Editorial Commentary

Could platelet washing be used to reduce adverse reactions in patients receiving platelet component transfusions?

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Comment on: Ikebe E, Matsuoka S, Tanaka A, *et al.* Reduction in adverse transfusion reactions with increased use of washed platelet concentrates in Japan-A retrospective multicenter study. Transfus Apher Sci 2019;58:162-8.

Received: 15 May 2019; Accepted: 27 May 2019; Published: 04 June 2019.

doi: 10.21037/aob.2019.05.02

View this article at: http://dx.doi.org/10.21037/aob.2019.05.02

Platelet component transfusion aims to bring substantial benefits to patients requiring them, either suffering from active bleeding or exposed to a bleeding condition. However, it is not devoid of side effects and, depending on the hemovigilance system in force, it is reported that nearly 5% of transfused platelet components are associated with complications, with one in ten being serious (1,2). This is around double that for all blood components, according to the French Hemovigilance system which is exhaustive by law (3). Since patients undergoing platelet transfusion are particularly fragile, the desire to limit these complications is particularly strong (4,5). Now, it has consistently been reported that most platelet transfusion hazards are inflammatory in nature (6,7), and the main constituents implicated in these inflammatory complications are biological response modifiers that accumulate in platelets during storage or which platelets secrete when stimulated by any type of stress, at all times in the processes (8,9). Moreover, two types of inflammatory complications are feared, since they are potentially avoidable: febrile non-hemolytic transfusion reactions (FNHTRs) and allergic (or allergic-type) reactions (2). Nonetheless, the consistent use of platelet additive solutions (PAS), which have evolved over time to maintain platelet function more efficiently and activate platelets less, has proven to have beneficial effects in many studies carried out, particularly in Europe (10). In many European countries, whole blood-derived (buffy-coat) pooled platelet components are used, unlike in other continents, where either apheresis platelets or plasma-rich platelets predominate (11). In addition, conclusive reports indicate that the longer platelet components are stored, the more likely it is that pro-inflammatory biological response modifiers are secreted, exposing the patient to the risk of an adverse reaction (8,9,12,13). Platelet component storage durations also vary from three to 7 days depending on the country and its regulations. Japan, a country which uses apheresis platelets only and no PAS, and stores platelets no longer than three to 4 days, has been exploring alternative methods of reducing adverse reactions associated with platelet component transfusion, mainly through the use of washing (to reduce the plasma content to as low as 5%) (14-16), and occasionally absorption columns (17,18); automation has also been made available for washing platelets (19,20). It should be noted that washing has been reported to efficiently mitigate the inflammatory risks of transfusion (in addition to eliminating conflicting antibodies) since the early 2000s (21,22).

A more recent survey conducted by the Japanese Red Cross has evaluated new systems to obtain readily washed platelets using automats (comparing manual procedures and unwashed components) (23). Our Japanese colleagues have added to the numerous studies on platelet washing, mainly conducted in country. In particular, it was observed that washing reduced the amount of soluble CD40-Ligand in platelet bags, the one factor chiefly responsible for inflammatory reactions (24). They report a dramatic reduction in inflammatory reactions and principally allergic reactions, while rates of FNHTRs were almost

unchanged (23). This data is particularly important as it brings novelty to the technical possibilities by mitigating the associated risks of platelet transfusion. It is validated for apheresis platelets, and Europeans would be eager to discover whether it is also applicable to whole-blood-derived platelets. Indeed, a recent French survey provided clear evidence that the latter in general carry a far smaller risk than apheresis platelets (25). This recent Japanese study takes a clinical perspective, since it does not yet indicate whether washed platelets perform well at maintaining vascular integrity and fixing attritions; in bleeding patients, it remains to be seen whether there is no further need for additional transfusion episodes (which would in itself increase risks in general and that of becoming all immunized in particular). Moreover, how this system is compatible with the pathogen reduction or inactivation procedures which tend to be deployed worldwide (26) remains another unanswered question. This study also takes a pathophysiological standpoint, since it suggests that there is another mechanism—independent of sCD40L and other factors—that is not targeted by washing and which remains responsible for FNHTR and not for allergic reactions. A mechanistic investigation of ours revealed that the difference between FNHTR and allergic-type reactions could be due to differential threshold levels of sCD40L and MIP-1a, for instance (27). The currently reported data from the Japanese Red Cross may challenge this model or reveal that it is even more complex than previously thought.

On the whole, there is much interest in washing procedures and in buffers used to bath platelets and render them unreactive to pathogenic stimuli, but strongly reactive to adhesion and aggregation stimuli (28,29), while maintaining their vascular healing propensity. Important questions are still being addressed and clinical data on efficacy are eagerly anticipated, as previously indicated several years ago (30).

Acknowledgments

The authors' research activity on the topics is mainly supported by grants from the Etablissement Français du Sang and the association "Les Amis de Rémi". The authors gratefully acknowledge their colleagues Dr. Sandrine Laradi and Dr. Hind Hamzeh-Cognasse, former PhD students, with special thanks to Dr. Kim Ahn Nguyen, Dr. Chaker Aloui, Dr. Caroline Sut and Dr. Sofiane Tariket, and skillful technicians Mr. Charles-Antoine Arthaud, Ms. Jocelyne Fagan and Ms. Marie-Ange Eyraud.

Footnote

Provenance and Peer Review: This article was commissioned and reviewed by the Section Editor Dr. Jinhui Xie (Tianjin Blood Center, Tianjin, China).

Conflicts of Interest: Both authors have completed the ICMJE uniform disclosure form (available at http://dx.doi.org/10.21037/aob.2019.05.02). OG serves as an unpaid editorial board member of *Annals of Blood* from Sept 2017 to Sept 2019. The authors have no other conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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doi: 10.21037/aob.2019.05.02
Cite this article as: Garraud O, Cognasse F. Could platelet washing be used to reduce adverse reactions in patients receiving platelet component transfusions? Ann Blood 2019;4:9.

