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Can admission anaemia predict mortality after acute coronary syndrome?

Czy niedokrwistość stwierdzona przy przyjęciu do szpitala jest czynnikiem prognostycznym śmiertelności po ostrym zespole wieńcowym?

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We have read with interest the article entitled "Does admission anaemia still predict mortality six years after myocardial infarction?" by Tomaszuk-Kazberuk et al. [1]. The authors retrospectively studied 551 patients with the diagnosis of ST-segment elevation myocardial infarction (STEMI) who underwent successful primary percutaneous coronary intervention (PCI). They aimed to establish the relation between haemoglobin (Hb) concentration on admission and six-year all-cause mortality in patients with STEMI treated invasively. They concluded that admission anaemia in patients with STEMI was significantly correlated with all-cause mortality in a six-year follow up.

Recent studies have reported that anaemia is a potent predictor for in-hospital and long-term mortality in patients with acute coronary syndromes (ACS) and in those undergoing elective PCI [2–5]. Meroño et al. [6] showed that nasocomial anaemia without apparent bleeding in patients with ACS was a frequent complication (25%) and a predictor of mortality and cardiovascular complications during the first year of follow-up.

It is well known that anaemia is not a diagnosis; it is a manifestation of an underlying disorder. As mentioned by the authors, anaemia is observed more often in patients of advanced age and in the presence of comorbid diseases. Therefore, it is possible that the association between anaemia and adverse outcomes during ACS may be a result of comorbid conditions commonly found in anaemic patients, which are actually the major determinants of poorer clinical outcomes.

The study by Tomaszuk-Kazberuk et al. [1] is limited to a single Hb measurement on hospital admission. In this regard, Leshem-Rubinow et al. [7] demonstrated that in patients after a first myocardial infarction, the laboratory follow-up of Hb levels was relevant because low Hb at the first determination, and subsequent decreases in Hb levels over a period of two years, were independently associated with an adverse outcome. In another study, admission anaemia was an important predictor of short-and medium-term mortality after ACS, but non-significant after adjustment or when included in the Global Registry of Acute Coronary Events (GRACE) risk score [8].

Anaemic patients are usually under-treated with aspirin, beta-blockers and reperfusion therapies, all of which are known to prolong survival after ACS. Nikolsky et al. [9] found that up to 18% of patients with anaemia at the time of ACS were not receiving aspirin at one-year follow-up. Indeed, contemporary ACS therapy that involves aggressive anticoagulation and anti-platelet regime may be associated with sub-clinical blood loss. Futhermore, renin angiotensin blocking agents have a mild hematocrit-lowering effect, and these drugs may be used preferentially in higher risk patients [10]. In the present study, the authors did not give any information about the patients' medication or history of prior drug usage.

Tomaszuk-Kazberuk et al. [1] suggest that admission anaemia may be used for risk stratification in ACS patients. If so, interventions aimed at correcting it, such as packed red blood cell transfusion, could improve mortality and other cardiovascular outcomes among these patients. However, several studies have found harm associated with transfusion among patients in the strata of Hb > 10 to 11 g/dL [11, 12].

Anaemia is a modifiable condition, but there are no findings to support a more aggressive approach other than standard guidelines recommendations. As noted, transfusing anaemic patients may increase rather than decrease the risk of adverse events. The question remains as to why do we need more mortality indices (such as Hb), given that we already have several of them such as GRACE, Thrombolysis In Myocardial Infarction (TIMI), and many others.

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References

1. Tomaszuk-Kazberuk A, Bolińska S, Młodawska E et al. Does admission anaemia still predict mortality six years after myocardial infarction? Kardiol Pol, 2014; 72: 488–493.
2. Bolińska S, Sobkowicz B, Zaniewska J et al. The significance of anaemia in patients with acute ST-elevation myocardial infarction undergoing primary percutaneous coronary intervention. Kardiol Pol, 2011; 69: 33–39.
3. Rathod KS, Jones DA, Rathod VS et al. Prognostic impact of anaemia on patients with ST-elevation myocardial infarction treated by primary PCI. Coron Artery Dis, 2014; 25: 52–59.
4. Dündar C, Oduncu V, Erkol A et al. In-hospital prognostic value of hemoglobin levels on admission in patients with acute ST segment elevation myocardial infarction undergoing primary angioplasty. Clin Res Cardiol, 2012; 101: 37–44.
5. McKechnie RS, Smith D, Montoye C et al. Prognostic implication of anemia on in-hospital outcomes after percutaneous coronary intervention. Circulation, 2004; 110: 271–277.
6. Meroño O, Cladellas M, Recasens L et al. In-hospital acquired anemia in acute coronary syndrome. Predictors, in-hospital prognosis and one-year mortality. Rev Esp Cardiol, 2012; 65: 742–748.
7. Leshem-Rubinow E, Steinvil A, Rogowski O et al. Hemoglobin nonrecovery following acute myocardial infarction is a biomarker of poor outcome: A retrospective database study. Int J Cardiol, 2013; 169: 349–353.
8. Timóteo AT, Hamad H, Miranda F et al. Can the presence of anemia on admission improve the predictive value of the GRACE risk score for short- and medium-term mortality after acute coronary syndrome? Rev Port Cardiol, 2012; 31: 279–285.
9. Nikolsky E, Aymong ED, Halkin A et al. Impact of anemia in patients with acute myocardial infarction undergoing primary percutaneous coronary intervention: analysis from the Controlled Abciximab and Device Investigation to Lower Late Angioplasty Complications (CADILLAC) Trial. J Am Coll Cardiol, 2004; 44: 547–553.
10. Marathias KP, Agroyannis B, Mavromoustakos T et al. Hematocrit-lowering effect following inactivation of renin-angiotensin system with angiotensin converting enzyme inhibitors and angiotensin receptor blockers. Curr Top Med Chem, 2004; 4: 483-486.
11. Alexander KP, Chen AY, Wang TY et al. Transfusion practice and outcomes in non-ST-segment elevation acute coronary syndromes. Am Heart J, 2008; 155: 1047–1053.
12. Aronson D, Suleiman M, Agmon Y et al. Changes in haemoglobin levels during hospital course and long-term outcome after acute myocardial infarction. Eur Heart J, 2007; 28: 1289–1296.

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Authors' response

We are grateful to Koza and Birdal [1] for their interest in, and comments on, our article [2]. In our study, we showed that admission anaemia in patients with ST-segment elevation myocardial infarction (STEMI) treated invasively significantly correlated with all-cause mortality in a six-year follow up. Many studies have reported that anaemia is a predictor of in-hospital and short-term, but not long-term, outcomes in patients with acute coronary syndromes (ACS) [3, 4].

Patients with myocardial infarction (MI) and anaemia have a high risk profile with coexisting diabetes, hypertension and renal failure [5]. It is well known that anaemia is a manifestation of various diseases such as heart failure and chronic kidney disease. We agree with the author's suggestion that the association between anaemia and adverse outcomes during ACS may be a result of comorbid conditions commonly found in anaemic patients. However, the effect of admission anaemia after MI is still intensively studied.

In our group, we analysed only a single haemoglobin (Hb) measurement on hospital admission because the study had a retrospective character. However, most of the studies also published recently also refer to Hb concentration on admission as the only marker [6, 7].

Some of the papers also took into account also hematocrit level [5]. Data relating erythrocytosis to clinical outcomes in patients with STEMI are is limited. Because erythrocytosis predisposes to a prothrombotic state, it can be associated with an increased risk of thrombotic complications in patients with STEMI undergoing primary percutaneous coronary intervention. Although not as strong a predictor of mortality as anaemia, erythrocytosis might be also associated with increased short-term mortality compared to a normal hematocrit. The authors concluded that the measurement of hematocrit can be used as a useful prognostic marker in patients with STEMI.

Moreover, Huang et al. [8] recently reported that serum iron concentration was significantly lower in those with ACS in whom left ventricular ejection fraction had not improved ≥ 10% from baseline regardless of Hb level. Serum iron concentration decreased as Thrombolysis In Myocardial Infarction (TIMI) risk score increased. In addition, lower serum iron concentrations were associated with higher levels of inflammatory markers. Multiple linear regression analysis showed that baseline serum iron concentration can predict left ventricular systolic function six months after primary angioplasty for acute MI even after adjusting for traditional prognostic factors.

Despite the strong correlation between anaemia and poor prognosis after MI, clinical risk scores like Global Registry of Acute Coronary Events (GRACE) does not include Hb concentration. Meneveau et al. [9] demonstrated that baseline anaemia, when added to the GRACE risk score, reclassified early risk (in-hospital and 30 day mortality) in a significant proportion of ACS patients.

Anaemia is indeed a modifiable clinical factor, but blood transfusion is controversial for anaemic patients with acute MI. A few previous studies have reported an increased risk of mortality associated with transfusion [10, 11]. On the other hand, Salisbury et al. [11] who investigated 35,000 patients with ACS, including 1,778 after blood transfusion, concluded that the majority of patients undergoing transfusion in clinical practice cannot be matched with the rest of the patients due to their markedly different clinical profiles. Among comparable patients, blood transfusion was associated with a lower risk of in-hospital mortality.

These findings suggest that previous observational reports of increased mortality with transfusion may have been influenced by selection bias. There is the a need for randomised trials to establish the role of transfusion during acute MI.

We would like to conclude that therapies aimed to correct anaemia, the Hb value threshold at which to treat, and the target Hb value, still remain sources subjects worthy of investigation and debate.

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References

1. Koza Y, Birdal O. Can admission anaemia predict mortality after acute coronary syndrome? Kardiol Pol, 2014; 72: 991–992.
2. Tomaszuk-Kazberuk A, Bolińska S, Młodawska E et al. Does admission anaemia still predict mortality six years after myocardial infarction? Kardiol Pol, 2014; 72: 488–493.
3. Sabatine MS, Morrow DA, Giugliano RP et al. Association of hemoglobin levels with clinical outcomes in acute coronary syndromes. Circulation, 2005; 111: 2042–2049.
4. Nikolsky E, Aymong ED, Halkin A et al. Impact of anemia in patients with acute myocardial infarction undergoing primary percutaneous coronary intervention: analysis from the Controlled Abciximab and Device Investigation to Lower Late Angioplasty Complications (CADILLAC) Trial. J Am Coll Cardiol, 2004; 44: 547–553.
5. Greenberg G, Assali A, Vaknin-Assa H et al. Hematocrit level as a marker of outcome in ST-segment elevation myocardial infarction. Am J Cardiol, 2010; 105: 435–440.
6. Dündar C, Oduncu V, Erkol A et al. In-hospital prognostic value of hemoglobin levels on admission in patients with acute ST segment elevation myocardial infarction undergoing primary angioblasty. Clin Res Cardiol, 2012; 101: 37–44.
7. Aronson D, Suleiman M, Agmon Y et al. Changes in haemoglobin levels during hospital course and long-term outcome after acute myocardial infarction. Eur Heart J, 2007; 28: 1289–1296.
8. Huang CH, Chang CC, Kuo CL et al. Serum iron concentration, but not hemoglobin, correlates with TIMI Risk Score and 6-month left ventricular performance after primary angioplasty for acute myocardial infarction. PLoS One, 2014; 9: e104495. doi: 10.1371/journal.pone.0104495. eCollection 2014.
9. Meneveau N, Schiele F, Seronde MF et al. Anemia for risk assessment of patients with acute coronary syndromes. Am J Cardiol, 2009; 103: 442-447.
10. Alexander KP, Chen AY, Wang TY et al. CRUSADE Investigators. Transfusion practice and outcomes in non-ST-segment elevation acute coronary syndromes. Am Heart J, 2008; 155: 1047–1053.
11. Salisbury AC, Reid KJ, Marso SP et al. Blood transfusion during acute myocardial infarction: association with mortality and variability across hospitals. J Am Coll Cardiol, 2014; 64: 811–819.

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