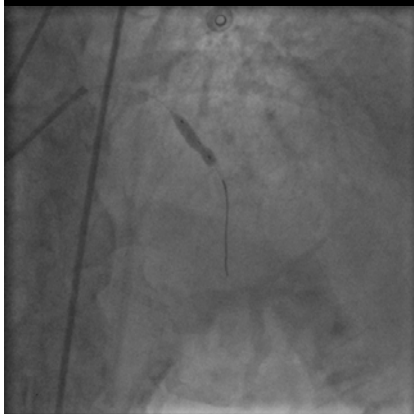
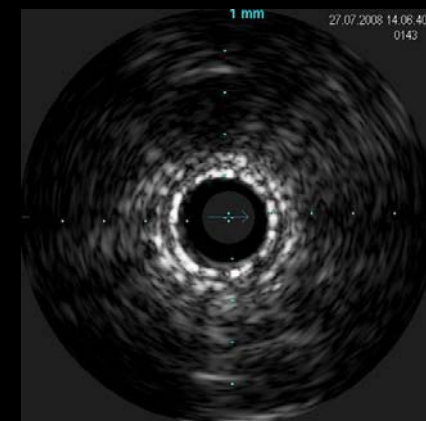


PCI: stato dell'arte e linea di confine con le indicazioni cardiocirurgiche



Dr. Stefano Rigattieri

UOSD Emodinamica e
Cardiologia Interventistica
Ospedale Sandro Pertini





- Stato dell'arte della PCI: cosa possiamo fare
- Stent medicati: il santo Graal del Cardiologo interventista?
- Quali pazienti dobbiamo inviare al Cardiocirurgo?
- Quali pazienti dobbiamo trattare noi?

PCI: stato dell'arte

- Sindromi coronariche acute
- Tronco comune
- Biforcazioni
- PCI su bypass
- CTO
- Multivaso
- FEVS depressa
- Comorbidità (IRC, anemia, vasculopatia)

SCA: STEMI



• Guidewire Lumen = 6cm
• Total usable length = 145cm

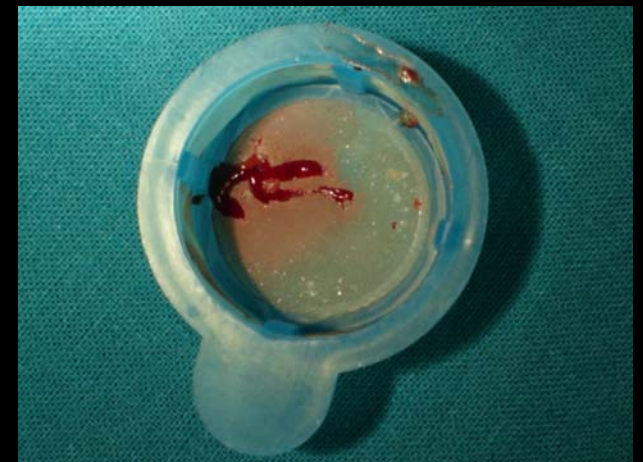
Wire Lumen

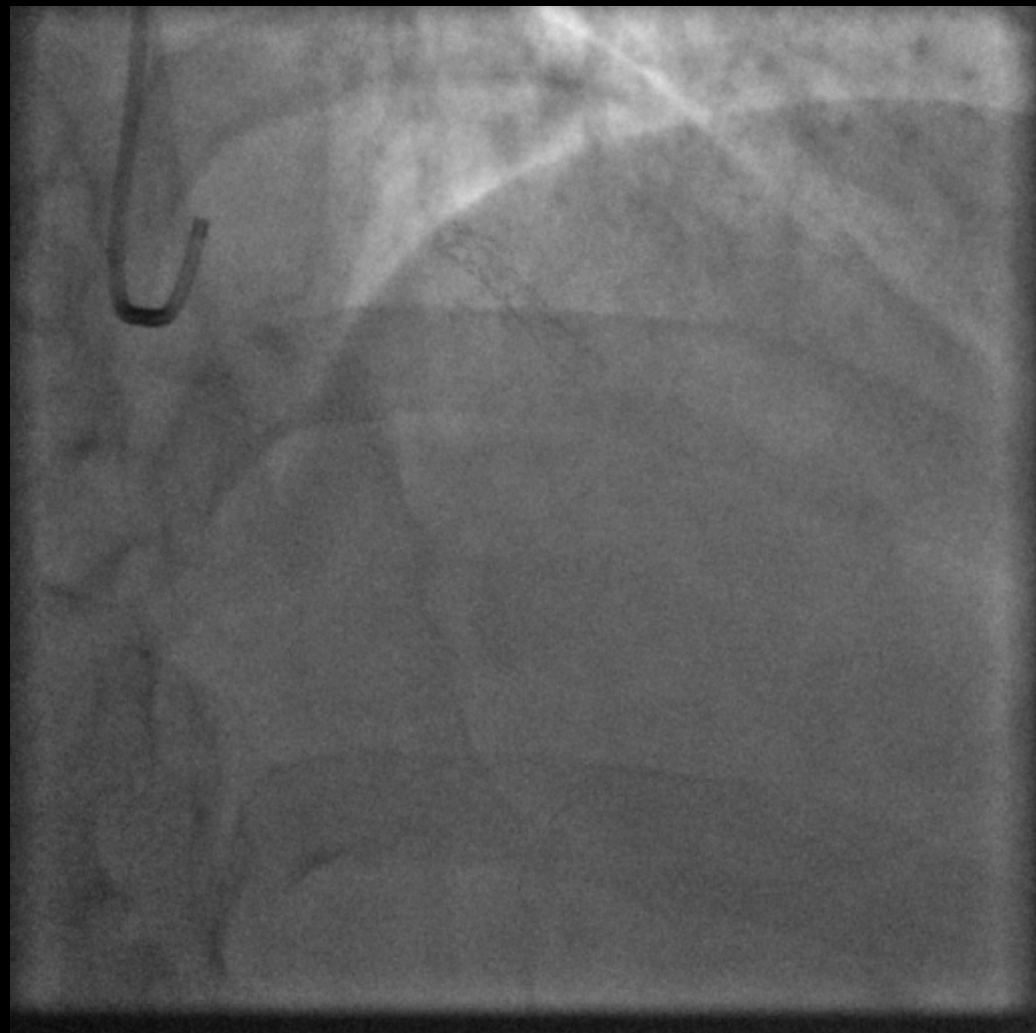
Distal radiopaque Marker band:
• 2mm from distal tip

Aspiration system:
• 20cc locking syringe
• 42cc/min aspiration rate

Oblique aspiration tip design:
• lumen ID = 0.042" (1 mm)
• lumen OD = 0.068"
• Max OD at joint = 0.054"

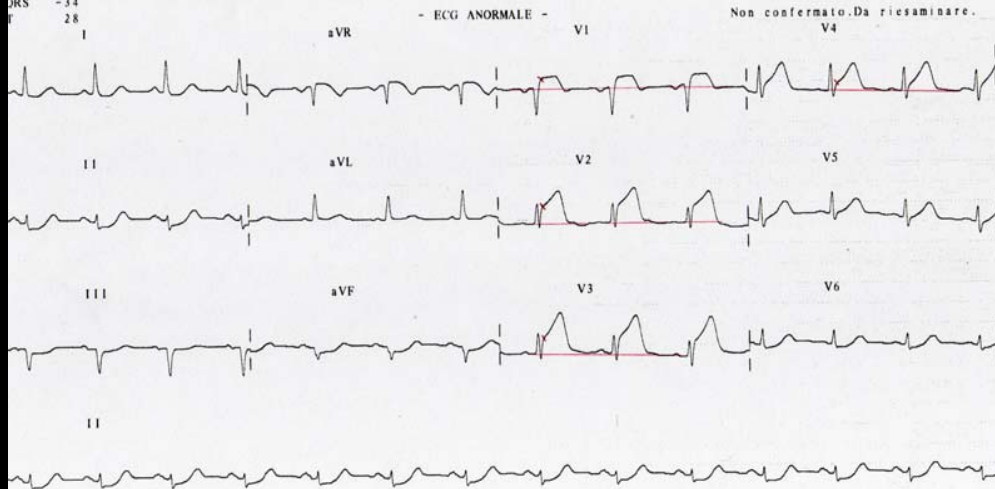
Compatible with 6F guiding catheters
(0.070" minimum ID)





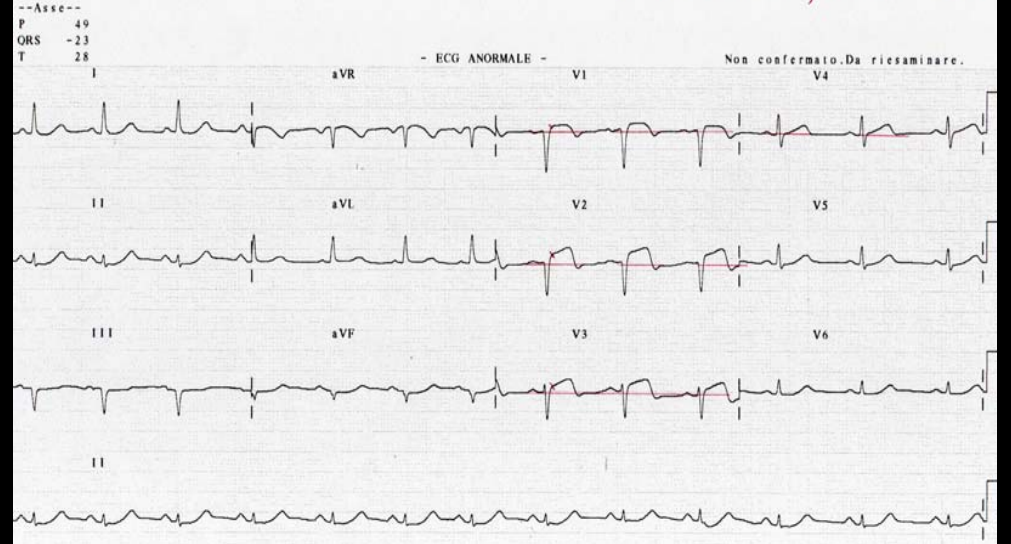
freq. 80 . RITMO SINUSALE REGOLARE, FREQUENZA 80
 PR 152 . DEVIAZIONE ASSIALE SINISTRA
 QRSD 70 . TRANSIZIONE ANTICIPATA
 QT 371 . CONSIDERARE INGRANDIMENTO ATRIALE SN
 QTc 428 . PROBABILE INFARTO INFERIORE PREGRESSO
 . SOTTOSLIVELLAMENTO ASPECIFICO DI ST INFERIORE
 . PROBABILE ISCHEMIA TRANSMURALE ANTERIORE

$\Sigma ST = 12.5 \text{ mm}$



Freq. 76 . RITMO SINUSALE REGOLARE, FREQUENZA 76
 PR 159 . ASSE DEL QRS A SINISTRA
 QRSD 71 . CONSIDERARE INFARTO INFERIORE PREGRESSO
 QT 388 . PROBABILE INFARTO ANTERIORE ACUTO
 QTc 436

$\Sigma ST = 5.5 \text{ mm}$; $\Sigma STR 56\%$



Shock cardiogeno



Table 1

Angiographic and procedural data

	Group 1 (n=26)	Group 2 (n=18)	P-value
Symptoms to balloon (h)	7.39±4.56	5.59±3.77	0.18
No. of diseased vessels (%)			0.195
– one vessel	5 (19.2)	8 (44.4)	
– two vessels	9 (34.6)	4 (22.2)	
– three vessels	12 (46.2)	6 (33.3)	
Anterior STEMI (%)	22 (84.6)	11 (61.1)	0.09
Left main disease (%)	3 (11.5)	0 (0.0)	0.25
Chronic total occlusion (%)	10 (38.5)	7 (38.9)	0.97
Abciximab (%)	21 (80.8)	17 (94.4)	0.37
Clopidogrel (%)	13 (50.0)	16 (88.9)	0.01
PCI failure	7 (26.9)	1 (5.6)	0.15
Stent (%)	19 (73.1)	16 (88.9)	0.18
Thrombus aspiration (%)	3 (11.5)	11 (61.1)	0.001
TIMI flow pre (%)			0.06
– 0	25 (96.2)	13 (72.2)	
– 1	0 (0.0)	2 (11.1)	
– 2	1 (3.8)	3 (16.7)	
– 3	0 (0.0)	0 (0.0)	
TIMI flow post (%)			0.39
– 0	7 (26.9)	2 (11.1)	
– 1	2 (7.7)	1 (5.6)	
– 2	10 (38.5)	6 (33.3)	
– 3	7 (26.9)	9 (50.0)	

STEMI: ST-elevation myocardial infarction.

PCI: percutaneous coronary intervention.

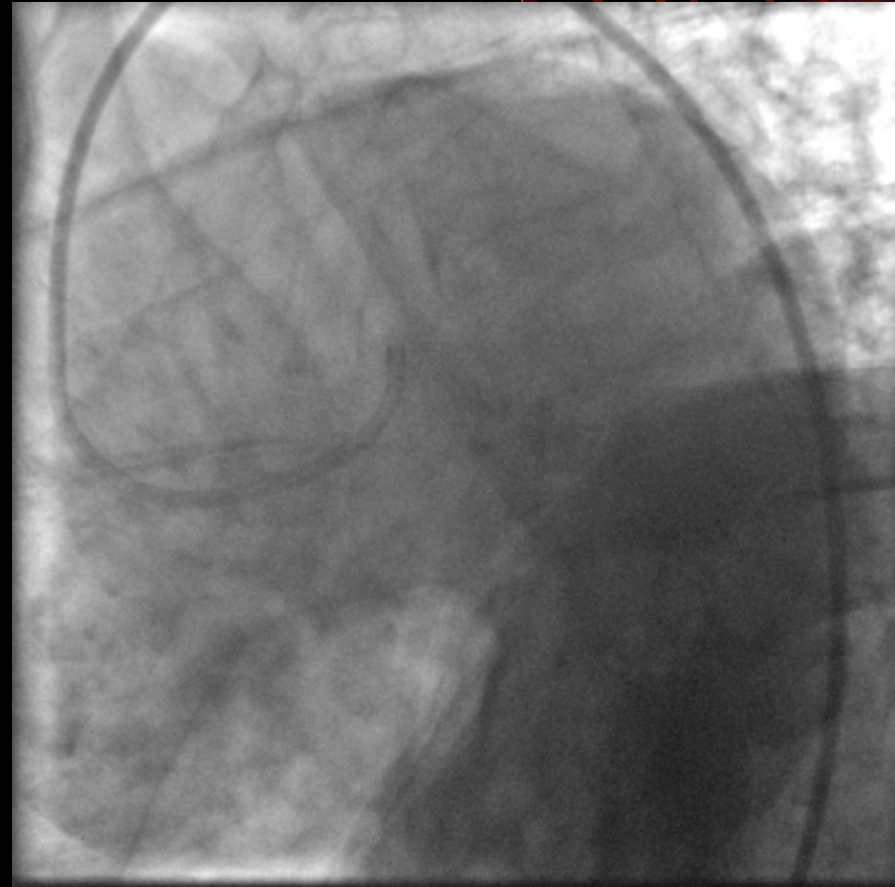
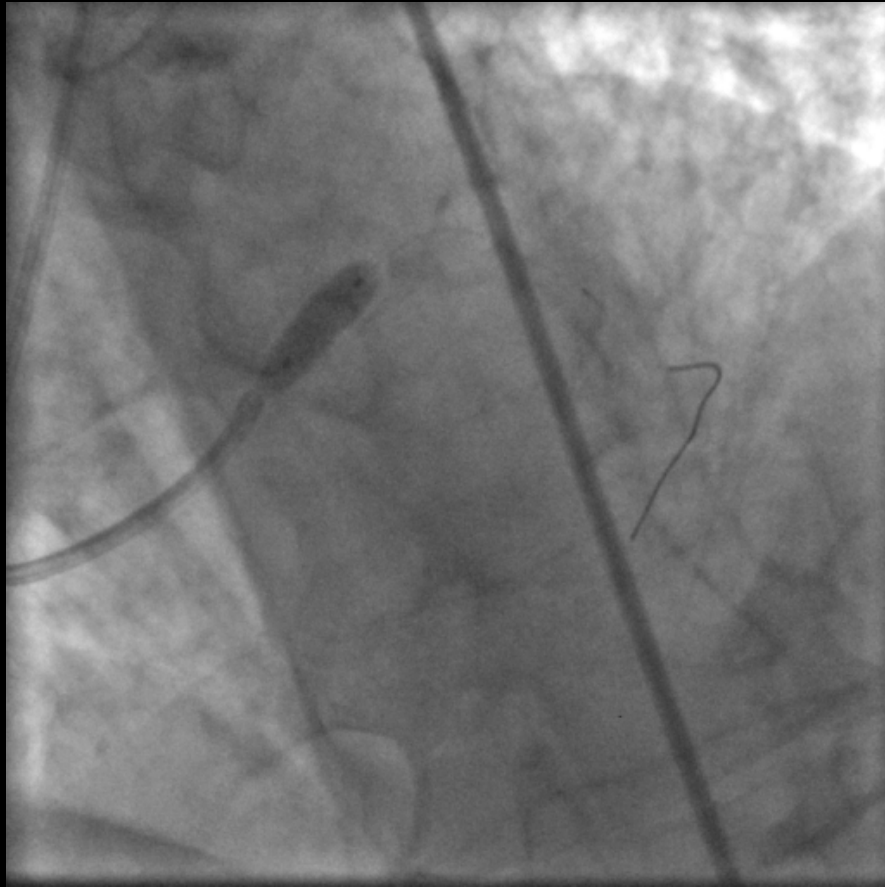
TIMI: Thrombolysis in Myocardial Infarction.

“at multivariate analysis TA is
A strong predictor of survival in
STEMI pts with cardiogenic shock”

Tronco comune



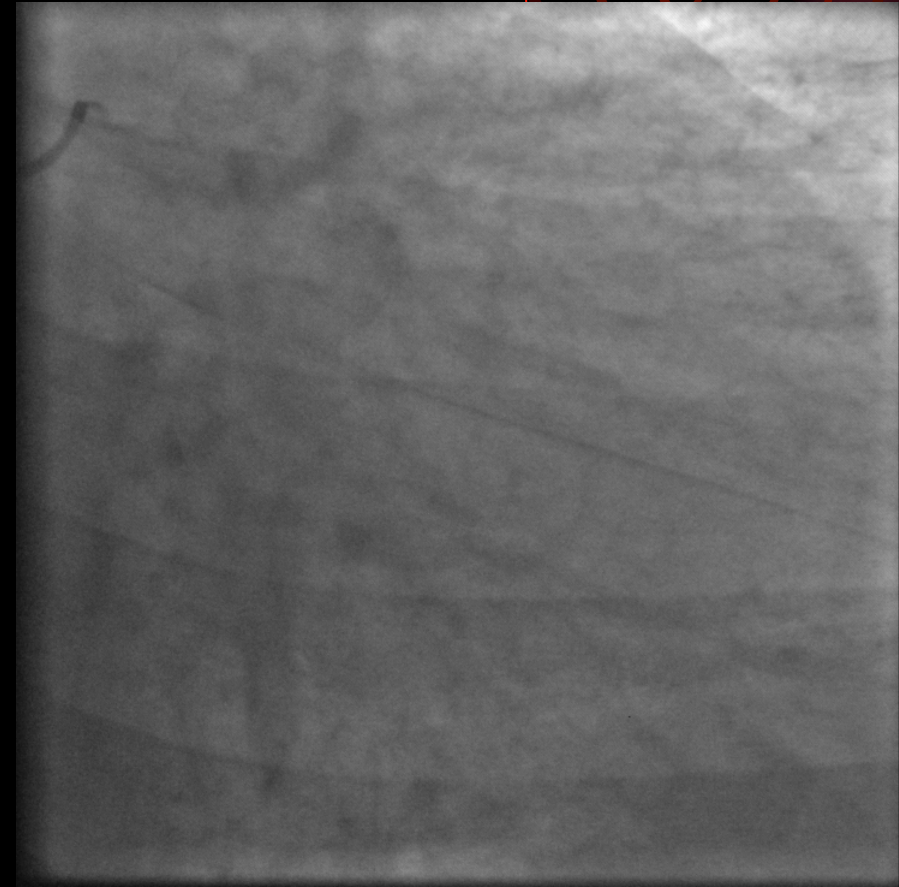
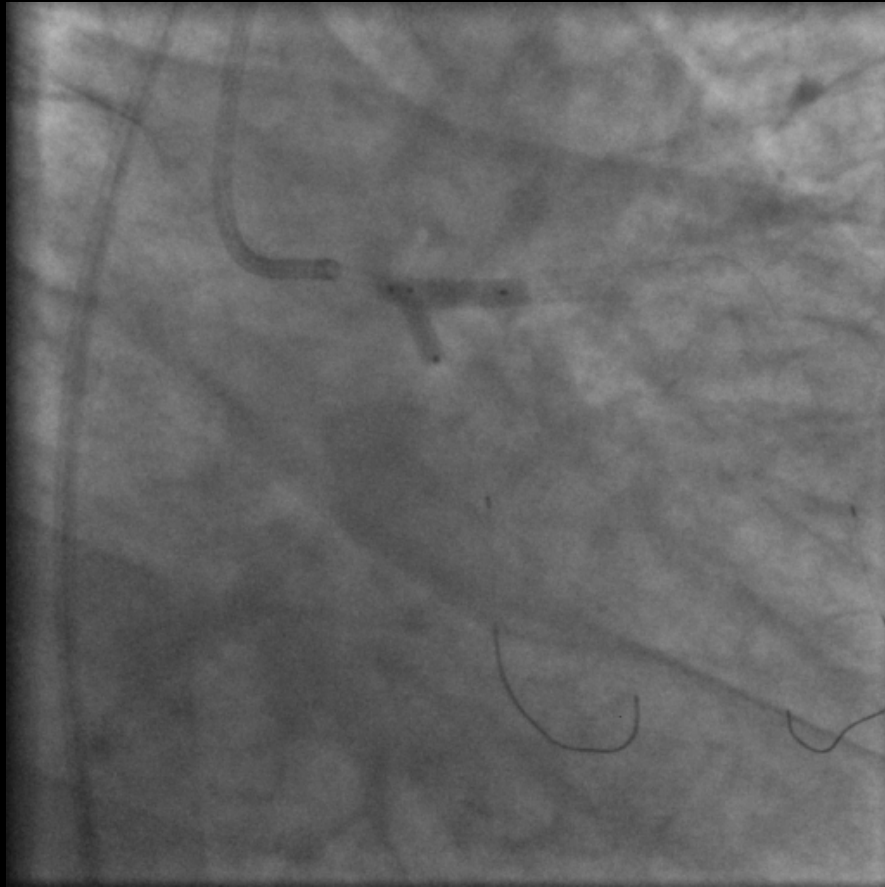
Tronco comune



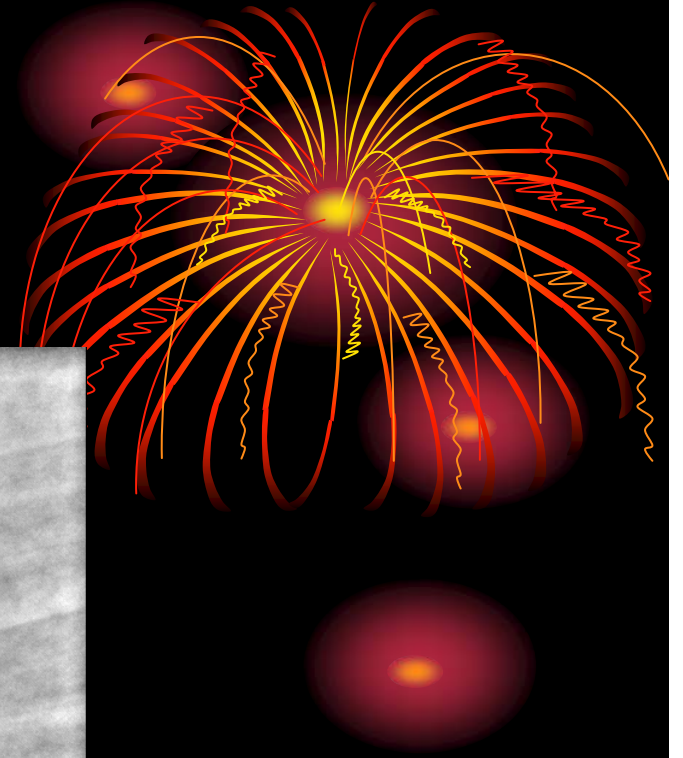
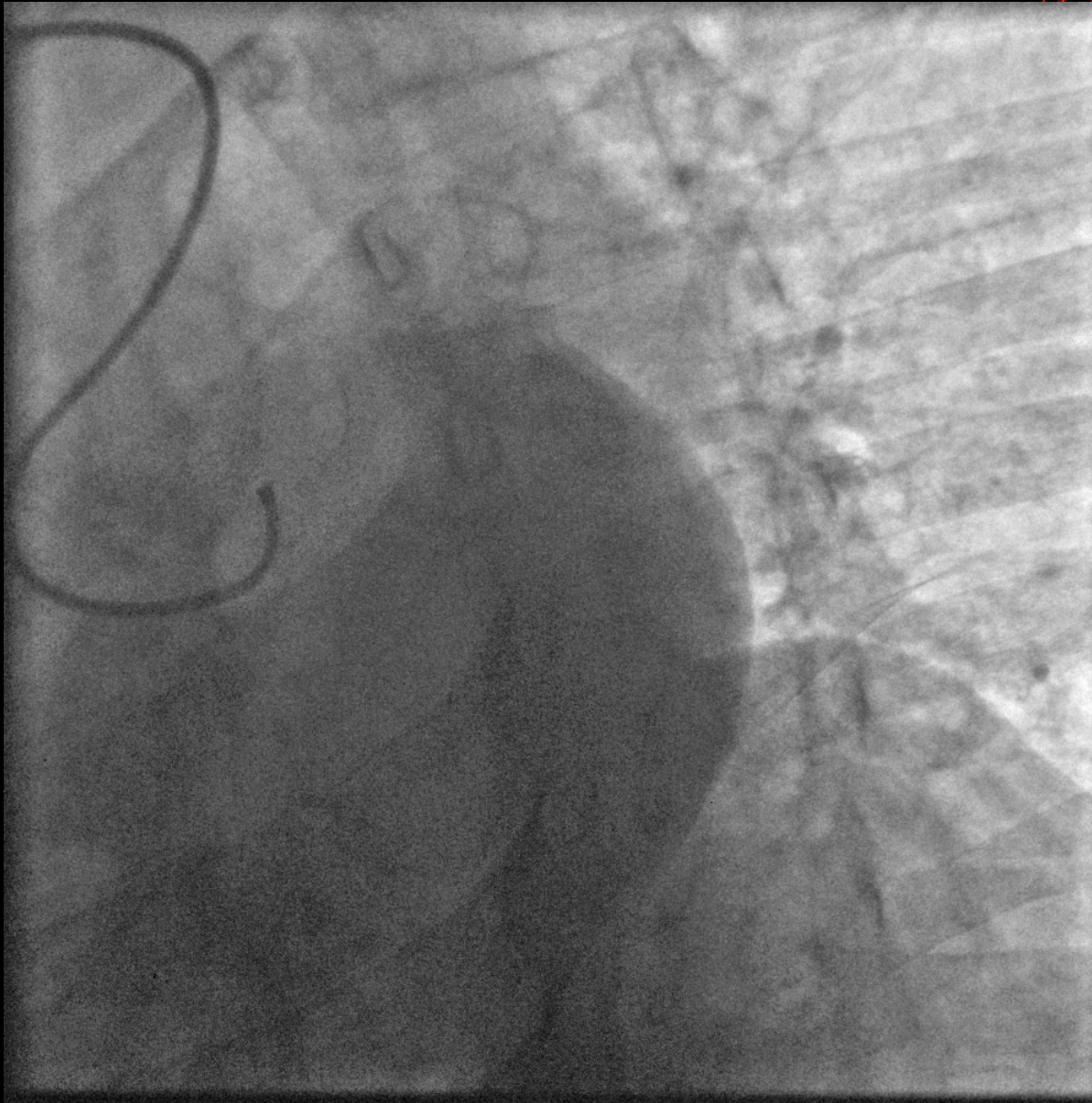
Biforcazione



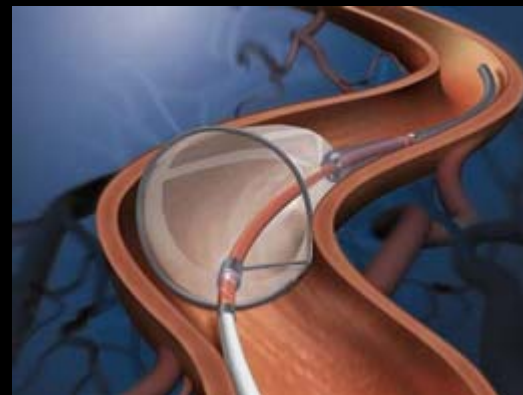
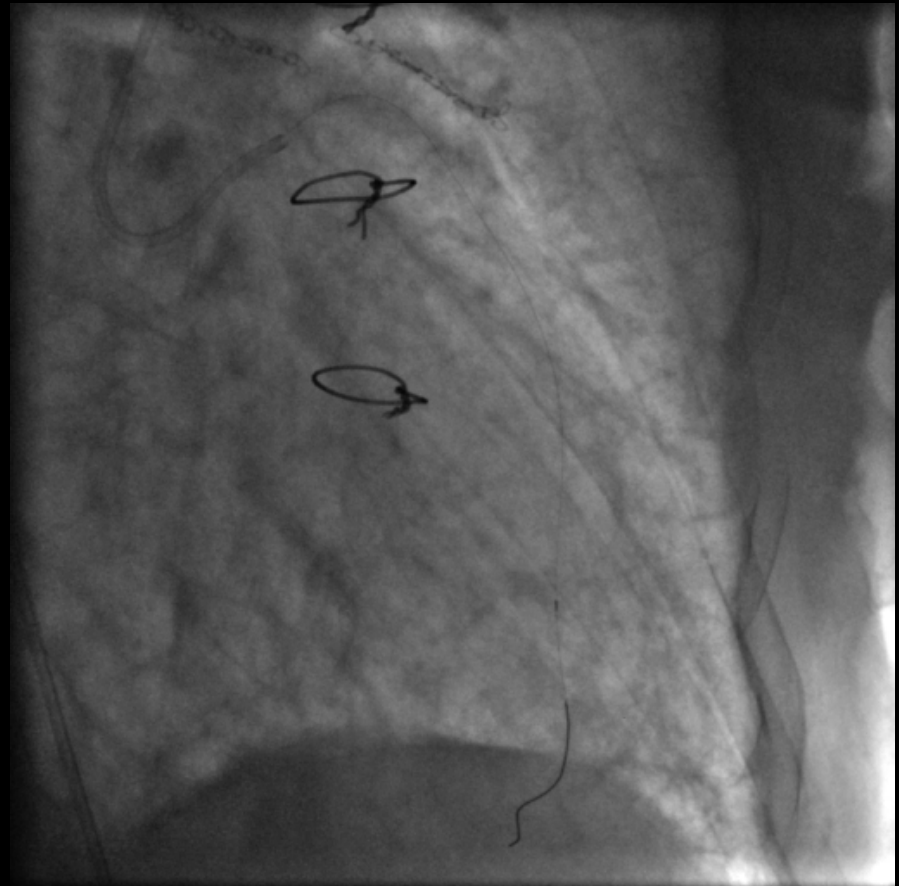
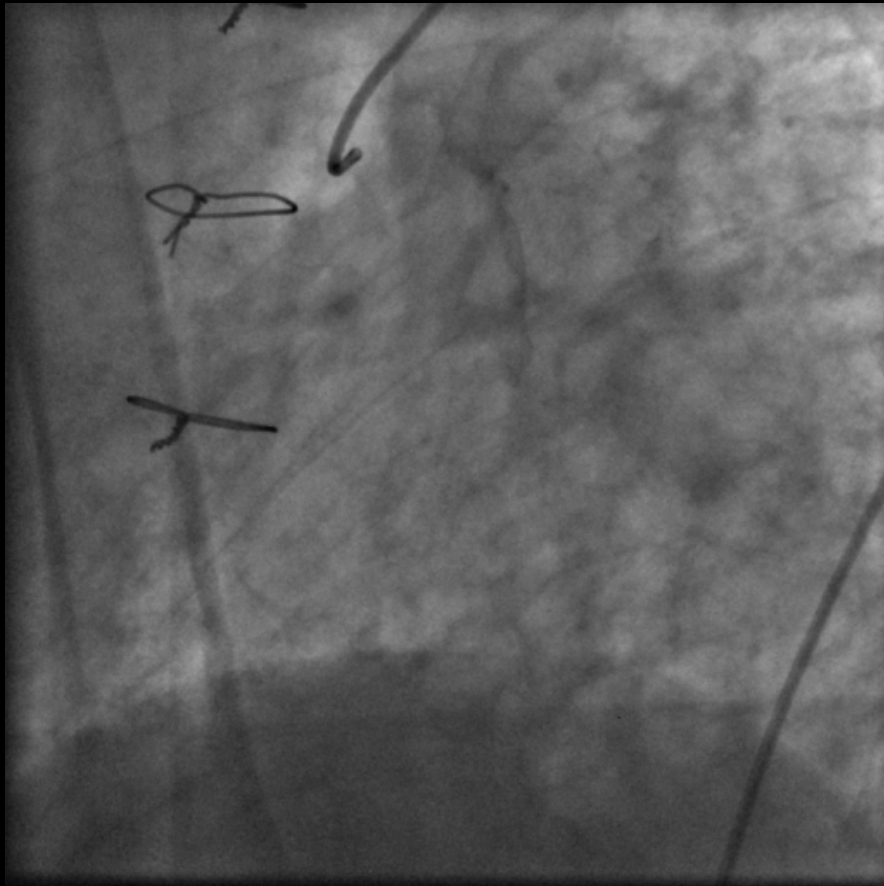
Biforcazione



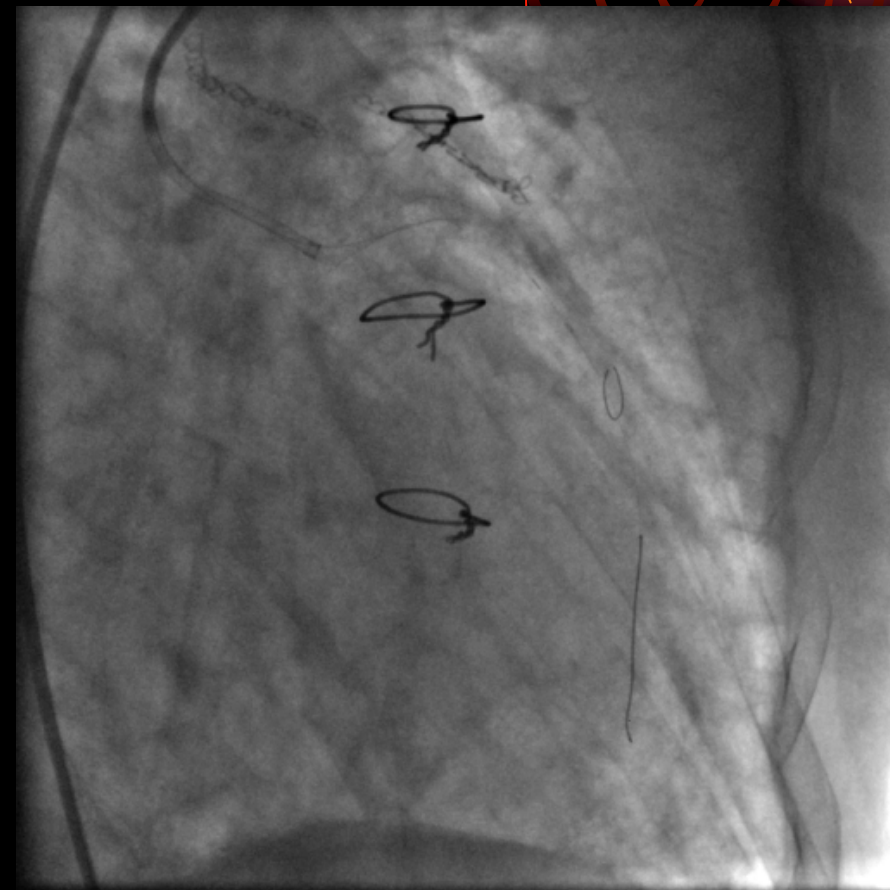
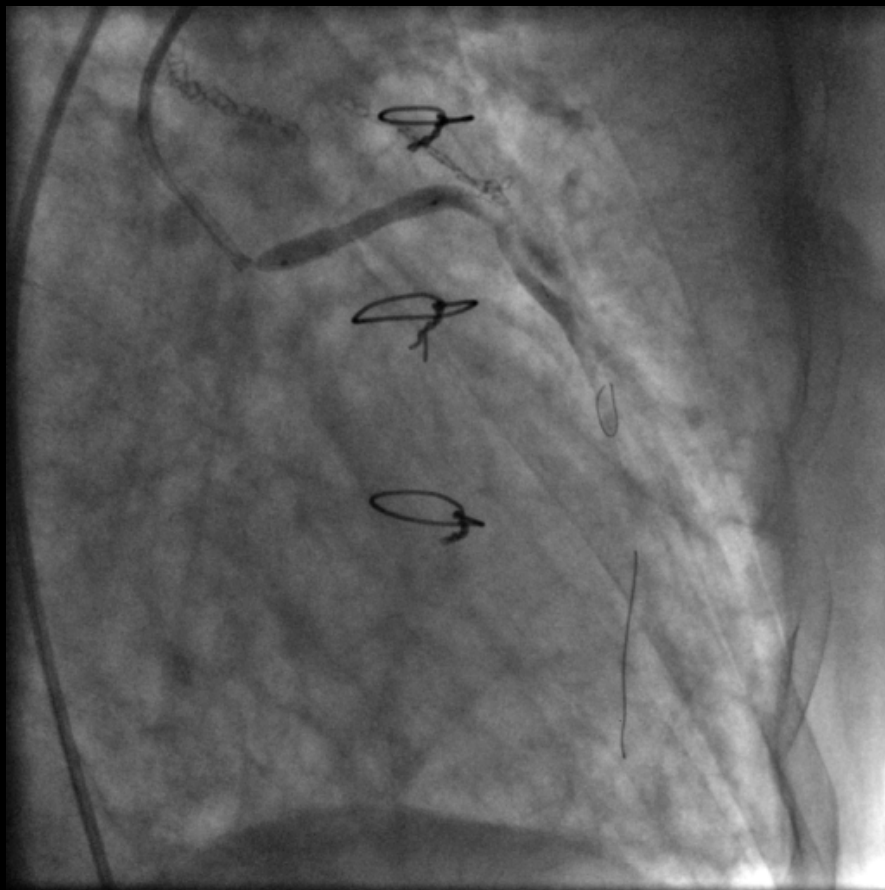
Biforcazione



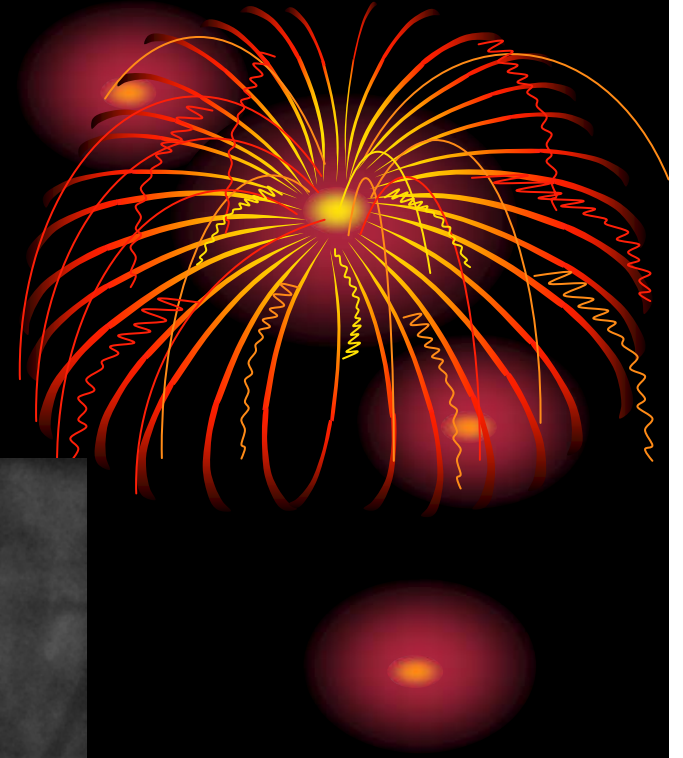
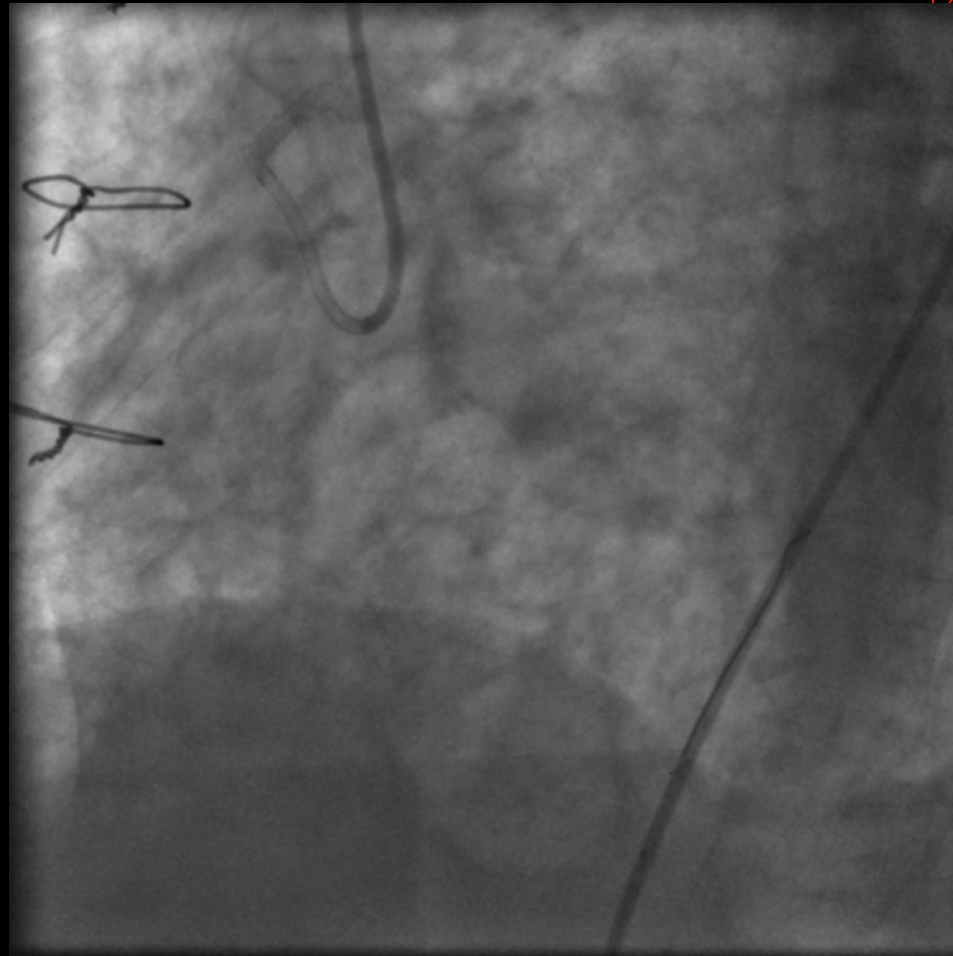
PCI su bypass



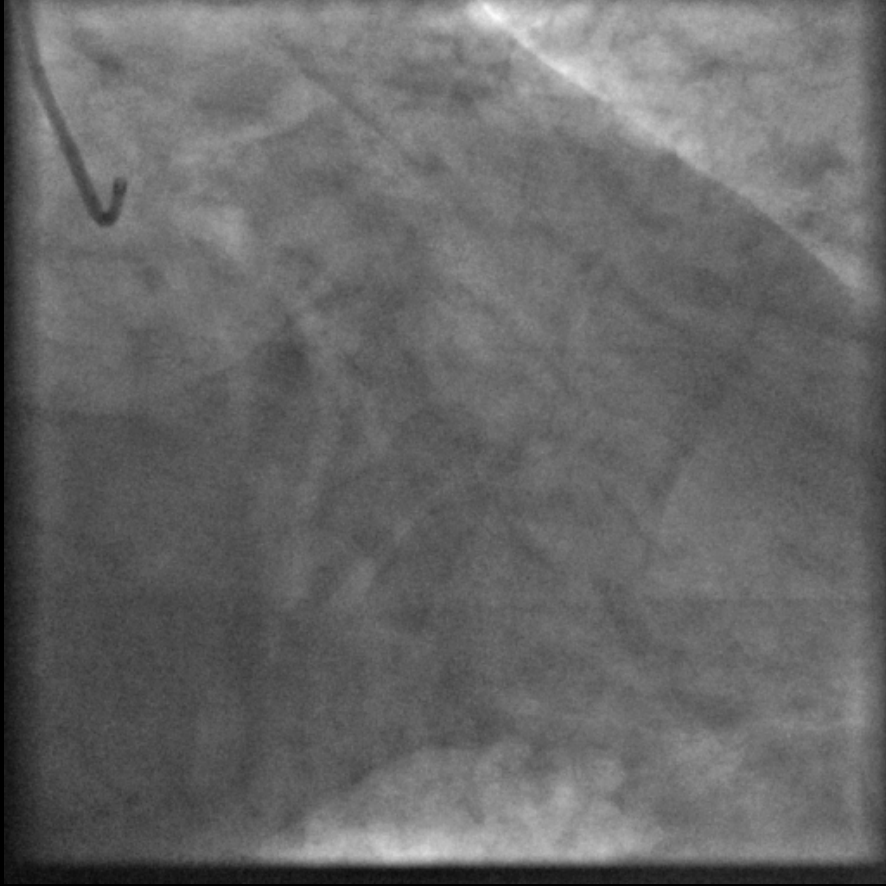
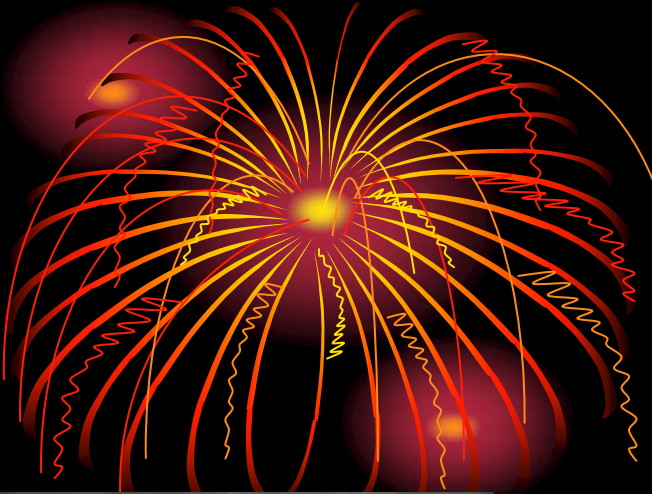
PCI su bypass



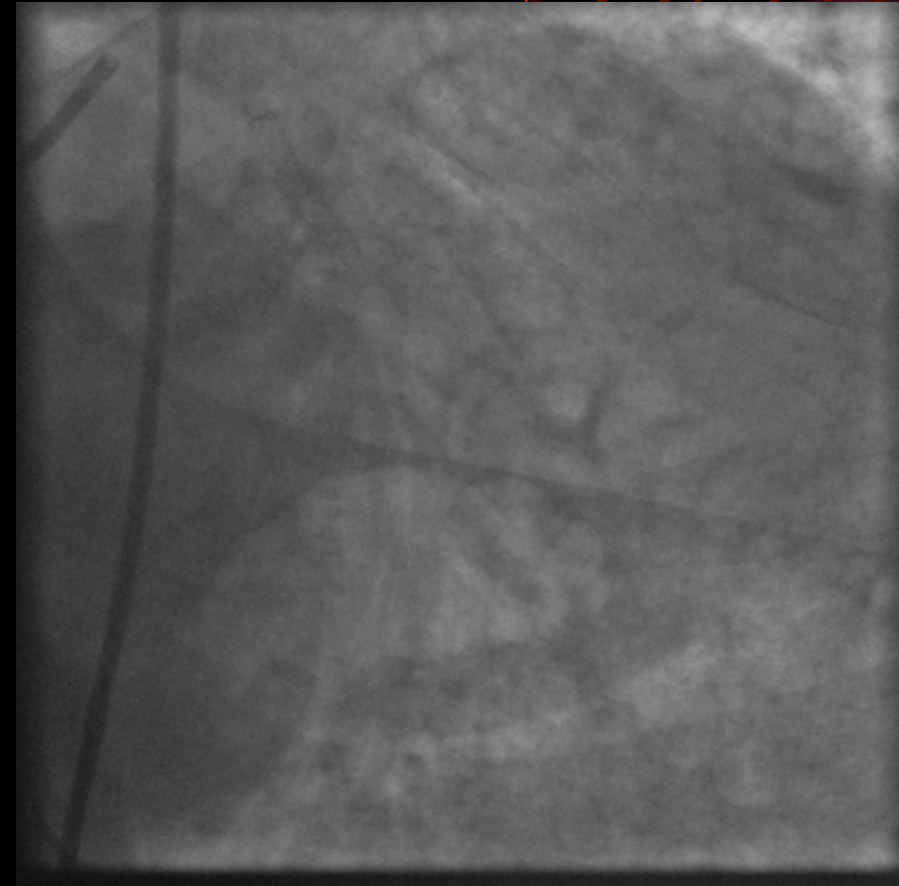
PCI su bypass



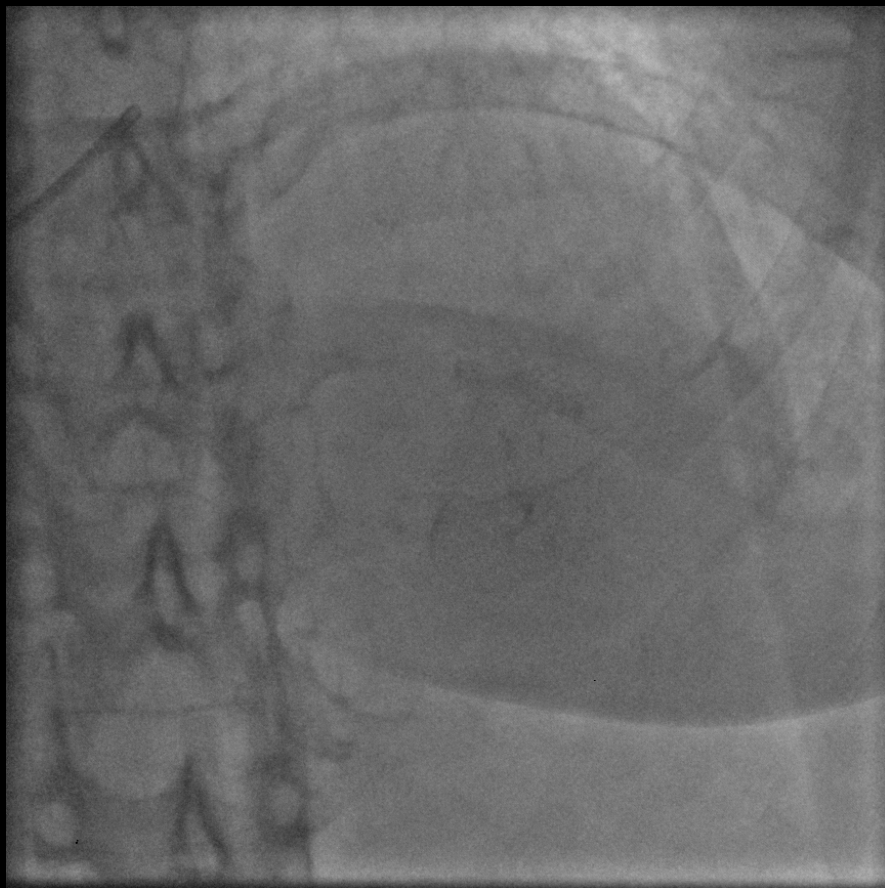
CTO



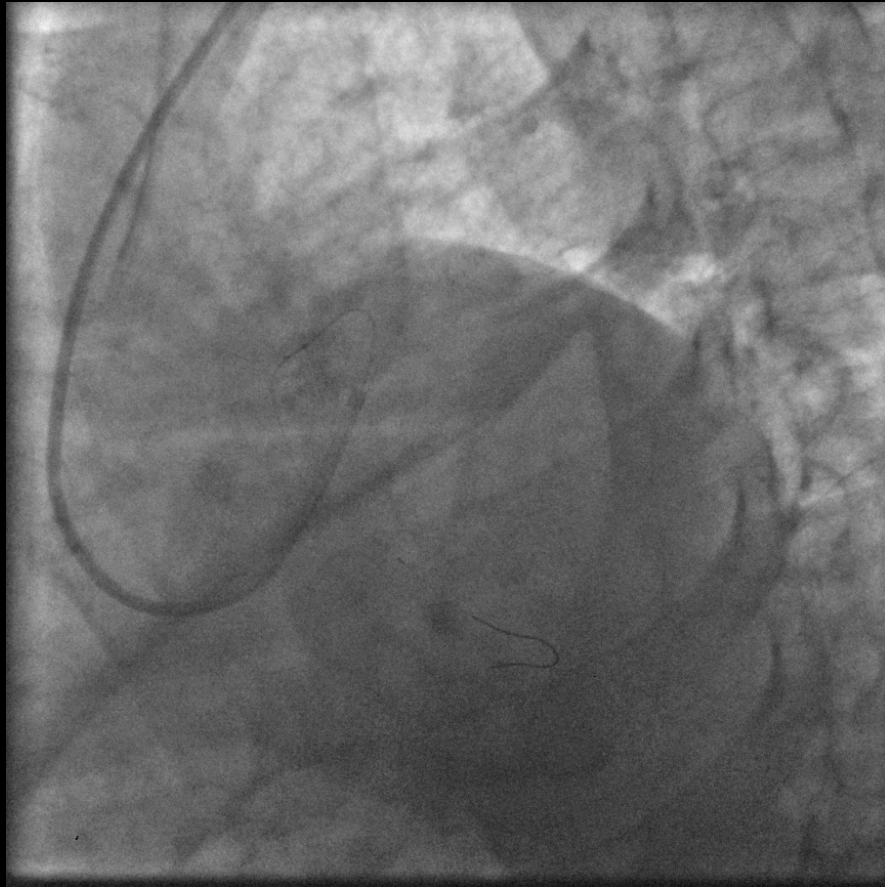
CTO



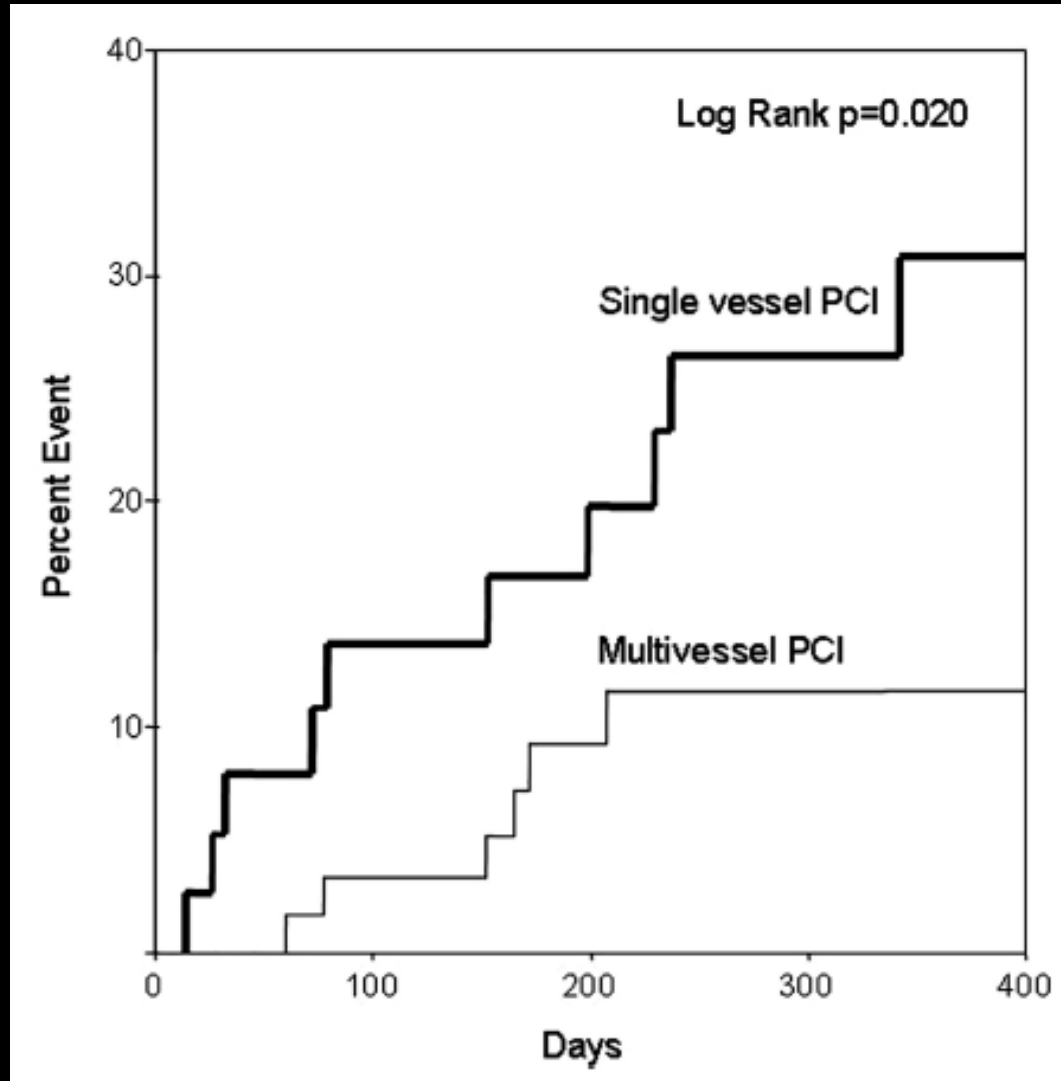
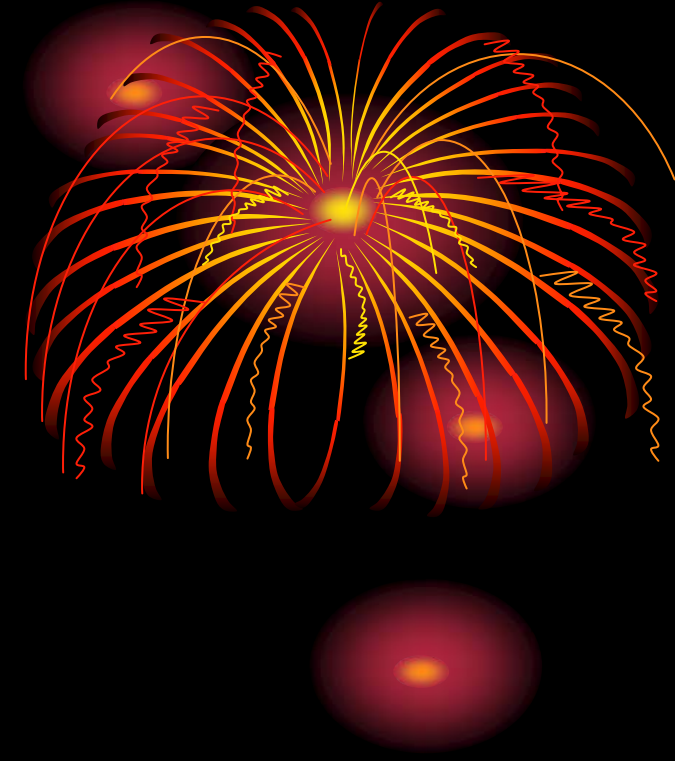
Multivasale



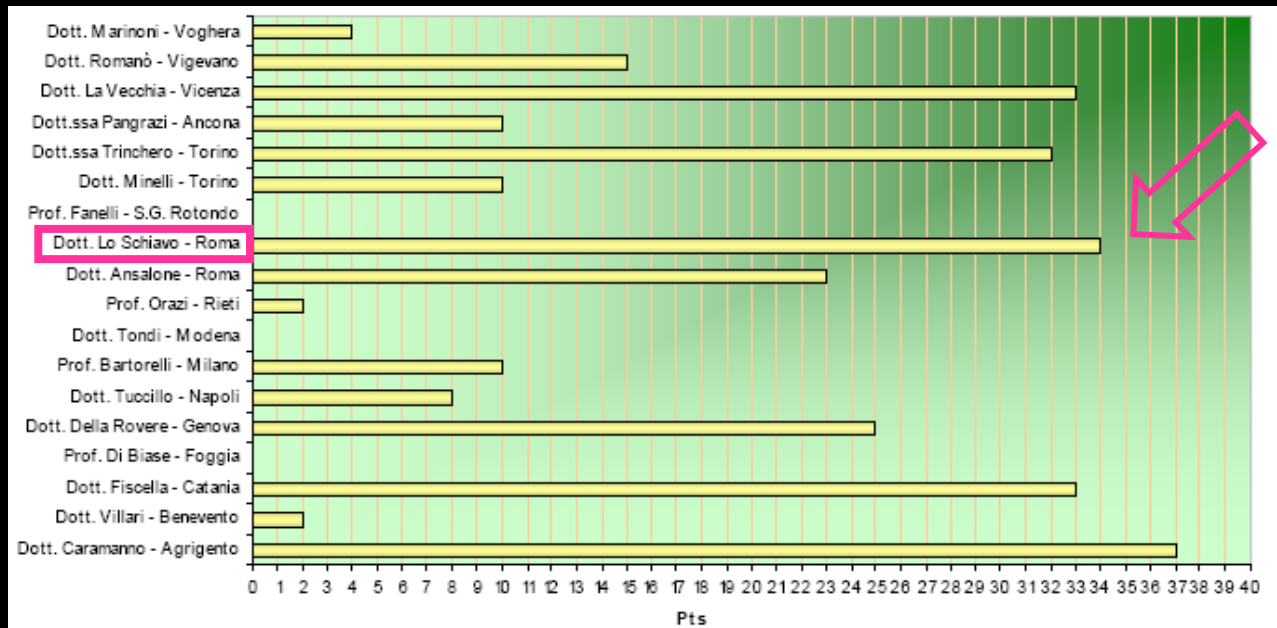
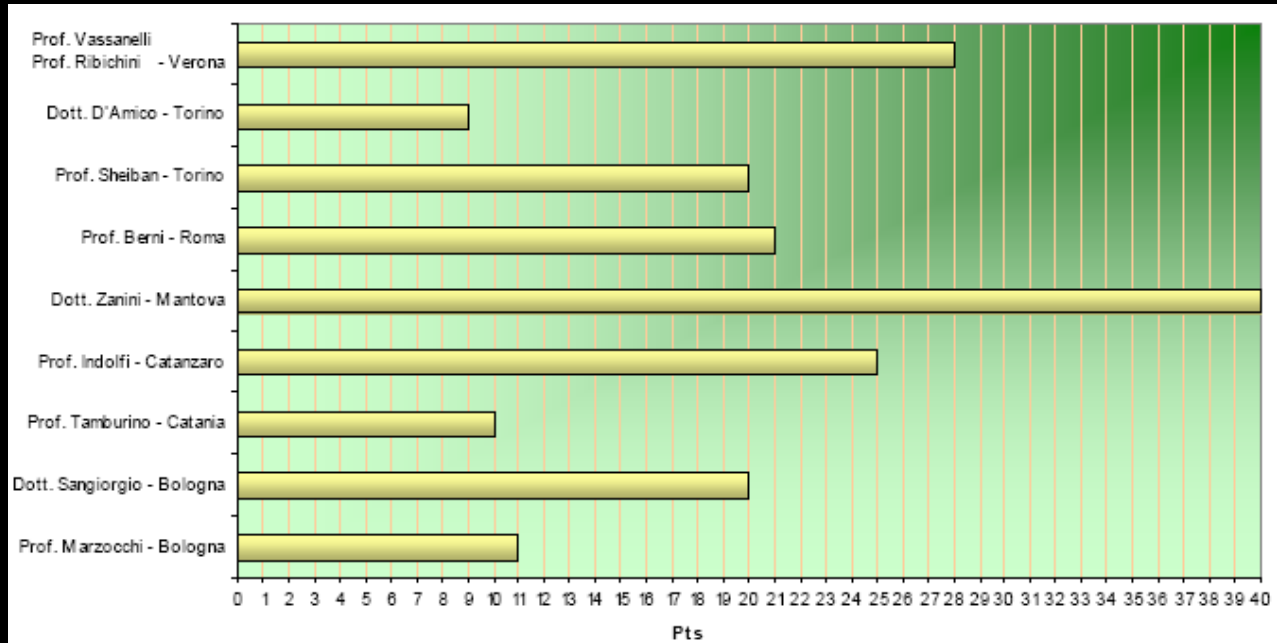
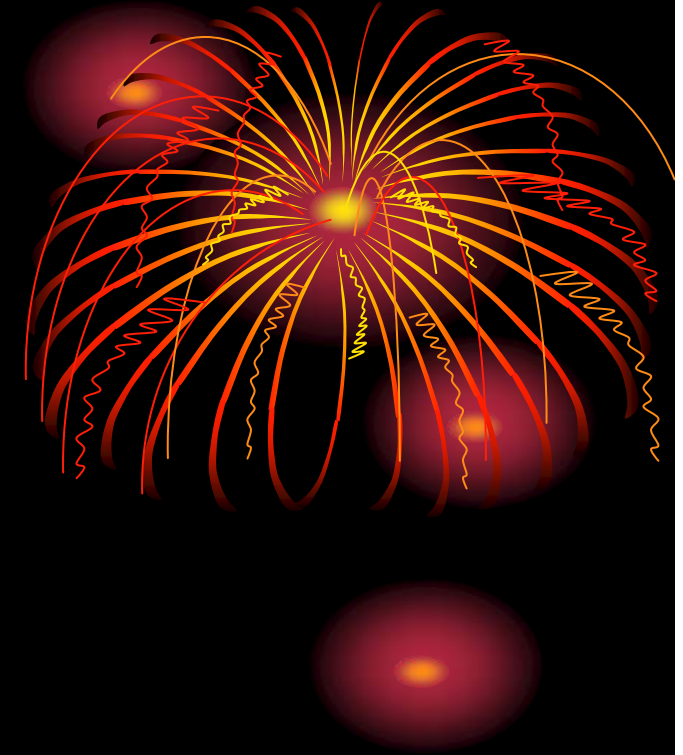
Multivasale



STEMI MV



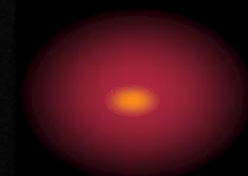
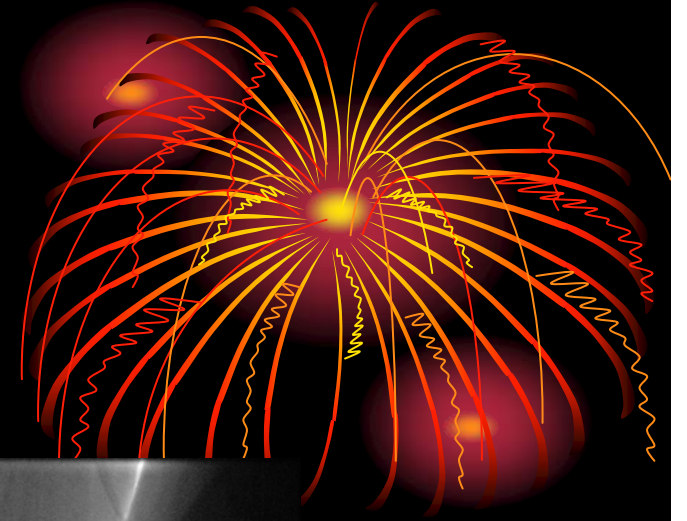
EXECUTIVE



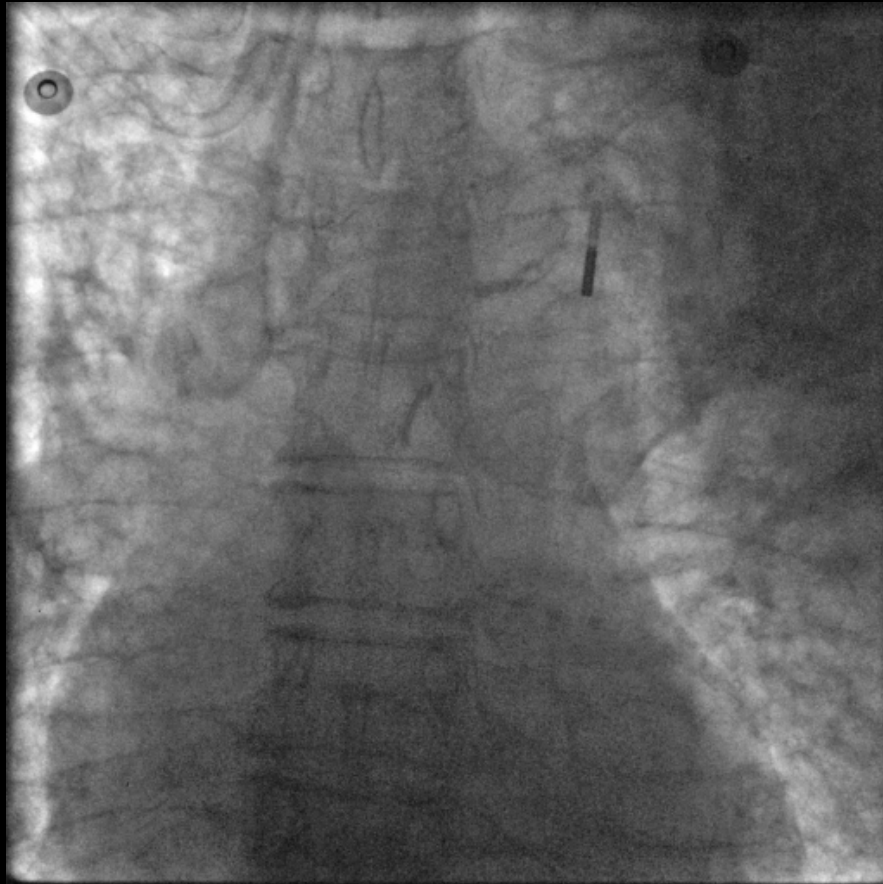
Vasculopatia



Accesso radiale

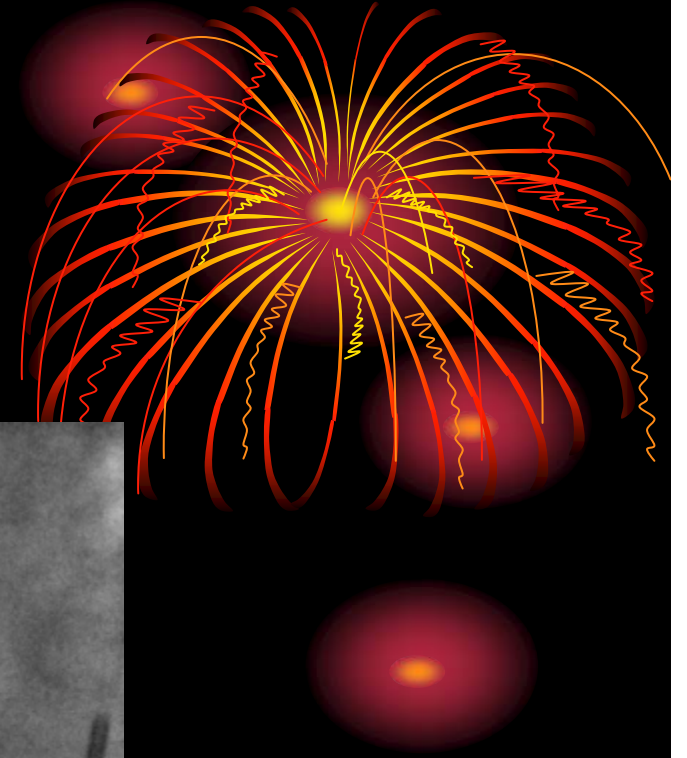
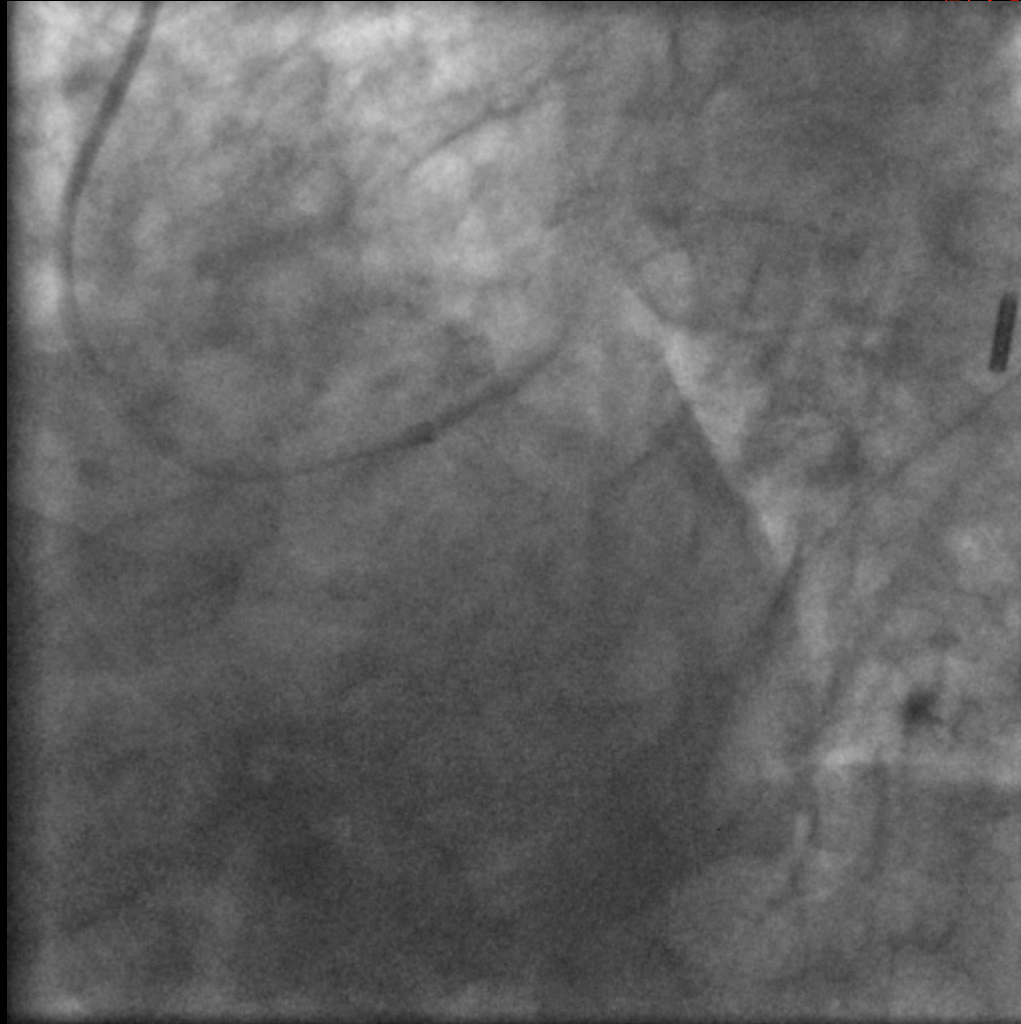


FE depressa



Logistic Euroscore 14

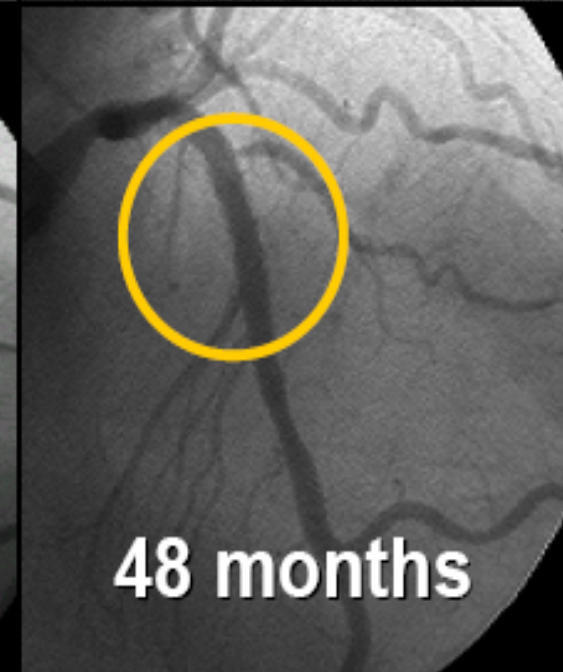
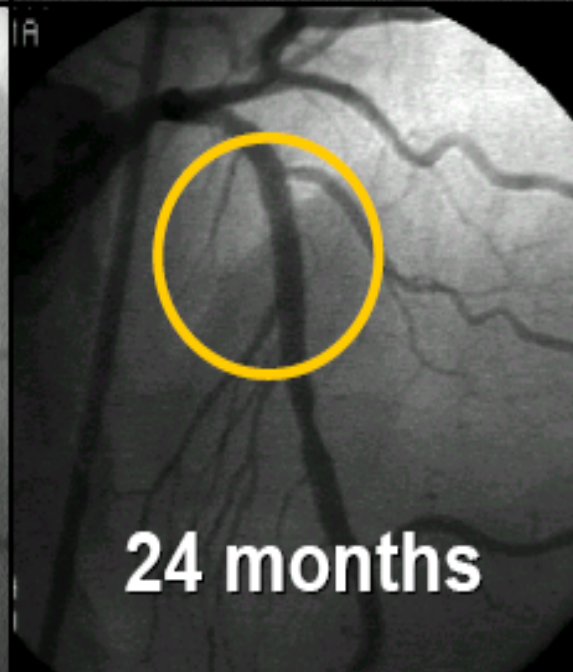
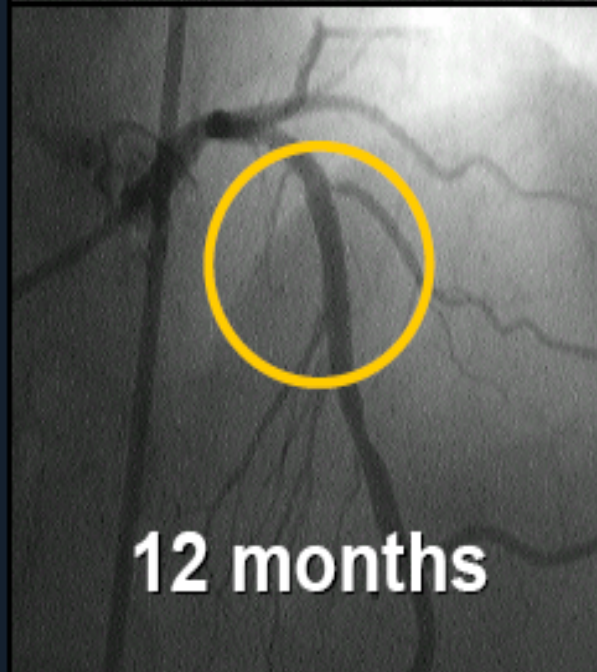
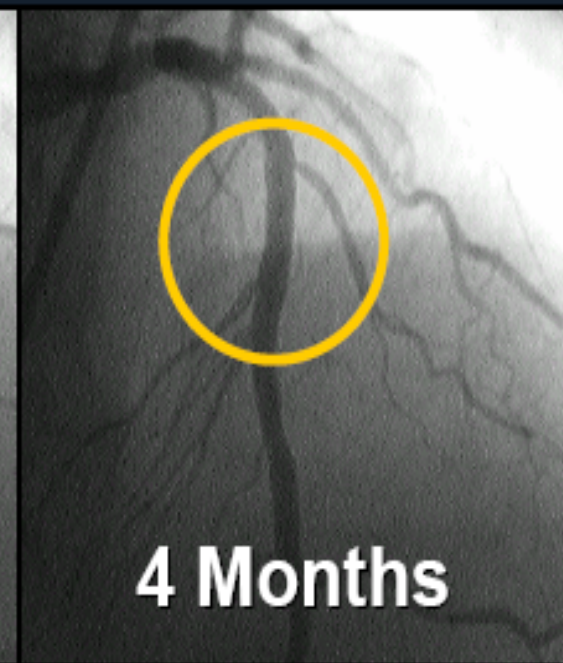
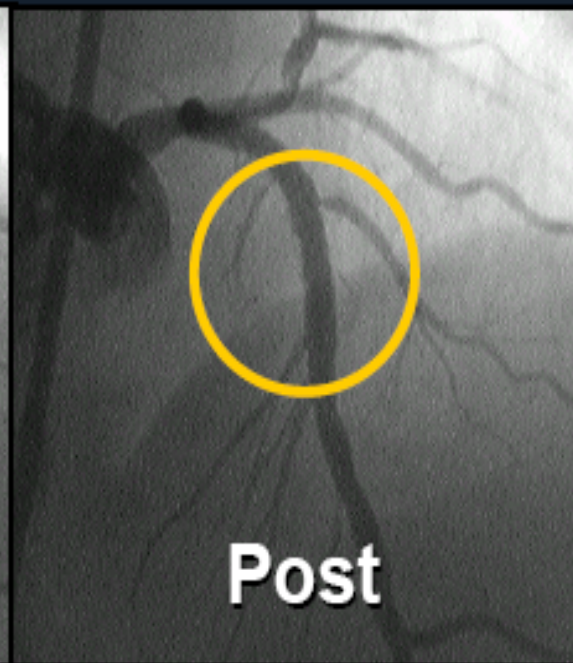
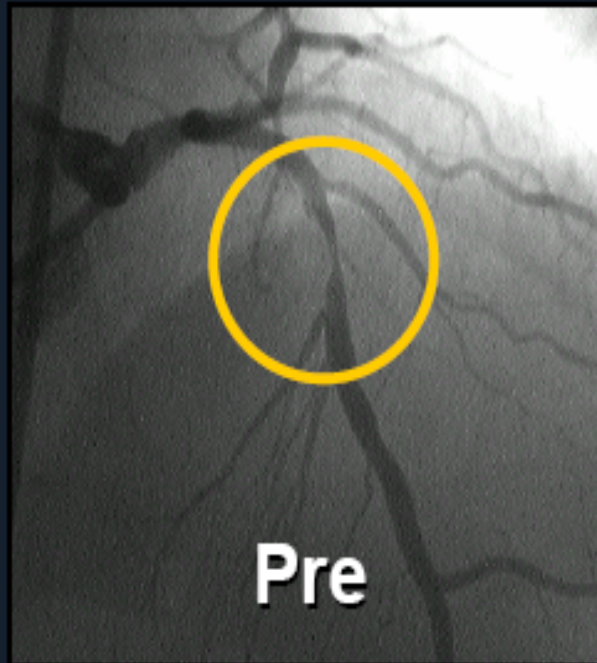
FE depressa





- Stato dell'arte della PCI: cosa possiamo fare
- Stent medicati: il santo Graal del Cardiologo interventista?
- Quali pazienti dobbiamo inviare al Cardiocirurgo?
- Quali pazienti dobbiamo trattare noi?

DES: A Transforming Technology



TUESDAY

ESC Congress News



WORLD HEART
FEDERATION*

World Congress of Cardiology 2006

*The unique meeting of the European Society of Cardiology Congress 2006
and the World Heart Federation's XVth World Congress of Cardiology*



Do drug-eluting stents increase deaths?

TWO SEPARATE, independent meta-analyses, presented in Hot Line session 1, suggest drug-eluting stents (DES) may increase death, Q-wave myocardial infarction (clinical surrogates of in-stent thrombosis) and cancer deaths, bringing the long-term safety of DES firmly into the spotlight. Discussant Salim Yusuf (McMaster University, Canada) hailed the data as one of the most important presentations to come out of this year's meeting.

"Six million people in the world have been implanted with DES, yet their long-term safety and efficacy is unknown," said Yusuf. "I've a feeling the data we're seeing today is only the tip of the iceberg. We need to encourage more public access to the data."



obtain this data from the manufacturer," said Nordmann. He speculated that the increase in cancer might be due to a rapid impairment of the immune system.

Yusuf widened the debate to include percutaneous coronary intervention (PCI). "The overuse of PCI is an insidious change in the culture of cardiology that needs to be reversed," he said. The use of PCI was established in MI, high-risk unstable angina and cardiogenic shock. However, its use in stable disease was a totally different question.

"There's no beneficial influence on mortality - PCI does nothing to prevent heart attack. All we are doing is providing short-term relief of chest pain. It's not re-stenosis that kills but the



**BMS 24 Months after
Deployment**



**Cypher 16 Months after
Deployment**

DES e trombosi

Inflammatione locale
(polimero?)

Effetto antiproliferativo

- Ritardata endotelizzazione di stent e parete vasale
- Azione sulla tunica media con rimodellamento positivo
- Malapposizione tardiva, aneurismi

Triade di Virchow

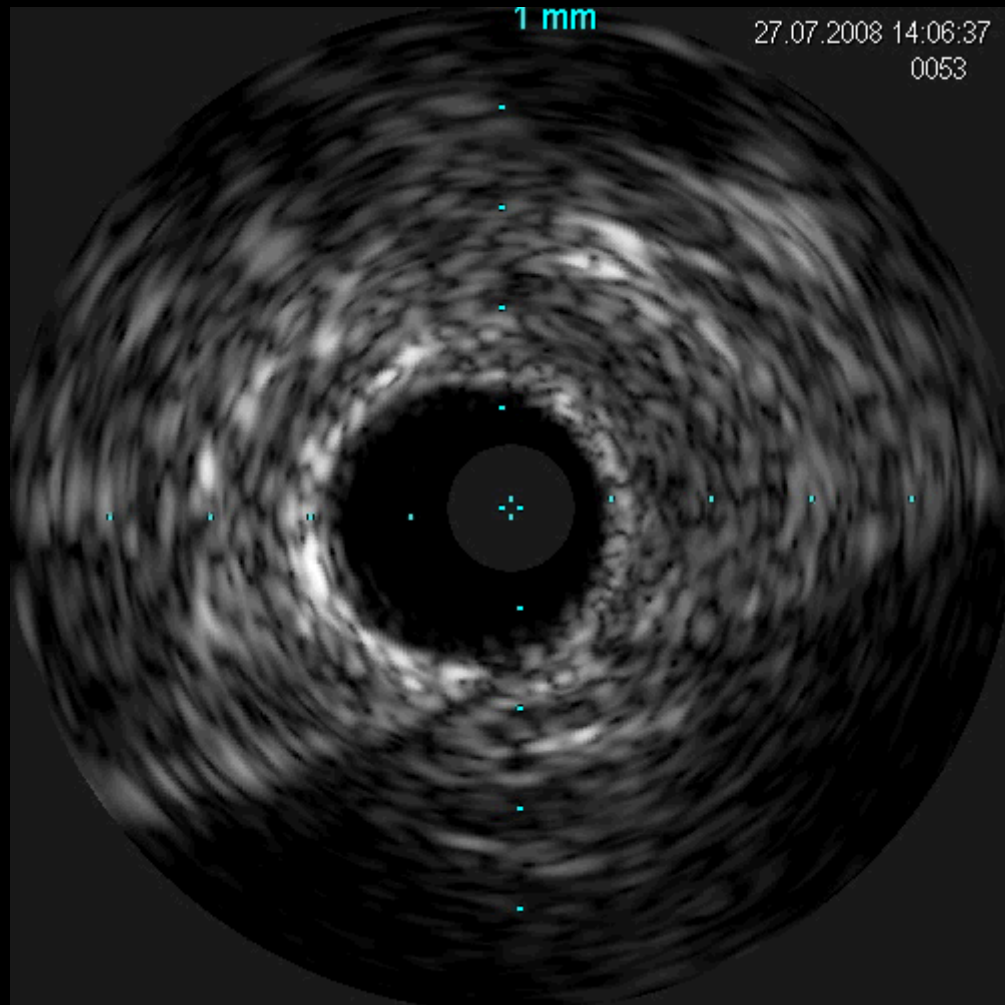
- *anomalia parete vasale*
- *pattern di flusso alterato*
- *stimolo protrombotico*

Very Late Stent Thrombosis (32 mesi)

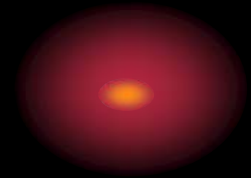


Angiografia

Very Late Stent Thrombosis (32 mesi)



IVUS



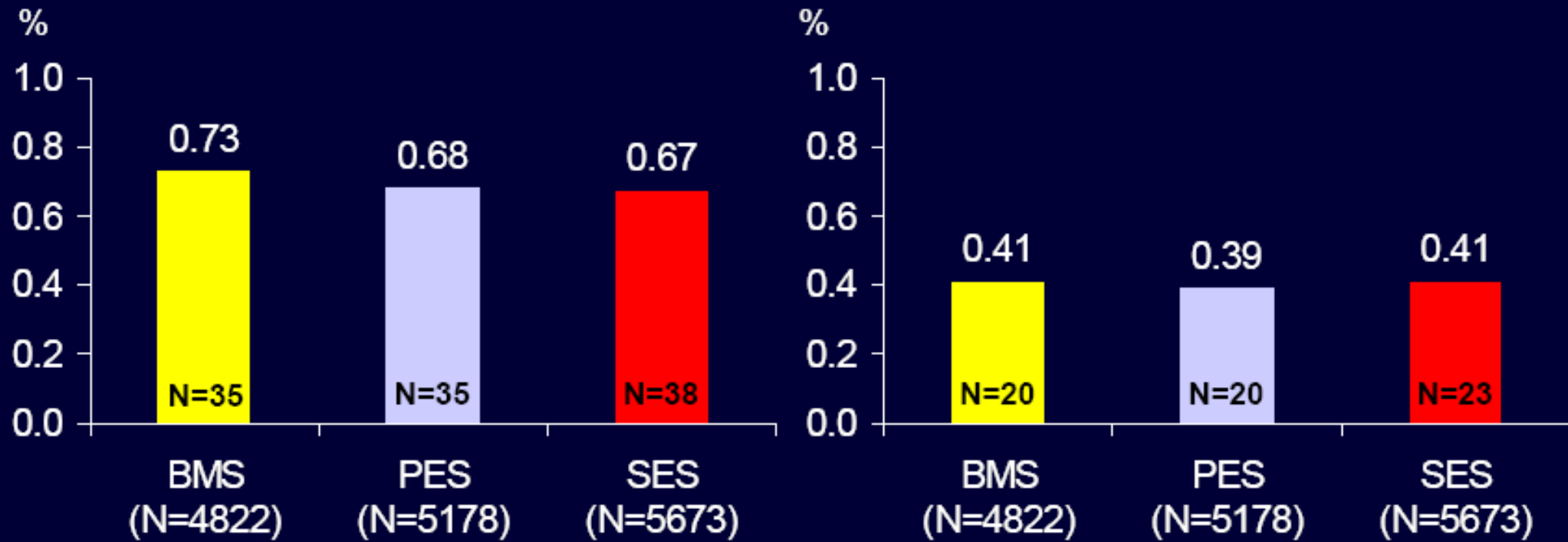
Early and Late Definite ST Drug-Eluting vs Bare Metal Stents

Early Stent Thrombosis
(0-30 Days)

Stettler C et al. *Lancet* 2007

Late Stent Thrombosis
(>1 month <1 year)

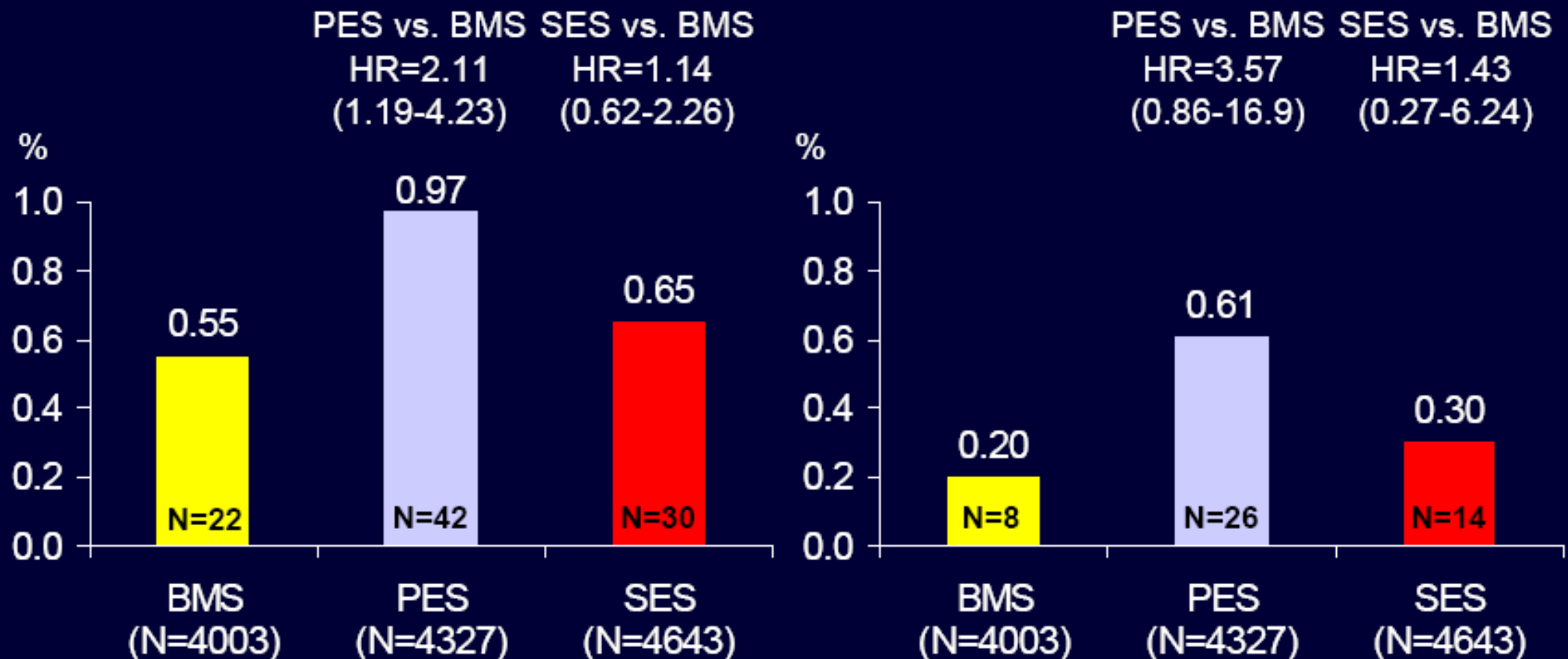
Stettler C et al. *Lancet* 2007



Late Definite Stent Thrombosis (ARC) Drug-Eluting vs Bare Metal Stents

Late Stent Thrombosis
(30 Days – 4 Years)
Stettler C et al. *Lancet* 2007

Very Late Stent Thrombosis
(1 Year – 4 Years)
Stettler C et al. *Lancet* 2007





- I DES riducono la necessità di nuove rivascolarizzazioni (Target Vessel Revascularization) del 50-70% rispetto ai BMS, sia nei diabetici che nei non diabetici.
- L'incidenza complessiva di trombosi è simile per DES e BMS fino a 4 anni di follow up.
- La trombosi molto tardiva (>12 mesi) è peculiarità dei DES.
- Morte ed infarto non differiscono tra DES e BMS fino a 4 anni di follow up, sia in diabetici che non diabetici

Stettler et al. Lancet 2007; 370: 937



- Stato dell'arte della PCI: cosa possiamo fare
- Stent medicati: il santo Graal del Cardiologo interventista?
- Quali pazienti dobbiamo inviare al Cardiocirurgo?
- Quali pazienti dobbiamo trattare noi?

CRITERI PER RIVASCOLARIZZAZIONE

- Presentazione clinica (SCA, angina stabile..)
- Gravità dell'angina (asintomatico, CCS 1-4)
- Estensione ischemia ai test non invasivi
- Scompenso
- Ridotta funzione ventricolare sinistra
- Diabete
- Entità della terapia farmacologica
- Anatomia coronarica
 - Malattia di uno, due, tre vasi
 - Coinvolgimento DA prossimale
 - Malattia del TC



Estensione della coronaropatia e prognosi nel paziente stabile

Extent of CAD	Prognostic Weight (0–100)	5-Year Survival Rate (%)*
1-vessel disease, 75%	23	93
>1-vessel disease, 50% to 74%	23	93
1-vessel disease, $\geq 95\%$	32	91
2-vessel disease	37	88
2-vessel disease, both $\geq 95\%$	42	86
1-vessel disease, $\geq 95\%$ proximal LAD	48	83
2-vessel disease, $\geq 95\%$ LAD	48	83
2-vessel disease, $\geq 95\%$ proximal LAD	56	79
3-vessel disease	56	79
3-vessel disease, $\geq 95\%$ in at least 1	63	73
3-vessel disease, 75% proximal LAD	67	67
3-vessel disease, $\geq 95\%$ proximal LAD	74	59

Stenosi coronarica "significativa"

- Alla stima visuale la stenosi del ramo epicardico, valutata nella proiezione angiografica in cui la stenosi stessa appare più grave, riduce di almeno il 70% il diametro luminale.
- Per il tronco comune, 50%.

PCI vs CABG

- Malattia coronarica multivasale
- Angina in classe CCS III-IV
- Profilo di rischio medio-alto ai test non invasivi

High-Risk (greater than 3% annual mortality rate)

- 1. Severe resting left ventricular dysfunction (LVEF less than 35%)**
- 2. High-risk treadmill score (score less than or equal to -11)**
- 3. Severe exercise left ventricular dysfunction (exercise LVEF less than 35%)**
- 4. Stress-induced large perfusion defect (particularly if anterior)**
- 5. Stress-induced multiple perfusion defects of moderate size**
- 6. Large, fixed perfusion defect with LV dilation or increased lung uptake (thallium-201)**
- 7. Stress-induced moderate perfusion defect with LV dilation or increased lung uptake (thallium-201)**
- 8. Echocardiographic wall motion abnormality (involving greater than two segments) developing at low dose of dobutamine (less than or equal to 10 mg/kg/min) or at a low heart rate (less than 120 beats/min)**
- 9. Stress echocardiographic evidence of extensive ischemia**

Intermediate-Risk (1% to 3% annual mortality rate)

- 1. Mild/moderate resting left ventricular dysfunction (LVEF equal to 35% to 49%)**
- 2. Intermediate-risk treadmill score (– 11 less than score less than 5)**
- 3. Stress-induced moderate perfusion defect without LV dilation or increased lung intake (thallium-201)**
- 4. Limited stress echocardiographic ischemia with a wall motion abnormality only at higher doses of dobutamine involving less than or equal to two segments**

Low-Risk (less than 1% annual mortality rate)

- 1. Low-risk treadmill score (score greater than or equal to 5)**
- 2. Normal or small myocardial perfusion defect at rest or with stress***
- 3. Normal stress echocardiographic wall motion or no change of limited resting wall motion abnormalities during stress***



[Home](#) / [Tools](#) / [Medical Calculators](#) / [Duke Treadmill Score](#)

The Duke Treadmill Score

Enter a value in millimeters for ST Depression: mm

Enter a value for METs:

Treadmill induced angina?

[Calculate](#)



[Home](#) / [Tools](#) / [Medical Calculators](#) / [Duke Treadmill Score](#) / [Results](#)

Duke Treadmill Score:

The Duke Score (**-17**) estimates an annual cardiovascular mortality of **6%** and a five year survival of **66%** Using the Duke Score there is **a high probability of severe angiographic coronary disease.**

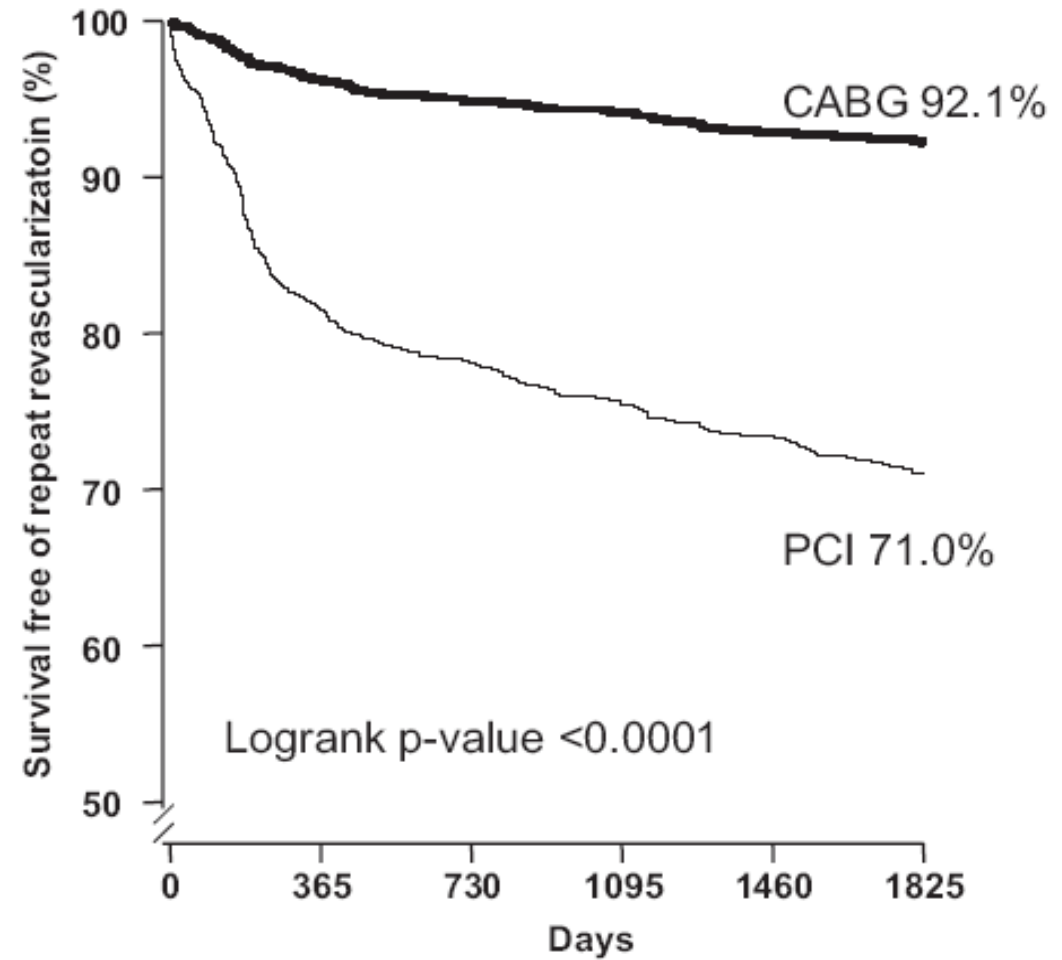
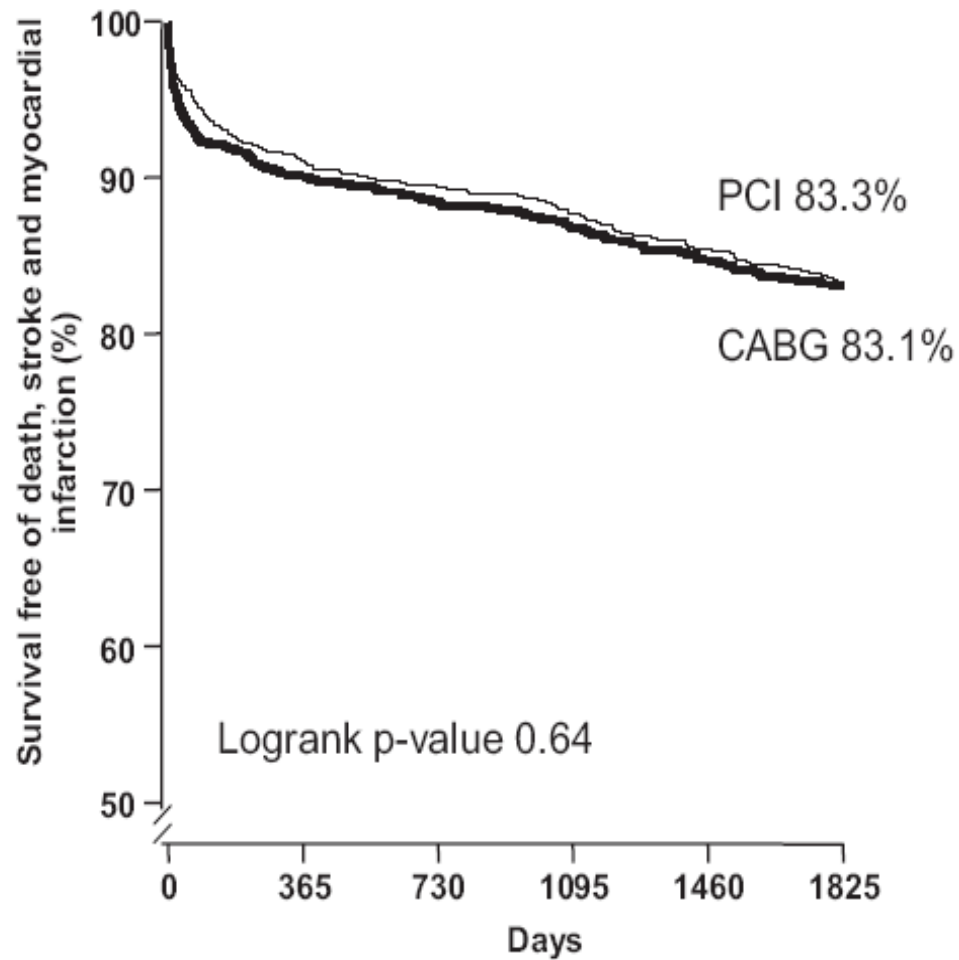
ACCF / SCAI / STS / AATS / AHA / ASNC 2009 Appropriateness Criteria for Coronary Revascularization

2 vasi + DA prox
3 vasi
TC isolato
TC + altro vaso

CABG			PCI		
No diabetes and normal LVEF	Diabetes	Depressed LVEF	No diabetes and normal LVEF	Diabetes	Depressed LVEF
A	A	A	A	A	A
A	A	A	U	U	U
A	A	A	I	I	I
A	A	A	I	I	I

PCI con stent non medicati (BMS) vs CABG nel trattamento della malattia multivasale

- ARTS I
- MASS II
- ERACI II
- SOS
- Tassi di sopravvivenza analoghi ma più elevato tasso di rivascularizzazione a 5 anni con PCI



SYNTAX Trial Design

62 EU Sites + 23 US Sites

Heart Team (surgeon & interventionalist)

Amenable for both treatment options

Amenable for only one treatment approach

Stratification:
LM and Diabetes

Randomized Arms
n=1800

Two Registry Arms

CABG
N=897

vs

TAXUS*
N=903

CABG
N=1077

PCI
N=198

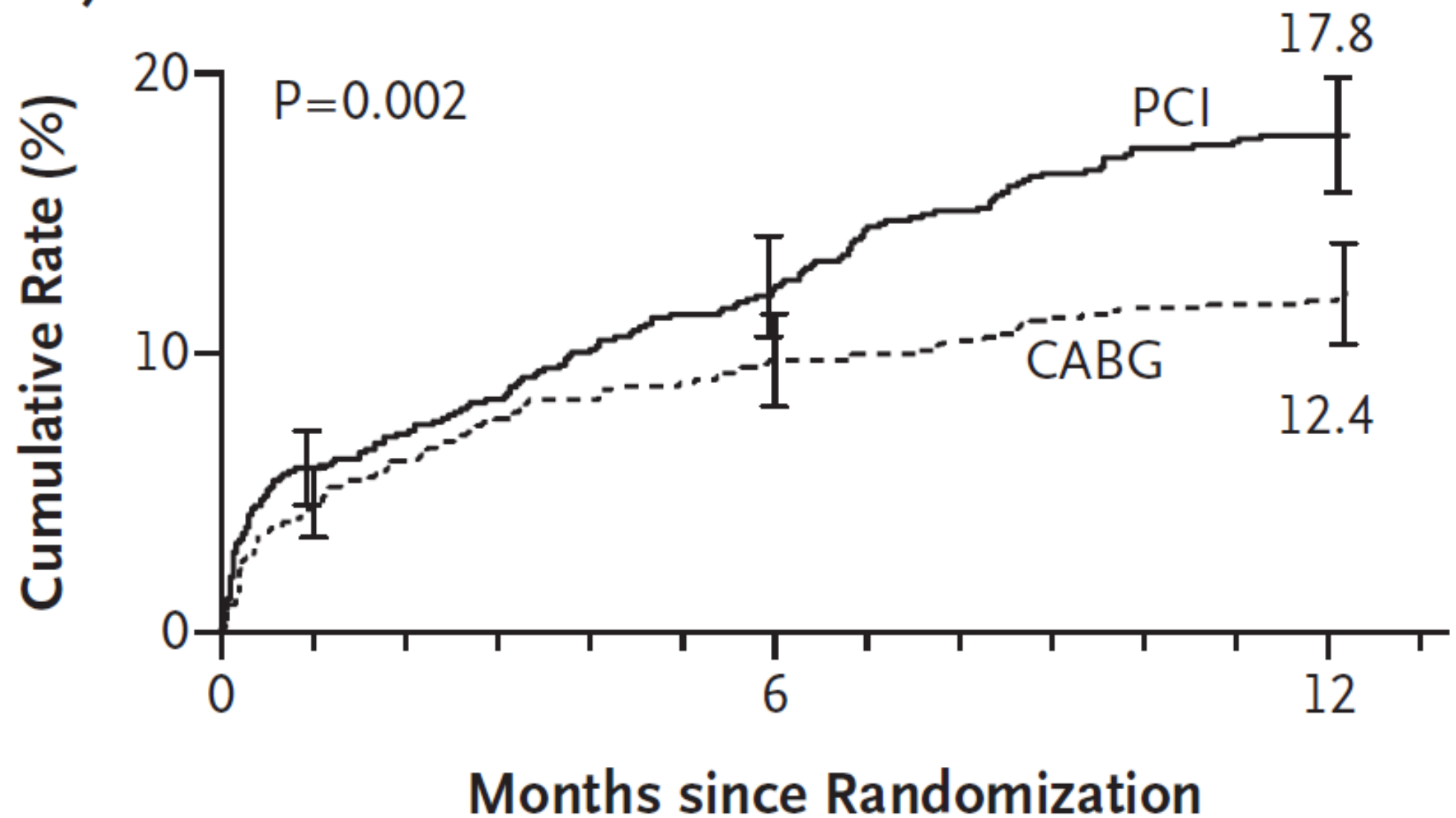
DM 28.5%
Non DM 71.5%

DM 28.2%
NonDM 71.8%

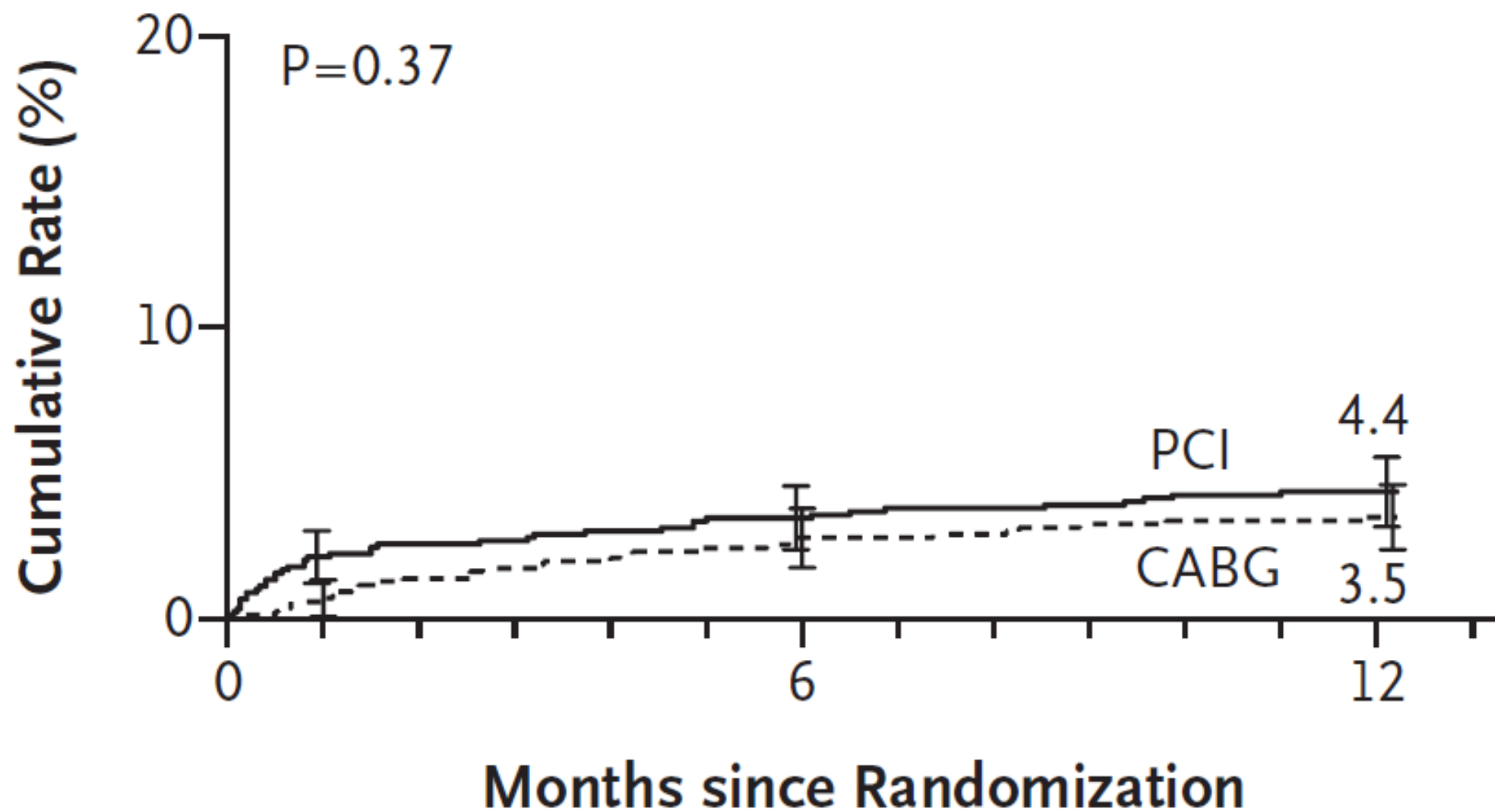
Mar 2009

	PCI (n=903)	CABG (n=897)	P value
3V only (%)	66,3	65,4	ns
LM any (%)	33,7	34,6	ns
- LM only	3,1	3,8	ns
- LM + 1V	5,1	5,4	ns
- LM + 2V	12,0	11,5	ns
- LM + 3V	13,5	13,9	ns
Angina stabile (%)	56,9	57,2	ns
Angina instabile (%)	28,9	28,0	ns
FE <30% (%)	1,3	2,5	ns
EuroScore	3,8±2,6	3,8±2,7	ns
CTO (%)	24,2	22,2	ns
Degenza post (gg)	3,4±4,5	9,5±8,0	<0,001
Rivascolarizzazione completa (%)	56,7	63,2	0,005

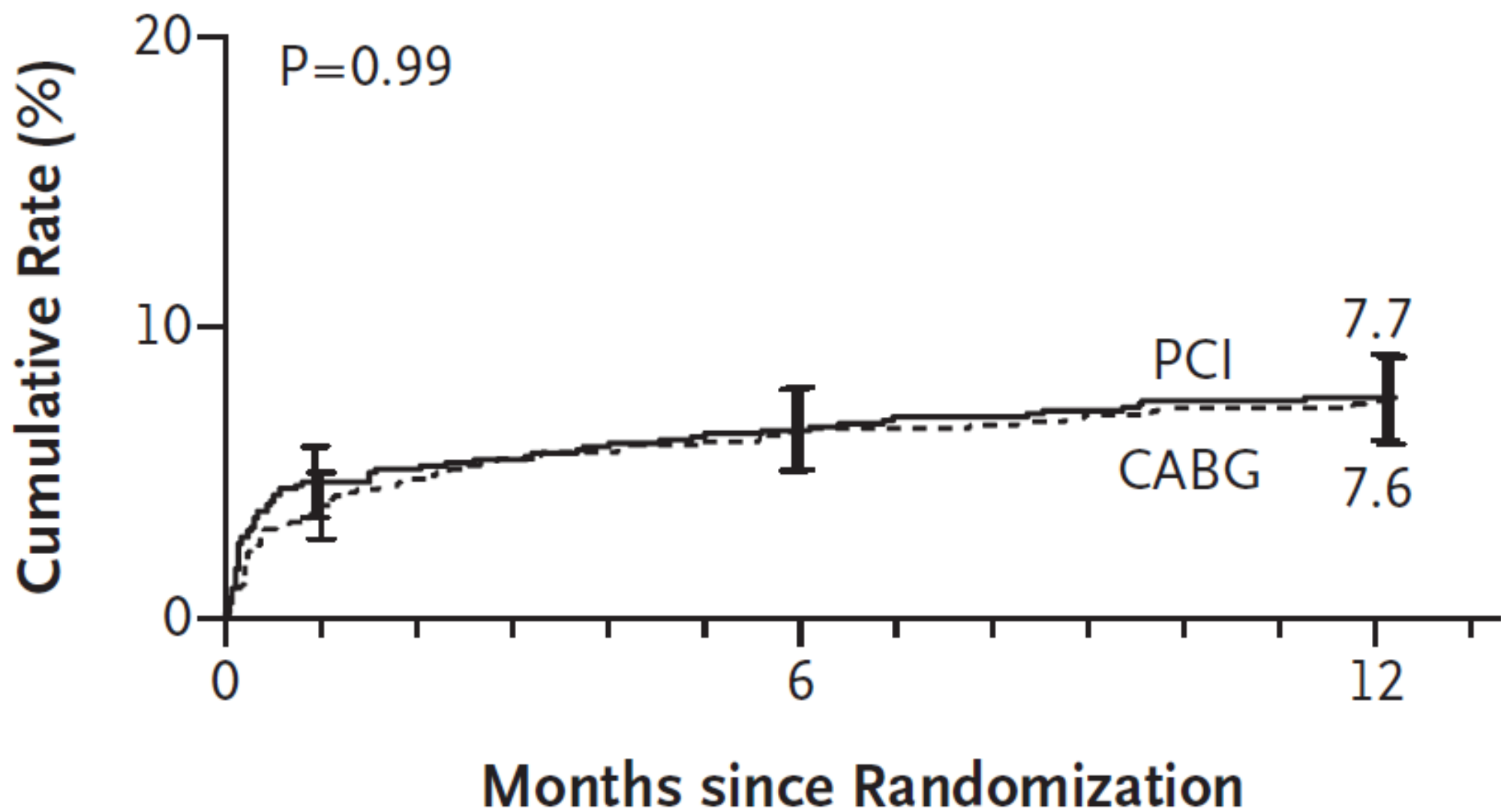
Major Adverse Cardiac or Cerebrovascular Event



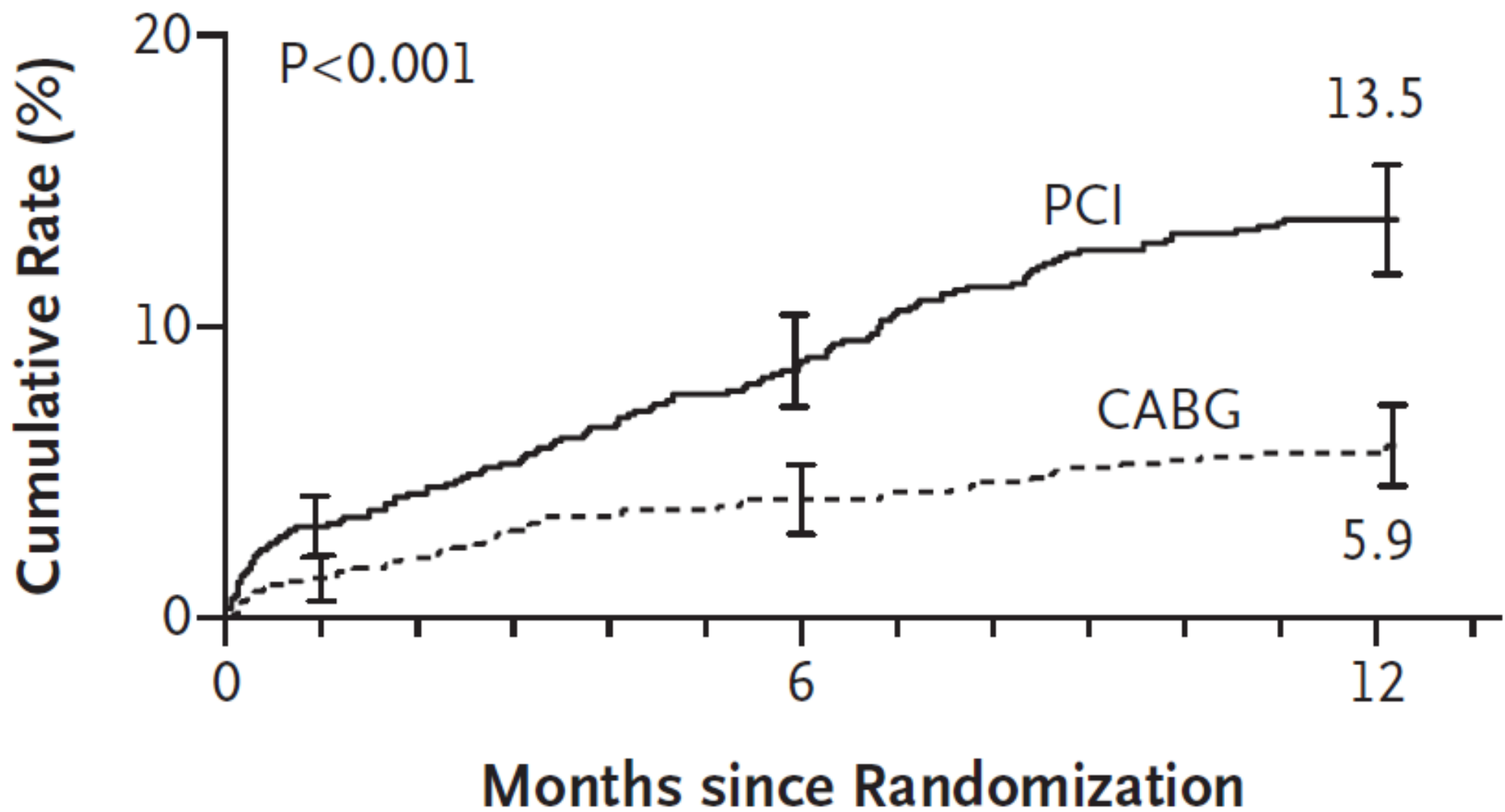
Death from Any Cause



Death from Any Cause, Stroke, or MI



Repeat Revascularization



	PCI	CABG	P value
Stroke (%)	0,6	2,2	0,003
Occlusione di bypass o trombosi di stent (%)	3,3	3,4	ns
- Acuta (<24h)	0,2	0,3	ns
- Precoce (<30 gg)	2,0	0,3	0,001
- Tardiva (30 gg - 1 anno)	1,0	2,5	0,02

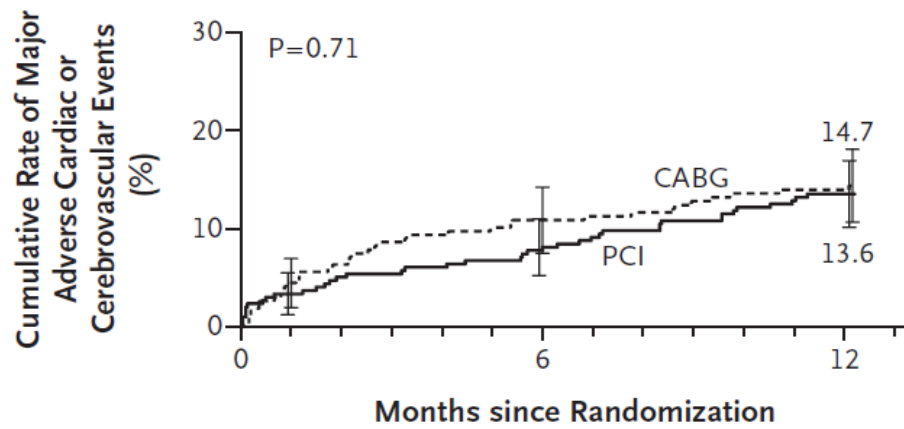
Modalità di rivascolarizzazione chirurgica nel SYNTAX

Chirurgia off-pump	15%
Bypass arterioso per a. discendente anteriore	96%
Doppia mammaria	28%
Rivascolarizzazione arteriosa completa	19%
Rivascolarizzazione venosa completa	3%

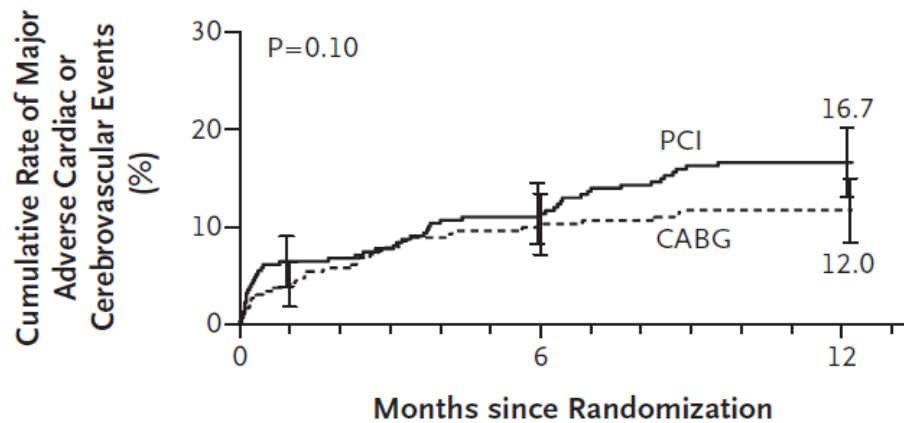
SYNTAX SCORE

- Dominanza
- Sede stenosi
- Tronco comune
- Trivasale
- CTO
- Tortuosità
- Biforcazione
- Trombo
- Calcificazione

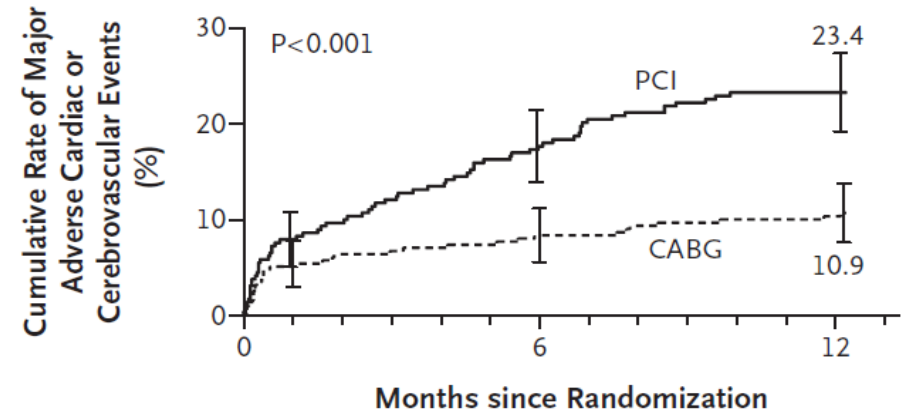
Low SYNTAX Score



Intermediate SYNTAX Score



High SYNTAX Score

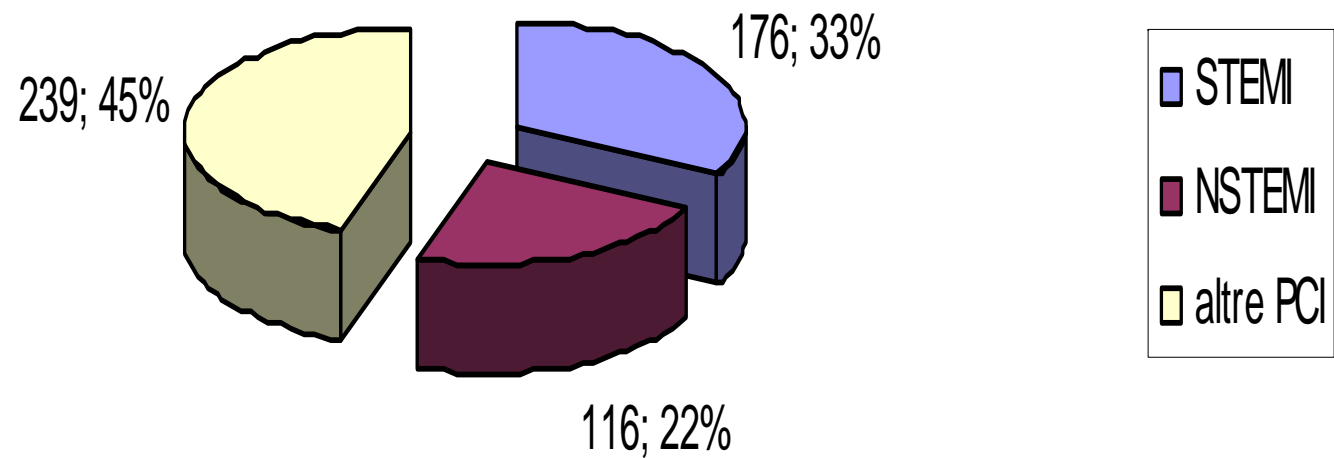




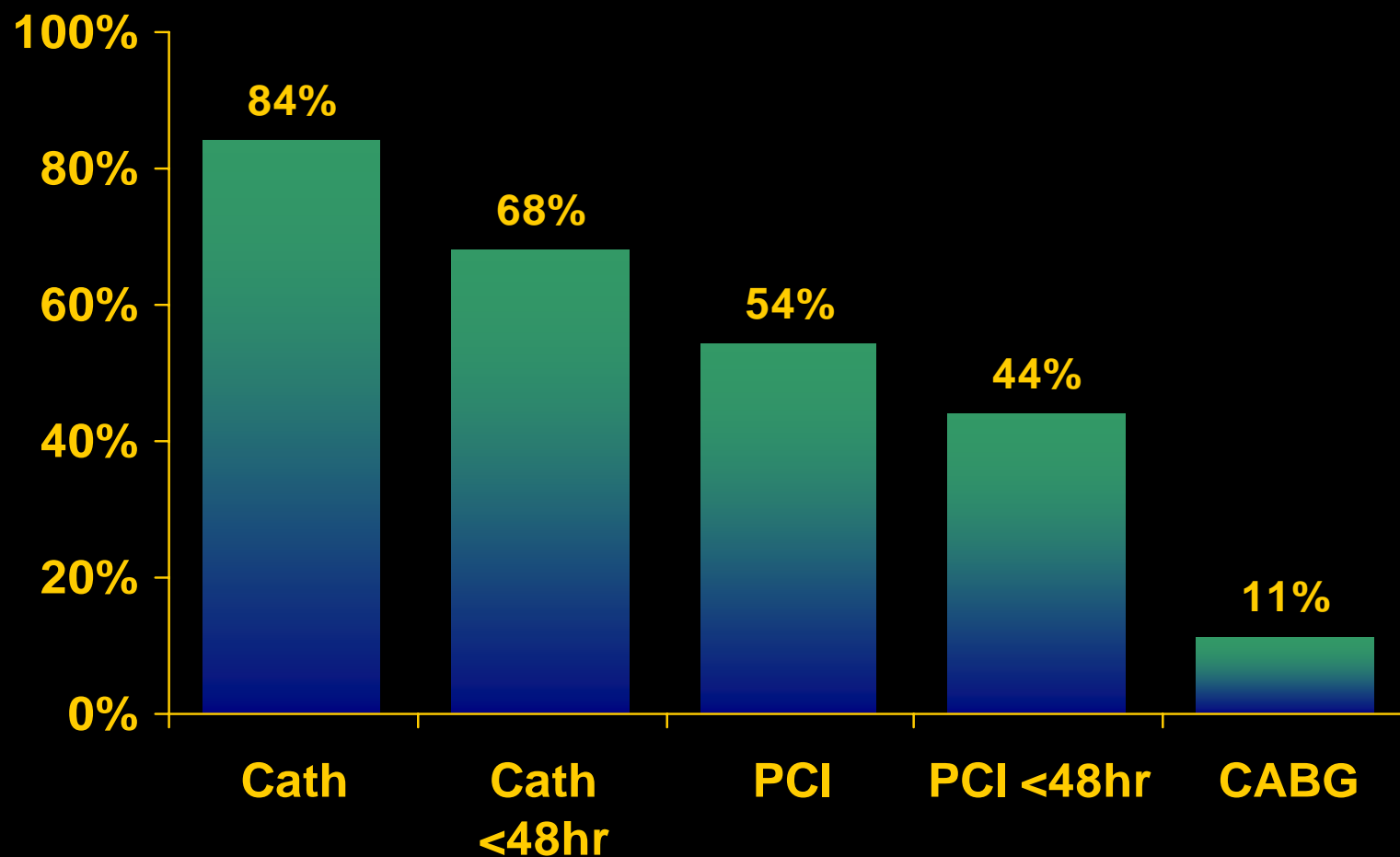
- Stato dell'arte della PCI: cosa possiamo fare
- Stent medicati: il santo Graal del Cardiologo interventista?
- Quali pazienti dobbiamo inviare al Cardiocirurgo?
- Quali pazienti dobbiamo trattare noi?

PCI AL "SANDRO PERTINI" - 2008

PCI 2008 (n=531)

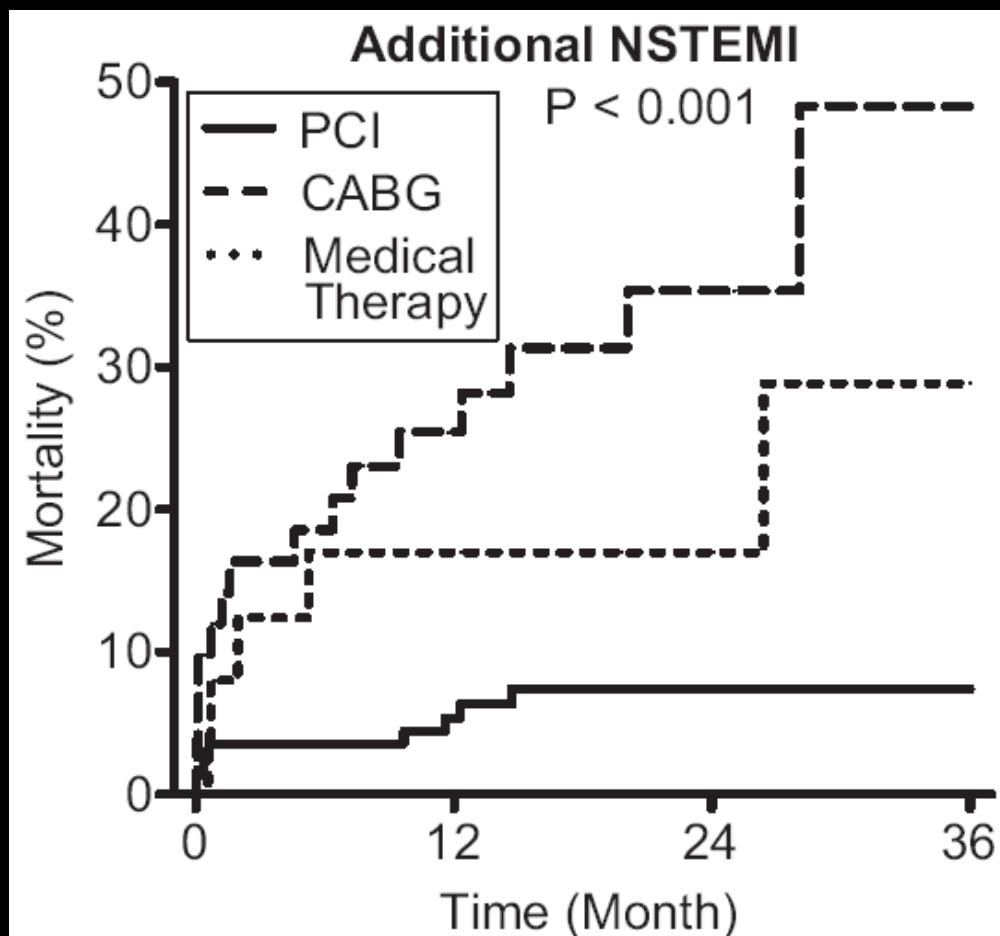


Procedure invasive nei pazienti con UA/NSTEMI



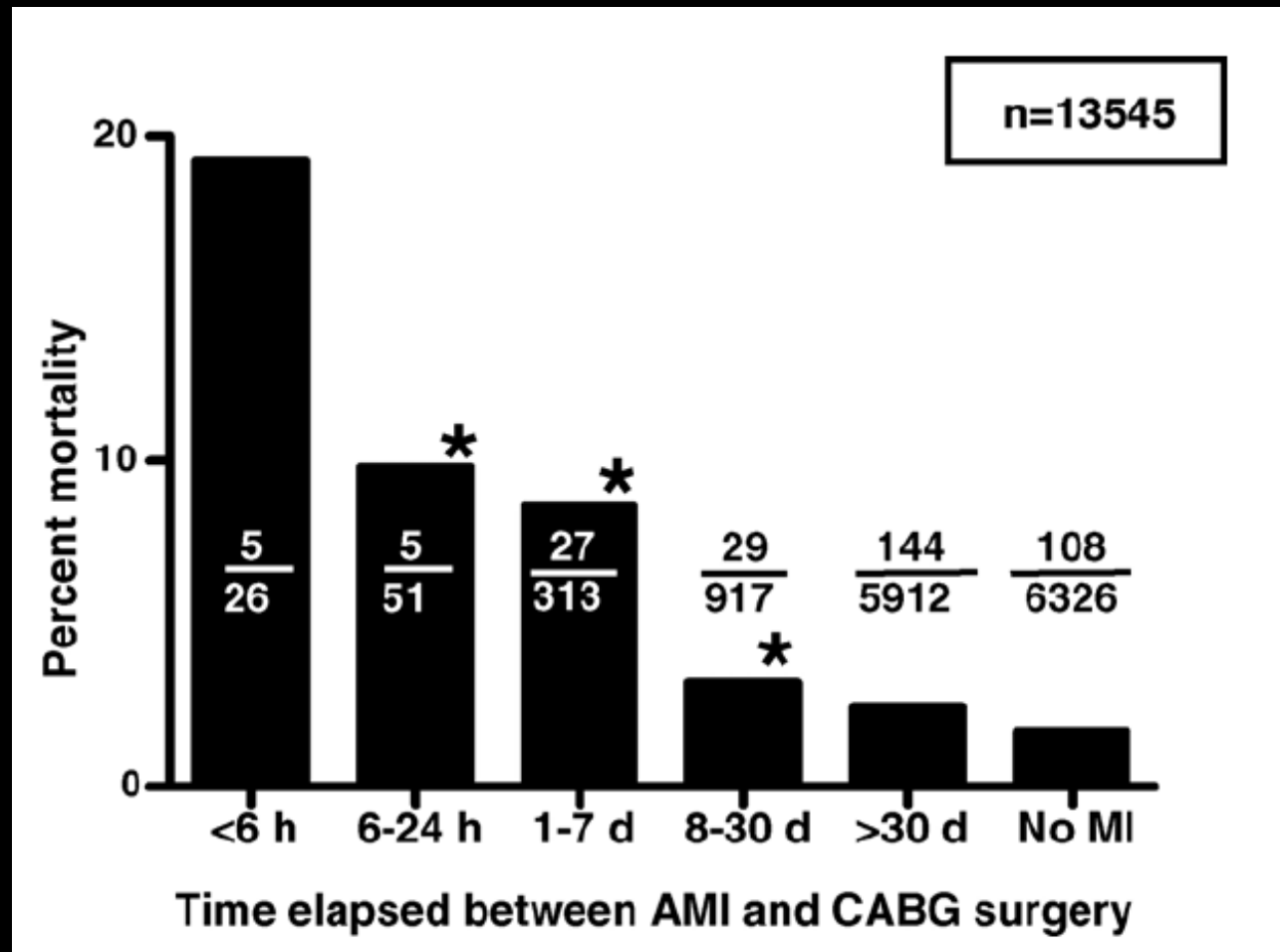
Q2 2006 CRUSADE Data (n=6923)

PCI vs CABG nel NSTEMI

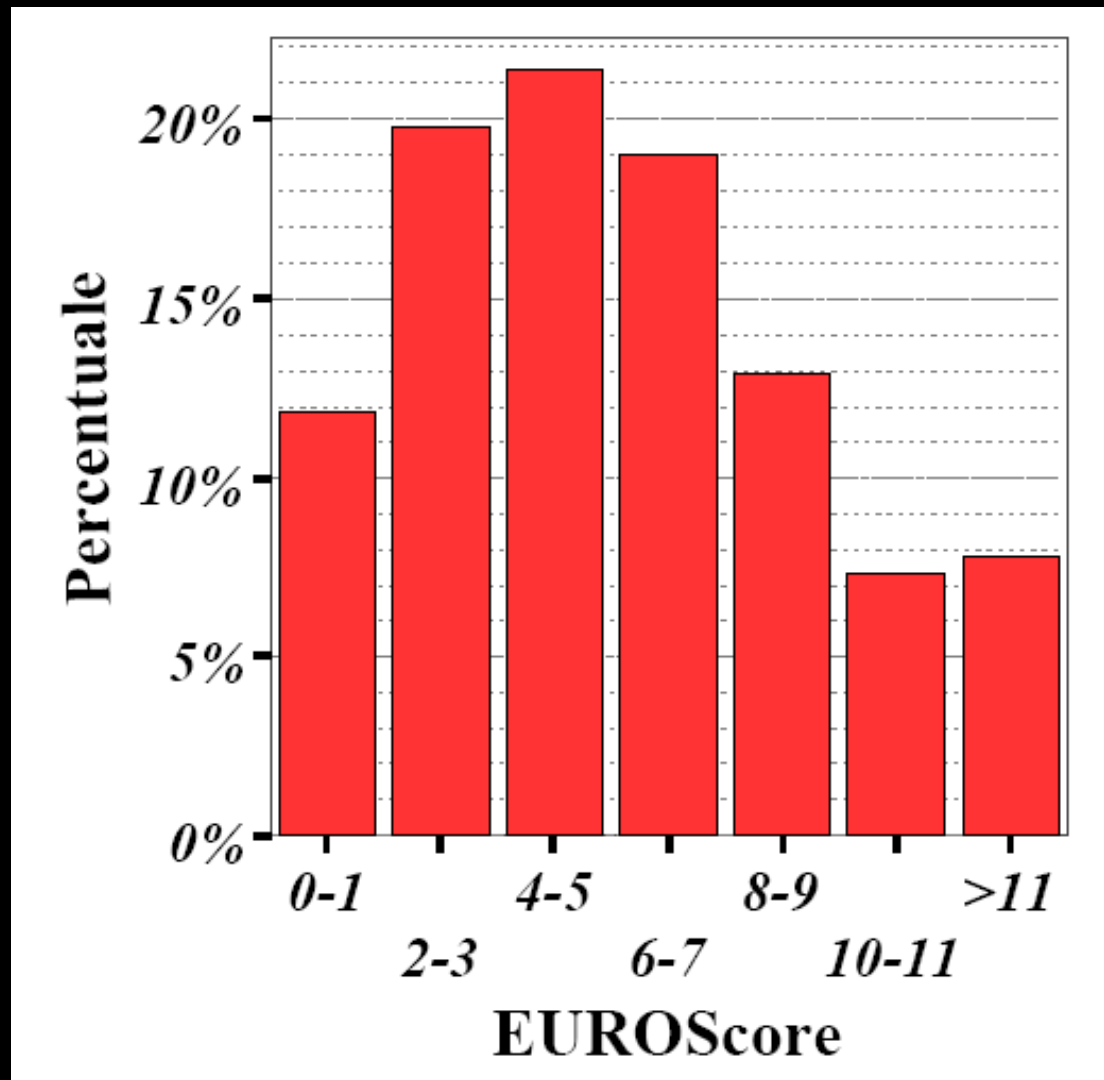


	Hazard Ratio	Confidence Interval	p Value
CABG as primary therapy	3.2	1.4–7.5	0.008
Age (ys)	1.1	1.0–1.1	0.001
Previous myocardial infarction	0.8	0.3–2.0	0.603
Impaired renal function*	2.2	0.9–5.8	0.095
C-Reactive protein (mg/L)	1.0	0.9–1.1	0.241
Creatinine kinase (U/L)	1.0	1.0–1.0	0.606
Cardiogenic shock	3.3	0.7–16.5	0.150
Impaired left ventricular function [†]	5.4	1.1–25.5	0.034

Mortalità perioperatoria (CABG) dopo IMA



Rapporto preliminare sulla Cardiochirurgia italiana - 2004



Conclusioni



- La malattia coronarica multivasale complessa (Syntax score elevato, TC) è ancora di pertinenza chirurgica, soprattutto nei pazienti con coronaropatia stabile.
- Nelle SCA e nei pazienti ad alto rischio operatorio, nel mondo reale, la PCI è spesso l'unica metodica di rivascularizzazione possibile.