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A Meta-Analysis of 3,773 Patients Treated With Percutaneous Coronary Intervention or Surgery for Unprotected Left Main Coronary Artery Stenosis

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Objectives This study sought to understand the total weight of evidence regarding outcomes in coronary artery bypass grafting (CABG) versus percutaneous coronary intervention (PCI) in unprotected left main coronary artery (ULMCA) stenosis.

Background Following a diagnosis of significant ULMCA stenosis in an individual that is a candidate for surgery, CABG is recommended by the American College of Cardiology/American Heart Association guidelines, whereas PCI is not recommended (Class III).

Methods Databases were searched for clinical studies that reported outcomes after PCI and CABG for the treatment of ULMCA stenosis. Ten studies were identified that included a total of 3,773 patients.

Results Meta-analysis showed that death, myocardial infarction, and stroke (major adverse cardiovascular or cerebrovascular events) were similar in the PCI- and CABG-treated patients at 1 year (odds ratio [OR]: 0.84 [95% confidence interval: 0.57 to 1.22]), 2 years (OR: 1.25 [95% CI: 0.81 to 1.94]), and 3 years (OR: 1.16 [95% CI: 0.68 to 1.98]). Target vessel revascularization was significantly higher in the PCI group at 1 year (OR: 4.36 [95% CI: 2.60 to 7.32]), 2 years (OR: 4.20 [95% CI: 2.21 to 7.97]), and 3 years (OR: 3.30 [95% CI: 0.96 to 11.33]). There was no difference in mortality in PCI- versus CABG-treated patients at 1 year (OR: 1.00 [95% CI: 0.70 to 1.41]), 2 years (OR: 1.27 [95% CI: 0.83 to 1.94]), and 3 years (OR: 1.11 [95% CI: 0.66 to 1.86]).

Conclusions Our analysis reveals no difference in mortality or major adverse cardiovascular or cerebrovascular events, for up to 3 years, between PCI and CABG for the treatment of ULMCA stenosis. However, PCI patients had a significantly higher risk of target vessel revascularization. In selected patients with ULMCA stenosis, PCI is emerging as an acceptable option. (J Am Coll Cardiol Intv 2009;2:739–47) © 2009 by the American College of Cardiology Foundation

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Significant left main stenosis is found in approximately 4% of patients undergoing diagnostic coronary angiography (1) and has been shown to portend high mortality (2–6). Trials comparing coronary artery bypass grafting (CABG) to medical therapy have shown a mortality reduction in patients with these lesions (7–9). A meta-analysis of all available trials has solidified CABG as the gold standard for the treatment of unprotected left main disease (9). According to published guidelines, it is a class I indication to perform CABG for significant unprotected left main coronary artery (ULMCA) stenosis in patients that are suitable for surgery (10).

Since these original trials were published, percutaneous coronary intervention (PCI) has emerged as an alternative to CABG for the treatment of coronary artery disease. Still, in patients that are CABG candidates, PCI is designated a Class III indication (10) and is a class IIa indication in unsuitable candidates for CABG (11).

Advances in PCI technology and technique have led some interventionalists to operate outside these guidelines. In fact, a recent meta-analysis of reports of unprotected left main stenting demonstrated reasonable outcomes (12), leading to the conclusion that left main stenting is at least feasible.

But how does PCI compare with CABG? Although some centers have published matched data (13,14) a meta-analysis is important because single-center studies are typically underpowered to detect differences in mortality. To understand the risk in unprotected left main patients, we performed a meta-analysis of all available PCI versus CABG studies.

Abbreviations and Acronyms

CABG = coronary artery bypass grafting

MACCE = major adverse cardiac and cerebrovascular events

MI = myocardial infarction

OR = odds ratio

PCI = percutaneous coronary intervention

TVR = target vessel revascularization

ULMCA = unprotected left main coronary artery

Methods

Search strategy. The meta-analysis considered studies that compared PCI with CABG for unprotected left main stenosis.

Candidate studies were identified by searching BioMed Central, ClinicalTrials.gov, Google Scholar, and PubMed and presentations of any randomized datasets at the major meetings of the American Heart Association, the American College of Cardiology, and Trans-Catheter Therapeutics. All searches covered the period January 2004 through December 2008. Key words used included "unprotected left main," "PCI," "CABG," and "comparison." We also perused the bibliographies of retrieved articles and relevant reviews to identify further relevant studies.

Studies were included if they met the following criteria: 1) unrestricted comparison of cohorts of CABG and PCI for the treatment of ULMCA stenosis; 2) a minimum of 1-year follow-up; 3) documentation of survival and major adverse cardiac and cerebrovascular events (MACCE); 4) more than 30 patients in each cohort along with reporting of risk scores; 5) publication in a peer-reviewed journal, or presentation of randomized datasets at a major national cardiology meeting.

Outcomes. The primary end point was the odds ratio for mortality after PCI or CABG, up to 3 years. Secondary end points were the odds ratio of MACCE (death, myocardial infarction [MI], and stroke) and target vessel revascularization (TVR) after the procedure.

Data. From each study, we extracted patient characteristics, study design, and outcomes at each of years 1, 2, and 3 after treatment of ULMCA stenosis. When possible, actual probabilities of mortality and death after 1, 2, or 3 years following PCI or CABG were used to calculate odds ratios (14–20). Alternatively, probabilities of mortality or MACCE were estimated from published Kaplan-Meier survival curves (13,21,22). Sample sizes at risk at each year were taken from the reports, or in 1 case (18), estimated using reported CABG/PCI group-specific means and variances of follow-up times and a log-normal model for actual sample at risk (18). We reanalyzed our own dataset to establish Kaplan-Meier curves and probabilities of mortality and MACCE, which were used to calculate odds ratios (14). We did not include adjusted odds ratios as only 1 study reported this data (15), and only 4 others reported hazard ratios (13,14,17,21). When possible, we also extracted TVR from the total MACCE events and reported this outcome as a separate measure. When MACCE was reported, all but 1 report defined MACCE to include death, MI, stroke, and TVR. One report did not include stroke, and we did not include this in our MACCE analysis (21). Another dataset did not report total MACCE (17). The data from our institution was reanalyzed up to September 2008 (14).

Statistical analysis. Each study is summarized by the odds ratio (OR) for CABG against PCI. The ORs were combined across studies using DerSimonian-Laird random effects model and were pre-specified (23,24). We also combined odds ratios with the fixed effects model using the Mantel-Haenszel model. We performed the Woolf's test for heterogeneity. Sensitivity analyses were performed omitting a single study at a time. Analysis was conducted in R (R Development Core Team 2007) package rmeta version 2.14. All p values were 2-tailed and $p < 0.05$ was considered significant (25).

Results

Characteristics of the included studies. We identified 13 eligible studies (13–22,26–28) that compared PCI and CABG cohorts for the treatment of ULMCA coronary stenosis. Three of these studies were excluded because of: 1) probable overlap with the institution's previous report (27);

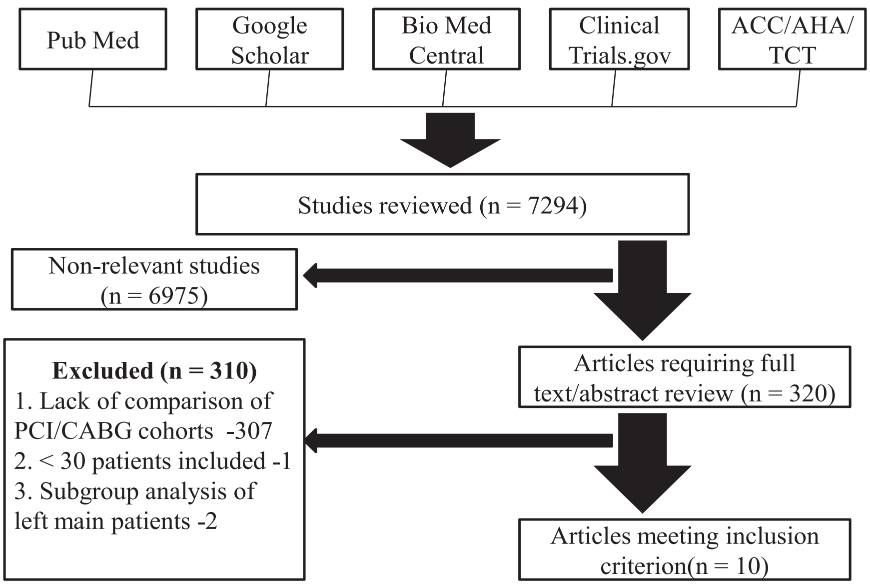

Figure 1. Search Process Algorithm

Flow chart demonstrating the resulting 10 studies that were analyzed. Subgroups of left main patients were not included due to the possibility of added confounding. ACC = American College of Cardiology; AHA = American Heart Association; CABG = coronary artery bypass grafting; PCI = percutaneous coronary intervention; TCT = Trans-Catheter Therapeutics.

2) subgroup analysis (27,28); and 3) <30 PCI patients were studied (26). Figure 1 demonstrates our search process. Characteristics of each study are shown in Table 1. A total of 3,773 patients were studied with 2,114 receiving CABG and 1,659 receiving PCI. There were 354 PCI patients who underwent bare-metal stent implantation and 1,305 PCI patients who underwent drug-eluting stent implantation. Of the total, 3,325 had more than 1 year of follow-up. The overall internal validity was moderate and is illustrated in Table 2. Of the 10 studies, 3 matched the treatment cohorts using EuroSCORE (15,18,22), 2 randomized patients to treatment group (16,20), and 3 used propensity scores to

Table 1. Study Characteristics

Study (Ref. #)	CABG, n	LIMA to LAD, %	PCI, n	DES, %	BMS, %	Unadjusted Risk	Method of Adjustment	Years
Brener et al. (18)	190	99	97	57	38	Matched on EuroSCORE	Unneeded	1997–2006
Buszman et al. (16)	53	81	52	35	65	Randomized, same risk	Unneeded	2001–2004
Chieffo et al. (15)	142	NA	107	100	0	CABG slightly higher	Propensity score adjusted	2002–2004
Makikallio, et al. (19)	238	NA	49	100	0	PCI group with a significantly higher EuroSCORE (7.7 vs. 5.2)	Unmatched, unadjusted	2005–2007
Palmerini et al. (21)	154	94.2	157	60	40	PCI higher. PCI group had a significantly higher Parsonett score (17% vs. 13%)	Propensity score adjusted	2002–2005
Sanmartin et al. (22)	245	98	96	100	0	CABG slightly higher	Propensity score adjusted	2000–2005
SYNTAX left main* (20)	348	NA	357	100	0	Randomized, same risk	Unneeded	2006–2008
Seung et al. (13)	542	"Whenever possible"	542	75	25	Propensity score matched	Unneeded	2000–2006
White et al.† (14)	67	96.4	67	100	0	Propensity score matched	Unneeded	2003–2007
Wu et al. (17)	135	NA	135	41	59	Propensity score matched	Unneeded	2000–2004
Total	2,114		1,659					

*Left main subset of the SYNTAX (Synergy Between Percutaneous Coronary Intervention With Taxus and Cardiac Surgery) trial. †Our data updated to October 2008.
BMS = bare-metal stent(s); CABG = coronary artery bypass grafting; DES = drug-eluting stent(s); LAD = left anterior descending; LIMA = left internal mammary artery; PCI = percutaneous coronary intervention.

Table 2. Internal Validity

Study (Ref. #)	Prospective Design	Multicenter Enrollment	Selection Bias	Performance Bias	Attrition Bias	Detection Bias	Multivariate Adjustment for Potential Confounders
Brener et al. (18)	No	No	B	B	D	B	Probably adequate
Buszman et al. (16)	Yes	Yes	A	B	A	B	Probably adequate
Chieffo et al. (15)	No	No	A	B	A	B	Probably adequate
Makikallio et al. (19)	No	No	C	B	D	B	Probably adequate
Palmerini et al. (21)	Yes	No	A	B	A	B	Probably adequate
Sanmartin et al. (22)	No	No	A	B	A	B	Probably adequate
SYNTAX left main* (20)	Yes	Yes	A	B	A	B	Probably adequate
Seung et al. (13)	Yes	Yes	A	B	A	B	Probably adequate
White et al.† (14)	No	No	A	B	A	B	Probably adequate
Wu et al. (17)	No	No	B	B	D	B	Probably adequate

This was performed by 3 independent reviewers. The overall bias of the combined studies was considered moderate. *Left main subset of the SYNTAX (Synergy Between Percutaneous Coronary Intervention With Taxus and Cardiac Surgery) trial. †Our data updated to October 2008.
A = risk of bias is low; B = risk of bias is moderate; C = risk of bias is high; D = incomplete reporting.

guarantee like-to-like comparisons (13,14,17). We also included the left main subset from the recently concluded SYNTAX (Synergy Between Percutaneous Coronary Intervention With Taxus and Cardiac Surgery) trial (20). In 2 studies (19,21), the baseline characteristics of the groups were different. One of these studies (21) used the propensity score to adjust for this difference. In these studies, the PCI group had higher risk characteristics than the CABG group as evidenced by a significantly higher Parsonnet (29) score or EuroSCORE value (30).

Outcome

Death. The OR of the risk of death in the PCI group compared with the CABG group in each study, at the 1-, 2-, and 3-year time points, is reported in Table 3. There was no evidence for heterogeneity of treatment effect among the studies for death at the 1-, 2-, or 3-year time points.

The overall OR (95% confidence interval) of mortality showed no difference between PCI and CABG at 1 year (OR: 1.00 [0.70 to 1.41]), at 2 years (OR: 1.27 [0.83 to 1.94]), at 3 years (OR: 1.11 [0.66 to 1.86]) (Table 3 and Figure 2).

MACCE. Table 4 and Figure 3 summarize MACCE without TVR, for each study for PCI and CABG patients, at the 1-, 2-, and 3-year time points. Table 5 and Figure 4 summarize the TVR results. Meta-analysis did not detect a difference in MACCE, excluding TVR (death, MI, and stroke), in PCI-versus CABG-treated patients at 1 year (OR: 0.84 [0.57 to

Table 3. Estimated OR of Death in the PCI Group Versus the CABG Group at Each Year

Study (Ref. #)	Year 1 OR (95% CI)	Year 2 OR (95% CI)	Year 3 OR (95% CI)
Brener et al. (18)	0.88 (0.26–2.99)	1.08 (0.38–3.1)	1.42 (0.56–3.63)
Buszman et al. (16)	0.24 (0.03–2.23)		
Chieffo et al. (15)	0.43 (0.11–1.61)		
Makikallio et al. (19)	0.36 (0.08–1.58)		
Palmerini et al. (21)	0.27 (0.53–3.02)	1.10 (0.29–4.2)	
Sanmartin et al. (22)	0.71 (0.20–2.53)	0.93 (0.22–3.97)	0.81 (0.07–9.35)
SYNTAX left main* (20)	0.97 (0.47–2.02)		
Seung et al. (13)	1.13 (0.58–2.19)	1.17 (0.65–2.12)	1.01 (0.54–1.92)
White et al.† (14)	1.36 (0.33–5.55)	1.62 (0.15–17.05)	
Wu et al. (17)	3.06 (0.99–9.45)	3.50 (0.89–13.80)	
Summary (random effects)	1.00 (0.70–1.41)	1.27 (0.83–1.94)	1.11 (0.66–1.86)
Summary (fixed effects)	0.97 (0.71–1.33)	1.28 (0.84–1.94)	1.11 (0.66–1.85)
Test for heterogeneity	chi-square (9) = 9.67, p = 0.38	chi-square (5) = 2.52, p = 0.77	chi-square (2) = 0.41, p = 0.81
	Est RE Var = 0.02	Est RE Var = 0.0	Est RE Var = 0.0

Both fixed effects and random effects analysis were performed. *Left main subset of the SYNTAX (Synergy Between Percutaneous Coronary Intervention With Taxus and Cardiac Surgery) trial. †Our data updated to October 2008. The chi-square test and p value are for the Woolf test of heterogeneity.
CI = confidence interval; Est RE Var = estimated random effects variance; OR = odds ratio; other abbreviations as in Table 1.

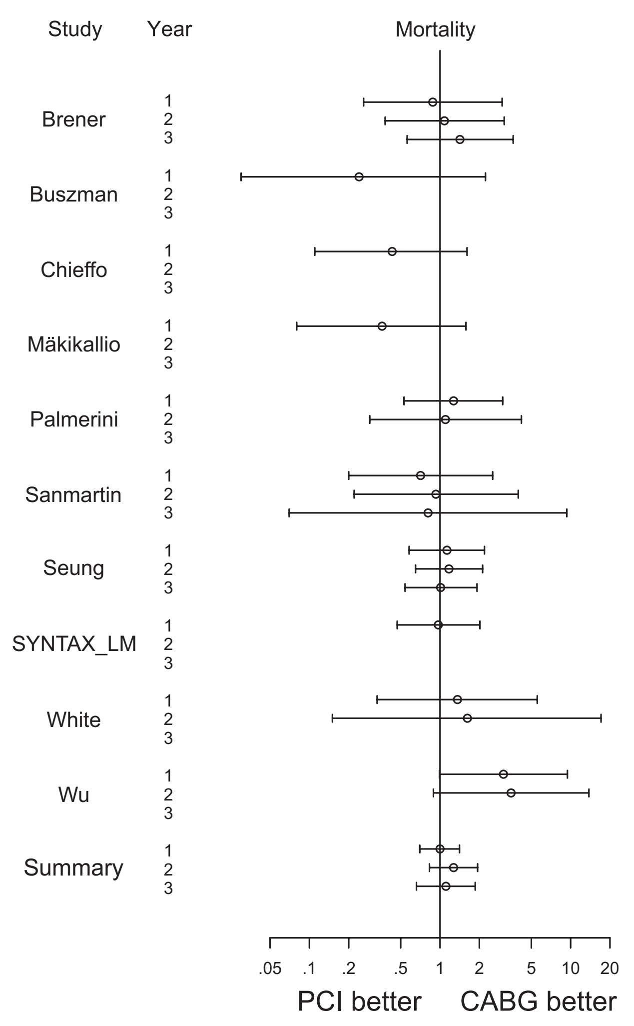

Figure 2. Odds Ratio of Mortality Following Treatment for ULMCA Disease in PCI Versus CABG Patients

Odds ratio of mortality (with confidence intervals) following treatment for unprotected left main coronary artery (ULMCA) disease after 1, 2, and 3 years. Year 1: 1,393 PCI patients and 1,932 CABG patients; year 2: 528 PCI patients and 890 CABG patients; and year 3: 263 PCI patients and 578 CABG patients. Abbreviations as in Figure 1.

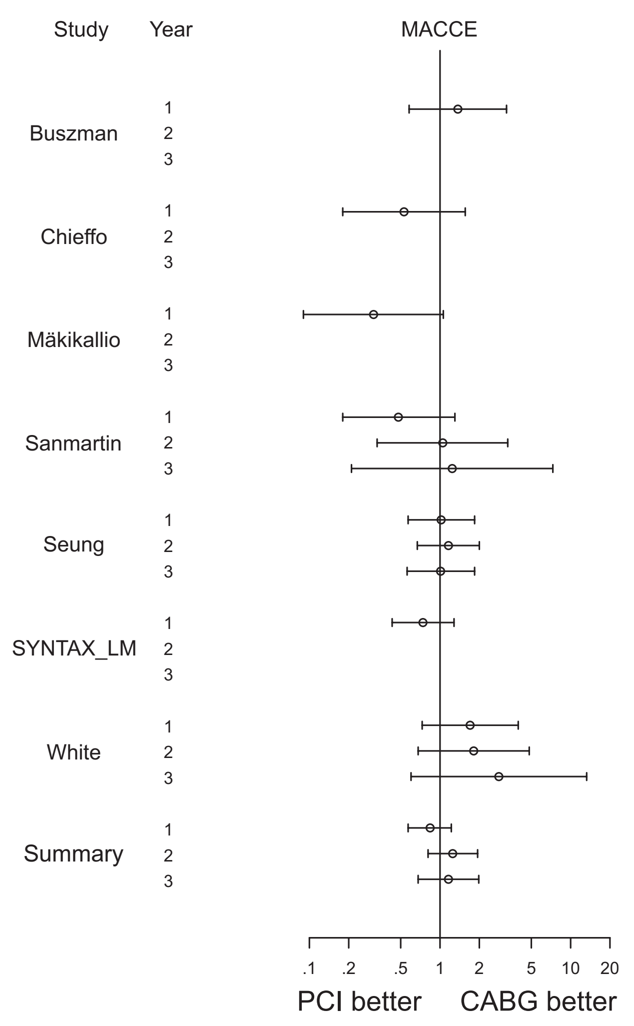

Figure 3. Odds Ratio of MACCE in PCI Versus CABG Patients

Odds ratio of major adverse cardiac and cerebrovascular events (MACCE) (death, myocardial infarction, and stroke) in PCI patients versus CABG patients after 1, 2, and 3 years. Year 1: 1,239 PCI patients and 1,614 CABG patients; year 2: 432 PCI patients and 652 CABG patients; and year 3: 236 PCI patients and 451 CABG patients. Abbreviations as in Figure 1.

1.22], 2 years (OR: 1.25 [0.81 to 1.94], or at 3 years (OR: 1.16 [0.68 to 1.98]). There was a statistically significant difference in TVR favoring CABG at year 1 (OR: 4.36 [2.60 to 7.32]) and year 2 (OR: 4.20 [2.21 to 7.97]). The effect was borderline not significant in year 3 (OR: 3.30 [0.96 to 11.33]).

We were not able to separate TVR data from MACCE from the study by Brener et al. (18), so this study did not contribute to this MACCE meta-analysis. Also, the study by Palmerini et al. (21) did not report stroke and thus we did not include this set in our MACCE (death, MI, and stroke) analysis.

There was no evidence of interstudy heterogeneity of treatment effect for years 1, 2, and 3 for death, MI, and stroke (year 1: chi-square test: 9.96, $p = 0.18$, estimated random effects variance: 0.08; year 2: chi-square test: 0.71, $p = 0.7$, estimated random effects variance: 0; year 3: chi-square test: 1.47, $p = 0.48$, estimated variance: 0). There also was no evidence of interstudy heterogeneity for TVR only (year 1: chi-square test: 13.28, $p = 0.66$, estimated random effects variance: 0; year 2: chi-square test: 3.69, $p = 0.30$, estimated random effects variance: 0.09; year 3: chi-square test: 3.53, $p = 0.55$, estimated random effects variance: 0).

Discussion

The most important finding in our meta-analysis of left main stenting versus CABG is that in a real-world appli-

Table 4. Estimated OR of Death, MI, and Stroke in the PCI Group Versus the CABG Group at Each Year

Study (Ref. #)	Year 1 OR (95% CI)	Year 2 OR (95% CI)	Year 3 OR (95% CI)
Buszman et al. (16)	1.37 (0.58–3.23)		
Chieffo et al. (15)	0.53 (0.18–1.56)		
Makikallio et al. (19)	0.31 (0.09–1.06)		
Sanmartin et al. (22)	0.48 (0.18–1.30)	1.05 (0.33–3.30)	1.24 (0.21–7.31)
SYNTAX left main* (20)	0.74 (0.43–1.28)		
Seung et al. (13)	1.02 (0.57–1.84)	1.16 (0.67–2.00)	1.01 (0.56–1.84)
White et al.† (14)	1.70 (0.73–3.97)	1.81 (0.68–4.82)	2.82 (0.60–13.27)
Summary (random effects)	0.84 (0.57–1.22)	1.25 (0.81–1.94)	1.16 (0.68–1.98)
Summary (fixed effects)	0.82 (0.62–1.09)	1.25 (0.81–1.94)	1.16 (0.68–1.96)
Test for heterogeneity	chi-square (6) = 9.67, p = 0.18	chi-square (2) = 0.71, p = 0.70	chi-square (2) = 1.47, p = 0.48
	Est RE Var = 0.08	Est RE Var = 0.0	Est RE Var = 0.0

Both fixed effects and random effects analysis were performed. *Left main subset of the SYNTAX trial. †Our data updated to October 2008. The chi-square test and p value are for the Woolf test of heterogeneity. MI = myocardial infarction; other abbreviations as in Tables 1 and 3.

cation among >3,000 patients, there was no difference in mortality between the 2 treatment options at 1, 2, or 3 years of follow-up. In addition to the absence of difference in mortality, we also found that the combined end point of death, MI, and stroke was similar in the 2 treatment groups. Of additional note is that 79% of the PCI patients received drug-eluting stents, without succumbing to a higher mortality than in patients treated with CABG. This is despite the recent controversy involving stent thrombosis (31).

In contrast to the mortality, MI, and stroke results, TVR was significantly higher in the PCI group. This result is consistent with all comparisons of PCI to CABG and reflects the restenosis rate associated with PCI (32). The difference might be influenced by the 21% of patients with bare-metal stents in the meta-analysis population, given that bare-metal stent implantation has higher TVR rates in large datasets (33). Regardless, it is clear from this analysis that even with drug-eluting stents, there is a statistically higher TVR rate.

Takagi et al. (34) recently presented a meta-analysis of PCI versus CABG in unprotected left main patients. This study identified only 6 studies. One study (35) included old data from our group, of which we have presented updated data here (14). Two of the studies (21,27) likely represent overlapping data. Finally, their data does not include the patients from 2 other studies (17,19) and the recently presented randomized left main subset of the SYNTAX trial (20). Given these reasons, we feel our analysis is more inclusive of the data that is currently available.

The idea that PCI treatment of left main disease, as compared with CABG, impedes treatment of moderate proximal lesions and thereby increases risk was not borne out in our data up to 3 years. Thus, the equivalence in death, MI, and stroke along with a higher rate of TVR with PCI

Table 5. Estimated OR of TVR in the PCI Group Versus the CABG Group at Each Year

Study (Ref. #)	Year 1 OR (95% CI)	Year 2 OR (95% CI)	Year 3 OR (95% CI)
Buszman et al. (16)	3.89 (1.30–11.68)		
Chieffo et al. (15)	6.69 (2.43–18.40)		
Makikallio et al. (19)	2.49 (0.44–13.99)		
Sanmartin et al. (22)	6.68 (1.27–35.02)	3.87 (0.75–19.88)	5.89 (0.57–60.59)
SYNTAX left main* (20)	1.94 (1.14–3.29)		
Seung et al. (13)	6.49 (2.96–14.23)	5.13 (2.50–10.54)	5.40 (2.37–12.31)
White et al.† (14)	3.10 (0.85–11.34)	1.55 (0.44–5.51)	0.71 (0.10–5.16)
Wu et al. (17)	13.77 (3.46–54.82)	8.85 (2.08–37.65)	
Summary (random effects)	4.36 (2.60–7.32)	4.20 (2.21–7.97)	3.30 (0.96–11.33)
Summary (fixed effects)	3.84 (2.77–5.33)	4.35 (2.54–7.44)	4.01 (2.01–7.98)
Test for heterogeneity	chi-square (9) = 9.67, p = 0.38	chi-square (9) = 9.67, p = 0.38	chi-square (9) = 9.67, p = 0.38
	Est RE Var = 0.02	Est RE Var = 0.02	Est RE Var = 0.02

Both fixed effects and random effects analysis were performed. *Left main subset of the SYNTAX trial. †Our data updated to October 2008. The chi-square test and p value are for the Woolf test of heterogeneity. TVR = target vessel revascularization; other abbreviations as in Tables 1 and 3.

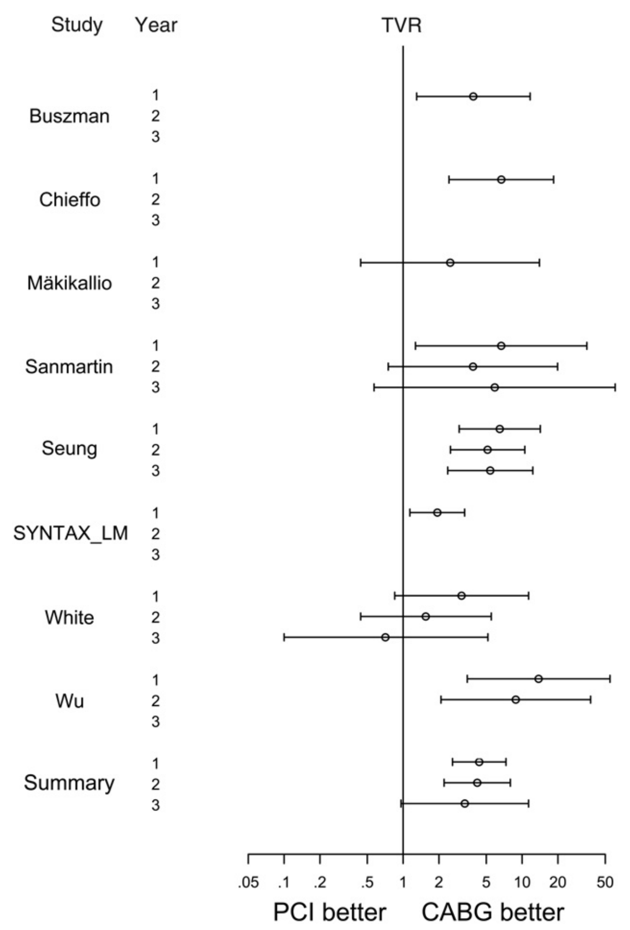

Figure 4. Odds Ratio of TVR in PCI Versus CABG Patients

Odds ratio of target vessel revascularization (TVR) in PCI patients versus CABG patients at 1, 2, and 3 years. Year 1: 1,240 PCI patients and 1,692 CABG patients; year 2: 417 PCI patients and 699 CABG patients; and year 3: 211 PCI patients and 447 CABG patients. Abbreviations as in Figure 1.

suggests that the choice between the 2 treatment options can be defined by both the individual clinical presentation and the practical tradeoff between differences in recovery period and repeat revascularization.

The details of our meta-analysis also deserve iteration. We only analyzed datasets that compared left main stenting to a cohort of CABG for left main disease. In 2 of the 10 datasets (19,21) we used, substantially higher risk PCI patients were compared with lower risk CABG. The other 8 datasets compared matched groups, which suggests that the operators in these programs felt that left main PCI does not portend worse outcomes. This view, different from the guidelines, may reflect the influence of a number of recently published datasets (12,36,37) reporting favorable outcomes in left main PCI, even though most of these reports do not compare PCI and CABG outcomes. One study (17), a New York state data registry, reported results that differed from the other 9 studies and from the conclusions of the meta-analysis. The difference may be due to the inclusion of data from many laboratories in the New York registry, as opposed to the single high-volume centers represented in other reports. Inclusion of this dataset makes our meta-analysis less susceptible to publication bias given the markedly different results reported.

We included in our analysis data from the recently completed SYNTAX trial (20). This trial contains the largest dataset to date comparing left main PCI and CABG. This data has not been analyzed fully given that it was a subset within the context of a larger group of patients (multivessel disease and left main stenosis patients). The study was not powered to detect statistically significant differences between these groups. However we can make inferences by including this data in a meta-analysis. Also, our test of heterogeneity did not detect much difference between studies, suggesting that the SYNTAX trial (20) and LEMANS (Study of Unprotected Left Main Stenting Versus Bypass Surgery) trial (16) (the only 2 randomized datasets) reflect the real-world data described in the other datasets. The absence of difference supports the notion that real-world data is consistent with current randomized trials for this particular analysis.

Although this meta-analysis represents >3,000 patients with general consistency between randomized and retrospective patients, the choice of therapy may best be determined by factors specific to the individual patient and operator experience. The SYNTAX score (38) recently has been developed to guide operators in this regard. This score describes the coronary and clinical complexity of a patient and might help us identify the most appropriate therapy (PCI vs. CABG) on an individual level.

Study limitations. Our study is subject to the usual limitations of meta-analyses, namely variation in study design and publication bias. The meta-analysis is also dominated by the Korean MAIN-COMPARE (Revascularization for Unprotected Left Main Coronary Artery Stenosis: Comparison of Percutaneous Coronary Angioplasty Versus Surgical Revascularization) registry (13), which accounts for approximately 30% of the PCI patients in the synthesis. However, their results are consistent with the other publications and are similar based on heterogeneity. An additional caveat is that with the exception of the New York Registry (17), data came from highly experienced centers, with >40 ULMCA PCI cases performed. Therefore, similar results may not be obtained by less experienced operators. A final limitation is the absence of adequate published comparative data for the third therapeutic option, medical therapy. Percutaneous coronary intervention has not been compared with medical therapy alone, but CABG has been shown to be superior to medical therapy. Further, the follow-up in this analysis is up to 3 years. The long-term durability of PCI versus CABG remains undetermined and will require longer follow-up.

Also, it would be ideal to perform statistical pooling of adjusted risk estimates of odds ratios or hazard ratios. However, only 5 of the 10 studies reported adjusted risk ratios that could be combined, and over one-third of the patients would not be included. For this reason, we did not include this analysis.

Conclusions

The notion that CABG is the only option for left main stenosis for the prevention of death and MI, at least up to 3 years, can be re-evaluated. More importantly, we suggest that a multidisciplinary management approach among surgeons, interventionalists, cardiologists, and primary care physicians should occur with patients who have significant left main disease. Then, based on patient and angiographic factors, PCI can be considered a reasonable choice in selected patients. Our results suggest that the current American College of Cardiology/American Heart Association guidelines regarding left main PCI (10) should be revisited.

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