



# Come rivascularizzare il paziente multivasale diabetico

Il ruolo della rivascularizzazione  
«ibrida»

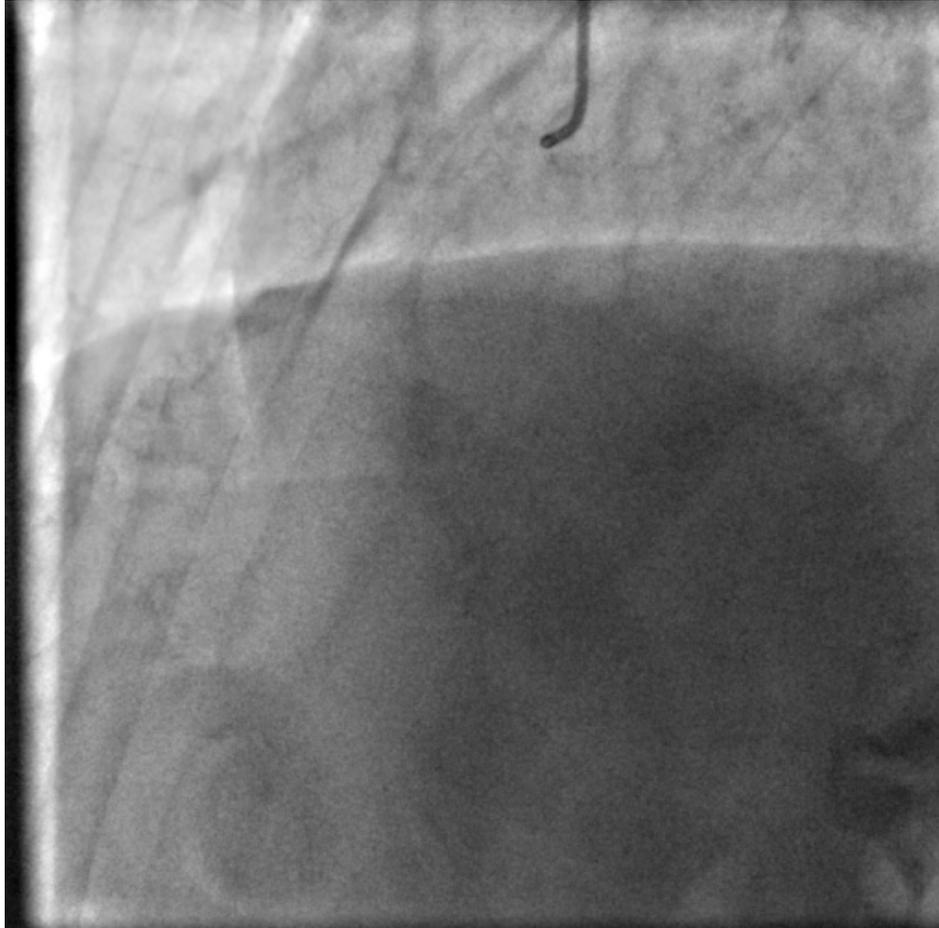
# Come rivascularizzare il paziente multivasale diabetico

- Maschio, 76 anni
- Diabete mellito in terapia orale
- Ipertensione arteriosa
- Dislipidemia
  
- Angina da sforzo da circa 4 mesi
- Ecocardiogramma da sforzo positivo, ipocinesia in ampio territorio anteriore/laterale/inferiore a bassa soglia (DP 20000)

# Come rivascularizzare il paziente multivasale ad ALTO RISCHIO

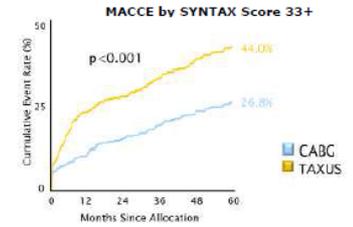
- Morbo di Parkinson
- Encefalopatia multinfartuale
- Esiti di emicolectomia sx per K colon
- IRC (GFR 60 ml/min)
- Insufficienza respiratoria, BPCO
- Ateromasia carotidea (ACI sx 30%, ACI dx 55%)

# Come rivascularizzare il paziente multivasale diabetico



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EUROSCORE II 9.07%



# BACKGROUND

## 2014 ESC/EACTS Guidelines on myocardial revascularization

Recommendations according to extent of CAD	CABG		PCI		Ref <sup>c</sup>
	Class <sup>a</sup>	Level <sup>b</sup>	Class <sup>a</sup>	Level <sup>b</sup>	
One or two-vessel disease without proximal LAD stenosis.	IIb	C	I	C	
One-vessel disease with proximal LAD stenosis.	I	A	I	A	107,108,160, 161,178,179
Two-vessel disease with proximal LAD stenosis.	I	B	I	C	108,135,137
Left main disease with a SYNTAX score ≤ 22.	I	B	I	B	17,134,170
Left main disease with a SYNTAX score 23–32.	I	B	IIa	B	17
Left main disease with a SYNTAX score >32.	I	B	III	B	17
Three-vessel disease with a SYNTAX score ≤ 22.	I	A	I	B	17,157,175,176
Three-vessel disease with a SYNTAX score 23–32.	I	A	III	B	17,157,175,176
Three-vessel disease with a SYNTAX score >32.	I	A	III	B	17,157,175,176

17 Mohr FW, Lancet 2013 Feb 23;381(9867):629-38. doi: 10.1016/S0140-6736(13)60141-5.

## 2012 ACCF/AHA/ACP/AATS/PCNA/SCAI/STS Guideline for the Diagnosis and Management of Patients With Stable Ischemic Heart Disease: Executive Summary

### Class IIa

- Hybrid coronary revascularization (defined as the planned combination of left internal mammary artery-to-LAD artery grafting and PCI of  $\geq 1$  non-LAD coronary arteries) is reasonable in patients with 1 or more of the following<sup>418–424</sup> (*Level of Evidence: B*):
  - Limitations to traditional CABG, such as heavily calcified proximal aorta or poor target vessels for CABG (but amenable to PCI);
  - Lack of suitable graft conduits;
  - Unfavorable LAD artery for PCI (ie, excessive vessel tortuosity or chronic total occlusion).

### Class IIb

- Hybrid coronary revascularization (defined as the planned combination of left internal mammary artery-to-LAD artery grafting and PCI of  $\geq 1$  non-LAD coronary arteries) may be reasonable as an alternative to multivessel PCI or CABG in an attempt to improve the overall risk-benefit ratio of the procedures. (*Level of Evidence: C*)

# Standardizing definitions for hybrid coronary revascularization

Ralf E. Harskamp, MD,<sup>a,c</sup> Johannes O. Bonatti, MD,<sup>b</sup> David X. Zhao, MD, PhD,<sup>c</sup> John D. Puskas, MD,<sup>d</sup> Robbert J. de Winter, MD, PhD,<sup>e</sup> John H. Alexander, MD, MHS,<sup>a</sup> and Michael E. Halkos, MD<sup>d</sup>

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TABLE 1. Currently used definitions for hybrid coronary revascularization

Guideline/registry	Definition
2011 ACCF/AHA/SCAI Guidelines for PCI; 2011 ACCF/AHA Guidelines for CABG <sup>11,12</sup>	The planned combination of LITA-LAD artery grafting and PCI of $\geq 1$ non-LAD coronary arteries. Hybrid coronary revascularization may be performed in a hybrid suite in a single operative setting or as a staged procedure (PCI and CABG performed in 2 different operative suites, separated by hours to 2 d, but typically during the same hospital stay).
2010 ESC/EACTS Guidelines on Myocardial Revascularization <sup>10</sup>	Planned, intentional combination of CABG, with a catheter-based intervention to other coronary arteries during the same hospital stay. Procedures can be performed consecutively in a hybrid operating room or sequentially on separate occasions in the conventional surgical and PCI environments.
STS Adult Cardiac Registry National Database (version 2.73) <sup>9</sup>	A <i>hybrid procedure</i> is defined as a procedure that combines surgical and transcatheter interventional approaches: (1) planned, concurrent is performed in same setting; (2) planned, staged is performed in the same hospital admission; (3) unplanned is performed after incomplete revascularization or graft closure during the same hospital admission.
NCDR CathPCI Registry (version 4.4) <sup>13</sup>	Hybrid therapy occurs when both surgical and percutaneous coronary revascularization are planned, with different lesions treated with the different techniques.
Clinicaltrials.gov (definitions by registered studies)	Minimal invasive LITA-to-LAD and PCI of non-LAD lesions. Procedures can be performed either in the same operating suite or during the same hospitalization

- **Non concordanza:** tipo vaso, n° vasi, sede di procedura, ordine di procedura
- **Concordanza:** stesso ricovero

# RAZIONALE

- L'Arteria mammaria sinistra (AMIsx) mantiene una funzionalità a 20 anni > del 90%
- AMIsx su IVA ha un tasso minore di rivascularizzazione e di angina post-rivascularizzazione comparata con la PCI nella malattia della sola IVA prossimale
- AMIsx su IVA ha una sopravvivenza comparabile alla PCI nella malattia multivasale
- **QUESTIONE: non ci sono studi di comparazione con i DES di II generazione**
- Il graft venoso è ancora il condotto più utilizzato per i vasi NON IVA nonostante la percentuale di degenerazione
- **QUESTIONE: la rivascularizzazione con solo arterie è rara (25% in EXCEL)**

## SVG graft patency for non-LAD targets

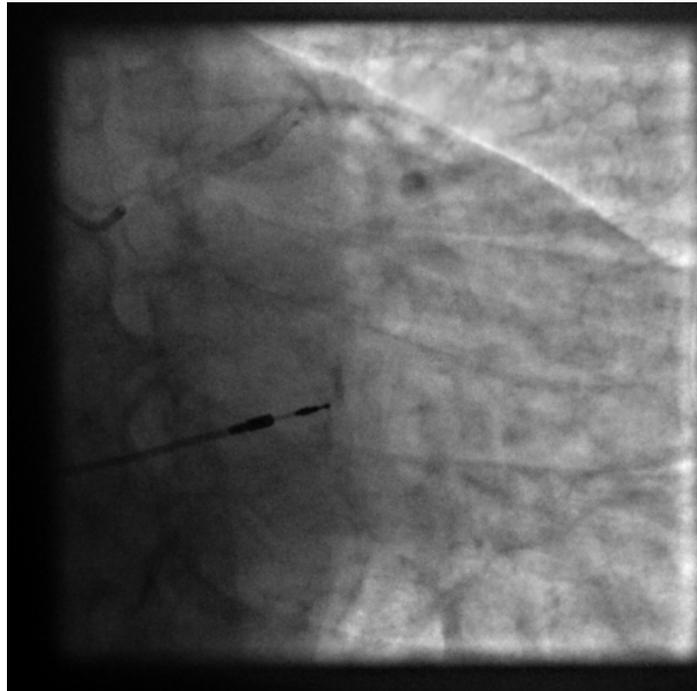
	YEAR	n	SVG imaged (SVG occluded) at 12 m	SVG occlusion rate %
Puskas et al	2004	153	306 (10)	3.2
Alexander et al	2005	1920	4537 (500)	11
Sabik et al	2005	4333	8733 (1621)	18
Cho et al	2007	833	218 (40)	13
Desai et al	2007	440	440 (60)	13.6
Kim et al	2008	240	121 (11)	9.9
			14355 (2242)	11.45

## DES stents patency for non-LAD target

	YEAR	n	Restenosis > 50% 6-12 m	Stent thrombosis
Silber et al TAXUS II	2009	536	2.4	0.1
Meredith et al ENDEAVOR I	2009	100	5.4	1
Fajadet et al ENDEAVOR II	2010	1197	9.4	0.5
Kandzari et al ENDEAVOR III	2011	436	9.2	0
Serruys et al SPIRIT I	2005	60	0	0
Serruys et al SPIRIT II	2006	300	2.1	0.9
Stone et al SPIRIT III	2008	1002	2.3	0.8
Average			4.39	0.47

# Eleggibilità per rivascolarizzazione ibrida

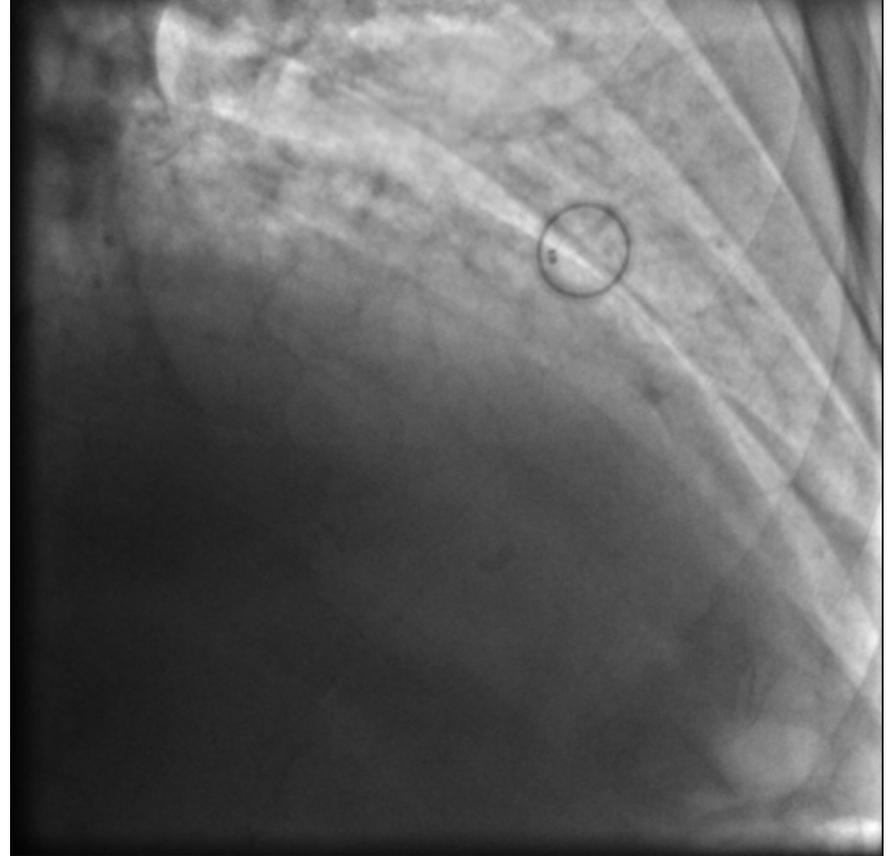
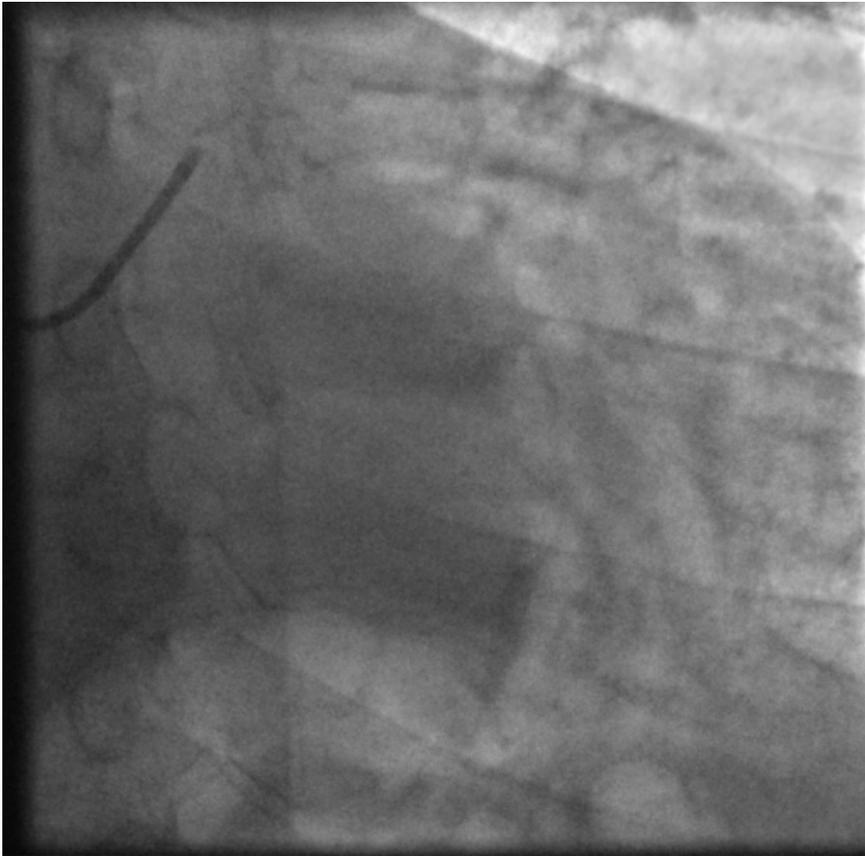
- Lesione ostiale o prossimale complessa di IVA con vaso a valle che garantisce un buon risultato di LITA-IVA
- Lesione non IVA, eleggibile per PCI con alta probabilità di buon risultato
- Non controindicazione a doppia antiaggregazione
- Lesione complessa di tronco comune(1,1,1) distale quando è fattibile PCI di TC-Cfx



SIMULTANEO	DIFFERITO	DIFFERITO
CABG e conseguente PCI	CABG prima	PCI prima
<b>Vantaggi</b>		
Possibilità di visualizzare la mammaria	Possibilità di visualizzare la mammaria in condizioni «stabili»	Possibilità di visualizzare la mammaria in condizioni «stabili»
Protezione della mammaria in PCI ad alto rischio	Doppia antiaggregazione a rischio di sanguinamento minore	Minor rischio di instabilizzazione con rivascularizzazione dei territori non IVA
Possibilità di conversione a CABG se problemi durante PCI	Protezione della mammaria in PCI ad alto rischio	Utile nelle lesioni instabili quando non interessa l'IVA
Miglior costo-efficacia	Asintomaticità post LITA-IVA	Utile in caso di non successo di PCI
Miglior tolleranza del paziente		
<b>Svantaggi</b>		
Fattibilità solo in sala ibrida	Rischio di instabilizzazione tra i due interventi	Impossibilità di visualizzare la mammaria
Stato proinfiammatorio postchirurgico aumenta il rischio di trombosi di stent	Alto rischio di reintervento se insuccesso di PCI	Alto rischio di stent trombosi durante CABG
La doppia antiaggregazione aumenta il rischio di sanguinamento		Rischio aumentato di sanguinamento durante CABG
Possibile insulto renale maggiore		Rischio di eventi su IVA

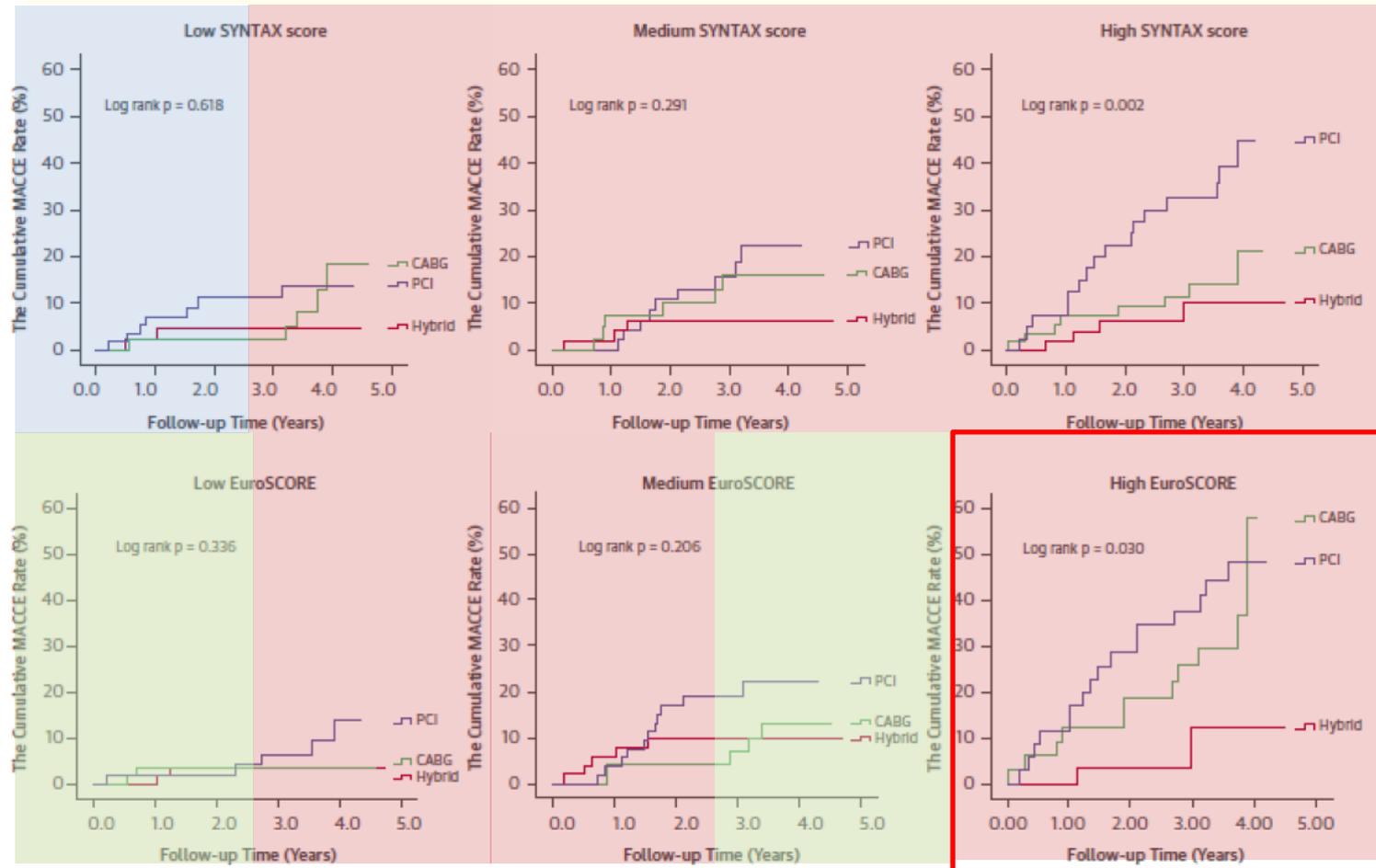
# PTCA prima

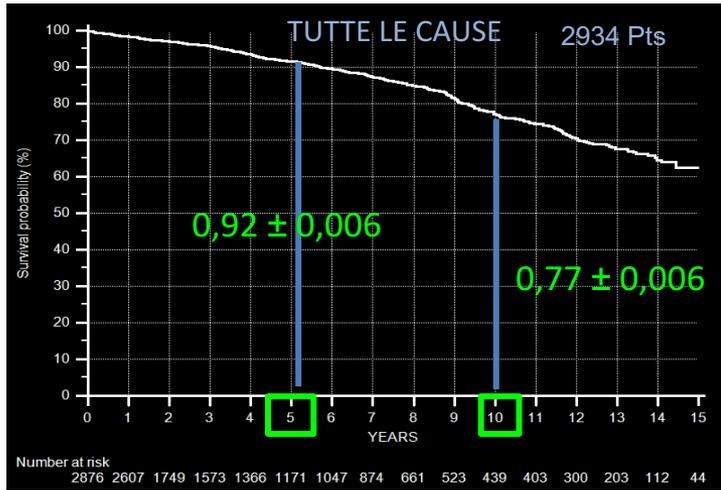
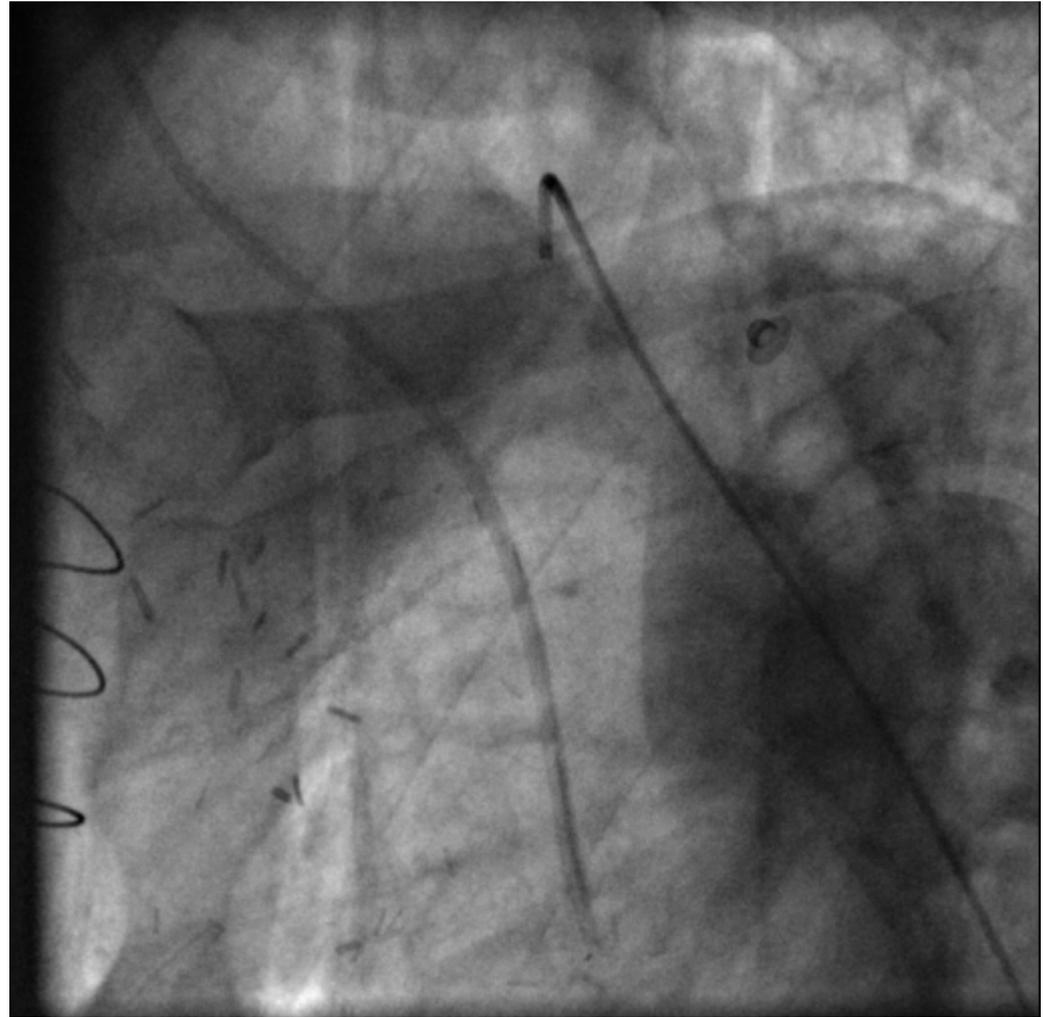
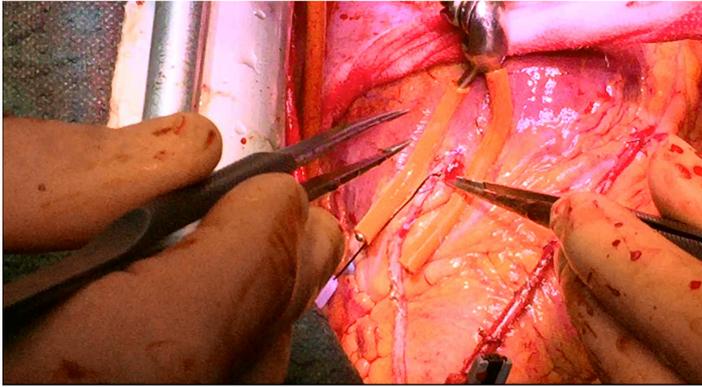
- Maschio, 82 anni, piastrinopenia
- Diabete mellito in terapia orale
- Fibrillazione atriale parossistica
- Angina instabile
- Ecocardiogramma TT: disfunzione ventricolare sinistra, FE 35%



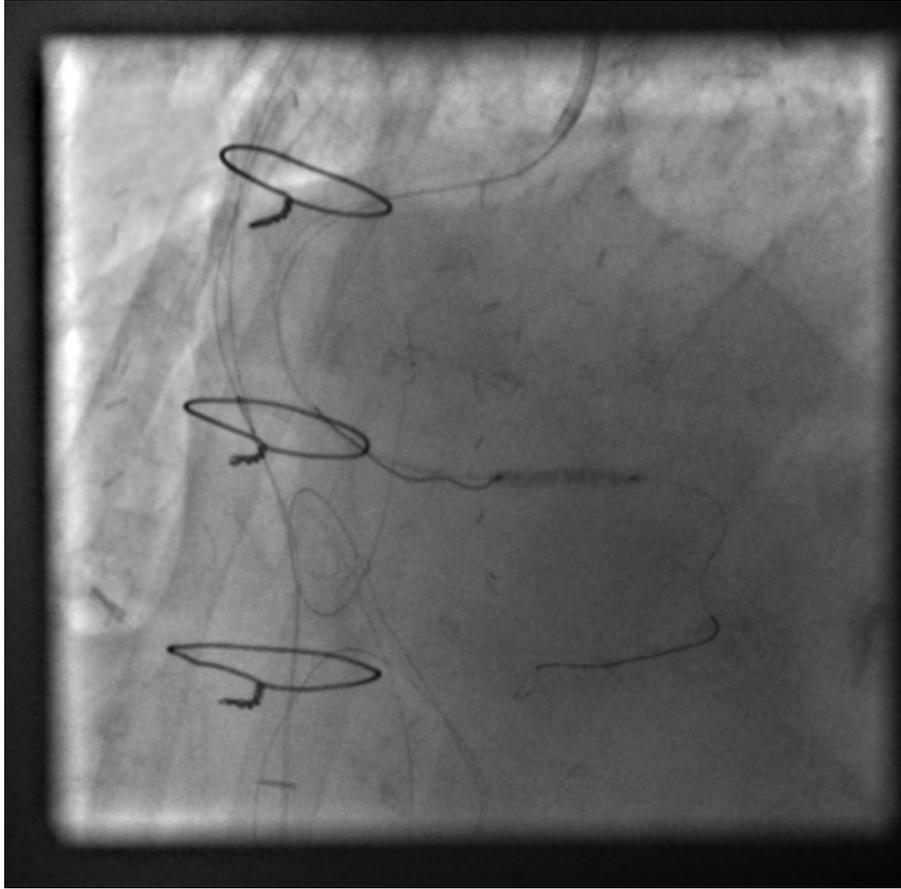
# One-Stop Hybrid Coronary Revascularization Versus Coronary Artery Bypass Grafting and Percutaneous Coronary Intervention for the Treatment of Multivessel Coronary Artery Disease

## 3-Year Follow-Up Results From a Single Institution

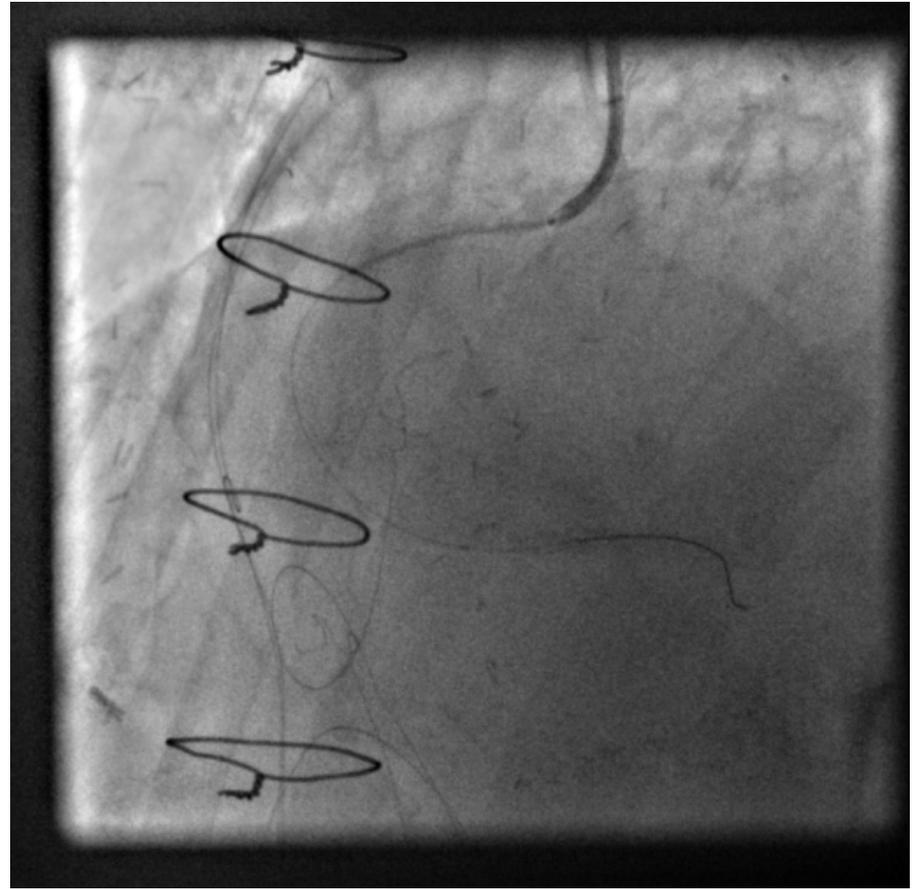




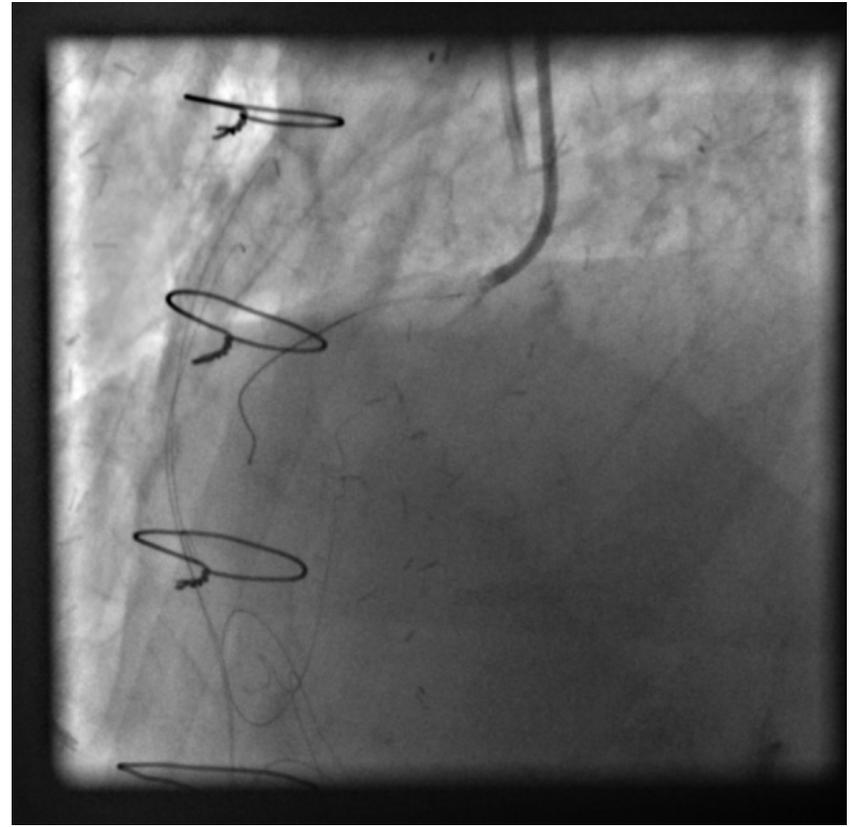
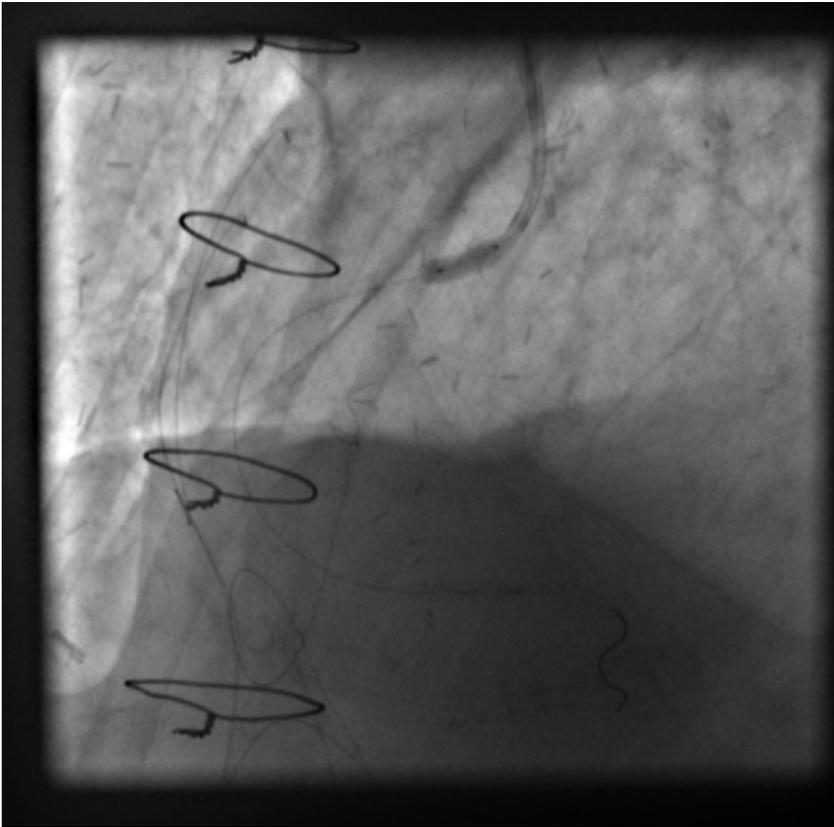
Fondazione Poliambulanza – Brescia (1997-2015)



Onyx 2.75 X 15 mm

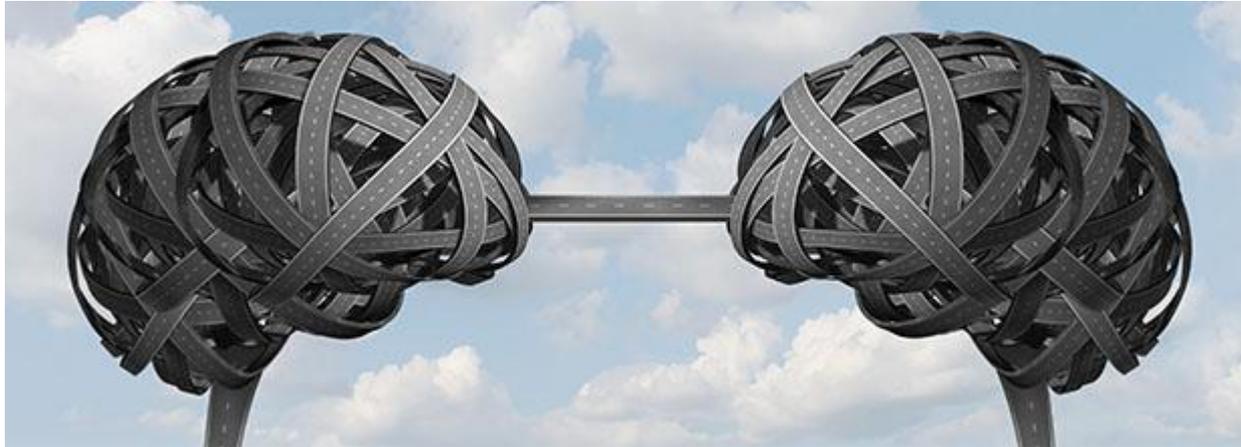


Onyx 3.5 X 28 mm



Euphora NC 3 x 8 mm mm

# La rivascularizzazione ibrida ha successo quando:



- Stima del profilo di rischio cardiovascolare
- Stima del rischio operatorio di rivascularizzazione completa
- Stima del rischio di angioplastica dei tre vasi
- Stima del rischio di procedura ibrida
- Pianificazione del «piano di volo»
- Vince il motto: + vasi con - rischio

La rivascularizzazione ibrida, nel paziente multivasale diabetico, quando:

- Ridurre il rischio operatorio (paziente complesso)
- Distalità dei vasi (non IVA) non favorevoli per una vena
- Distalità IVA adatto ad accettare LITA
- Alta probabilità di buon risultato di PTCA
- Tolleranza doppia antiaggregazione



Letter to the Editor

Hybrid coronary revascularization versus coronary artery bypass surgery: Systematic review and meta-analysis<sup>☆</sup>



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DIABETICI 39%  
ETA' MEDIA 64 ANNI

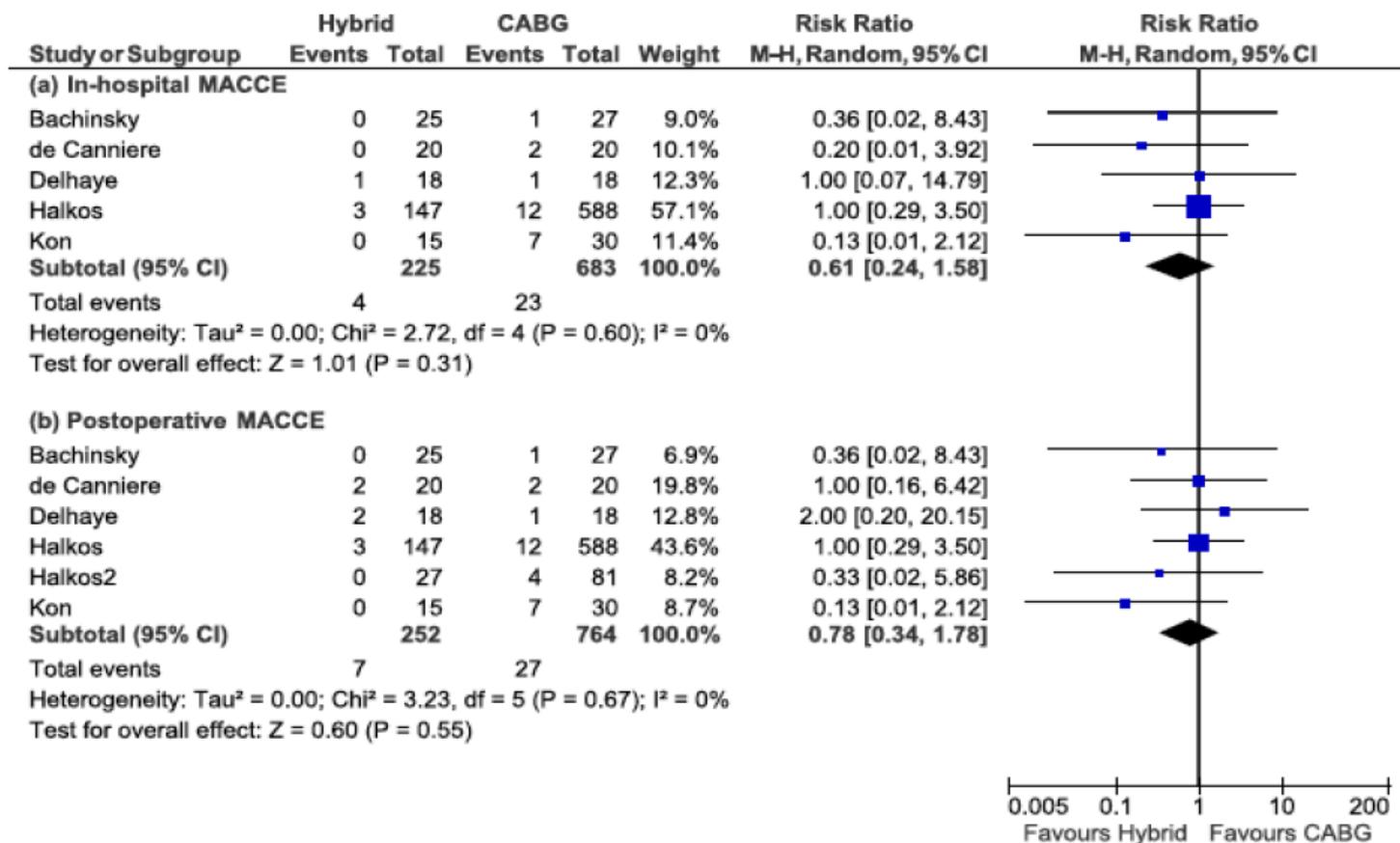


Fig. 1. Forest plot of (a) in-hospital MACCE, (b) postoperative MACCE, from eligible studies comparing hybrid coronary revascularization with coronary artery bypass grafting in a random-effects model.

# Comparative Effectiveness of Hybrid Coronary Revascularization vs Coronary Artery Bypass Grafting



Ralf E Harskamp, MD, Thomas A Vassiliades, MD, FACS, Rajendra H Mehta, MD, MS, Robbert J de Winter, MD, PhD, Renato D Lopes, MD, PhD, Ying Xian, MD, PhD, Eric D Peterson, MD, MPH, John D Puskas, MD, MS, FACS, Michael E Halkos, MD, MS, FACS

**Table 3.** Thirty-Day Major Adverse Cerebrovascular and Cardiovascular Events and In-Hospital Outcomes

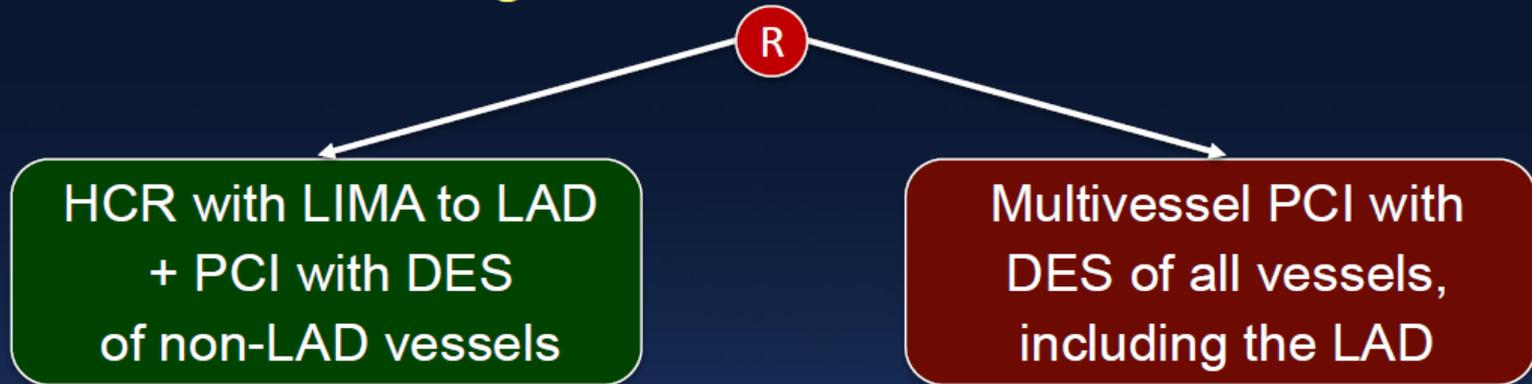
Characteristics	HCR (n = 306)	CABG (n = 918)	OR (95% CI)	p Value
Composite of 30-d death, MI, stroke, n (%)	10 (3.3)	28 (3.1)	1.07 (0.52–2.21)	0.85
Death	5 (1.6)	10 (1.1)	1.50 (0.51–4.39)	0.46
MI	2 (0.7)	8 (0.9)	0.75 (0.16–3.53)	0.72
Stroke	3 (1.0)	16 (1.7)	0.56 (0.16–1.93)	0.36
In-hospital major morbidity, n (%)	26 (8.5)	142 (15.5)	0.55 (0.36–0.83)	0.005
Reoperation	13 (4.2)	53 (5.8)	0.74 (0.40–1.35)	0.32
Renal failure	5 (1.7)	21 (2.3)	0.71 (0.27–1.89)	0.50
Prolonged ventilation, >24 h	16 (5.3)	102 (11.1)	0.48 (0.28–0.81)	0.006
Access site infection	0 (0.0)	11 (1.2)	—	—
Bleeding outcomes				
CABG-related bleeding, n (%)	22 (7.2)	85 (9.3)	0.78 (0.49–1.24)	0.29
Need for blood transfusion, n (%)	66 (21.6)	428 (46.6)	0.46 (0.36–0.60)	<0.001
Chest tube drainage, mL/24 h	690 (485–1,050)	920 (710–1,230)	$\beta = -1.58, t = -5.57^*$	<0.001
Recovery parameters, n (%)				
Short PLOS, <5 d	161 (52.6)	350 (38.1)	1.38 (1.15–1.66)	0.001
Long PLOS, >14 d	7 (2.3)	46 (5.0)	0.46 (0.21–1.01)	0.053

\*Linear regression models were used.

HCR, hybrid coronary revascularization; OR, odds ratio; PLOS, postoperative length of stay.

# Randomized Trial of Hybrid Coronary Revascularization vs. PCI

2,354 pts at up to 100 sites with MVD involving the LAD distribution eligible for both HCR and PCI with DES



**Follow-up:** 30 days, 1 year and annually through 5 years

## Primary endpoint

5-year MACCE (death, MI, stroke, repeat revascularization)

Powered to detect superiority of HCR over PCI

**Principal Investigators:** John D. Puskas and Gregg W. Stone

# One-stop hybrid coronary revascularization versus off-pump coronary artery bypass in patients with diabetes mellitus

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The Journal of Thoracic and Cardiovascular Surgery • June 2016

Variable	HCR (n = 120)	OPCAB (n = 240)	<i>P</i> value
Chest tube drainage within 24 hours, mL, median (IQR)	573 (320-835)	700 (530-950)	<.001
Total chest tube drainage, mL, median (IQR)	748 (540-1080)	990 (730-1250)	<.001
Transfusion of packed RBCs, n (%)	22 (18.3)	71 (29.6)	.032
Transfusion of plasma, n (%)	23 (19.2)	53 (22.1)	.523
Transfusion of any blood products, n (%)	35 (29.2)	95 (39.6)	.076
Reoperation for controlling bleeding, n (%)	1 (0.8)	6 (2.5)	.307
Mechanical ventilation time, hour, median (IQR)	13.7 (10.3-16.9)	16.8 (13.0-19.6)	<.001
Length of ICU stay, hour, median (IQR)	21.7 (19.0-44.3)	46.5 (24.3-72.7)	<.001
Length of hospital stay, day, median (IQR)	7 (7-9)	7 (7-9)	.627

*HCR*, Hybrid coronary revascularization; *OPCAB*, off-pump coronary artery bypass grafting; *IQR*, interquartile range; *RBC*, red blood cell; *ICU*, intensive care unit.

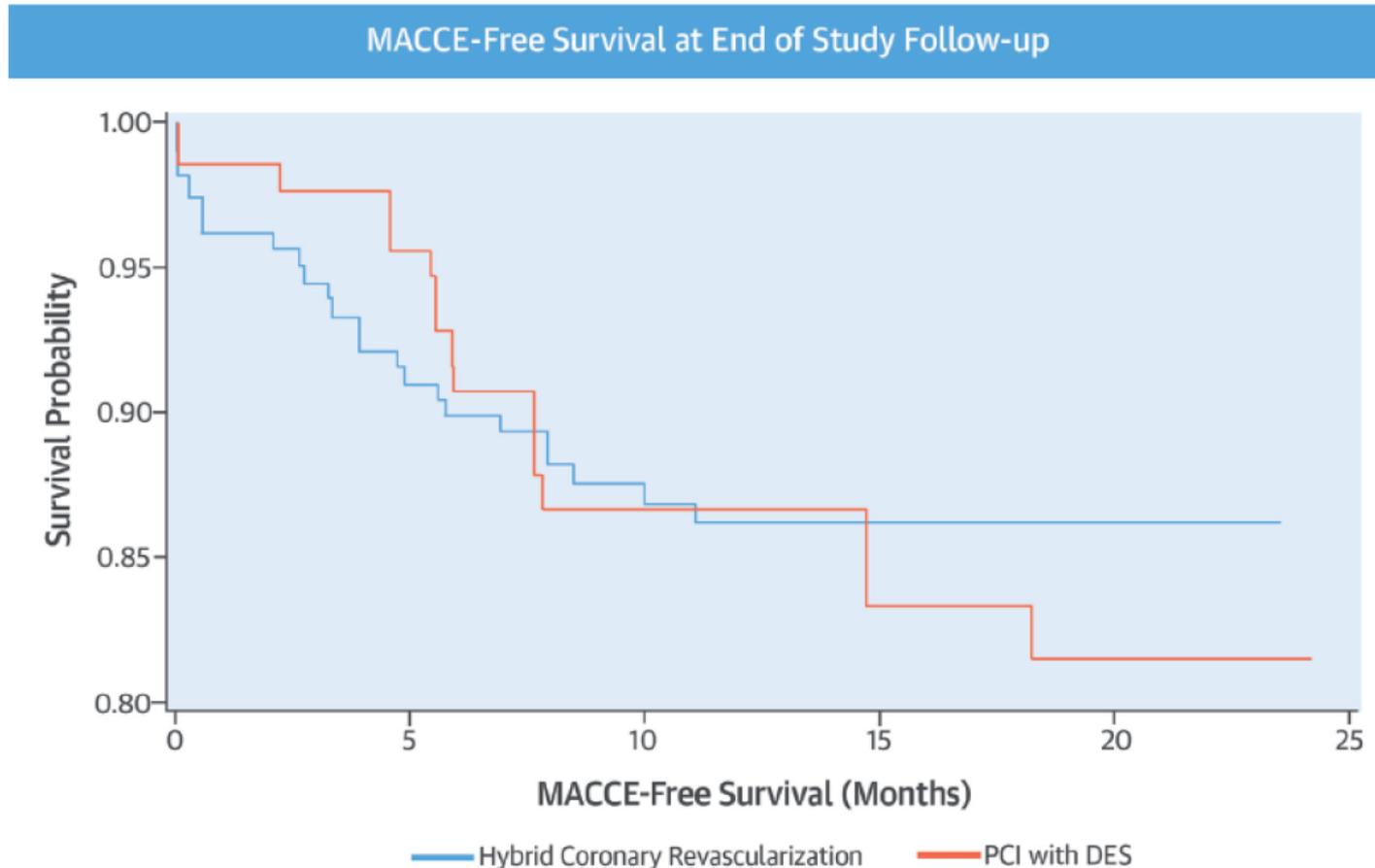
DM patients who underwent one-stop HCR from June 2007 to September 2014. (n = 120)

Propensity score matching.  
(One-stop HCR : OPCAB = 1 : 2)

DM patients who underwent OPCAB. (n = 1658)

# Hybrid Coronary Revascularization for the Treatment of Multivessel Coronary Artery Disease:

## A Multicenter Observational Study



Puskas, J.D. et al. *J Am Coll Cardiol.* 2016;68(4):356-65.

In this first multicenter observational study of hybrid coronary revascularization (HCR) and multivessel percutaneous coronary intervention (PCI) for patients with hybrid-eligible coronary anatomy, risk-adjusted major adverse cardiovascular and cerebrovascular events (MACCE) rates were similar between groups through 12 months of follow-up. During longer follow-up, at 18 months, MACCE-free survival curves for HCR versus PCI began to diverge, with increasing MACCE in the multivessel PCI group. DES = drug-eluting stent(s).