

Haemodynamic Assessment in Pre deposited Autologous Blood Transfusion

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Abstract:

Aim: Auto transfusion is a safe, economical and practical procedure with unchallenged merits in elective surgery. Blood drawn from healthy patients in immediate pre-operation period, and stored in a blood bank can be safely used for replacing blood during an elective operation in the same person, avoiding many complication related to homologous blood transfusion. A prospective study, the first of its kind in Bihar, was therefore undertaken in a tertiary university Hospital to determine the feasibility, safety and benefit of pre deposited autologous blood transfusion in elective surgery.

Material & Methods: Subjects chose were healthy adult patients having hemoglobin of more than 10gm% and suffering from illness in which the elective operation procedures needed 1 unit or 2 units of blood. Pre phlebotomy and post phlebotomy laboratory tests for hemoglobin, red blood cells, hematocrit, white blood cells, platelets, reticulocytes and serum iron were done repeatedly to ensure the hematological safety of autologous blood transfusion. Pre deposited autologous blood transfusion was safely conducted in 50 patients in Nalanda Medical College Hospital, Patna from August 2004 to December 2010. Laboratory tests for hemoglobin, red blood cell, hematocrit, white blood cell, platelet, reticulocytes and serum iron were done in pre phlebotomy and regularly in post phlebotomy to ensure the hematological safety of pre deposited autologous blood transfusion.

Conclusion: Autologous blood transfusion has failed to gain the desired momentum due to the barrier of acceptance by the patients, attendants and attending surgeon. Autologous blood transfusion has shown to decrease the blood bank requirements and improve coagulation parameters. By 72 hours postphlebotomy, 76% patients were found to have recovered their pre letting blood volume, hemoglobin recover in 78% and platelet 86% and packed cell volume in 74%.

Keywords: Autologous Blood transfusion, Homologous blood transfusion, Phlebotomy, Pre deposited blood.

I. Introduction

Blood transfusion from healthy patients and stored in a bold bank can be safely used for replacing blood during an elective operation, in the same person, avoiding post transfusion complication.[1][2][3] There are 3 main types of autologous transfusion. (a) Predeposit 2-3 units of blood may be donated over 2-3 weeks before elective surgery.(b) Preoperative haemodilution in cases such as surgery for thyrotoxicosis or abdominal perianal resection where in one can expect 1-2 units of blood loss, just before surgery, 1-2 units of blood are removed and retransfused after the procedure.(c) Blood salvage blood which are lost during surgery is collected mixed with anticoagulant solution, washed and rein fused.[4][5] Grant in 1921[6] first reported use of autologous blood. The safest blood a person can receive is his own and this undoubtedly reflects public concern about the transmission of disease by blood transfusion.[7][8] Autologous blood transfusion may take the form of blood predeposited in advance of schedule surgery or alternatively obtained at the time of operation by preoperative haemodilution and intraoperative blood salvage.[9] Milles et al 1962[10] reintroduced autotransfusion in elective surgery and since then it has been employed in elective surgery by Langston et al, 1963; Cuello et al, 1967; Wilson et al, 1968; Dagget et al, 1970; Newman et al, 1971; Nicholson, 1972 and Cowell and Swickard, 1974. The problems of shortage of blood in blood bank and the hazards of homologous blood transfusion, autotransfusion is a safe, economical and practical procedure with unchallenged merits, Autotransfusion used in elective surgery and hemodynamic parameters were assessed to determine their feasibility safely and benefits. Due to the AIDS epidemic in the 1980, patient's and surgeon's interest in preoperative blood donation has expanded donation accounted for upto 6% of all blood collected in the United States. It is accurate to state that many surgeon take for granted the safety of the US blood supply but lessons learned in other countries are illustrative. Approximately 80% of the world's population has access to only 20% for the safe blood supply for instance in places such as Latin America Africa & Asian subcontinent where donations are often non altruistic (i.e. done for livelihood purposes) infection with HIV & hepatitis not in common transfusion with unsafe blood product account for up to 16 million hepatitis B, > 4 million hepatitis C and 160,000 HIV infection per year. From studies the paid donors are more likely to conceal information about risky behavior.

II. Material And Methods

Auto transfusion was done in 50 cases posted for elective surgery done in Nalanda Medical College and Hospital, a tertiary University Hospital in Patna. Subjects chosen were healthy adult patients having hemoglobin more than 10gm% (Cyan methhemoglobin method) Blood volume evaluated by Evans blue dye method (Osler, 1965). Single phlebotomy was best timed 72 to 96 hours prior to surgery. In cases where 2 Units were needed, the first unit was drawn at least 7 days and second unit not less than 72 hours before surgery. The drawn blood was kept in commercial Acid-Citrate-Dextrose plastic bag and banked in blood bank at 4⁰ C. For compensatory erythropoiesis, soon after, 250 mg Iron Dextran dilute in 500 ml of 5% Dextrose intravenously in 1 hour. Pre and post phlebotomy laboratory tests were collected for Hb%, TLC, DLC, PCV, Reticulocyte count, Platelet count and serum Iron level for haematological assessment. Serum iron was determined spectrophotometrically (Wootton 1964) [24]. 50 patients aged varied between 18-65 years with Nephrectomy, Nephrolithotomy, Urethroplasty, cholecystectomy, Radical Mastectomy with axillary clearance and tubercular stricture abdomen. The patients were frequently monitored clinically, during and after the blood letting for any signs of hypovolemic. The procedure was explained to the patients and attendant and their written consent taken before bloodletting.

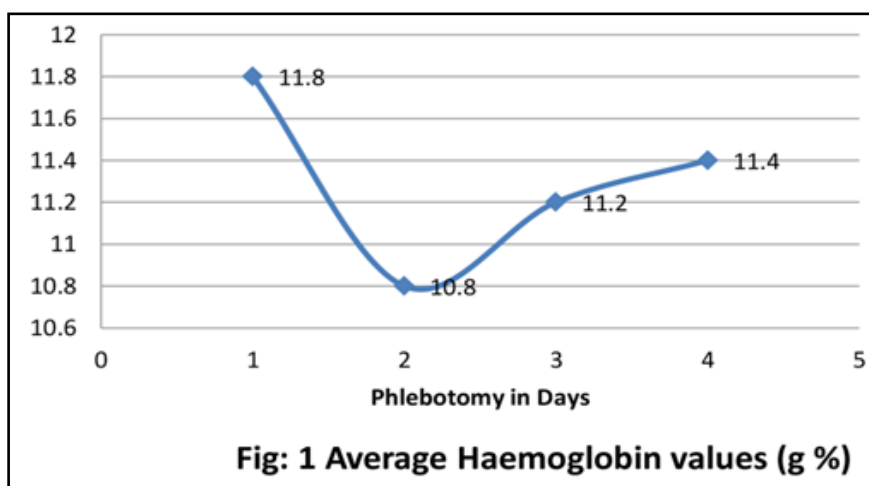
III. Results

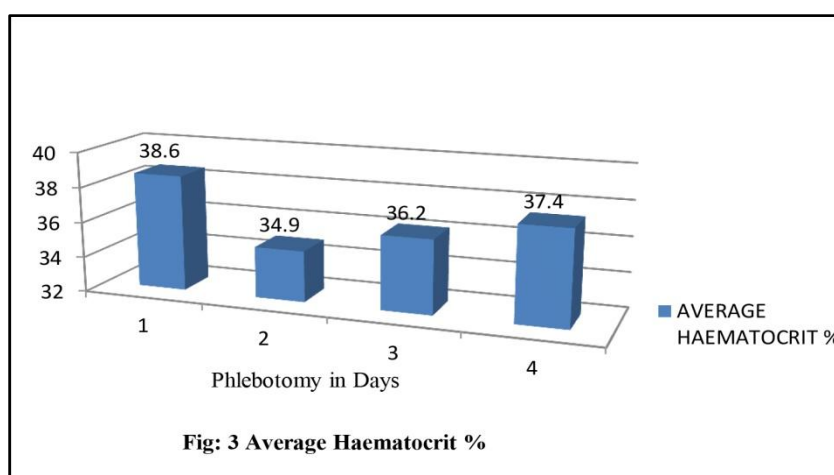
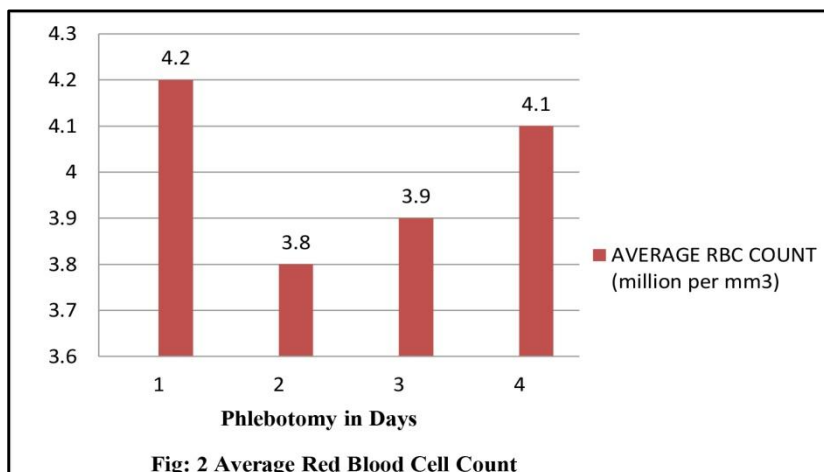
Pre deposited autologous blood was found to be in 88% patients while 12% needed additional demand for blood transfusion with homologous blood of the total 62 units of blood utilized in these fifty patients. All the patients tolerated the phlebotomy well and without any sign of hypovolemic. Estimation of Hemoglobin, red blood cells plasma & Blood volume, platelets count and serum iron were done serially, which showed that the values, in all cases, returned to pre phlebotomy level with 96 hours in 76% patients. Increased bone marrow activity was noticed by enhanced reticulocyte count in the post phlebotomy blood film. High serum iron, after the used and, its progressive fall in post phlebotomy period, showed that the iron infusion being consumed during compensatory erythropoiesis.

(A) Plasma & Blood Volume: All patents tolerated the phlebotomies without signs of hypovolemic. Plasma Volume ranged between 1.66 to 3.58L (Mean 2.79± .5L) and blood volume between 2.4 to 5.6L (Mean 4.28 ± .97) 72 hours after phlebotomy plasma volume increased between 0.01 to 0.33L in 42/50 cases 84% whereas blood volume increased between 0.1 to 0.2L in 38/50, 76% cases.

(B) Hemoglobin: The pre letting hemoglobin concentration was between 10 to 14 gm.%, mean 11.6± 0.82 after 72 hours of postphlebotomy, 26 patients had Hb% decrease between 0.5 to 0.9%, in 20 cases decreased by 1gm% and 4 cases the hemoglobin decreased was greater between 1.1 to 1.5g. On the 7th day the hemoglobin determined showed 78% recovered, 17% had more Hb% values while 5% not recovered.

(C) Packed Cell Volume (PCV): The pre letting valve ranged from 32-42% mean 36.2% ± 2.6%. On 72 hours phlebotomy the PCV decreased by 1-5% in all patients. After 72 hour post phlebotomy, the values were found to be decreased in all the patients. 16 patients showed a decrease of 1% 14 patients between 1.1-2%, 12 patients between 2.1-3%, 6 patients between 3-3.5% and 2 cases between 4.1 to 5% PCV decrease. Estimation of Hemoglobin (fig 1), red blood cells (fig 2) and hematocrit (fig 3) showed that the values returned to pre-phlebotomy level in all cases within 72-96 hours of phlebotomy 81% - 88%.





D) Reticulocyte Count

Prephlebotomy reticulocyte count ranged between 0.82 to 2%, Mean 1.2% ± 0.28%. 72 hours after bloodletting thereticulocyte value was found to raise in 86% patients between 0.6-1%, 8% patients showed increase of 0.0.5%, and 6 % patients showed increase of 1% to 1.1%.

(E) Platelet Count

The pre letting values were found in the range of 2.4-4.8 lakh per mm³ of blood. On the 3rd post letting day the values were found to be increased by 0.1 to 0.9 lac in 38 cases, in 10 cases the value decreased by 0.1 to 0.4 laces and there was no change in 2 cases.

(F)Serum Iron

Preletting serum iron ranged from 70 to 100µg/dl, Mean 84.2 + 9.3µg/dl.After72 hr. phlebotomized all patient showed a decrease of 4 to 13µg/dl.

(g) TCL & DCL

No Signification change occurred in prephlebotomy or post phlebotomy patients.

IV. Discussion

Although autologous blood transfusion has unchallenged merits for diverse reasons, it has failed to gain the desired momentum. The greatest barrier to the acceptance of using autologous, banked, blood, by surgeons, has been a persistent false belief that the patient would come to surgery in an impaired condition, due to decreased blood volume or depletion of the vital resources. My patients and their attendants having a firm belief against blood donation were hard to convince in favor of autologous blood transfusion. 50 selected patients, out of 256 counseled agreed for pre deposit autologous blood transfusion in elective surgery. Milles et al 1962 and Langston et al 1963 suggested that from the surgeon’s point of view the minimum hemoglobin concentration for auto transfusion must be above 10g% Newman et at 1971 also included the patients having hemoglobin level of 10gm% and found no adverse effect. In the present,Nalanda series, patients having hemoglobin 10gm% were

used and no ill effect was noticed. After phlebotomy hemoglobin level decreased by 0.5 to 1.5g in all patients but about 78% canes recovered their prephlebotomy level by the 7th day.72 hours after phlebotomy reticulocyte count were found to be increased by 0.5-1% in 86% patients Langston et al 1963 observed an average increase of 0.6 to 0.7% after 24 hours and Henry 1974 found an average increase of 1% after one phlebotomy .The increase in reticulocyte count is attributed to the effects to recoup the red blood cell loss. After one phlebotomy it was found that 76% cases recovered their preletting blood volume by the 3rd day the deficiency was minimal between 0.03 tp 0.1 L Milles et al 1962 and Newman et al 1971 have also reported that the blood volume certainly returns to prephlebotomy level on the 3rd day. The plasma volume was found to be increased in 44 out of 50 cases on the 3rd day of phlebotomy. Dagget et al 1970 observed that the fluid component is usually replaced with 24 to 48 hours after prelobotomy if the patients has normal fluid intake. Packed cell volume was found to be decreased by 1% to 5 % in all patients on the 3rd day whereas plasma volume increased in 88 % cases indicating that the plasma volume recoups faster than the cellular components. Serum iron level decreased by 4 -15 µg/dl on the 3rd day of phlebotomy, observation collaborated by Cowell and Swickard 1974. The decrease in the serum iron level is due to the utilization of iron for the active erythropoiesis TLC DLC and platelet count showed no definite pattern and hence no significance could be attached to their variation. From the present study it has been concluded that autologous blood transfusion in elective surgery can be safely employed. This is simple, economical and eliminates most of homologous blood transfusion reactions. Auto transfusion needs motivation, perseverance guidance and counseling on the part of the surgical team for popularization.

V. Summary & Conclusion

Autologous blood transfusion was successfully performed is 50 patients undergoing elective surgery. On the basis of hemodynamicassessment hematological investigation and statistical analysis autotransfusion is safe effective and practical procedure this procedure when used judiciously will reduce the load on blood bank hospital bed doctors and paramedics and increased awareness of blood transfusion in the society. Autologous blood transfusion has unparalleled merits and mitigated demerits need to be popularized by doctors/surgeons and media and promising future.Liberal use of autologous transfusion shall remarkably reduce the demands for homologous blood, from blood banks,which would then easily cater for emergency operations,elective surgery in poor health patients and the surgical procedures anticipating large amounts of blood replacement. Shortage of wholesome blood for transfusion, a perpetual cry in all our Indian hospitals, may well be reduced to a great extent by our sincere approach to autologous transfusion. In the interest of patients, hospital, our society and nation we strongly appeal to all those engaged in the profession, for a greater use of autologous blood transfusion. Unlike storage in CPD solution, cryopreservation of blood in glycerol allows it to be kept for years rather than weeks. This is generally not undertaken, due to expense involved, but the long term storage of blood from an individual with a very rare blood group may be considered prudent, if future transfusions are anticipated.

Conflict of Interest **None**
Funding **None**
Ethical Issue **None**

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