



ORIGINAL ARTICLE

Does anemia affect the predictive ability of bleeding risk scores in patients with acute coronary syndromes?



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Received 24 April 2016; accepted 13 June 2016
Available online 17 November 2016

KEYWORDS

Bleeding risk stratification;
Acute coronary syndromes;
Anemia;
Comorbidities

Abstract

Introduction and objective: Anemia is a common comorbidity in patients with acute coronary syndromes (ACS), and is associated with higher risk for both bleeding and ischemic complications. We aimed to assess the predictive ability of bleeding risk scores (Can Rapid risk stratification of Unstable angina patients Suppress ADverse outcomes with Early implementation of the ACC/AHA guidelines [CRUSADE], Mehran and Acute Coronary Treatment and Intervention Outcomes Network [ACTION]) in ACS patients with anemia.

Methods: All consecutive ACS patients were prospectively included. The primary outcome was in-hospital major bleeding according to the CRUSADE, Mehran and ACTION definitions. Anemia was defined as hemoglobin <130 g/l in men and <120 g/l in women. The predictive ability of the bleeding risk scores was assessed by binary logistic regression, calculating receiver operating characteristic (ROC) curves and their corresponding area under the curve (AUC).

Results: We included 2255 patients, mean age 62.4 years. Anemia was present in 550 patients (24.4%). Patients with anemia had a significantly higher prevalence of comorbidities. The three bleeding risk scores adequately predicted major bleeding in the whole cohort.

No significant differences were observed regarding the predictive ability of each of the scores in patients with and without anemia (CRUSADE: AUC 0.73 without anemia vs. 0.74 with anemia, $p=0.913$; ACTION: AUC 0.68 without anemia vs. 0.73 with anemia, $p=0.353$; Mehran: AUC 0.69 without anemia vs. 0.61 with anemia, $p=0.210$). Only the Mehran score showed significantly lower predictive ability in patients with hemoglobin <11 g/dl (AUC 0.51, $p=0.044$).

Conclusions: Anemia was a common comorbidity in patients with ACS from our series. Currently available bleeding risk scores showed an adequate predictive ability in patients with mild anemia.

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PALAVRAS-CHAVE

Estratificação de risco de hemorragia;
Síndromes coronárias agudas;
Anemia;
Comorbilidades

Em doentes com síndromes coronárias agudas, a presença de anemia altera a capacidade preditiva de scores de risco hemorrágico?

Resumo

Introdução e objetivo: A anemia é uma comorbilidade frequente em doentes com síndromes coronárias agudas (SCA) e associa-se tanto a um maior risco de hemorragia, como de complicações isquêmicas. O nosso objetivo foi avaliar a capacidade preditiva de scores de risco de hemorragia (*Can Rapid risk stratification of Unstable angina patients Suppress ADverse outcomes with Early implementation of the ACC/AHA guidelines* [CRUSADE], *Mehran e Acute Coronary Treatment and Intervention Outcomes Network* [ACTION]) em doentes com SCA e anemia.

Métodos: Todos os doentes consecutivos com SCA foram prospetivamente incluídos. O resultado primário foi a hemorragia intra-hospitalar *major*, de acordo com as definições CRUSADE, Mehran e ACTION. A anemia foi definida como uma concentração de hemoglobina <130 g/L em homens e <120 g/L em mulheres. A capacidade preditiva dos scores de risco de hemorragia foi avaliada pelo método de regressão logística binária, calculando curvas ROC e a sua área correspondente sob a curva (AUC).

Resultados: Foram incluídos 2255 doentes. A média de idades foi de 62,4 anos. A anemia estava presente em 550 doentes (24,4%). Doentes com anemia apresentaram uma prevalência significativamente maior de comorbilidades. Os três scores de risco previram corretamente hemorragia *major* no conjunto da coorte.

Não se observaram diferenças significativas em relação à capacidade preditiva de cada um dos scores de risco de hemorragia em pacientes com e sem anemia (CRUSADE AUC 0,73 sem anemia *versus* 0,74 com anemia; $p < 0,913$; ACTION AUC 0,68 sem anemia *versus* 0,73 com anemia; $p < 0,353$; Mehran AUC 0,69 sem anemia *versus* 0,61 com anemia $p < 0,210$). Apenas o score Mehran mostrou uma capacidade preditiva significativamente menor nos doentes com hemoglobina <11 g/dL (AUC 0,51, $p < 0,044$).

Conclusões: Na nossa amostra, a anemia foi uma comorbilidade frequente em doentes com SCA. Os scores de risco de hemorragia estudados mostraram uma capacidade de previsão adequada em doentes com anemia leve.

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Introduction

The incidence of major bleeding in patients with acute coronary syndromes (ACS) ranges from 3 to 5%.¹⁻⁵ Major bleeding events are associated with worse outcomes in this clinical setting.⁶⁻⁸ Several bleeding risk scores⁹⁻¹¹ have been developed in recent years in order to properly predict bleeding complications in patients with ACS, and their use is recommended in the current clinical guidelines.¹² However, it has been suggested that these scores have lower predictive ability in the elderly¹³ and in patients with comorbidities.

Anemia is a common comorbidity among patients with ACS,¹⁴ and its prevalence is expected to increase due to the aging of the population. Anemia is associated with higher risk for both bleeding and ischemic complications in patients with ACS.¹⁵ Information on the predictive ability of bleeding risk scores in patients with anemia is scarce; no study has assessed the performance of bleeding risk scores according to hematocrit status in patients with ACS. The aim of this study was to assess the predictive ability of the most widely used bleeding risk scores according to anemia status in a series of consecutive patients with ACS from routine clinical practice.

Methods**Study design and population**

This is an observational single-center registry, conducted at a tertiary care hospital in Spain (Hospital Universitari de Bellvitge, l'Hospitalet de Llobregat, Barcelona). All consecutive ACS patients admitted to the coronary care unit between October 2009 and April 2014 were prospectively included. Informed consent was provided by all patients before their inclusion in the study. Confidential patient data were protected according to current national directives. This manuscript was revised for publication by the Clinical Research Ethics Committee of Bellvitge University Hospital (IRB00005523).

The primary outcome was in-hospital major bleeding according to the CRUSADE,⁹ Mehran¹⁰ and ACTION¹¹ definitions.

Definitions, data collection and management

Non-ST-segment elevation ACS was defined as the presence of chest pain during the previous 48 hours with ST-segment

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