Plasma components: An Update from COBM

In today’s blood bank environment several plasma products are available for transfusion. In 2006, 77.2% of the plasma transfused in the USA was fresh frozen plasma (FFP). This product is prepared from whole blood or apheresis donations and is frozen within 8 hours of collection.

Once thawed, plasma contains all clotting factors at physiological levels although there is considerable variability between donors in their level of individual clotting factors. However, since anti-HLA antibodies are often implicated in causing transfusion related acute lung injury (TRALI), and because multiparous females are often sensitized to HLA antigens, many donor centers are diverting the plasma component of female donations to fractionation. To make up the shortfall in plasma supply, there are several other plasma products that can be prepared. Plasma frozen within 24 hours of phlebotomy (FP24) is an AABB/FDA approved plasma product, which as its name suggests, represents plasma that is frozen between 8-24 hours after collection. In 2006 it made up approximately 15% of the transfused plasma in the USA. Several studies have demonstrated that most clotting factor levels are well maintained in FP24 such that it is often used interchangeably with FFP. Once thawed, both FFP and FP24 can be maintained in the liquid state for up to 24 hours at refrigerator temperatures. Previously both products would have been discarded after 24 hours, however recent studies have demonstrated that both FFP and FP24 can be maintained as thawed plasma (TP) for up to 5 days in the refrigerator with minimal degradation of clotting factor levels. Although the AABB/FDA have only approved the use of TP prepared from FFP, in light of this evidence several transfusion services are routinely providing TP prepared from FP24. Note that none of these other plasma products have been directly compared to FFP in efficacy studies; however, given that they all demonstrate similar clotting factor levels to FFP, there is no a priori reason to suspect that they would be any less effective in reversing a significant coagulopathy or reducing bleeding. Thus, although “FFP” is commonly ordered, there are several other products that might be issued by the blood bank, so a more generic term of “plasma” should be adopted.

The indications for plasma transfusion include reversal of a significant coagulopathy in a bleeding patient or one who is about to undergo a surgical procedure; bleeding in the setting of multiple factor deficiencies; or, in the rare patient with a deficiency of a factor for which there is no viral-inactivated/recombinant concentrate available. Regardless of the setting, plasma use should always be guided by coagulation tests. Laboratory parameters, in conjunction with a clinical assessment of the patient, that would support the use of plasma include a prolongation of the PT to greater than 1.5 times the middle of the reference range, INR ≥1.6, or an aPTT greater than 1.5 times the top of the normal range. Thromboelastography can also be used to guide therapy. A mild to moderate coagulopathy, defined as an INR < 1.5, does not appear to be associated with excessive bleeding. In addition, the mean INR of plasma is 1.1 while the range is 0.9 – 1.3 thus plasma transfusion has limited to no effect in circumstances where a mild or moderate coagulopathy is present. The availability of FP24 may help reduce the increased use of plasma in non-bleeding patients with elevated INR by waiting to see if microvascular
bleeding occurs and then transfusing the plasma. Many patient with INR of < 2.5 may be able to clot without plasma transfusion. Since plasma can be stored for days after thawing, having it available and returning plasma back to the blood bank if not used reduce inappropriate use and conserves this resource.

In emergent situations, plasma may be used to reverse the effect of warfarin prior to surgery or during active bleeding episodes. However, if time allows, oral or parenteral (IV) vitamin K will reverse an elevated INR in 6-12 hours without exposing patients to the risks associated with human blood components. The hemostatic effect of the appropriate dose (see below) of plasma generally lasts for approximately 8 hours\textsuperscript{22}, thus if plasma is being used for emergent reversal of warfarin, it should be given close to the start of any invasive surgical procedure and in conjunction with vitamin K administration. On the other hand once plasma is transfused it, like all blood products, remains almost entirely in the intravascular space. This needs to be borne in mind because rapid infusion rates, intended to facilitate the administration of the entire dose of plasma before the start of the surgery, could lead to circulatory (volume) overload. Plasma should not be transfused prophylactically in patients undergoing cardiopulmonary bypass in the absence of diffuse microvascular bleeding\textsuperscript{23}, nor should it be used as a volume expander or as a source of nutrition.

The literature on fixed RBC:plasma ratios in the resuscitation of trauma patients is controversial and based mainly on retrospective and observational studies with significant methodological and/or statistical limitations.\textsuperscript{24,25} No recommendation at this time can be made for a specific ratio of plasma to red cells in massive transfusion despite many trauma center’s adoption of such ratios.\textsuperscript{26} No data exists for aggressive plasma transfusion outside of the massive trauma setting. When plasma is indicated, it should be administered in a dose of at least 10-15 mL/kg.\textsuperscript{27,28} Although a dose of 5-8 mL/kg has previously been recommended for warfarin reversal\textsuperscript{29}, more recent guidelines suggest 10-15 mL/kg should be used.\textsuperscript{30} It is important to remember that hypothermia and acidosis should be corrected prior to plasma administration.

References

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