

Comparison of Coronary Artery Bypass Surgery With PCI With Drug-Eluting Stents for Unprotected Left Main Coronary Artery Disease: Cedars-Sinai Experience

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Study Design



Apr 2003 - Feb 2007, 343 consecutive patients with ULMCA disease underwent revascularization
(excluding patients that received concomitant valve surgery)

Doctor Discretion / Patient Preference / Surgical Rejection

**PCI with
Drug-eluting Stents**

120 Patients

CABG

223 Patients

Primary endpoints: Survival and Freedom from major adverse cardiac and cerebrovascular events (MACCE) at 30-days and intermediate-term follow-up

41% of patients were considered poor surgical candidates

Methods

Stratification by surgical risk

Parsonnet score

Parsonnet *et al* *Circulation*.1989.79:13

Variable	Points
Female	1
Pre-op IABP	2
Diabetes / HT / Obesity	3 each
LV aneurysm	5
Emergency surgery, Dialysis	10 each
Ejection fraction:	
>50% / 30-49% / <30%	0 / 2 / 4
Age:	
<70 / 70-74 / 75-79 / ≥80 years	0 / 7 / 12 / 20
Re-operation:	
First / second	5 / 10

Ellis score

Ellis *et al* *Am Heart J*.1998.135:335

Variable	Points
COPD	2
Renal insufficiency	3
Age:	
60-69	3
70-79	6
>80 years	9



Ellis score category:

- category I (0 points)
- category II (1-3 points)
- category III (5-6 points)
- category IV (≥7 points)

Subject characteristics

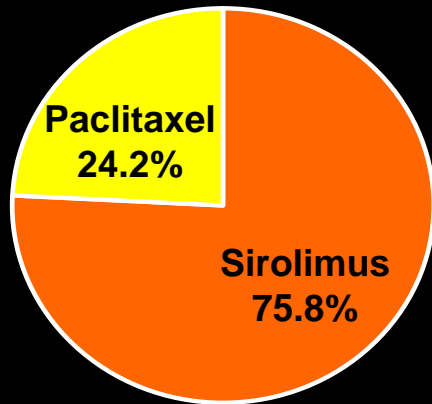
	CABG	PCI	p
n	223	120	
Age, y. Mean \pm SD	69.4 \pm 10.7	70.9 \pm 13.9	0.31
Age \geq 75 years	33%	49%	0.005
Sex, male	77%	58%	<0.001
Diabetes Mellitus	27%	35%	0.11
Hypertension	76%	76%	0.90
Hypercholesterolemia	77%	75%	0.69
Current Smoker	17%	18%	0.76
Chronic Renal Insufficiency \geq 1.5 mg/dL	10%	18%	0.06
Previous Stroke	9%	7%	0.68
EF, %	54 \pm 11	54 \pm 14	0.94
Stenosis of RCA	71%	28%	<0.0001

Subject characteristics

	CABG	PCI	p
Clinical Presentation			<0.001
Stable Angina	45%	27%	
UA/MI/other	55%	73%	
Parsonnet Score, Mean \pm SD	13.0 \pm 9.3	17.3 \pm 11.3	<0.001
Patients with Parsonnet Score >15	37%	54%	0.002
Ellis score			<0.001
category I	12%	21%	
category II	30%	16%	
category III	34%	25%	
category IV	24%	38%	

Procedural characteristics

PCI



2.6±1.4 stents / patient
49.9±33.7 mm stent length
Final diameter 3.5 ± 0.4mm

IVUS: 86% cases
GP IIb/IIIa: 14% cases
IABP: 48% cases
Tandem assist LV assist: 2.5%
Follow-up Angiogram: 44%

CABG

3.0±0.8 grafts / patient

96.4% received a LIMA to LAD
3% emergency CABG
3% pre-op IABP

Length of stay

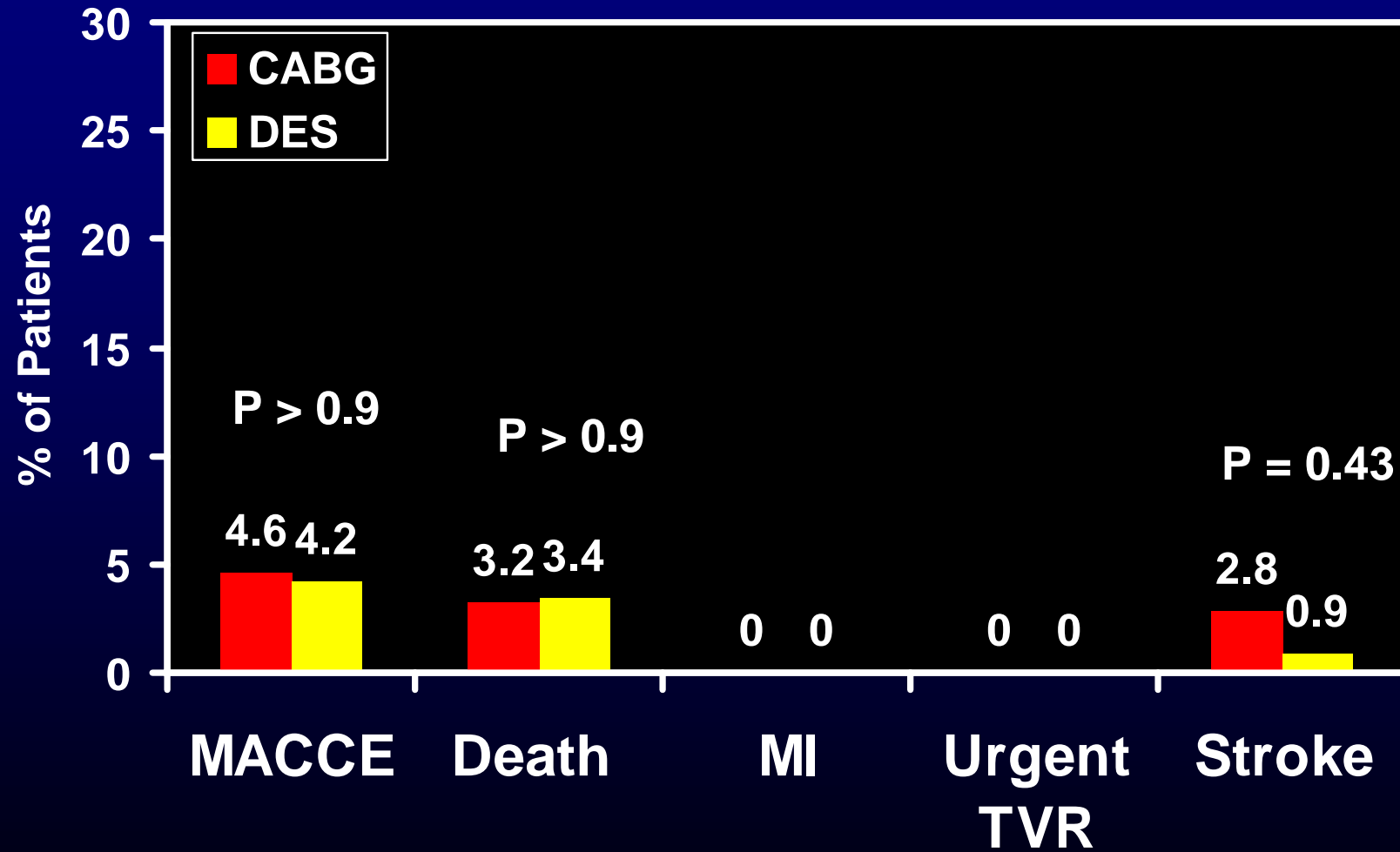
PCI	CABG	p
4.3 ± 5.1 days	7.5 ± 4.6 days	<0.0001

PCI - Procedural characteristics (cont)

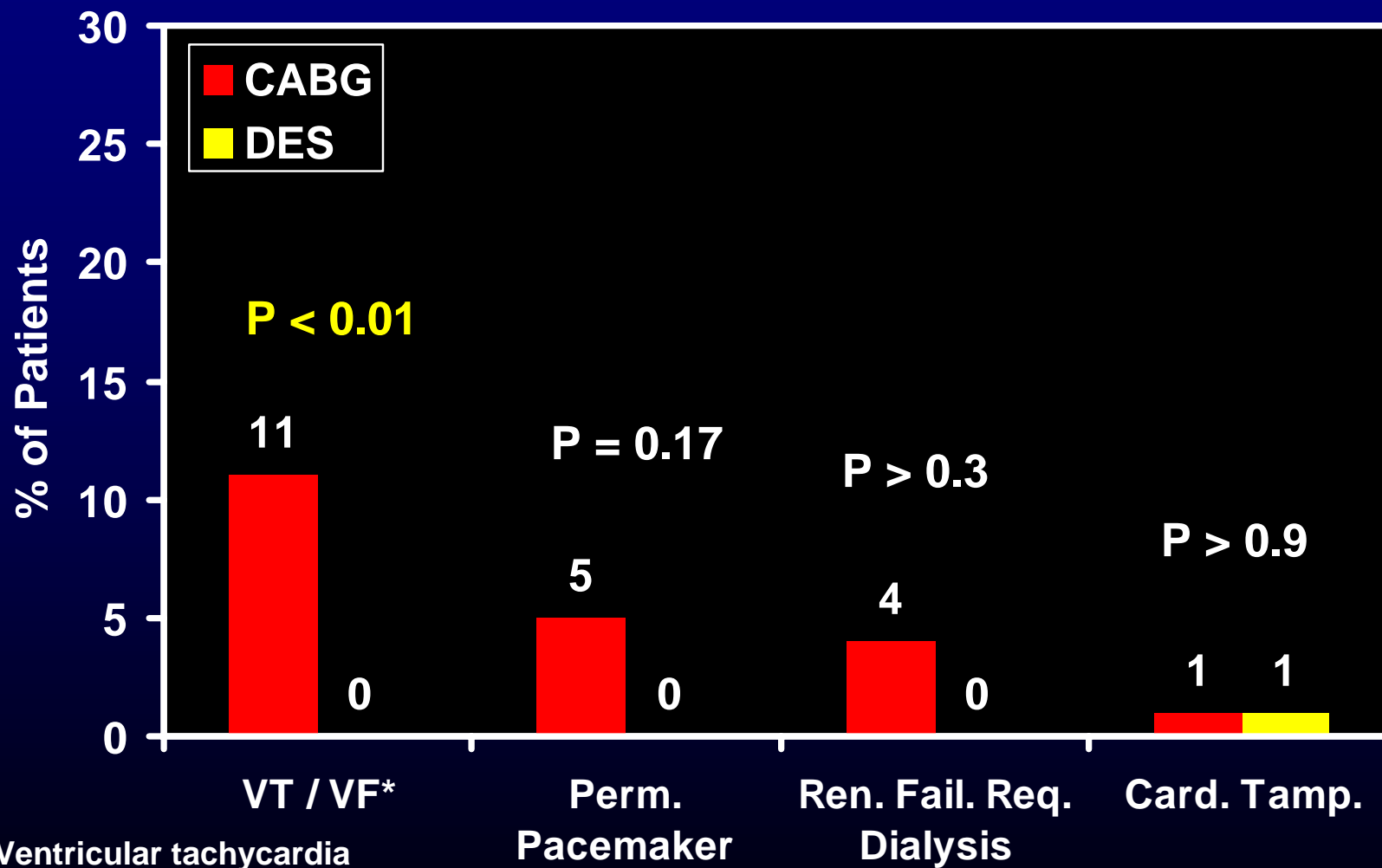
Left Main Location (not mutually exclusive)	%
Ostial	42
Mid	21
Distal Bifurcation	64

Procedural technique for the 77 bifurcation cases	%
Single stent across ostium of Cx	43
Double Barrel/Kissing Stent	29
Crush	22
T-stent	6

30-Day Outcomes

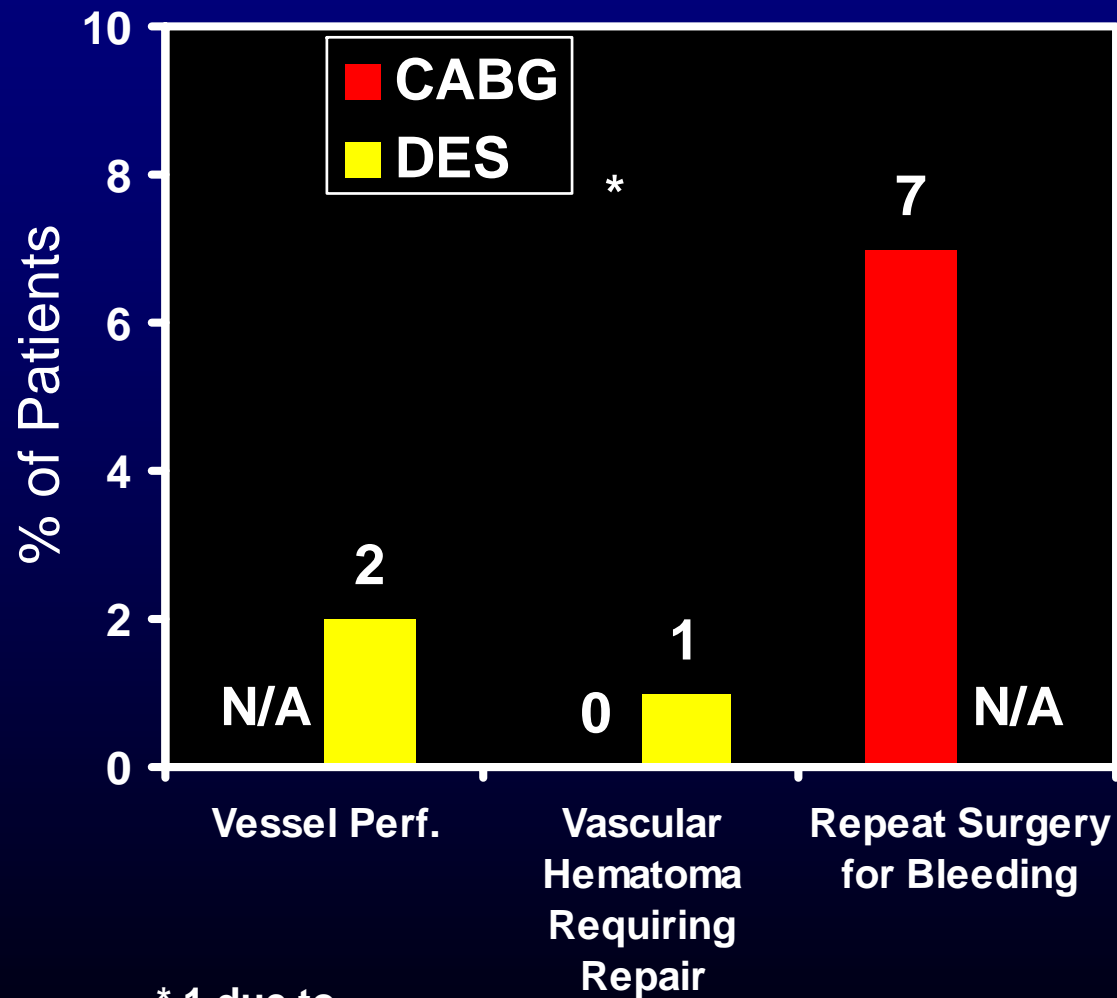


Procedural Outcomes



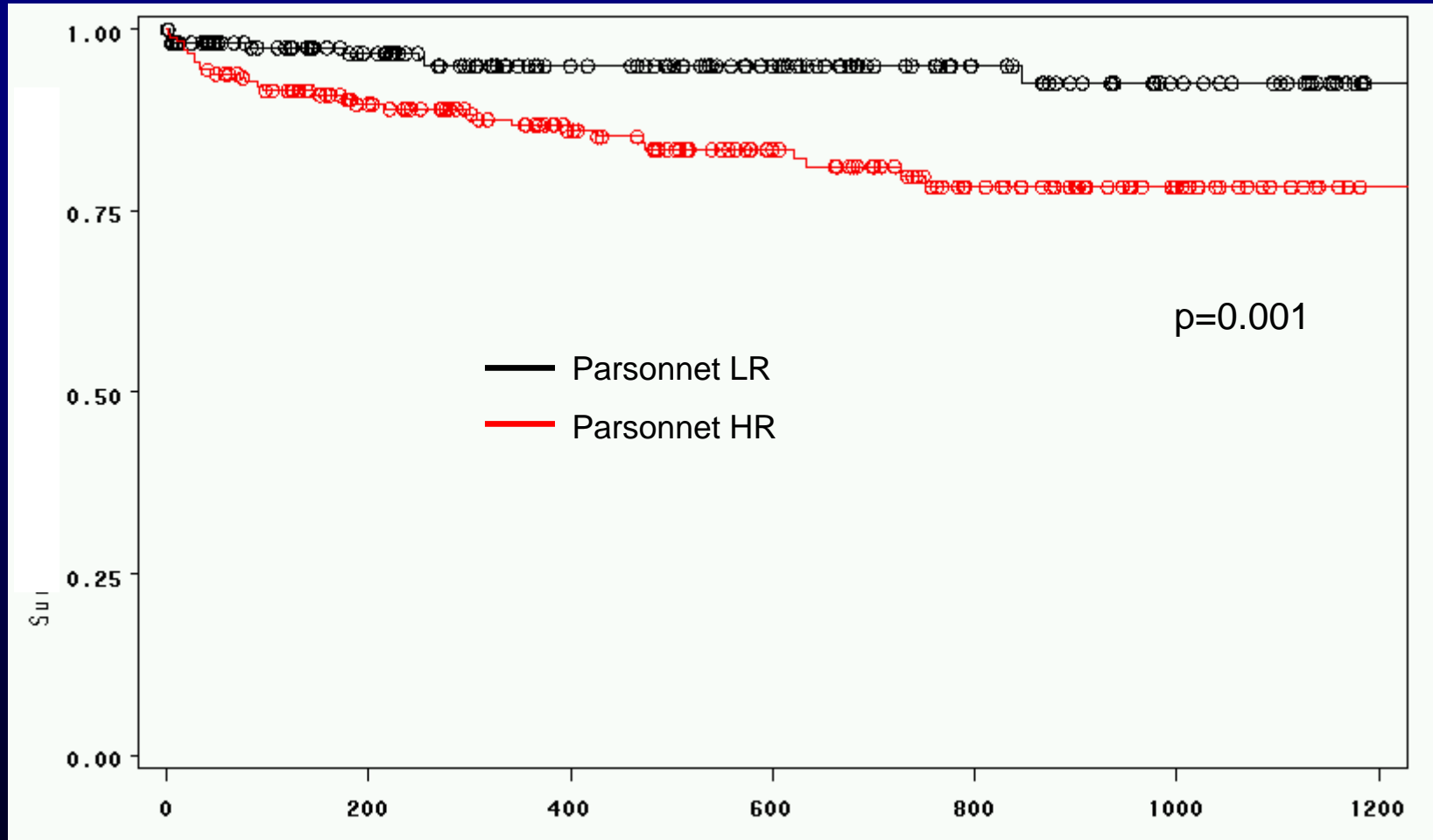
* Ventricular tachycardia
Ventricular Fibrillation

Vascular Complications



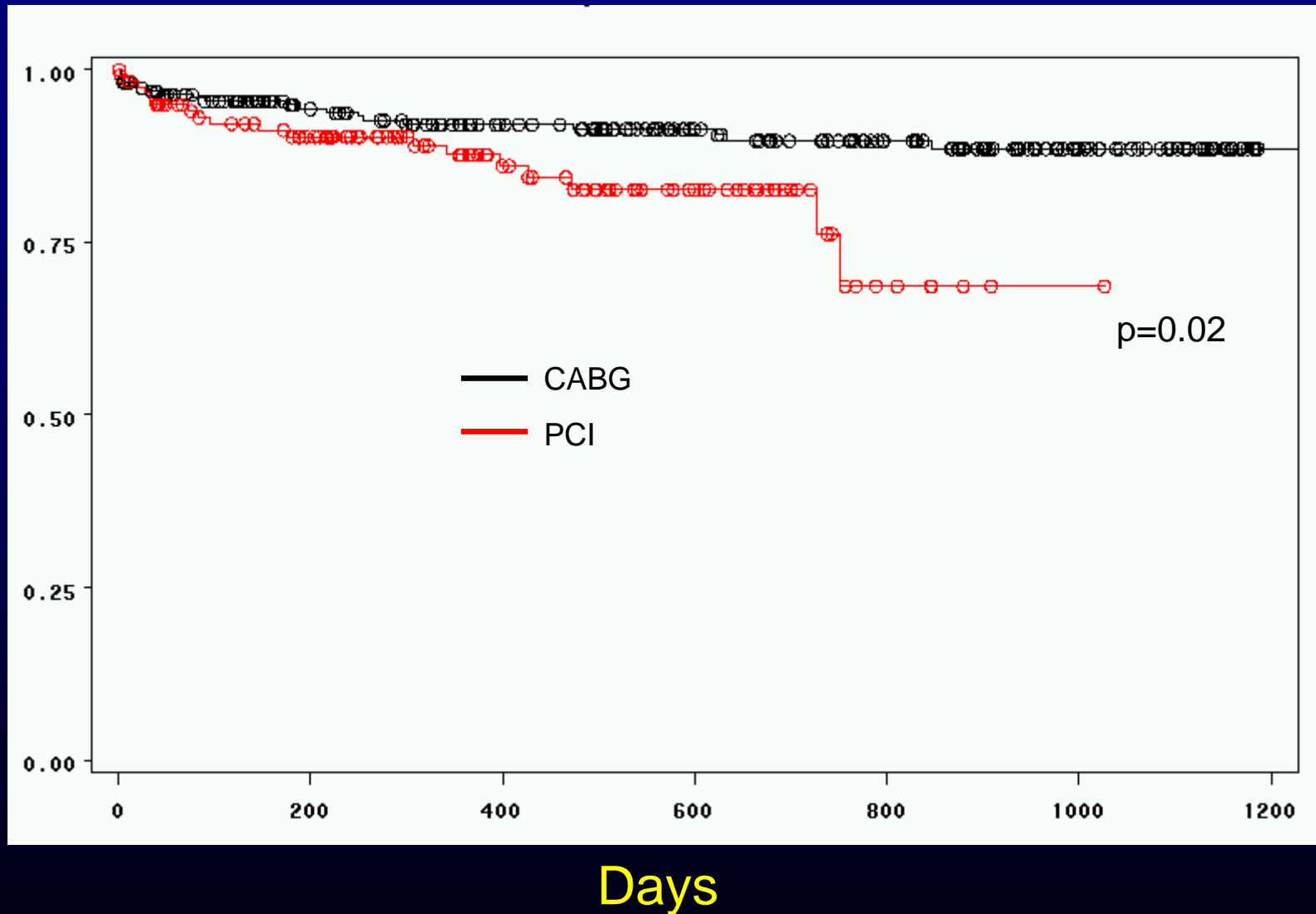
* 1 due to cardiac tamponade

Survival by Parsonnet Score (All 343 patients)



Days

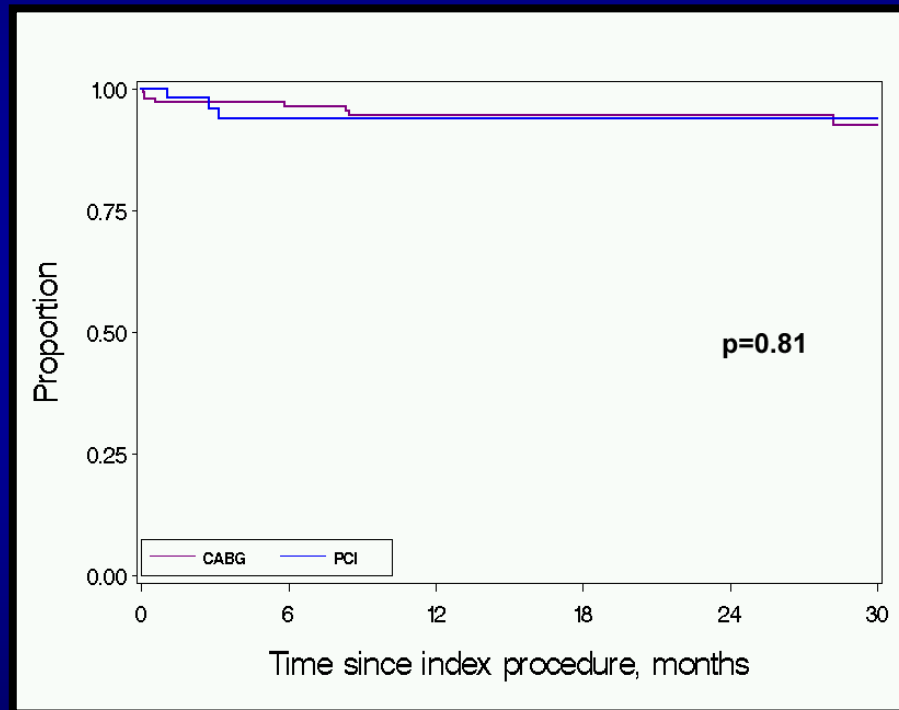
Unadjusted Survival: CABG vs. PCI



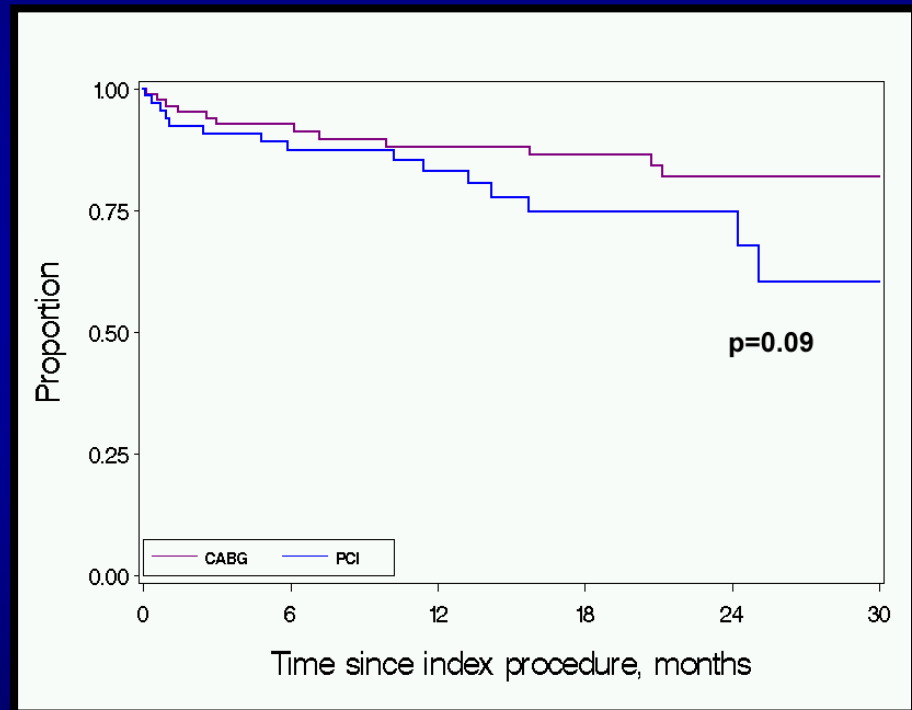
Survival

According to Parsonnet score

Parsonnet score ≤ 15



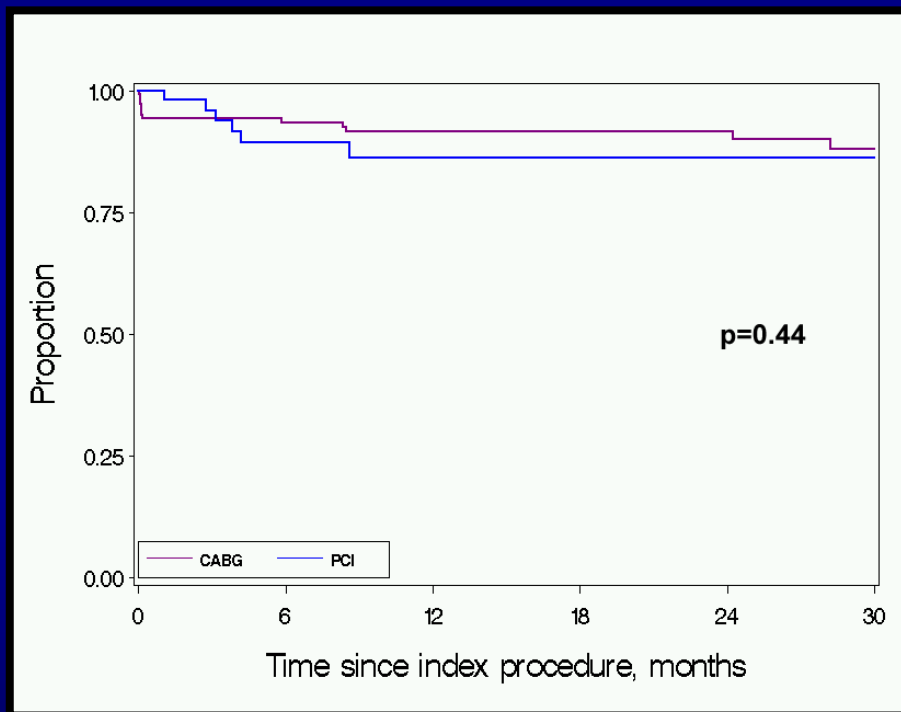
Parsonnet score > 15



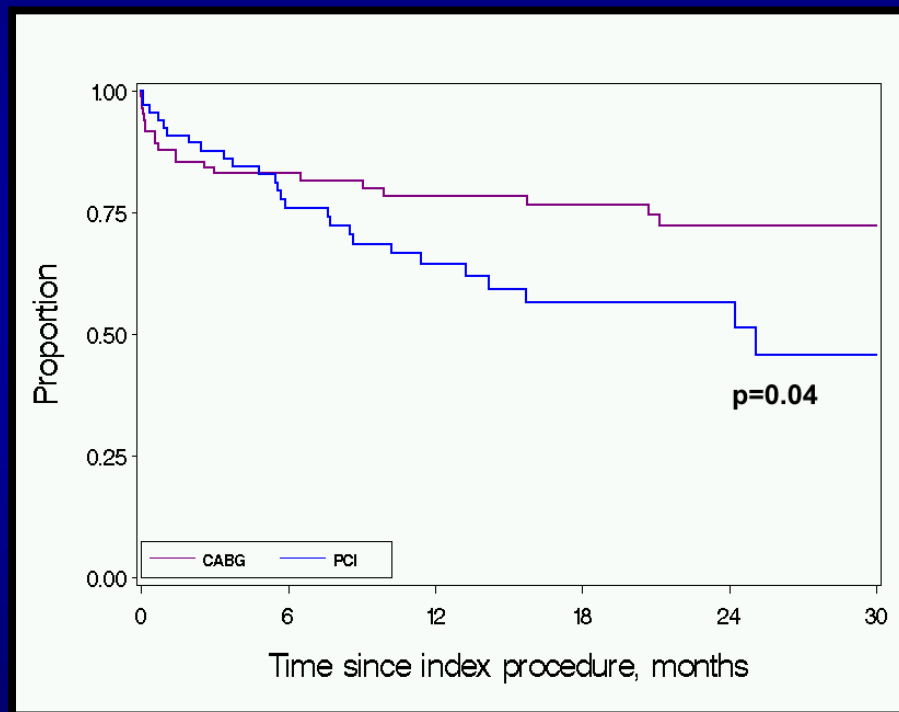
MACCE-free survival

According to Parsonnet score

Parsonnet score ≤ 15



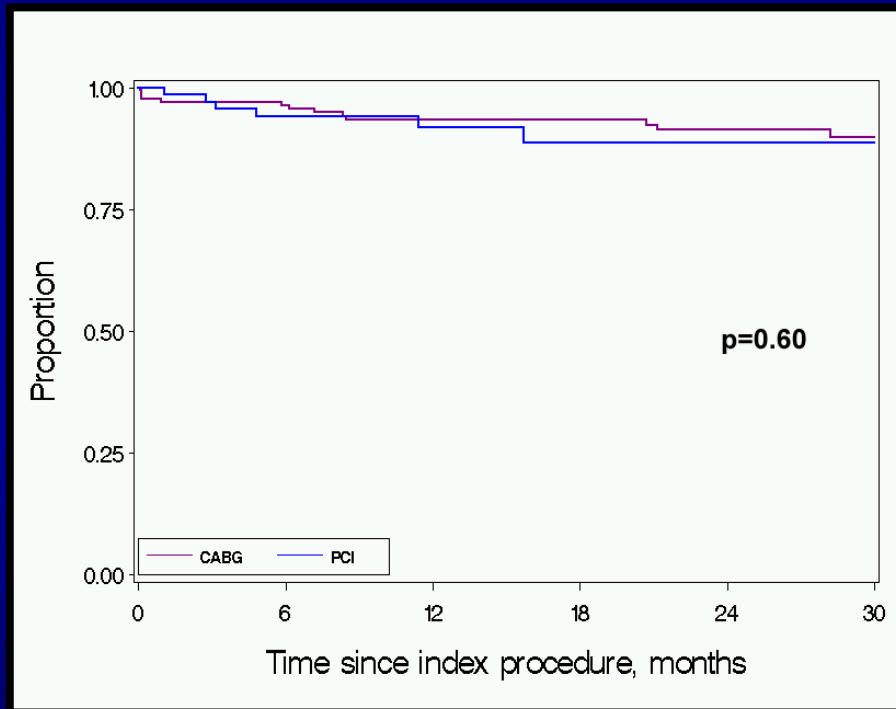
Parsonnet score > 15



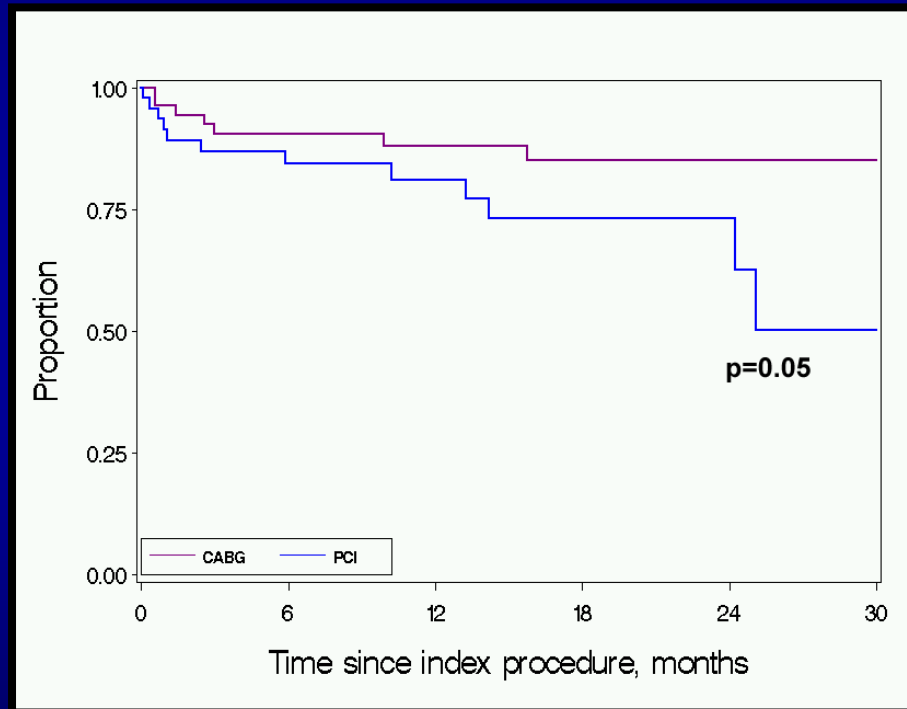
Survival

According to Ellis category

Ellis category I,II or III



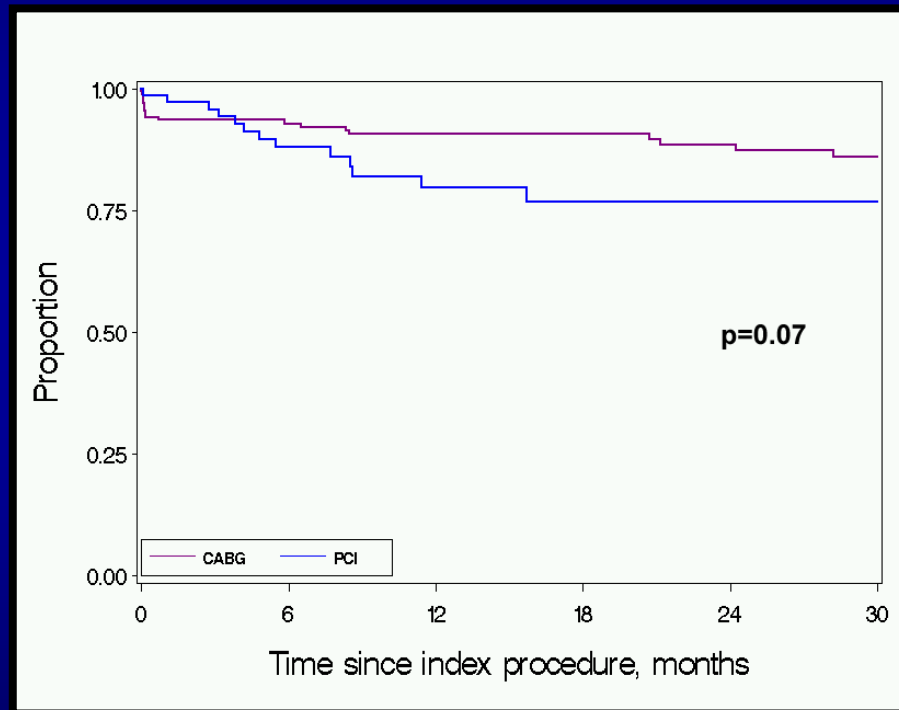
Ellis category IV



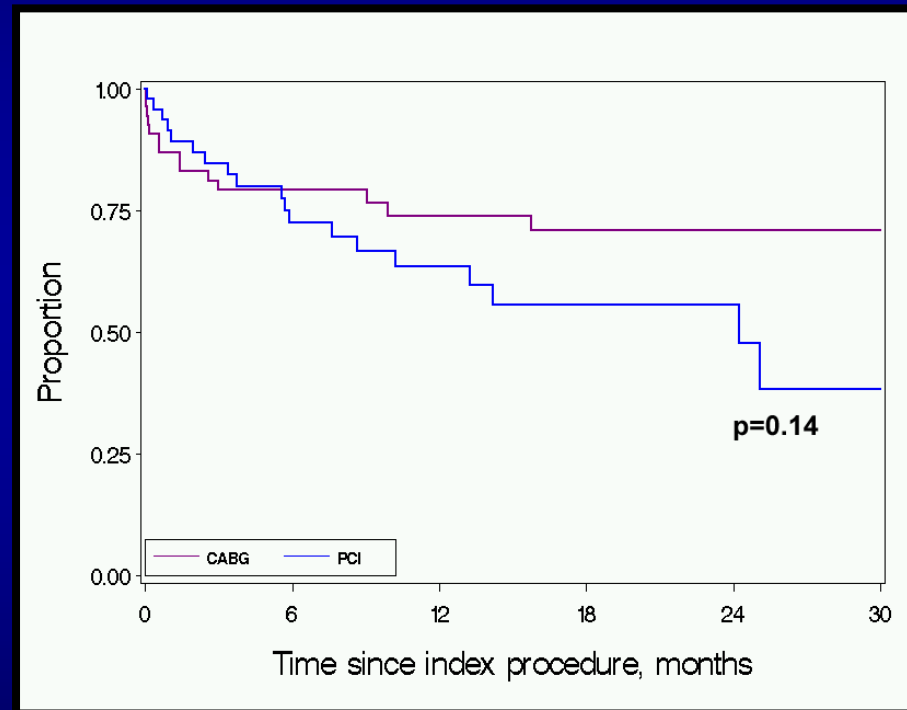
MACCE-free survival

According to Ellis category

Ellis category I,II or III



Ellis category IV



Target Vessel Revascularization

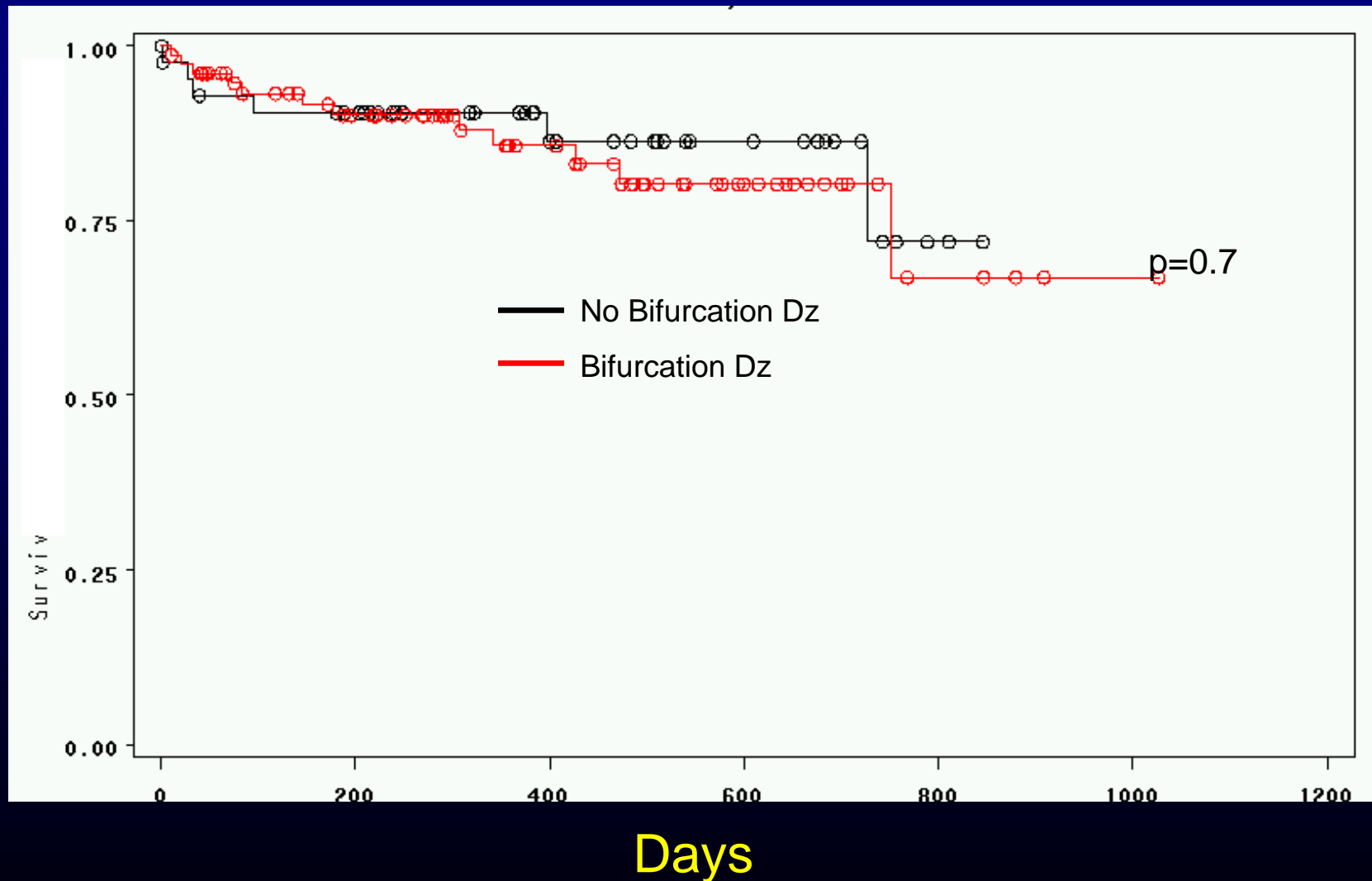
- 11 of 120 PCI patients underwent TVR
 - 7 by PCI
 - 4 by CABG
- 6 of the 7 patients who underwent repeat PCI had distal bifurcation involvement
 - 4 patients had focal in-stent restenosis at the ostium of the LCx artery
 - 3 patients had in-stent restenosis of the Left Main artery

Stent thrombosis

- **Academic Research Consortium definitions**
 - **Definite/confirmed:** 3 patients
 - 1 patient had mid-LAD thrombosis 9 months after procedure
 - 1 patient had Lt Main thrombosis confirmed on coronary CT 8 months after procedure
 - 1 patient had Lt Main thrombosis confirmed on pathology 48 hours after procedure
 - **Probable:** 1 patient
 - **Possible:** 5 patients

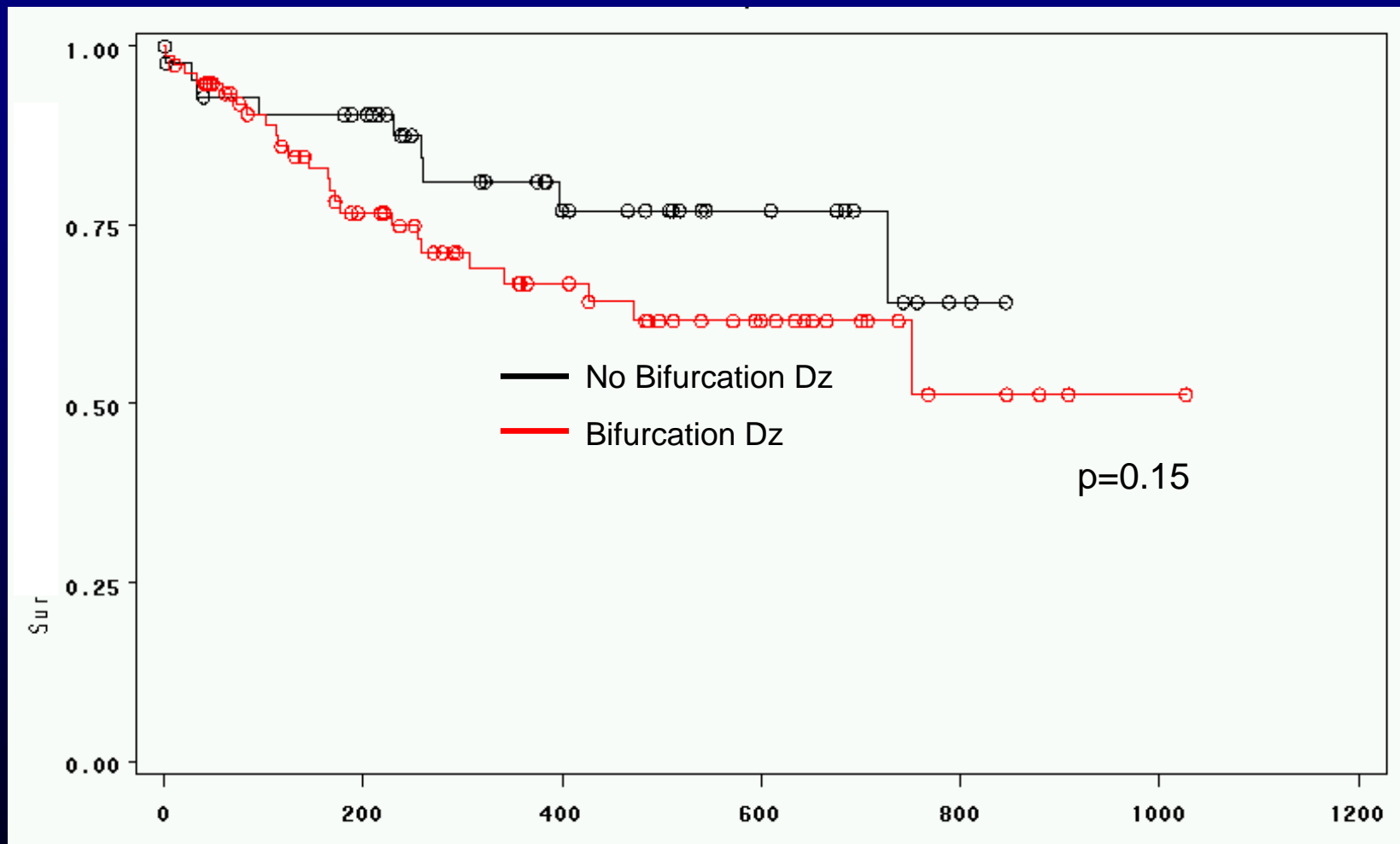
Survival (PCI only)

According to Bifurcation Disease Status



MACCE-free survival (PCI only)

According to Bifurcation Disease Status



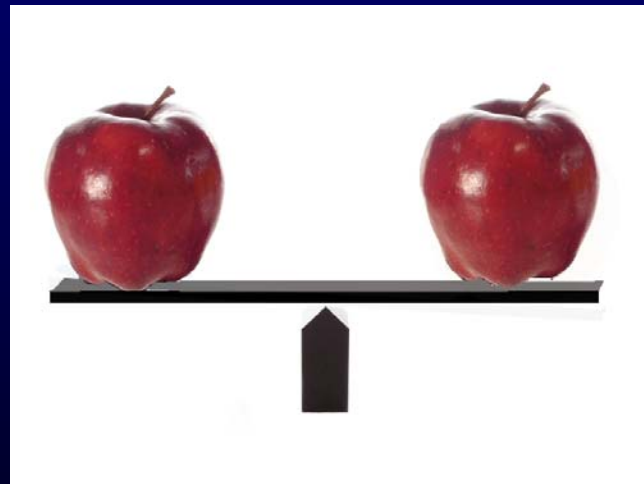
Days

Propensity analysis

Propensity model

Used in two ways

- Propensity adjusted hazard ratios
- 134 subjects matched by propensity score



18 variables in the Propensity Model

Categorical variables (Yes/No):

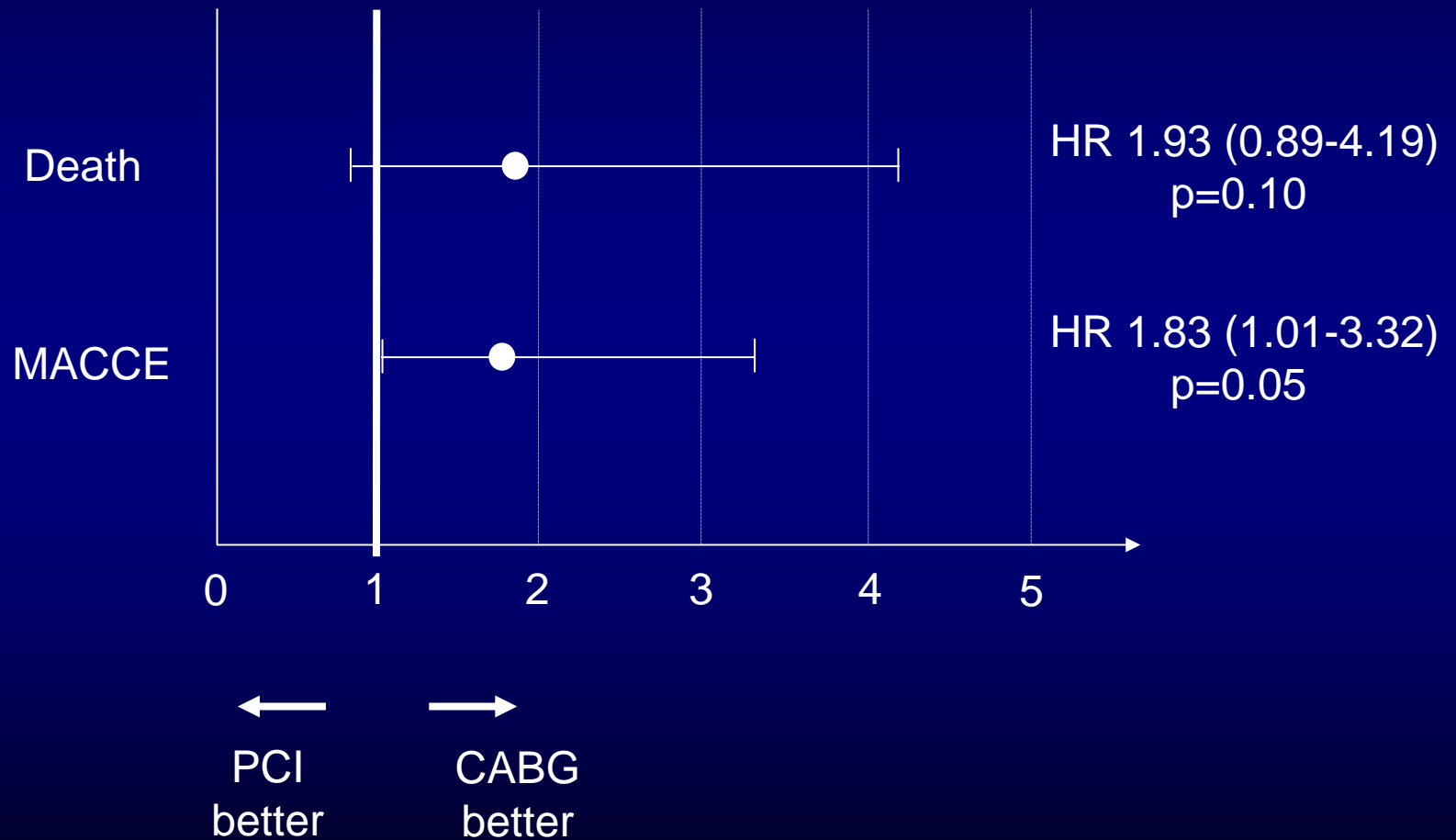
>75 years
Male sex
Diabetes
Hypertension
Chronic renal impairment
COPD
Hypercholesterolemia
History of MI
History of CAD
Presentation with unstable angina
Presentation with stable angina
Presentation with myocardial infarction
Involvement of distal left main coronary artery
Right coronary artery stenosis
Ellis score category III or IV (versus I or II)

Continuous variables:

Age
Serum creatinine
Parsonnet score

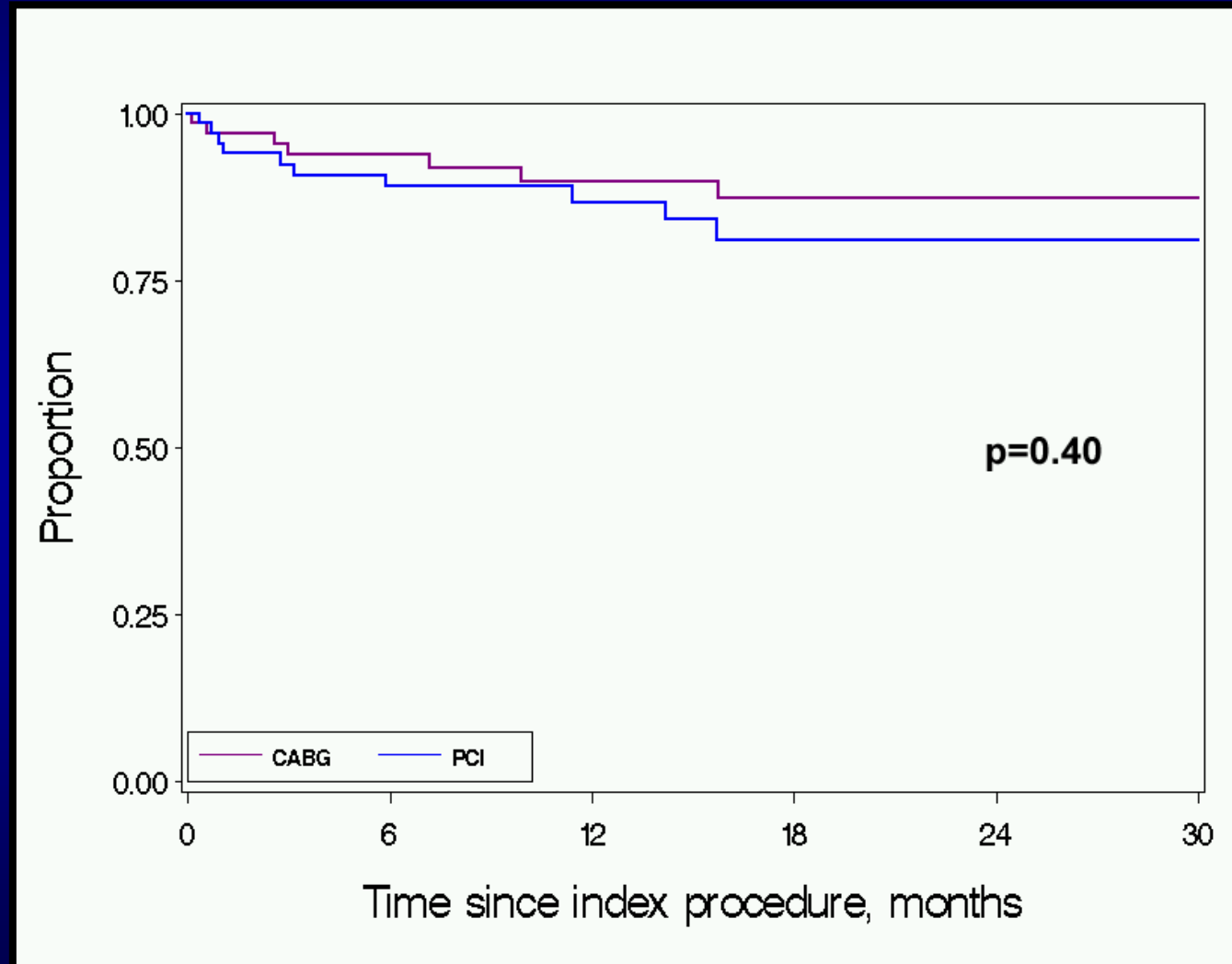
Hazard ratios

Propensity score entered as a covariate



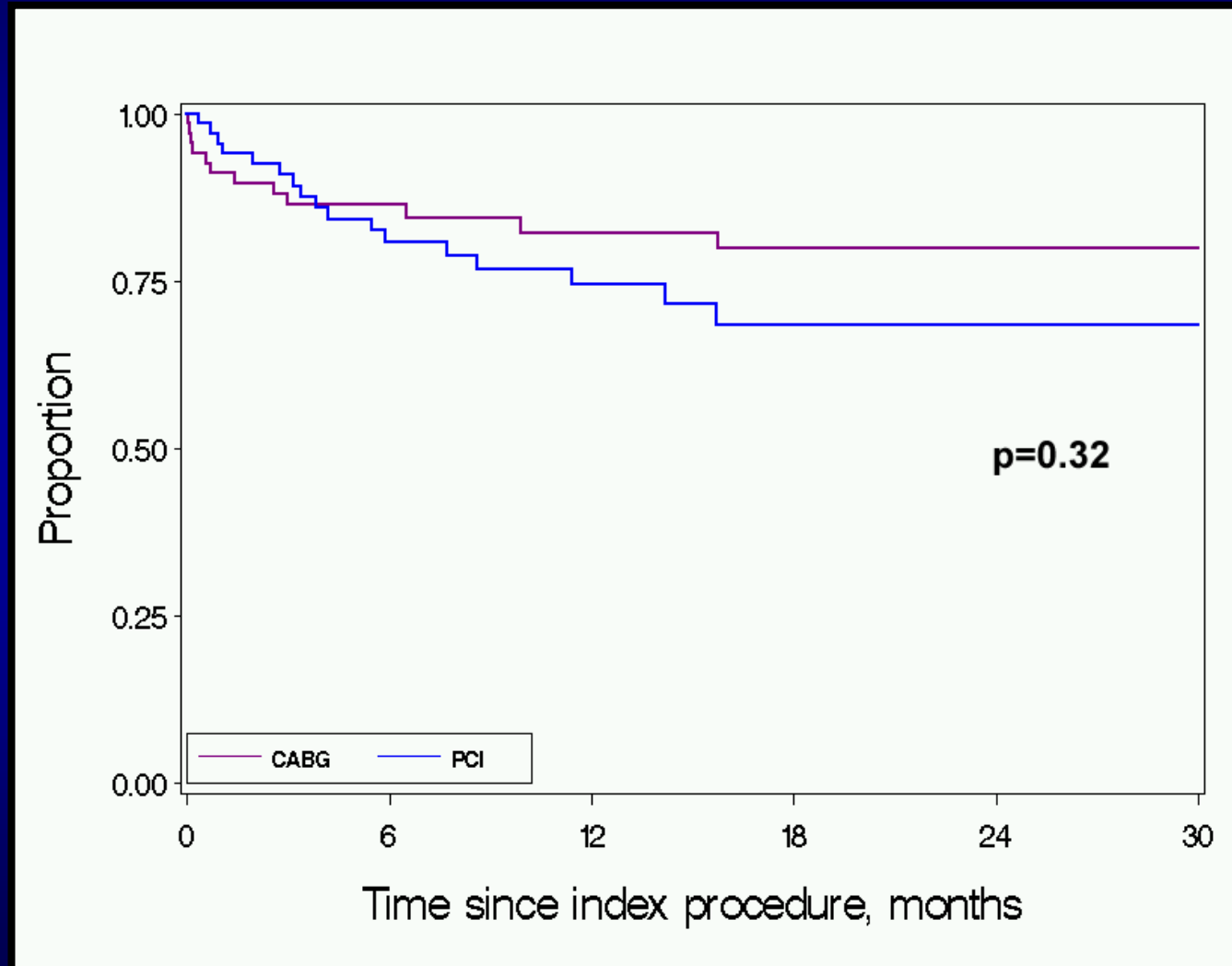
Survival

Propensity matched subjects
(n=134)



MACCE-free survival

Propensity matched subjects (n=134)



Summary

- **Left main stenosis patients referred for PCI are sicker with greater co-morbidities compared to patients undergoing CABG**
- **Outcomes after left main revascularization are heavily influenced by co-morbidities**
- **In a propensity analysis, survival between PCI and CABG patients is not significantly different but MACCE is higher with PCI**
- **Low-surgical risk patients do extremely well both by PCI and CABG, while high surgical risk patients do better with CABG beyond 6 months. This difference may primarily be driven by doctors selectively triaging end-stage patients to PCI strategy**

Summary

- Irrespective of the surgical risk, MACCE is higher with PCI compared to CABG
- Bifurcation status did not affect survival in this study
- Patient selection may be the key in determining the success of ULMCA PCI. Patients who are good candidates for CABG may be the best candidates for PCI
- Our study suggests there is equipoise between two revascularization strategies such that randomized trial is justified