Platelet Components

Description

Platelets prepared from individual units of WB by centrifugation are referred to as "random-donor platelets" or "whole-blood-derived platelet concentrates" (herein referred to as PCs). Although units should contain at least 5.5×10^{10} platelets, most units contain more than this amount. PCs should be suspended in sufficient plasma (usually 50 to 70 mL) to maintain a pH greater than 6.2 throughout the storage period.[1]

A platelet unit that is collected from an individual donor during a 1- to 2-hour apheresis procedure (Apheresis Platelets) must contain at least 3×10^{11} platelets,[1] which is equal to 4 to 6 PC units. The volume of plasma in this component varies from 200 to 400 mL. The indications, contraindications, precautions, dosage, and administration of Apheresis Platelets are the same as those for PCs, with the exception that Apheresis Platelets are often preferentially used when the platelets to be transfused must have a specific antigen profile because of platelet refractoriness. (See Management of Platelet Refractoriness in Chapter 4: Transfusion Practices.)

Conventional platelet products are stored in the blood bank for as long as 5 days at 20 to 24 C with constant, gentle agitation. Platelet storage can be extended up to 7 days if additional requirements are met.[35] Platelets pooled in an open system expire 4 hours from the time the system is opened. Prepooled PCs have the same outdate as Apheresis Platelets. It has been demonstrated that 5- to 7-day-old platelets have nearly normal posttransfusion recovery and survival.[36-37]

The FDA has approved the use of platelet additive solution (PAS) in Apheresis Platelets. The addition of PAS to these platelets involves 65% of the plasma volume being replaced with this sterile buffered solution containing citrate, phosphate, and acetate. PAS platelets have been shown to have a significantly

reduced incidence of allergic transfusion reactions without affecting platelet increases in patients at 12 to 24 hours after transfusion.[38] Thus, indications for PAS platelet transfusion include repeated allergic transfusion reactions or ABO-mismatched hematopoietic progenitor/stem cell transplantation (HSCT) where the second or third choice of platelets is used.

Pathogen inactivation of platelets has been approved by the FDA, with the use of amotosalen plus ultraviolet A (UVA) light technology. These components, referred to as pathogen-reduced platelets, have been shown to inactivate bacteria species that commonly contaminate platelets, as well as viruses and parasites. Platelets treated with the amotosalen/UVA light phototherapy system can be stored in either plasma or PAS. Patients receiving pathogen-reduced platelets do not demonstrate any difference in mortality, clinically significant bleeding, or severe bleeding.[39] However, the 1- and 24-hour corrected count increment (CCI) is lower with pathogen-reduced platelets, and slightly more frequent transfusions of these risk-reduced platelets may be required. (See Pathogen Inactivation section later in this chapter.)

Cold-stored platelets are an emerging product as they do not need to be agitated, minimize bacterial growth, and expand availability to areas such as prehospital settings where conventional platelets routinely are unavailable. Cold-stored platelets can be stored between 1-6 C without agitation for up to 3 days with an FDA variance.[40] Although these cold-stored platelets have lower recoveries and survival compared to conventional platelets, as well as high discard rate due to clot formation and short expiration time, they also have an activated in-vitro hemostatic profile that may be beneficial in bleeding patients.[41] Further studies with alternative storage solutions and increased duration times are needed to better characterize this unique product.

Indications

Platelets are indicated for treatment of bleeding associated with thrombocytopenia (platelet counts usually <50,000/μL) or for

use in patients with functionally abnormal platelets (congenital or acquired disorders; see Chapter 3: Hemostatic Disorders).[42-44] They are also indicated during surgery or before certain invasive procedures in patients who have platelet counts <50,000/μL. Prophylactic transfusion of platelets is common for patients who have platelet counts <5000 to 10,000/μL associated with marrow hypoplasia resulting from chemotherapy, tumor invasion, or primary aplasia.[45-47] This range may be higher for patients with complicating clinical factors.[46] Additionally, platelet transfusions are often included in massive transfusion protocols. In the setting of massive bleeding, improved survival has been observed in patients who received a higher ratio of platelet-to-RBC transfusions.[48,49] AABB guidelines for platelet transfusion are published and available.[50] See also Chapter 4: Transfusion Practices.

Contraindications and Precautions

In patients with rapid platelet destruction, such as immune thrombocytopenia (ITP) and disseminated intravascular coagulation (DIC), transfusion solely to achieve a platelet increment is not clinically appropriate. Patients with thrombocytopenia secondary to sepsis or hypersplenism may also fail to demonstrate an increment in platelet count. In such patients, platelet transfusion should be used in the presence of active bleeding with clinical monitoring. Platelet transfusions are relatively contraindicated in patients with thrombotic thrombocytopenic purpura (TTP) and heparin-induced thrombocytopenia (HIT), but platelets may be transfused if these patients are bleeding.[51]

Transfusion reactions, including febrile nonhemolytic and allergic reactions, may occur. The treatment of fever should not include antipyretics containing aspirin (acetylsalicylic acid), because aspirin will inhibit platelet function. Rapid infusion of platelets may cause circulatory overload and other complications related to increased intravascular volume.[52] The risk of transfusion-transmitted viral disease from either PCs or Apheresis Platelets is small and similar to the risk associated with any other blood component (See Chapter 7: Adverse Effects of Blood Transfusion).