

Platelet Additive Solution

For decades, platelets have been collected from whole blood or as a separate blood component by apheresis. Conventionally, these platelets are suspended in 100 percent plasma. However, interest is growing in using platelets stored in PAS whereby approximately 65 percent of plasma in a unit of platelets is replaced by an electrolyte-based chemical solution. PAS platelets offer two main advantages over conventional platelets: They are associated with fewer low-grade transfusion reactions and free up plasma for other purposes. Like

AMICUS-derived, leukoreduced apheresis platelets. A similar product, Isoplate Solution Platelet Additive Solution F (PAS-F), was approved in 2013, and is intended for use with products collected using Terumo BCT's Trima Accel System.

Fewer Low-Grade Transfusion Reactions

According to Steven Kleinman, MD, clinical professor of pathology at the University of British Columbia and AABB's senior medical advisor, randomized controlled trials and observational studies have shown

plasma lowers the rate of reactions to platelet transfusion, specifically allergic transfusion reactions and febrile nonhemolytic transfusion reactions," said Kleinman.

Claudia Cohn, MD, PhD, director of the blood bank laboratory at the University of Minnesota, has seen this benefit firsthand when her facility started using PAS platelets in 2011. As one of the largest centers for umbilical cord stem cell transplants, her facility uses about 1,000 units of platelets each month.

Her facility took part in a large multicenter study of PAS-C. The results showed a significant reduction in overall transfusion reactions, allergic transfusion reactions, and febrile nonhemolytic transfusion reactions among 14,000 transfusions at six study sites.

"Many transfusion reactions occur because of the plasma component in products. But, if you reduce the amount of plasma, you theoretically reduce the amount of transfusion reactions and that's just good for patients," said Cohn.

Advantages exist for lowering the rate of allergic transfusion reactions and febrile nonhemolytic transfusion reactions, even though these reactions are generally mild. In addition to being uncomfortable for patients, these events sometimes force clinical staff to stop the transfusion or prompt a work-up to ensure that the fever is not being caused by something more serious.

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conventional platelets, PAS platelets can survive in storage for five days and are viable when transfused.

PAS has been available in the United States for about four years. The InterSol Solution Platelet Additive Solution 3 (PAS-C) was approved by the U.S. Food and Drug Administration in 2009. It is designed to replace a proportion of the plasma used in the storage of Fenwal's

that PAS platelets are equivalent to platelets collected in standard plasma, with similar outcomes for clinical bleeding. "We are not increasing the hemostatic efficacy," said Kleinman. "The platelets don't work better, but they work as well."

However, their use results in less low-grade transfusion reactions among recipients. "We now have evidence that reducing the amount of



Plus, the potential added cost of PAS platelets would likely be offset by not having as many allergic transfusion reactions.

Similar Corrected Count Increment

Karen King, MD, medical director of hemapheresis and associate medical director of transfusion medicine at Johns Hopkins Hospital, brought PAS platelets to her institution in June 2012, where they were used interchangeably with conventional platelets. After six months, she and her colleagues determined in a retrospective review that PAS platelets were associated with nearly a 50 percent decrease in allergic transfusion reactions. They also looked at whether patient response to platelet transfusion — as measured by corrected count increment — was equal, better or worse.

“Whenever you manipulate platelets, you are concerned that you are losing platelets and decreasing viability, so that there may be some impact on the efficacy of the product once transfused,” said King. “If you have a decreased corrected count increment, you’ll have to use more platelet product, which could be detrimental to inventory issues and, of course, a huge cost increase.”

Although King found that PAS platelets were associated with a statistically significant decrease in corrected count increments at 1 to 4 hours post transfusion, no significant difference was seen at 12 to 24 hours.

More Plasma for Other Purposes

Another potential advantage is that using PAS leaves more plasma available for other purposes, should centers decide to collect the additional plasma. For example, because only 100 ml of plasma is needed for a unit of PAS platelets (compared with 300 ml of plasma for conventional platelets), the 200 ml of plasma that are no longer necessary could be used for another transfusion or to make other products, such as coagulation factor concentrate.

Research in Progress

The conceivable advantages and disadvantages of PAS platelets may not be fully known yet. One unresolved question is whether using PAS platelets might reduce the risk for transfusion-related acute lung injury, or TRALI, which is thought to be caused by antibodies present in the plasma. Theoretically, if TRALI is related to the strength of antibodies in the plasma and the amount of plasma that is transfused, then reducing their volume by two-thirds might lower risk for the complication. But it is unclear if that reduction is sufficient and there is no direct observational data on this hypothesis. Along these lines, Cohn is hoping to conduct a study to see if levels of bioactive lipids, which are present in the plasma fraction and may be related to TRALI, are lower in PAS platelets than conventional platelets.

In addition, King and colleagues are interested to find out if PAS platelets are equivalent to concentrated platelets for the prevention of allergic transfusion reactions. Concentrating platelets is associated with platelet loss due to the manipulation, decreased corrected count increments and additional labor. “If we could stop concentrating products for the prevention of allergic transfusion reactions, it would be a significant cost savings in terms of labor, it would improve laboratory efficiency, and it would be better for patient corrected count increments,” King said.

King and Cohn also would like to determine if PAS platelets have lower titers for ABO antibody by virtue of having less plasma.

Lastly, according to Kleinman, research also is underway on a PAS that requires only 5 to 10 percent plasma.

