Carter BloodCare
SPECIALTY SERVICES

Blood Matters

Nov/Dec 2018

Blood Matters is a quarterly news *outlet with important medical information for you, our customers and colleagues, from Carter BloodCare. We hope you will share it with others interested in the work we do together.*

IN THIS ISSUE

HOT TOPICS

Update on the Use of Irradiated Blood Components for Transplantation

Laurie J. Sutor, MD, MBA, VP of Medical and Technical Services

Irradiation of blood is done to prevent graft-versus-host disease (GVHD) in susceptible patients getting transfusion. Current practice in U.S. blood banks tends to use one of two types of dedicated blood component irradiators: the traditional cesium source irradiator which emits gamma rays, or the x-ray irradiator which has been growing in popularity. Both will inactivate the lymphocytes in the components and prevent their proliferation and attack on recipient tissues after transfusion. Leukocyte reduction filters are NOT considered adequate to remove enough white cells to guarantee prevention of GVHD. GVHD is 90 to 100% fatal when caused from transfusion (as opposed to the GVHD a patient gets following a hematopoietic stem cell transplant). Pathogen reduction technology (now available for platelet components but not often used in our area) can also inactivate lymphocytes and prevent GVHD without irradiation.

So which patients need irradiated blood? This question is a never-ending source of debate. Some patients are clearly at risk and are outlined in references such as the AABB Technical Manual. They include fetuses, premature infants, some with congenital immunodeficiencies, some solid tumors, hematopoietic stem cell transplants, those getting HLA matched components, patients getting directed donations from relatives, patients getting purine analogue drugs (e.g. fludarabine), and patients with Hodgkin disease. Less clear are other patients with cancer, especially leukemias and lymphomas. Unresolved questions seem to be whether irradiated blood is ever indicated for solid organ transplant patients, and when exactly to start and possibly stop use of irradiated blood in hematopoietic stem cell transplant (HSCT) patients who successfully engraft.

I did a review of current literature to see if there have been any changes to recommendations for use of irradiated blood, or especially if there were any published studies to support an evidence-based medicine approach to practice.

A very useful article that I found was by Treleaven et al in the British Journal of Haematology in 2010. These authors did an extensive review of the English literature from 1950 to 2009 on blood irradiation and transfusion-associated GVHD and did an evidence-based grade of each article on the strength of its recommendations. They found articles to support that if chronic GVHD is present after HSCT, or if immunosuppression is required, irradiation should be continued indefinitely. Also, if an allogeneic donor will be required for the HSCT patient, and their harvest occurs within 7 days of transplant, they should also get irradiated blood if transfusion is necessary. The same goes for autologous HSCT donors needing transfusion within 7 days of freezing their product. Otherwise, if all goes well with the transplant, autologous HSCT patients should receive irradiated blood from the time of conditioning treatment until 3 months post-transplant (or 6 months if total body irradiation was used). Hodgkin disease patients should receive irradiated blood for life, as should patients receiving purine analogue drugs. Patients with leukemia, not undergoing HSCT, do not need irradiated blood unless getting HLA matched components. This article did not comment on organ transplant or solid tumors.

Another interesting article was by Kopolovic et al in Blood in 2015. This article looked at 348 cases of known transfusion-associated GVHD from 6 databases. 34.8% of the cases occurred in patients that should have gotten irradiated blood but didn't (e.g. high risk patients). Five cases of TA-GVHD in this study got GVHD despite getting irradiated blood, raising the question of

HOT TOPICS Continued

whether it was done correctly. The other cases were apparently immunocompetent patients with no known risk factors under our current guidelines. Of all the cases, 89.7% died at a median of 24 days.

The newest publication I found was a May 2018 article in Archives of Pathology and Laboratory Medicine by Bahar and Tormey. This article did specifically say that organ transplant patients do not need irradiated blood. They cited old evidence that kidney transplant patients getting non-irradiated blood actually do better than those getting irradiated blood (Opelz and Terasaki 1978). Finally, they state that any GVHD in this group has been found to be from passenger lymphocytes from the organ, not the transfusions (Triulzi et al 2001).

Finally, I did a survey of local hospitals to see what regional practice is for irradiation in the transplant population. Few conclusions could be drawn, other than once a patient gets irradiated blood, the blood bank flags the patient's chart and continues to give irradiated blood until told not to. The practices for using irradiated blood for organ transplant patients varied significantly from place to place, as did whether to use irradiated blood for leukemia and lymphoma patients and solid malignancies. Every place surveyed that has HSCT patients replied that they never stop giving irradiated blood to that group.

In summary, although there have been some slight changes in recommendations in recent years, much remains unresolved as to our transplant and cancer population and the use of irradiated blood, but there is evidence that many facilities probably overuse irradiated blood in an effort to be safe rather than sorry.

References

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Survey of irradiation practice for the prevention of transfusion-associated graft-versus-host disease. AE Pritchard and BH Shaz. Arch Pathol Lab Med 2016 140(10):1092-7.

A systematic review of transfusion-associated graft-versus-host disease. I Kopolovic, J Ostro, H Tsubota, Y Lin, CM Cserti-Gazdewich et al. Blood 2015 26(3):406-14.

Guidelines on the use of irradiated blood components prepared by the British Committee for Standards in Haematology blood transfusion task force. J Treleaven, A Gennery, J Marsh, D Norfolk et al. Brit J Haematol 2010 152:35-51.

Microchimerism, GVHD, and tolerance in solid organ transplantation. DJ Triulzi and MA Nalesnik. Transfusion 2001. 41(3):419-26.

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MEDICAL MINDS

What topic do you want included in the next issue of Blood Matters?

A) Molecular Updates **B)** Cold Stored Platelets **C)** Platelet Transfusion Recommendations **D)** Other

Click **here** to submit your choice. If you answered ***D (Other)***, remember to include your topic.

PHYSICIAN RESOURCES

Download updates.

- **Highlights of the 2018 CAP Transfusion Medicine Checklist**
- **Revised Recommendations for Reducing the Risk of Zika Virus Transmission by Blood and Blood Components**
- **Draft FDA Guidance: Recommendations for Reducing the Risk of Transfusion-Transmitted Babesiosis**

Red Cell Exchange and Sickle Cell Disease

Pamela L. Malvern, BSN, RN, CNN and Victoria Hall, BSN, RN

Sickle cell disease is the most common indication when red cell exchange is carried out by Carter BloodCare clinical apheresis staff. The procedure can be elective for those sickle cell disease patients whose clinical circumstances are best managed by performing exchange every six to eight weeks. By comparison, emergency exchanges are indicated when a patient presents with such complications as acute chest syndrome, stroke, vaso-occlusive pain crisis, or hepatic or renal dysfunction.

With regard to sickle cell exchange protocols, a number of considerations contribute to a successful outcome:

- The patient's height, weight, gender, and hematocrit are used to calculate the volume of red cells needed for exchange
- The desired fraction of patient cells remaining and the desired post-procedure hematocrit should be decided. Unless otherwise specified, a desired fraction of patient cells remaining is usually set at 30%
- Vascular access for emergency exchanges most often relies on dialysis type dual lumen catheters, since peripheral access can be difficult in sickle cell disease patients
- With a physician's order, Carter BloodCare apheresis personnel can carry out a custom prime of the apheresis kit with one unit of leukoreduced red cells for a patient presenting with a hematocrit less than 20%. This custom prime eliminates any delay waiting for a transfusion to increase the patient's hematocrit before connecting the patient to the extracorporeal circuit.

Comparison of pre and post exchange laboratory testing for hemoglobin S and hematocrit will indicate if the desired outcomes have been achieved.

The Clinical Apheresis department at Carter BloodCare is available 24/7 at 972-788-0650 to answer questions and schedule emergency or elective procedures.

A Brief Overview of Cryoprecipitate

William Crews, MD

Cryoprecipitated Antihemophilic Factor is more commonly known as cryoprecipitate, or simply cryo. Cryoprecipitate can only be made from Fresh Frozen Plasma (FFP), which has been removed from whole blood and frozen within eight hours of being collected. The FFP is slowly thawed between 1 and 6C. This results in a supernatant that includes proteins that have gone back into solution, and a precipitated component consisting of cold-insoluble proteins. After thawing is complete the unit is centrifuged, the supernatant is removed, leaving behind the cryoprecipitate plus 5 to 15 mL of plasma. The cryoprecipitate is refrozen within 1 hour of thawing and stored at -18C or colder, and has a shelf life of 12 months.

Cryoprecipitate contains mostly fibrinogen (factor I) and factor VIII, but also contains (smaller amounts of) factor XIII, von Willebrand factor (VWF), and fibronectin. A single unit of cryo typically has a volume between 10 to 15 mL. As a convenience to transfusion services, the majority of the cryo we manufacture is pre-pooled frozen cryo. We pool together 5 single units of cryo with the same ABO type into a single bag of pooled cryo. The volume of pooled cryo generally ranges from 95 – 130mL.

AABB standards require each unit of cryo contain a minimum of 150mg of fibrinogen and 80 IU of factor VIII.

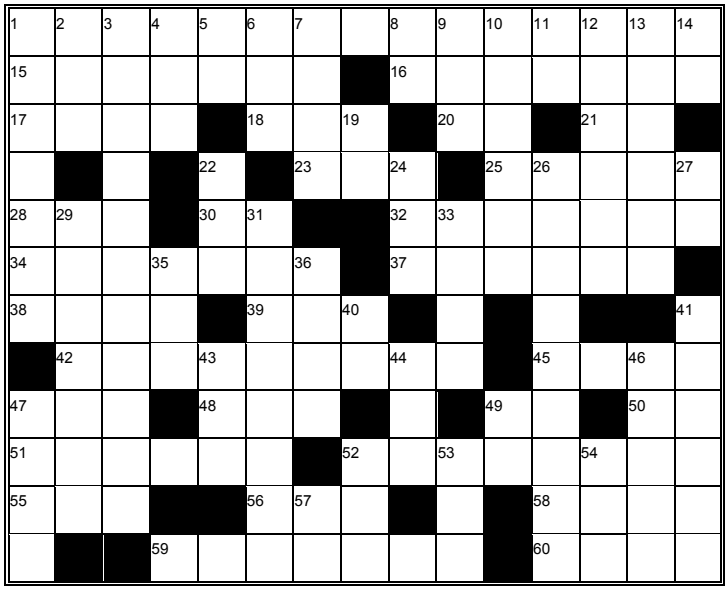
Historically, cryo was used to treat congenital factor VIII deficiency (Hemophilia A) and von Willebrand disease. Due to the development of virus-inactivated Factor VIII concentrates and recombinant factor preparations, cryo is no longer considered first-line therapy for these diseases. Today the most common indication for cryoprecipitate is replacement of fibrinogen in patients with acquired hypofibrinogenemia and bleeding, usually in the setting of surgical bleeding or trauma.

In the average patient, each unit raises the plasma fibrinogen concentration by at least 7 to 10 mg/dL; thus, 10 units will raise the fibrinogen by approximately 70 to 100 mg/dL in a 70 kg recipient.

ABO-compatible cryoprecipitate is NOT required due to the small volume of plasma transfused, although this may be important in patients receiving large volumes of cryo relative to their red blood cell mass. Rh compatibility need not be considered when selecting this product for transfusion and cross matching is not necessary.

Blood Matters

CROSSWORD PUZZLE - *Created by Dr. Laurie Sutor*



- Click **here** to download the answer key.

Across

1. Fatal transfusion complication: ____ disease (3 words)
15. Country of mad cow disease
16. Immunogenic membrane moiety
17. Spaghetti sauce brand
18. Fuel molecule for cells (abbr)
20. Continent of Chagas' disease (abbr)
21. Molecule in saline (abbr)
23. Do something
25. Monocyte mono____ assay
28. Hospital area for very sick patients (abbr)
30. "By mouth" on prescription (abbr)
32. Form in which procedures should be kept
34. Positively charged molecules
37. Old name for USC's football conference
38. Possible treatment after a needlestick injury (abbr)
39. ___ pulmonale: old name for right-sided heart failure
42. Female lover, in Italy perhaps
45. Sense organ
47. Autoimmune screening test (abbr)
48. Beverage served in a tavern
49. Atomic symbol for gold
50. Dallas Cowboys QB that was Superbowl XXVII MVP (init)
51. Prefix for -zygous
52. Spice from bark
55. French summer
56. Maker of the Yukon
58. College Station school (abbr)
59. Pre-med course
60. French for "state"

Down

1. Blood group missing in Melanesians
2. Genetic material in Zika virus (abbr)
3. What RBCs do in tube testing
4. Common vaccine
5. One who does lectures in lieu of the professor (abbr)
6. Group for RNs who help at home (abbr)
7. Purple top tube anticoagulant (abbr)
8. Direction from Dallas to Zavala Texas (abbr)
9. Needed to keep equipment running if electricity is out (abbr)
10. _____ acid
11. How tall you are (abbr)
12. Biologic term for egg
13. When its gone you see Howell Jolly bodies
14. Jason Witten was one for the Dallas Cowboys (abbr)
19. Desktop or laptop (abbr)
22. Generic term for group that approaches families for liver and heart donation (abbr)
24. A division of a county (abbr)
26. Reduce the effect or strength of
27. Health care worker who can administer blood (abbr)
29. Biologic safety _____
31. The study and treatment of cancer
33. Pro ___: in proportion
35. Class of antibody implicated in some anaphylaxis
36. Achy
40. Cause of swan neck deformity of the hands (abbr)
41. Plant yielding Arachis hypgaea lectin
43. Damage or spoil
44. Conditioning regimen for allogeneic marrow transplant (abbr)
46. Mouth-like opening
47. Attention-getting exclamation
49. Man for whom Peace Prize is named (init)
52. Used to properly calculate platelet transfusion response (abbr)
53. Rapper with 1994 album Illmatic
54. Wrestler's need
57. Its capital is Jackson (abbr)