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Platelet transfusion

Bleeding in a number of acute and chronic conditions that require medical and surgical treatment may be prevented and treated with platelet transfusion. The purpose of this intervention is to compensate insufficient production of platelets or correct defective platelet function. A detailed set of guidelines for the clinical use of platelet concentrates (PC) has been recently published by the *American Society of Clinical Oncology*.[1] These guidelines can be downloaded from the URL: *http://www.asco.com*.

PC may be obtained from whole blood collected into a multiple plastic bag set. The most popular procedures for the preparation of PC from whole blood donations are the platelet-rich plasma (PRP) and the buffy-coat (BC) methods. In the former, mostly used in the USA, whole blood is centrifuged at low speed, the PRP is transferred to a satellite bag, which is then centrifuged at high speed. The platelet button is left undisturbed in 50-70 mL plasma to favor disaggregation. Finally, platelets are resuspended and stored at 20-24°C under continuous gentle agitation for a maximum of 5 days. In the latter method, most popular in Europe, whole blood units are first centrifuged at high speed in order to concentrate most white cells and platelets into the BC layer formed at the interface between red cells and plasma. BC can be further processed into PC as individual units or as a pool of BC diluted in autologous plasma or in crystalloid media. Both options involve low speed centrifugation and transfer of the supernatant PC into an appropriate bag. Platelets may also be prepared by apheresis, the automated process of blood collection, on line centrifugation and return to the donor of the unwanted cells and plasma. PC may undergo leukoreduction to prevent significant side effects such as anti-HLA alloimmunization,[2,3] transmission of leukotropic viruses[4,5] or non-hemolytic febrile transfusion reactions.[2] To prevent transfusion-associated graft-versus-host disease in susceptible recipients, these products must be irradiated.[6] Good quality platelets obtained from whole blood and from apheresis show similar clinical effectiveness. The use of platelets to prevent hemorrhage is called the *prophylactic approach* while their use to *treat* the actual bleeding episodes is termed the *therapeutic approach*. The choice to transfuse platelets prophylactically stems from several studies showing a decrease in the incidence of hemorrhagic deaths in leukemic patients following this policy. The platelet count above which platelet transfusion is not necessary is termed the *platelet transfusion trigger*. Recently, in stable oncohematologic recipients the prophylactic trigger of platelet transfusion has been decreased from the traditional level of 20×10^9/L to 10×10^9/L.[7,8] Transfusion at higher levels may be necessary in patients with hemorrhage, fever, infection, or a large spleen, and in those receiving treatment with drugs affecting platelet function (the so called *detrimental factors*), or undergoing surgical treatment. The effectiveness of prophylactic platelet transfusion is determined by the evaluation of the corrected count increment (CCI), i.e. the post-transfusion platelet count increment divided by the number of platelets transfused and multiplied by the patient's body surface area. The CCI can be determined 10-60 minutes and 20-24 hours after the transfusion. Platelet transfusion is considered effective when it is associated with a CCI $\geq 7.5\times10^9$/L at 1 hour or $\geq 4.5\times10^9$/L at 20-24 hours.

About 15% of chronic recipients of platelets become refractory to platelets from random donors, i.e. they present repeated CCI at 1 and 24 hours below the above values. This is mainly due to the development of antibodies against antigens of the human leukocyte antigen (HLA) system, which are present on the platelet membrane. Refractoriness may cause longer hospital stay and higher costs in addition to having clinical implications for the patient's safety.[9] In fact, because of the lack of adequate post-transfusion platelet count increments, these patients tend to be repeatedly and ineffectively transfused. In our institution we have chosen to try to overcome refractoriness by random donor platelet cross matching after having experienced difficulties with a previous strategy based on the use of HLA typed platelets. This policy was associ-

ated with effective transfusions in approximately 50% of occasions. In disorders of platelet function such as Glanzmann's thrombasthenia, Bernard-Soulier, gray platelet and Scott syndromes and storage pool disease, other interventions, including the use of DDAVP, corticosteroids and antifibrinolytic agents, might be necessary.[10] Unfortunately, in these conditions specific triggers for platelet transfusion cannot be easily identified because platelet count may be normal. Therefore, in these cases careful observation of the clinical development of hemorrhage is of utmost importance and the ultimate target is to restore sufficient platelet function. The lack or incomplete expression of specific glycoproteins in some platelet function disorders has raised the concern that the administration of normal platelets could trigger the development of antibodies capable of decreasing the efficacy of future platelet transfusions. However, this seems quite uncommon and is not considered a reason to withhold platelet support. In conclusion, use of good quality products, regular monitoring of patients and close co-operation between the clinical staff and the transfusion service are the cornerstones of effective platelet transfusion.

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Note

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Desmopressin in the treatment of patients with defects of platelet function

Desmopressin (1-deamino-8-D-arginine vasopressin, DDAVP) is a synthetic analog of the antidiuretic hormone vasopressin. Like the natural antidiuretic hormone, desmopressin increases the plasma levels of factor VIII and von Willebrand factor (VWF), with the advantage, compared to vasopressin, that it produces little or no vasoconstriction, no increase in blood pressure, and no contraction of the uterus or gastrointestinal tract, so that it is well tolerated when administered to humans.[1] In 1977, desmopressin was used for the first time in patients with mild hemophilia A and von Willebrand's disease (VWD) for the prevention and treatment of bleeding. The clinical indications for desmopressin quickly expanded beyond hemophilia and VWD. The compound was shown to be efficacious even in bleeding disorders not involving a deficiency or dysfunction of factor VIII or VWF, including congenital and acquired defects of platelet function and such frequent abnormalities of hemostasis as those associated with chronic kidney and liver diseases. Desmopressin has also been used prophylactically in patients undergoing surgical operations characterized by large blood loss and transfusion requirements. Some of these indications have been strengthened by the experience accumulated; others have not been supported by rigorous clinical trials or have been superceded by the advent of more