LETTER TO THE EDITORS

Identifying very low-risk STEMI patients for early ICU discharge in the COVID-19 era

Omar Abdul-Jawad Altisent1,2 · Xavier Carrillo1,2 · Rishi Puri3 · Antoni Bayés-Genís1,2

Received: 1 June 2020 / Accepted: 30 June 2020 / Published online: 13 July 2020
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Keywords STEMI · Primary percutaneous coronary intervention · COVID-19

Sirs:

Assessment of individual patient risk for short-term outcomes following acute ST-elevation myocardial infarction (STEMI) has focused on risk scores with high sensitivity to identify high-risk patients [1]. By contrast, there is a lack of uniformly accepted scores for predicting the absence of complications following primary percutaneous intervention (pPCI), and current guidelines still recommend admission in intensive care unit (ICU) during at least 24 h after symptoms onset in patients with uncomplicated STEMI [1–3]. Minimizing ICU admissions, particularly in the current COVID-19 era, is paramount for minimizing patient exposure and optimizing resource allocation [4–6].

We hypothesized whether in the era of regional pPCI reperfusion networks, uncomplicated STEMI patients remaining event-free following prompt TIMI 3 flow restoration, would facilitate early discharge from the ICU [7, 8]. The present study aimed to identify predictors of very low-risk STEMI patients following uncomplicated pPCI, and to assess the safety of an early ICU discharge strategy.

To test our hypothesis, we analyzed consecutive STEMI patients undergoing pPCI in our referral area (~850,000 inhabitants) arriving within 12 h after symptom onset, between 2012 and 2019 (n = 2185). Per protocol all patients received a loading dose of 300 mg of aspirin plus 600 mg of clopidogrel or 180 mg of ticagrelor or 60 mg of prasugrel before the procedure. We recorded in a prospective dedicated database clinical characteristics, peri-procedural complications including arrhythmias, Killip-Kimball class, reperfusion time, and procedural characteristics; 24-h ICU cardiac complications including ventricular fibrillation/tachycardia, A-V block or asystole, acute pulmonary edema, mechanical ventilation, shock, acute stent thrombosis and cardiac death; and 30-day cardiac death. Patients were divided in two cohorts: a derivation cohort (n = 1492; years 2012–2016) to identify independent very low-risk predictors; and a validation cohort (n = 693; years 2017–2019).

Univariate and multivariate logistic regression analysis were used to determine predictors of 24-h cardiac complications and 30-day cardiac death. Multivariate analysis included clinical and procedural predictors that exhibited a p value < 0.05 in the univariate analysis. First, multivariable-independent predictors allowed patient stratification in to very low-risk (odds ratio ≤ 0.85 for early cardiac complications and 30-day cardiac death) and other risk groups. Next, cardiac events beyond the first 6 h in the ICU were characterized in the very low-risk group. Finally, specificity to predict early cardiac complications and 30-day cardiac death in the very-low risk group was also assessed.

Derivation cohort independent predictors of very low-risk were age ≤ 75 years-old, absence of primary malignant arrhythmias during the first assistance, Killip-Kimball class I, radial access, absence of left main or three-vessel coronary disease, and successful angioplasty-stenting (defined as final TIMI 3 flow), as shown in Table 1. The same very low-risk predictors emerged in the validation cohort (data not presented).

In the derivation cohort, 144 of 1492 (9.7%) patients had a 24-h-cardiac event (21 patients with stent thrombosis); 50 (3.4%) suffered a 30-day cardiac death; and 638 (43%) met very-low risk criteria. In the very-low-risk group, seven patients (1.1%) had a 24-h-cardiac event, all...
due to stent thrombosis, one with concomitant ventricular fibrillation (specificity = 0.95, \( p < 0.01 \)). No 30-day cardiac deaths were recorded in the very low-risk group (specificity = 1, \( p < 0.01 \)).

In the validation cohort, 78 of 693 (11.3\%) patients had a 24-h-cardiac event (16 of them stent thrombosis); 17 (2.5\%) suffered a 30-day cardiac death; and 369 (53\%) met criteria of very low-risk. In the very-low risk group, ten patients (2.7\%) had a 24-h-cardiac event, nine due to stent thrombosis, (one with concomitant ventricular fibrillation) and one due to heart failure (patient with active hemolytic anemia complicated with systemic inflammatory syndrome) (specificity = 0.88, \( p < 0.01 \)). No 30-day cardiac deaths were recorded in the very low-risk group (specificity = 1, \( p < 0.01 \)).

The 6-h ICU cut-point analysis performed in the very-low risk group only revealed one stent thrombosis event beyond the 6 h (0.9 \%), without other complications (specificity \( \approx 1, p < 0.01 \)).

This is the first study to focus on predictors of very low-risk of complications following STEMI in the pPCI reperfusion era. We found that younger patients with uncomplicated STEMI without complex coronary anatomy are highly likely to remain uncomplicated providing the infarct related artery is successfully opened via transradial pPCI. Importantly, the identified variables may be easily recorded upon completion of the pPCI procedure. Proper identification of such very low-risk patients should improve current post-procedural decision-making algorithms, including very early (within 6 h) patient transfer from the intensive care to a conventional ward, thus optimizing intensive care resources for other life-threatening pathologies.

Stent thrombosis is always concerning, and in this very-low risk stratification model, it was the least accurate event to predict; nevertheless, stent thrombosis usually manifests early post-pPCI. Indeed, only one patient presented stent thrombosis beyond 6 h after ICU admission. These data should be interpreted in the context of a regional pPCI reperfusion network that includes a high percentage of radial
access and stenting, and short reperfusion delay [2]. Nevertheless, pending confirmation in larger prospective studies, an early discharge strategy from the ICU within 6 h post-successful pPCI may be a reasonably safe option in almost half of STEMI patients.

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