CLINICAL RESEARCH STUDY

THE AMERICAN JOURNAL of MEDICINE®

Impact on Long-Term Mortality of Presence of Obstructive Coronary Artery Disease and Classification of Myocardial Infarction

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ABSTRACT

BACKGROUND: In contrast to the associated-with-thromboembolic-event type 1 myocardial infarction, type 2 myocardial infarction is caused by acute imbalance between oxygen supply and demand of myocardium. Type 2 myocardial infarction may be present in patients with or without obstructive coronary artery disease, but knowledge about patient characteristics, treatments, and outcome in relation to coronary artery status is lacking. We aimed to compare background characteristics, triggering mechanisms, treatment, and long-term prognosis in a large real-life cohort of patients with type 1 and type 2 myocardial infarction with and without obstructive coronary artery disease.

METHODS: All 41,817 consecutive patients with type 1 and type 2 myocardial infarction registered in the Swedish myocardial infarction registry (SWEDEHEART) who underwent coronary angiography between January 1, 2011 and December 31, 2013, with the last follow-up on December 31, 2014, were studied.

RESULTS: In 92.8% of 40,501 patients classified as type 1 and in 52.5% of patients classified as type 2 myocardial infarction, presence of an obstructive coronary artery disease could be shown. Within the patients with obstructive coronary artery disease, those with type 2 myocardial infarction were older, and had more comorbidities and smaller necrosis as compared with type 1 myocardial infarction. In contrast, there was almost no difference in risk profile and extent of myocardial infarction between type 1 and type 2 myocardial infarction patients with non-obstructive coronary artery stenosis. The crude long-term mortality was higher in type 2 as compared with type 1 myocardial infarction with obstructive coronary artery disease (hazard ratio [HR] 1.72; 95% confidence interval [CI], 1.45-2.03), but was lower after adjustment (HR 0.76; 95% CI, 0.61-0.94). In myocardial infarction patients with nonobstructive coronary artery stenosis, the mortality risk was similar regardless of the clinical myocardial infarction type (crude HR 1.14; 95% CI, 0.84-1.55; adjusted HR 0.82; 95% CI, 0.52-1.29).

CONCLUSIONS: The substantial differences in risk factors, treatment, and outcome in patients with type 1 and type 2 myocardial infarction with obstructive coronary artery disease supports the relevance of the division between type 1 and type 2 in this population. On the contrary, in patients with nonobstructive coronary artery stenosis, irrespective of the clinical type, a similar risk profile, extent of necrosis, and long-term prognosis were observed, indicating that distinction between type 1 and type 2 myocardial infarction in these patients seems to be inappropriate.

 • *The American Journal of Medicine (2016) 129, 398-406*

KEYWORDS: Coronary artery disease; Outcome; Therapies; Type 2 myocardial infarction; Universal definition of myocardial infarction

Funding: See last page of article.

Conflict of Interest: See last page of article.

Authorship: See last page of article.

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0002-9343/$ -see front matter
http://dx.doi.org/10.1016/j.amjmed.2015.11.035

In *the universal definition of myocardial infarction* published in 2007[1] and in the recently updated *the third universal definition of myocardial infarction*,[2] 5 different clinical types of acute myocardial infarction are distinguished. The incidence of "classical" type 1 myocardial infarction, caused by an acute atherothromboembolic coronary event, varies from 38% to 98%.[3-10] The more heterogeneous type 2 myocardial infarction, caused by an acute imbalance between oxygen supply and demand of the myocardium, is being diagnosed in 2% to 62%[3-10] of all myocardial infarction hospitalizations. The wide variation in incidence of type 1 and type 2 myocardial infarction is heavily dependent on the selection of study population in the different studies. The remaining type 3-5 constitute only a small minority of all acute myocardial infarction patients.[9,10]

Type 2 myocardial infarction might affect patients with or without coronary artery disease, but conditions other than coronary artery disease per se contribute to an acute imbalance between oxygen supply and demand. The proportion of type 2 myocardial infarction patients who have obstructive coronary artery disease in a real-life setting is fairly unknown because only 25% to 50% of the patients have undergone coronary angiography in the published studies[4,5,10-12]; however, 22% to 47% of the invasively managed type 2 myocardial infarction patients did not have an obstructive stenosis on coronary angiography in these studies.[4,5,9,11]

Contrarily, in the total population diagnosed with myocardial infarction, thus representing predominantly type 1 myocardial infarction, the prevalence of nonobstructive coronary atherosclerosis is less common, a recently published systematic review of 28 studies indicates a 6% prevalence of nonobstructive status among myocardial infarction patients.[13] Further detailed imaging evaluations of patients with a clinical diagnosis of myocardial infarction and nonobstructive coronary arteries, have shown that "true" myocardial infarction could be verified only in around one-fourth; changes compatible with myocarditis were found in more than one-third and in the remaining cases, containing a substantial proportion of stress cardiomyopathies, no significant myocardial necrosis was found.[13-18]

Patients with myocardial infarction with nonobstructive coronary artery stenosis seem to have a better short-[19] and long-term prognosis,[13] and after excluding patients with comorbidities/triggering mechanisms suggestive for type 2 myocardial infarction, the long-term mortality is low, not exceeding 1% during 2-year follow-up.[20] However, the prognostic impact of obstructive coronary artery disease in patients classified as having type 2 myocardial infarction has not been studied.

We hypothesized that there are important differences regarding patient characteristics and outcome in patients with obstructive coronary artery disease classified as type 1 and type 2, while there are no detectable differences in patient characteristics and outcomes between patients with nonobstructive coronary arteries classified as type 1 and type 2 myocardial infarction. Therefore, the aim of this study was to compare the incidence, patient characteristics, pharmacological and invasive treatment, and long-term mortality between invasively managed myocardial infarction patients with and without significant coronary artery disease who have been classified as having type 2 or type 1 myocardial infarction, respectively, in a large contemporary cohort of patients included in a nationwide quality registry.

CLINICAL SIGNIFICANCE

- In patients with obstructive coronary artery disease, those with type 2 myocardial infarction (MI) represent a higher-risk population than those with type 1 MI.
- In contrast, in patients without obstructive coronary artery disease, the prognosis is similar regardless of clinical classification, and the distinction between type 2 and type 1 may be inappropriate.
- Evaluation of coronary artery status seems to have a key role in choice of treatment and risk prediction.

METHODS

Study Population

Consecutive patients with acute myocardial infarction admitted to a cardiac unit at all 73 hospitals in Sweden between January 1, 2011 and December 31, 2013 recorded in the Swedish Web-system for Enhancement and Development of Evidence-based care in Heart disease Evaluated According to Recommended Therapies (SWEDEHEART) registry, were included in the present study. The registry, which, during the study period had a completeness of 82% of all myocardial infarctions diagnosed at Swedish hospitals,[21,22] contains data about baseline characteristics, electrocardiogram (ECG) changes, biochemical markers, coronary angiography results, medical and invasive treatment, and outcome (see http://www.swedeheart.se for details). Since 2010, classification of the myocardial infarction into type 1-5 is included in the registry. The classification is done by the responsible physician according to the universal definition of myocardial infarction.[1,2] The identification of triggering mechanisms was done retrospectively using all reported diagnoses on discharge, coded with use of the 10th revision of the International Statistical Classification of Diseases and Related Health Problems (ICD-10).

To ensure the quality of the data entered into the database, a monitor visits approximately 10-20 hospitals (out of a total of 73 hospitals in Sweden) each year. During 2011-2013, 32 units were monitored. There was a 95.7% agreement between data in the registry and the information in the patients' records in 30 randomly chosen patients for each hospital (http://www.swedeheart.se).