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Complete Heart Block Complicating ST-Segment Elevation Myocardial Infarction

Temporal Trends and Association With In-Hospital Outcomes

Prakash Harikrishnan, MD,* Tanush Gupta, MD,* Chandrasekar Palaniswamy, MD,† Dhaval Kolte, MD, PhD,‡ Sahil Khera, MD,* Marjan Mujib, MD, MPH,* Wilbert S. Aronow, MD,* Chul Ahn, PhD,§ Sachin Sule, MD,* Diwakar Jain, MD,* Ali Ahmed, MD, MPH,‖ Howard A. Cooper, MD,* Jason Jacobson, MD,* Sei Iwai, MD,* William H. Frishman, MD,* Deepak L. Bhatt, MD, MPH,¶ Gregg C. Fonarow, MD,# Julio A. Panza, MD*

ABSTRACT

OBJECTIVES The purpose of this study was to determine the association of complete heart block (CHB) with outcomes and to examine temporal trends in the incidence and outcomes of CHB complicating ST-segment elevation myocardial infarction (STEMI).

BACKGROUND There are limited data available on the incidence and outcomes of CHB in STEMI patients who undergo contemporary management.

METHODS We used the 2003 to 2012 National Inpatient Sample databases to identify all patients age ≥18 years hospitalized with STEMI. Patients with a concomitant diagnosis of CHB were then identified. Multivariable logistic regression was used to analyze the association of CHB with outcomes and to examine the temporal trends in incidence and outcomes of CHB complicating STEMI.

RESULTS Of 2,273,853 patients with STEMI, 49,882 (2.2%) had CHB. The incidence of CHB increased from 2.1% in 2003 to 2.3% in 2012 (adjusted odds ratio [OR] per year: 1.02; 95% confidence interval [CI]: 1.02 to 1.03). STEMI patients with CHB had higher in-hospital mortality than those without CHB (20.4% vs. 8.7%; adjusted OR: 2.47; 95% CI: 2.41 to 2.53). The higher mortality associated with CHB was independent of the location of STEMI; however, the magnitude of this association was greatest in patients with anterior STEMI. In patients with CHB complicating STEMI, although permanent pacemaker implantation rates declined (adjusted OR per year: 0.96; 95% CI: 0.95 to 0.97), in-hospital mortality remained unchanged during the study period (adjusted OR per year: 1.00; 95% CI: 0.99 to 1.01).

CONCLUSIONS The incidence of CHB complicating STEMI has increased slightly over the last decade, although the absolute incidence remains quite low. CHB remains associated with higher in-hospital mortality in STEMI patients even in the current era of prompt reperfusion therapy. In patients with CHB complicating STEMI, there was no change in risk-adjusted in-hospital mortality during the study period. (J Am Coll Cardiol EP 2015;1:529–38)

From the *New York Medical College, Valhalla, New York; †Icahn School of Medicine at Mount Sinai Hospital, New York, New York; ‡Brown University/Rhode Island Hospital, Providence, Rhode Island; §Department of Clinical Sciences and Biostatistics, University of Texas Southwestern Medical Center, Dallas, Texas; ‖VA Medical Center, Washington, DC; ¶Brigham and Women's Hospital Heart & Vascular Center and Harvard Medical School, Boston, Massachusetts; and the #David-Geffen School of Medicine, University of California at Los Angeles (UCLA), Los Angeles, California. Dr. Iwai has received honoraria from Medtronic, Inc., Biotronik, and St. Jude Medical; and has been a consultant for Biosense-Webster. Dr. Bhatt has been a member of the advisory board for Cardax, Elsevier Practice Update Cardiology, Medscape Cardiology, Regado Biosciences; has been a member of the Board of Directors for Boston VA Research Institute, Society of Cardiovascular Patient Care; has been the Chair of American Heart Association Get With The Guidelines Steering Committee; has been a member of the Data Monitoring Committees for Duke Clinical Research Institute, Harvard Clinical Research Institute, Mayo Clinic, Population Health Research Institute; has received honoraria from the American College of Cardiology (Senior Associate Editor, *Clinical Trials and News*, ACC.org), Belvoir Publications (Editor in Chief, *Harvard Heart Letter*), Duke Clinical Research Institute (clinical trial steering committees), Harvard Clinical Research Institute (clinical trial steering committee), HMP Communications (Editor in Chief, *Journal of Invasive Cardiology*), *Journal of the American College of Cardiology* (Associate Editor), Population Health Research Institute (clinical trial steering committee), Slack

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ABBREVIATIONS AND ACRONYMS

AMI = acute myocardial infarction

AV = atrioventricular

CABG = coronary artery bypass grafting

CHB = complete heart block

CI = confidence interval

LOS = length of stay

NIS = National Inpatient Sample

OR = odds ratio

PCI = percutaneous coronary intervention

PPM = permanent pacemaker

STEMI = ST-segment elevation myocardial infarction

TTVP = temporary transvenous pacemaker

Complete heart block (CHB) is a relatively frequent complication in patients hospitalized with acute myocardial infarction (AMI) (1). Previous studies have reported the overall incidence of CHB in patients with AMI to be between 3% and 13% depending on the type and anatomical location of the AMI being investigated (2–8). Patients who develop CHB in the setting of AMI have a 3- to 5-fold increase in in-hospital mortality compared with those without CHB (6–8). However, most of these reports are from the pre-thrombolytic and thrombolytic era in the 1980s and 1990s, before the widespread use of percutaneous coronary intervention (PCI) and the advent of modern adjunctive medical therapies. Data on the incidence and outcomes of CHB in patients with ST-segment elevation myocardial infarction (STEMI) in the contemporary PCI era are limited. Hence, the primary objective of this study was to examine the association of CHB with in-hospital outcomes in patients hospitalized with STEMI and to examine the temporal trends in the incidence and outcomes of CHB complicating STEMI using the National Inpatient Sample (NIS) databases from 2003 to 2012. It has been previously shown that inferior STEMI is associated with a higher incidence of CHB (6,9); therefore, we also conducted subgroup analysis after stratifying patients by STEMI location to those with anterior, inferior, or other STEMI.

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METHODS

DATA SOURCE. Data were obtained from the 2003 to 2012 NIS databases. The NIS, developed as a part of the Healthcare Cost and Utilization Project, is the largest publicly available all-payer inpatient care database in the United States, and is sponsored by the Agency for Healthcare Research and Quality (10). The NIS includes data from all nonfederal, short-term, general, and other specialty hospitals in the United States (excluding rehabilitation and long-term acute care hospitals) in the form of de-identified patient information containing demographics, discharge diagnoses, comorbidities, procedures, outcomes, and hospitalization costs. All the states that participate in Healthcare Cost and Utilization Project (n = 44 in 2012) provide data to the NIS, covering >95% of the U.S. population. The design of the NIS changed during our study. Between 2003 and 2011, the NIS included data on all inpatient discharges from a random 20% sample of community hospitals in the United States. However, in 2012, the database was redesigned to include data from a 20% sample of discharges from all participating hospitals. The new design of the NIS reduces the margin of error for estimates and delivers more stable and precise estimations. For patient-level trend analysis, a new set of weights called trend weights are provided for the 2012 data, as well as for the data from previous years (11). The New York Medical College Institutional Review Board deemed this study exempt because Healthcare Cost and Utilization Project-NIS is a publicly available database containing de-identified patient information.

STUDY POPULATION. We used the International Classification of Diseases-Ninth Edition-Clinical Modification (ICD-9-CM) diagnosis codes 410.01, 410.11, 410.21, 410.31, 410.41, 410.51, 410.61, 410.81, and 410.91 to identify all patients ≥18 years of age hospitalized with the principal diagnosis of STEMI. We chose the principal diagnosis because it is considered the primary reason for hospitalization. This approach has been used by previous studies using the NIS database to accurately identify patients with STEMI (12,13). Patients with pacemakers (ICD-9-CM code V45.01) or implantable cardioverter-defibrillators (ICD-9-CM code V45.02) were excluded. Patients with CHB were then identified using ICD-9-CM code 426.0.

OUTCOMES MEASURED. We studied the temporal trends in incidence of CHB in the overall cohort of patients with STEMI. All-cause in-hospital mortality, which was defined as "died" during the hospitalization encounter in the NIS database, was the primary outcome of interest. Use of temporary transvenous pacing (TTVP), permanent pacemaker

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