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ORIGINAL ARTICLE

Modified shock index: A bedside clinical index for risk assessment of ST-segment elevation myocardial infarction at presentation

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KEYWORDS

ST-elevation myocardial infarction;
Stratification;
Mortality;
Outcome;
Modified shock index

Abstract

Introduction: Prompt identification of higher-risk patients presenting with ST-segment elevation myocardial infarction (STEMI) is crucial to pursue a more aggressive approach.

Objective: We aimed to assess whether the modified shock index (MSI), the ratio of heart rate to mean arterial pressure, could predict six-month mortality among patients admitted with STEMI.

Methods: A retrospective observational cohort study was performed in a single center including 1158 patients diagnosed with STEMI, without cardiogenic shock on admission, between July 2009 and December 2014. They were divided into two groups: group 1 – patients with $MSI < 0.93$ (72%); group 2 – patients with $MSI \geq 0.93$ (28%). The primary endpoint was six-month all-cause mortality.

Results: $MSI \geq 0.93$ identified patients who were more likely to have signs of heart failure ($p=0.002$), anemia ($p<0.001$), renal insufficiency ($p=0.014$) and left ventricular systolic dysfunction ($p=0.045$). They more often required inotropic support ($p<0.001$), intra-aortic balloon pump ($p<0.001$) and mechanical ventilation ($p<0.001$). Regarding in-hospital adverse events, they had a higher prevalence of malignant arrhythmias ($p=0.01$) and mechanical complications ($p=0.027$). $MSI \geq 0.93$ was an independent predictor of overall six-month mortality (adjusted HR 2.00, 95% CI 1.20-3.34, $p=0.008$).

Conclusion: MSI was shown to be a valuable bedside tool which can rapidly identify high-risk STEMI patients at presentation.

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PALAVRAS-CHAVE

Enfarte com supradesnivelamento do segment ST (EAMCSST); Estratificação; Mortalidade; Prognóstico; Índice de choque modificado (ICM)

Índice de choque modificado: um índice clínico simples para estratificação de risco nos doentes admitidos com enfarte com supradesnivelamento do segmento ST

Resumo

Introdução: A identificação precoce dos doentes (dts) de maior gravidade que se apresentam com enfarte com supradesnivelamento do segment ST (EAMCSST) é fundamental para uma abordagem mais eficaz e/ou segura.

Objetivo: Avaliar se o índice de choque modificado (ICM) – razão entre a frequência cardíaca e a pressão arterial média – poderá ser um preditor de mortalidade aos seis meses, nos doentes admitidos com enfarte com EAMCSST.

Métodos: Estudo observacional, unicêntrico, retrospectivo que incluiu 1158 doentes admitidos com o diagnóstico de EAMCSST, sem choque cardiogénico à admissão, desde julho de 2009 a dezembro de 2014. Os doentes foram divididos em dois grupos: grupo 1 – dts com $ICM < 0,93$ (72%); grupo 2 – dts com $ICM \geq 0,93$ (28%). O *endpoint* primário foi a ocorrência de morte por todas as causas aos seis meses.

Resultados: Os doentes com $ICM \geq 0,93$ apresentavam mais frequentemente sinais de insuficiência cardíaca ($p=0,002$), anemia ($p<0,001$), insuficiência renal ($p=0,014$) e disfunção ventricular esquerda ($p=0,045$) à admissão. Estes doentes necessitaram mais frequentemente de suporte aminérgico ($p<0,001$), suporte com balão intra-aórtico ($p<0,001$) e ventilação mecânica invasiva ($p<0,001$). Relativamente aos eventos hospitalares adversos, os doentes com $ICM \geq 0,93$ apresentaram mais frequentemente arritmias malignas ($p=0,01$) e complicações mecânicas ($p=0,027$). O valor de $ICM \geq 0,93$ mostrou-se um preditor independente de mortalidade por todas as causas aos seis meses – HR ajustada 2,00, 95% CI (1,20-3,34), $p=0,008$.

Conclusão: O índice de choque modificado mostrou ser uma ferramenta útil, capaz de estratificar rapidamente os doentes com EAMCSST de maior risco.

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Introduction

In daily practice, when dealing with ST-segment elevation myocardial infarction (STEMI), it is important to identify patients who may potentially suffer complications.

Risk assessment provides an opportunity to estimate the patient's prognosis, alerting the physician to possible hazards, in order to pursue a more aggressive approach.¹ Several risk stratification systems have been developed, such as Thrombolysis In Myocardial Infarction (TIMI) and the Global Registry of Acute Coronary Events (GRACE), but they are time-consuming and difficult to perform routinely at the bedside.²⁻⁵ It is crucial to find an easier method to stratify STEMI patients, in order to recognize subclinical indicators of worse prognosis, such as cardiogenic shock, early.

In the GUSTO trial, cardiogenic shock was reported to occur on average 12 hours after STEMI presentation in patients who were not considered to have cardiogenic shock at the time of initial assessment. Some of these patients may have had subclinical shock with no sign of organ hypoperfusion.¹

The shock index – the ratio of heart rate to systolic blood pressure (SBP) – is recognized as a predictor of hemodynamic instability. It is an easy tool to assess prognosis in different settings, including STEMI.⁶⁻⁹ A more recent index, the modified shock index (MSI), which is the ratio of heart rate to mean arterial pressure (MAP), has been shown in

small studies to predict mortality in medical and trauma emergency patients.¹⁰⁻¹² The purpose of the present study was to assess the MSI as a predictor of six-month all-cause mortality among patients admitted with STEMI.

Methods

Study population

The study population included 1234 patients admitted with a diagnosis of STEMI between July 2009 and December 2014, either directly from the community to our center or transferred from one of its satellite hospitals, to perform emergent percutaneous coronary intervention. Of these, 26 patients were excluded as lost to follow-up (2%), and 50 patients (5%) presented with cardiogenic shock, defined as Killip class IV, on admission. Therefore, the study population consisted of 1158 patients without cardiogenic shock, presenting within 12 hours of symptom onset and with persistent ST-segment elevation or new left bundle branch block, or >12 hours after symptom onset and with ongoing ischemia, life-threatening arrhythmias or stuttering electrocardiogram (ECG) changes.

The diagnosis of STEMI was based on the presence of chest pain suggestive of myocardial ischemia, a 12-lead ECG showing persistent ST-segment elevation of ≥ 2.5 mm in men

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