Fresh whole blood transfusion in cardiac surgery

Medhat Hashem

Department of Anesthesiology, Cairo University, Cairo, Egypt

Correspondence to Medhat Hashem, MD, FMLM, FCAI, FRCA, Department of Anesthesia, Cairo University, Cairo, 11516, Egypt. Tel: +20 111 508 6363; fax: +202 2364 1687; e-mail: medhashem@yahoo.com

Received: 28 February 2021
Revised: 5 March 2021
Accepted: 9 March 2021
Published: 02 July 2021

The Egyptian Journal of Cardiothoracic Anesthesia 2021, 15:1–2

Egypt J Cardiothorac Anesth 15:1–2

1687-9090

The first documented blood transfusion was in 1665, Oxford. It was from one dog to another. It was followed by animal-to-human blood transfusion in 1667, but that was soon prohibited owing to fatal allergic reactions. The first human-to-human blood transfusion was successfully performed by the British obstetrician James Blundell in 1818 for the treatment of postpartum hemorrhage [1].

The transfusion of collected stored blood in an unmodified state is known as 'whole blood' (WB) transfusion. Since the 1970s, blood has been processed into its components, such as red cell concentrate, platelet concentrates, plasma, and cryoprecipitate before storage at blood banks. Component use permits optimal storage conditions for each of the components of blood, minimizes hemolytic reactions, and supports precision treatment based on laboratory results. Targeted transfusion therapy also supports the sustainability of blood services where demand can outstrip supply. Thus, blood banks have preferred to stock components over WB. Currently, the capacity to provide patients with the different blood components they require is still limited in low-income countries: 37% of the blood collected in low-income countries is separated into components, 69% in lower-middle-income countries, 95% in upper-middle-income countries, and 97% in high-income countries [2].

As yet, there are advocates for WB transfusion that cite a definite qualitative advantage by limiting patient exposure to multiple donors. A bag of WB, with fewer additives, is closer in physiology to the patient's own blood. It would guarantee a more effective oxygen-carrying capacity, coagulation factors, and volume in the same package, with the correct component ratio, thus allowing hemostasis and hemodynamic stability to be achieved faster. Other pros of WB transfusion include easy administration as there is no need for multiple components and thawing of plasma. Theoretically, the smaller the number of transfused blood bags, the less the chance of clerical errors.

WB transfusion is currently used to resuscitate emergency casualties in military settings where WB is collected through a 'walking blood bank.' Donors are prescreened, where possible, but do not undergo complete transfusion transmissible disease testing before transfusion; this fact makes it not approvable in the civilian setting. Because fresh WB presents a higher risk of disease transmission, it is reserved for situations in which tested blood products are unavailable and the need for transfusion is urgent [3].

Perioperative transfusion of blood 'or its components' is commonly used in cardiac surgery as cardiopulmonary bypass (CPB) leads to hemodilution, platelet dysfunction, systemic inflammatory response, and coagulopathy. In an attempt to mitigate CPB drawbacks, fresh WB was used to prime the CPB circuit during heart surgery in neonates and infants [4]. The hemostatic benefits of transfusing fresh WB are more controversial in pediatric cardiothoracic surgical patients than conventional priming with packed red cells and fresh-frozen plasma. Proponents of this approach cite two main advantages: improved postoperative hemostasis and decreased systemic

 DOI: 10.4103/ejca.ejca_7_21

inflammation, which results in reduced postoperative edema formation and organ dysfunction. Despite the fact that recent blinded studies reflect fresh blood ineffectiveness, a pediatric cardiothoracic surgical program using fresh WB to reduce transfusion requirements has been in existence since 1995 at the Children's Hospital of Philadelphia [5].

Soliman and Abukhudair [6] reported a better hemostatic profile and less transfusion requirement with fresh WB transfusion, when compared with component transfusion, in adult patients on clopidogrel undergoing emergency coronary artery bypass grafting surgery. The authors did not have access to perioperative point-of-care testing of hemostasis. Their use of fresh WB transfusion seems to be a pragmatic alternative for elective cardiac surgery. Blood donors who are usually related to the patient's family are cross-matched and tested against viral diseases a few days before elective cardiac surgery. On the day of the surgery, the prescreened donors' blood is collected and stored at room temperature to be used perioperatively within 24 h. In addition to the known risks of blood transfusion, there are logistic difficulties associated with its procurement and expedited testing as directed donors had higher viral marker rates compared with volunteer donors [5]. Higher transfusion triggers may also be employed to avoid wasting precious unused WB units. Despite the controversial results of WB transfusion in cardiac surgery, the only advantage of fresh WB against reconstituted blood is less exposure to multiple donors. The use of fresh WB is currently not recommended in cardiac surgery, if blood components are available [7].

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

References

1 AABB. Advancing transfusion and cellular therapies worldwide. Available at: http://www.aabb.org/tm/Pages/highlights.aspx). [Accessed July 15, 2020].

2 World Health Organization. Blood safety and availability fact sheet 279. https://www.who.int/news-room/fact-sheets/detail/blood-safety-and-availability. [Accessed July 5, 2020].

3 Cap A, Beckett A, Benov A, Borgman M, Chen J, Corley J, *et al*. Whole blood transfusion. Mil Med 2018; 183:9–44.

4 Mou S, Giroir B, Molitor-Kirsch E. Fresh whole blood versus reconstituted blood for pump priming in heart surgery in infants. N Engl J Med 2004; 351:1635–1644.

5 Sesok-Pizzini D, Friedman D, Cianfrani L, Jobes D. How do I support a pediatric cardiac surgery program utilizing fresh whole blood?. Transfusion 2019; 59:1180–1182.

6 Soliman R, Abukhudair W. Effect of the fresh whole blood transfusion on perioperative bleeding in adult patients undergoing emergency coronary artery bypass grafting surgery: a randomized study. Egypt J Cardiothorac Anesth 2020; 14:84–91.

7 Ertugay S, Kudsioğlu T, Şen T. Patient Blood Management Study Group Members, Consensus report on patient blood management in cardiac surgery by Turkish Society of Cardiovascular Surgery (TSCVS), Turkish Society of Cardiology (TSC), and Society of Cardio-Vascular-Thoracic Anaesthesia and Intensive Care (SCTAIC). Turk J Thorac Cardiovas Surg 2019; 27:429–450.