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Should cellular blood products for exchange transfusion in neonates be routinely irradiated?

A transfusion medicine physician in a Southern State wants to know what policy other e-network colleagues are following for irradiation of cellular products that are used during exchange transfusion of neonates. She wants to know if other institutions are routinely irradiating ALL cellular products that are used for neonatal exchange transfusion, or if irradiated products are used on a case by case basis only if the neonate fulfills one or more specific criteria. Her facility's current protocol does NOT require that irradiated cellular products must be used for every exchange transfusion of a neonate, unless the neonate or the blood product intended for transfusion meet one or more of her facility's standard irradiation criteria. Her facility's irradiation criteria includes neonates who have a birth weight less than 1200g, or who underwent intrauterine transfusion(s), or those being treated with ECMO, or those with a confirmed or suspected diagnosis of DiGeorge syndrome (or other immunodeficient diseases), or who are BMT candidates. The blood product qualifies to be irradiated even if the neonate does not, if the product is from a blood related directed donor or it is an HLA matched product. Thus, at the inquiring physician's institution, it is possible that a neonate with Rh disease who is born weighing more than 1200 grams, and who did not require an intrauterine transfusion might receive an exchange transfusion of unirradiated blood. (As a side note, when the facility prepares an irradiated product, the irradiation takes place at the time of issue of the product).

The inquiring physician has reviewed and presented the following information to her service chief in an effort to update the facility policy to irradiate **all** cellular blood products used for **all** neonatal exchange transfusions, but to date, the policy is unchanged.

Technical Manual 14th Ed, p. 607 states "Published guidelines additionally recommend irradiation for ... (4) neonates undergoing exchange transfusion" and on p. 520 Table 24-2 lists Special Indications for Irradiation in Neonatal and Pediatric Population: Intrauterine transfusion, Exchange transfusion, and ECMO.

Simon TL, et al. Practice Parameter for the Use of Red Blood Cell Transfusions. Arch Pathol Lab Med 1998;122:130-8. From Table 2 on p. 131: "Relative (possible) indications for Irradiated products" included exchange transfusion (It was not listed under "Well-defined indications".)

AABB Standards 21st Edition, 5.16.2.1 for irradiation states cellular components shall be irradiated when:

- a patient is at risk for transfusion-associated GVHD (5.16.2.1.1)
- the donor of the component is a blood relative of the recipient (5.16.2.1.2)
- the donor is selected for HLA compatibility, by typing or crossmatching (5.16.2.1.3)

The Circular of Information (p. 36 of current pamphlet) states the following groups at risk for GVHD should receive irradiated products: "intrauterine transfusions, selected immunoincompetent or immunocompromised patients, products from blood relative, BMT or peripheral stem cell transplant patients, products from HLA compatible donor."

Please share your opinion as to the routine use of irradiated blood products for exchange transfusions of neonates.

The following responses were received.

1. **A transfusion medicine physician at an academic center in Pennsylvania** reports that at his medical center they **do not routinely irradiate blood for postnatal exchange transfusions**, but they do leukocyte-reduce the product. Irradiation in such cases is done on a case-by-case basis. However, they do irradiate all intrauterine transfusions. When queried as to why the Pennsylvanian follows the policy of not irradiating all cellular products for neonatal exchange transfusion, he said that they have not felt it necessary to irradiate blood for the 'routine' neonate. An individual case might call for irradiation if there is some evidence of immune deficiency/suppression, for example, but otherwise they (including the neonatologists) have been comfortable with this policy. They also do

not routinely irradiate blood for any other neonate. The Pennsylvanian thinks the literature and the textbooks are also unclear on this issue.

2. **A transfusion medicine physician at an academic center in Virginia** reports that they irradiate blood for ALL intrauterine transfusions, including for neonates who have had intrauterine transfusions as well as for all babies less than 4 months old. The GVHD seen in babies usually occurs when a child has surgery with an unrecognized immunodeficiency. According to the responding physician, she is not aware of evidenced-based data for using a certain age of the baby for deciding whether or not there is a risk of GVHD. Her facility uses 4 months for ease; **all infants under this age get the same products to avert making mistakes (CMV-negative, irradiated, and abbreviated serology is employed for pretransfusion compatibility testing)**. By using 4 months, they also hope that they might catch some babies who have an undiagnosed immunodeficiency before the immunodeficiency comes to clinical attention. Their pediatric cardiac surgeons have started discussing the use of irradiated blood for their newborns, since certain congenital immune deficiencies are associated with certain congenital heart defects. The Virginia physician adds that Dr. Ron Strauss has written extensively and very eloquently on this subject, and at the upcoming AABB meeting in Orlando, Florida, there will be a workshop on Sunday morning regarding neonatal transfusion at which Dr. Strauss is the third speaker. He will be talking about irradiation and leukoreduction. The responding physician concludes saying that "As the author of the Technical Manual Chapter, the recommendation for irradiation of blood products for use in exchange transfusion of neonates came from the committee's general consensus - most did this in their institutions". There were limited data available, thus the qualified "relative" indication as printed in the Technical Manual 14th Ed.. p. 607, which states 'Published guidelines additionally recommend irradiation for ... (4) neonates undergoing exchange transfusion' and on p. 520 Table 24-2 lists Special Indications for Irradiation in Neonatal and Pediatric Population Intrauterine transfusion, Exchange transfusion, and ECMO. Finally, she commented that at her hospital, they do so FEW exchange transfusions that it is not a big resource issue for them to irradiate the product.
3. **A pediatric transfusion medicine specialist in Washington DC** commented that at her institution, the policy is to NOT irradiate blood for the transfusion of all of babies, but to consider blood product irradiation on **a case-by-case basis**. Some of the criteria used include low birth weight, whether or not the baby received an intrauterine transfusion, or if the baby has a diagnosis of cardiac disease. She was asked what she would do in the following hypothetical case: a near-term 2500 gram neonate with Rh disease needs a double-volume exchange because of risk of hyperbilirubinemia. The patient did not receive an intrauterine transfusion. Her opinion was that since there is little to suggest such an infant had cellular immunodeficiency, she would put this case in the "OK to use irradiated blood if you have a unit already irradiated, but if you need to move fast, she would use a nonirradiated unit". Interestingly, the Washington physician makes reference to Dr. Ron Strauss and his recent publications to address neonatal transfusion issues (see response #2 above).
4. **A blood banker in Boston** reports that to keep things simple in their Blood Bank, they **irradiate all blood products** that are issued to the NICU (including FFP).
5. **A transfusion service physician in Minnesota** reports that at his academic center, their policy is to automatically irradiate all RBCs intended for intra-uterine transfusion. However, for exchange transfusions, irradiation of the blood product is **only done upon the request of the Neonatology Service**. That group has a list of indications which includes: very low birth weight, prematurity, suspicion of congenital immunodeficiency and diagnosis of or suspected congenital cardiac anomaly (because of the association with immunodeficiency) and if the baby has already received an intra-uterine transfusion. The Minnesotan also comments that they automatically irradiate all blood from directed donors (family or otherwise) including all products which are HLA-matched. This rule applies to all patients (regardless of age), not just those receiving exchanges.
6. **A transfusion medicine physician at a West Coast Naval Medical Center** reported that they **irradiate all** cellular products used for neonatal transfusions. The responding physician added that while she attended a seminar entitled "Innovations in Perinatal Transfusion and Transplantation" at the AABB meeting in 1998, one of the speakers informally polled the audience regarding their irradiation practices for neonates. The clear majority of attendees indicated that they irradiated all the cellular products they issued for neonates.
7. **A transfusion medicine physician in New Mexico** reports that at his university hospital they **irradiate all** blood going to the Neonatal ICU and for every patient in the Pediatric ICU under six months of age. Irradiation is done immediately prior to issuing the blood, and they believe that their policy avoids the problem of complex algorithms that set us up for failure.
8. **A nurse from Washington state** wrote that at her medical center they have a neonatal intensive care unit for treatment of very sick newborns, and pediatric (and most full term neonates) receive care at a nearby hospital and regional medical center. Their policy is to **irradiate all** blood components for infants less than 4 months of age. The discussion encouraged the responding nurse to find a reference for using irradiated products for neonates who need exchange transfusion after intrauterine transfusions. She believes that the following review article is germane to this discussion

Hume, HA and Preiksaitis, JB entitled Transfusion associated graft-versus-host disease, cytomegalovirus infection and HLA alloimmunization in neonatal and pediatric patients. *Transfusion Science*, 1999;2173 - 95. In this article, numerous references are cited and a paragraph with no reference reads "With respect to infants undergoing IUT, it has been postulated that the lymphocytes transfused in the IUT may induce a state of non-specific immune tolerance in the fetus which then renders the neonate susceptible to TA-GVHD following subsequent transfusions."

(**Editor's note:** In response to this nurse's suggestion, here is a reference to the [first report](#) of GVH (1969) in an infant following 3 intrauterine transfusions and 6 exchange transfusions. In this case chromosome studies suggested one of the intrauterine transfusion donors as the source of the offending lymphocytes.)

ADDENDUM Aug. 8, 2002

9. **A transfusion medicine physician from Texas** fully agrees with Virginia practice ([reply #2](#) above) and the reasons for doing so. The Texan follows the same protocols for their NICU which has approx. 100 babies a day. His hospital delivers over 16,000 babies every year. According to the Texan, it is impossible to know which baby is or will be immunodeficient, and hence **all** cellular products are irradiated. If they know that a newborn is **definitely** immunodeficient, they even irradiate **plasma**.

Please submit comments to the [e-Network Forum](#).

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