

Temporal Trends and Outcomes of Contemporary LM Treatment From ASAN MAIN Registry

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Background

“Surgery is Better” for LM Disease

15-year Survival, CASS registry

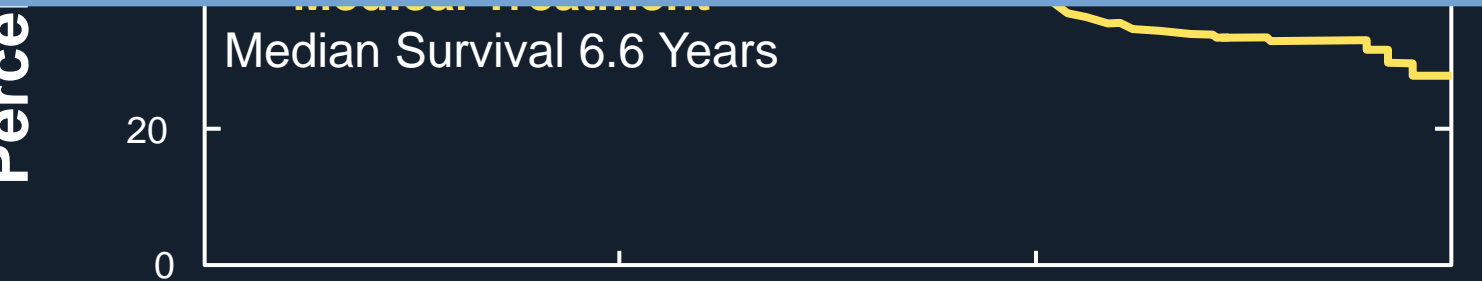
100

CABG Surgery

40 Years Old Data !

Percent

Medical Treatment
Median Survival 6.6 Years



YEAR	0	5	10	15
—	1153 100	973 85	745 67	20 37
.....	331 100	194 59	128 39	6 27

Background

1. *CABG has been considered the standard care for the patients with LM disease.*
2. Since the introduction of PCI, coupled with the accumulation of experience, improved technology and pharmacology has led to this approach being rapidly evolved and broadly adopted in treatment for LM disease.
3. However, temporal changes in revascularization strategies (PCI or CABG) for LM disease are not well documented.

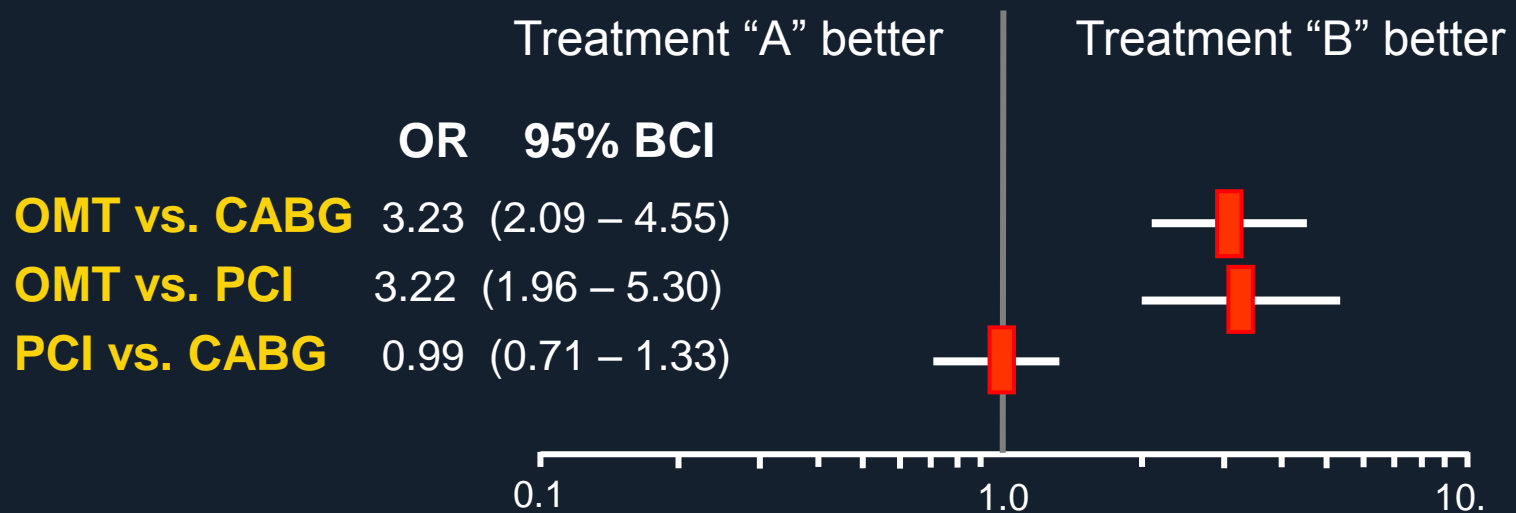
PCI vs CABG

For Left Main Disease

***Survival Benefit* of PCI or CABG Over Medication**

Bayesian Net-work Meta-analysis, PCI vs. CABG vs. Medical Treatment
Posterior Median OR and 95% Bayesian Credible Intervals (BCI)

One-Year Mortality



PCI vs CABG for LM Disease

12 Meta-Analyses, 2009-2014

Author	Journal	Year	RCT	Non-RCT	Pts	FU
Naik et al	JACC Cardiovasc Interv	2009	2	8	3,773	3 yrs
Lee et al	Am J Cardiol	2010	2	6	2,905	1 yr
Capodanno et al	J Am Coll Cardiol	2011	4	0	1,611	1 yr
Ferrante et al	EuroIntervention	2011	4	0	1,611	1 yr
Jiang et al	Am J Cardiol	2012	0	25	7,230	≤3 yrs
Jang et al	Am J Cardiol	2012	3	9	5,079	1 yr
Desch et al	Herz	2013	4	0	1,611	2 yrs
Sa et al	Eur J Cardiothorac Surg	2013	3	13	5,674	1 yr
Alam et al	Circulation J	2013	4	23	11,148	5 yrs
Athappan et al	JACC Cardiovasc Interv	2013	3	21	14,203	5 yrs
Sa et al	Rev Bras Cir Cardiovasc	2013	1	4	2,914	5 yrs
Li et al	TRIALS	2014	4	17	8,413	5 yrs

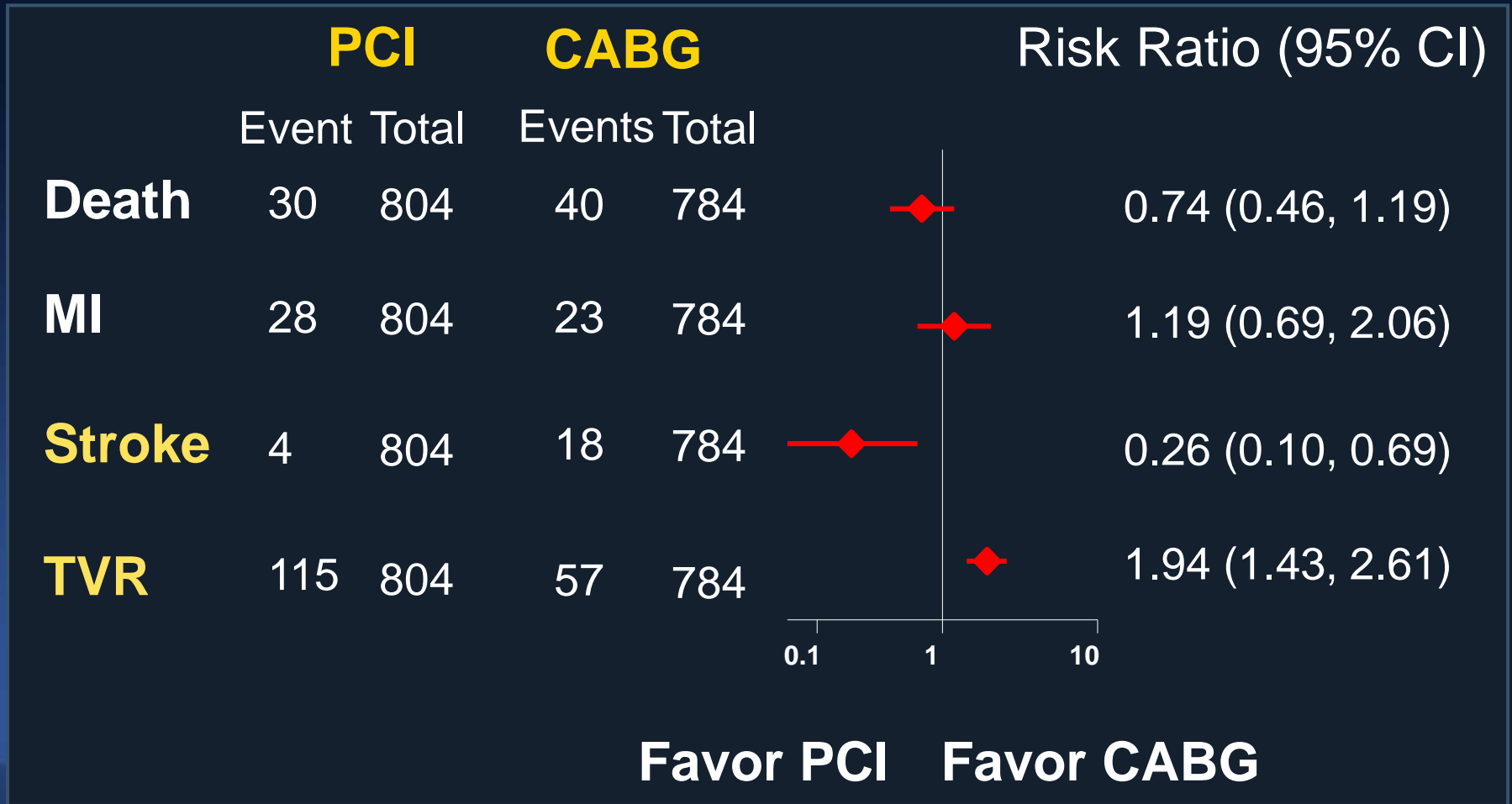
Meta-analysis (n=1,611) of RCT 2011

Outcomes at 1 Year

	PCI (n = 809)	CABG (n = 802)	OR (95% CI)	P Value
Primary Endpoint	14.5%	11.8%	1.28 (0.95-1.72)	0.11
Death	3.0%	4.1%	0.74 (0.43-1.29)	0.29
MI	2.8%	2.9%	0.98 (0.54-1.78)	0.95
Stroke	0.1%	1.7%	0.15 (0.03-0.67)	0.013
TVR	11.4%	5.4%	2.25 (1.54-3.29)	< 0.001

Meta-analysis (n=1,611) of RCT 2013

Outcomes at 2 Year



Meta-analysis (n=5,079), 2012

Death, MI or Stroke at 1 Year

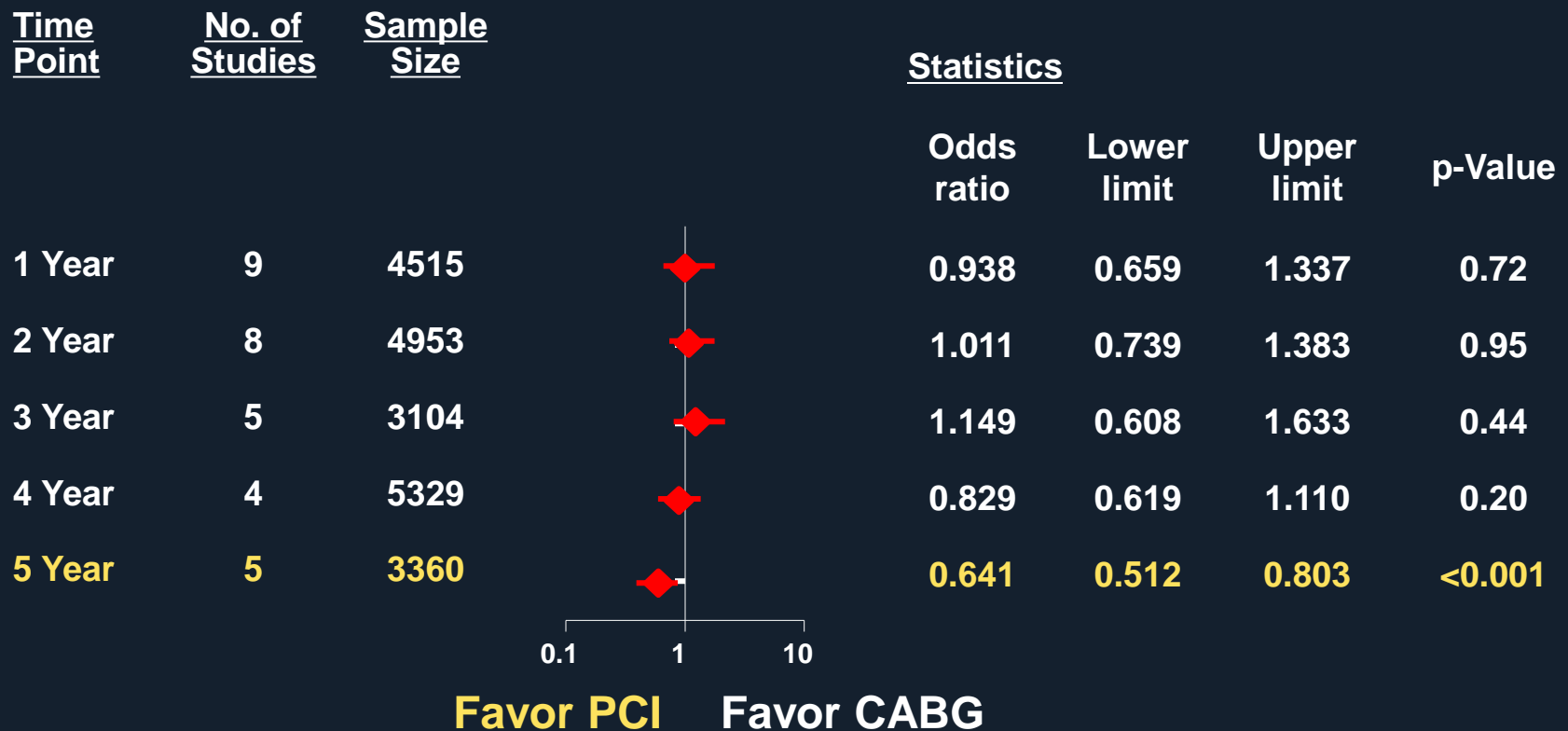


Test for overall effect: Z=1.97 (p=0.05)

Favors DES **Favors CABG**

Meta-analysis (n=14,203), 2013

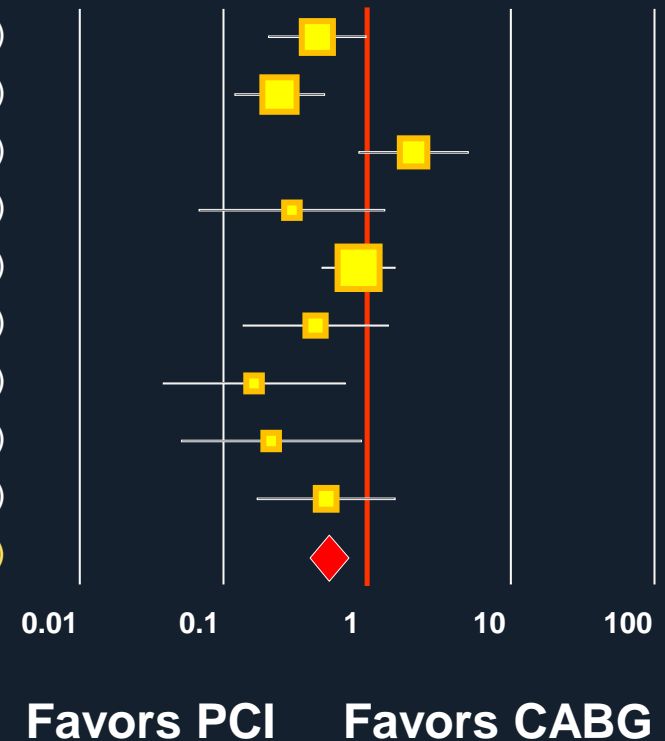
Death, MI or Stroke at 5 Year



Meta-analysis (n=8,413), 2014

Death, MI or Stroke at 5 Year

Study	PCI		CABG		Weight	Risk Ratio
	Events	Total	Events	Total		
Cheng	8	94	37	216	7.6%	0.50 (0.24,1.03)
Chieffo	10	107	42	142	12.3%	0.32 (0.17,0.60)
Kang	13	205	8	257	2.4%	2.04 (0.86,4.82)
Lee	2	50	15	123	3.0%	0.33 (0.08,1.38)
Park	20	176	28	219	8.5%	0.89 (0.52,1.52)
Park SJ	4	300	9	300	3.1%	0.44 (0.17,1.43)
Rittger	2	95	18	155	4.7%	0.18 (0.04,0.76)
Sanmartin	2	96	22	245	4.2%	0.23 (0.06,0.97)
Wu	4	131	14	245	3.3%	0.53 (0.18,1.59)
Total	65	1254	193	1902	49.1%	0.53 (0.40,0.70)



Meta-analysis, 2009-2012



Favor PCI



Favor CABG

Author	Year	FU	Odds Ratio (95% Confidence Interval)				
			Death	MI	Stroke	TVR	D/MI/Stroke
Naik et al	2009	1 yr	1.00 (0.70,1.41)	-	-	4.36 (2.60,7.32)	0.84 (0.57,1.22)
		2 yrs	1.27 (0.83,1.94)	-	-	4.20 (2.21,7.97)	1.25 (0.81,1.94)
		3 yrs	1.11 (0.66,1.86)	-	-	3.30 (0.96,11.3)	1.16 (0.68,1.98)
Lee et al	2010	1 yr	0.71 (0.42,1.23)	-	-	3.23 (1.47,7.14)	0.80 (0.55,1.16)
Capodanno et al	2011	1 yr	0.74 (0.43,1.29)	0.98 (0.54,1.78)	0.15 (0.03,0.67)	2.25 (1.54,3.29)	-
Ferrante et al	2011	1 yr	0.72 (0.42,1.24)	0.97 (0.54,1.74)	0.14 (0.04,0.55)	2.17 (1.48,3.17)	-
Jiang et al	2012	≤2 yrs	0.82 (0.61,1.11)	-	-	3.29 (2.39,4.51)	-
		≤3 yrs	0.88 (0.57,1.37)	-	-	3.60 (2.60,4.99)	-
		>3 yrs	0.72 (0.52,1.00)	-	-	3.49 (2.19,5.56)	-
Jang et al	2012	1 yr	0.68 (0.45,1.02)	-	-	3.52 (2.72,4.56)	0.70 (0.49,1.00)

Meta-analysis, 2013-2014

■ Favor PCI ■ Favor CABG

Author	Year	FU	Hazard Ratio (95% Confidence Interval)				
			Death	MI	Stroke	TVR	D/MI/Stroke
Desch et al	2013	2 yrs	0.74 (0.46,1.19)	1.19 (0.69, 2.06)	0.26 (0.10,0.69)	1.94 (1.43,2.61)	-
Sa et al	2013	1 yr	0.69 (P=0.051)	-	-	3.60 (P<0.001)	0.83 (P=0.26)

Outcomes of PCI Is Getting Better Over Time !

		5 yrs	0.79 (0.67,1.08)	1.38 (0.71,2.70)	0.27 (0.13,0.55)	3.77 (2.43,5.87)	0.64 (0.51,0.80)
Alam et al	2013	30days	0.47 (0.20,1.10)	1.41 (0.56,3.51)	0.24 (0.10,0.62)	0.74 (0.30,1.85)	0.55 (0.18,1.63)
		1 yr	0.71 (0.55,0.92)	1.32 (0.75,2.31)	0.22 (0.10,0.49)	4.20 (3.07,5.75)	0.65 (0.52,0.82)
		~ 5 yrs	0.83 (0.71,0.98)	1.41 (0.94,2.11)	0.33 (0.20,0.55)	3.69 (2.85,4.76)	0.63 (0.49,0.82)
Li et al	2014	<30 day	0.49 (0.30,0.78)	0.97 (0.68,1.38)	0.19 (0.08,0.45)	-	0.53 (0.40,0.70)
		1-5 yrs	0.79 (0.61,0.95)	-	-	3.77 (3.35,4.26)	0.78 (0.71,0.85)

15 Years of Temporal Changes In PCI vs. CABG For LM Disease Data from ASAN MAIN Registry

Objective

To evaluate temporal trends in revascularization strategies and outcomes in patients who received PCI or CABG for LMCA stenosis.

Study Population (1)

The ASAN MAIN Registry is a single center registry to investigate the outcomes of PCI and CABG for patients with LMCA stenosis.

Between January 1995 and December 2010, a total of 2,630 patients were enrolled.

Study Population (2)

Inclusion Criteria

- All consecutive patients who have significant LMCA stenosis with a visual estimated DS of >50%.
- Revascularization was clinically indicated.

Exclusion Criteria

- Concomitant valvular or aortic surgery
- AMI within 24 hours
- Cardiogenic shock
- life expectancy <12 months.

Study Endpoints

Primary Endpoint

A Composite of MACCE including

- Death
- Myocardial Infarction
- Stroke
- Repeat Revascularization

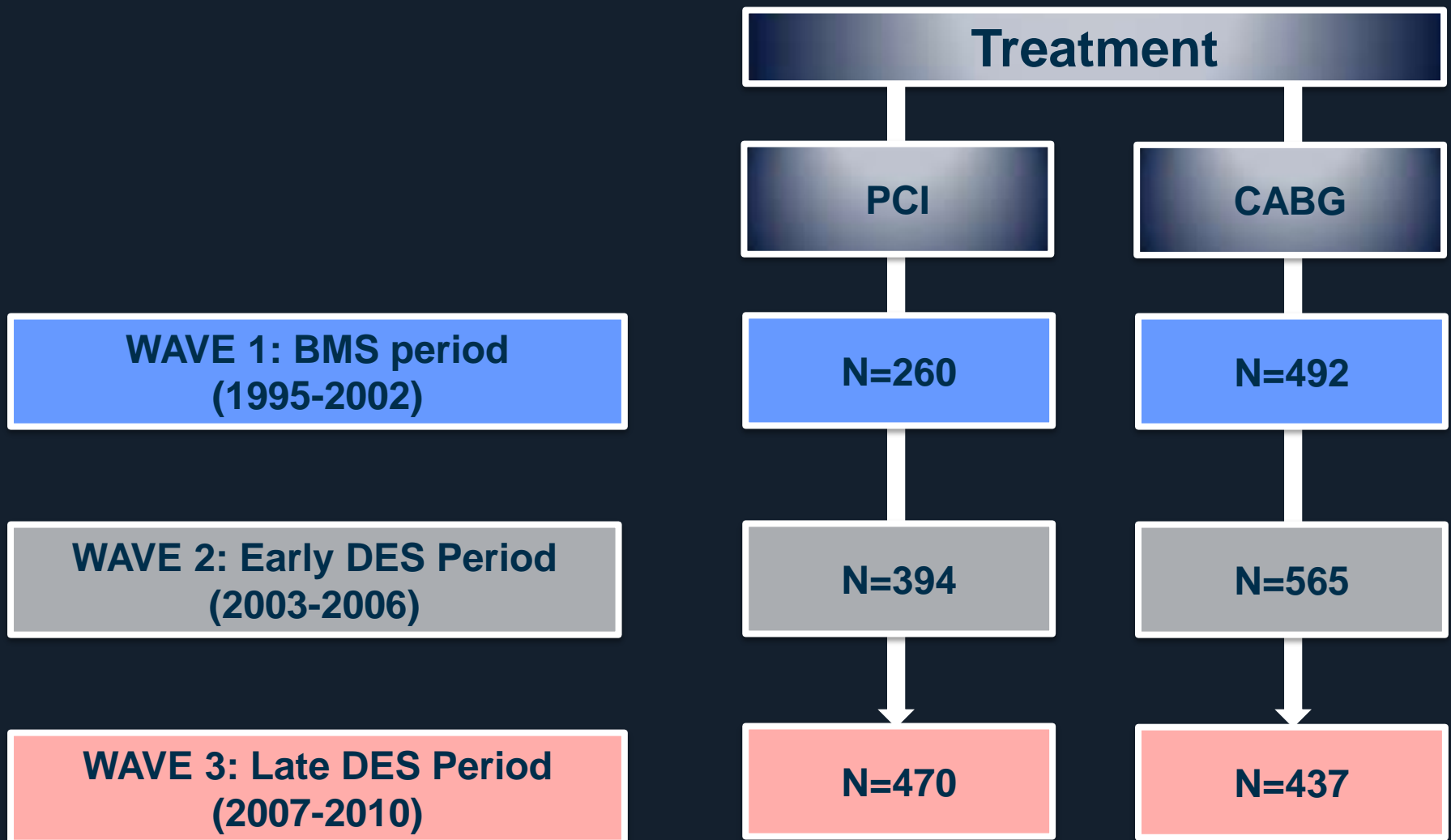
Secondary End Point

- The composite of Death, MI, and stroke
- Any Repeat Revascularization
- Changes in Treatment Strategies

Follow-up

- Clinical, angiographic, procedural, and outcome data were retrospectively recorded in the dedicated PCI database by independent research personnel.
- Patients were clinically followed up at 1, 6, 12, and 24 mons.
- All outcomes of interest were carefully verified and adjudicated by independent clinicians.

Study Periods



Baseline Clinical Characteristics

PCI

CABG

	Wave 1 (N=260)	Wave 2 (N=394)	Wave 3 (N=470)	Wave 1 (N=492)	Wave 2 (N=565)	Wave 3 (N=437)
Age	56.7±11.3*	60.9±11.3	63.2±10.5	62.0±9.4*	63.6±8.6	65.1±9.3
Male gender	171 (65.8)*	285 (72.3)	358 (76.2)	380 (77.2)	424 (75.0)	332 (76.0)
BMI, kg/m ²	24.5±3.1	24.7±3.4	24.5±2.9	24.5±2.7	24.6±3.0	24.4±2.8
Atrial fibrillation	5 (1.9)	8 (2.0)	11 (2.3)	13 (2.6)	9 (1.6)	9 (2.1)
Hypertension	111 (42.7)*	214 (54.3)	286 (60.9)	260 (52.8)	335 (59.3)	280 (64.1)
Diabetes	58 (22.3)*	125 (31.7)	176 (37.4)	164 (33.3)*	230 (40.7)	179 (41.0)
Smoking	81 (31.2)	104 (26.4)	130 (27.7)	162 (32.9)*	149 (26.4)	115 (26.3)
Hypercholesterolemia	94 (36.2)*	152 (38.6)	265 (56.4)	184 (37.4)*	271 (48.0)	208 (47.6)
Previous MI	38 (14.6)*	34 (8.6)	42 (8.9)	83 (16.9)	93 (16.5)	52 (11.9)

* p<0.05

Baseline Clinical Characteristics

PCI

CABG

	Wave 1 (N=260)	Wave 2 (N=394)	Wave 3 (N=470)	Wave 1 (N=492)	Wave 2 (N=565)	Wave 3 (N=437)
Previous PCI	36 (13.8)	74 (18.8)	90 (19.1)	51 (10.4)	84 (14.9)	65 (14.9)
Previous cardiac OP	0	1 (0.3)	6 (1.3)	0	2 (0.4)	0
Previous stroke	8 (3.1)*	27 (6.9)	41 (8.7)	42 (8.5)	46 (8.1)	44 (10.1)
Chronic lung disease	4 (1.5)	12 (3.0)	10 (2.1)	51 (10.4)*	84 (14.9)	65 (14.9)
Chronic renal failure	5 (1.9)	9 (2.3)	12 (2.6)	10 (2.0)*	24 (4.2)	22 (5.0)
Clinical presentation						
Stable angina	77 (29.6)*	178 (45.2)	270 (57.4)	59 (12.0)*	104 (18.4)	196 (44.9)
Unstable angina	156 (60.0)	160 (40.6)	148 (31.5)	401 (81.5)	408 (72.2)	202 (46.2)
NSTEMI	17 (6.5)	25 (6.3)	28 (6.0)	22 (4.5)	37 (6.5)	25 (5.7)
STEMI	4 (3.8)	31 (7.9)	24 (5.1)	10 (2.0)	16 (2.8)	14 (3.2)

* p<0.05

Baseline Angiographic Characteristics

PCI

CABG

	Wave 1 (N=260)	Wave 2 (N=394)	Wave 3 (N=470)	Wave 1 (N=492)	Wave 2 (N=565)	Wave 3 (N=437)
Lesion location						
Ostial or shaft	139 (53.5)*	154 (39.1)	155 (33.0)	147 (29.9)	164 (29.0)	111 (25.4)
Bifurcation	121 (46.5)	240 (60.9)	315 (67.0)	345 (70.1)	401 (71.0)	326 (74.6)
Disease extent						
Left main only	102 (39.2)*	63 (16.0)	38 (8.1)	34 (6.9)*	13 (2.3)	11 (2.5)
Left main plus 1VD	75 (28.8)	86 (21.8)	107 (22.8)	51 (10.4)	42 (7.4)	28 (6.4)
Left main plus 2VD	55 (21.2)	113 (28.7)	184 (39.1)	122 (24.8)	100 (17.7)	77 (17.6)
Left main plus 3VD	28 (10.8)	132 (33.5)	141 (30.0)	285 (57.9)	410 (72.6)	321 (73.5)
Ejection fraction, %	62.1±8.2*	60.5±9.0	59.1±8.2	57.9±11.7*	55.2±11.9	56.4±10.8

Procedural Characteristics of **PCI**

	Wave 1 (N=260)	Wave 2 (N=394)	Wave 3 (N=470)	P value
Use of IVUS	207 (79.9)	341 (86.8)	406 (86.6)	0.028
Stent technique				<0.001
Left main stent only	169 (65.0)	110 (28.0)	68 (14.5)	
Simple cross over	54 (20.8)	168 (42.7)	283 (60.3)	
Two-stent technique	37 (14.2)	115 (29.3)	108 (25.1)	
Total stent number in LM	1.3±0.6	1.7±0.9	2.0±1.0	<0.001
Total stent length in LM	16.5±9.5	36.2±25.0	46.3±24.8	<0.001
Total stent number per patient	1.6±0.9	2.4±1.4	2.6±1.4	<0.001
Total stent length per patient	22.5±15.3	54.2±38.7	63.0±36.7	<0.001
Stent type				<0.001
BMS	260 (100)	27 (6.9)	12 (2.6)	
1 st DES	0	365 (92.6)	217 (46.1)	
2 nd DES	0	2 (0.6)	240 (51.1)	

Procedural Characteristics of CABG

	Wave 1 (N=492)	Wave 2 (N=565)	Wave 3 (N=437)	P value
Number of conduit	3.8±1.2	3.2±1.0	2.8±0.9	<0.001
Number of arterial conduit	1.9±1.3	2.4±0.9	1.8±0.8	<0.001
Number of vein conduit	1.9±1.8	0.8±0.7	1.1±1.0	<0.001
Internal thoracic artery	425 (86.4)	542 (95.9)	422 (96.6)	<0.001
Off-pump	73 (14.8)	204 (36.1)	292 (66.8)	<0.001

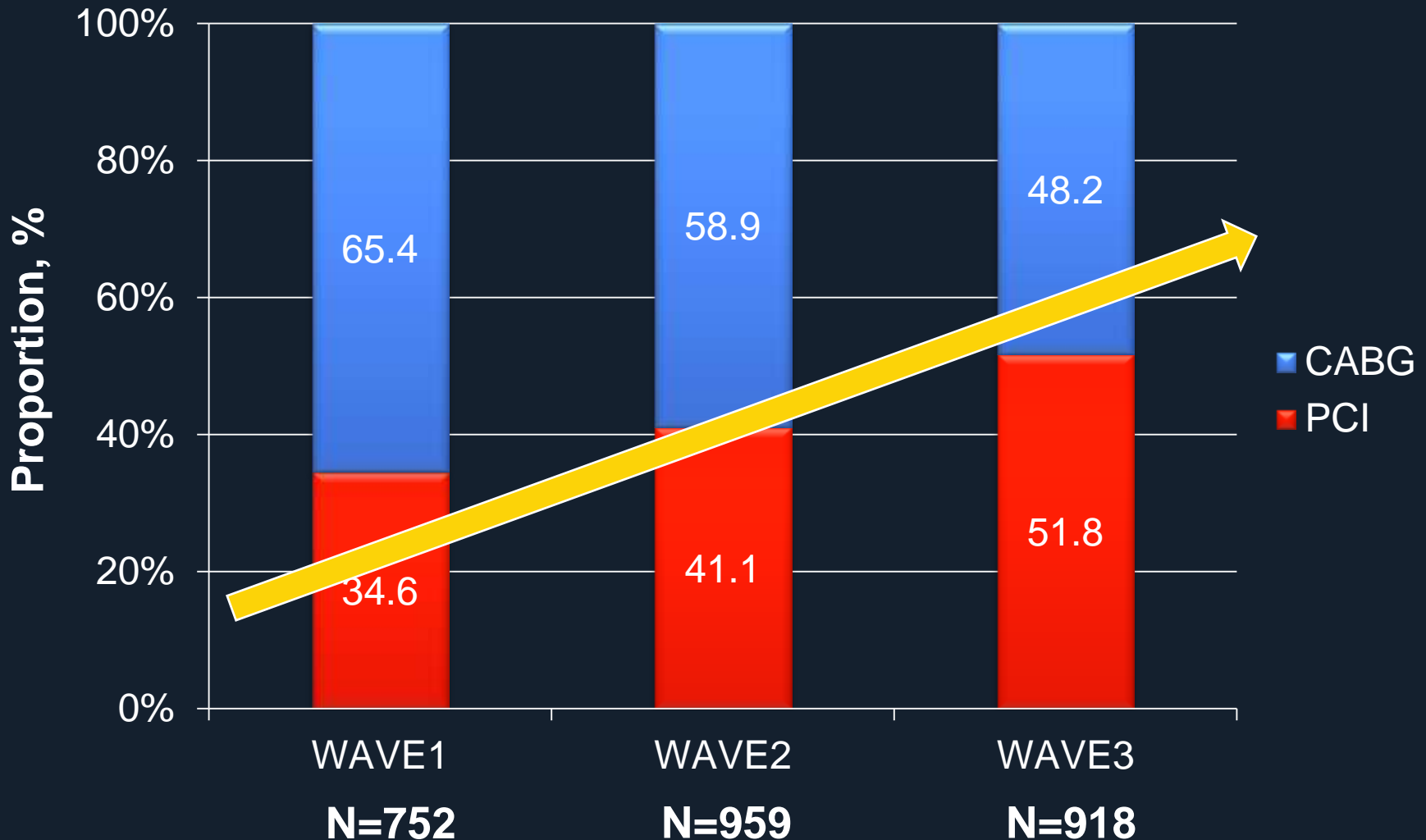
Revascularization Strategy

PCI/CABG

0.53

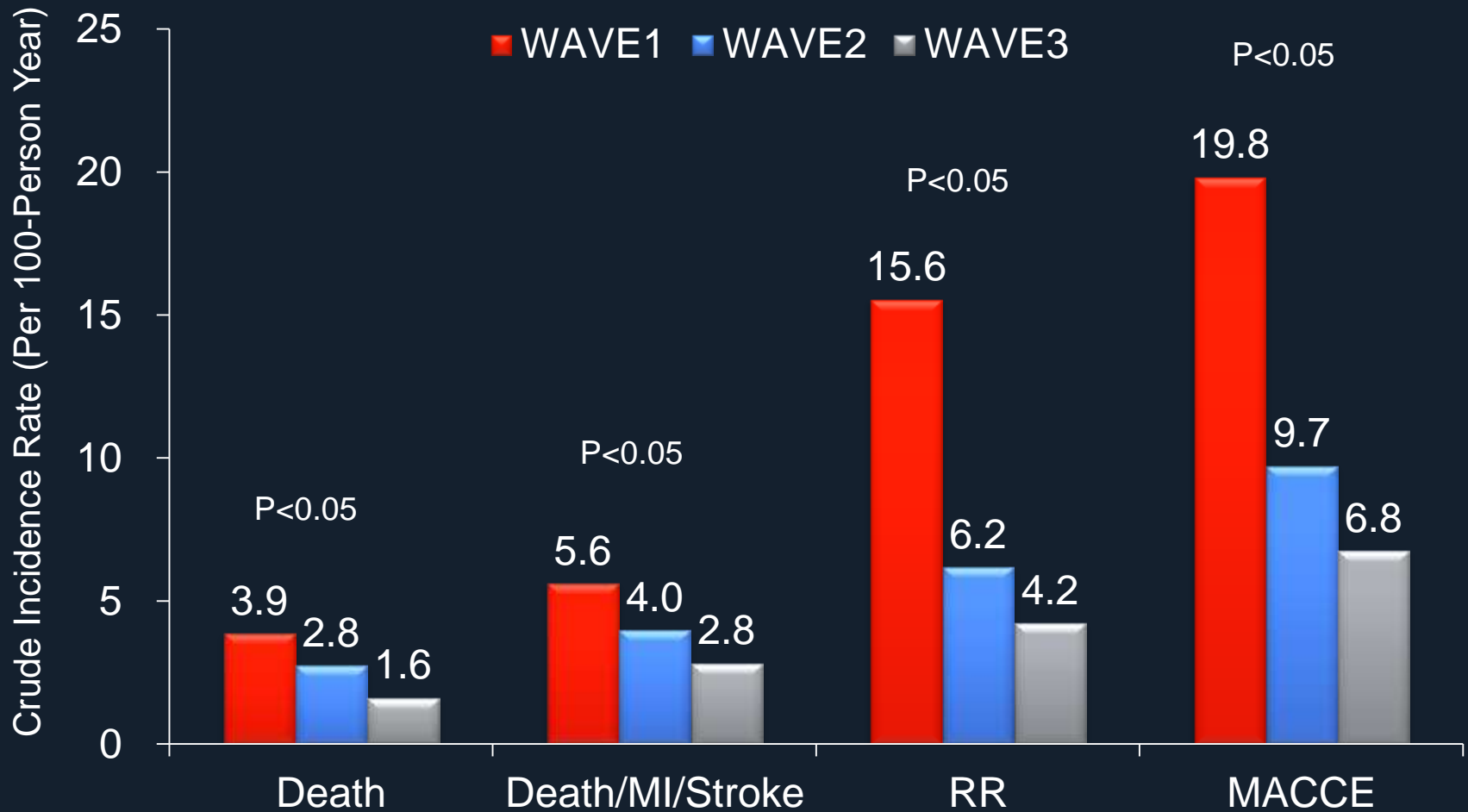
0.70

1.08



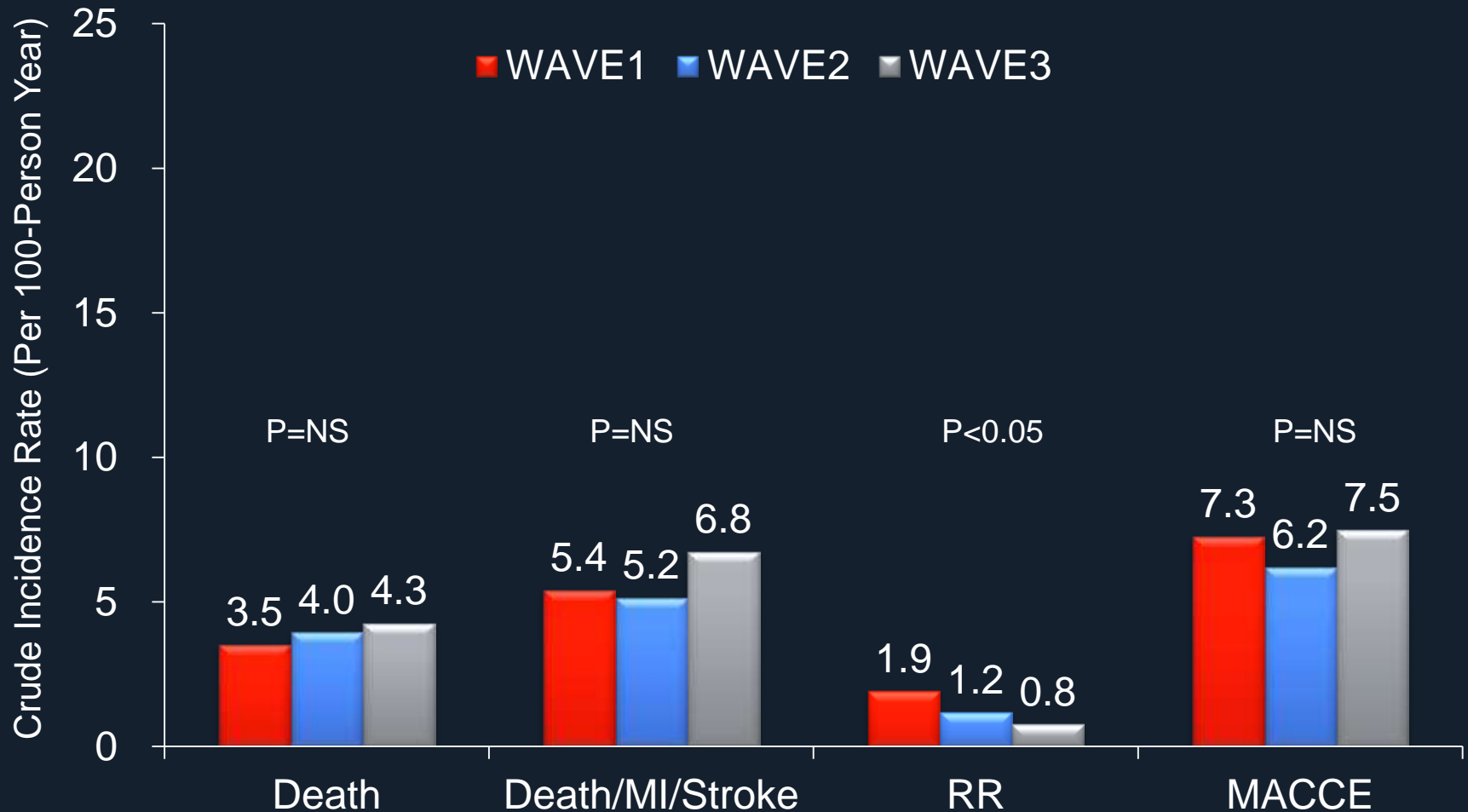
Crude Incidence Rate (Per 100-Person Year)

Percutaneous Coronary Intervention



Crude Incidence Rate (Per 100-Person Year)

Coronary Artery Bypass Grafting



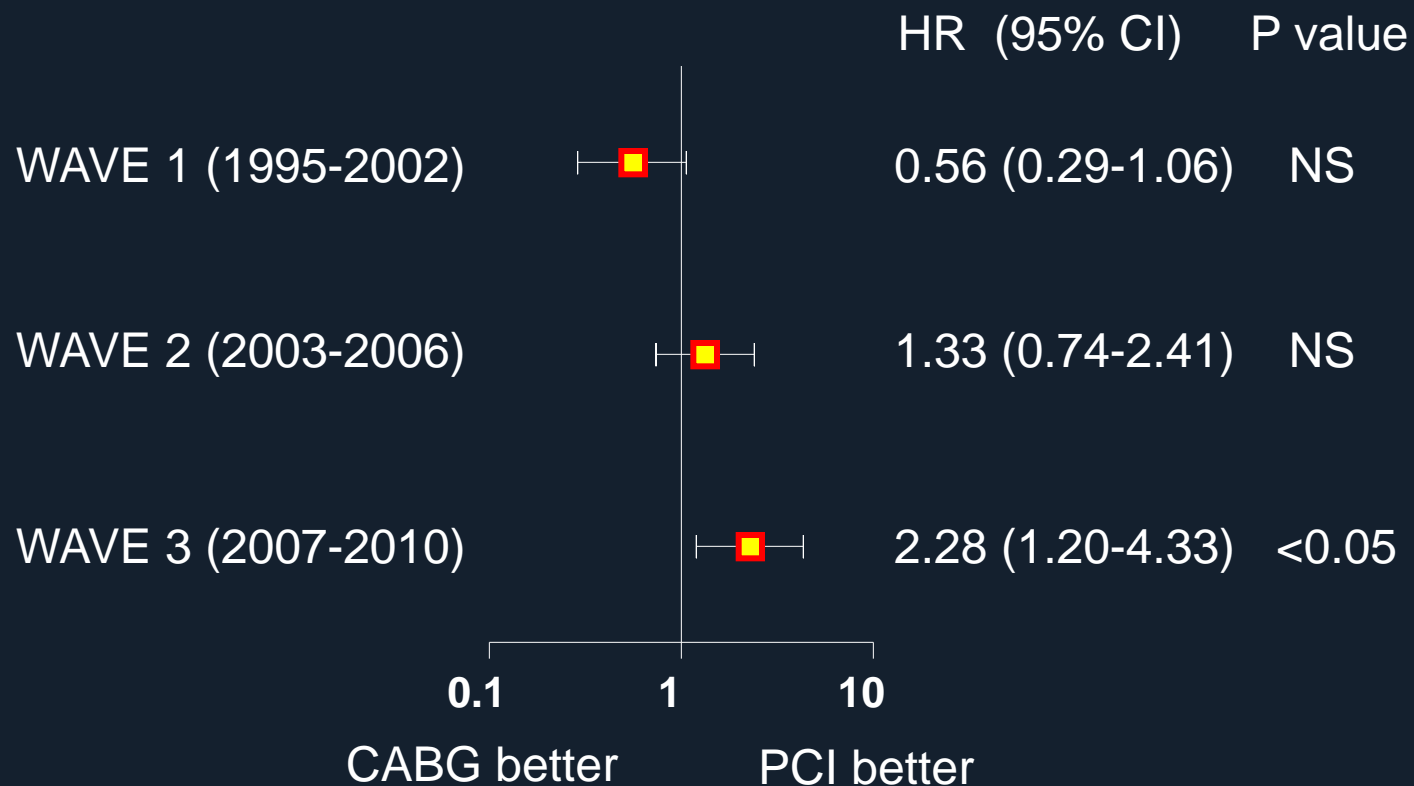
Risk Adjusted Incidence Rate

(Per 100-Person Year)

		Wave 1	Wave 2	Wave 3	Adjusted HR (95% CI)	P for trend
PCI	Death	4.51	2.13	1.62	0.60 (0.41–0.87)	0.008
	Death, MI, or Stroke	6.71	3.61	2.83	0.65 (0.48–0.89)	<0.001
	Repeat Revascularization	14.03	5.99	4.24	0.54 (0.43–0.67)	<0.001
	MACCE	20.18	9.28	6.77	0.57 (0.47–0.70)	<0.001
CABG	Death	4.35	3.77	4.28	0.99 (0.77–1.29)	0.97
	Death, MI, or Stroke	6.09	5.07	6.75	1.06 (0.85–1.31)	0.60
	Repeat Revascularization	2.14	1.24	0.79	0.60 (0.38–0.95)	0.028
	MACCE	7.63	6.03	7.50	0.99 (0.82–1.20)	0.92

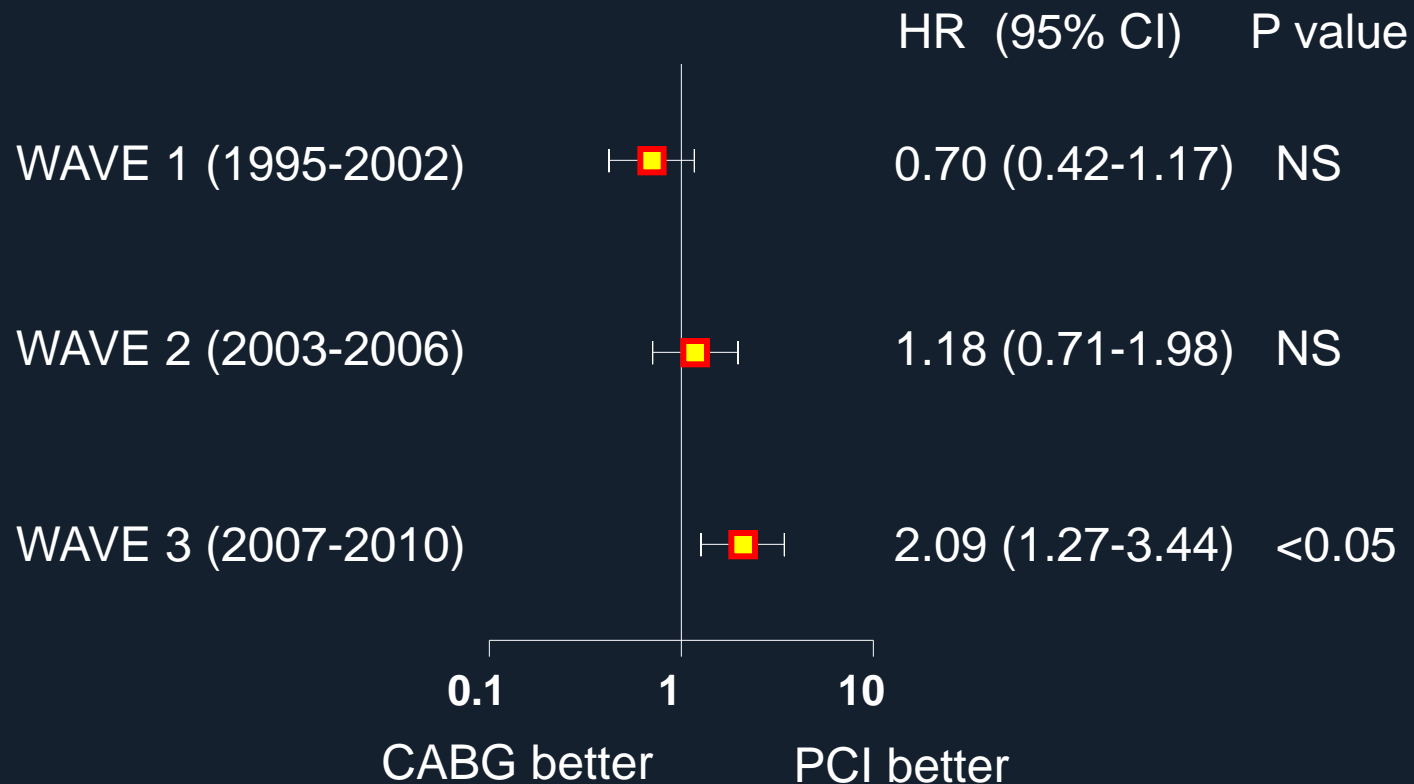
Risk Adjusted Hazard Ratio

Death



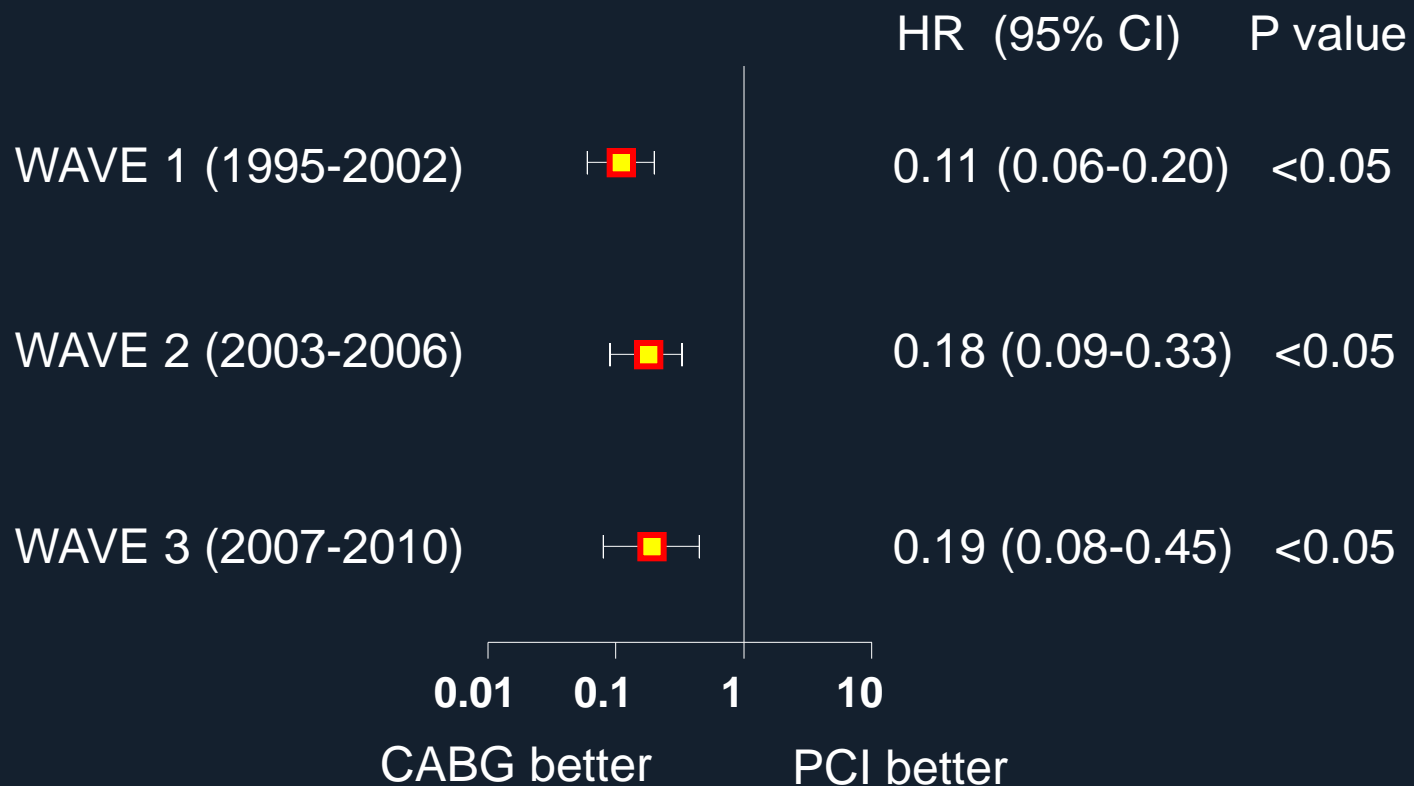
Risk Adjusted Hazard Ratio

Death, MI or Stroke



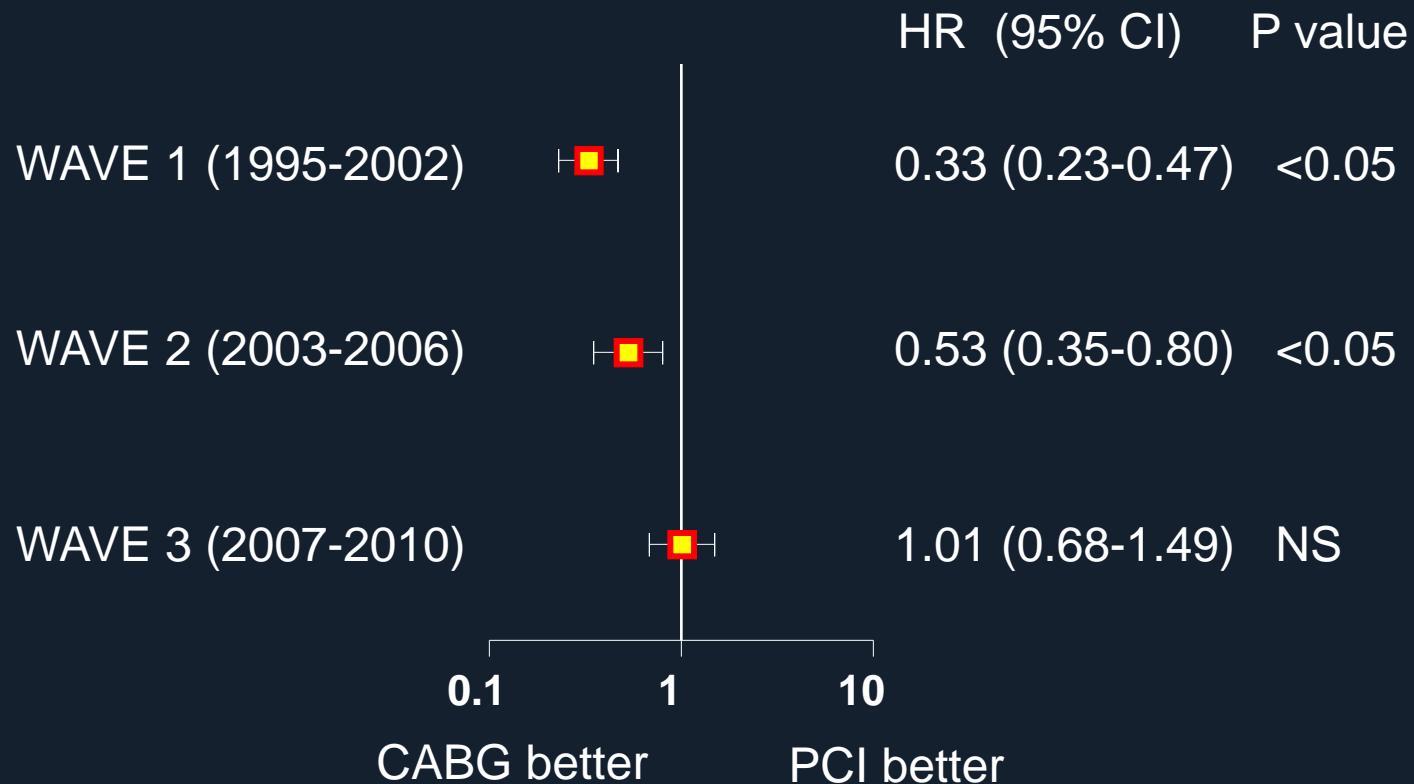
Risk Adjusted Hazard Ratio

Repeat Revascularization



Risk Adjusted Hazard Ratio

MACCE



Why ?

Outcomes of PCI Have Improved !

1. LM Disease is *Totally Different Disease Entity*.
Proximally Located Large Vessel. Easy to Approach and
Easy to Perform the Procedures.
2. *DES* is A Clear Revolution.
3. *Better Concept of PCI with Use of FFR and IVUS, the
Accumulation of Experience, Improved Technology and
Pharmacology* Can Make A Good Clinical Outcomes of PCI.

Conclusion

- This large study demonstrates that *clinical outcomes of patients receiving PCI for ULMCA stenosis have improved* with respect to the safety and efficacy of the procedure during the last 15 years, although patient comorbidities and ULMCA stenosis complexity have worsened over time.
- In addition, *the gap in treatment effect between PCI and CABG has decreased*. As a result, PCI could have been successfully substituted for CABG in a significant portion of revascularizations for ULMCA stenosis.



Thank You !!

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