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VIII CONGRESSO NAZIONALE ECOCARDIOCHIRURGIA 2016

NO, 21 - 22 - 23 MARZO 2016 MILANO, 21 - 22 - 23 MARZO 2016 MILANO, 21 - 22 - 23 MARZO 2016 MILANO
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**Centro Congressi
Palazzo delle Stelline
Corso Magenta, 61
20123 Milano**

MINI CORSO INTERVENTISTICA/CARDIOCHIRURGIA

Martedì, 22 marzo 2016

2ª Parte: La terapia nella CAD cronica

QUANDO AVVIARE IL PAZIENTE ALLA CARDIOCHIRURGIA NELLA CAD CRONICA

Enrico Citterio U.O. di Cardiochirurgia

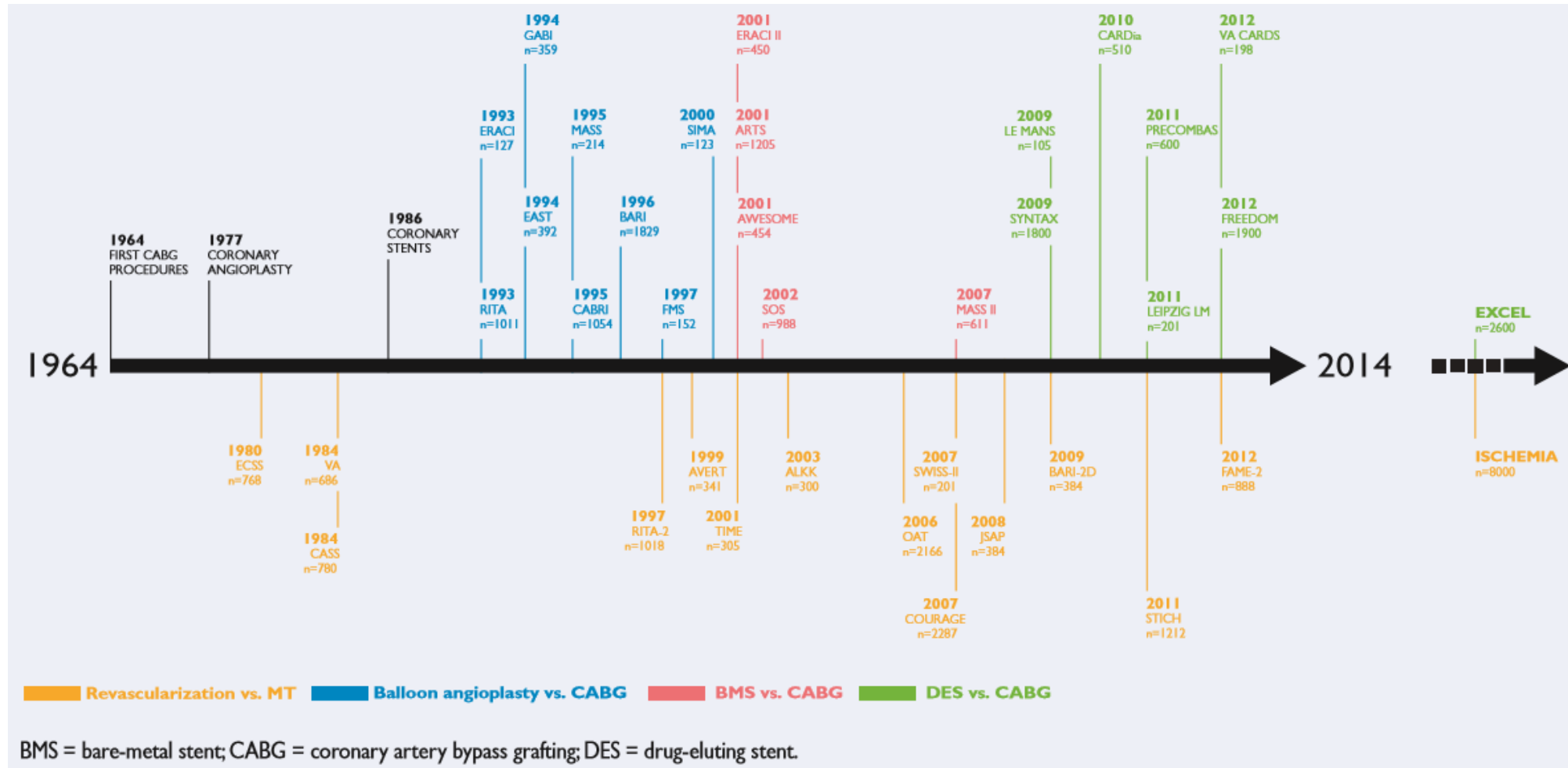
Humanitas Research Hospital

1964 – 2014 Fifty years of coronary artery bypass with mammary artery



February 25, 1964 in the clinic of Pavlov Medical Institute Vasily Kolesov performed the world's first coronary bypass surgery for 44-year-old patient with severe stenocardia. This successful operation was preceded by several experiments on dogs during which the surgeon managed to win a hard time limit using his own suture machine. Using this technological advantage in 1968 Vasily Kolesov performed the first surgery to restore blood flow in the arteries on open heart. Mammary coronary bypass is now worldwide known as "Kolesov's operation".

“The optimal treatment approach for patients with multivessel coronary disease remains unclear despite a myriad of randomized clinical trials performed in the last several decades”



- ▶ CABG: bypass grafts are placed in the mid-coronary vessel beyond the culprit lesion providing extra sources of blood flow to the myocardium and offering protection against the consequences of further proximal obstructive disease
- ▶ Coronary STENTS aim at restoring normal blood flow of the native coronary vasculature by local treatment of obstructive lesions without offering protection against new disease proximal to the stent



2014 ESC/EACTS Guidelines on myocardial revascularization

The Task Force on Myocardial Revascularization of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS)

Myocardial revascularization has been subject to more randomized clinical trials (RCTs) than almost any other intervention (*Figure 1*). In order to inform the current Guidelines, this Task Force performed a systematic review of all RCTs performed since 1980, comparing head-to-head the different revascularization strategies—including CABG, balloon angioplasty, and PCI with bare-metal stents (BMS) or with various US Food and Drug Administration-approved drug-eluting stents (DES)—against medical treatment as well as different revascularization strategies, and retrieved 100 RCTs involving 93 553 patients with 262 090 patient-years of follow-up.⁴

2014 ESC/EACTS Recommendation for the type of revascularization in Stable Coronary Artery Disease

Recommendation for the type of revascularization (CABG or PCI) in patients with SCAD with suitable coronary anatomy for both procedures and low predicted surgical mortality

Recommendations according to extent of CAD	CABG		PCI		Ref ^c
	Class ^a	Level ^b	Class ^a	Level ^b	
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

CABG = coronary artery bypass grafting; LAD = left anterior descending coronary artery; PCI = percutaneous coronary intervention; SCAD = stable coronary artery disease.

^aClass of recommendation.

^bLevel of evidence.

^cReferences.

Characteristics to guide decision-making between CABG and PCI

Coronary Anatomy

Syntax Score

Clinical Characteristics

Age/Fragility

Sex

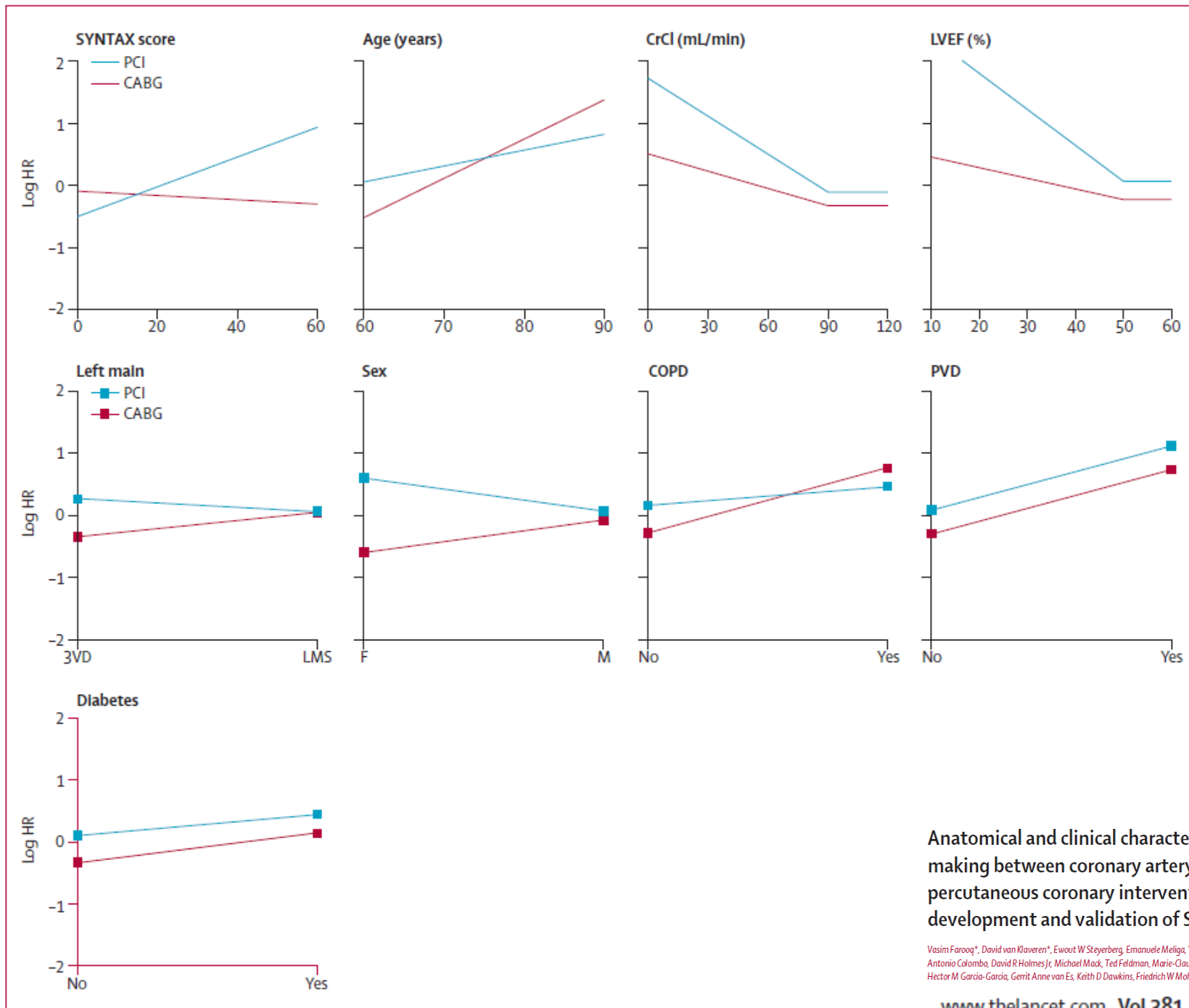
Left Ventricle Ejection Fraction

Chronic Renal Failure

Chronic Obstructive Pulmonary Disease

Diabetes

Re-do patients



Anatomical and clinical characteristics to guide decision making between coronary artery bypass surgery and percutaneous coronary intervention for individual patients: development and validation of SYNTAX score II

Vasim Farooq*, David van Klaveren*, Ewout W Steyerberg, Emanuele Meliga, Yvonne Vergouwe, Alaiide Chieffo, Arie Pieter Kappetein, Antonio Colombo, David R Holmes Jr, Michael Mack, Ted Feldman, Marie-Claude Morice, Elisabeth Stähle, Yoshinobu Onuma, Marie-angèle Morel, Hector M Garcia-Garcia, Gerrit Anne van Es, Keith D Dawkins, Friedrich W Mohr, Patrick W Serruys

Figure 1: Predictor effects for CABG and PCI in SYNTAX score II

Anatomical and clinical characteristics to guide decision making between coronary artery bypass surgery and percutaneous coronary intervention for individual patients: development and validation of SYNTAX score II

Vasim Farooq*, David van Klaveren*, Ewout W Steyerberg, Emanuele Meliga, Yvonne Vergouwe, Alaide Chieffo, Arie Pieter Kappetein, Antonio Colombo, David R Holmes Jr, Michael Mack, Ted Feldman, Marie-Claude Morice, Elisabeth Stähle, Yoshinobu Onuma, Marie-angèle Morel, Hector M Garcia-Garcia, Gerrit Anne van Es, Keith D Dawkins, Friedrich W Mohr, Patrick W Serruys

The present study shows the important principle of **combination of anatomical and clinical variables**, which interact with CABG and PCI to affect 4-year mortality (ie, are more predictive of mortality in one or the other revascularisation methods), and therefore drive decision making between CABG and PCI.

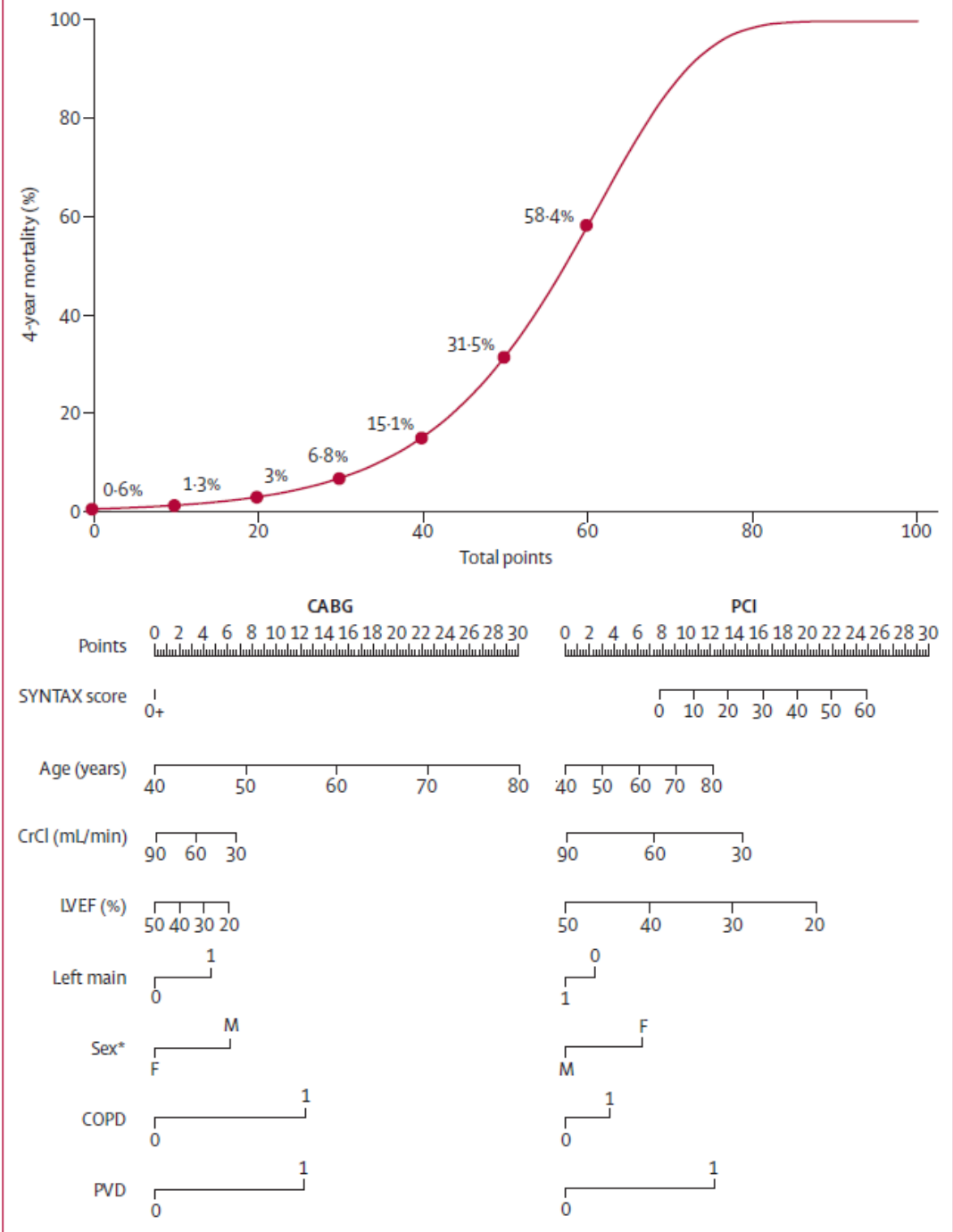
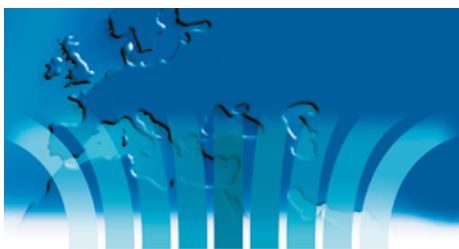


Figure 4: SYNTAX Score II nomogram for bedside application

Guidelines on myocardial revascularization...who cares?



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Rev Esp Cardiol. 2009;62(07):719-25 - Vol. 62 Num.07 DOI: 10.1016/S1885-5857(09)72350-3

Percutaneous Coronary Interventions for All Patients With Complex Coronary Artery Disease: Triple Vessel Disease or Left Main Coronary Artery Disease. Yes? No? Dont Know?

Patrick Serruys^a, Scot Garg^a

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Coronary artery disease remains the leading cause of mortality worldwide. Coronary

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Percutaneous Coronary Interventions for All Patients With Complex Coronary Artery Disease: Triple Vessel Disease or Left Main Coronary Artery Disease. Yes? No? Don't Know?

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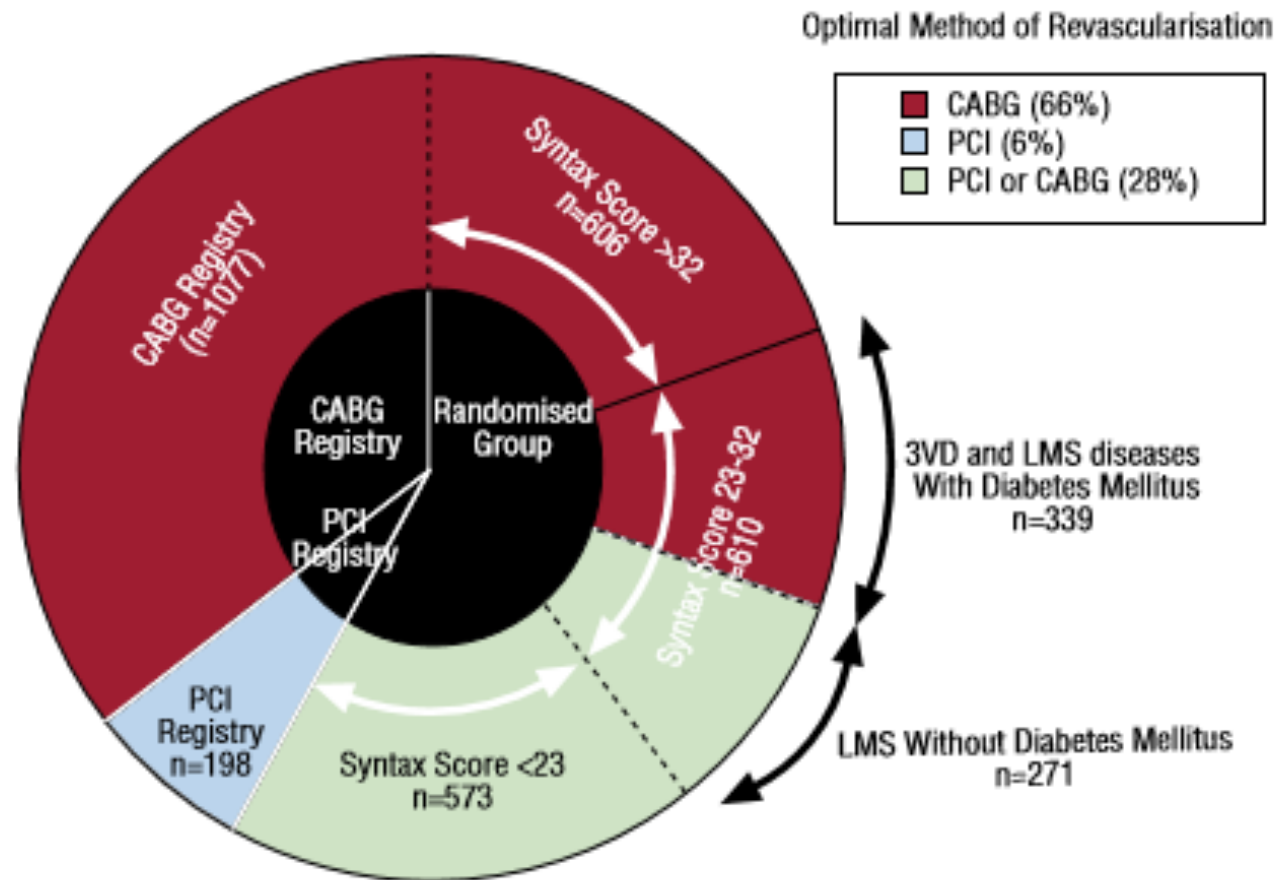


Figure 2. A pie chart summarising the optimal method of revascularisation of all patients in the SYNTAX trial taking into account both the initial decision of the Heart team, and the SYNTAX score. The central pie chart (black) shows the distribution of patients on entry into the study, whilst the outer pie chart shows those patients in the randomised group split according to their SYNTAX score. Finally, the colours represent the preferred method of primary revascularisation for each subgroup. Reproduced with permission Garg S, Serruys PW¹⁹. CABG, coronary artery bypass surgery; LMS, left main stem; PCI, percutaneous coronary intervention; 3VD, triple vessel disease.

The Heart Team Decision-Making



- ▶ The so-called “Heart Team” concept has not been widely implemented
- ▶ Decision-making remains suboptimal
Large variability in PCI-CABG ratios
- ▶ Overuse, underuse and inappropriate selection of revascularization

Variability in PCI - CABG ratio in Western Countries

The **Organization of Economic Cooperation and Development (OECD)** reported a mean PCI-to-CABG ratio of 3.29 in 2007 in those countries affiliated with the organization, ranging from a low of 0.67 in Mexico to a high of 8.63 in Spain

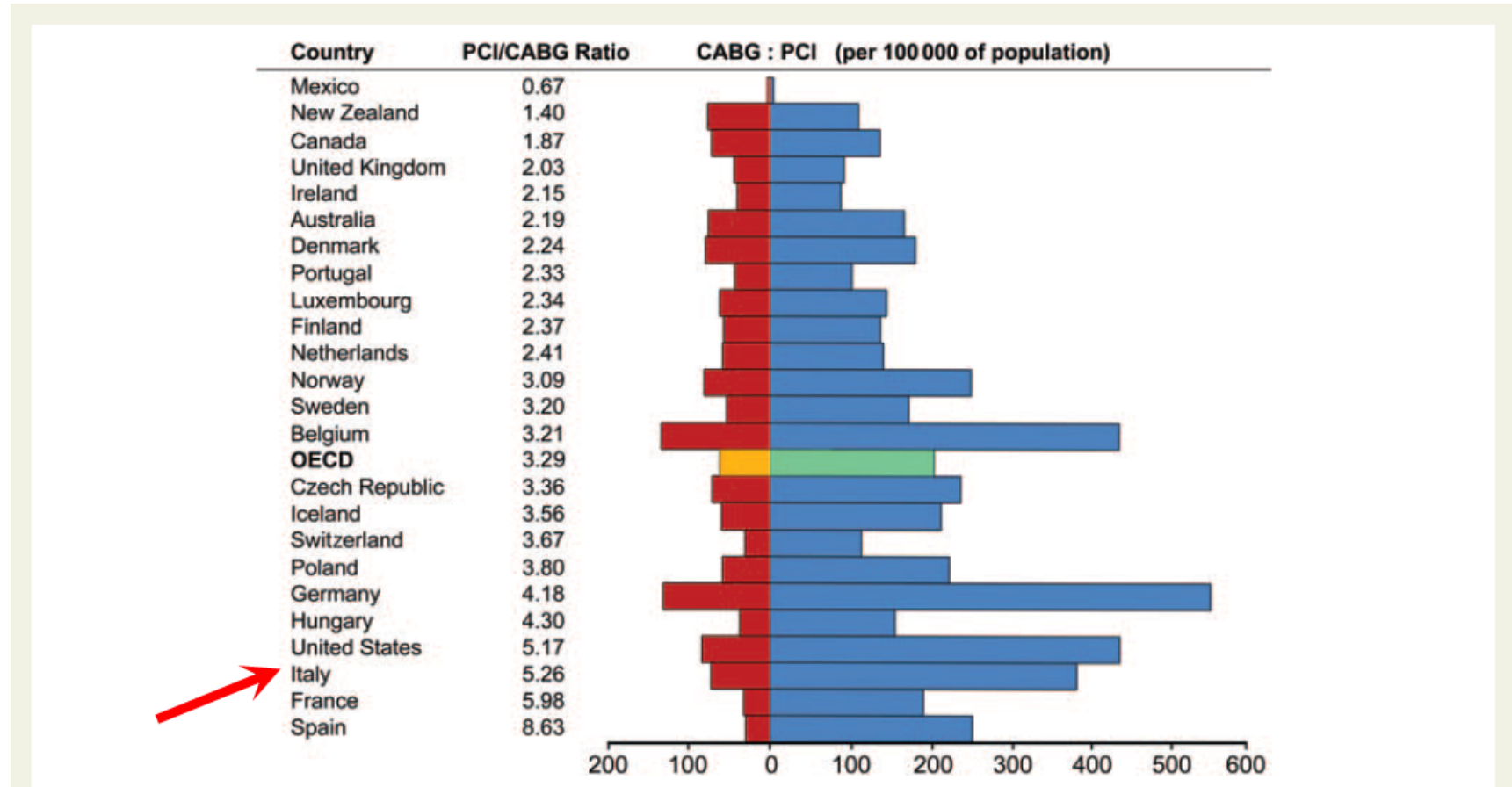


Figure 1 Revascularization procedures performed in countries throughout the Western world. Data from the Organisation for Economic Cooperation and Development (OECD) shows a great variety in the number of revascularization procedures per 100 000 inhabitants.¹³ CABG, coronary artery bypass grafting; PCI, percutaneous coronary intervention.

Coronary Artery Disease

Appropriateness of Coronary Revascularization for Patients Without Acute Coronary Syndromes

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 Alice K. Jacobs, MD,‡ David R. Holmes, Jr, MD,§ Nicholas J. Stamato, MD,|| Samin Sharma, MD,¶
 Ferdinand J. Venditti, MD,# Icilma Fergus, MD,** Spencer B. King III, MD††
*Albany, Binghamton, and New York, New York; Baltimore, Maryland; Boston, Massachusetts;
 Rochester, Minnesota; Toledo, Ohio; and Atlanta, Georgia*

Conclusions

Our study: 1) reinforces earlier findings regarding the relatively low percentage of patients undergoing PCI for reasons deemed appropriate by the ACCF; 2) provides new evidence that the ACCF criteria indicate very high levels of appropriateness for CABG surgery; and 3) demonstrates that in addition to the many PCI patients deemed inappropriate or uncertain for the procedure, there are many more for whom proper judgment of appropriateness cannot be made for lack of supporting information. Our intent is to share these findings with clinicians and to work collaboratively to reduce inappropriate clinical decisions and variations in hospital and cardiologist practice patterns.

(ACCF), The American College of Cardiology Foundation

Table 1

Rating Cases as Appropriate for Revascularization According to ACC/AHA Appropriate Use Criteria Patients*

Case Description	Procedure Performed	
	CABG	PCI
Total cases reported	14,519	81,407
Eligible cases—no ACS, no previous CABG (% of all cases reported that are eligible)	10,460 (72.04)	33,970 (41.73)
Eligible cases where rating cannot be determined	2,292	9,425
Cases rated for appropriateness of revascularization	8,168	24,545
Revascularization (CABG or PCI) is		
Appropriate	7,372 90.25%	8,856 36.08%
Inappropriate	91	3,508
Uncertain	1.11% 705	14.29% 12,181
	8.63%	49.63%

*Patients without prior bypass and without ACS, New York, July 1, 2009, to December 31, 2010.
 ACC = American College of Cardiology; ACS = acute coronary syndrome(s); AHA = American Heart Association; CABG = coronary artery bypass graft surgery; PCI = percutaneous coronary intervention.

Overt and subconscious factors that influence whether comprehensive and well-balanced information of revascularization strategies is provided by physicians

'Building an empire' leading to (inter)national recognition

Conflict of interest with industry

Knowledge of patient's preferences

No appreciation of personal therapeutic limits

Not being up-to-date regarding PCI and/or CABG (technology, outcomes, indications, etc.)

Opportunity to include a patient in an enrolling randomized trial

Personal conflict between interventional cardiologist and/or surgeon

Physician–patient bonding

Preservation of patient–referral pathways

The physician's centre is a centre of excellence in PCI or CABG

The Coronary Heart Team

- ▶ **The Heart Team has recently become a class 1C recommendation in European and American guidelines on myocardial revascularization**

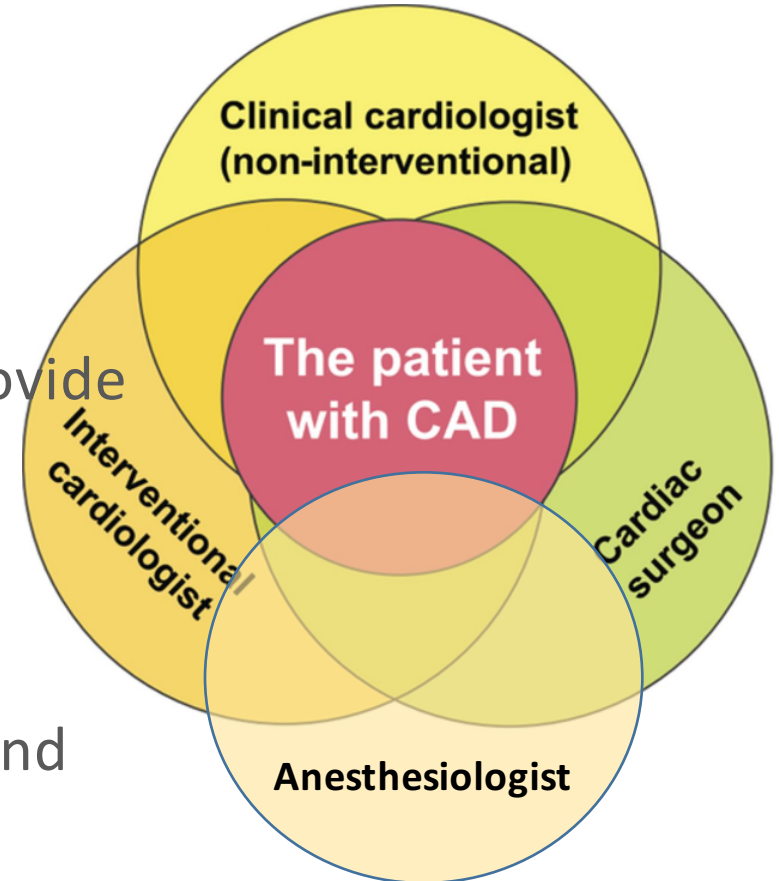
Physician-related factors dominate treatment decision

Surgeons and cardiologists differ in the information they provide the patient regarding the choice between PCI and CABG

Physicians can be held accountable for inappropriate decision-making and face medico-legal consequences

Heart Team approach can cause delays in decision-making and treatment

Logistics are of course the major barrier to convening the Heart Team



Repeated PCI procedures, it's not always like the first time

Long-Term Outcomes of Coronary-Artery Bypass Grafting versus Stent Implantation

Edward L. Hannan, Ph.D., Michael J. Racz, Ph.D., Gary Walford, M.D., Robert H. Jones, M.D., Thomas J. Ryan, M.D., Edward Bennett, M.D., Alfred T. Culliford, M.D., O. Wayne Isom, M.D., Jeffrey P. Gold, M.D., and Eric A. Rose, M.D.

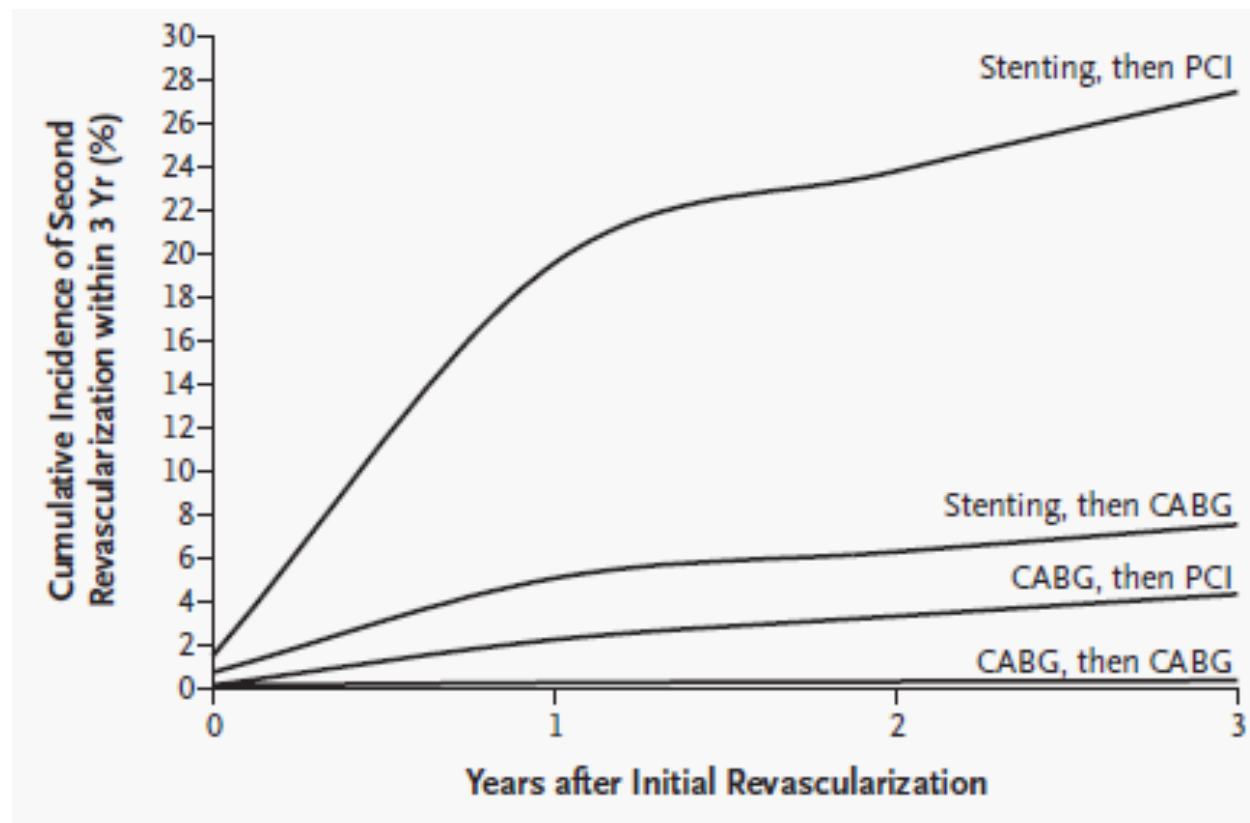


Figure 1. Percentage of Patients Undergoing a Second Revascularization Procedure within Three Years.

Prognostic impact of previous percutaneous coronary intervention in patients with diabetes mellitus and triple-vessel disease undergoing coronary artery bypass surgery

Matthias Thielmann, MD,^a Markus Neuhäuser, PhD,^b Stephan Knipp, MD,^a Eva Kottenberg-Assenmacher, MD,^c Anja Marr,^b Nikolaus Pizanis, MD,^a Matthias Hartmann, MD,^c Markus Kamler, MD,^a Parwis Massoudy, MD,^a and Heinz Jakob, MD^a

Between January 2000 and March 2006, 621 consecutive patients with diabetes mellitus and triple-vessel disease undergoing isolated first-time coronary artery bypass grafting as the primary revascularization procedure (group 1)

128 patients with diabetes mellitus and triple-vessel disease treated during the same time period with previous percutaneous coronary intervention before coronary artery bypass grafting (group 2).

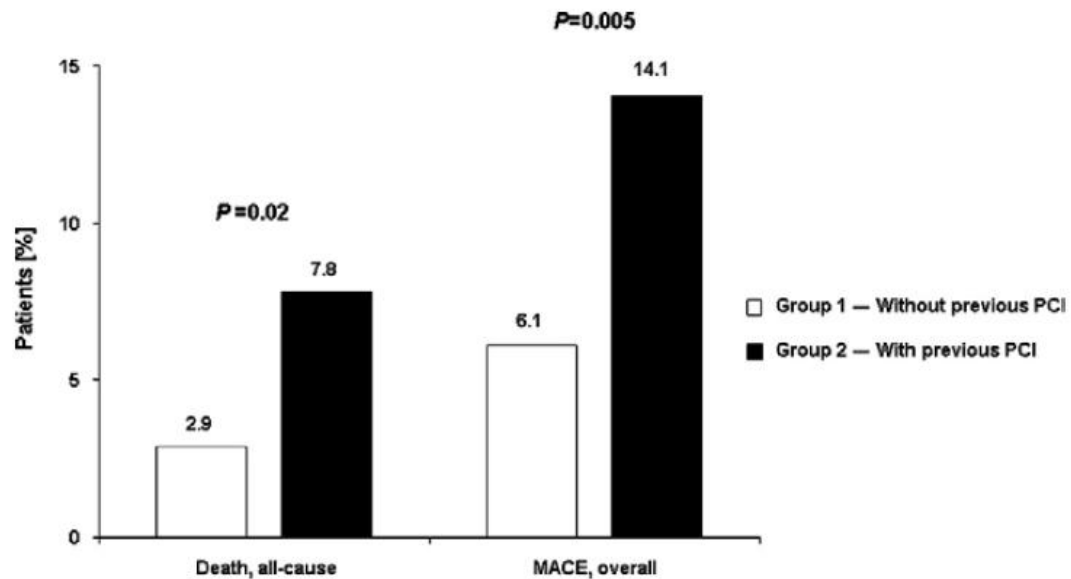


Figure 1. Incidence of death and major adverse cardiac events (MACE) during hospital stay. *P*, Overall significance between the groups.

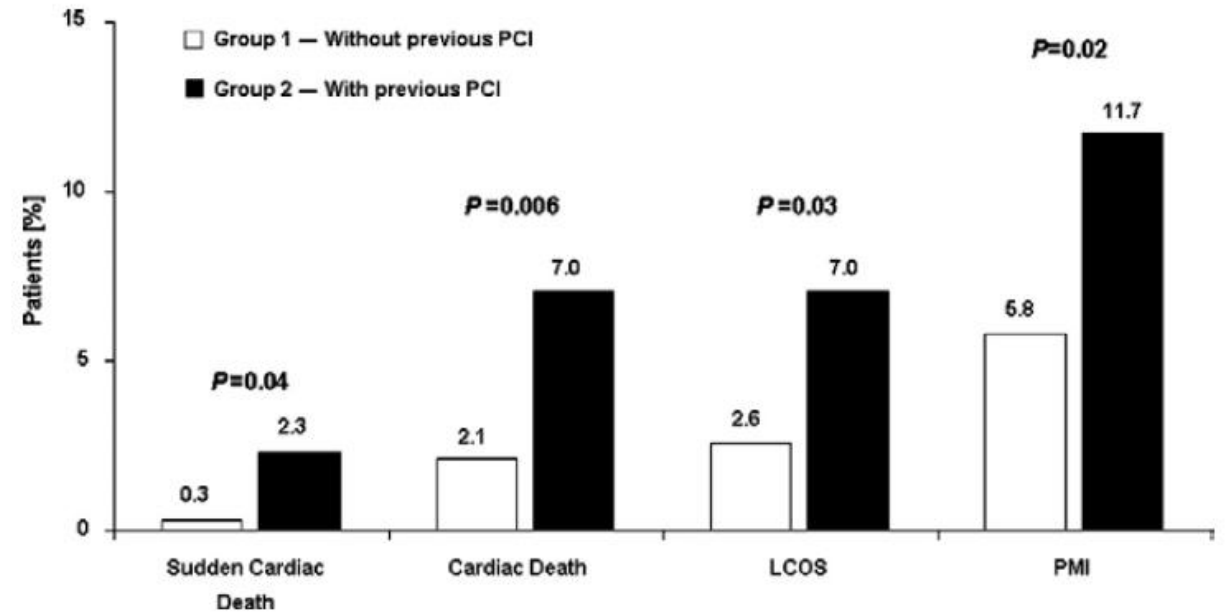


Figure 2. Incidence of secondary end points during hospital stay. *P*, Overall significance between the groups; *PCI*, percutaneous coronary intervention; *LCOS*, low cardiac output syndrome; *PMI*, perioperative myocardial infarction.

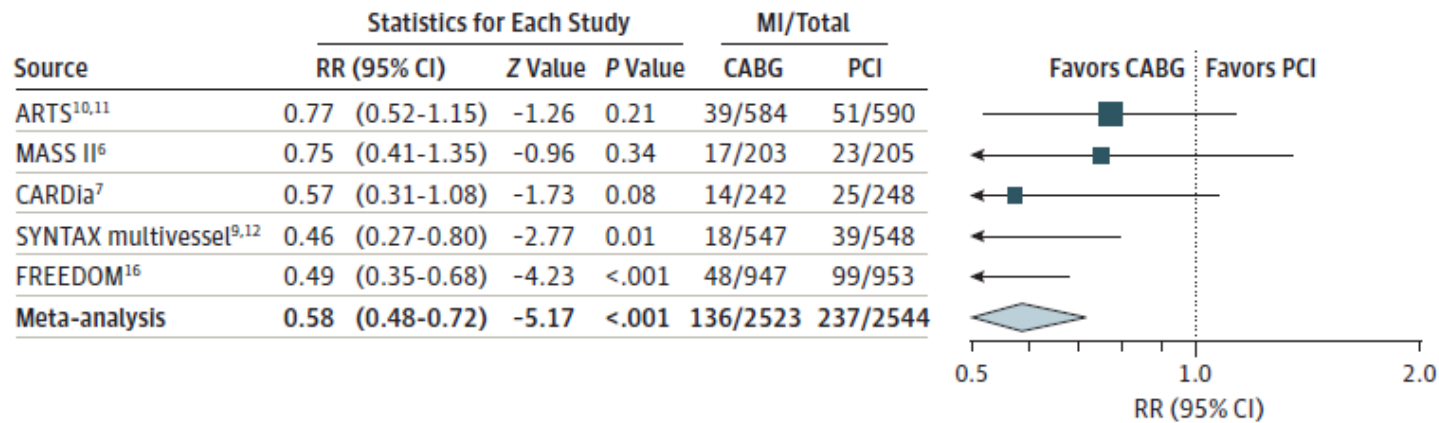
Conclusion: Previous percutaneous coronary intervention before coronary artery bypass grafting in patients with diabetes mellitus and triple-vessel disease independently increases the risk for in-hospital mortality and major adverse cardiac events.

Coronary Artery Bypass Grafting vs Percutaneous Coronary Intervention and Long-term Mortality and Morbidity in Multivessel Disease

Meta-analysis of Randomized Clinical Trials of the Arterial Grafting and Stenting Era

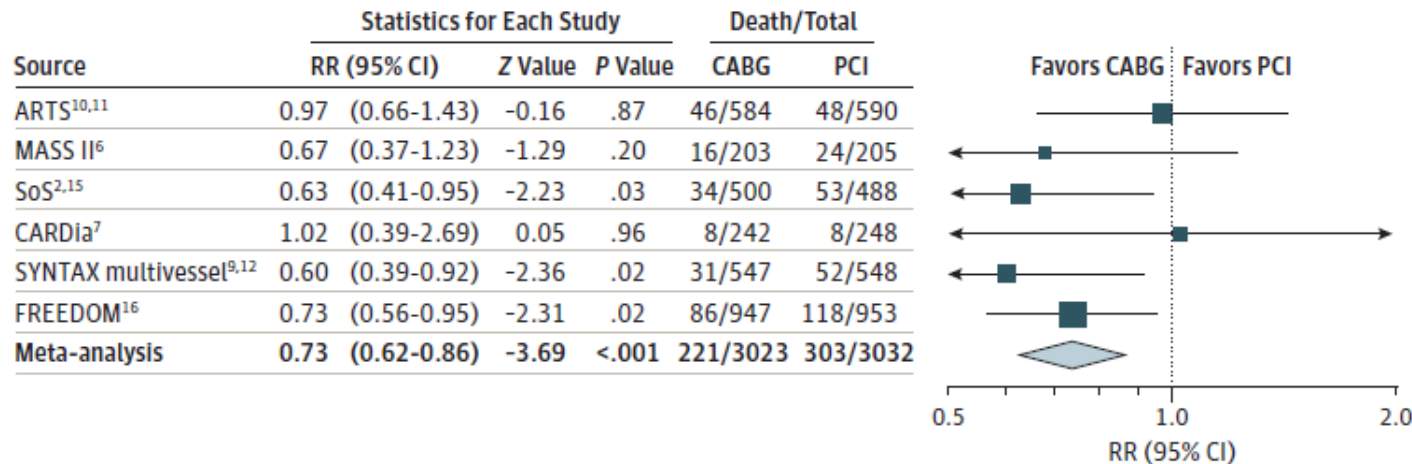
Ilke Sipahi, MD; M. Hakan Akay, MD; Sinan Dagdelen, MD; Arie Blitz, MD; Cem Alhan, MD

Figure 4. Myocardial Infarctions (MIs) According to Treatment Arm



Total number of patients, 5067 ($I^2 = 8.02\%$ for the fixed effects model). CABG indicates coronary artery bypass graft; PCI, percutaneous coronary intervention; RR, risk ratio; for expansion of all study name acronyms, see the cited references.

Figure 3. Mortality According to Treatment Arm



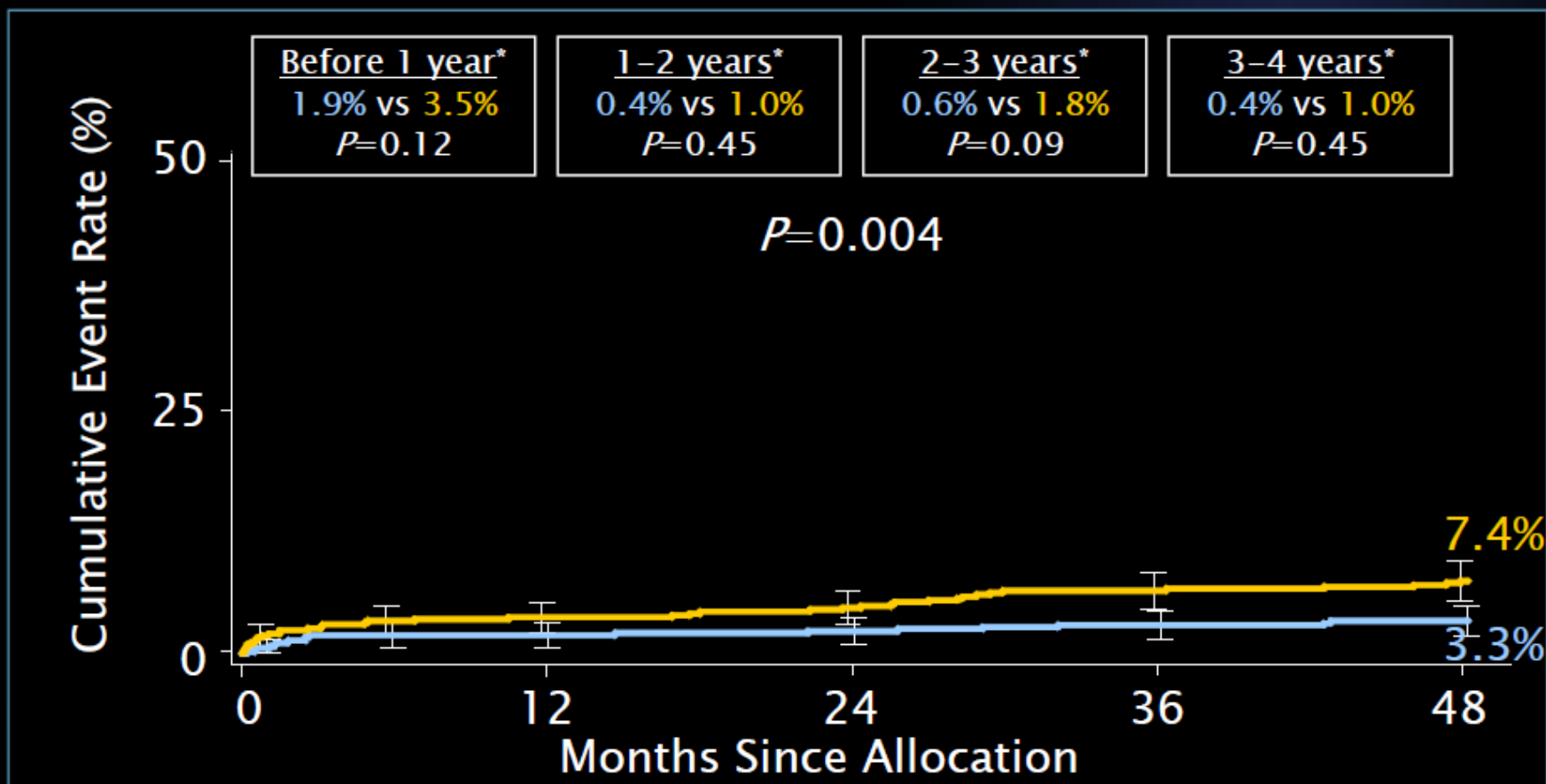
Total number of patients, 6055 ($I^2 = 0\%$ for the fixed effects model). CABG indicates coronary artery bypass graft; PCI, percutaneous coronary intervention; RR, risk ratio; for expansion of all study name acronyms, see the cited references.

Cardiac Death to 4 Years 3VD Subset

SYNTAX

■ CABG (N=549)

■ TAXUS (N=546)



Cumulative KM Event Rate \pm 1.5 SE; log-rank P value; *Binary rates

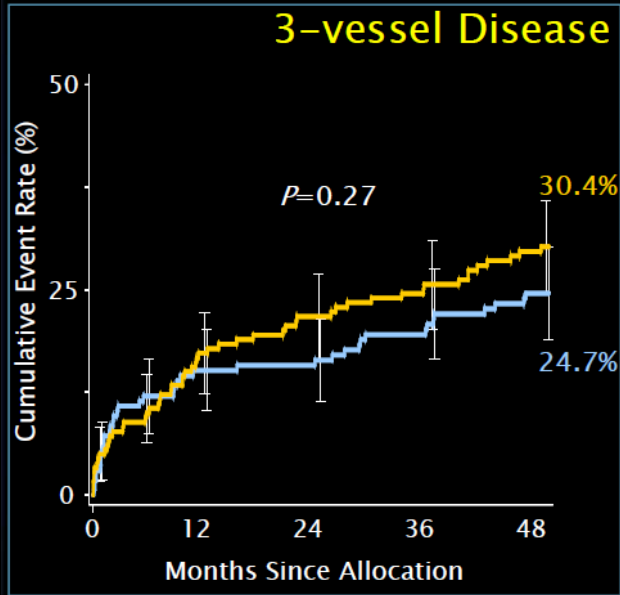
ITT population

MACCE to 4 Years by SYNTAX Score

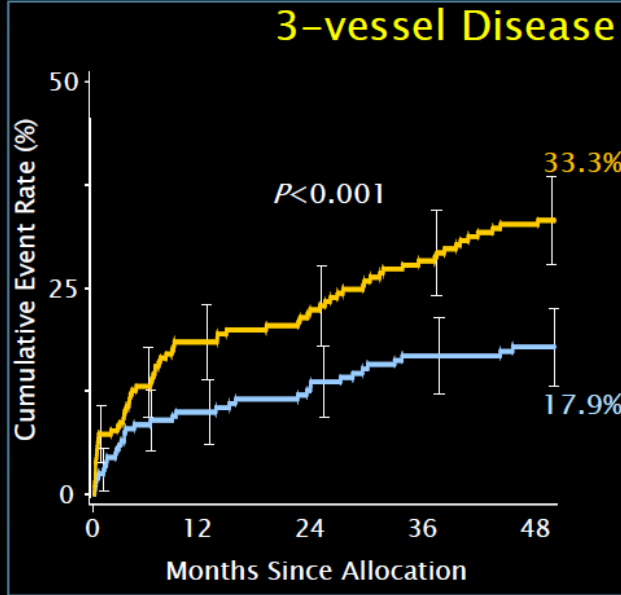


Tercile *Low Scores (0-22)* *Intermediate Scores (23-32)*

■ CABG (N=171)
■ TAXUS (N=181)

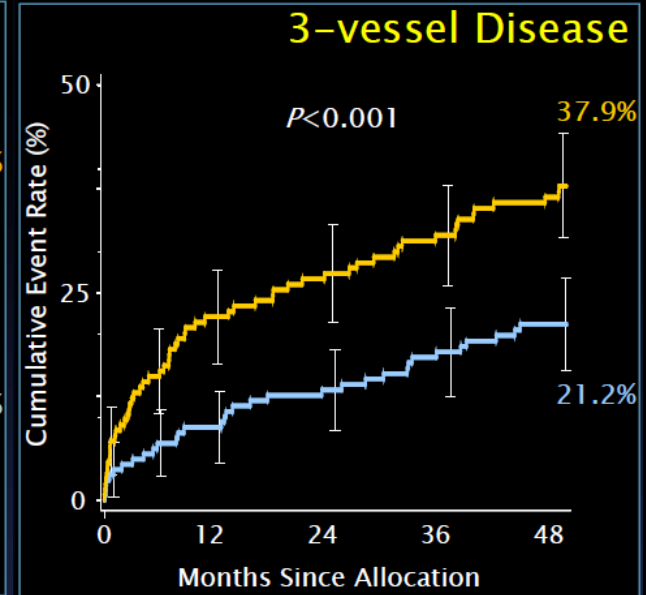


■ CABG (N=208)
■ TAXUS (N=207)



Tercile *High Scores (≥ 33)*

■ CABG (N=166)
■ TAXUS (N=155)

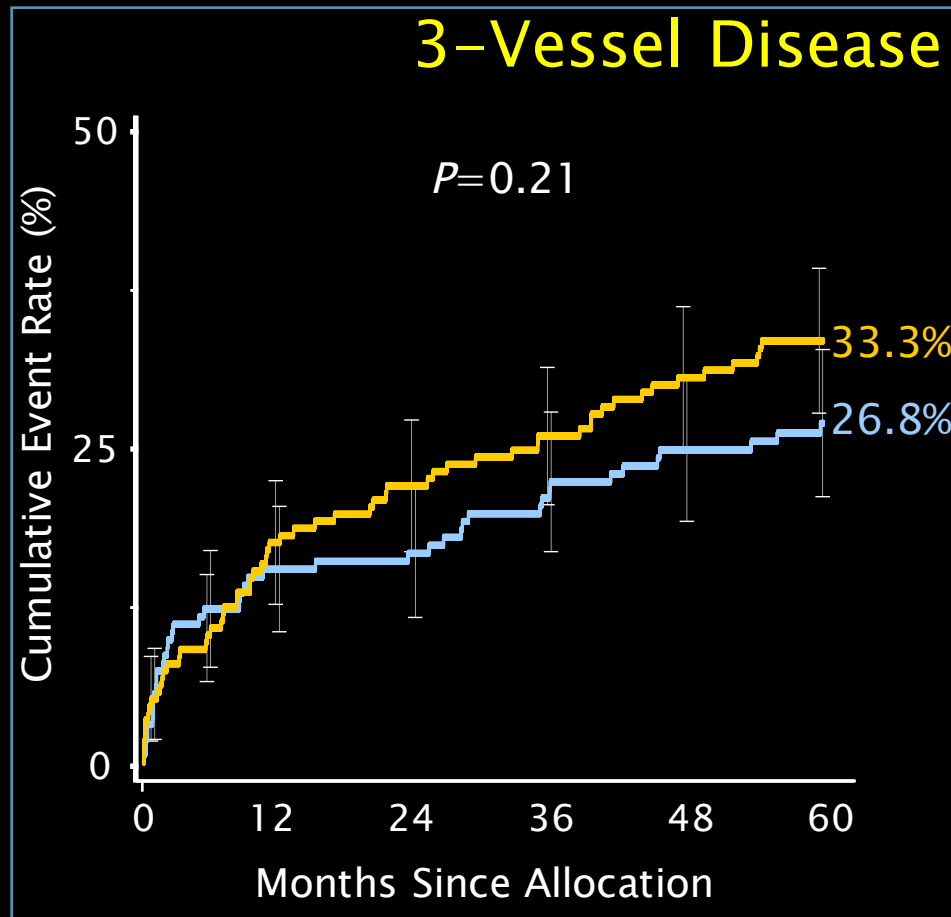


MACCE to 5 Years by SYNTAX Score Tercile

3VD Subset *Low Scores 0-22*



■ CABG (N=171)
 ■ TAXUS (N=181)



	CABG	PCI	P value
Death	9.3%	10.2%	0.81
CVA	3.9%	1.8%	0.24
MI	4.9%	8.8%	0.20
Death, CVA or MI	14.8%	17.5%	0.56
Revasc.	14.6%	23.1%	0.04

Cumulative KM Event Rate \pm 1.5 SE; log-rank P value

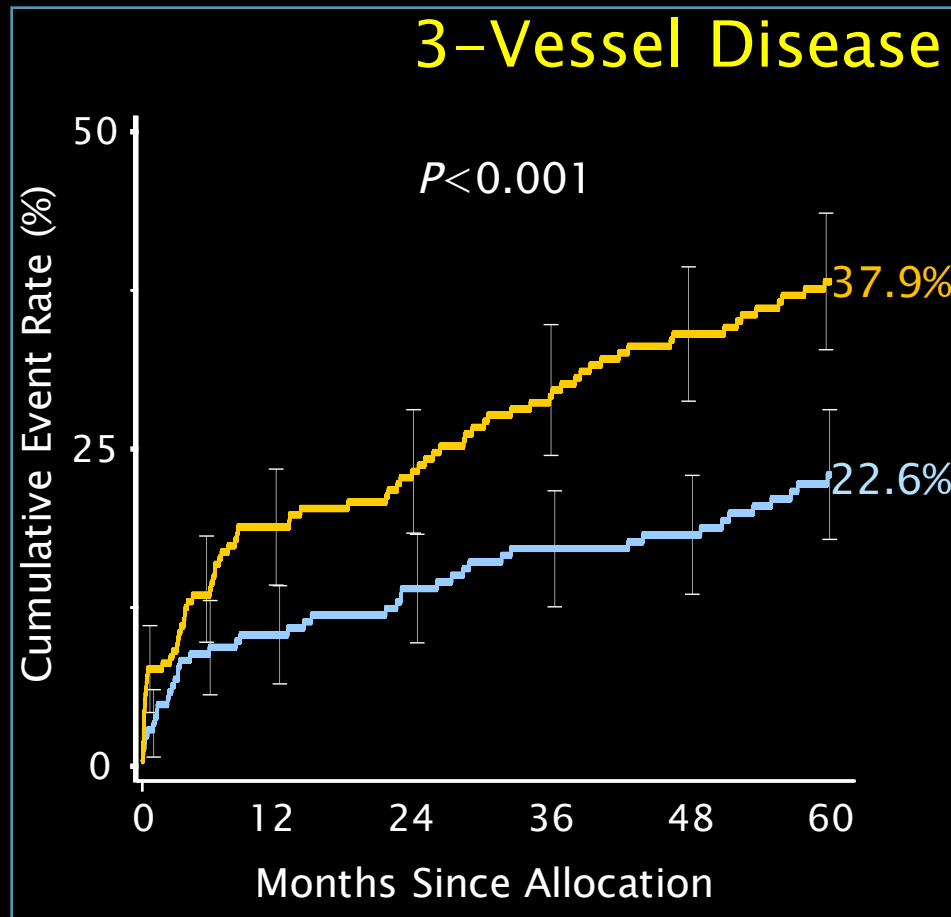
Site-reported Data; ITT population

MACCE to 5 Years by SYNTAX Score Tercile

3VD Subset *Intermediate Scores 23-32*



■ CABG (N=208)
 ■ TAXUS (N=207)



	CABG	PCI	P value
Death	9.6%	16.3%	0.047
CVA	3.6%	2.5%	0.53
MI	3.1%	13.8%	<0.001
Death, CVA or MI	14.7%	23.2%	0.04
Revasc.	11.0%	25.1%	<0.001

Cumulative KM Event Rate \pm 1.5 SE; log-rank P value

Site-reported Data; ITT population

Summary & Conclusions



- ❖ The final 5-year results of the SYNTAX trial demonstrate that surgery remains the gold standard for patients with complex multivessel disease
- ❖ In patients with less complex disease, PCI is an acceptable alternative treatment
- ❖ Treatment decisions for an individual patient should continue to be made in consultation between the patient and the Heart Team, while considering the risks and benefits of the respective treatment options

Thank you to the SYNTAX Steering Committee and Investigators



Percutaneous or surgical revascularization in multi-vessel coronary artery disease

CAD is a chronically progressive disease that predominantly affects the proximal coronary arteries. The most likely reason for the survival benefit of CABG over PCI is that the placement of bypass grafts to the mid coronary vessel not only makes the complexity of proximal CAD lesions irrelevant but over the longer term also offers prophylaxis against the development of new proximal disease

It has been recognized for almost three decades that **high rates of nitric oxide production** from the internal mammary artery (IMA) graft protects the native coronary circulation from further disease development

Consequently, **simply changing the nature of the stent** cannot offer the prophylactic benefit of bypass grafts.

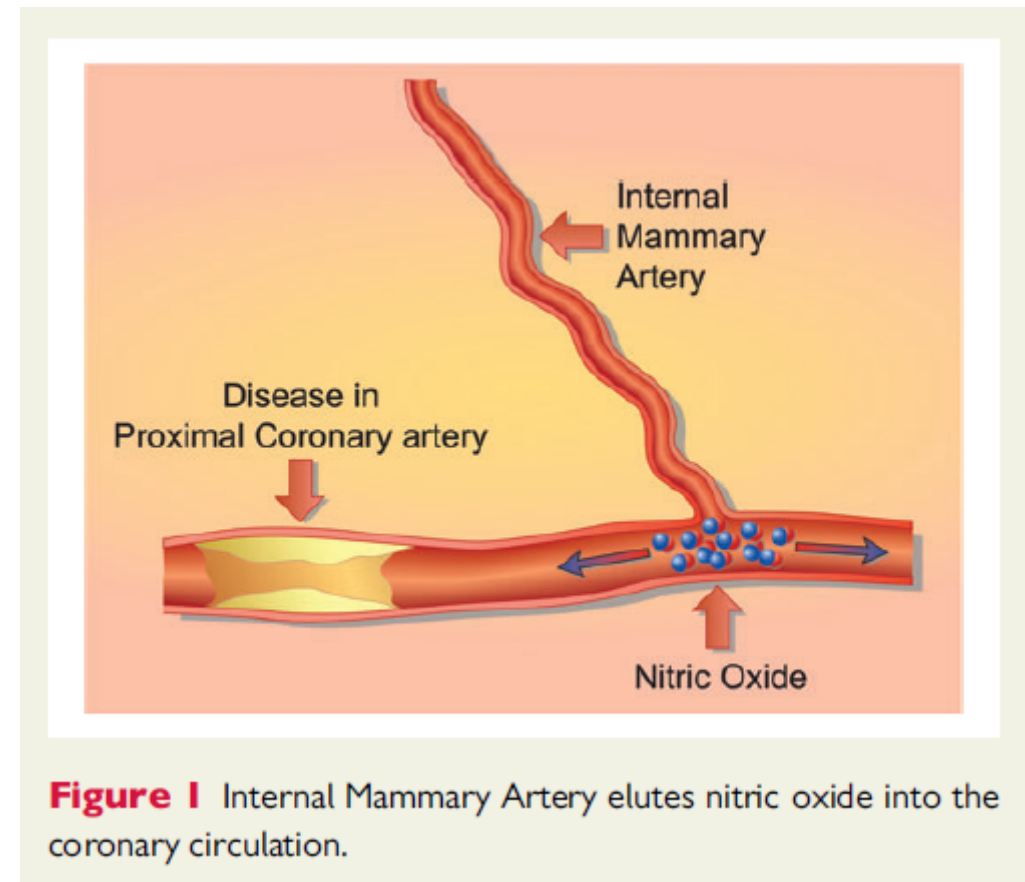


Figure 1 Internal Mammary Artery elutes nitric oxide into the coronary circulation.



SURGERY

Advanced Age
COPD/Obesity
Re-do condition
Fragility
Life expectancy
Conduits availability

Three-vessels disease
LM + multi-vessels disease
Intermediate and Elevated Syntax Score
Diabetes
Repeated PCI procedures
Complex anatomy of lesions/CTO
Revascularization with arterial conduits



PCI PREFERABLE

Conclusions

In patients with multi-vessel coronary disease, CABG does not only lead to a reduction in repeat revascularization and MACCE but also leads to a 27% reduction in long-term all-cause mortality and a 42% reduction in Mis compared with PCI.

The benefits were not only observed in trials of diabetic patients but also in trials where the great majority of patients were nondiabetic.

Considering the clinical condition of the patient, balancing risks and benefits in a multidisciplinary team will lead to better results

