Should we irradiate red cells transfused to patients with sickle cell anemia?

As you recall, an e-network member recently wrote that her transfusion service received an inquiry from a pediatric hematologist regarding the routine use of irradiated red blood cells (RBCs) for the transfusion of sickle cell anemia patients. The inquiring member indicated that it is the **policy of her hospital to irradiate ALL cellular blood components, even for transfusion of patients who are NOT known to be immunosuppressed**. She was concerned over published data suggesting that irradiation of donor blood results in a slight decrease in ATP and 2,3-DPG, a significant increase in plasma free hemoglobin, and a decrease in Cr-tagged red cell survival following of irradiated red cells. These data suggest that a certain amount of damage is done by the irradiation to the red cells. The hematologist raised a concern over the hospital's policy of using irradiated RBCs for ALL patients who need RBC transfusion, because some patients are receiving monthly exchange transfusions as a transfusion regimen for sickle cell disease, but are NOT immunosuppressed. The hematologist wonders if the use of irradiated RBCs might be impacting the care of her patients, (i.e., resulting in the need for additional transfusions) since the patients who are getting monthly exchange transfusions have mostly circulating transfused cells.

The following comments were submitted from the e-network membership regarding the universal use of irradiated RBCs, especially for patients who have sickle cell anemia.

1. A medical director of a **blood collection center in California** wrote that "universal use of irradiated RBCs is an expensive and unwarranted overkill." This California blood banker goes on to comment that whereas it might make sense in an homogeneous population (say Japan, or the Galapagos), it makes no sense in this heterogeneous population where the risk of spontaneous Graft v Host Disease (GVHD) is minuscule. Although he was not sure that the studies on RBC survival were done with RBCs irradiated and immediately transfused, he does believe the decreased survival time, etc. were a result of the impact of irradiation during storage. Thus, irradiating blood immediately prior to transfusion may not have a substantial negative impact on survival or function. Nevertheless, since there is no clear indication for this manipulation, and since it is simple to choose to irradiate units only for selected patients (for whom irradiation is clearly indicated), the responding blood banker would strongly advise the inquiring member to convince her hospital to discontinue this policy."

2. The **chief of a Hematology and Transfusion Medicine Service** at a busy General Hospital (which has a moderately sized adult sickle cell program) indicated that his hospital does NOT routinely irradiate RBCs for sickle cell patients unless hematopoietic stem cell transplantation is imminent (within 6 months). This member refers the e-network to the following reference (Rosse et al.: Transfusion support for patients with sickle cell disease, AABB Press 1998). The member commented that theoretically, use of irradiated blood could lead to suboptimal transfusion results, more frequent transfusions, or both. The member is not aware if this reduced efficacy of transfusion has actually been shown in practice (neither is he aware of a higher risk of TA-GVHD in sickle cell patients compared to the general population).

3. A **medical director of a large sickle cell program on the East Coast** wrote that she would not consider using irradiated RBCs for sickle cell patients. She pointed out data from Moroff et al (ABSTRACT, Transfusion, Feb, 1999), that showed changes in the potassium level of irradiated and then long term stored RBCs, and she expressed concern over how irradiated RBCs would tolerate mechanical stress during manual or machine assisted exchange transfusions (erythrocytapheresis). Finally, she commented that between irradiation and leukodepletion, which decreases the volume of blood in any unit by 10% or more, the patients may well be under transfused with a product that has shortened red cell survival.

4. **Several blood bankers from hospitals around the country**, indicated that they do not irradiate RBCs for transfusion of sickle cell patients, even for those on the monthly erythrocytapheresis protocol. The shortened red cell survival would be undesirable, and the added cost unjustifiable.

5. **A blood banker in Ohio** commented that at her hospital they do not irradiate red cells for patients unless they are immunocompromised or likely to be so. They DO irradiate all of platelet units. Their

rationale is that most RBCs go to patients who are not intrinsically or extrinsically immunocompromised; while most platelets go to patients who are immunocompromised. Thus, irradiation of all platelets protects against the possibility of an error. Further, there is no apparent irradiation effect on platelets unlike the situation with RBCs. Having provided this as background, the Ohio blood banker would avoid irradiation of RBCs for sickle cell patients in an effort to try to maximize red cell survival and minimize the frequency and number of RBC transfusions.

6. **A blood banker from Texas** commented that at her large pediatric hospital they do not routinely irradiate transfusions for sickle cell patients. The Texas blood banker shares the hematologist's concern that such a practice, because of the shortened red cell life, could result in increased transfusions for those who are already heavily transfused. The Texan points out that there are a few institutions (some of which are prestigious places) who do irradiate all RBCs for all children, and that there has been at least one case where the diagnosis of SCID (severe combined immunodeficiency) or something similar has been missed, and transfusion with non-irradiated cells was followed by development of GVHD. This has not happened at the Texan's hospital. The clinicians at the Texas hospital seem to think that a diagnosis requiring use of irradiated blood products would not be missed. Whether or not that is true, the Texan believes that sickle cell patients who are closely followed medically should not be at risk of undiagnosed immunodeficiency. Sickle cell patients do have some immune defects, based on splenic function and possibly iron overload, but as far as the Texas blood banker knows, this does not put them at risk of GVHD.

And finally, an **EDITOR's NOTE**: The following abstracts of articles might be of interest to the e-network, in regard to the above discussion:

- Davey et al. Prestorage irradiation and post-transfusion RBC survival. Transfusion, 1992
- Yin et al. Effects of gamma irradiation on red cells from donors with sickle cell trait. Transfusion, 1997
- Mintz et al. Effect of gamma irradiation on in vivo recovery of stored red cells. Ann Clin Lab Sci 1993

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7. A network member who is in charge of a **independent blood center** in California commented that he would agree that it is **not necessary to irradiate RBCs** for the routine transfusion of sickle cell patients, **unless** one has to try to match them for RBC phenotype where the potential donors may be more likely of the same racial background and limited HLA types. This might set them up for G-V-H-D from a transfusion. This member just returned from **Scotland** where all **platelets** are routinely irradiated! This is done as part of their production at the central processing centers. The rationale is that platelets are generally given to patients with diseases or treatments associated with immunosuppression, and one does not know from the regional centers' perspective the diagnoses of the patients receiving them.

Please submit comments to the e-Network Forum.

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