Clinical Characteristics, Management, and Outcomes of Acute Coronary Syndrome in Patients With Right Bundle Branch Block on Presentation

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We examined the relations between right bundle branch block (RBBB) and clinical characteristics, management, and outcomes among a broad spectrum of patients with acute coronary syndrome (ACS). Admission electrocardiograms of patients enrolled in the Global Registry of Acute Coronary Events (GRACE) electrocardiogram substudy and the Canadian ACS Registry I were analyzed independently at a blinded core laboratory. We performed multivariable logistic regression analysis to assess the independent prognostic significance of admission RBBB on in-hospital and 6-month mortality. Of 11,830 eligible patients with ACS (mean age 65; 66% non−ST-elevation ACS), 5% had RBBB. RBBB on admission was associated with older age, male sex, more cardiovascular risk factors, worse Killip class, and higher GRACE risk score (all p <0.01). Patients with RBBB less frequently received in-hospital cardiac catheterization, coronary revascularization, or reperfusion therapy (all p <0.05). The RBBB group had higher unadjusted in-hospital (8.8% vs 3.8%, p <0.001) and 6-month mortality rates (15.1% vs 7.6%, p <0.001). After adjusting for established prognostic factors in the GRACE risk score, RBBB was a significant independent predictor of in-hospital death (odds ratio 1.45, 95% CI 1.02 to 2.07, p = 0.039), but not cumulative 6-month mortality (odds ratio 1.29, 95% CI 0.95 to 1.74, p = 0.098). There was no significant interaction between RBBB and the type of ACS for either in-hospital or 6-month mortality (both p >0.50). In conclusion, across a spectrum of ACS, RBBB was associated with preexisting cardiovascular disease, high-risk clinical features, fewer cardiac interventions, and worse unadjusted outcomes. After adjusting for components of the GRACE risk score, RBBB was a significant independent predictor of early mortality. **(Am J Cardiol 2016;117:754−759)**

Right bundle branch block (RBBB) in the context of acute coronary syndrome (ACS) is not an infrequent occurrence, ranging from 1.6% to 15% in hospitalized patients.[1,2] Several studies demonstrate increased mortality in this high-risk group despite advances in therapeutics and early revascularization strategies.[3−11] It is widely known that RBBB after anterior myocardial infarction (MI), caused by complete occlusion of the proximal left anterior descending (LAD) artery, is a predictor of mortality. In patients presenting with RBBB, those with ST-segment elevation MI (STEMI) undergoing fibrinolysis or angioplasty have poorer short- and long-term prognosis than those without STEMI. Investigators have recently called for updated reperfusion guidelines to reflect the adverse prognosis of new RBBB in ACS, even in the absence of ST elevation.[8] Patients with non−ST-elevation (NSTE) ACS comprise a heterogeneous group with variable prognoses that

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See page 758 for disclosure information.

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Table 1
Baseline patient characteristics of patients with and without right bundle branch block

Variables	Right Bundle Branch Block		
	No (n = 11,240)	Yes (n = 590)	P value
Age, (years)*	65 (55-74)	73 (65-80)	< 0.001
Men	66.8%	76.2%	< 0.001
Systemic hypertension	54.2%	61.9%	< 0.001
Dyslipidemia	45.3%	45.3%	0.99
Diabetes mellitus	23.3%	31.3%	< 0.001
Current smoker	30.0%	22.4%	< 0.001
Prior angina pectoris	55.9%	63.5%	< 0.001
Prior myocardial infarction	30.7%	37.3%	0.001
Prior heart failure	9.2%	15.5%	< 0.001
Prior percutaneous coronary intervention	14.9%	16.7%	0.24
Prior coronary bypass graft surgery	11.1%	19.9%	< 0.001
Prior transient ischemic attack/stroke	7.5%	12.1%	< 0.001
Prior peripheral vascular disease†	9.0%	14.3%	0.001

* Median (25th to 75th percentiles).
† Data were available for 7,470 (63%) participants.

Table 2
Clinical presentation of patients with and without right bundle branch block

Variables	Right Bundle Branch Block		
	No (n=11,240)	Yes (n=590)	P value
Systolic blood pressure, (mm Hg)*	142 (124-161)	140 (124-164)	0.81
Diastolic blood pressure, (mm Hg)*	80 (70-91)	80 (68-90)	0.001
Heart rate, (beats/min)*	75 (63-88)	80 (65-94)	<0.001
Killip Class I	82.7%	76.0%	<0.001
Killip Class II	13.8%	18.1%	
Killip Class III	2.9%	4.9%	
Killip Class IV	0.6%	1.0%	
Creatinine, (μmol/L)*	90 (79-106)	99 (83-127)	<0.001
Elevated cardiac biomarkers	41.8%	45.3%	0.10
Any T-wave inversion(≥2 contiguous leads)	27.7%	36.3%	<0.001
T-wave inversion in V1 and V2	8.6%	32.7%	<0.001
T-wave inversion in V2 and V3	8.4%	23.9%	<0.001
T-wave inversion in 2 adjacent precordial leads	19.3%	29.7%	<0.001
Q wave in V1 and V2	8.2%	11.5%	0.005
Q wave in ≥2 precordial leads	14.4%	23.4%	<0.001
ST deviation (≥0.5 mm)	78.7%	79.0%	0.86
Any ST depression (>0.5 mm)	53.2%	61.0%	<0.001
ST depression ≥0.5 mm in V1 and V2	5.5%	10.0%	<0.001
ST elevation ≥1 mm in ≥2 contiguous leads	34.6%	29.0%	0.005
ST elevation ≥1 mm in V1 and V2	4.8%	3.2%	0.081
Cardiac arrest	1.5%	3.8%	<0.001
GRACE risk score*	128 (104-153)	143 (118-173)	<0.001

* Median (25th to 75th percentiles).

warrant early risk stratification to minimize adverse outcomes. NSTE-ACS with RBBB may predict worse outcomes because of more extensive underlying coronary artery disease as opposed to STEMI, where RBBB may reflect larger infarcts.[12] Furthermore, previous studies were limited by small sample sizes usually from single centers, lacked blinded electrocardiogram (ECG) interpretation, and did not adjust for other independent prognosticators in validated risk scores. Therefore, the objective of our study was to determine the relation between presenting RBBB and clinical characteristics, in-hospital management, and clinical outcomes across a broad spectrum of patients with ACS, including NSTE-ACS and STEMI.

Methods

The Canadian ACS Registry I and Global Registry of Acute Coronary Events (GRACE) were prospective, multicenter, observational studies of the clinical characteristics, management, and outcomes of patients with NSTE-ACS and STEMI. Their rationale and design have been described elsewhere.[13–16]

In brief, the ACS Registry I enrolled patients from September 1999 to June 2001 across 51 Canadian hospitals (n = 4,627). Eligible patients were aged ≥18 years and admitted to hospital for suspected ACS within 24 hours of symptom onset. ECGs from all patients were obtained at admission. GRACE included patients from 94 international sites aged ≥18 years and admitted to hospital with a presumed diagnosis of ACS based on ischemic cardiac symptoms and at least one of the following: ECG changes, elevated biomarkers, and/or documented history of coronary artery disease. For the present study, we included patients from the GRACE ECG substudy involving 39 sites in 11 countries from March 1999 to January 2004 (n = 7,900). Both registries excluded patients if their presenting condition was triggered by another major co-morbidity such as surgery, trauma, or gastrointestinal bleeding. All centers were encouraged to enroll consecutive patients to minimize selection bias.

All data on patient demographics, clinical presentation, investigations, management, and outcomes were recorded on standardized case report forms by local study coordinators or the responsible physician during index hospitalization. Forms for the ACS Registry were scanned into a central database (Teleform, version 7.0; Cardiff, San Diego, California) at the Canadian Heart Research Center in Toronto, Canada. GRACE data were managed by a coordinating center at the University of Massachusetts (Worcester, Massachusetts). Central data checks were executed and queries forwarded to participating centers for clarification of sampling protocols. After hospital discharge, patients were followed up through telephone interviews at 6 months in GRACE and 12 months in the ACS Registry to ascertain vital status. Study protocols were approved by local review boards, and all patients provided informed consent. Primary outcomes were in-hospital and cumulative 6-month all-cause mortality. Secondary outcomes included in-hospital myocardial (re)infarction (defined as new or recurrent beyond 24 hours of hospitalization),[17] heart failure (only recorded in GRACE), and the composite of death or myocardial (re)infarction.

Admission ECGs were recorded at standard paper speed of 25 mm/s and calibration of 10 mm/mV and were forwarded to the Canadian Heart Research Center ECG core laboratory for systematic interpretation. ECGs were read by trained physicians blinded to clinical data, site interpretation, and patient outcomes. The core laboratory has previously