BITA Grafting: Technical Aspects

Daniel O. Navia
Chief Cardiac Surgery
Institute Cardiovascular.
Buenos Aires, Argentina
No disclosures
Current Evidence
Hazard function curves demonstrate the increased risk of death associated with SITA grafting with increasing follow-up inter-val.
How to do BITA?

Total Revascularization With T Grafts

Alfred J. Tector, MD, Susan Amundsen, PA-C, Terence M. Schmahl, MD, David C. Kress, MD, and Mohan Peter, MD

• Composite Y or T grafts with RITA allows adequate reperfusion of the left system with minimal resistance to maximal flow and an even distribution of flow in both distal branches.

• The flow reserve of the proximal ITA is adequate for multiple anastomoses.

• Composite T-graft technique of BITA should be reserved for patients with severe (70% or more) LAD and Cx stenosis.
Off-pump BTA grafting All arterials in multivessels disease

Our current Surgical Technique

Daniel Navia M.D.
Cardiac Surgery Dept. ICBA.
Buenos Aires 2017
Argentina
Our work
**Off-pump BITA grafting 2003-2017 (n: 3086)**

**PO results:**

- Operative mortality: 1.17
- Stroke: 0.58
- Po. MI: 2.23
- Return for Bleeding: 2.5
- Sternal Infection: 2.5
- RF/Dialysis: 0.8
Our publications
Total Arterial Off-Pump Coronary Revascularization Using Bilateral Internal Thoracic Arteries in Triple-Vessel Disease: Surgical Technique and Clinical Outcomes


### Table 4. Postoperative Angiographic Results in 250 Patients

<table>
<thead>
<tr>
<th></th>
<th>Fitzgibbon A</th>
<th>Fitzgibbon B</th>
<th>Occlusion</th>
<th>Patency Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LITA to LAD (n = 248)</td>
<td>238</td>
<td>6</td>
<td>4</td>
<td>98.3</td>
</tr>
<tr>
<td>RITA to CX 1 (n = 206)</td>
<td>192</td>
<td>0</td>
<td>14</td>
<td>93.2</td>
</tr>
<tr>
<td>RITA to CX 2 (n = 56)</td>
<td>50</td>
<td>0</td>
<td>6</td>
<td>89.3</td>
</tr>
<tr>
<td>RITA to CX 1–2 (n = 262)</td>
<td>242</td>
<td>0</td>
<td>20</td>
<td>92.3</td>
</tr>
<tr>
<td>RITA to RCA/PDA (n = 160)</td>
<td>142</td>
<td>4</td>
<td>14</td>
<td>91.2</td>
</tr>
</tbody>
</table>

CX 1 = first circumflex artery; CX 2 = second circumflex artery; LAD = left anterior descending; LITA = left internal thoracic artery; PDA = posterior descending artery; RCA = right coronary artery; RITA = right internal thoracic artery.
Is the second internal thoracic artery better than the radial artery in total arterial off-pump coronary artery bypass grafting? A propensity score–matched follow-up study

Daniel Navia, MD, Mariano Vrancic, MD, Fernando Piccinini, MD, Jorge Thierer, MD, Christian Gil, MD, and Mariano Benzadon, MD (J Thorac Cardiovasc Surg 2014;147:632-8)

B, Postoperative readmission/reintervention-free survival after TAR OPCAB in the propensity score–matched patient population: BITA (red line) versus LITA-RA (blue line); log-rank: P = .031.

C, Postoperative combined end point–free survival (mortality plus reintervention/readmission) after TAR OPCAB in the propensity score–matched patient population: BITA (red line) versus LITA-RA (blue line); log-rank: P = .038.
Myocardial Revascularization Exclusively With Bilateral Internal Thoracic Arteries in T-Graft Configuration: Effects on Late Survival

Daniel O. Navia, MD, Mariano Vrancic, MD, Fernando Piccinini, MD, Mariano Camporrotondo, MD, Alberto Dorsa, MD, Juan Espinoza, MD, Mariano Benzadon, MD, and Juan Camou, MD

Table 3. Cox Proportional Hazard Regression Analysis for Long-Term (10 Years) All-Cause Mortality

<table>
<thead>
<tr>
<th>Covariate</th>
<th>HR</th>
<th>95% CI</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y)</td>
<td>1.07</td>
<td>1.06–1.08</td>
<td>0.000</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>1.69</td>
<td>1.39–2.06</td>
<td>0.000</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>2.16</td>
<td>1.49–3.11</td>
<td>0.000</td>
</tr>
<tr>
<td>Previous renal dysfunction</td>
<td>2.12</td>
<td>1.58–2.85</td>
<td>0.000</td>
</tr>
<tr>
<td>Smoking habit</td>
<td>1.47</td>
<td>1.21–1.78</td>
<td>0.000</td>
</tr>
<tr>
<td>Elective operation</td>
<td>0.78</td>
<td>0.64–0.94</td>
<td>0.009</td>
</tr>
<tr>
<td>Left ventricular dysfunction (moderate/severe)</td>
<td>2.47</td>
<td>1.92–3.19</td>
<td>0.000</td>
</tr>
<tr>
<td>BITA</td>
<td>0.71</td>
<td>0.58–0.87</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Bilateral Internal Thoracic Artery Grafting Increases Mediastinitis: Myth or Fact?

Juan M. Vrancic, MD, Fernando Piccinini, MD, Mariano Camporrotondo, MD, Juan C. Espinoza, MD, Juan I. Camou, MD, Francisco Nacinovich, MD, Pablo Fernandez Oses. MD. and Daniel Navia. MD

(Ann Thorac Surg 2017;103:834–9)
Intra - Postoperative Results
Propensity Matched Group (n: 1040)

In this series of patients, BITA did not increase the risk of mediastinitis in the total population or in the propensity score matched subgroups.
Is the patency rate of the RA equivalent to the RITA when used as a second conduit in composite T graft configuration in multiple vessel disease?

Daniel O. Navia, Juan C. Espinoza, Juan M. Vrancic, Fernando Piccinini, Mariano Campomotondo, Agustina Sciancalepore, Paola Kuschnir.

Instituto Cardiovascular de Buenos Aires, Argentina
• Patency rate of the distal anastomosis of the RA and RITA from LITA.
  • Angiogram or 64 slice-coronary CT
  • Fitzgibbon classification
Results

Risk-adjusted 10-years patency rate

Cox’s proportional hazard model

Radial Artery used in this configuration showed no effect in patency rate

Hazard Ratio 1.01 (95%CI 0.42-2.43, p=0.986)
Limitations

• This group of patients represent only the 13% of the entire population, operated in the same period.

• The patients underwent patency studies in the follow-up not only for symptoms but also as a preop study of other cardiac surgery procedure. The reminders, despite of being asymptomatic agree to perform the study (64 slice-coronary CT).
Conclusion

- Our findings suggest that the RA graft has an equivalent long-term patency rate compared to the RITA, when both are used as a composite conduit in T graft configuration.
Superior Results in BITA Grafts are Independent of Gender

Juan M. Vrancic, Juan C. Espinoza, Fernando Piccinini, Mariano Camporotondo, Mariano Benzadon, Alberto Dorsa, Daniel O. Navia

Instituto Cardiovascular De Buenos Aires, Argentina
Two Hypotheses

Superior Results in BITA Grafts are Independent of Gender

• 1. BITA is better than SITA in women

• 2. BITA match women with men in long term survival
4406 CABG patients
Elective Surgery 63%
Off-pump in 87%

BITA (T grafts)
N:2979 (68%)

- MEN
  N:2680 (90%)
- WOMEN
  N:299 (10%)

SITA
N:1427 (32%)

- MEN
  N:1220 (85,5%)
- WOMEN
  N:207 (14,5%)
10 years survival
Matched Female Population

Cox's proportional hazard model for survival
HR 0.59 (95% CI 0.49-0.72, p<0.001)

P log rank = 0.01

At Risk
0  2  4  6  8  10
131  98  81  65  60  44
131  97  72  55  38  19
10 years survival
BITA Matched population

Survival (proportion)

P log rank = 0.382

Female gender as risk for late survival
HR 0.94 (95%CI 0.60-1.47, p=0.784)

86.6 ± 3.1%
77.6 ± 4.5%

Female gender as risk for late survival
HR 0.94 (95%CI 0.60-1.47, p=0.784)
Take home message

• BITA is better than SITA in both genders

• CABG in women using BITA grafting was associated with similar 10-years survival compared with men

• Female gender with BITA grafting is not a risk factor for late death at follow up
Conclusions

• Total Arterial Off-pump coronary revascularization using BITA exclusively, in T grafts configuration, although a more demanding procedure, is safe with low incidence of complications and with long term survival advantages.

• This surgical technique offer a low incidence of stroke (no touch aorta), only one skin incision and rapid postoperative recovery (OR extubation).

• We think that BITA off-pump in triple vessels disease should be considered a CABG technique of the new millennium.
Thank You
TWO INTERNAL THORACIC ARTERY GRAFTS ARE BETTER THAN ONE
Bruce W. Lytle, Eugene H. Blackstone, Floyd D. Loop, Penny L. Houghtaling, John H.

Survival

Survival %

Years After CABG

Reoperation

Reoperation (%/year)

A meta-analysis comparing bilateral internal mammary artery with left internal mammary artery for coronary artery bypass grafting

<table>
<thead>
<tr>
<th>Study Or Subgroup</th>
<th>log[Hazard Ratio]</th>
<th>SE</th>
<th>Total</th>
<th>Total Weight</th>
<th>IV, Random, 95% CI</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nauheim</td>
<td>-0.288</td>
<td>0.265</td>
<td>100</td>
<td>100</td>
<td>1.7%</td>
<td>0.75 [0.45, 1.26]</td>
</tr>
<tr>
<td>Dewar</td>
<td>0.01</td>
<td>0.272</td>
<td>377</td>
<td>765</td>
<td>1.6%</td>
<td>1.01 [0.59, 1.72]</td>
</tr>
<tr>
<td>Pick</td>
<td>-0.198</td>
<td>0.247</td>
<td>180</td>
<td>161</td>
<td>1.9%</td>
<td>0.82 [0.51, 1.33]</td>
</tr>
<tr>
<td>Buxton</td>
<td>-0.342</td>
<td>0.127</td>
<td>1269</td>
<td>1557</td>
<td>4.9%</td>
<td>0.71 [0.56, 0.91]</td>
</tr>
<tr>
<td>Jones</td>
<td>-0.288</td>
<td>0.181</td>
<td>172</td>
<td>338</td>
<td>3.1%</td>
<td>0.75 [0.53, 1.07]</td>
</tr>
<tr>
<td>Tarelli</td>
<td>0.02</td>
<td>0.349</td>
<td>150</td>
<td>150</td>
<td>1.0%</td>
<td>1.02 [0.51, 2.02]</td>
</tr>
<tr>
<td>Berreklouw</td>
<td>-0.274</td>
<td>0.301</td>
<td>249</td>
<td>233</td>
<td>1.4%</td>
<td>0.76 [0.42, 1.37]</td>
</tr>
<tr>
<td>Endo</td>
<td>-0.051</td>
<td>0.179</td>
<td>443</td>
<td>688</td>
<td>3.1%</td>
<td>0.95 [0.67, 1.35]</td>
</tr>
<tr>
<td>Danzer</td>
<td>-1.347</td>
<td>0.639</td>
<td>382</td>
<td>139</td>
<td>0.3%</td>
<td>0.26 [0.07, 0.91]</td>
</tr>
<tr>
<td>Hirokami</td>
<td>-1.386</td>
<td>0.805</td>
<td>179</td>
<td>124</td>
<td>0.2%</td>
<td>0.25 [0.05, 1.21]</td>
</tr>
<tr>
<td>Stevens</td>
<td>-0.431</td>
<td>0.106</td>
<td>1808</td>
<td>2498</td>
<td>5.8%</td>
<td>0.65 [0.53, 0.80]</td>
</tr>
<tr>
<td>Calafiore</td>
<td>0.642</td>
<td>0.367</td>
<td>570</td>
<td>570</td>
<td>1.0%</td>
<td>1.90 [0.93, 3.90]</td>
</tr>
<tr>
<td>Lytle</td>
<td>-0.301</td>
<td>0.071</td>
<td>1152</td>
<td>1152</td>
<td>7.9%</td>
<td>0.74 [0.54, 0.95]</td>
</tr>
<tr>
<td>Townpoulis</td>
<td>-0.117</td>
<td>0.126</td>
<td>490</td>
<td>490</td>
<td>4.9%</td>
<td>0.89 [0.59, 1.34]</td>
</tr>
<tr>
<td>Bonacchi</td>
<td>-0.58</td>
<td>0.306</td>
<td>320</td>
<td>332</td>
<td>1.3%</td>
<td>0.56 [0.31, 1.02]</td>
</tr>
<tr>
<td>Mohammadali</td>
<td>-3.912</td>
<td>1.528</td>
<td>1388</td>
<td>9566</td>
<td>0.1%</td>
<td>0.02 [0.00, 0.40]</td>
</tr>
<tr>
<td>Carrier</td>
<td>-0.431</td>
<td>0.119</td>
<td>1235</td>
<td>5420</td>
<td>5.2%</td>
<td>0.65 [0.51, 0.82]</td>
</tr>
<tr>
<td>Kurlansky</td>
<td>-0.186</td>
<td>0.047</td>
<td>2215</td>
<td>2369</td>
<td>9.3%</td>
<td>0.83 [0.76, 0.91]</td>
</tr>
<tr>
<td>Kleser</td>
<td>-0.117</td>
<td>0.103</td>
<td>1038</td>
<td>4029</td>
<td>6.0%</td>
<td>0.89 [0.73, 1.09]</td>
</tr>
<tr>
<td>Locker</td>
<td>-0.315</td>
<td>0.107</td>
<td>1153</td>
<td>1153</td>
<td>5.8%</td>
<td>0.73 [0.59, 0.90]</td>
</tr>
<tr>
<td>Puskas</td>
<td>-0.431</td>
<td>0.165</td>
<td>812</td>
<td>2715</td>
<td>3.8%</td>
<td>0.55 [0.48, 0.68]</td>
</tr>
<tr>
<td>Kinoshita</td>
<td>-0.58</td>
<td>0.291</td>
<td>217</td>
<td>217</td>
<td>1.4%</td>
<td>0.56 [0.32, 0.99]</td>
</tr>
<tr>
<td>Kelly</td>
<td>-0.198</td>
<td>0.096</td>
<td>1079</td>
<td>6554</td>
<td>6.4%</td>
<td>0.82 [0.68, 0.99]</td>
</tr>
<tr>
<td>Joo</td>
<td>-0.01</td>
<td>0.169</td>
<td>366</td>
<td>368</td>
<td>3.4%</td>
<td>0.99 [0.71, 1.38]</td>
</tr>
<tr>
<td>Grau</td>
<td>-0.4</td>
<td>0.151</td>
<td>928</td>
<td>928</td>
<td>5.4%</td>
<td>0.67 [0.54, 0.84]</td>
</tr>
<tr>
<td>Gilmore</td>
<td>-0.301</td>
<td>0.127</td>
<td>297</td>
<td>297</td>
<td>4.9%</td>
<td>0.74 [0.58, 0.95]</td>
</tr>
<tr>
<td>Parsa</td>
<td>-0.051</td>
<td>0.065</td>
<td>728</td>
<td>16881</td>
<td>9.2%</td>
<td>0.96 [0.94, 1.08]</td>
</tr>
</tbody>
</table>

Total (95% CI): 19277 59786 100.0% 0.78 [0.72, 0.84]

Heterogeneity: Tau² = 0.01; Chi² = 47.10, df = 26 (P = 0.007), P = 45%

Test for overall effect: Z = 6.61 (P < 0.00001)
• Composite Y or T grafts with RITA allows adequate reperfusion of the left system with minimal resistance to maximal flow and an even distribution of flow in both distal branches.

• The flow reserve of the proximal ITA is adequate for multiple anastomoses.

• Composite T-graft technique of BITA should be reserved for patients with severe (70% or more) LAD and Cx stenosis.
Three Arterial Grafts Improve Late Survival

The use of 3 arterial grafts was associated with a statistically significant reduction of late death compared with the use of 2 arterial conduits (HR, 0.8; 95% CI, 0.75–0.87; P < 0.001)