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ACUTE MYOCARDIAL INFARCTION

When Is Door-to-Balloon Time Critical?

Analysis From the HORIZONS-AMI (Harmonizing Outcomes with Revascularization and Stents in Acute Myocardial Infarction) and CADILLAC (Controlled Abciximab and Device Investigation to Lower Late Angioplasty Complications) Trials

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Objectives Our objective was to evaluate the impact of door-to-balloon time (DBT) on mortality depending on clinical risk and time to presentation.

Background DBT affects the mortality rate in ST-segment elevation myocardial infarction treated with primary percutaneous coronary intervention, but the impact may vary across subgroups.

Methods The CADILLAC (Controlled Abciximab and Device Investigation to Lower Late Angioplasty Complications) and HORIZONS-AMI (Harmonizing Outcomes with Revascularization and Stents in Acute Myocardial Infarction) trials evaluated stent and antithrombotic therapy in patients undergoing primary percutaneous coronary intervention. We studied the impact of DBT on mortality in 4,548 patients based on time to presentation and clinical risk.

Results The 1-year mortality rate was lower in patients with short versus long DBT (≤90 min vs. >90 min, 3.1% vs. 4.3%, $p = 0.045$). Short DBTs were associated with a lower mortality rate in patients with early presentation (≤90 min: 1.9% vs. 3.8%, $p = 0.029$) but not those with later presentation (>90 min: 4.0% vs. 4.6%, $p = 0.47$). Short DBTs showed similar trends for a lower mortality rate in high-risk (5.7% vs. 7.4%, $p = 0.12$) and low-risk (1.1% vs. 1.6%, $p = 0.25$) patients. Short DBTs had similar relative risk reductions in patients with early presentation in high-risk (3.7% vs. 7.0%, $p = 0.08$) and low-risk (0.8% vs. 1.5%, $p = 0.32$) patients, although the absolute benefit was greatest in high-risk patients.

Conclusions Short DBTs (≤90 min) are associated with a lower mortality rate in patients with early presentation but have less impact on the mortality rate in patients presenting later. The absolute mortality rate reduction with short DBT is greatest in high-risk patients presenting early. These data may be helpful in designing triage strategies for reperfusion therapy in patients presenting to non–percutaneous coronary intervention hospitals. (J Am Coll Cardiol 2010;56:407–13) © 2010 by the American College of Cardiology Foundation

Short door-to-balloon (DBT) times are associated with reduced mortality in patients with ST-segment elevation myocardial infarction (STEMI) treated with primary percutaneous coronary intervention (PCI), but the importance of DBT may differ across subgroups (1–3). Previous studies suggested that delays in DBT may affect the mortality rate

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Abbreviations and Acronyms

DBT = door-to-balloon time
PCI = percutaneous coronary intervention
STEMI = ST-segment elevation myocardial infarction
TIMI = Thrombolysis In Myocardial Infarction

most in patients presenting early after the onset of symptoms and in patients at high clinical risk, but the data are limited and conflicting (2,3). Improved understanding of how delays in DBT affect the mortality rate in subgroups may help in triaging STEMI patients presenting at non-PCI hospitals.

The purpose of this study was to evaluate the impact of delays in DBT on mortality in patients with early versus late presentation and in patients with high and low clinical risk from the CADILLAC (Controlled Abciximab and Device Investigation to Lower Late Angioplasty Complications) and HORIZONS-AMI (Harmonizing Outcomes with Revascularization and Stents in Acute Myocardial Infarction) trials (4,5).

Methods

Study population. The CADILLAC trial evaluated abciximab and coronary stenting and the HORIZONS-AMI trial evaluated bivalirudin and drug-eluting stents in STEMI patients undergoing primary PCI (4,5). The current study population included all patients randomized in these trials who underwent primary PCI and had DBT data available (n = 4,548).

Definitions. DBT was the time from hospital arrival until balloon inflation. Time to presentation was the time from symptom onset until arrival at the first hospital. Clinical risk was assessed using a modified Thromobolysis In Myocardial Infarction (TIMI) risk score (6). Selected variables were assigned points weighted as follows: age 75 years and older (3 points), age 65 years and older (2 points), Killip class II to IV (2 points), anterior infarction (1 point), diabetes (1 point), weight <67 kg (1 point), and these were summed for each patient to give a modified TIMI risk score.

Statistical analyses. Baseline categorical variables were compared using chi-square testing, and continuous variables were compared using *t* tests. Mortality rates at 1 year were determined by Kaplan-Meier estimates, and comparisons between categories of DBT were performed with univariate and multivariate Cox regression analyses. In the multivariate Cox regression models, all clinical variables in Tables 1 and 2 were entered into the models.

Table 1 Baseline Variables by Door-to-Balloon Time

	Door-to-Balloon Time		
	≤90 min (n = 1,611)	>90 min (n = 2,937)	p Value
Clinical variables			
Age, yrs	60.1 (11.8)	60.3 (12.0)	0.62
Age ≥65 yrs	35.1%	35.8%	0.64
Age ≥75 yrs	12.5%	13.5%	0.35
Female	22.7%	26.1%	0.011
Diabetes	14.6%	17.0%	0.032
Prior infarction	10.1%	12.6%	0.012
Anterior infarction	40.1%	40.0%	0.92
Killip class II to IV	8.8%	10.1%	0.16
Weight, kg	81.6 (15.4)	82.6 (16.4)	0.058
Weight <67 kg	15.9%	15.3%	0.58
Time to presentation ≤90 min	41.1%	42.0%	0.55
TIMI risk score	1.7 (1.6)	1.8 (1.7)	0.19
Angiographic variables			
Infarct artery location			
Left anterior descending	40.1%	40.0%	0.98
Circumflex	16.2%	18.6%	0.042
Right coronary artery	46.9%	44.4%	0.10
Left main	0.3%	0.1%	0.23
3-vessel disease	17.5%	19.8%	0.061
Index LVEF, %	58.1 (12.7)	57.8 (12.8)	0.62
Index LVEF <40%	9.5%	9.7%	0.31
TIMI flow grade 2 to 3 pre-PCI	27.9%	37.7%	<0.0001

Values are mean (SD) or percent.
LVEF = left ventricular ejection fraction; PCI = percutaneous coronary infarction; TIMI = Thrombolysis In Myocardial Infarction.

Table 2 Baseline Variables by Time to Presentation

	Time to Presentation		
	≤90 min (n = 1,917)	>90 min (n = 2,700)	p Value
Clinical variables			
Age, yrs	58.4 (11.7)	61.6 (11.9)	<0.0001
Age ≥65 yrs	29.6%	40.2%	<0.0001
Age ≥75 yrs	10.1%	15.2%	<0.0001
Female	21.1%	27.2%	<0.0001
Diabetes	12.9%	18.3%	<0.0001
Prior infarction	12.8%	11.0%	0.064
Anterior infarction	41.6%	38.9%	0.07
Killip class II to IV	9.1%	10.0%	0.32
Weight, kg	83.4 (16.3)	81.5 (15.9)	<0.0001
Weight <67 kg	14.1%	16.6%	0.02
TIMI risk score	1.6 (1.6)	1.9 (1.7)	<0.0001
Angiographic variables			
Infarct artery location			
Left anterior descending	41.4%	39.1%	0.11
Circumflex	16.3%	18.8%	0.029
Right coronary artery	45.2%	45.2%	0.97
Left main	0.1%	0.2%	0.34
3-vessel disease	16.5%	21.2%	<0.0001
Index LVEF, %	58.2 (12.6)	57.9 (12.7)	0.46
Index LVEF <40%	8.5%	9.4%	0.44
TIMI flow grade 2 to 3 pre-PCI	35.2%	33.6%	0.25

Values are mean (SD) or percentage.
Abbreviations as in Table 1.

Results

Median time to presentation was 112 min (interquartile range 60 to 205 min) and median DBT, including both transferred and nontransferred patients, was 107 min (interquartile range 79 to 146 min).