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Correspondence

Association between red blood cell parameters & atrial fibrillation after acute myocardial infarction

Sir,

We read with interest the study by Distelmaier and colleagues[1]. They analyzed the association between the blood parameters and new-onset atrial fibrillation (AF) after acute myocardial infarction (MI), as diagnosed with coronary angiography. The patient group with the occurrence of AF after AMI had a significantly higher level of haemoglobin and higher red blood cell counts compared with the group without. The odds ratios of haemoglobin and the red blood cell count for the occurrence of AF were significantly high. The occurrence of AF is multifactorial, and the parameters predictive of AF remain to be explored; therefore, identifying such parameters would be helpful to prevent the development of subsequent adverse complications and mortality in the management of MI patients. The findings of this study are thus valuable, although the authors did not fully seem to state a hypothesis and perspectives for the reported epiphenomenon.

In another recent study conducted by Oda *et al*[2], a higher level of haemoglobin was reported to be associated with AF. Both studies[1,2] appear to have found similar results, which indicate that it is necessary to think about the meaning of red blood cell parameters.

In our clinical experience, a good parameter for the occurrence of AF is ageing, which is referred to as an oxidative condition[3]. We have paid special attention to the relevance of oxidative stress in cardiometabolic pathologies. Notably, oxidative stress conditions are involved in the pathogenesis of AF[3,4]. Thus, we wonder if some patients had a relatively high red blood cell level (even though it was not at the level of polycytemia), which could have led to oxidative stress. For instance, information obtained from patients with pathologies related to hypoxia, including sleep apnoea syndrome, and measurement of oxidative stress markers should be included in future studies. Additional information about abdominal obesity and the smoking status (which are also associated with oxidative stress) should also be included. Distelmaier group study did not offer such data[1].

In the Oda group study[2], erythropoiesis, a factor associated with increased red blood cell parameters, was discussed in terms of the occurrence of AF. This seems to be an important point, considering that hypoxia can also stimulate erythropoiesis. Measuring the erythropoietin level may be of interest in future work. Linked to erythropoiesis, iron metabolism is another point to debate regarding the association between the red cell biology and heart pathophysiology. Ferritin has already been reported to be associated with an increased cardiovascular risk[5]. Measurement of the iron metabolism, therefore, needs to be simultaneously considered.

Hyperhaemodynamic states (accompanied with hyperviscosity)[2] and impaired rheological properties[6] caused by increased red blood cell parameters would be additional points, because these can enhance oxidative stress. Also, a relative decrease in the plasma volume (even if it is not at the level of obvious dehydration) leads to increased red blood cell parameters. Although this cannot be thought to contribute directly to the occurrence of AF, it may provide a potential basis for AF if overlapping some conditions (*e.g*. sympathetic nerve activation and oxidative stress) are also present[7].

The fact that the haematocrit level did not show a similar impact on the occurrence of AF in a manner proportional to the haemoglobin and red blood cell counts in this study[1] is seemingly confusing. This implies that subsequent investigation is necessary,

while it may also lead to a hint of hypothesis about the association between red blood cell parameters and AF. For more sophisticated future research based on this study[1], a detailed analysis of the heart rates and blood pressure levels at admission and prior to the onset of AF, as well as unification of the timing of data collection (blood and electrocardiogram examinations), clarification of the underlying diseases (*i.e*. valvular heart diseases)[8], and therapeutic situations (including fluid therapy) should be included. Although we outlined an aspect of cardiometabolic pathologies from the viewpoint of oxidative stress, further studies with hypotheses from a wide range of research fields are called for, because these will be useful to identify predictors of the onset of AF during the post-MI management.

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Authors' response

Sir,

We thank Kotani and colleagues for the appreciation of our work[1]. In view of the published data[2-4], we agree that oxidative stress might be potentially involved in the pathogenesis of atrial fibrillation. Increased blood viscosity has been identified as a sensitive marker for underlying oxidative stress[5,6]. It is tempting to speculate that our findings might be regarded as surrogate parameter for oxidative stress, showing an association between haematocrit and the occurrence of atrial fibrillation after acute myocardial infarction. The fact that in our study the haematocrit level did not show a similar impact on the occurrence of atrial fibrillation in a manner proportional to the haemoglobin and red blood cell counts might be purely owed to the small sample size and the retrospective study design. The blood count levels in our predominantly male study population (61%) were more in the upper normal range (95% percentiles: haemoglobin 15.9 mg/dl, haematocrit 47.8 per cent, erythrocyte count 5.3 T/l). We agree with Kotani and colleagues that the measurement of oxidative stress and antioxidant capacity might reveal valuable additional information and should be addressed by further studies. We also agree that unification of the timing of blood sample collection and additional clinical variables (*e.g*. heart rate and blood pressure prior to onset of atrial fibrillation, fluid therapy, *etc*.) is of potential interest. However, due to the retrospective nature of our nested-case control study we were not able to provide this information and should, therefore, be evaluated by future prospective studies. The present study was not designed to reveal the underlying pathophysiological mechanisms of new onset of atrial fibrillation after acute myocardial infarction, but was purely conducted to identify novel predictors, that might be objective of further studies.

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