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Original Research Paper

Pathology

ELECTROLYTE CHANGES OF CPDA-1 STORED WHOLE BLOOD

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ABSTRACT Whole blood is still commonly transfused in developing countries including India where blood components are not easily available. The hematological and biochemical changes associated with the storage of blood in our blood banks have been reported. Blood (350 ml) was drawn from 65 healthy volunteer donors into CPDA-1 anticoagulant and placed on the quarantine shelf of the blood bank refrigerator maintained at 2-6°C. Blood bags were screened for HCV, HBsAg, Syphilis, Malaria and HIV 1&2 and were confirmed negative. Samples were collected at 1, 7, 14, 21, and 28 days and tested for Electrolytes.

KEYWORDS : Whole blood, Electrolytes,CDPA1

INTRODUCTION

Preservation and long term storage of Red Blood Cells (RBCs) is needed to ensure readily available, safe blood supply for transfusion medicine. Some studies have suggested that the risk of complications after transfusion increases when transfused blood has been stored for long periods [1]. During storage, in fact, preserved blood cells undergo progressive structural and functional changes that may reduce red cell function and viability after transfusion [1]. Storage has a negative effect on RBC oxygen delivery [2] and emerging evidence suggests that allogenic RBC infusion may actually harm some recipients. Considerable evidence suggests that transfusion increases the risk of serious complications and death in critically ill patients, especially in patients who are undergoing cardiac surgery. Current research indicated that the RBC hypothermic storage lesion is responsible for the association of blood transfusion with an increased length of stay in the hospital, impaired tissue oxygen use, proinflammatory and immunomodulatory effects, increased infections, multiple organ system failure, and ultimately increased morbidity and mortality [3]. Clinical implications, collectively known as the RBC storage medium lesion, is in part related to bioreactive substances released by leucocytes in the storage medium, such as histamine, lipids, and cytokines, which may exert direct effect on metabolic and physical changes associated with the senescence, such as membrane reticulation, decrease in cell size, increase of cell density, alteration of cytoskeleton, enzymatic desilylation,and phosphatidylserine exposure, RBCs lose potassium 2,3-diphosphoglycerate (2, 3-DPG), Adenosine Triphosphate(ATP) stores, lipids and membrane, while becoming more rigid and demonstrating reduced oxygen off-loading [4].Moreover, stored units become more acidic and the suspending fluid has higher concentrations of free hemoglobin and biologically active lipids, and contains greater quantities of negatively charged micro vesicles with pro- inflammatory and procoagulant activity [4]. The only important electrolyte change in stored blood is that of potassium. During blood storage there is a slow but constant leakage of K ion from cells into the surrounding plasma. In severe kidney disease even small amount of K ion fluctuations can be dangerous and relatively fresh or washed red cells are indicated. Due to a higher K ion content of stored blood, blood <5 days old is recommended by Ono et al. [7] for neonatal exchange and top-up transfusion.

MATERIALS AND METHODS

This study was conducted Blood Bank, Anugrah Narayan Magadh Medical College, Gaya. The Blood (350 ml) was drawn from ten healthy volunteer donors into Citrate Phosphate Dextrose Adenine (CPDA-1) anticoagulant and placed on the quarantine shelf of the blood bank refrigerator. The donors were 95 in number; they had their ages ranging from 23 to 38 years . The donors were all male and tested negative for: HCV, HbsAg , Syphilis, Malaria and HIV 1 & 2.

Blood collection and storage:

Blood bag of 350 ml ± 10% which contains CPDA-1 was used. The citrate prevents coagulation by binding or chelating to calcium, phosphate acts as a buffer hence, maintains the pH of the blood. Dextrose serves as substrate for the blood cells, while adenine maintains high ATP level in the RBC. Most blood collection bags (adult) contain 49 ml CPDA anticoagulant which is sufficient to anticoagulant and ensure the viability of blood cells in 350 ml ± 10% blood for up to 35 days when the blood is stored at 2-6°C [11].

Procedures Electrolyte parameters were measured using Easy Lyte Electrolyte Analyzer .

RESULTS:

The evaluation of the effect of blood storage on both hematological parameters was carried out using Citrate Phosphate Dextrose Adenine (CPDA -1) anticoagulant and blood was kept for 35 days and samples were evaluated on days 1, 7, 14, 21 and 28 days.

Electrolytes	Day 1	Day 7	Day 14	Day 21	Day 28
Na mEq/L	137.38	135.30	128.94	129.33	126.25
K mEq/L	2.64	6.14	9. 25	11.31	15.71
Cl mEq/L	75.93	73.37	69.78	72.05	69.82

DISCUSSION

In this study, potassium ion increased within the period of 7 days and continued subsequently. During blood storage there is a slow but constant leakage of potassium ion from cells into surrounding plasma. In severe kidney disease even small amount of potassium ion fluctuations can be dangerous and relatively fresh or washed red cells are indicated. Potassium ion loss is recognized to be secondary to the changes in metabolic activity. The loss of DPG and reduced glycolytic activity are also related to decreasing pH [4]. The leakage of potassium ion from cells into surrounding plasma may be responsible for the drastic progression in potassium ion increase in this study. Sodium on the contrary reduced,

suggesting that sodium in stored whole blood may produce adverse effect after transfusion.

CONCLUSION

Hemolysis of the red cells that occurs during storage of red cell units has serious clinical implications for the transfused patients. An elevated potassium and free hemoglobin itself may cause significant complications in some patients. The extent of hemolysis in blood components is an important indicator of cellular integrity and a quality parameter. The increase in potassium value and reduction in sodium value simply indicates the preference of component therapy to whole blood transfusion.

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