News from the Transfusion Services Laboratory

Transfusion Reactions

By Marilyn Hamilton, MD, PhD

Transfusion of blood products can never be completely safe. Suspected transfusion reactions should be reported to the TSL immediately for evaluation so that the safest possible blood can be given to the patient in the future. If in doubt, report and let the investigation take place.

Hemolytic Transfusion Reactions: Acute intravascular hemolysis of donor red cells with hemoglobinemia and hemoglobinuria is associated with transfusion of ABO incompatible blood, usually secondary to process error, which accounts for > 85% of deaths associated with this severe reaction. Antibodies to minor (non AB) antigens, developed in response to a previous transfusion, are also associated with acute hemolysis. Rh are the most common antigens in this class but there are many others. In newborns, antibodies from the mother are associated with these reactions. These antibodies should be detected in the antibody screen, direct coombs test and cross match. Fever, nausea, pain, dyspnea and hypotension are the most common symptoms. Delayed extra vascular hemolysis may also occur with antibodies to minor antigens. RBCs disappear from the circulation in an accelerated manner and heme products, particularly bilirubin, accumulate. Delayed reactions can be very hard to identify. Less severe HTR may also occur as a result of infusion of incompatible plasma components, invariably platelets. Antibodies of the donor lyse recipient RBCs. At CMH, when it is necessary to issue incompatible platelets to patients < 36 kg, we remove as much plasma as possible to limit this problem.

Febrile Nonhemolytic Transfusion Reactions: These reactions, traditionally defined as a rise in temperature of 1C, may be accompanied by chills, headache and nausea. Antipyretics address the fever but may do little to alleviate other symptoms, which develop towards the end of the transfusion but may occur 1-2 hours after it is completed. It is believed that cytokines produced by WBCs of the transfused product or patient’s antibodies to donor’s lymphocytes are responsible for the symptoms. Therefore, the reaction is associated with cellular blood products, RBC and platelets. At CMH, all cellular blood products are leukoreduced, which helps to minimize this problem.

Allergic and Anaphylactic Reactions: These reactions occur at the beginning of a transfusion. IgE of the patient interacts with an antigen in the blood. These reactions are plasma associated so occur most frequently with FFP, platelets and cryoprecipitate but may occur with RBCs. The mildest reactions, manifested by pruritus and hives, can be managed with diphenhydramine. These severe reactions can be life threatening. Respiratory difficulty, hypotension and GI symptoms are the hallmark signs and require immediate intervention. A unique situation occurs when a patient is totally deficient in IgA. Repeated transfusion can lead to IgE anti-IgA and anaphylactic reaction. In extreme situations it may be necessary to wash RBCs and platelets before transfusion.
Circulatory Overload: This is a special problem for our small patients. Pulmonary edema, which may not be manifested for several hours, is the main symptom. Respiratory difficulty, cyanosis, tachycardia and hypertension may be observed. The Transfusion Services Laboratory questions blood volumes in excess of 20 cc/kg except in cases where there is active bleeding. Slowing the transfusion can help limit this problem.

Bacterial Contamination: This can lead to sepsis but the immediate symptoms are associated with bacterial products, which have accumulated in the blood. High fever, rigors, hypotension and GI symptoms occur during or shortly after the transfusion. FFP and cryoprecipitate are stored frozen and therefore not associated with contamination. RBC and platelets are the products, which may be contaminated. Now all platelets are cultured to detect contamination.

Transfusion Related Acute Lung Injury (TRALI): This is acute pulmonary edema involving the entire lung fields over time occurring 1-6 hours after transfusion of plasma containing products. It most commonly occurs with plasma from multiparous donors. Hypotension, respiratory distress, cyanosis, tachycardia and fever may be observed. Donor antibodies to recipient’s leukocytes, HLA antigens and granulocyte antigens, are believed to initiate an immunological cascade and lung injury. This is very similar to respiratory distress syndrome and is a diagnosis of exclusion.

Transfusion Associated Graft-vs-Host Disease: This reaction occurs in immunosuppressed patients. Lymphocytes of the donor recognize HLA antigens of the recipient and proliferate to induce a graft-vs-host reaction. Immunologically intact patients can successfully contain the donor lymphocytes and graft-vs-host disease is not a problem. This process can be prevented by irradiation of the cellular blood products, RBC and platelets.

Post Transfusion Purpura and Neonatal Alloimmune Thrombocytopenia: This reaction of sudden, self-limiting thrombocytopenia occurs 5-10 days after transfusion, usually of RBCs, of a patient sensitized by previous transfusions. This reaction is characterized by the destruction of autologous platelets, which differentiates it from platelet alloimmunization. In newborns the antibodies are maternally derived and thrombocytopenia may be evident at birth. Anti-platelet reactivity is usually directed at the antigen PlA1 but other platelet specific antigens may be involved.

No Transfusion Reaction: Symptoms associated with the transfusion reactions discussed above can occur for many reasons that have nothing to do with the transfusion. Sometimes a suspected transfusion reaction will be reported but further investigation will indicate that a transfusion reaction did not occur. It is better to report a suspected reaction and let the lab investigate.

Reports of Transfusion Reaction Investigations: When a transfusion reaction is suspected it is documented in Meditech. This prints off in the Transfusion Services Laboratory and is evaluated by a physician, usually Marilyn Hamilton. Reports of this evaluation can be found in Meditech PCI under Laboratory Data, Blood Bank Reports. They are labeled “Eval”. When additional blood is ordered in Meditech on a patient who has had a previous suspected transfusion reaction, there is a pop up screen that warns that a previous suspected transfusion reaction has occurred.

CME Series
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Date: February 17, 2004
Time: 12:00 Noon
Location: Conference Room 2206.10 WT
Speaker: Joan Knoll, Ph.D.
Topic: Chronic Myelogenous Leukemia