<table>
<thead>
<tr>
<th>Group</th>
<th>S</th>
<th>V</th>
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<tr>
<td></td>
<td>201</td>
<td>107</td>
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<tr>
<td>0</td>
<td>156</td>
<td>87</td>
</tr>
<tr>
<td>12</td>
<td>134</td>
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<td>113</td>
<td>73</td>
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<tr>
<td>36</td>
<td>86</td>
<td>68</td>
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<tr>
<td>48</td>
<td>65</td>
<td>67</td>
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</table>

Group S 77.9±3.3
Group V 63.9±4.7
freedom from cardiac events

Survival probability (%)

months

Number at risk
Group: S
201 156 134 113 86 65
Group: V
107 87 81 73 68 67

Group S 77.9±3.3
Group V 63.9±4.7

p=0.011
freedom from cardiac events

Survival probability (%)

<table>
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<tr>
<th>months</th>
<th>0</th>
<th>12</th>
<th>24</th>
<th>36</th>
<th>48</th>
<th>60</th>
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<tbody>
<tr>
<td>Group S</td>
<td>100</td>
<td>95</td>
<td>90</td>
<td>85</td>
<td>80</td>
<td>75</td>
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<tr>
<td>Group V</td>
<td>100</td>
<td>95</td>
<td>90</td>
<td>85</td>
<td>80</td>
<td>75</td>
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HR = 2.4 95%CI = 1.4-4.1
p = 0.001

Number at risk

<table>
<thead>
<tr>
<th>Group</th>
<th>201</th>
<th>156</th>
<th>134</th>
<th>113</th>
<th>86</th>
<th>65</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group S</td>
<td>107</td>
<td>87</td>
<td>81</td>
<td>73</td>
<td>68</td>
<td>67</td>
</tr>
</tbody>
</table>
freedom from cardiac events (1st month excluded)

Survival probability (%)

Number at risk
Group: S
188 155 133 113 86 65
Group: V
95 87 81 73 68 67

Group S 81.1±3.3
Group V 71.2±4.7
freedom from cardiac events (1st month excluded)

Number at risk
Group: S
188 155 133 113 86 65
Group: V
95 87 81 73 68 67

Group S 81.1±3.3
Group V 71.2±4.7

p=0.039
freedom from cardiac events (1st month excluded)

Group S 81.1±3.3
Group V 71.2±4.7

HR=2.2 95CI=1.2-3.8  p=0.007

Number at risk
Group: S
188 155 133 113 86 65
Group: V
95 87 81 73 68 67
Department of Adult Cardiac Surgery
Prince Sultan Cardiac Center, Riyadh, Saudi Arabia

June 2009 to December 2010

56 elective or urgent patients underwent LV surgical remodeling
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June 2009 to December 2010

56 elective or urgent patients underwent LV surgical remodeling

septal reshaping
n=30
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June 2009 to December 2010

56 elective or urgent patients underwent LV surgical remodeling

- Septal reshaping, n=30
- Septoapical Dor, n=15
June 2009 to December 2010

56 elective or urgent patients underwent LV surgical remodeling

- Septal reshaping: n=30
- Septoapical Dor: n=15
- Lateral resection: n=8
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Prince Sultan Cardiac Center, Riyadh, Saudi Arabia

June 2009 to December 2010

56 elective or urgent patients underwent LV surgical remodeling

- Septal reshaping: n=30
- Septoapical Dor: n=15
- Inferior resection: n=3
- Lateral resection: n=8
Department of Adult Cardiac Surgery
Prince Sultan Cardiac Center, Riyadh, Saudi Arabia

June 2009 to December 2010

56 elective or urgent patients underwent LV surgical remodeling

mitral valve surgery

yes n=41, 73.2%

no n=15, 27.8%
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June 2009 to December 2010

56 elective or urgent patients underwent LV surgical remodeling

mitral valve surgery

- yes n=41, 73.2%
- no n=15, 27.8%

mitral valve procedure

- repair n=41, 73.2%
- prosthesis insertion n=15, 27.8%
Department of Adult Cardiac Surgery
Prince Sultan Cardiac Center, Riyadh, Saudi Arabia

June 2009 to December 2010

56 elective or urgent patients underwent LV surgical remodeling

mitral valve surgery
- yes n=41, 73.2%
- no n=15, 27.8%

mitral valve procedure
- repair n=41, 73.2%
- prosthesis insertion n=15, 27.8%
- no n=32, 57.2%

tricuspid valve surgery
- yes n=24, 42.8%
- no n=32, 57.2%
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Prince Sultan Cardiac Center, Riyadh, Saudi Arabia

June 2009 to December 2010

56 elective or urgent patients underwent LV surgical remodeling

No patient died during the first 30 days

3 to 6 months after surgery
3 patients (5.3%) died due to septicemia
(dyalisis catheter, defibrillator wire and pacemaker wire)
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Prince Sultan Cardiac Center, Riyadh, Saudi Arabia

June 2009 to December 2010

56 elective or urgent patients underwent LV surgical remodeling
EF modification before surgery and at discharge
56 elective or urgent patients underwent LV surgical remodeling

EF modification before surgery and at discharge

27±9
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Prince Sultan Cardiac Center, Riyadh, Saudi Arabia

June 2009 to December 2010

56 elective or urgent patients underwent LV surgical remodeling

EF modification before surgery and at discharge

27±9
p <0.0001

33±8

%
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Prince Sultan Cardiac Center, Riyadh, Saudi Arabia

June 2009 to December 2010

56 elective or urgent patients underwent LV surgical remodeling
volumes modification before surgery and at discharge
June 2009 to December 2010

56 elective or urgent patients underwent LV surgical remodeling volumes modification before surgery and at discharge

113±31 ml/m²

preoperative
June 2009 to December 2010

56 elective or urgent patients underwent LV surgical remodeling volumes modification before surgery and at discharge.
June 2009 to December 2010

56 elective or urgent patients underwent LV surgical remodeling volumes modification before surgery and at discharge

\[113 \pm 31 \text{ ml/m}^2\]

\[p < 0.0001\]

\[85 \pm 44 \text{ ml/m}^2\]
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Prince Sultan Cardiac Center, Riyadh, Saudi Arabia

June 2009 to December 2010

56 elective or urgent patients underwent LV surgical remodeling volumes modification before surgery and at discharge

56 elective or urgent patients underwent LV surgical remodeling volumes modification before surgery and at discharge.

<table>
<thead>
<tr>
<th></th>
<th>Preoperative</th>
<th>Postoperative</th>
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</thead>
<tbody>
<tr>
<td>End diastole</td>
<td>113±31</td>
<td>83±31</td>
</tr>
<tr>
<td>End systole</td>
<td>85±44</td>
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</tbody>
</table>

p < 0.0001
Department of Adult Cardiac Surgery
Prince Sultan Cardiac Center, Riyadh, Saudi Arabia

June 2009 to December 2010

56 elective or urgent patients underwent LV surgical remodeling volumes modification before surgery and at discharge

\[ \text{Ventricular Volumes} \]

- Preoperative: 113±31 ml/m²
- Postoperative: 83±31 ml/m²

p < 0.0001

- Preoperative: 85±44 ml/m²
- Postoperative: 57±36 ml/m²
56 elective or urgent patients underwent LV surgical remodeling volumes modification before surgery and at discharge.
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Department of Adult Cardiac Surgery
Prince Sultan Cardiac Center, Riyadh, Saudi Arabia

June 2009 to December 2010

56 elective or urgent patients underwent LV surgical remodeling

After a median follow up of 10 months, we were able to contact only 31 of the 53 survivors (60%).
Department of Adult Cardiac Surgery
Prince Sultan Cardiac Center, Riyadh, Saudi Arabia

June 2009 to December 2010

56 elective or urgent patients underwent LV surgical remodeling

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One patient (3.2%) was unchanged and the remaining 30 (96.8%) improved of at least 1 NYHA Class.
Department of Adult Cardiac Surgery
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June 2009 to December 2010

56 elective or urgent patients underwent LV surgical remodeling

After a median follow up of 10 months, we were able to contact only 31 of the 53 survivors (60%). One patient (3.2%) was unchanged and the remaining 30 (96.8%) improved of at least 1 NYHA Class. One patient had a late CVA, but fully recovered.
conclusions

Long term outcome after left
t ventricular surgical remodeling
is good.
conclusions

Long term outcome after left ventricular surgical remodeling is good.

In our experience better results, in particular freedom from cardiac events, are achieved when purpose of surgery is to recover a conical shape.