

# STS/EACTS Latin America Cardiovascular Surgery Conference

September 21-22, 2017 | Cartagena, Colombia

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## Bilateral IMA and All-Arterial Revascularization: How To Do It and Current Evidence

**Dr. Daniel Navia**  
Chief of Cardiac Surgery, ICBA.  
Buenos Aires, Argentina



The Society  
of Thoracic  
Surgeons



**EACTS**  
European Association For Cardio-Thoracic Surgery





# Disclosure

- Nothing to disclose

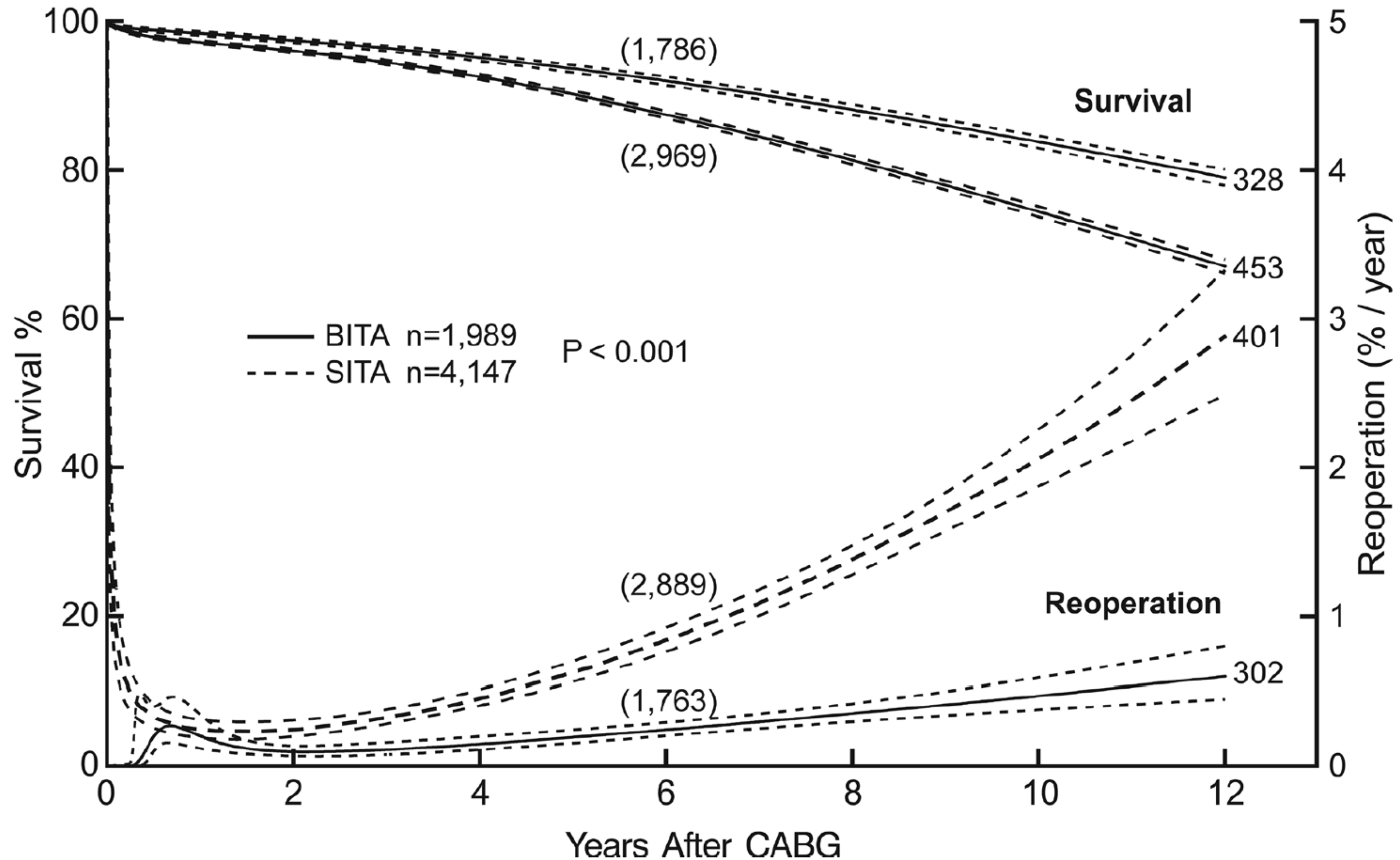
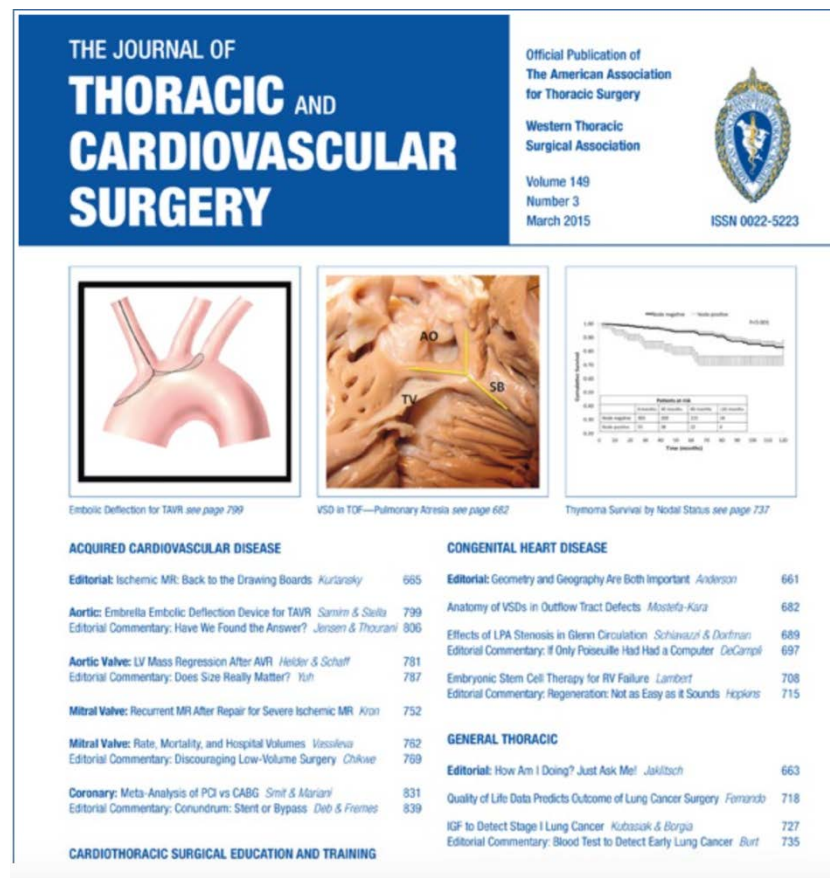
# Current Evidence

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# TWO INTERNAL THORACIC ARTERY GRAFTS ARE BETTER THAN ONE

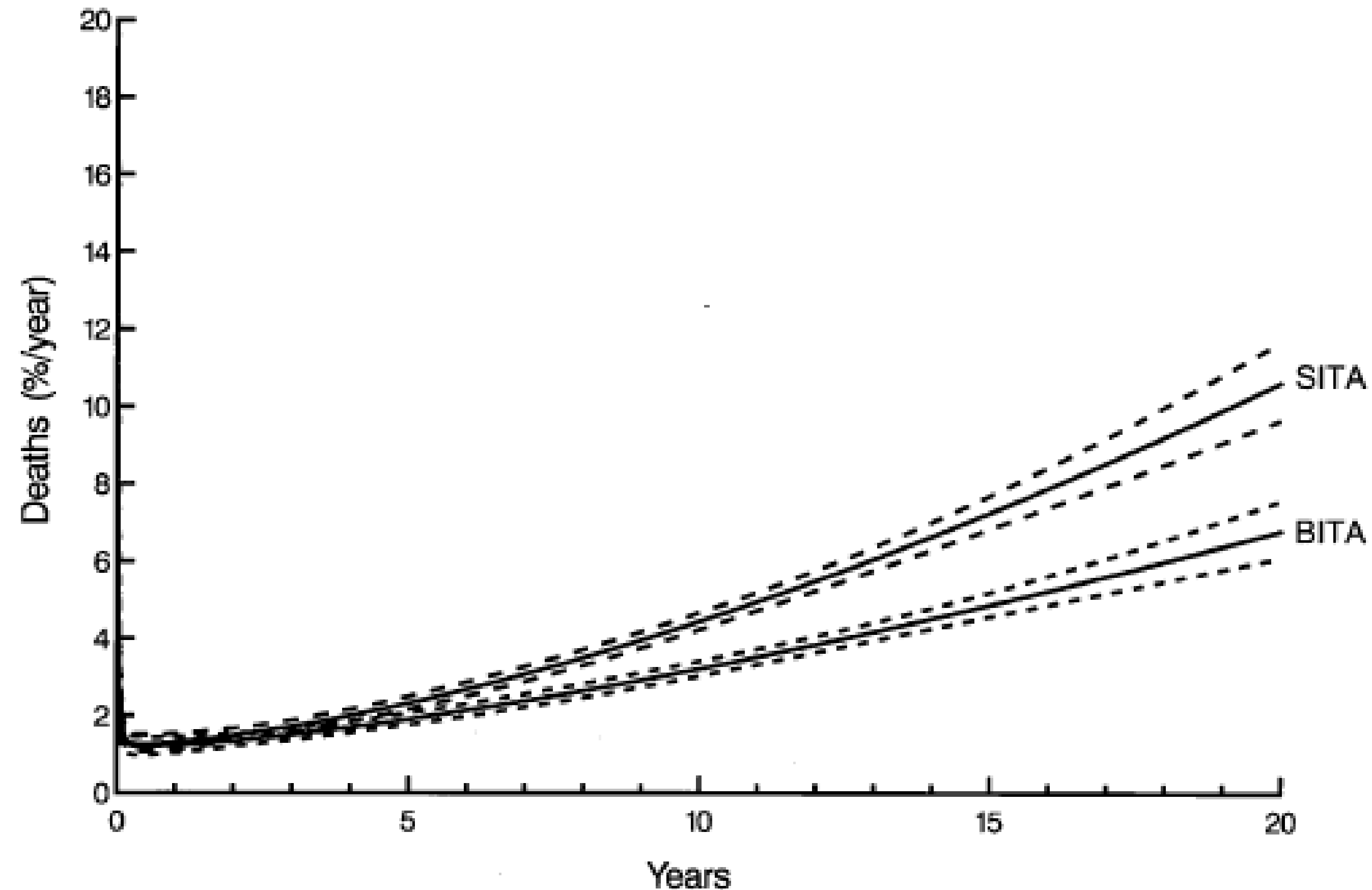
Bruce W. Lytle, Eugene H. Blackstone, Floyd D. Loop, Penny L. Houghtaling, John H.



# The Effect of Bilateral Internal Thoracic Artery Grafting on Survival During 20 Postoperative Years

Bruce W. Lytle, MD, Eugene H. Blackstone, MD, Joseph F. Sabik, MD,  
Penny Houghtaling, MS, Floyd D. Loop, MD, and Delos M. Cosgrove, MD

Departments of Thoracic and Cardiovascular Surgery, and Biostatistics and Epidemiology, The Cleveland Clinic Foundation,  
Cleveland, Ohio



*Hazard function curves demonstrate the increased risk of death associated with SITA grafting with increasing follow-up interval.*



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

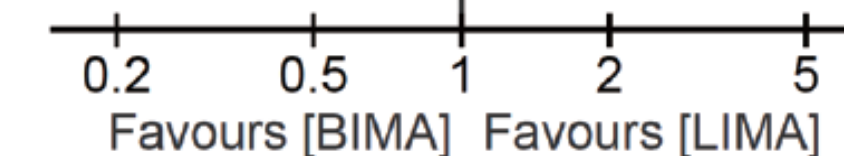
Aaron J. Weiss<sup>1,2</sup>, Shan Zhao<sup>3</sup>, David H. Tian<sup>2</sup>, David P. Taggart<sup>4</sup>, Tristan D. Yan<sup>2,5</sup>

Study or Subgroup	log[Hazard Ratio]	SE	Total	Total	Weight	IV, Random, 95% CI	Year	IV, Random, 95% CI
Naunheim	-0.288	0.265	100	100	1.7%	0.75 [0.45, 1.26]	1992	
Dewar	0.01	0.272	377	765	1.6%	1.01 [0.59, 1.72]	1995	
Pick	-0.198	0.247	160	161	1.9%	0.82 [0.51, 1.33]	1997	
Buxton	-0.342	0.127	1269	1557	4.9%	0.71 [0.55, 0.91]	1998	
Jones	-0.288	0.181	172	338	3.1%	0.75 [0.53, 1.07]	2000	
Tarelli	0.02	0.349	150	150	1.0%	1.02 [0.51, 2.02]	2001	
Berreklouw	-0.274	0.301	249	233	1.4%	0.76 [0.42, 1.37]	2001	
Endo	-0.051	0.179	443	688	3.1%	0.95 [0.67, 1.35]	2001	
Danzer	-1.347	0.639	382	139	0.3%	0.26 [0.07, 0.91]	2001	←
Hirovani	-1.386	0.805	179	124	0.2%	0.25 [0.05, 1.21]	2003	←
Stevens	-0.431	0.106	1808	2498	5.8%	0.65 [0.53, 0.80]	2004	
Calafiore	0.642	0.367	570	570	1.0%	1.90 [0.93, 3.90]	2004	
Lytle	-0.301	0.071	1152	1152	7.9%	0.74 [0.64, 0.85]	2004	
Toumpoulis	-0.117	0.126	490	490	4.9%	0.89 [0.69, 1.14]	2006	
Bonacchi	-0.58	0.306	320	332	1.3%	0.56 [0.31, 1.02]	2006	
Mohammadi	-3.912	1.528	1388	9566	0.1%	0.02 [0.00, 0.40]	2008	←
Carrier	-0.431	0.119	1235	5420	5.2%	0.65 [0.51, 0.82]	2009	
Kurlansky	-0.186	0.047	2215	2369	9.3%	0.83 [0.76, 0.91]	2010	
Kieser	-0.117	0.103	1038	4029	6.0%	0.89 [0.73, 1.09]	2011	
Locker	-0.315	0.107	1153	1153	5.8%	0.73 [0.59, 0.90]	2012	
Puskas	-0.431	0.155	812	2715	3.8%	0.65 [0.48, 0.88]	2012	
Kinoshita	-0.58	0.291	217	217	1.4%	0.56 [0.32, 0.99]	2012	
Kelly	-0.198	0.096	1079	6554	6.4%	0.82 [0.68, 0.99]	2012	
Joo	-0.01	0.169	366	366	3.4%	0.99 [0.71, 1.38]	2012	
Grau	-0.4	0.115	928	928	5.4%	0.67 [0.54, 0.84]	2012	
Glineur	-0.301	0.127	297	291	4.9%	0.74 [0.58, 0.95]	2012	
Parsa	-0.051	0.065	728	16881	8.2%	0.95 [0.84, 1.08]	2013	

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

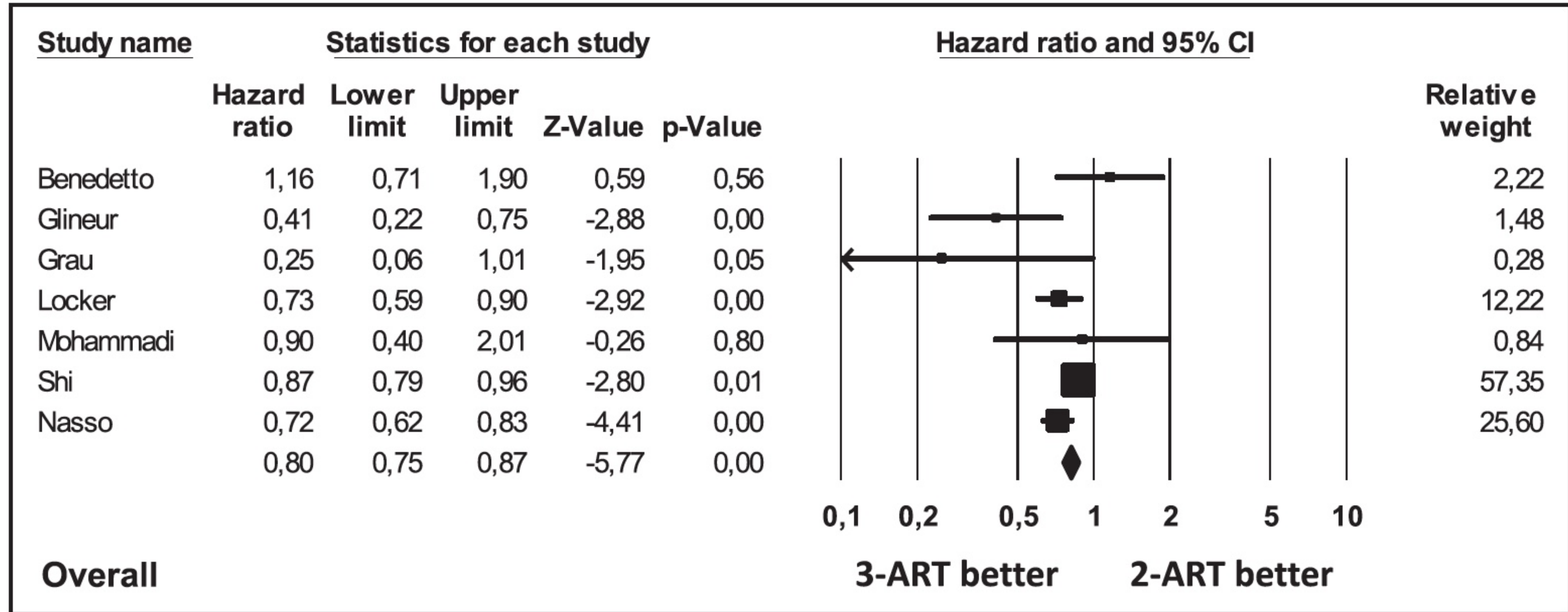
Heterogeneity: Tau<sup>2</sup> = 0.01; Chi<sup>2</sup> = 47.10, df = 26 (P = 0.007); I<sup>2</sup> = 45%

Test for overall effect: Z = 6.61 (P < 0.00001)





# Three Arterial Grafts Improve Late Survival

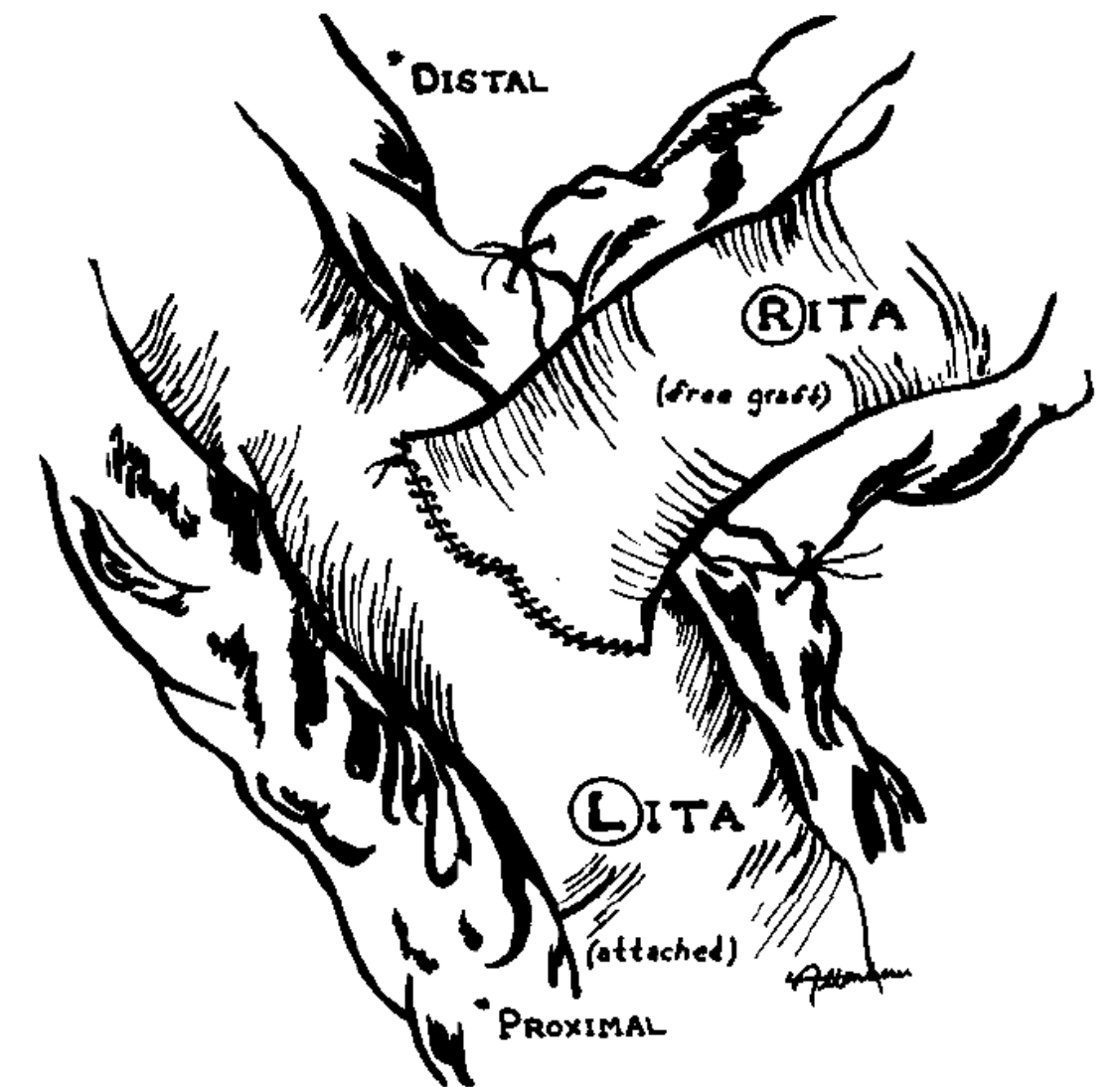
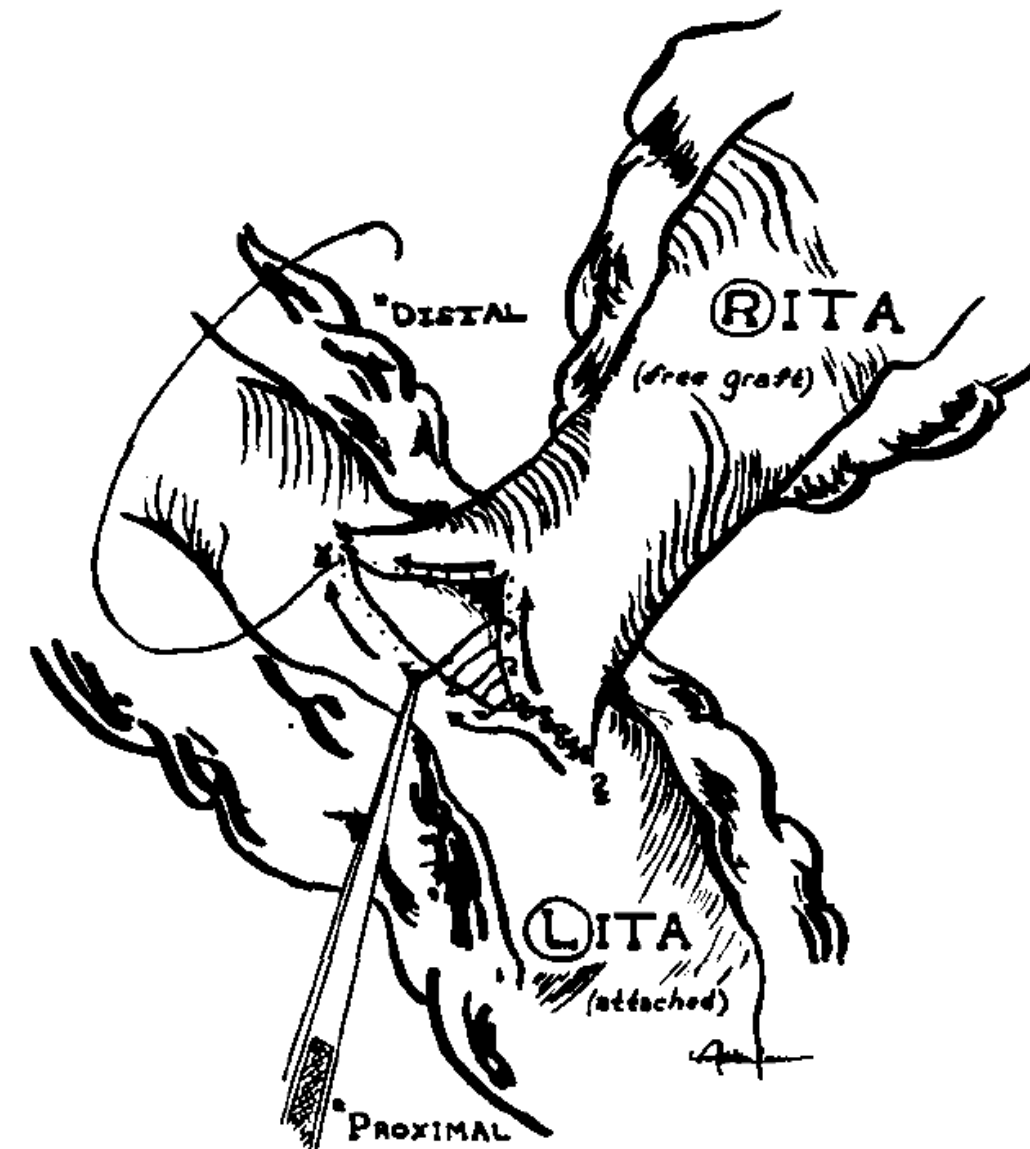
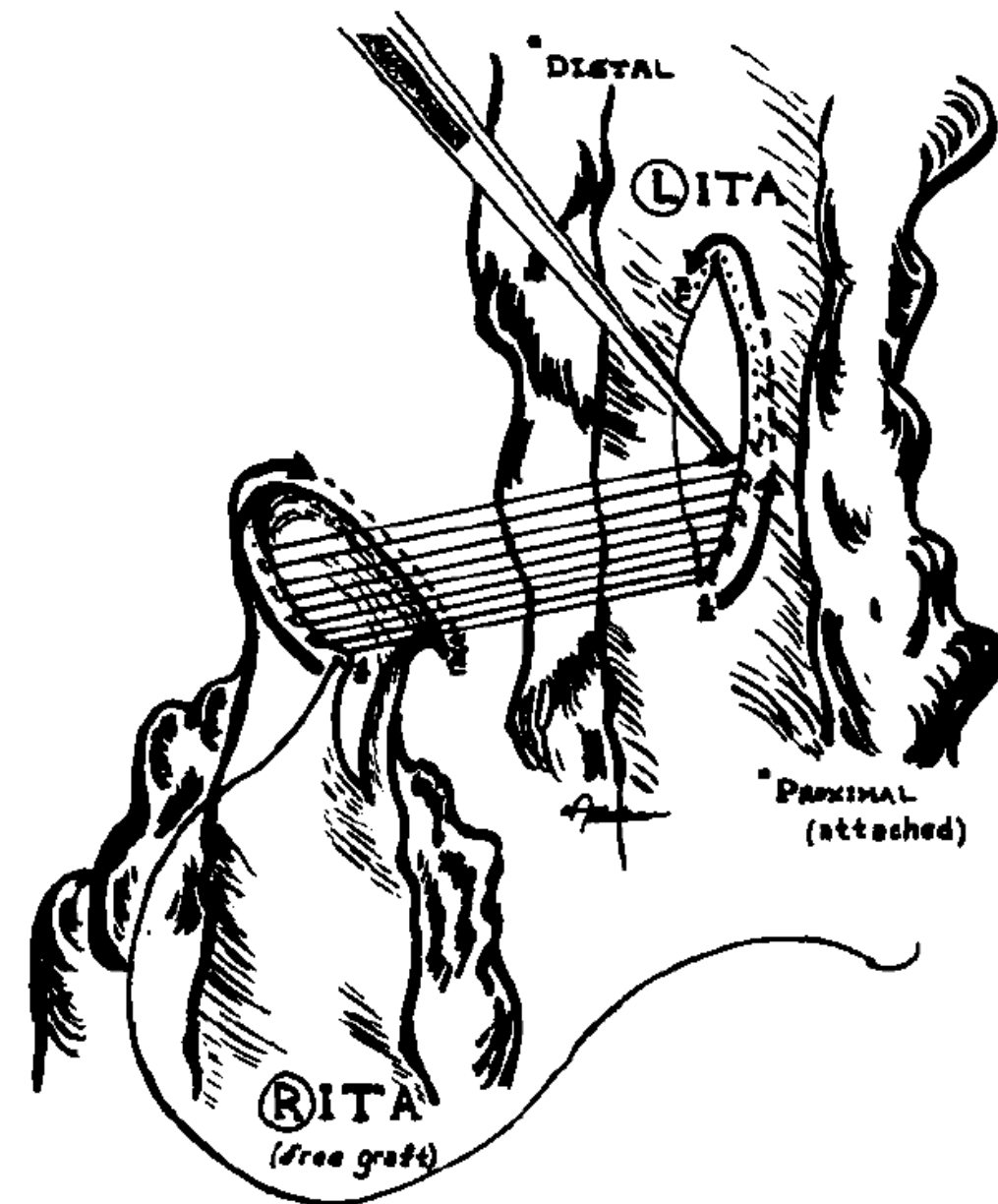
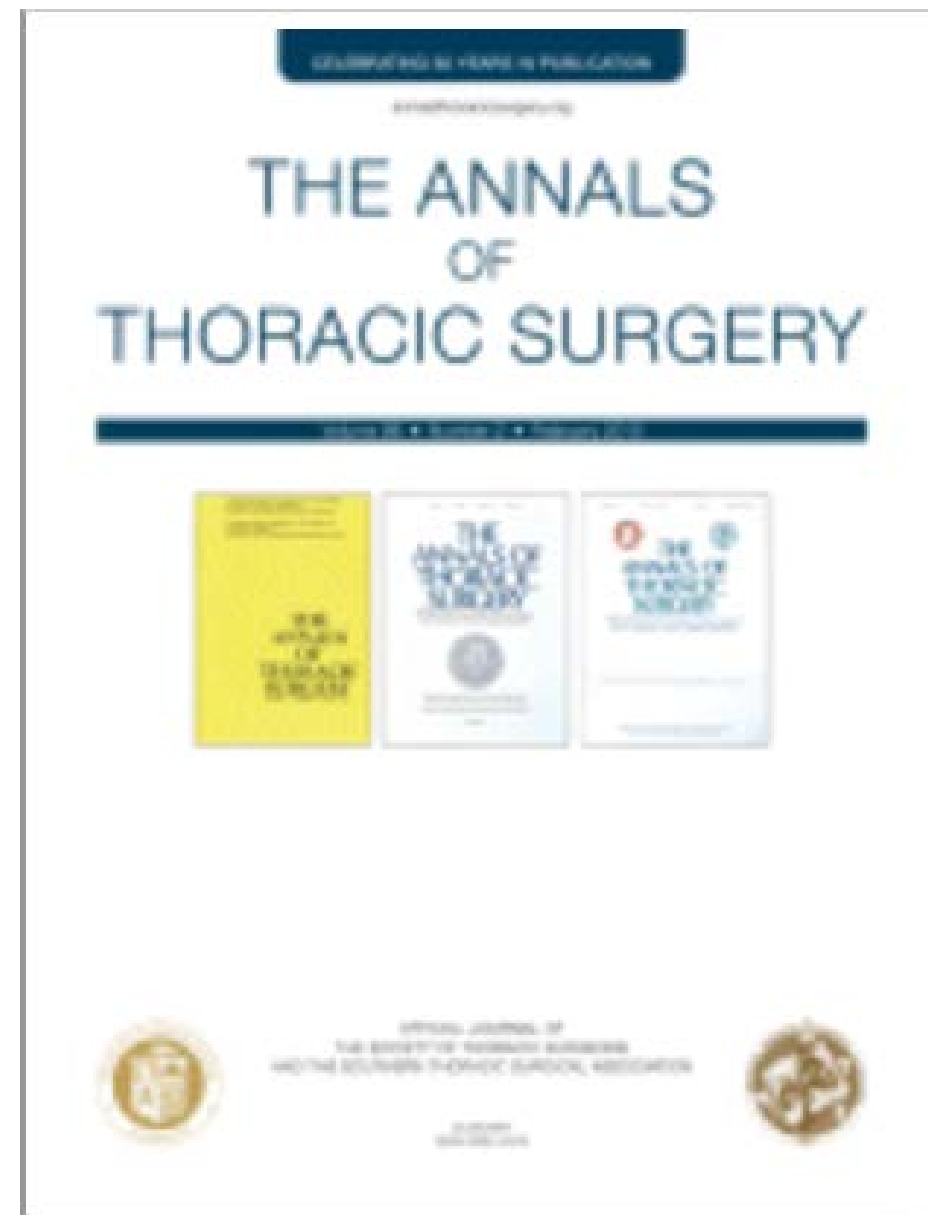


**The use of 3 arterial grafts was associated with a statistically significant reduction of late death compared with the use of 2 arterial conduits (HR,0.8; 95% CI, 0.75–0.87; P <0.001)**

# 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



(Ann Thorac Surg 1994;57:33-9)



## Angiographic evidence for reduced graft patency due to competitive flow in composite arterial T-grafts

Dmitry Pevni, MD,<sup>a</sup> Itzhak Hertz, MD,<sup>b</sup> Benjamin Medalion, MD,<sup>c</sup> Amir Kramer, MD,<sup>a</sup> Yosef Paz, MD,<sup>a</sup> Gideon Uretzky, MD,<sup>a</sup> and Rephael Mohr, MD<sup>a</sup>

**Objective:** Composite arterial grafting causes splitting of internal thoracic artery flow to various myocardial regions. The amount of flow supplying each region depends on the severity of coronary stenosis. Competitive flow in the native coronary artery can cause occlusion or severe narrowing of the internal thoracic

Causes of non-functioning right internal mammary used in a Y-graft configuration: insight from a 6-month systematic angiographic trial<sup>S,SS</sup>

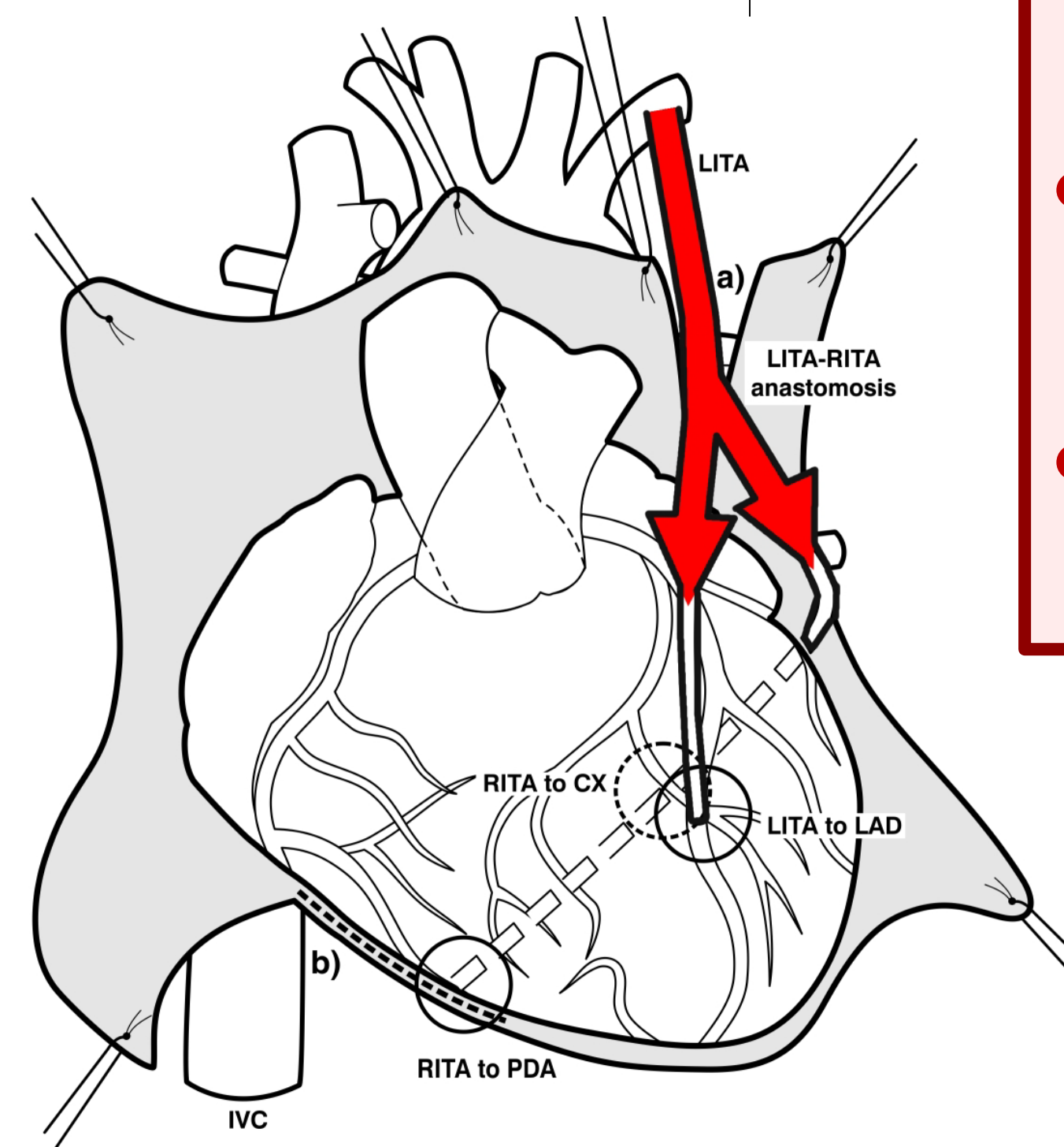
David Glineur<sup>\*</sup>, Claude Hanet, William D'hoore, Alain Poncelet, Laurent De Kerchove, Pierre Yves Etienne, Philippe Noirhomme, Gebrine El Khoury

Department of Cardiovascular Medicine and Surgery, University of Louvain Medical School, Brussels, Belgium

Received 1 September 2008; received in revised form 23 January 2009; accepted 16 February 2009; Available online 15 April 2009

Abstract

- 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.



### T GRAFTS WITH THE RIGHT INTERNAL THORACIC ARTERY TO LEFT INTERNAL THORACIC ARTERY VERSUS THE LEFT INTERNAL THORACIC ARTERY AND RADIAL ARTERY: FLOW DYNAMICS IN THE INTERNAL THORACIC ARTERY MAIN STEM

Olaf Wendler, MD<sup>a</sup>  
 Benno Hennen, MD<sup>b</sup>  
 Torsten Markwirth, MD<sup>b</sup>  
 Jochem König, MD<sup>c</sup>  
 Dietmar Tscholl<sup>a</sup>  
 Qi Huang<sup>a</sup>  
 Erfane Shahangi<sup>a</sup>  
 Hans-Joachim Schäfers, MD, PhD<sup>a</sup>

Sponsor: Hans G. Borst, MD

**Objective:** Complete arterial coronary artery bypass grafting with 2 grafts can be achieved even in triple vessel disease by use of a T configuration. There is still uncertainty whether the coronary flow reserve in the main stem of the left internal thoracic artery is sufficient to supply more than 1 anastomosed coronary vessel. **Methods:** Between March 1996 and February 1999, 251 patients with multivessel coronary artery disease underwent complete arterial revascularization with T grafts, using either the left internal thoracic artery with the free right internal thoracic artery graft (n = 73, group I) or the left internal thoracic artery

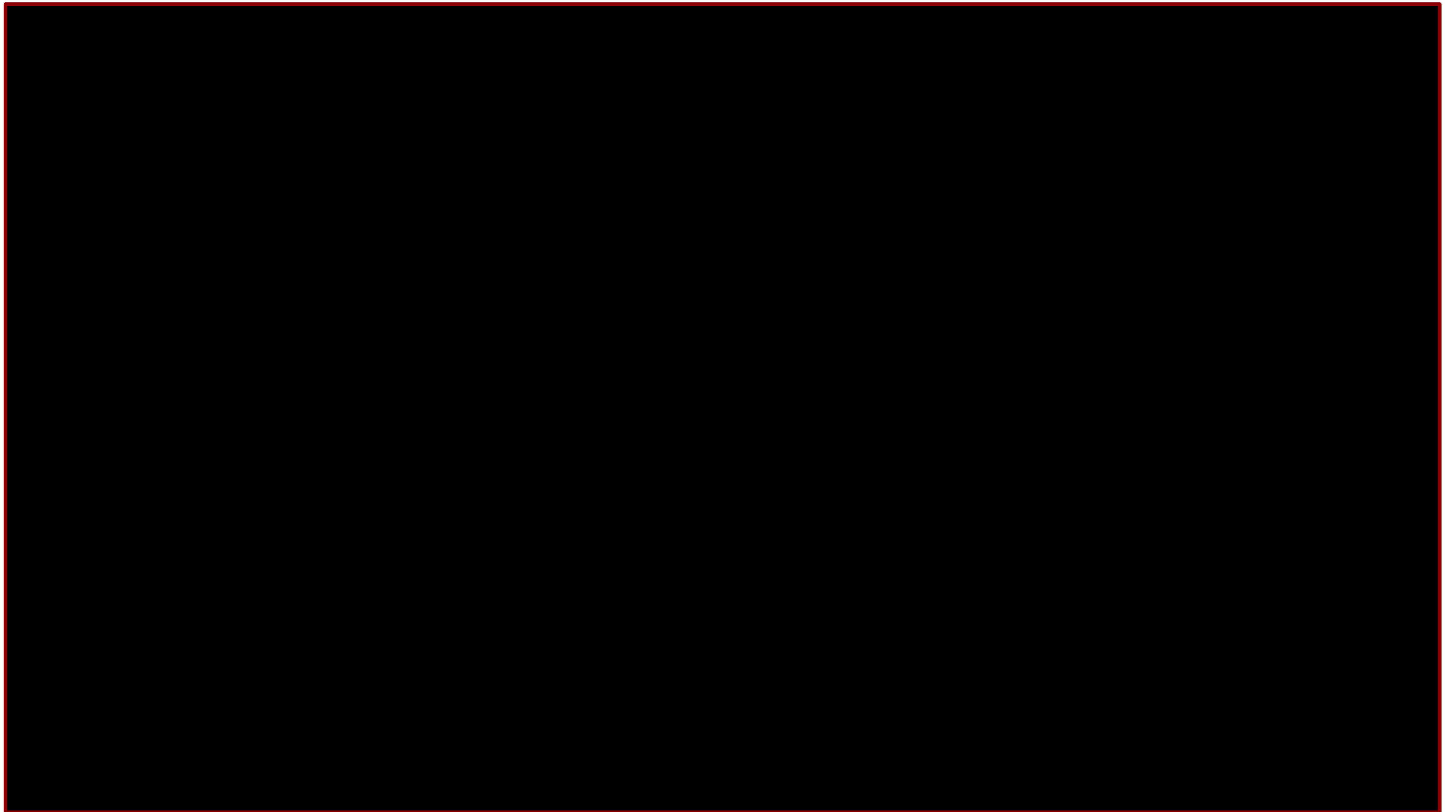
# **Off-pump BITA grafting All arterials in multivessels disease**

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## **Our current Surgical Technique**

**Daniel Navia M.D.**  
Cardiac Surgery Dept. ICBA.  
Buenos Aires 2017  
Argentina





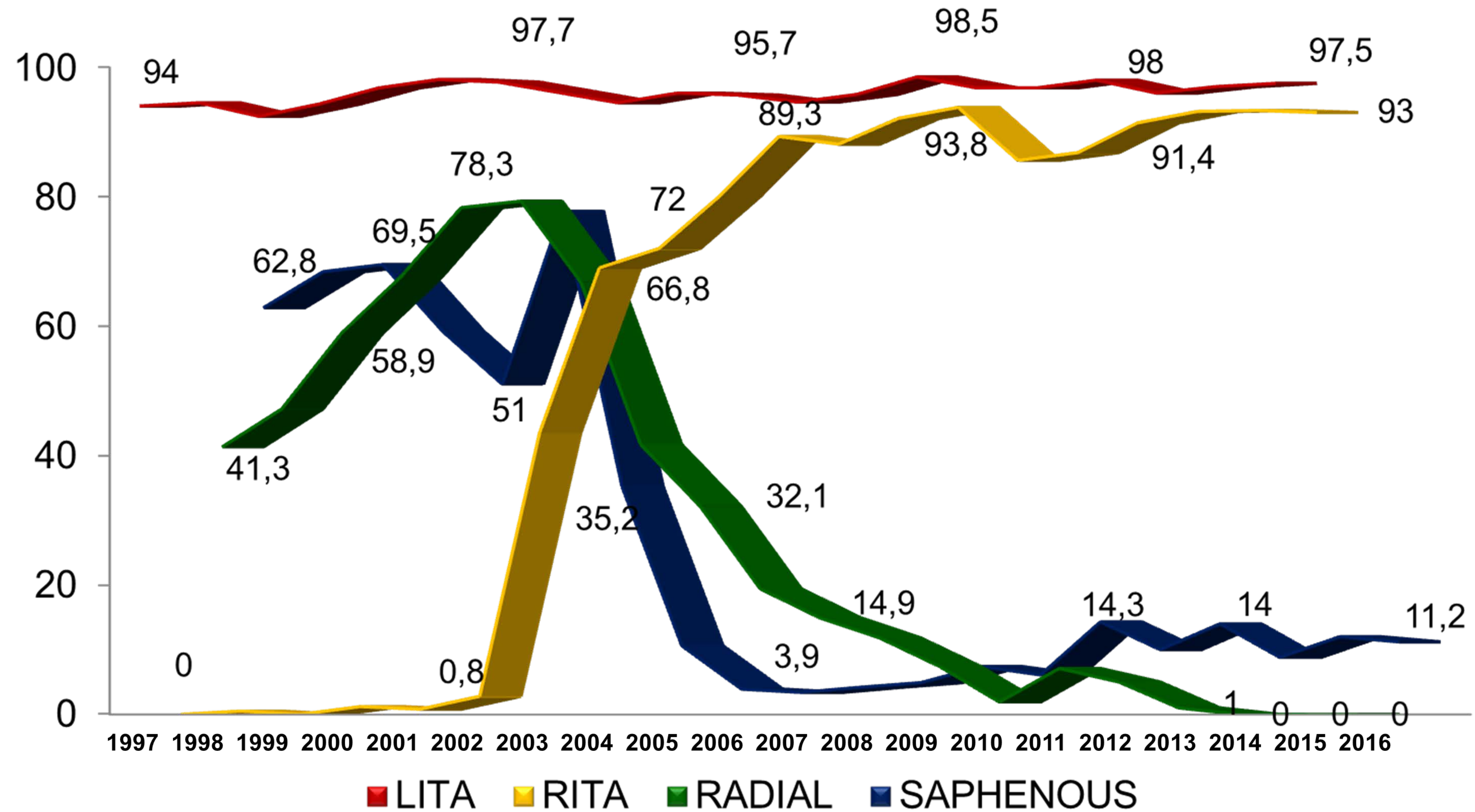
# Our work

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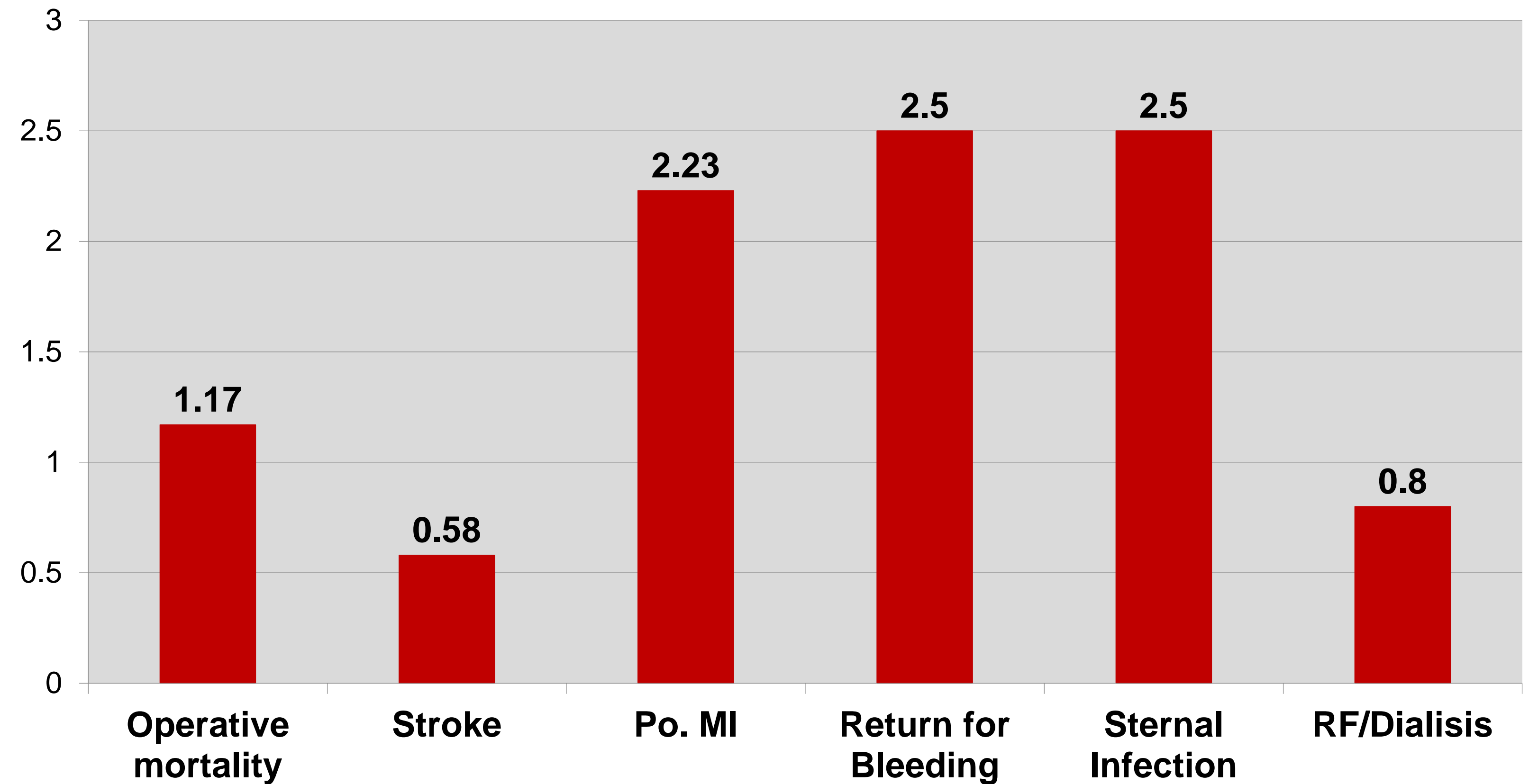
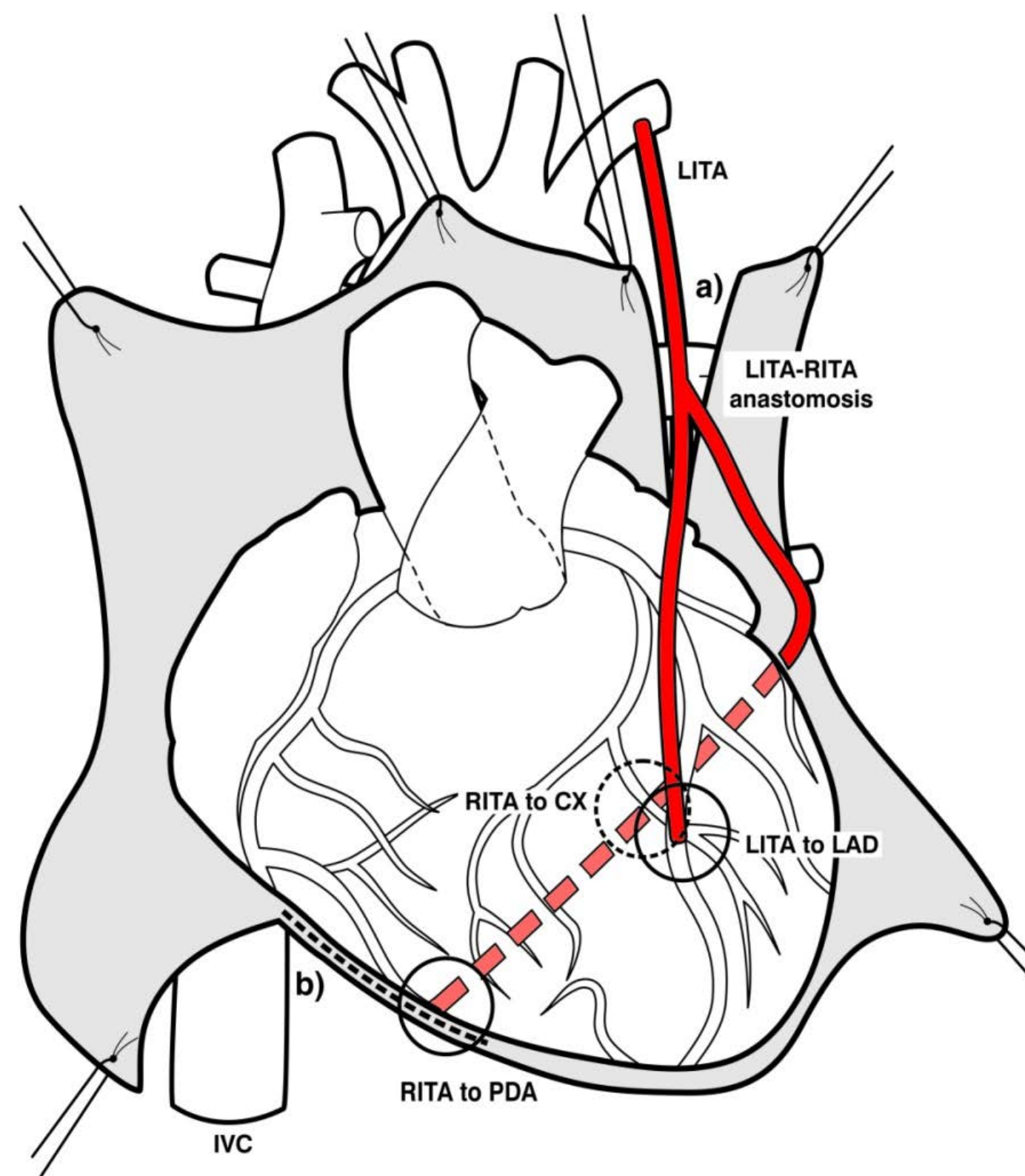


# Conduit Selection over time



# Off-pump BITA grafting 2003-2017 (n: 3086)

PO results:

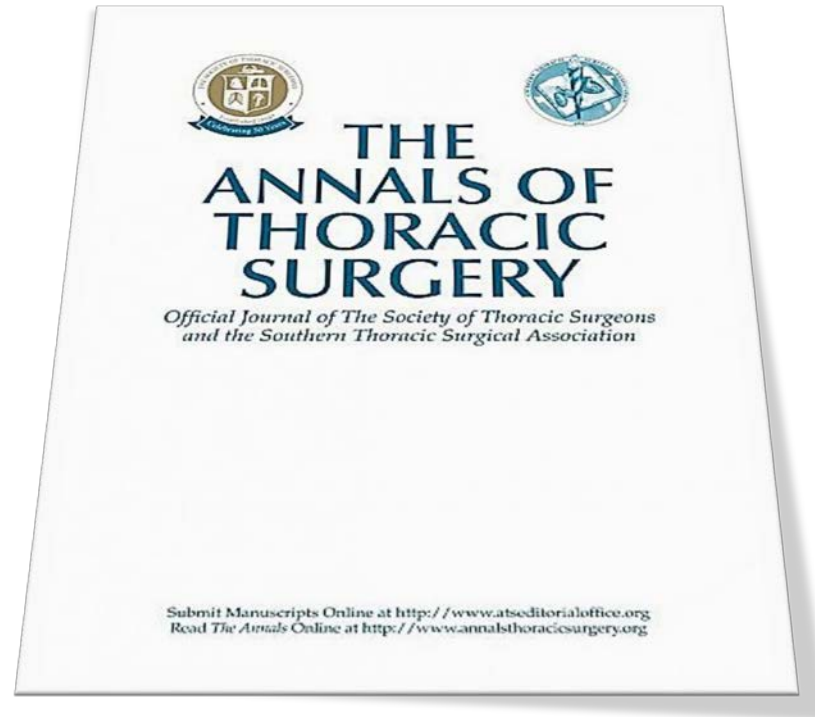




# Our publications

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# Total Arterial Off-Pump Coronary Revascularization Using Bilateral Internal Thoracic Arteries in Triple-Vessel Disease: Surgical Technique and Clinical Outcomes

Daniel Navia, MD, Mariano Vrancic, MD, Guillermo Vaccarino, MD, (Ann Thorac Surg 2008;86:524–31)



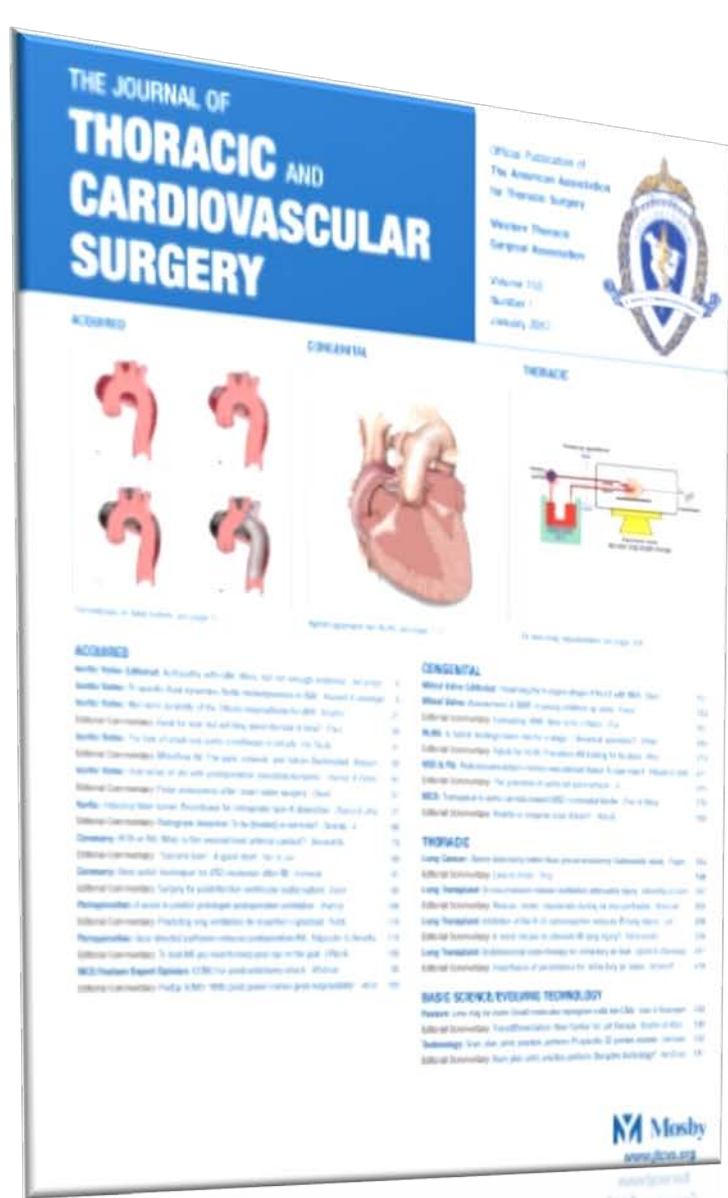
Table 4. Postoperative Angiographic Results in 250 Patients

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

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.

95% CI — Freedom from combined endpoint



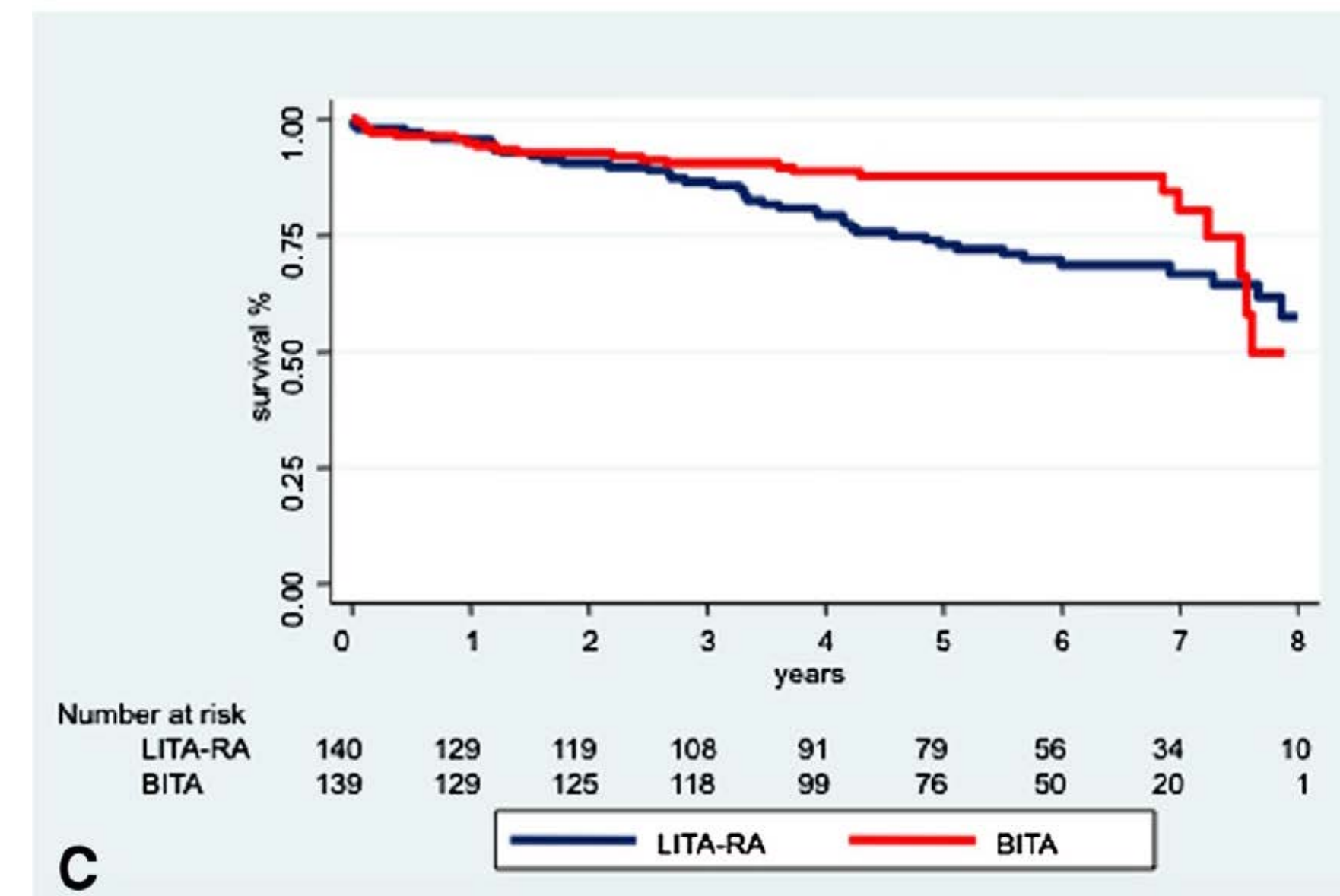
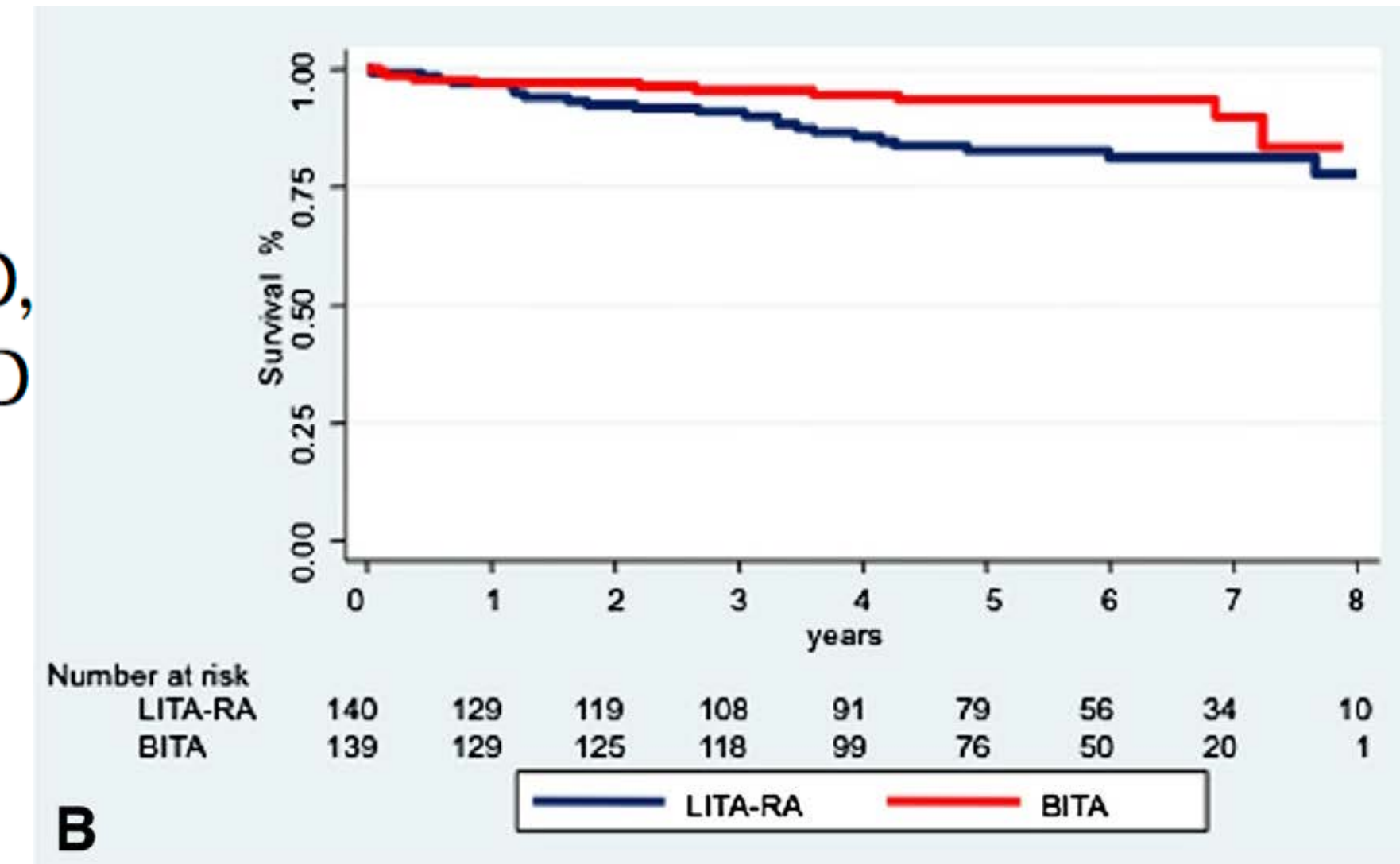


# Is the second internal thoracic artery better than the radial artery in total arterial off-pump coronary artery bypass grafting? A propensity score-matched follow-up study

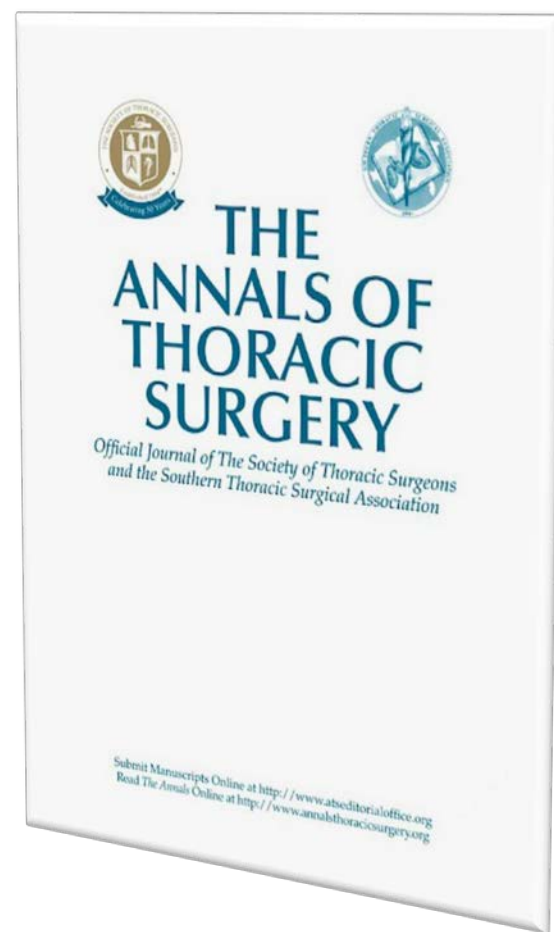
Daniel Navia, MD, Mariano Vrancic, MD, Fernando Piccinini, MD, Jorge Thierer, MD, Christian Gil, MD, and Mariano Benzadon, MD (J Thorac Cardiovasc Surg 2014;147:632-8)

**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 Camporotondo, MD, Alberto Dorsa, MD, Juan Espinoza, MD, Mariano Benzadon, MD, and Juan Camou, MD

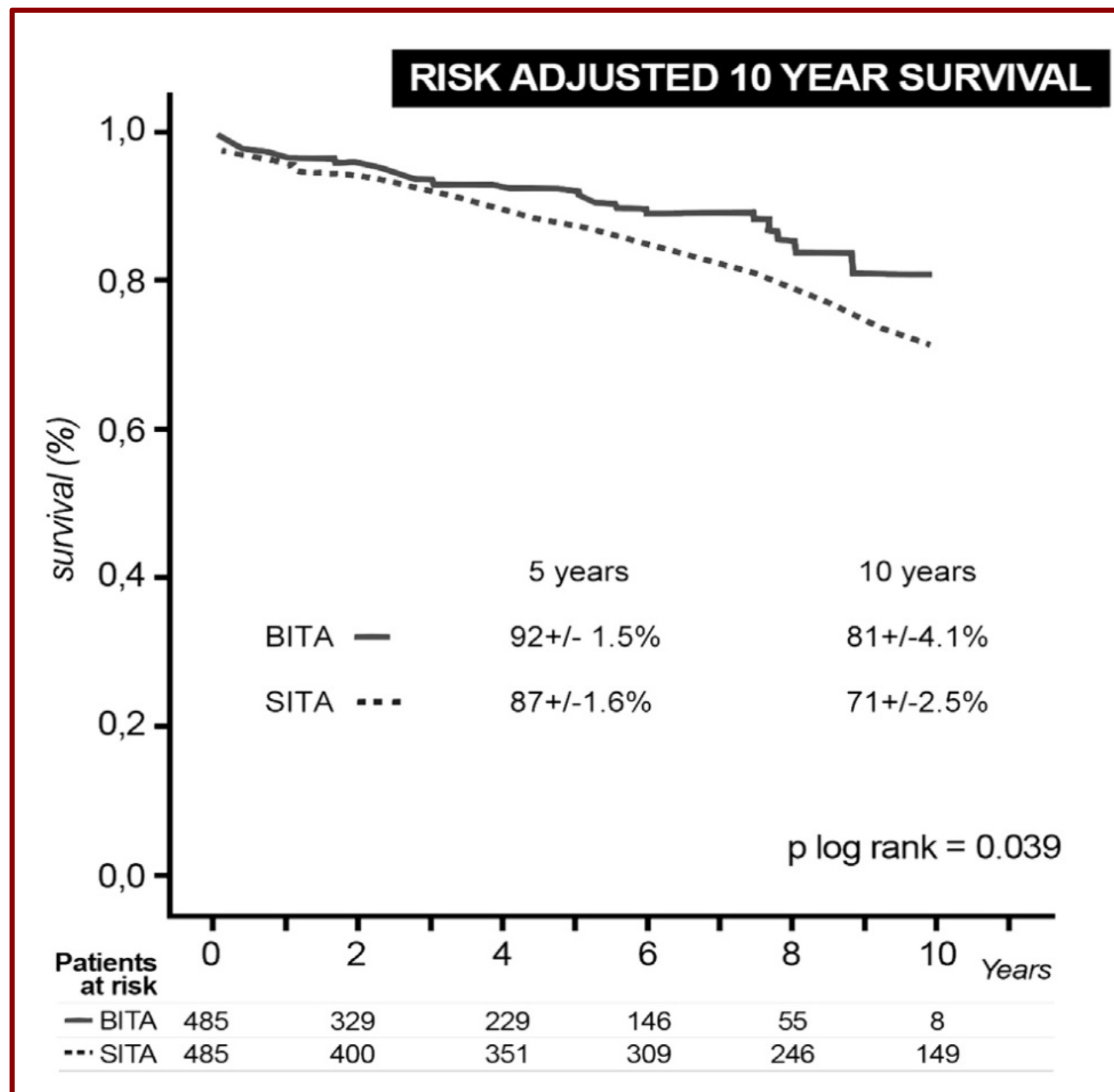
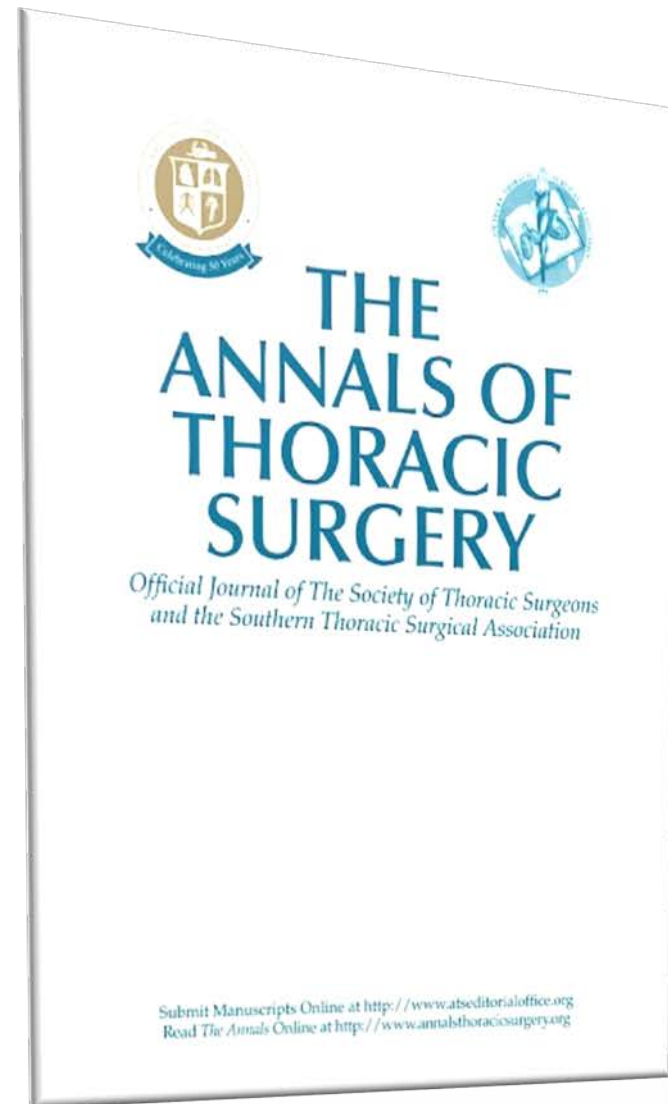


Table 3. Cox Proportional Hazard Regression Analysis for Long-Term (10 Years) All-Cause Mortality

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



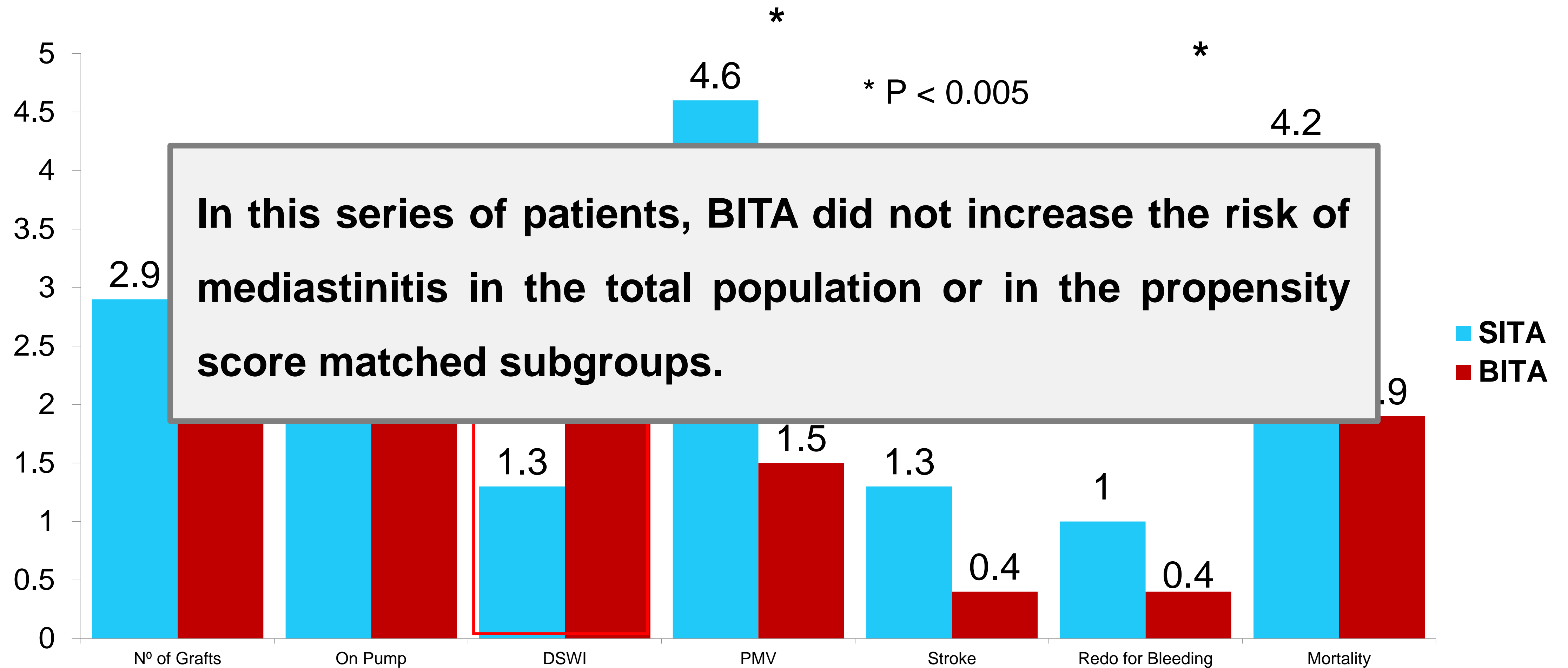


# **Bilateral Internal Thoracic Artery Grafting Increases Mediastinitis: Myth or Fact?**

**Juan M. Vrancic, MD, Fernando Piccinini, MD, Mariano Camporotondo, 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)





**2017 INTERNATIONAL CORONARY CONGRESS:**

**STATE-OF-THE-ART SURGICAL CORONARY REVASCLARIZATION**

**18-20 August 2017**

**New York Marriott Marquis, Times Square  
New York, NY**



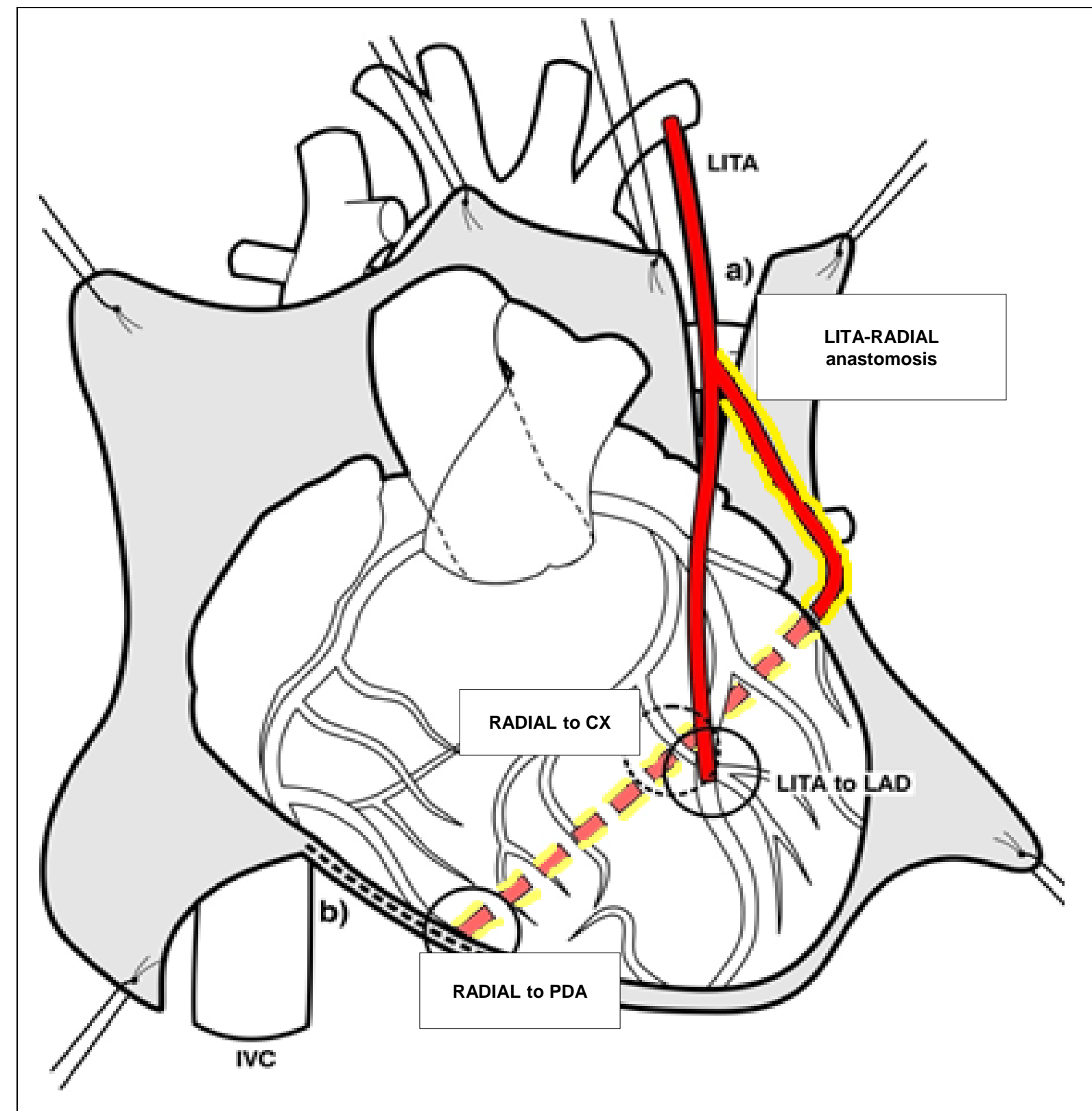
**Is the patency rate of the RA equivalent to the RITA when used as a second conduit in composite T graft configuration in multiple vessel disease?**

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

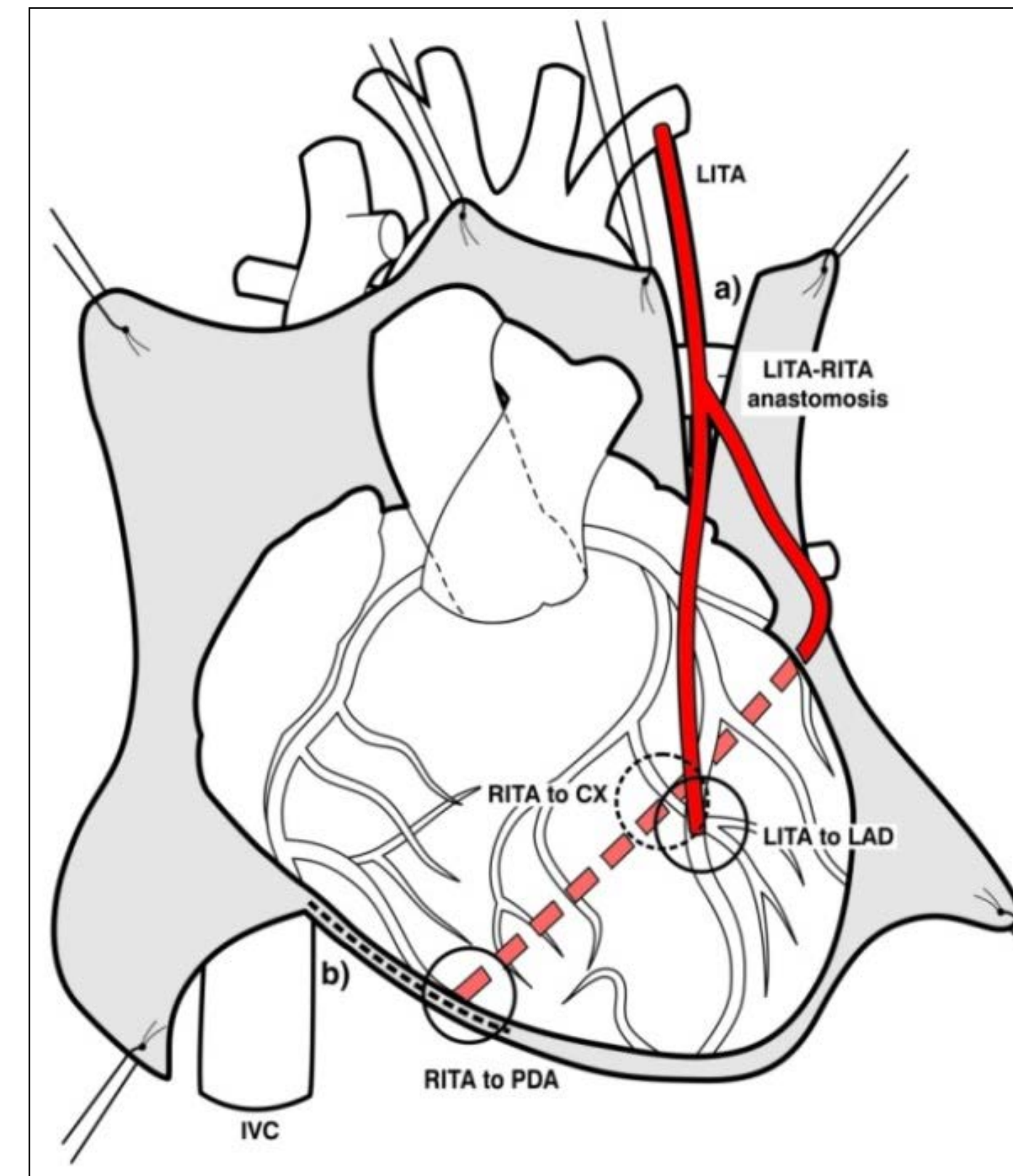
**Instituto Cardiovascular de Buenos Aires, Argentina**

# Methods

- Patency rate of the distal anastomosis of the RA and RITA from LITA.
  - Angiogram or 64 slice-coronary CT
  - Fitzgibbon classification



**Radial Artery  
Group N: 115**



**RITA Group  
N: 277**



# Results

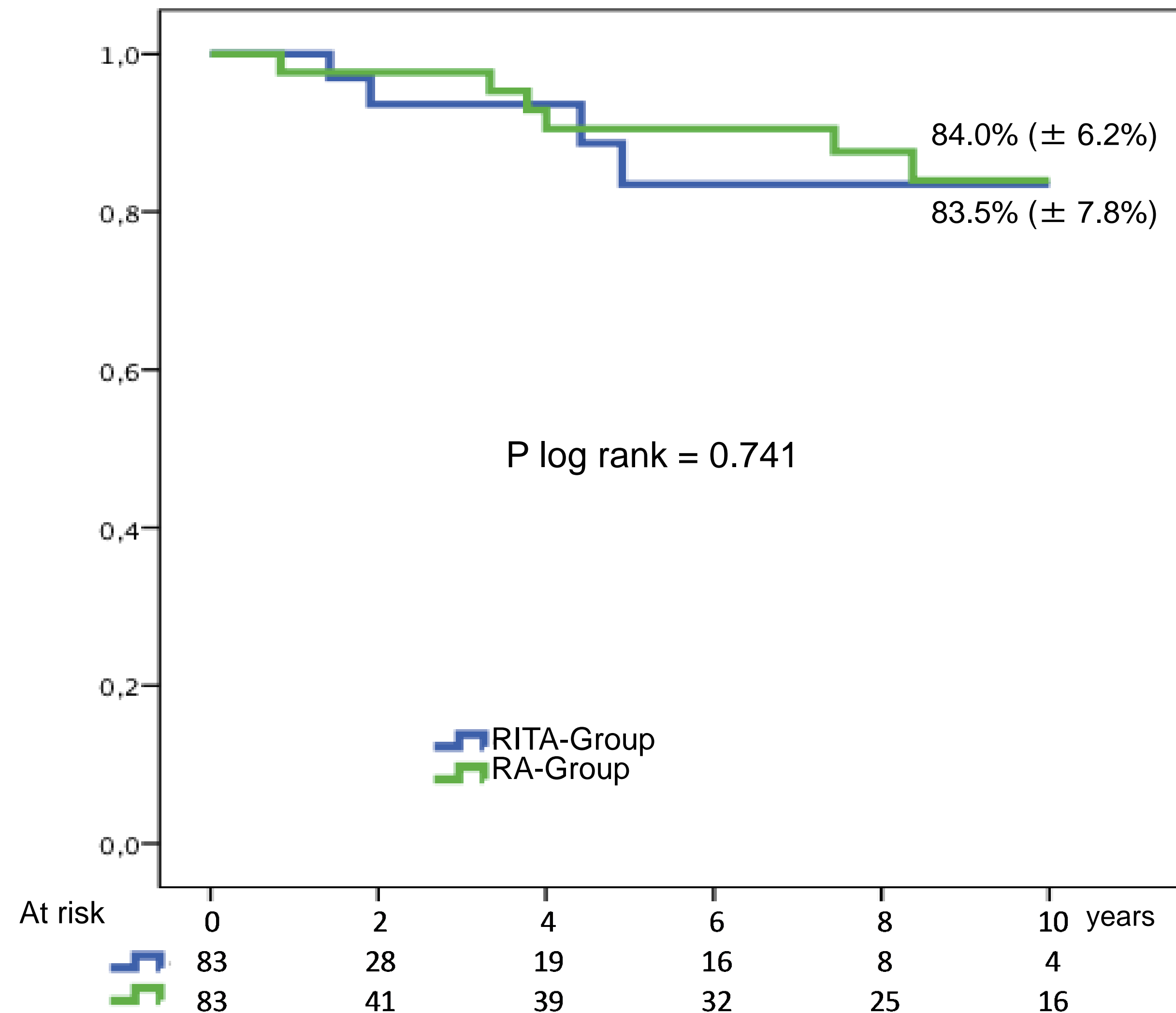
**Risk-adjusted 10-years patency rate**

**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)

**Propensity-matched sample**



# 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



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## **Superior Results in BITA Grafts are Independent of Gender**

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

**Instituto Cardiovascular De Buenos Aires, Argentina**

# Two Hypotesis

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%)**

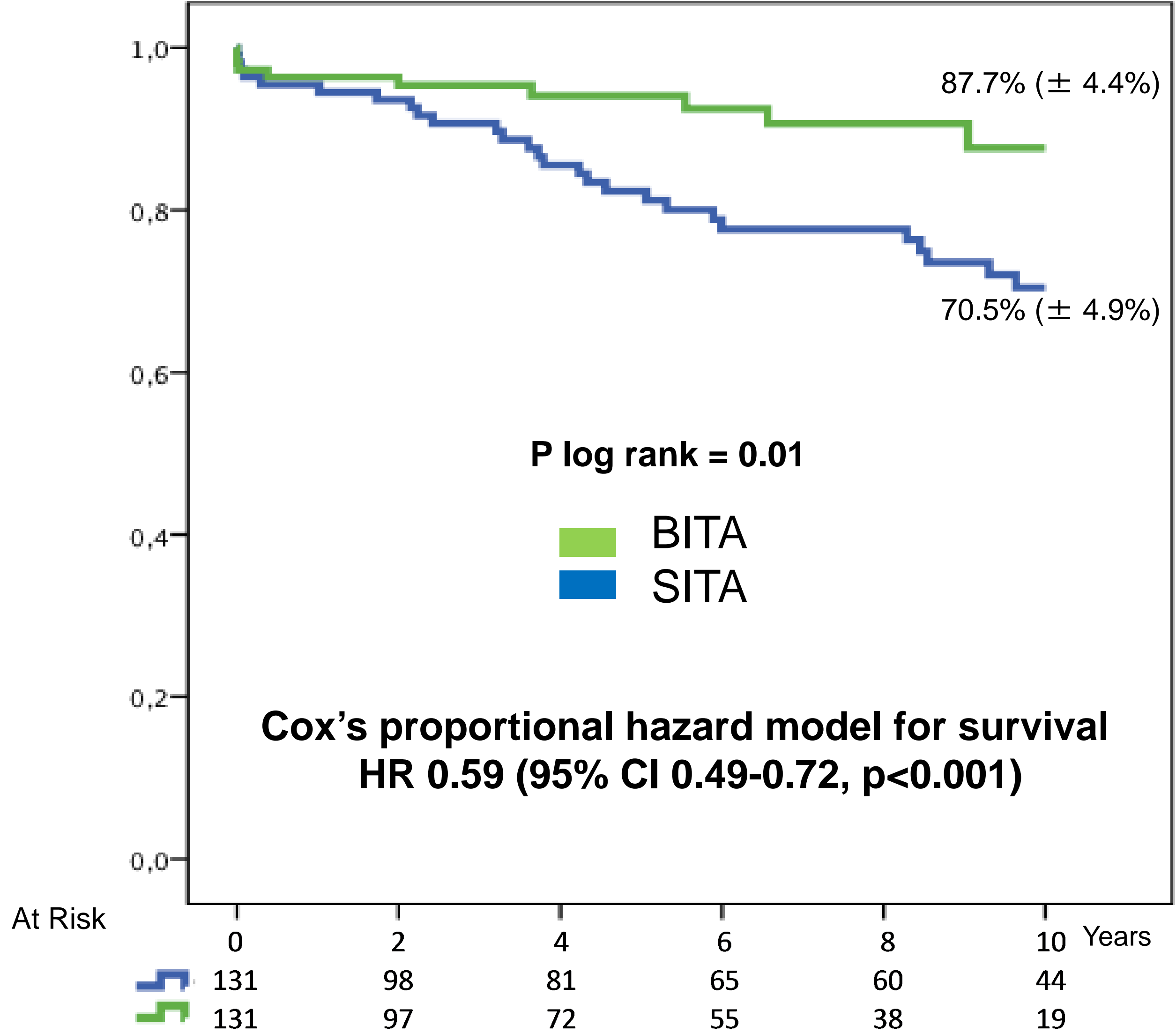
**MEN**

**N:1220 (85,5%)**

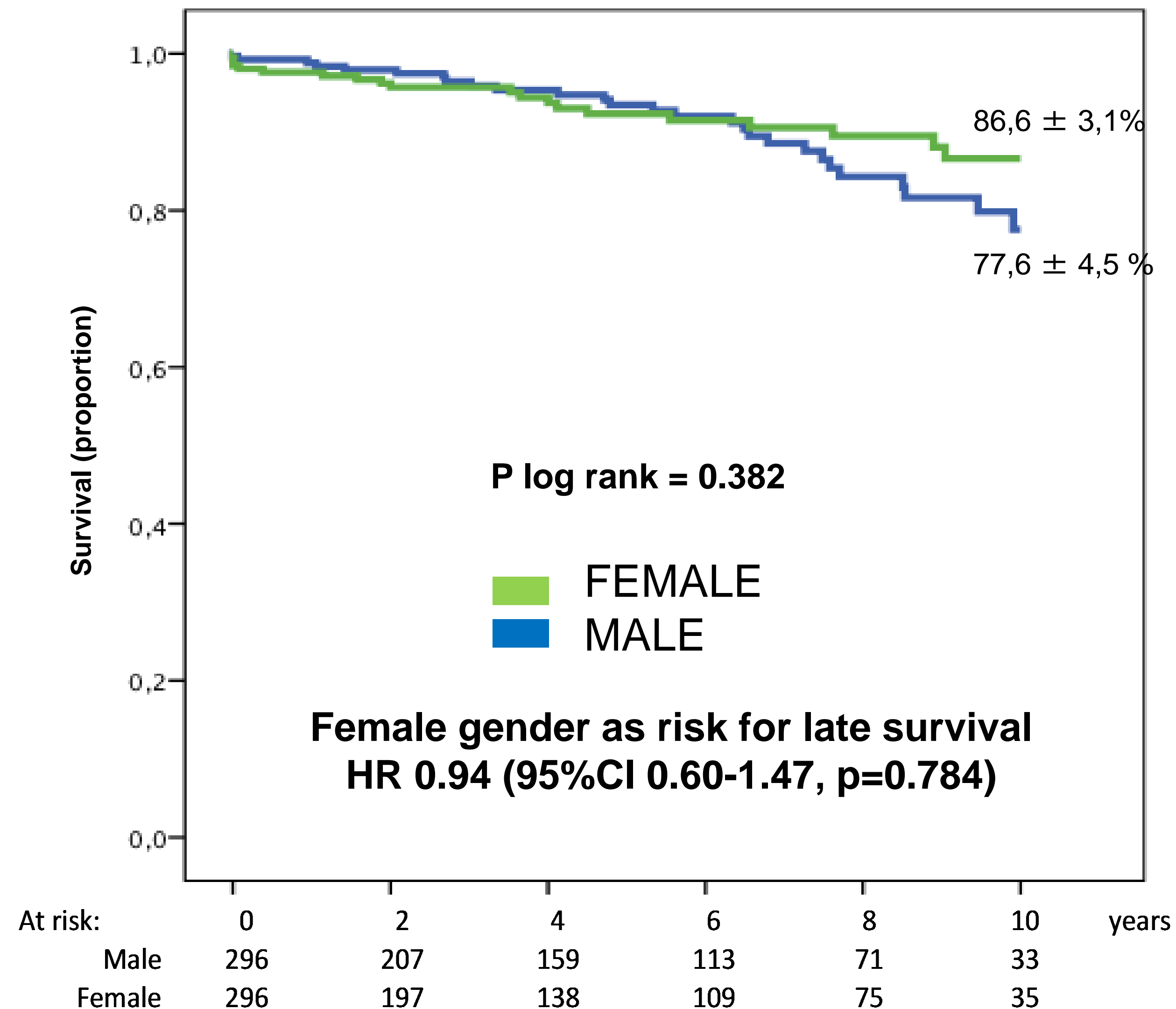
**WOMEN**

**N:207 (14,5%)**

# 10 years survival Matched Female Population



# 10 years survival BITA Matched population





# 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





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# Thank You



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