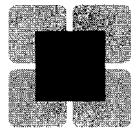

Benefits and risks of blood transfusion

TRANSFUSION of blood components is a necessary and critical part of treatment for some patients. Fortunately, current procedures for the procurement, testing, and preservation of blood make it a safer product than ever before. Nevertheless, a variety of hazards to blood transfusion demand a careful balancing of the risks and benefits in each clinical situation.[1–3] Also, variability in the use of blood products between institutions and individual physicians suggests that some use of blood components is unnecessary.[4]

■ *See Hoe and associates, p 515.*

Well-known potential hazards of blood transfusion include reactions due to incompatibility and transmission of infectious disease due to bacterial, viral, or protozoal organisms. It is less well known that blood transfusions can produce clinically important changes in the patient's immune system.

There is convincing evidence that the immunomodulating effects of blood transfusion can be of benefit to the recipients of organ transplants.[5,6] However, circumstantial evidence has led to a strong suspicion that these same effects may reduce the patient's resistance to infection and increase the recurrence rate after surgical resection of cancer.[7–10]

The similarity between tumor antigens and histocompatibility antigens has led a number of investigators to question whether blood transfusions given to cancer patients might favor tumor growth just as transfusions favor preservation of transplanted organs. The report by Hoe, Herman, and Hermann in this issue shows that stage I breast cancer patients who received perioperative blood transfusions had significantly worse survival rates than non-transfused patients. The authors conclude that the blood transfusions had an "adverse effect," and they may well be correct. However, I would prefer to assert that they have shown an association between transfusion and cancer patient survival, but that a causal relationship has not yet been definitively established.

Numerous retrospective reviews have indicated an adverse relationship between transfusion and survival after surgery for breast cancer, colon cancer, lung cancer, soft tissue sarcoma, head and neck cancers, cervical cancer, and colorectal liver metastases. Many other retrospective reviews, however, have found no differences in survival. Our own retrospective studies have identified an adverse association between perioperative transfusion and survival in surgically resected lung cancer patients and colon cancer patients, but we failed to find such a relationship in patients with breast cancer or rectal cancer.[9]

The apparently conflicting reports on the relationship between blood transfusions and survival in cancer patients are reminiscent of the conflicting reports that appeared in the 1970s relative to the relationship between transfusion and increased kidney allograft survival. Prospective and randomized studies in primates eventually provided incontrovertible evidence of a causal relationship between blood transfusion and improved renal allograft survival.

The components of transfused blood that are most strongly suspected of producing the immunomodulating effect are leukocytes and platelets, which are present even in most red blood cell preparations. Special means to prepare leukocyte- and platelet-depleted blood products are now available, and prospective studies have been initiated comparing such products with routine red blood cell preparations in cancer patients.

Until safer products are developed, red blood cells should be given only when the patient clearly requires more hemoglobin to transport oxygen to peripheral tissues. When blood volume is adequately maintained with crystalloid solutions, tissue oxygenation can fre-

quently be well maintained at hematocrit concentrations of 20% and lower.[11] Higher hematocrit levels may be beneficial in some patients with cardiac or pulmonary disease, or when further blood loss is anticipated. It has been suggested that mixed venous pO_2 and oxygen extraction ratios are better indices of critical need for transfusion than hematocrit or hemoglobin levels.[12]

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