



Evaluation of Blood Clot in the Blood Bag: Experience from Bangladesh

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Abstract

For proper ensuring thorough anticoagulation of the blood, adequate mixing of blood with anticoagulation present in the blood bag is essential. It is also necessary for long term adequate quality of blood during storage for preventing clot formation and fibrin strands which is result from the activation of the clotting processes. Blood containing clots should not be transfused. So it is very crucial things to maintain a good quality of blood in the blood bag. In this study we have tried to focus on how blood clot can be occurred in blood bag during collection and how we can avoid the incidences.

Keywords: Anticoagulation, Blood shaker, ACD, CPDA1, CPDA2.

Introduction

Dr. Carl Waldemar Walter was invented the blood bag first who was a surgeon and professor at Harvard Medical School. From then Walter has been addressed "a pioneer in the transfusion and storage of blood". He inaugurated the first blood in the world. He designed blood bag for collection, managing and also storage for whole blood. Designed blood bag keep the blood components from septic conditions and make it contamination free. By high molecular weight PVC, blood bag are made that shield better ductile strength and amalgamate strength. Legitimize sterilization processes has been used for monitoring automatically that is a data logger that ensures the product purity. Improved and regulated coiling method for preventing kinks, that confirms a free flow throughout the collection and dissociation process. Blood bag must contains

anticoagulant that was first used by Rous and Turner in 191. That was consisted of a citrate-glucose solution. During the first world war Rous Turner used human blood for storage. During the second world acidified Citrate Dextrose (ACD) solution was launched by Loutit and Mollison. Gibson et al has invented citrate-phosphate-dextrose (CPD) in 1957 which replaced ACD after a time of period. It became routinely used as preservative for blood/red cells storage in liquid stage. CPD has made shelf-life of blood for about 21 at 2-4 °C was which became a mile stone of blood transfusion. Moreover, in 1978 citrate-phosphate-dextrose with adenine (CPDA-1) was invented in which addition of adenine ameliorate the synthesis of ATP in the stored blood. It prolonged the shelf life of blood/red cells about 35 at 2-4 °C. The main purposes of blood bag anticoagulant is to prevent the coagulation and to

maintain the life and also the survival of RBCs as to confirm the maximum post transfusion survival. Blood bag has different component to ensure blood safety and also to confirm the donor benefits. The packaging of blood bag is made of laminated polyester or aluminium to reduce the moisture loss and to assure the sterility by externally. It also confirms a best yield of blood components by un-interrupting damage to the blood when collection. Needles of the blood bags are usually made by thin walled silicone which has high quantity smoothness for phlebotomy. It also ensures the minimal stress on the donor. As because 100% aseptic condition can not ensure during collection so pre donation bag is essential for ensuring blood diversion during collection and making blood in the bag skin particles and bacteria free. All are designed to make blood in liquid state for designated time period. Besides all things some-times blood clots can occur in the blood bag. In this study we have tried to focus on how blood clots can occur in blood bag before transfusion.

Materials and Methods

According to the institutes operating procedures and the Safe Blood Donation Law of Bangladesh all donor was screened for blood donation. Blood clots were found in 5 blood bags two different private hospitals in Dhaka, Bangladesh. Cause analysis include methodological way to find out all possible reason which are responsible and factors that might cause adverse donor reaction during blood transfusion or may near miss issue. It is a team work in which multi level approach was needed. When observe the incidence we collect the information from the donor record books. When whole team found the possible cause of the blood clot, we rebuild up standard operating procedure which was already built in the past. Medication list was checked and clotting abnormality was ruled out. Veins were checked on both antecubital area and found suitable for venepuncture. Venepunctures were done by expert technologist after taking proeper aseptic

precaution. Teumo BCT (Vietnam) triple bag was chosen for blood collection as were targeting to prepare component. Needle was checked before venepuncture. Anticoagulatn of blood bag was CPDA-1 within available expiry date. Proper pressure was maintained above the venepuncture area by blood pressure cuff which range was in-between 40-60mmHg. By this proper flow was maintained throughout the donation period. Blood bag was kept on blood collection monitor (Terumo, Penpol, India) for monitoring the whole event. Blood pressure was checked during the procedure and by this low flow of blood was ruled out.

Results

Blood clots were developed in the blood bag due to in proper mixing of blood with anticoagulant presented in the blood bag in a fixed ratio. Due to proper ratio of blood to anticoagulant (1:14) and proper mixing during blood-letting clots usually do not occur in that blood bag. Lacking of one or both may cause formation of blood clot in the blood bag that may be visible sometimes but may not visible also. Usually blood shaker makes proper mixing of blood with anticoagulant. But when shaker not present or non-functioning, manually it can be done by every 30 seconds mixing the blood with anticoagulant by gentle shaking. But in all these cases, due to shaker non functioning and lack of attention to the blood bags, blood clots were developed during blood collection.





Figure: Blood clot in blood bag.

Discussion

In many a times with a low flow, we tend to continue and complete the collection of blood to avoid misuse of the bag and the inestimable resource. Fish-bone diagram has shown in the figure which showed different factors related to

the personnel, machine, material, and the technique can influence the clot formation⁽¹⁾. How quick the clot will generate depends on chemical composition of the substrate, physical circumstances, such as flow rate, space width, and surface energy⁽²⁾. We all know that blood flow rate regulates the thrombus formation, and under the low flow conditions, fibrin formation is sufficient and high flow rate raise shear rate and advocates initial attachment of the platelets⁽³⁾. In retrograde analysis, we found that at the time of operation monitor was malfunctioning due to some technical error. So alarm was not working and flow could not be detected. Mixing was not eventful and eventually clot was formed during blood collection. According to the American Association of Blood Banks (AABB) guidelines, component cannot be prepared from this type of error⁽⁴⁾.

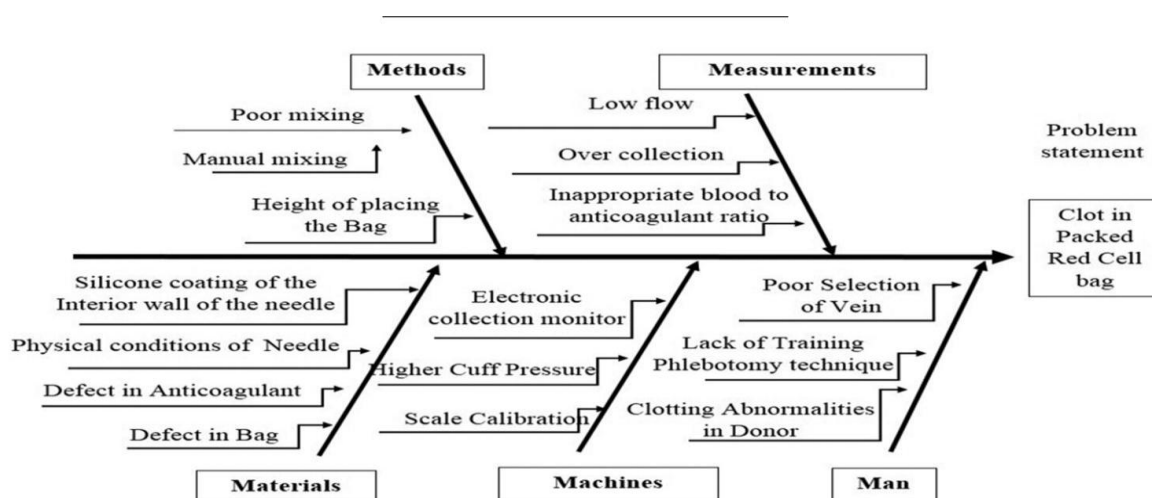


Figure: Fish bone analysis of blood clot in blood bag (5)

Conclusion

We concluded our study by commenting that further many evaluation will be needed to evaluate what steps are necessary to minimize this type of error.

Conflict of Interest: No conflict of interest.

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