Prediction of Death or Revascularization Using the SYNTAX Score in Unprotected Left Main Coronary Revascularization

Application to MAIN-COMPARE Registry

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SYNTAX Score

The SYNTAX score algorithm

1. Dominance
2. Number of lesions
3. Segments involved per lesion
Lesion Characteristics
4. Total occlusion
- i. Number of segments involved
- ii. Age of the total occlusion (>3 months)
- iii. Blunt Stump
- iv. Bridging collaterals
- v. First segment beyond the occlusion visible by antegrade or retrograde filling
- vi. Side branch involvement

5. Trifurcation
- i. Number of segments diseased

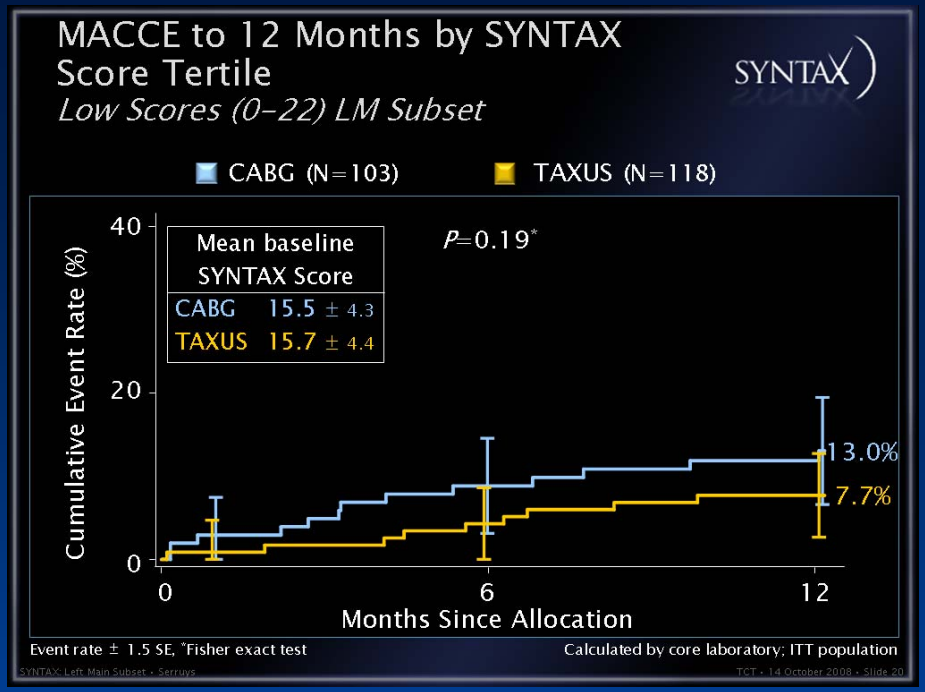
6. Bifurcation
- i. Type
- ii. Angulation between the distal main vessel and the side branch <70°

7. Aorto-ostial lesion
8. Severe tortuosity
9. Length >20mm
10. Heavy calcification
11. Thrombus
12. Diffuse disease/small vessels
- i. Number of segments with diffuse disease/small vessels

The Syntax score was proposed to take into account the heterogeneity in the lesion anatomy and complexity.

Sianos G EuroInterv.2005;1:219

Prediction of MACCE
SYNTAX Score



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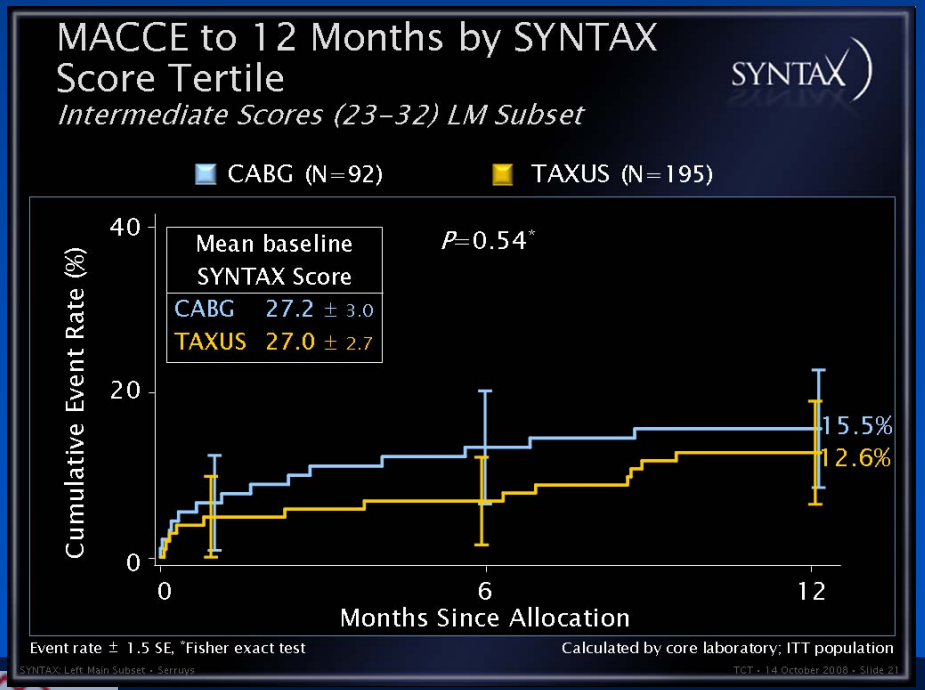
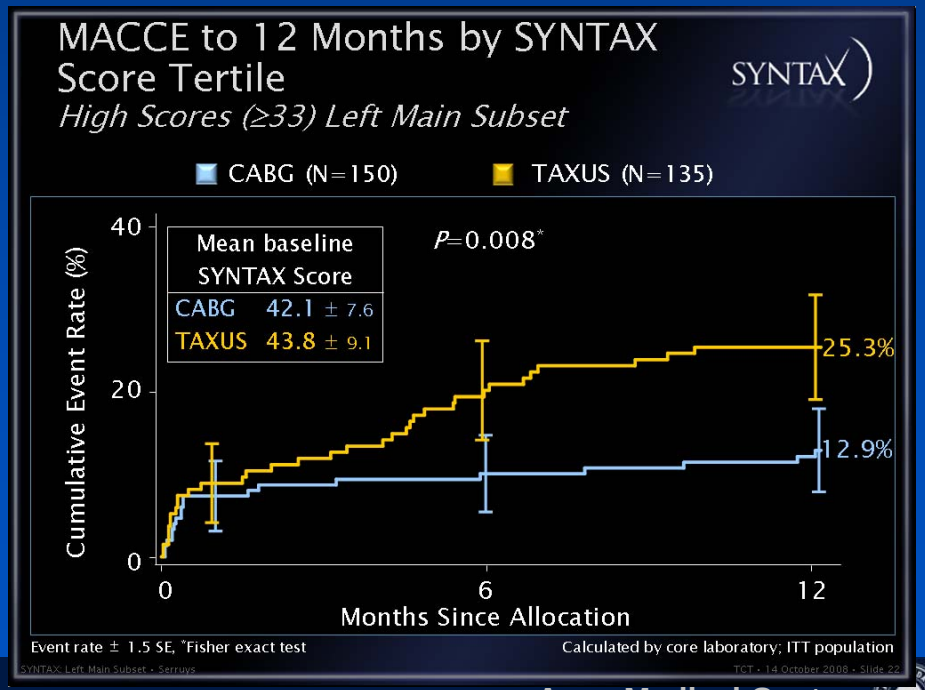


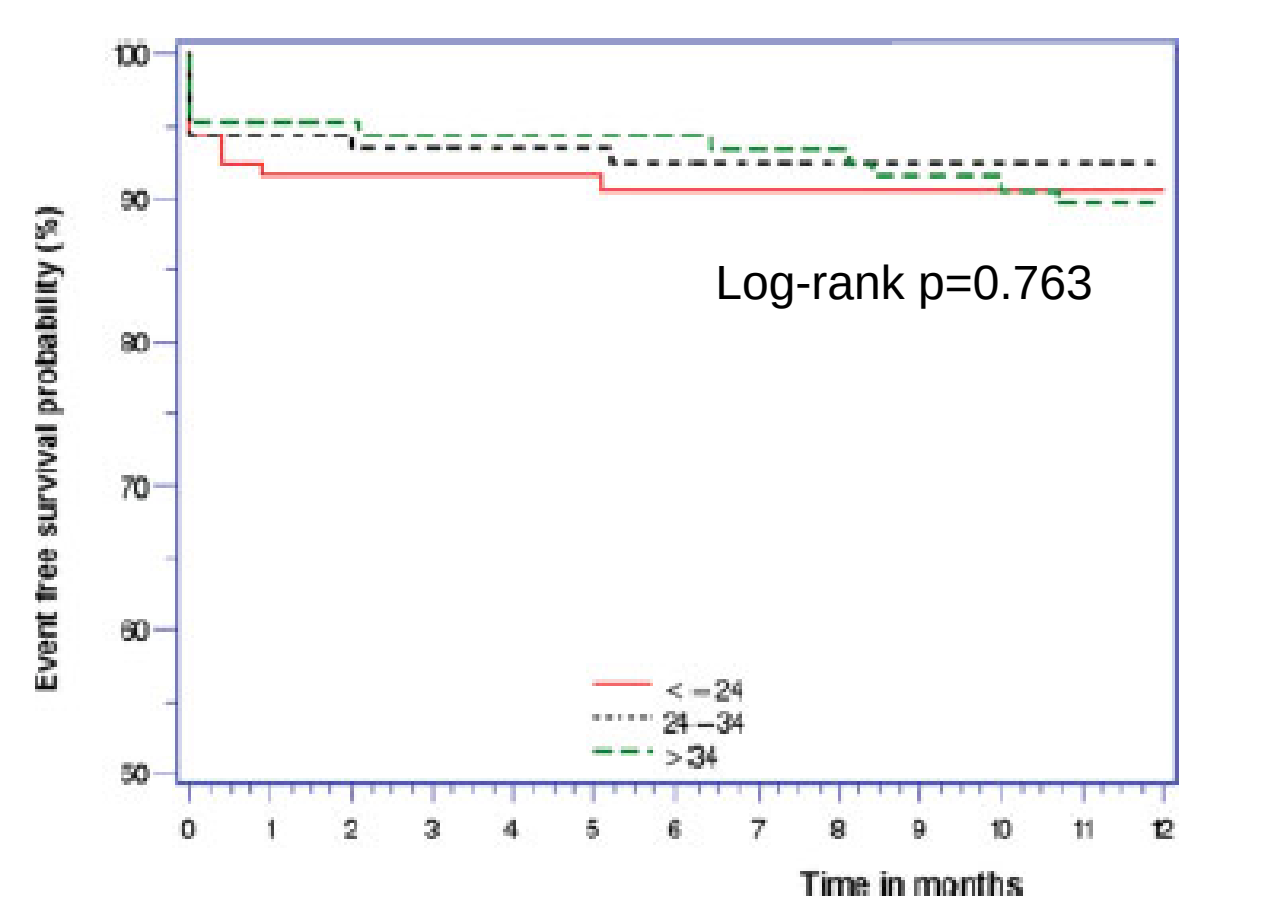


SYNTAX Score

- No consideration of clinical parameters
- Not based on the multivariate analysis of true database
- Inhomogeneous risk factors between PCI versus CABG
- Inconsistent weigh on the anatomical complexity between PCI versus CABG

Predictability of SYNTAX Score for 320 CABG Patients

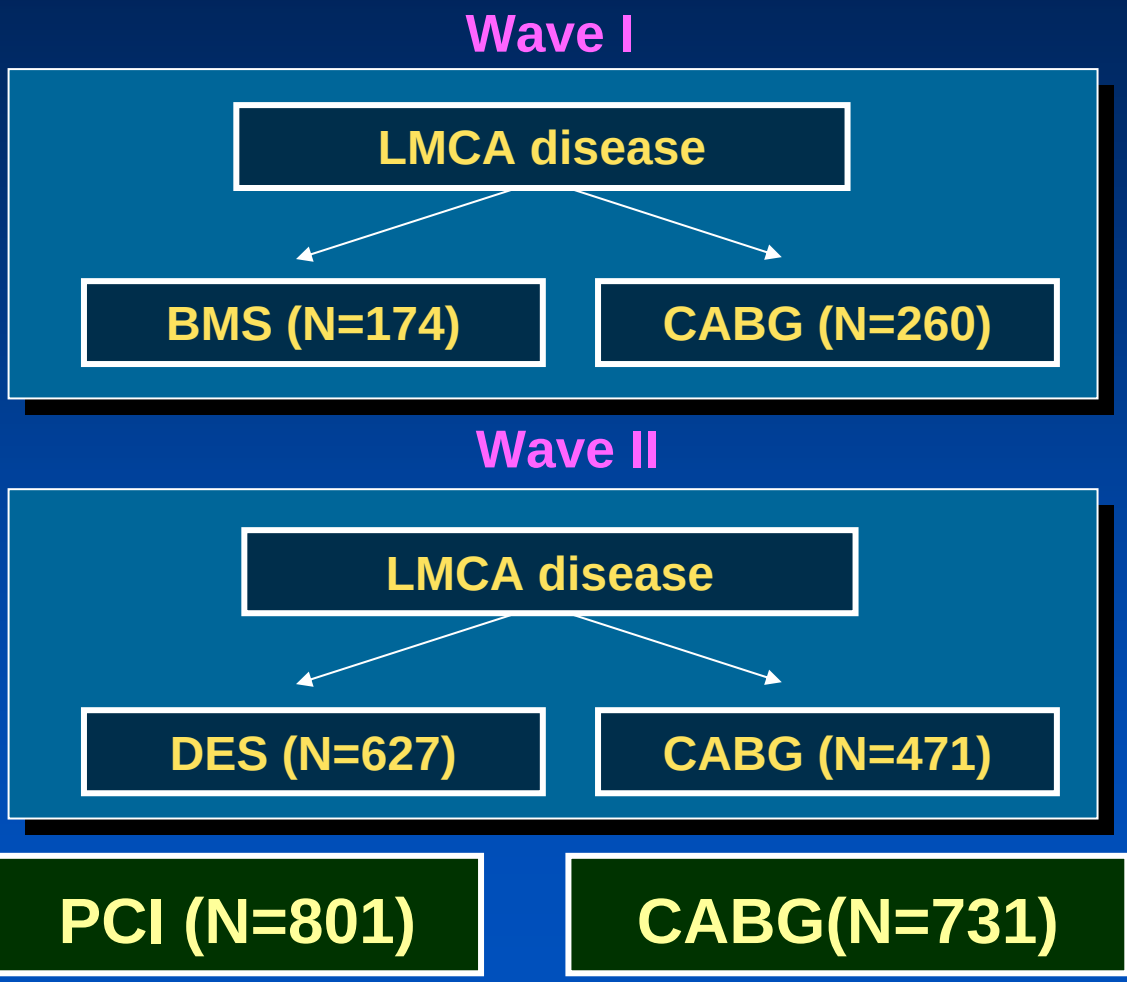
Event Free Survival Probability (%)



Lemesle G et al. Cathet Cardiovasc Interven 2009;73:612

Angiographic Analysis Cohort
from MAIN-COMPARE Registry

1532 (68.3%)* from all 2242 patients



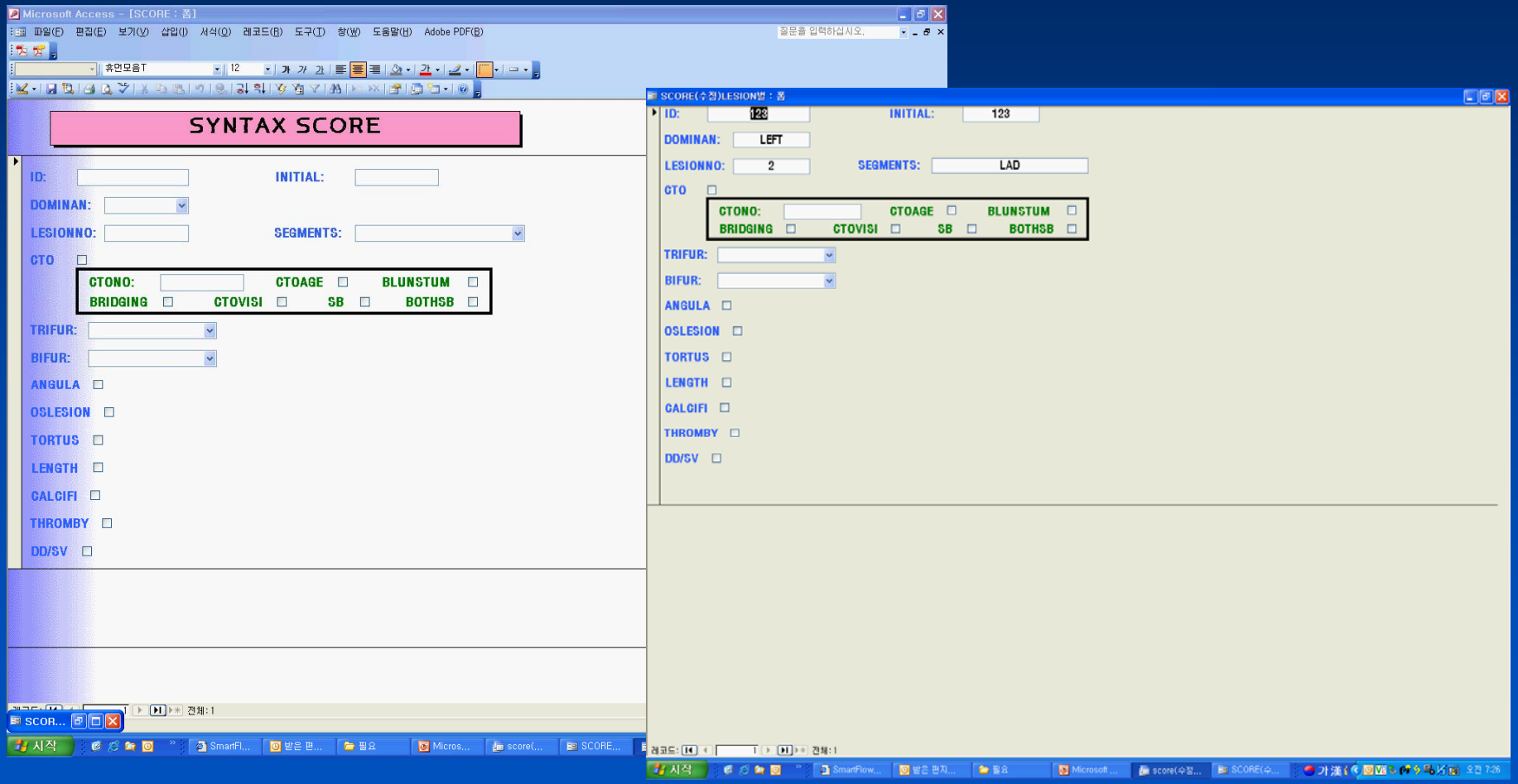
* Patients in whom angiograms were successfully retrieved for analysis

Statistics

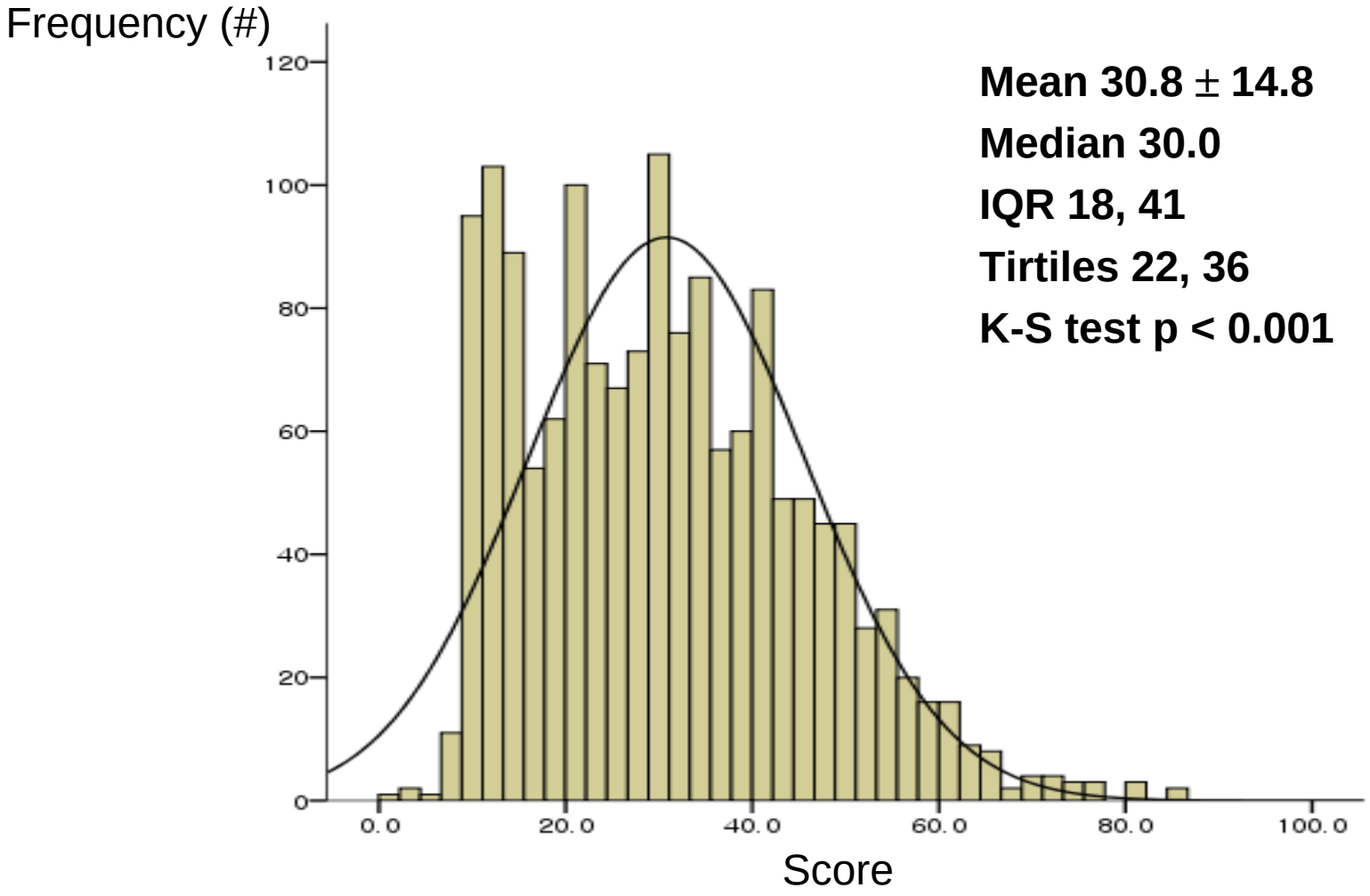
- Outcomes of interest were death (all cause) and target vessel revascularization (TVR)
- Patients were stratified into 3 groups with the SYNTAX score defined as a low score as ≤22, an intermediate score as 23 to 32, and a high score as ≥33 (NEJM 2009;360:961)
- Chi square and ANOVA for 3-group comparison
- Log-rank test to compare survival curves
- Multivariate Cox model to identify predictors of death or TVR
- C-statistic for predictability accuracy
- Creation of propensity score for all angiographic cohort
- Multivariate Cox model to adjust the selection bias of two treatments, using the covariates of propensity-score, Euro-Score, and SYNTAX-Score

Angiographic Analysis in Core Lab of CVRF

Creation of SYNTAX Calculator for both Core-lab analyzer and on-site operators



Distribution of SYNTAX Score
Non-normal distribution



Mean 30.8 ± 14.8

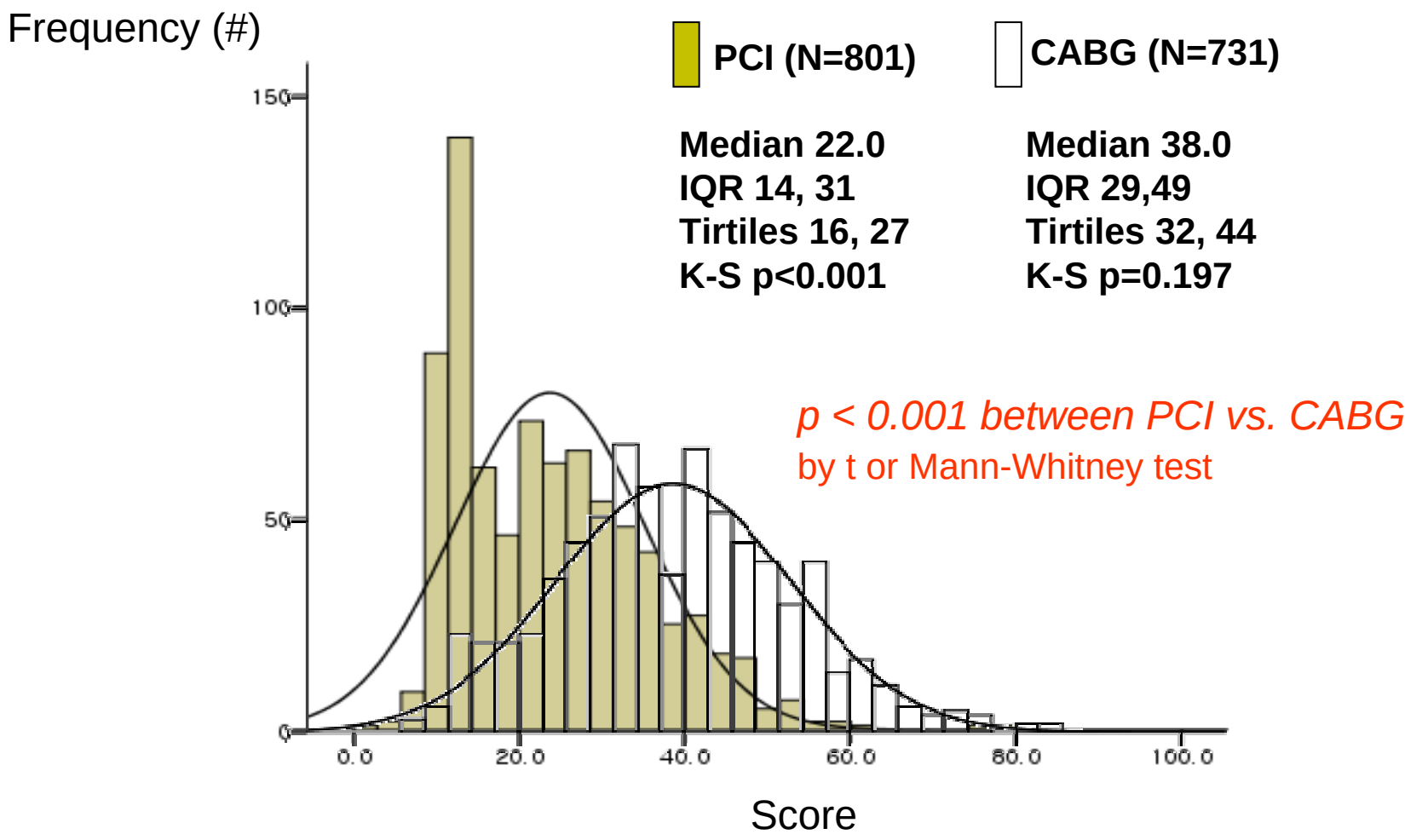
Median 30.0

IQR 18, 41

Tirtiles 22, 36

K-S test p < 0.001

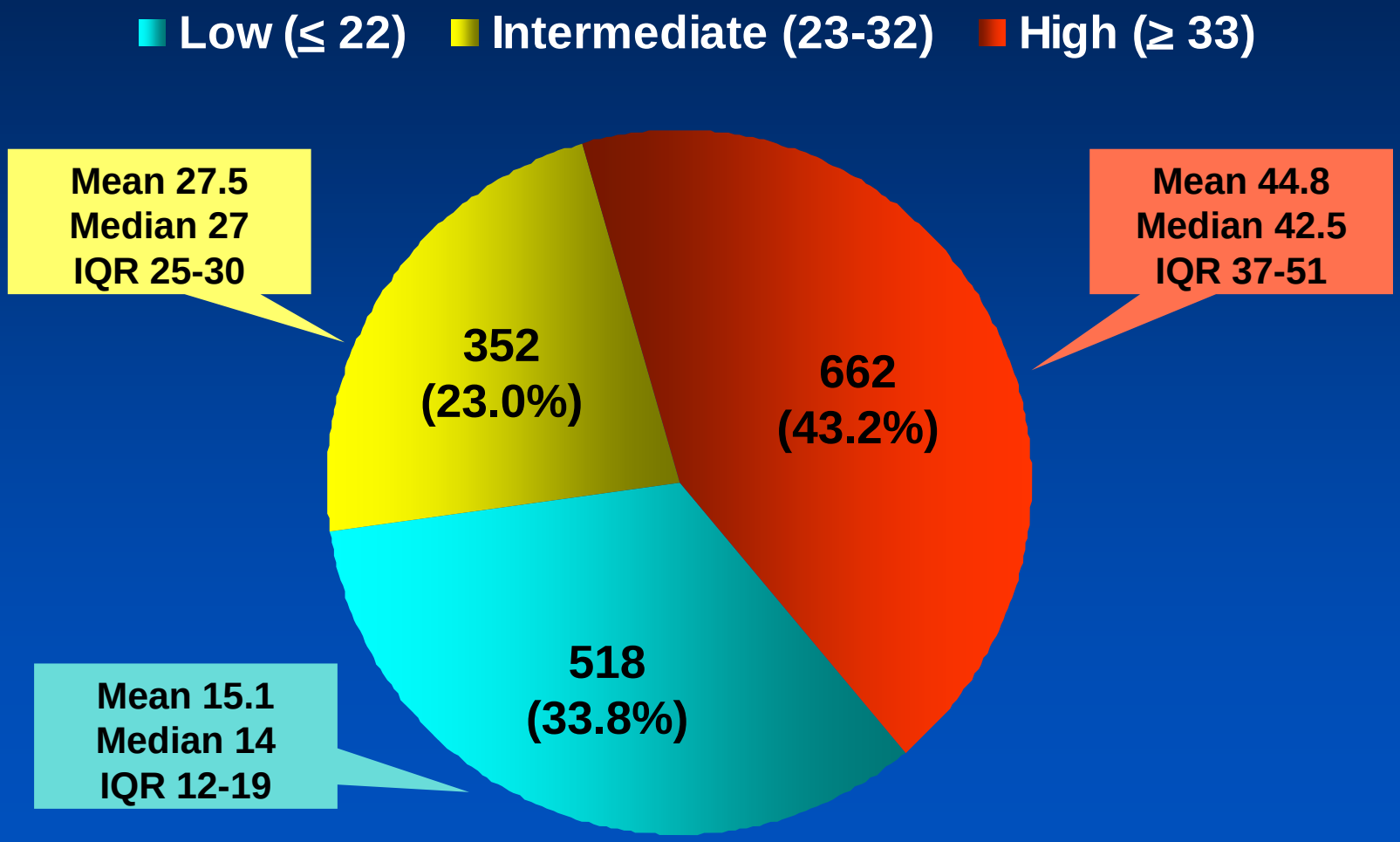
Distribution of SYNTAX Score
Comparison between PCI vs. CABG



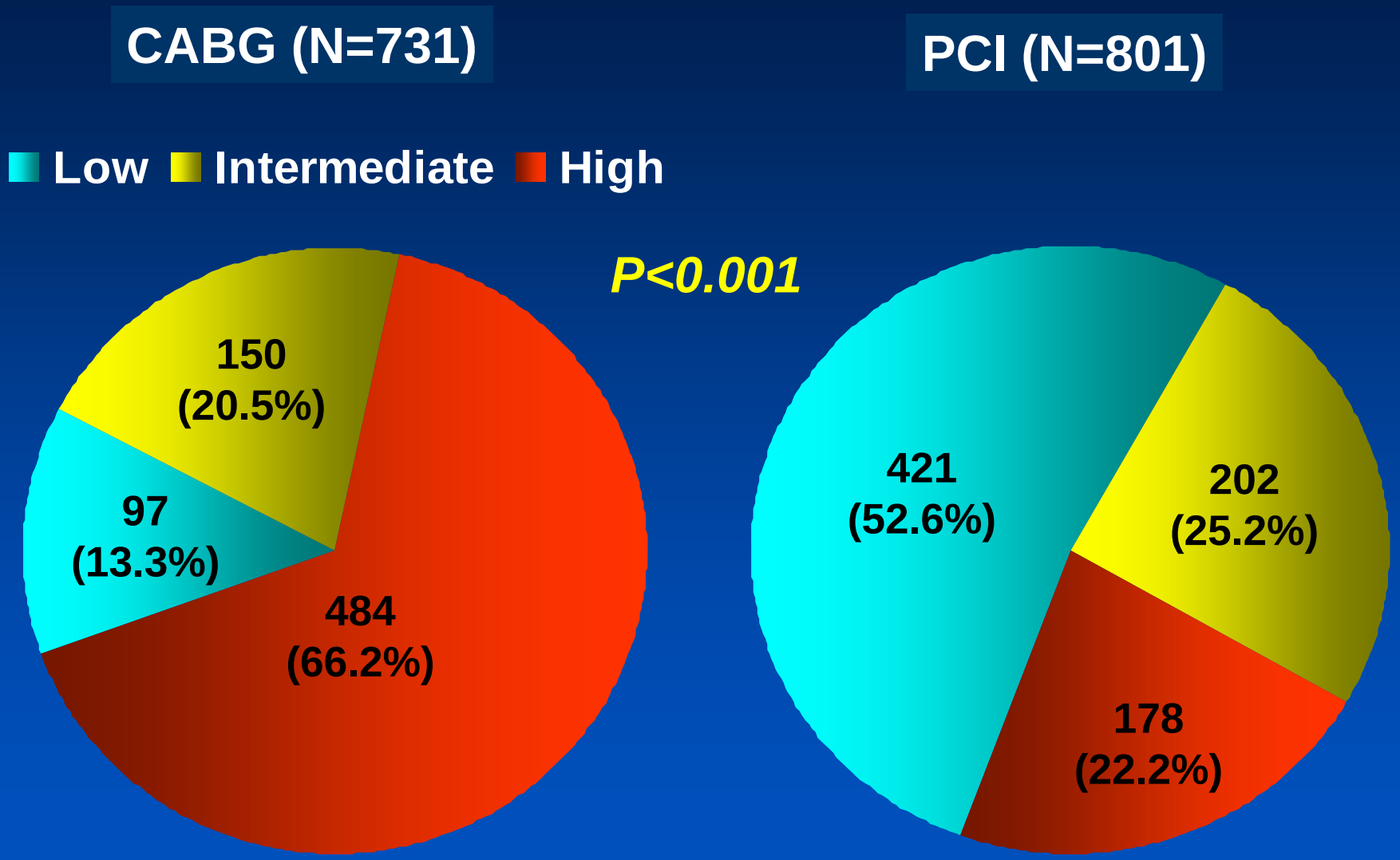
p < 0.001 between PCI vs. CABG
by t or Mann-Whitney test

Distribution of SYNTAX Score

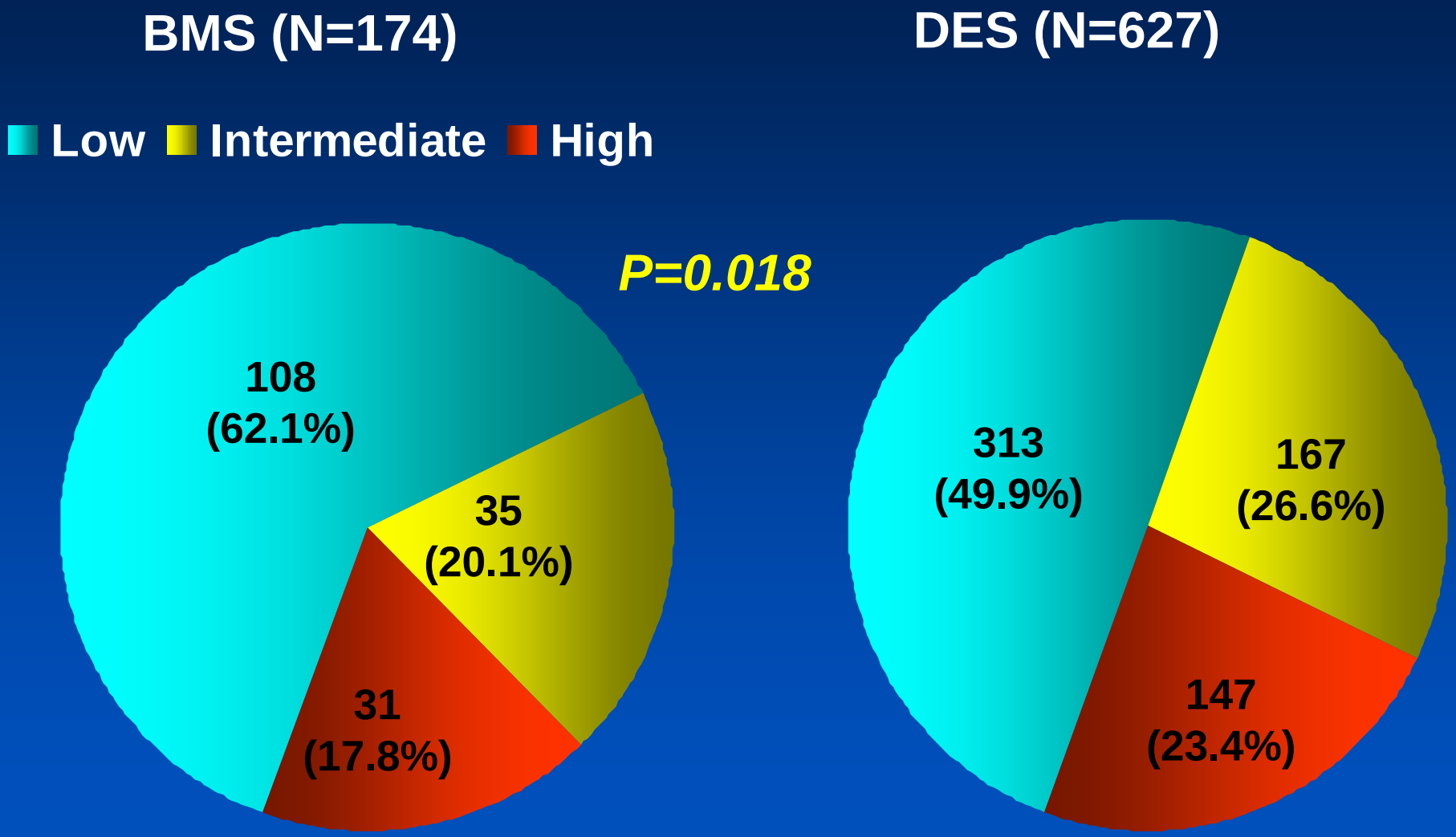
Overall 1532 patients



SYNTAX Score between CABG vs PCI



SYNTAX Score between BMS vs DES



Baseline Demographics

	Low (N=518)	Intermediate (N=352)	High (N=662)	P value
Age (yrs)	58.5 ± 11.5	63.0 ± 10.0	64.5 ± 9.4	< 0.001
Male gender	347 (67.0)	253 (71.9)	493 (74.5)	0.018
Hypertension	217 (41.9)	183 (52.0)	363 (54.8)	< 0.001
Diabetes mellitus	121 (23.4)	111 (31.5)	254 (38.4)	< 0.001
(Insulin-treated)	20 (3.9)	28 (8.0)	39 (5.9)	0.036
Hypercholesterolemia	154 (29.7)	122 (34.7)	264 (39.9)	0.003
Current smoking	143 (27.6)	102 (29.0)	161 (24.3)	0.218

Baseline Demographics

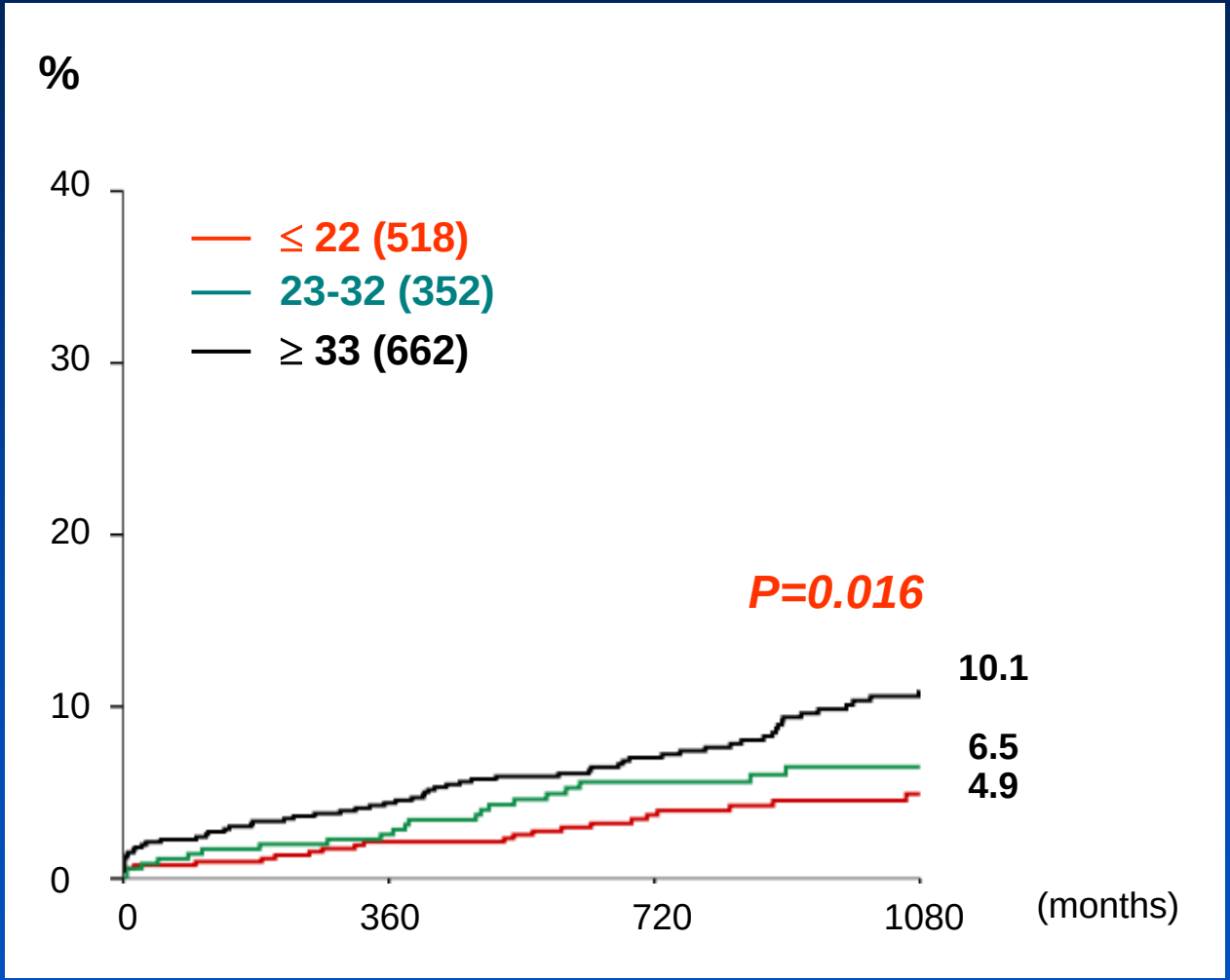
	Low (N=518)	Intermediate (N=352)	High (N=662)	P value
Previous MI	27 (19.1)	38 (27.0)	76 (53.9)	0.001
Previous CHF	10 (1.9)	6 (1.7)	24 (3.6)	0.093
History of CVA	27 (5.2)	26 (7.4)	63 (9.5)	0.021
Peripheral disease	11 (2.1)	10 (2.8)	36 (5.4)	0.007
Chronic lung disease	10 (1.9)	7 (2.0)	15 (2.3)	0.913
CRF (Cr > 2.0 mg/dl)	9 (1.7)	9 (2.6)	29 (4.4)	0.027
Euro Score	3.6 ± 2.2	4.1 ± 2.3	4.6 ± 2.3	< 0.001
LV Ejection Fraction (%)	61.5 ± 9.6	59.4 ± 11.7	56.6 ± 11.8	< 0.001

Clinical Presentation & Involved Vessels
(Site Reported)

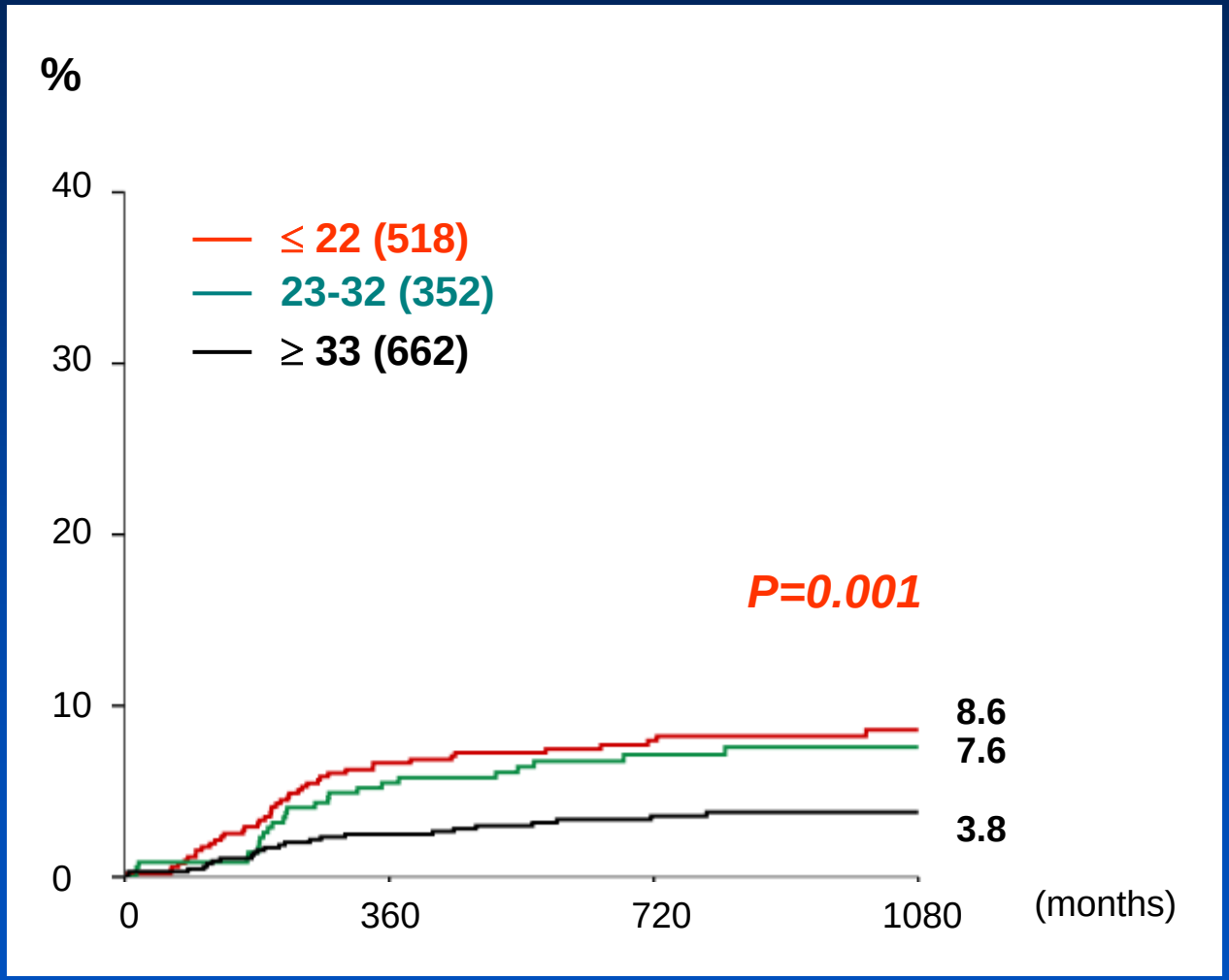
	Low (N=518)	Intermediate (N=352)	High (N=662)	P value
Presentation				**0.048**
Silent ischemia	16 (3.1)	11 (3.1)	15 (2.3)	
Stable angina	159 (30.7)	102 (29.0)	150 (22.7)	
Unstable angina	295 (56.9)	209 (59.4)	428 (64.7)	
MI	48 (9.3)	30 (8.5)	69 (10.4)	
Vessel diseased (site reported)				**< 0.001**
LM only	200 (38.6)	22 (6.3)	12 (1.8)	
LM + 1VD	137 (26.4)	69 (19.6)	47 (7.1)	
LM + 2VD	110 (21.2)	130 (36.9)	163 (24.6)	
LM + 3VD	71 (13.7)	131 (37.2)	440 (66.5)	

Outcomes
According to SYNTAX Score

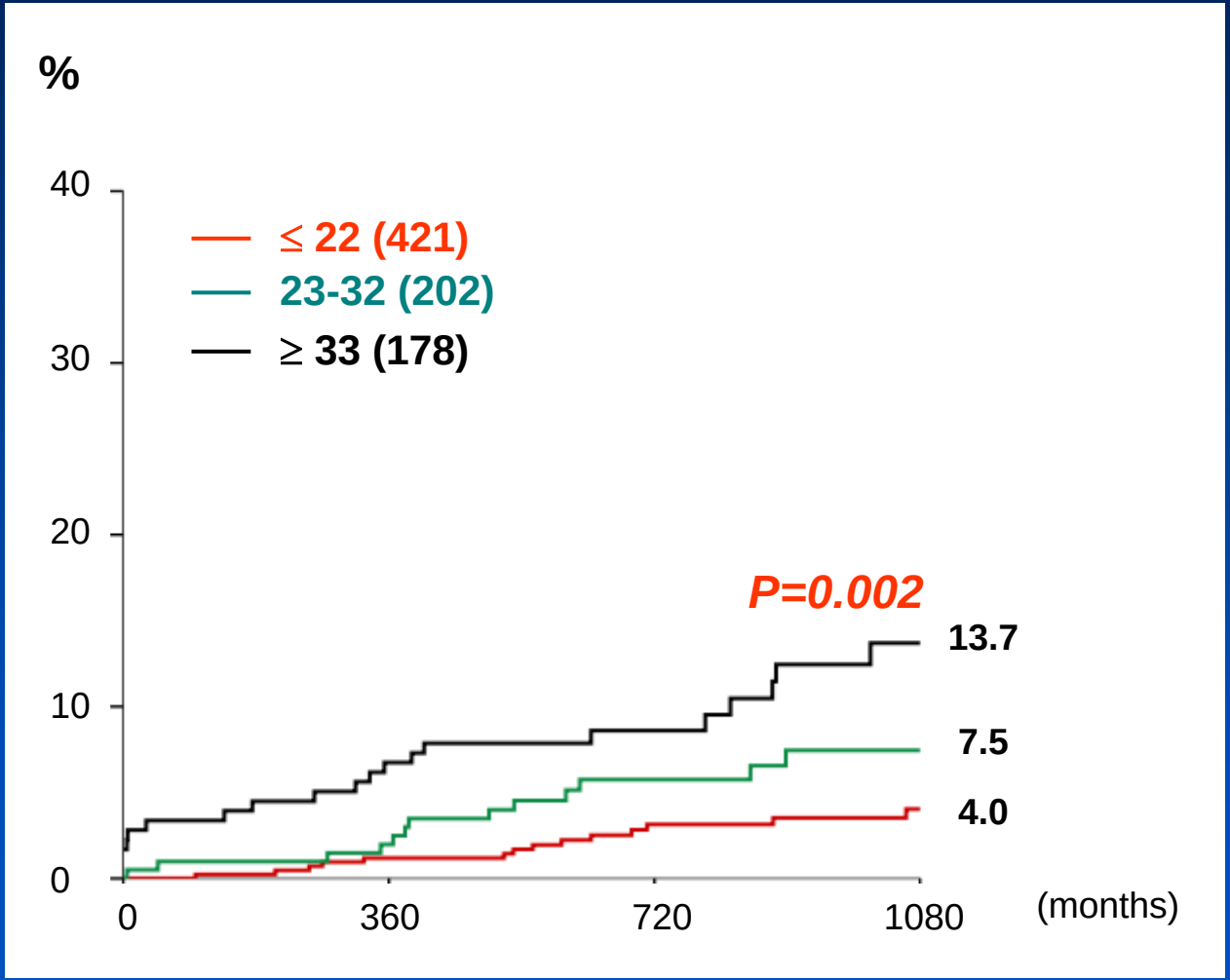
Mortality by SYNTAX Score
Overall Patients



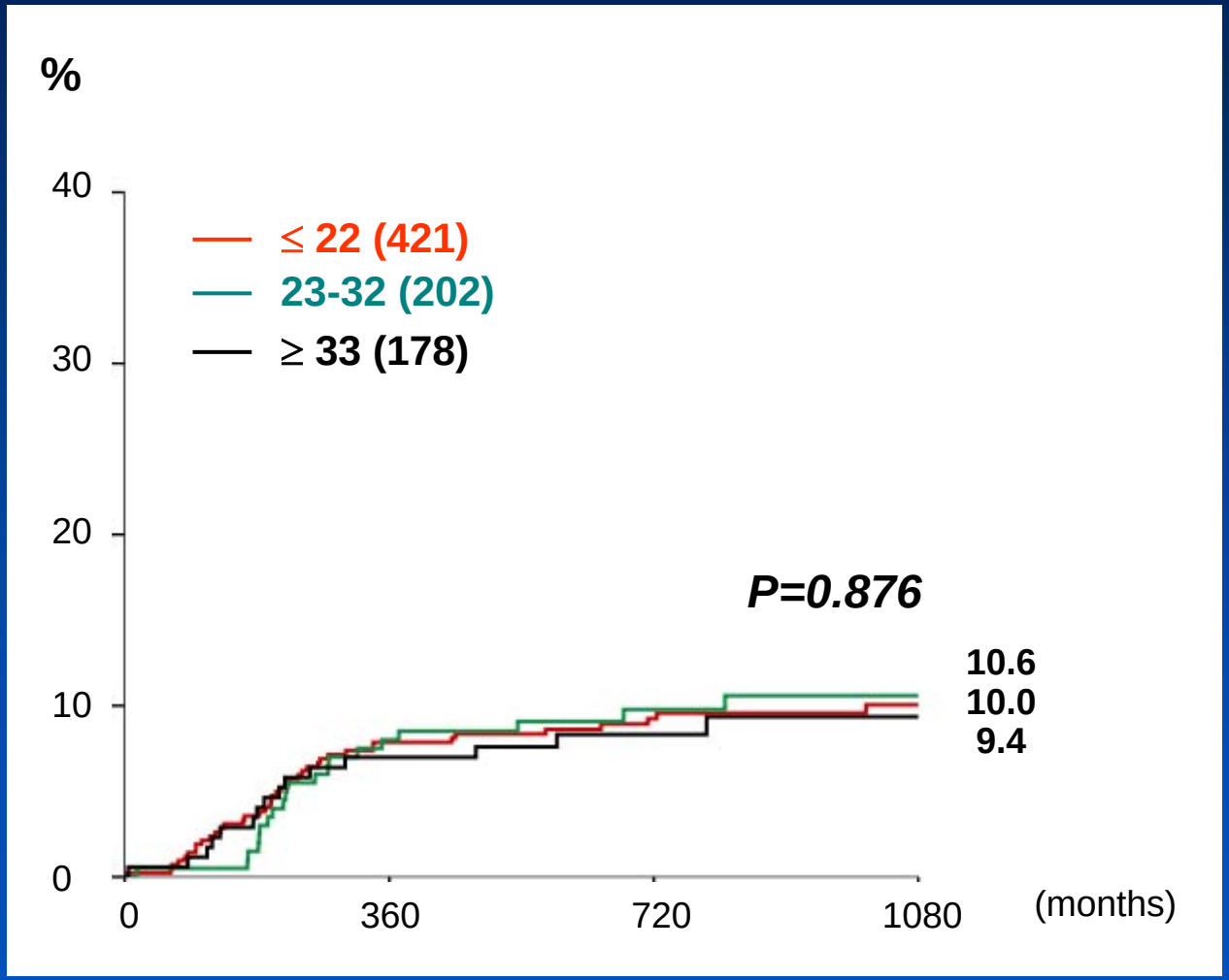
TVR by SYNTAX Score
Overall Patients



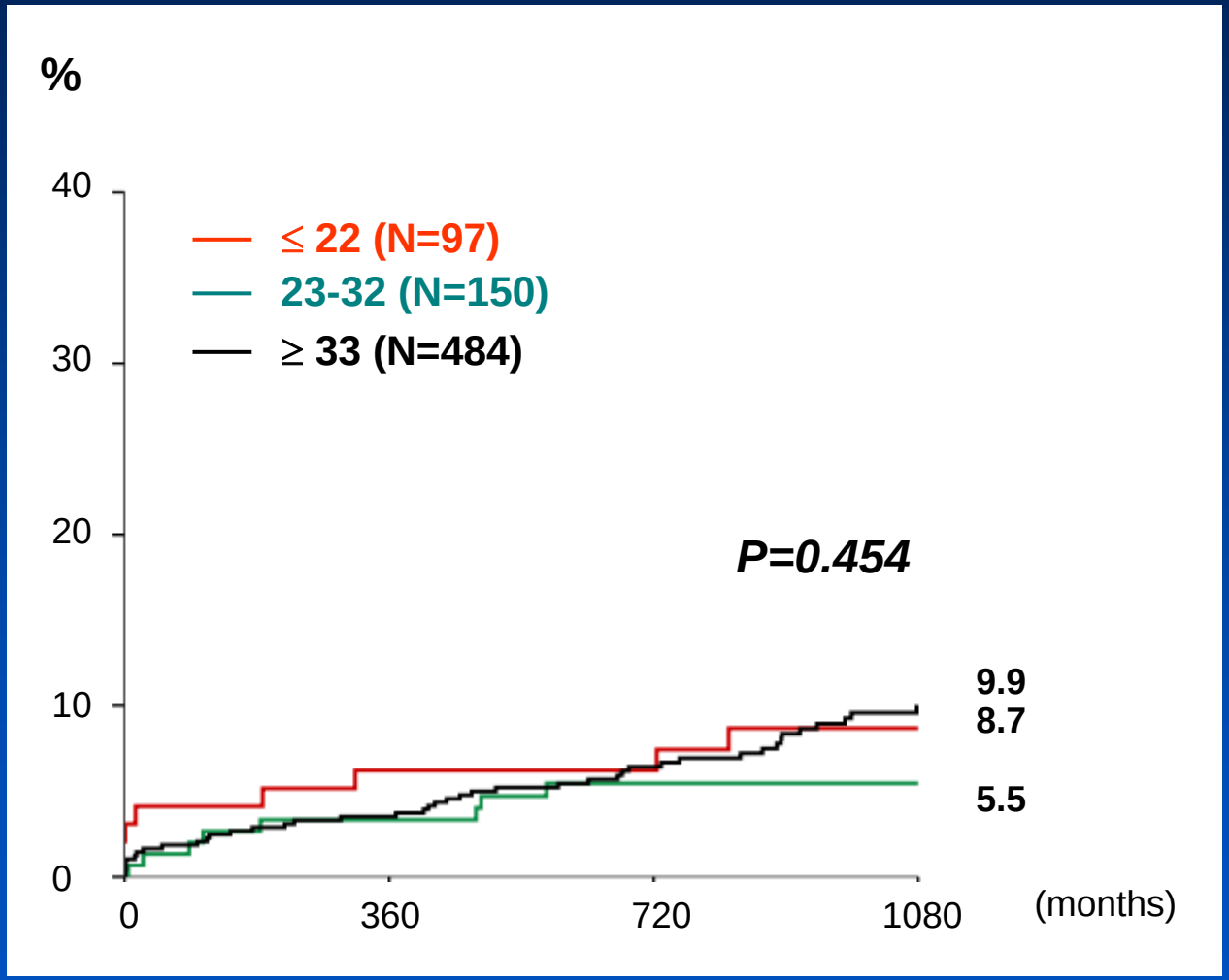
Mortality by SYNTAX Score
PCI Patients



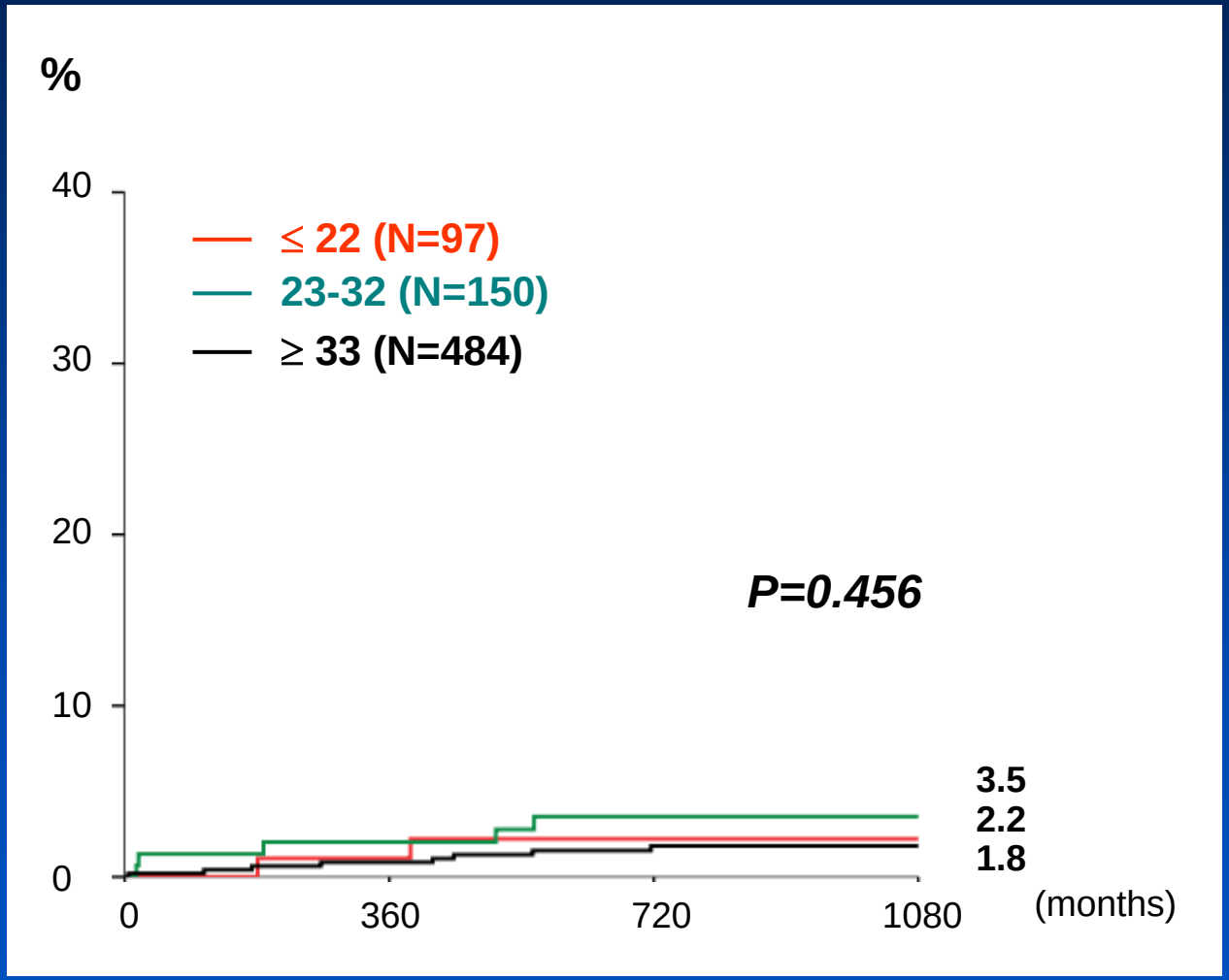
TVR by SYNTAX Score
PCI Patients



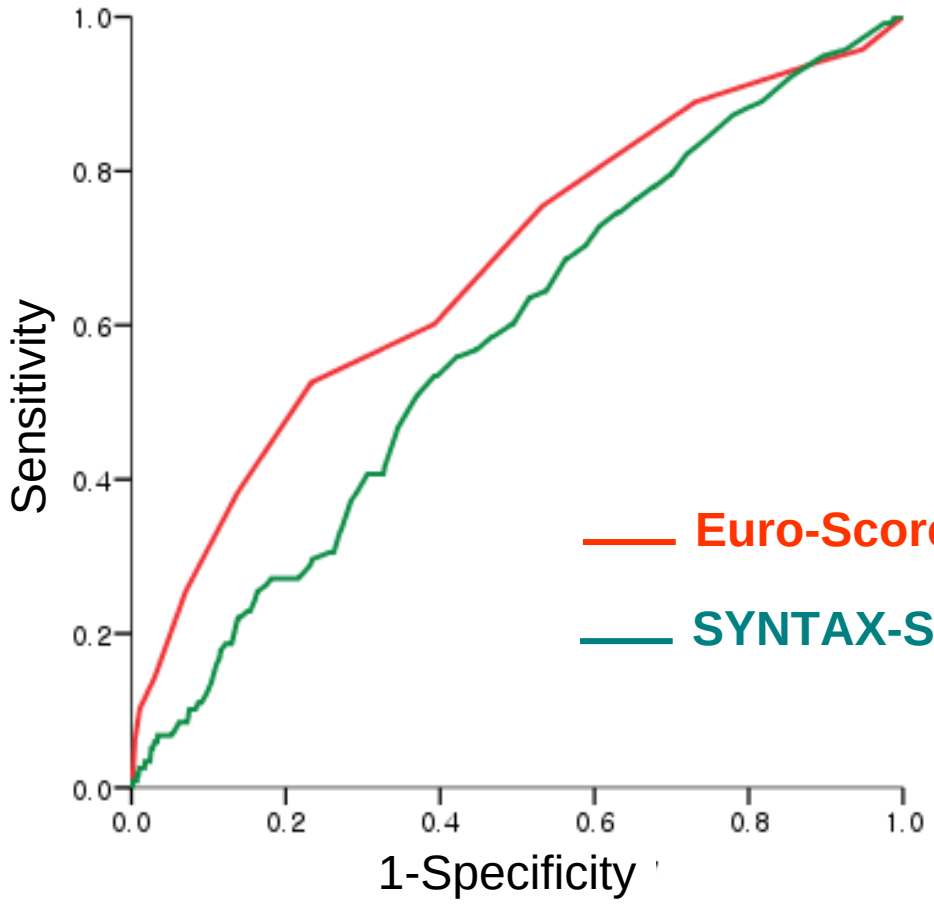
Mortality by SYNTAX Score
CABG Patients



TVR by SYNTAX Score
CABG Patients



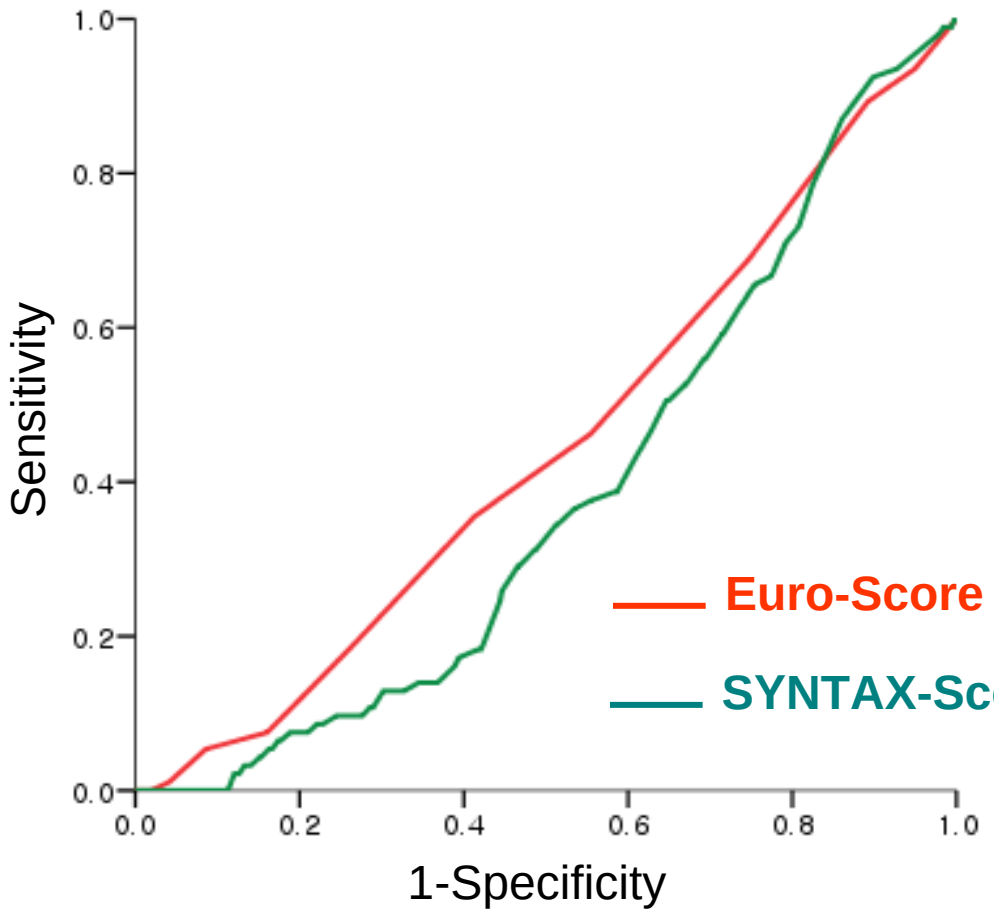
Predictability of Death



	AUC	95% CI
Euro-Score	0.675	0.622 – 0.729
SYNTAX-Score	0.581	0.529 – 0.633

AUC, area under the curve

Predictability of TVR



	AUC	95% CI
Euro-Score	0.445	0.388 – 0.502
SYNTAX-Score	0.383	0.333 – 0.433

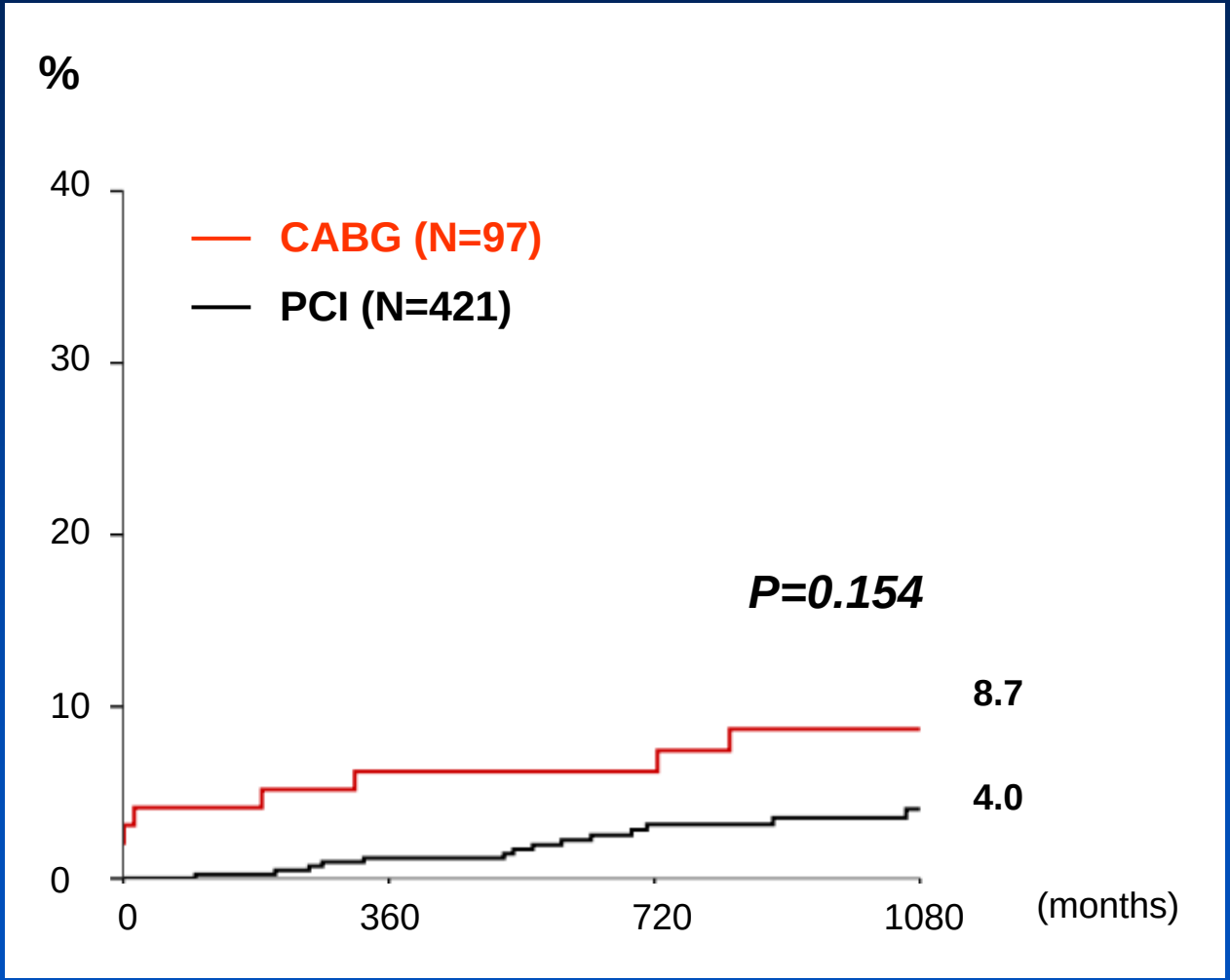
AUC, area under the curve

Outcomes
Between PCI vs. CABG Stratified by SYNTAX Score

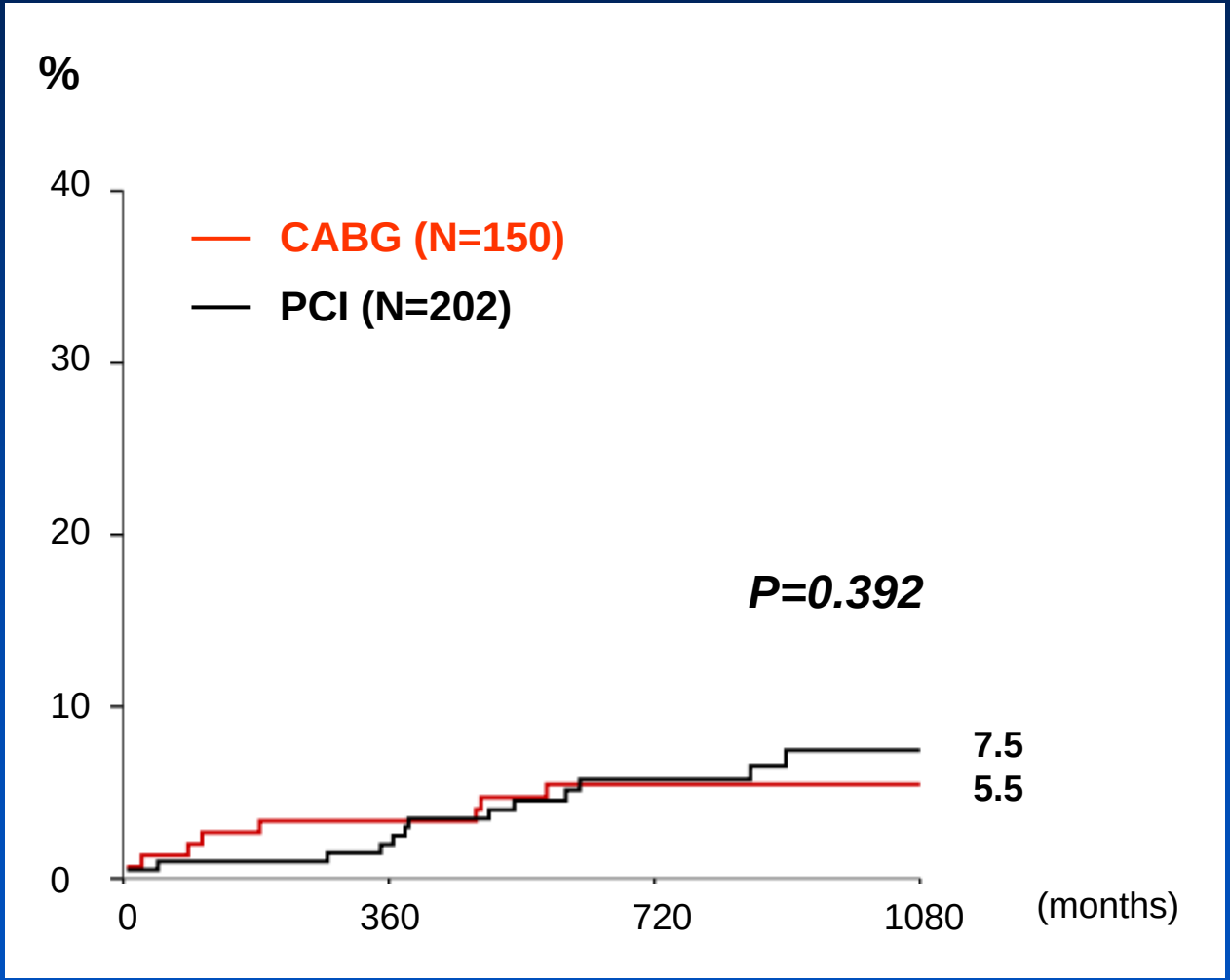
Mortality

Between PCI vs. CABG stratified by SYNTAX Score

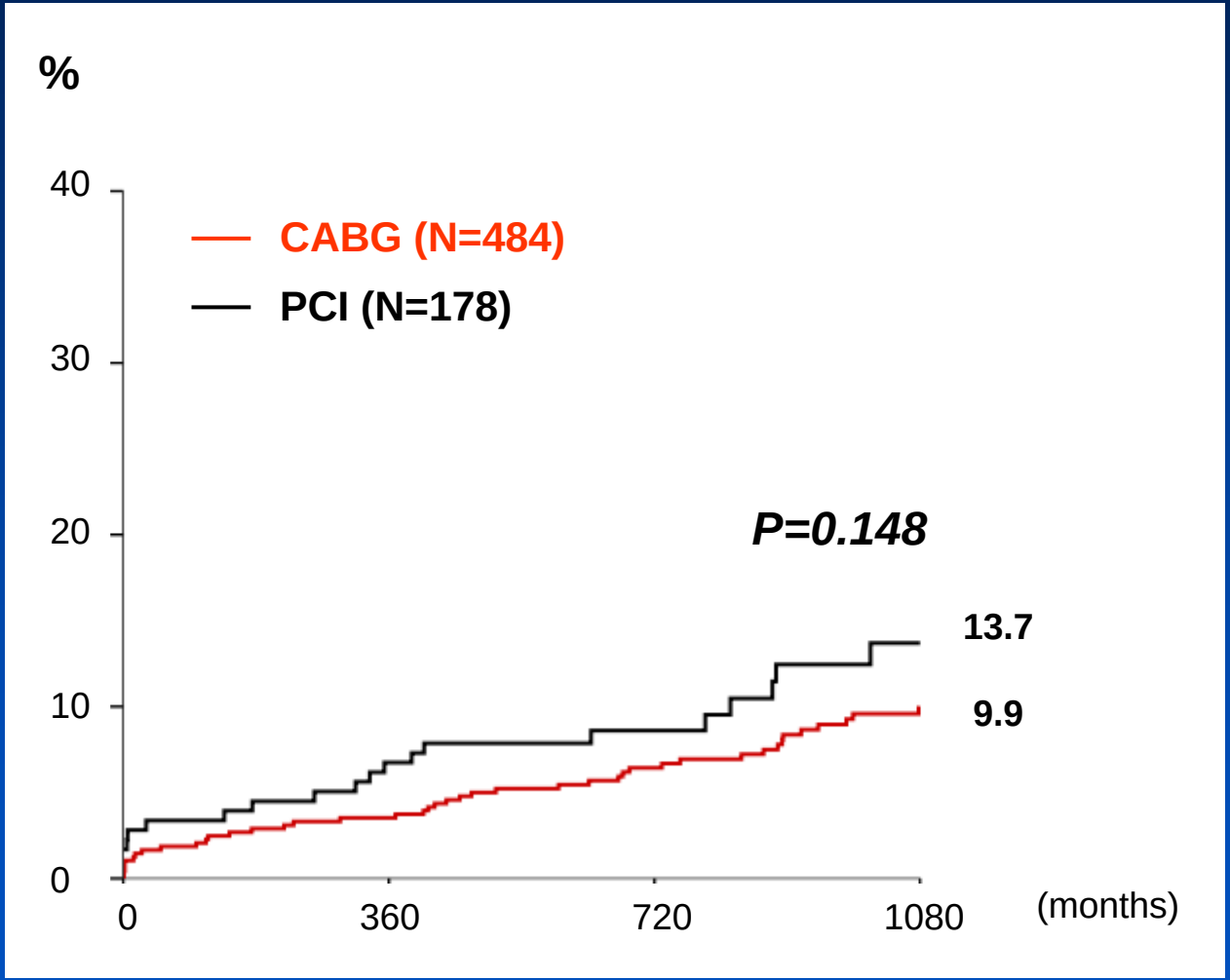
Mortality between PCI vs. CABG
In Low SYNTAX Score



Mortality between PCI vs. CABG
In Intermediate SYNTAX Score

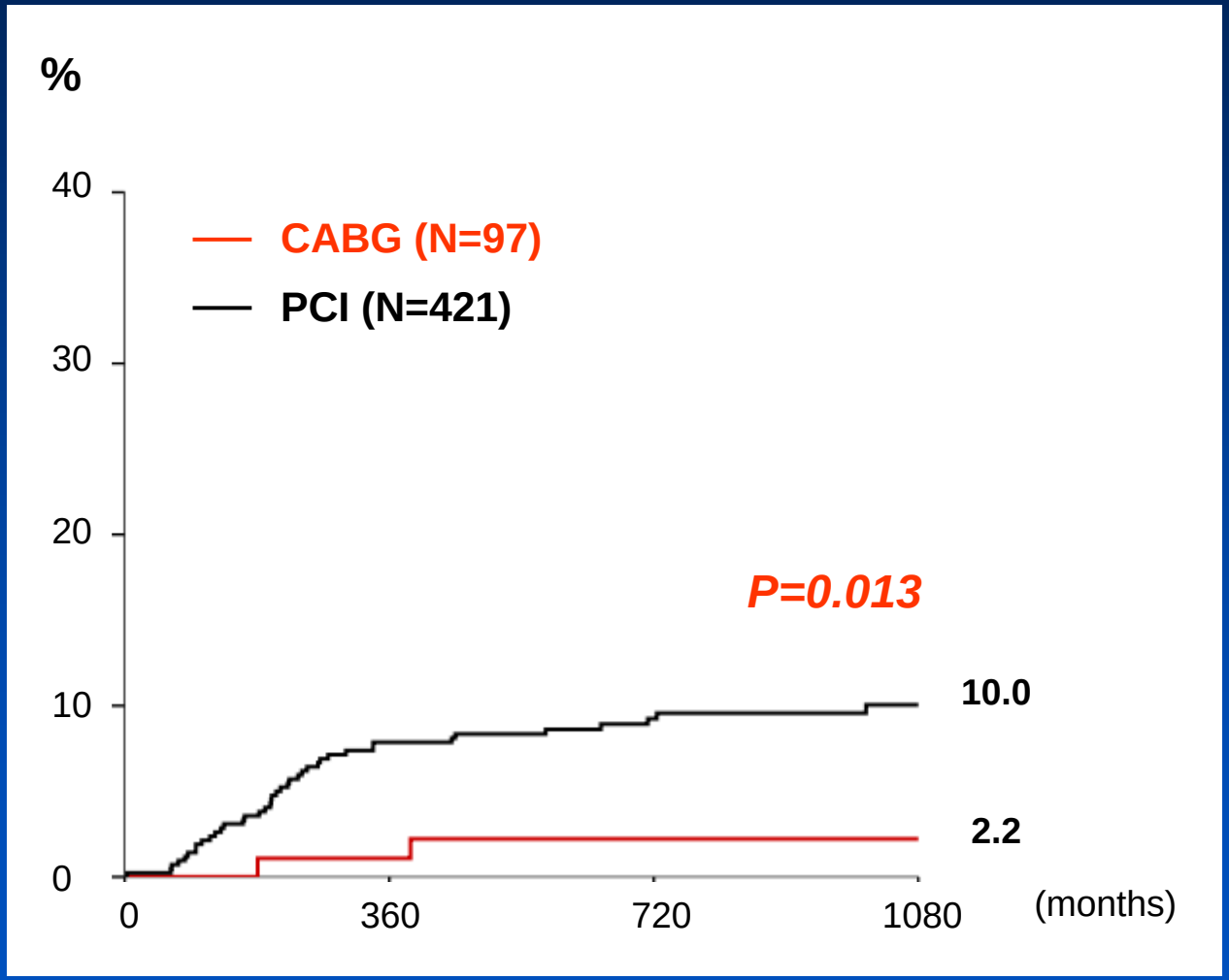


Mortality between PCI vs. CABG
In High SYNTAX Score

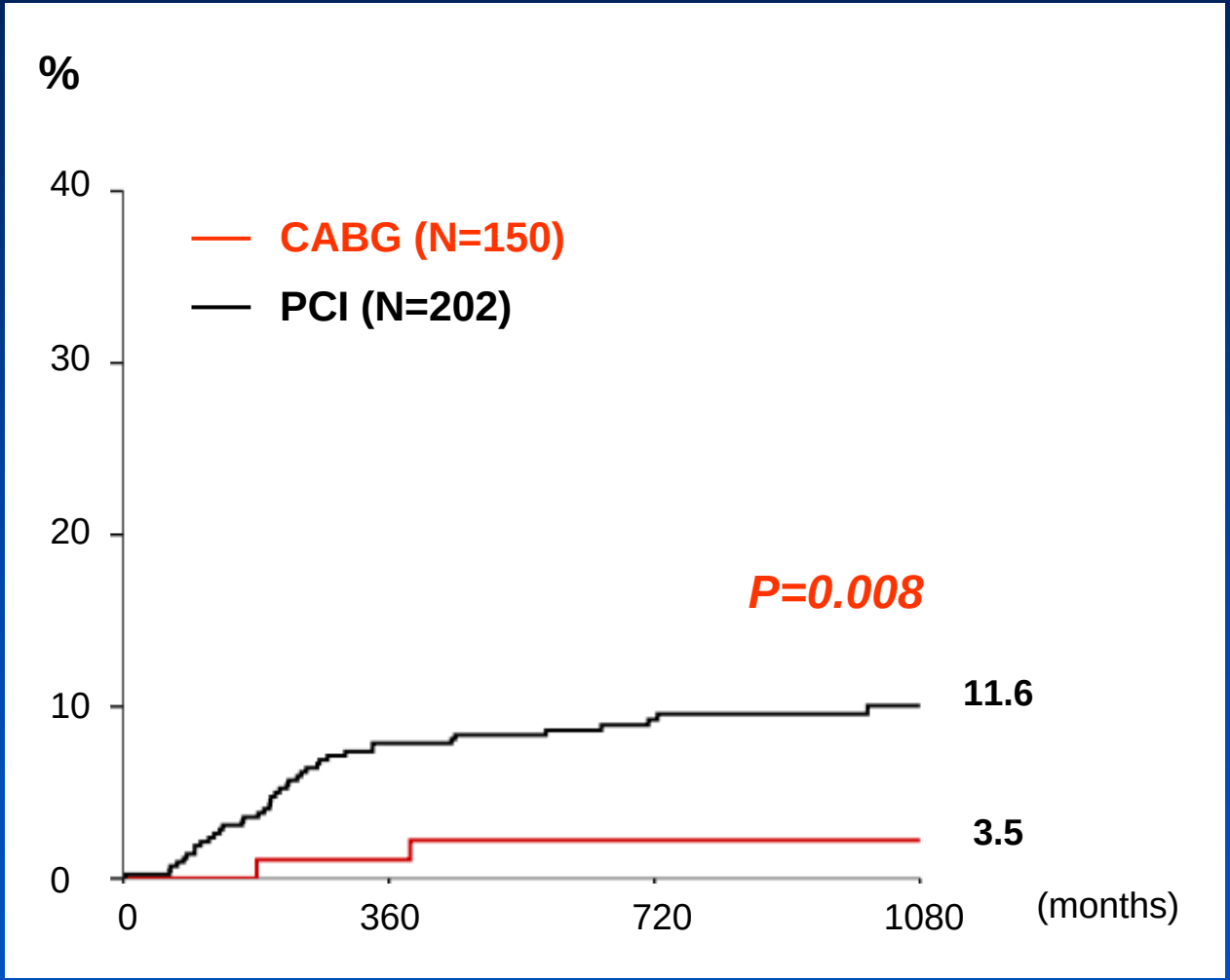


TVR
Between PCI vs. CABG
Stratified by SYNTAX Score

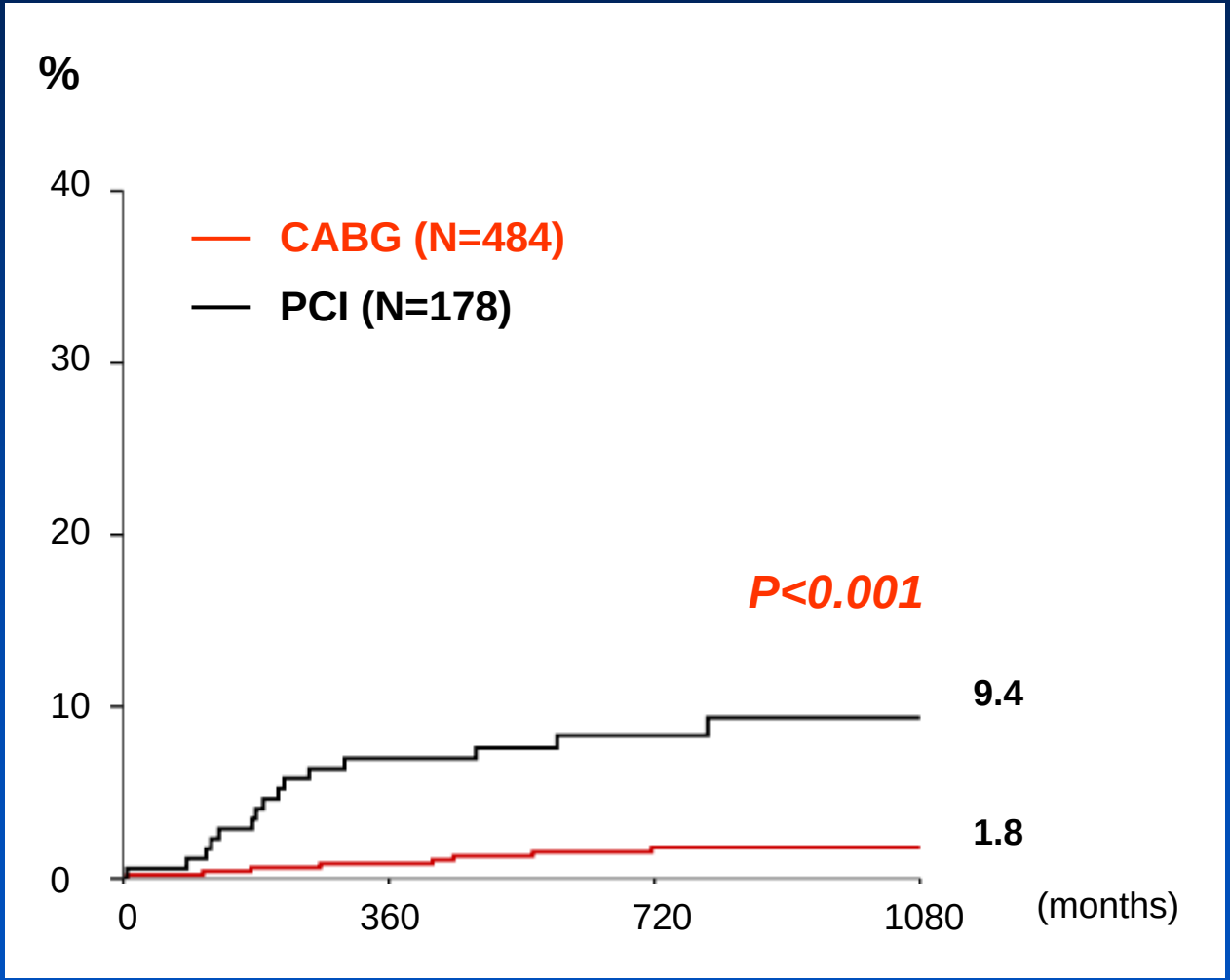
TVR between PCI vs. CABG
In Low SYNTAX Score



TVR between PCI vs. CABG
In Intermediate SYNTAX Score



TVR between PCI vs. CABG
In High SYNTAX Score



Multivariate Predictors by Cox Model
For Overall Patients

SYNTAX Score was not an independent predictor.

Mortality			TVR		
Predictors	HR (95% CI)	P value	Predictors	HR (95% CI)	P value
Euro-SCORE	1.31 (1.21 – 1.41)	< 0.001	**PCI (vs. CABG)**	5.04 (2.90 – 8.78)	< 0.001
CRF	2.30 (1.23 – 4.32)	0.009			

Multivariate Predictors by Cox Model
For PCI Patients

Mortality			TVR		
Predictors	HR (95% CI)	P value	Predictors	HR (95% CI)	P value
Euro-SCORE	1.23 (1.10 – 1.38)	< 0.001	**BMS (vs. DES)**	1.79 (1.12 – 2.89)	0.016
CHF	3.25 (1.31 – 8.04)	0.011			
CRF	3.81 (1.65 – 8.80)	0.002			
Ostial LCX stenosis	2.13 (1.22 – 3.72)	0.008			
BMS (vs. DES)	1.81 (0.99 – 3.30)	0.051			

Multivariate Predictors by Cox Model
For CABG Patients

Mortality			TVR		
Predictors	HR (95% CI)	P value	Predictors	HR (95% CI)	P value
Euro-SCORE	1.30 (1.17 – 1.45)	< 0.001	**Prior PCI**	4.60 (1.57 – 13.44)	0.005
Lung ds	2.53 (0.99 – 6.49)	0.053			
Ostial LCX stenosis	1.85 (1.05 – 3.27)	0.034			

Conclusion

- The SYNTAX score is a useful representative of coronary angiographic complexity.
- Predictably, the patients having high SYNTAX score were more likely to be older, had multiple coronary risk factors and received bypass surgery as compared with those with low SYNTAX score.
- In our ‘MAIN-COMPARE’ registry enrolling unprotected LMCA stenosis, the SYNTAX score did not confer an additional predictive power of adverse outcomes in either PCI or CABG patients.

Conclusion

- In contrast, traditional risk factors, such as Euro-Score or other comorbidities, still remain important predictors of adverse outcomes.
- The comparative effectiveness of PCI with reference to CABG, shown in the previous literature, was not changed with the angiographic adjustment using SYNTAX score.
- A new risk score model integrating clinical and angiographic parameters is warranted to better predict prognosis of revascularization for unprotected LMCA stensosis.


Thank You !!
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Hazards of PCI compared with CABG

Adjusted by Cox Model using Propensity Score, Euro SCORE, SYNTAX Score

	Death		TVR	
	HR (95% CI)	p	HR (95% CI)	p
Crude	0.88 (0.61 – 1.27)	0.491	5.04 (2.90 – 8.78)	< 0.001
Covariates of				
Propensity-Score	1.19 (0.79 – 1.80)	0.414	5.16 (2.85 – 9.37)	< 0.001
Euro-Score	1.07 (0.74 – 1.54)	0.737	4.93 (2.82 – 8.60)	< 0.001
SYNTAX-Score	1.18 (0.78 – 1.80)	0.435	4.53 (2.46 – 8.35)	< 0.001
All three scores	1.31 (0.85 – 2.02)	0.215	4.71 (2.53 – 8.76)	< 0.001