Transfusion Medicine Update

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Acute, Non-Infectious Transfusion Reactions

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INTRODUCTION

Adverse events associated with blood transfusion therapy can be classified based on time of onset (acute vs. delayed) and etiology (immune vs. non-immune). Acute transfusion reactions generally occur during or within 2 hours of transfusion. Transfusion reaction manifestations may vary with the type of blood product transfused and the clinical condition of the recipient.

DESCRIPTION AND MANAGEMENT

When a transfusion reaction is suspected, the transfusion must be discontinued immediately, while evaluation of the event is performed. (Only mild allergic reactions may be restarted.) A normal saline drip should be started to maintain IV access, while a clerical check is performed at the bedside to verify that the unit being transfused is the unit intended for that particular patient (transfusion compatibility tag vs. patient identification band). Post-reaction blood and urine samples, along with the blood bag implicated in the reaction, should then be sent to the blood bank for further testing. The initial transfusion reaction evaluation by the blood bank is designed to rule out a hemolytic transfusion reaction. Once the laboratory evaluation is completed, the blood bank physician will review the case, provide a final diagnosis, and issue recommendations.

Acute Febrile Reactions

Because fever (alone or accompanied by chills/rigors) may be the first manifestation of a life-threatening reaction (e.g. acute hemolysis, transfusion-associated sepsis, transfusion-related acute lung injury), as well as, the more benign and common febrile non-hemolytic transfusion reaction (FNHTR), any significant increase in temperature (≥1ºC or 2ºF) occurring during transfusion must be taken seriously.

Acute Hemolytic Transfusion Reaction (AHTR): Besides fever and chills, other presenting signs/symptoms of an AHTR include: hypotension, flank pain, hemoglobinuria and hemoglobinemia. The most severe reactions result from transfusion of ABO-incompatible red cells, with resultant complement-mediated intravascular hemolysis and the release of vasoactive amines (e.g. histamine) and other mediators/cytokines, which cause vasodilation, hypotension, and contraction of bronchial and intestinal smooth muscle. The combined effects of these changes can bring about renal damage, DIC, shock and even death. These catastrophic consequences can be observed with transfusion of as little as 10-15 mL of incompatible blood. In an anesthetized recipient, red urine or microvascular bleeding (DIC) may be the only observable manifestations of an AHTR.

Early recognition and management of an immune AHTR is essential in minimizing/ preventing associated morbidity/mortality. It is critical to maintain adequate urine output with fluids and diuretics (furosemide). For treatment of hypotension, low-dose dopamine is preferred (enhances renal perfusion).

AHTRs may also arise from non-immune, in vitro hemolysis (use of non-isotonic IV solutions, heat, cold, or mechanical stress), most often manifested by asymptomatic hemoglobinuria. These tend to be self-limited and usually resolve within 24 hours. Maintenance of adequate renal perfusion is the focus of treatment, especially for patients with compromised renal function.

Febrile Non-Hemolytic Transfusion Reaction (FNHTR): FNHTRs are the most frequent adverse reactions observed with transfusion. Described as a temperature increase of ≥1ºC (2ºF) in relation to transfusion, they can also be accompanied by chills/rigors, hypertension, tachycardia and dyspnea. The symptoms most often present toward the end of the transfusion or within two hours post-transfusion. Usually self-limited, the symptoms occur secondary to the effects of cytokines actively released in vivo by interaction of a recipient's preformed anti-leukocyte antibodies with white cells present in the transfused blood component or from passively acquired cytokines in the product. The fever can be treated with antipyretics and meperidine has been found to be effective in treating the associated rigors. In those patients with repeated reactions, it may be beneficial to premedicate with antipyretics and/or use leukoreduced blood products

Acute Allergic Reactions

Allergic transfusion reactions range from mild itching and urticaria (hives) to generalized reactions with bronchoconstriction (wheezing), hypotension and shock.

Mild Allergic Transfusion Reaction: Mild allergic transfusion reactions are frequently observed with transfusion and thought to result from an allergic, antibody-mediated response to donor plasma proteins. They are characterized by pruritis and urticaria, during a transfusion. Antihistamines are generally effective in treating and/or preventing these reactions.

Generalized Allergic & Anaphylactic Transfusion Reactions: Generalized allergic reactions occur less frequently and, in rare cases, can progress rapidly to full-blown anaphylactic shock. Symptoms include: wheezing, GI upset and hypotension with no fever. Occurring primarily as an isolated episode to a particular donor, the causative allergen is seldom identified. These reactions can occur with as little as 5 mL of blood component transfused. Antihistamines, steroids and, in severe cases, epinephrine are useful in treatment/prevention of these reactions. When these measures are ineffective, the use of washed red blood cells and platelets may be necessary. Rarely, anaphylactic reactions due to anti-IgA antibodies in IgA-deficient recipients are seen. This should be suspected in previously untransfused patients. In such cases, specialized blood products – double-washed red cells/platelets and/or blood products derived from IgA-deficient donors – are required, in addition to steroid premedication.

Dyspneic transfusion reactions

These reactions are characterized by the development of shortness of breath, most often occurring toward the end of a transfusion or within two hours after transfusion. They differ in the changes in the systemic blood pressure and response to diuretics. (FNHTRs may also present with dyspnea.)

Circulatory Overload: Circulatory overload most often manifests as cardiogenic pulmonary edema secondary to a rapid infusion or large volume transfusion in a patient with cardiorespiratory compromise. Respiratory distress and hypertension are seen during or shortly after transfusion. These patients usually respond to diuresis and respiratory support with resolution of symptoms.

Transfusion Related Acute Lung Injury (TRALI): TRALI is usually attributed to the interaction of passively acquired donor antibodies directed against the recipient's white cells. Symptoms include: marked dyspnea, hypoxemia, and bilateral non-cardiogenic pulmonary edema. Fever and hypotension may also be present. Diuretics are ineffective and the patients classically require ventilatory support for 3-4 days followed by resolution of symptoms.

CONCLUSION

While the majority of acute transfusion reactions are transient and do not result in lasting sequelae, similarities in the presenting signs and symptoms among the various types of reactions make it impossible to differentiate a relatively benign event from the early stages of a severe, life-threatening transfusion reaction. Therefore, prompt recognition and appropriate action to limit exposure, initiate investigation by the blood bank and manage clinical manifestations of suspected transfusion reactions is essential in minimizing the potential adverse effects of transfusion and providing quality patient care.

REFERENCE

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