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Association of Coronary Vessel Characteristics With Outcome in Patients With Percutaneous Coronary Interventions With Incomplete Revascularization

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Key Points

Question

Are some patients undergoing incomplete revascularization (IR) with percutaneous coronary interventions at higher risk than others?

Findings

In this registry-based study, patients with IR in a vessel with at least 90% stenosis were at higher risk than other patients with IR. More than 20% of all patients with percutaneous coronary interventions had IR of 2 or more vessels, and more than 30% had IR with more than 90% stenosis.

Meaning

Patients with percutaneous coronary interventions with IR are at higher risk of mortality if they have IR with at least 90% stenosis, IR in 2 or more vessels, or proximal left anterior descending artery IR.

Abstract

Importance

Many studies have compared outcomes for incomplete revascularization (IR) among patients undergoing percutaneous coronary interventions (PCI), but little is known about whether outcomes are related to the nature of the IR.

Objective

To determine whether some coronary vessel characteristics are associated with worse outcomes in patients with PCI with IR.

Design, Setting, and Participants

New York's PCI registry was used to examine mortality (median follow-up, 3.4 years) as a function of the number of vessels that were incompletely revascularized, the stenosis in those vessels, and whether the proximal left anterior descending artery was incompletely revascularized after controlling for other factors associated with mortality for patients with and without ST-elevation myocardial infarction (STEMI). This was a multicenter study (all nonfederal PCI hospitals in New York State) that included 41 639 New York residents with multivessel coronary artery disease undergoing PCI in New York State between January 1, 2010, and December 31, 2012.

Exposures

Percutaneous coronary interventions, with complete and incomplete revascularization.

Main Outcomes and Measures

Medium-term mortality.

Results

For patients with STEMI, the mean age was 62.8 years; 26.2% were women, 11.9% were Hispanic, and 81.5% were white. For other patients, the mean age was 66.6 years, 29.1% were women, 11.3% were Hispanic, and 79.1% were white. Incomplete revascularization was very common (78% among patients with STEMI and 71% among other patients). Patients with IR in a vessel with at least 90% stenosis were at higher risk than other patients with IR. This was not significant among patients with STEMI (17.18% vs 12.86%; adjusted hazard ratio [AHR], 1.16; 95% CI, 0.99-1.37) and significant among patients without STEMI (17.71% vs 12.96%; AHR, 1.15; 95% CI, 1.07-1.24). Similarly, patients with IR in 2 or more vessels had higher mortality than patients with completely revascularization and higher mortality than other patients with IR among patients with STEMI (20.37% vs 14.39%; AHR, 1.35; 95% CI, 1.15-1.59) and among patients without STEMI (20.10% vs 12.86%; AHR, 1.17; 95% CI, 1.09-1.59). Patients with proximal left anterior descending artery vessel IR had higher mortality than other patients with IR (20.09% vs 14.67%; AHR, 1.31; 95% CI, 1.04-1.64 for patients with STEMI and 20.78% vs 15.62%; AHR, 1.11; 95% CI, 1.01-1.23 for patients without STEMI). More than 20% of all PCI patients had IR of 2 or more vessels and more than 30% had IR with more than 90% stenosis.

Conclusions and Relevance

Patients with IR are at higher risk of mortality if they have IR with at least 90% stenosis, IR in 2 or more vessels, or proximal left anterior descending IR.

Introduction

Numerous studies have found that patients with multivessel coronary artery disease who undergo incomplete revascularization (IR) with percutaneous coronary interventions (PCIs) experience higher mortality and/or complication rates than their counterparts who undergo complete revascularization (CR). However, little is known about whether the specific vessels that are incompletely revascularized or the degree of stenosis in those vessels are associated with differential mortality rates.

The primary purposes of this study were to contrast mortality rates for patients undergoing PCI with CR with (1) patients undergoing PCI with IR having different ranges of stenosis, (2) patients having different numbers of vessels with IR, and (3) patients with IR in the proximal left anterior descending (PLAD) artery.

Methods

Databases

The databases used to conduct the study were New York's Percutaneous Coronary Interventions Reporting System and New York's Vital Statistics file. The Percutaneous Coronary Interventions Reporting System was created in 1992 to evaluate and improve the quality of PCI in New York through the risk adjustment of outcomes and dissemination of reports to hospitals, cardiologists, and the public. It contains demographics; patient risk factors; complications; hospital and cardiologist identifiers; admission, discharge, and procedure dates; and discharge disposition for all PCI procedures performed in nonfederal hospitals in the state. Also included are lesion-specific information that identifies all diseased lesions, attempted lesions, and the stenosis before and after attempting PCI. Intended staged procedures are also reported at the initial procedure and at the time of the staged procedure. A procedure is regarded as staged only if it is reported at both times.

Data are audited for completeness and accuracy by matching to New York's acute care hospital administrative database, the Statewide Planning and Research Cooperative System, and by reviewing medical records from hospitals. A total of 60 hospitals performed PCI in the state in 2012. Vital statistics data were matched to the Percutaneous Coronary Interventions Reporting System using unique patient identifiers to obtain deaths that occurred after discharge following the index PCI procedure.

Patients and Outcomes

All 58 126 patients with multivessel disease (2 or more of the 3 major coronary arteries with at least 70% stenosis) undergoing PCI between January 1, 2010, and December 31, 2012, were first identified. Patients were then excluded if they were out-of-state residents (n = 2629), did not have a valid social security number (n = 2255), had refractory shock (systolic blood pressure <80 mm Hg or cardiac index <2.0 L/min/m^2 despite pharmacologic or mechanical support [n = 282]), left main disease (n = 980), a chronic total occlusion (n = 6433), were staged from a previous admission (n = 272), or were completely revascularized in a subsequent admission without being noted as staged (n = 1636). Non–New York residents were excluded because the New York vital statistics file only applies to New York residents, and patients without social security numbers were excluded because they could not be matched to vital records data. All remaining 41 639 patients were participants of the study. Because this was a retrospective observational study, the University at Albany Institutional Review Board waived approval of the study, and informed consent was not required.

Patients with PCI were defined as having CR if PCI was successfully attempted (with residual stenosis of ≤50%) in at least 1 lesion in every diseased (≥70% stenosis) major epicardial coronary vessel (proximal, mid, and distal segments; major left anterior descending diagonals; and circumflex marginal branches) during the index hospitalization or during a staged procedure within 60 days after discharge prior to experiencing any myocardial infarction. Procedures were regarded as staged if they were coded as intended to be staged in the index admission, coded as a staged procedure in the subsequent admission, and were elective procedures.

Patients with PCI not meeting the definition of CR were regarded as patients with IR. Also, patients were followed up through December 31, 2014, to identify all-cause mortality after having linked Percutaneous Coronary Interventions Reporting System data with New York's Vital Statistics data.

Statistical Analysis

Patient risk factor prevalences were compared for patients with IR and patients with CR. This was done separately for patients with ST-elevation myocardial infarction (STEMI) and for patients without STEMI. χ^2 Tests and Fisher exact tests were used to identify significant differences between patients with IR and patients with CR for categorical variables, and the *t* test was used for comparing continuous variables.

Relative frequencies and unadjusted mortality rates were compared for patients who underwent CR and patients with IR having different highest stenosis levels in IR vessels (>90% and 70%-89%), patients with IR having different numbers of IR vessels (1 or 2 or more), and patients with IR having and not having IR in the PLAD artery.

Cox proportional hazards models with robust sandwich covariances to account for within-hospital clustering were used to compare mortality rates for CR patients with rates for patients whose highest IR stenosis was in the ranges specified in previous paragraph. For these analyses and all subsequent analyses, 2 models were used to separately analyze patients with STEMI and all other patients. The binary outcome was mortality/survival. Each of the stenosis ranges was represented as a category, and the remaining category (CR) used as the reference category. Control variables in the model included all significant risk factors selected by cross-validation including demographics, comorbidities, left ventricular function, and vessels diseased. The candidate patient-level predictors of mortality were all the risk factors presented in Table 1. A second pair of Cox models were developed to compare mortality rates for patients with IR in 1 vessel and patients with IR in 2 or more vessels with rates for patients with CR. Again, a categorical variable was created with CR used as a reference category, and the same patient characteristics in the first model were used as control variables. A third pair of models compared mortality for patients with CR with the mortality for patients with IR who did and did not have IR in the PLAD vessel. All tests were 2-sided and conducted at the .05 level of significance, and all analyses were conducted in SAS, version 9.4 (SAS Institute).

Results

For patients with STEMI and patients without STEMI, patients with IR were older, more likely to be black, had lower body mass indexes and ejection fractions, were more likely to have had a previous PCI and coronary artery bypass grafting surgery, had more vessels diseased, and were more likely to have several comorbidities (Table 1 and Table 2).

Table 3 demonstrates that among patients with STEMI undergoing PCI, 34% had an IR vessel with at least 90% stenosis, nearly one-quarter had 2 or more incompletely revascularized major epicardial vessels, and nearly 10% had the PLAD vessel with IR. For patients with PCI without STEMI (Table 4), nearly one-third had at least 1 IR vessel with at least 90% stenosis, one-fifth had 2 or more IR vessels, and 7% had the PLAD vessel with IR. Also, prior to controlling for other factors related to mortality, patients with PCI with IR with and without STEMI had higher mortality rates if they had IR in a vessel with at least 90% stenosis (Figure, A and C), 2 or more vessels with IR (Figure, B and D), or the PLAD vessel incompletely revascularized (eFigure in the Supplement).

As noted in Table 3, among patients with STEMI, the subgroup with IR in a vessel with at least 90% stenosis had significantly higher 5-year risk-adjusted mortality than patients with CR (17.18% vs 8.11%; adjusted hazard ratio [AHR], 1.49; 95% CI, 1.18-1.88), and other patients with IR also had higher mortality than patients with CR (12.86% vs 8.11%; AHR, 1.28; 95% CI, 1.02-1.61). However, higher mortality rates in patients with IR in a vessel with 90% or greater stenosis compared with other patients with IR did not reach statistical significance (17.18% vs 12.86%; AHR, 1.16; 95% CI, 0.99-1.37). Among patients without STEMI, the findings were similar (Table 4). The subgroup with IR in a vessel with at least 90% stenosis had significantly higher risk-adjusted mortality than patients with CR (17.71% vs 10.15%; AHR, 1.36; 95% CI, 1.25-1.47), and other patients with IR also had higher mortality than patients with CR (12.96% vs 10.15%; AHR, 1.18; 95% CI, 1.09-1.28). Patients with IR in a vessel with at least 90% stenosis also had higher mortality than other patients with IR (17.71% vs 12.96%; AHR, 1.15; 95% CI, 1.07-1.24).

Having more vessels that were incompletely revascularized also put patients at a higher risk. Patients with PCI with STEMI who had IR in 2 or more vessels had higher medium-term risk-adjusted mortality than patients with CR (20.37% vs 8.08%; AHR, 1.71; 95% CI, 1.35-2.16), as did patients who had IR in a single vessel (12.96% vs 8.08%; AHR, 1.26; 95% CI, 1.01-1.57) (Table 3). However, patients with IR in 2 or more vessels were at higher risk than other patients with IR (20.37% vs 12.96%; AHR, 1.35; 95% CI, 1.15-1.59). Among patients without STEMI, patients with IR in 2 or more vessels (20.10% vs 10.19%; AHR, 1.42; 95% CI, 1.30-1.55) and other patients with IR (14.39% vs 10.19%; AHR, 1.22; 95% CI, 1.13-1.31) had higher adjusted 5-year mortality than patients with CR, but patients with IR in 2 or more vessels also had higher mortality that other patients with IR (20.10% vs 14.39%; AHR, 1.17; 95% CI, 1.09-1.59) (Table 4).

Table 3 and Table 4 show that patients with the PLAD vessel incompletely revascularized were also at higher risk. Among patients with STEMI, this group had higher adjusted mortality than patients with CR (20.09% vs 8.08%; AHR, 1.78; 95% CI, 1.33-2.37), as did other patients with IR (14.67% vs 8.08%; AHR, 1.36; 95% CI, 1.10-1.69) (Table 3). However, patients with PCI with IR in the PLAD vessel had higher mortality than other IR patients (20.09% vs 14.67%; AHR, 1.31; 95% CI, 1.04-1.64). Similar findings occurred among patients without STEMI (Table 4). Patients with IR in the PLAD vessel had higher adjusted mortality than patients with CR (20.78% vs 10.19%; AHR, 1.40; 95% CI, 1.25-1.57), as did other IR patients (15.62% vs 10.19%; AHR, 1.26; 95% CI, 1.17-1.35), but patients with PCI with IR in the PLAD vessel had higher mortality than other patients with IR (20.78% vs 15.62%; AHR, 1.11; 95% CI, 1.01-1.23).

Discussion

Numerous earlier observational studies have demonstrated that patients with multivessel disease undergoing PCI with IR have higher mortality rates than their counterparts who undergo CR. However, we are not aware of any studies that have investigated whether patients undergoing PCI with IR are at differential risk of mortality based on the specific vessels that are incompletely revascularized, the stenosis in those vessels, or the number of vessels that are incompletely revascularized. The purpose of this study was to investigate the association of those factors with medium-term mortality outcomes (median follow-up, 3.4 years).

We found that patients with PCI who had at least 1 vessel with 90% stenosis that was not revascularized, as well as other patients with IR, were at higher risk of mortality than patients with CR, but the group with IR in a vessel with at least 90% stenosis was also at higher risk than other patients with IR. This was not significant among patients with STEMI and significant among patients without STEMI. Surprisingly, 34% of patients with STEMI (n = 1874) and 32% of patients without STEMI (n = 10 205) underwent PCI with at least 1 vessel with 90% stenosis not revascularized.

Also, although patients with 1 vessel incompletely revascularized had higher risk-adjusted mortality than patients with CR, patients with IR in 2 or more vessels had higher mortality than patients with CR and higher mortality than other patients with IR. We found this to be true both among patients with STEMI and among patients without STEMI. Furthermore, more than 20% of both patients with STEMI and patients without STEMI had IR in 2 or more vessels.

In addition, patients with IR in the PLAD vessel, regardless of whether they had STEMI, had higher adjusted mortality rates than other patients with IR as well as patients with CR. Eight percent of patients with STEMI had IR in the PLAD vessel compared with 7% of patients without STEMI.

Earlier findings from the same database demonstrate that a very high percentage of PCI with IR (96%) occur because of unattempted CR, not because of unsuccessful attempts at CR. This is pertinent because it indicates that IRs among patients with high-risk characteristics, such as multivessel IR and IR in vessel with high stenosis levels, are planned in advance when other options could be considered.

Limitations

As with all observational studies, a caveat of this study is selection bias. Patients with IR in general and patients with IR with higher stenosis and more vessels incompletely revascularized may have worse outcomes because they are sicker and have more comorbidities than patients with CR. There are factors related to mortality and/or choice of CR vs IR that we did not have access to such as adequate functional revascularization, lesion complexity, frailty, malignancies, bleeding risks, contrast volume, and radiation dose. Also, we had no information related to patient preferences.

We tried to minimize selection bias by using Cox proportional hazards models to control for differences in the prevalence of numerous factors related to mortality and choice of CR including ventricular function, extent of coronary artery disease, and comorbidities. Also, staged procedures resulting in CR within 60 days were counted as CR so that the prevalence of CR would not be erroneously underestimated for high-risk patients. Nevertheless, an observational study cannot fully address causality, and the outcome differences identified in our study may still be related to differences in patients' severity of illness.

Another limitation of the study is that we did not have access to cause of death, so we were unable to capture cardiac deaths. It is possible that our conclusions may have been different if the study had been limited to cardiac deaths, although cause of death is frequently difficult to confirm.

Conclusions

Patients undergoing IR in vessels with very high stenosis levels (≥90%), multivessel IR, or IR in the PLAD are at even higher risk of mortality. A relatively high percentage of patients with PCI undergo IR with these higher-risk conditions.

Notes

Supplement.

eFigure. Four-Year Survival Curves for Complete Revascularization and for Incomplete Revascularization by Proximal Left Anterior Descending Artery Disease

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Figures and Tables

Table 1.

Patient Risk Factors for Patients With ST-Elevation Myocardial Infarction Undergoing PCI With Complete and Incomplete Revascularization

Risk Factor	No. (%)			*P* Value
	Total	CR	IR	
Patients	5646	1226	4420	NA
Age, mean (SD), y	62.8 (12.7)	60.6 (11.8)	63.4 (12.9)	<.001[a]
Female	1481 (26.2)	301 (24.6)	1180 (26.7)	.13
Hispanic ethnicity	669 (11.8)	130 (10.6)	539 (12.2)	.13
Race/ethnicity				
White	4602 (81.5)	1019 (83.1)	3583 (81.1)	.007
Black	520 (9.2)	99 (8.1)	421 (9.5)	
Asian	296 (5.2)	75 (6.1)	221 (5.0)	
Other	228 (4.0)	33 (2.7)	195 (4.4)	
BMI				
<18.5	61 (1.1)	5 (0.4)	56 (1.3)	.003
18.5-24.9	1349 (23.9)	254 (20.7)	1095 (24.8)	
25.0-30.0	2282 (40.4)	512 (41.8)	1770 (40.0)	
30.1-34.9	1275 (22.6)	289 (23.6)	986 (22.3)	
35.0-40.0	470 (8.3)	113 (9.2)	357 (8.1)	
>40.0	209 (3.7)	53 (4.3)	156 (3.5)	
Ejection fraction, %				
<20	96 (1.7)	10 (0.8)	84 (1.9)	<.001
20-29	408 (7.2)	59 (4.8)	349 (7.9)	
30-39	839 (14.9)	139 (11.3)	700 (15.8)	
40-49	1672 (29.6)	389 (31.7)	1283 (29.0)	
≥50	2633 (46.6)	629 (51.3)	2004 (45.3)	
Previous PCIs	896 (15.9)	150 (12.2)	746 (16.7)	<.001
Carotid/cerebrovascular disease	312 (5.5)	53 (4.3)	259 (5.9)	.04
Peripheral vascular disease	261 (4.6)	38 (3.1)	223 (5.0)	.004
Hemodynamic instability	208 (3.7)	27 (2.2)	181 (4.1)	.002
Congestive heart failure				
None	5351 (94.8)	1195 (97.5)	4156 (94.0)	

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Abbreviations: BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); CABG, coronary artery bypass grafting; CR, complete revascularization; IR, incomplete revascularization; MI, myocardial infarction; NA, not applicable; PCI, percutaneous coronary interventions.

SI conversion factor: To convert creatinine to micromoles per liter, multiply by 88.4.

[a]Two-sample *t* test.
[b]Fisher exact test.

Table 2.

Patient Risk Factors for Patients Without ST-Elevation Myocardial Infarction Undergoing PCI With Complete and Incomplete Revascularization

Risk Factor	No. (%)			P Value
	Total	CR	IR	
Patients	35 993	10 261	25 732	NA
Age, mean (SD), y	66.6 (11.5)	65.0 (11.5)	67.2 (11.5)	<.001[a]
Female	10458 (29.1)	3115 (30.4)	7343 (28.5)	.001
Hispanic ethnicity	4062 (11.3)	982 (9.6)	3080 (12.0)	<.001
Race/ethnicity				
White	28476 (79.1)	8249 (80.4)	20227 (78.6)	<.001
Black	3803 (10.6)	981 (9.6)	2822 (11.0)	
Asian	3033 (8.4)	882 (8.6)	2151 (8.4)	
Other	681 (1.9)	149 (1.5)	532 (2.1)	
BMI				
<18.5	292 (0.8)	82 (0.8)	210 (0.8)	.001
18.5-24.9	7308 (20.3)	1934 (18.8)	5374 (20.9)	
25.0-30.0	13742 (38.2)	3955 (38.5)	9787 (38.0)	
30.1-34.9	8888 (24.7)	2629 (25.6)	6259 (24.3)	
35.0-40.0	3712 (10.3)	1060 (10.3)	2652 (10.3)	
>40.0	2051 (5.7)	601 (5.9)	1450 (5.6)	
Ejection fraction, %				
<20	270 (0.8)	47 (0.5)	223 (0.9)	<.001
20-29	1409 (3.9)	295 (2.9)	1114 (4.3)	
30-39	2382 (6.6)	470 (4.6)	1912 (7.4)	
40-49	5288 (14.7)	1318 (12.8)	3970 (15.4)	
≥50	26644 (74.0)	8131 (79.2)	18513 (71.9)	
Previous PCIs	12631 (35.1)	2867 (27.9)	9764 (37.9)	<.001
Previous MI	15783 (43.9)	4010 (39.1)	11773 (45.8)	<.001
Carotid/cerebrovascular disease	3846 (10.7)	848 (8.3)	2998 (11.7)	<.001
Peripheral vascular disease	3614 (10.0)	721 (7.0)	2893 (11.2)	<.001
Hemodynamic instability	83 (0.2)	14 (0.1)	69 (0.3)	.02
Congestive heart failure				

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Abbreviations: BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); CABG, coronary artery bypass grafting; CR, complete revascularization; IR, incomplete revascularization; MI, myocardial infarction; NA, not applicable; PCI, percutaneous coronary interventions.

SI conversion factor: To convert creatinine to micromoles per liter, multiply by 88.4.

[a]Two-sample *t* test.
[b]Fisher exact test.

Table 3.

Frequencies, Unadjusted All-Cause Mortality Rates,[a] and Adjusted HRs for 5646 Patients With STEMI[b] Undergoing PCIs With Incomplete Revascularization: New York, 2010-2012

Type of Revascularization	No. (%)	Observed Mortality Rate, %	Adjusted HR[c] (95% CI)	*P* Value
Complete revascularization	1220 (22.29)	8.11	1 [Reference]	NA
Highest stenosis in incomplete lesion, %[d]				
70-89	2380 (43.48)	12.86	1.28 (1.02-1.61)	.03
>90	1874 (34.23)	17.18	1.49 (1.18-1.88)	.001
(>90 vs 70-89)	NA	NA	1.16 (0.99-1.37)	.08
Vessels incomplete, No.				
None	1226 (21.71)	8.08	1 [Reference]	NA
1	3065 (54.29)	12.95	1.26 (1.01-1.57)	.04
2 or more	1355 (24.00)	20.37	1.71 (1.35-2.16)	<.001
2 or more vs 1	NA	NA	1.35 (1.15-1.59)	<.001
Location of incomplete vessel				
Complete revascularization	1226 (21.71)	8.08	1 [Reference]	NA
Not PLAD	3967 (70.26)	14.67	1.36 (1.10-1.69)	.005
PLAD	453 (8.02)	20.09	1.78 (1.33-2.37)	<.001
PLAD vs not PLAD	NA	NA	1.31 (1.04-1.64)	.02

Abbreviations: HR, hazard ratio; NA, not applicable; PCI, percutaneous coronary interventions; PLAD, proximal left anterior descending; STEMI, ST-elevation myocardial infarction.

[a]Median follow-up, 3.4 years.
[b]Within 24 hours before PCI.
[c]Adjusted for significant risk factors selected by cross-validation including age, body mass index, ejection fraction, hemodynamic instability, congestive heart failure, malignant ventricular arrhythmia, chronic obstructive pulmonary disease, diabetes, and renal failure.
[d]Excluded 4440 patients with PCI in bypassed vessel because there was no information about percentage of stenosis for those patients.

Table 4.

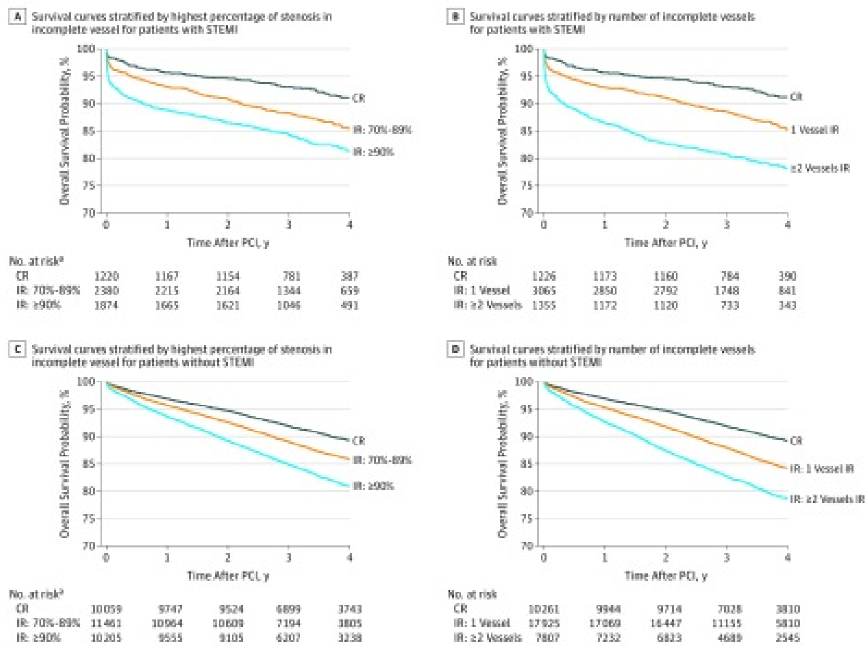
Frequencies, Unadjusted All-Cause Mortality Rates,[a] and Adjusted HRs for Patients Without STEMI[b] Undergoing PCI With Incomplete Revascularization: New York, 2010-2012 (N = 35 993)

Type of Revascularization	No. (%)	Observed Mortality Rate, %	Adjusted HR[c] (95% CI)	*P* Value
Complete revascularization	10 059 (31.71)	10.15	1 [Reference]	NA
Highest stenosis in incomplete lession, %[d]				
70-89	11 461 (36.13)	12.96	1.18 (1.09-1.28)	<.001
>90	10 205 (32.17)	17.71	1.36 (1.25-1.47)	<.001
>90 vs 70-89	NA	NA	1.15 (1.07-1.24)	<.001
Vessels incomplete, No.				
None	10 261 (28.51)	10.19	1 [Reference]	NA
1	17 925 (49.50)	14.39	1.22 (1.13-1.31)	<.001
2 or more	7807 (21.69)	20.10	1.42 (1.30-1.55)	<.001
2 or more vs 1	NA	NA	1.17 (1.09-1.59)	<.001
Location of incomplete vessel				
Complete Revascularization	10 261 (28.51)	10.19	1 [Reference]	NA
Not PLAD	23 230 (64.54)	15.62	1.26 (1.17-1.35)	<.001
PLAD	2502 (6.95)	20.78	1.40 (1.25-1.57)	<.001
PLAD vs not PLAD	NA	NA	1.11 (1.01-1.23)	.03

Abbreviations: HR, hazard ratio; NA, not applicable; PCI, percutaneous coronary interventions; PLAD, proximal left anterior descending; STEMI, ST-elevation myocardial infarction.

[a]Median follow-up, 3.4 years.
[b]Within 24 hours before PCI.
[c]Adjusted for significant risk factors selected by cross-validation including age, race/ethnicity, body mass index, ejection fraction, time of previous MI, cerebrovascular disease, peripheral vascular disease, hemodynamic instability, congestive heart failure, malignant ventricular arrhythmia, chronic obstructive pulmonary disease, diabetes, renal failure, previous coronary artery bypass grafting surgery, emergency PCI owing to diagnostic catheterization complication, and previous organ transplant.
[d]Excluded 4440 patients with PCI in bypassed vessel because there was no information about percentage of stenosis for those patients.

Figure.



Four-Year Survival for Patients With Complete Revascularization (CR) and Incomplete Revascularization (IR)

A, Patients with ST-elevation myocardial infarction (STEMI) with subgroups of patients with IR based on severity of nonrevascularized stenoses. B, Patients with STEMI with subgroups of patients with IR based on number of nonrevascularized vessels. C, Patients without STEMI with subgroups of patients with IR based on severity of nonrevascularized stenosis. D, Patients with STEMI with subgroups of patients with IR based on number of nonrevascularized vessels.

[a]Excluded 4440 patients with percutaneous coronary interventions (PCIs) in bypass grafts because there was no information about percentage of stenosis for those patients.