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Brief Report

A Retrospective Analysis of Intraoperative Transfusions at a Tertiary Care Hospital: A Brief Report

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ABSTRACT

Background and objectives: Intraoperative blood transfusion is a common medical intervention worldwide. Although mostly lifesaving when indicated, inappropriate administration of intraoperative can be potentially life-threatening. The aim of this study was to analyze the most common surgery/invasive procedures requiring intraoperative transfusion and to determine indications for intraoperative transfusion as well as the outcome of the patients after intraoperative transfusion.

Methods: A retrospective review of the electronic database of medical records was done for surgical patients who received intraoperative transfusion from June 2019 to December 2019. Preoperative hemoglobin values, associated comorbidities, and physiological triggers including hypotension and tachycardia were recorded. Descriptive statistics were used to summarize the data.

Results: A total of 36 patients (age range: 9-80 years) were studied. Orthopedic surgeries (53%) were the most common surgeries that required intraoperative transfusion. Preoperative anemia (hemoglobin <10 g/dl) was the predominant reason for intraoperative transfusion. Type 2 diabetes mellitus (36.3%) was the most frequent comorbidity among the cases of intraoperative transfusion. Half the cases received two units of packed red blood cell (pRBC), while 39% of the cases received one unit of pRBC. The remaining 11.1% received more than two units of pRBC. Furthermore, 77.7% of the patients were discharged to home within a week, while 16.6% of the patients were discharged after a prolonged hospital stay (> one week). The remaining 5.5% died in the hospital within a week of the procedure/surgery.

Conclusion: Transfusion practices vary among physicians, hospitals, and countries. The findings highlight that the hospital might be the most important determinant of the number of administered transfusions, with some adopting programs to reduce transfusions for elective surgery.

Keywords: Erythrocytes, General Surgery, Blood Transfusion.

INTRODUCTION

Perioperative blood transfusion and adjuvant therapies of patients undergoing surgery or other invasive procedures in which significant blood loss occurs or is expected, constitutes perioperative blood management. It encompasses preoperative, intraoperative, and postoperative administration of blood and blood components (1). Blood components such as allogeneic or autologous blood, red blood cells (RBCs), platelets, cryoprecipitate, and plasma products such as fresh-frozen plasma, PF24, or thawed plasma may be administered in perioperative blood management. Most experts have now reached a consensus that transfusion should be considered if hemoglobin (Hb) is below 80 g/l, while an Hb level below 70 g/l indicates the need for transfusion. The decision for blood transfusion should be based on the clinical condition of the patient (higher thresholds may be appropriate in individual cases (2).

The Association for the Advancement of Blood & Biotherapies guidelines (2012) have stressed upon the importance of taking symptoms and expected surgical blood loss as well as the Hb concentration into consideration while making the decision for blood transfusion (3). Intraoperative transfusion of allogeneic blood can greatly influence outcome after surgery. Blood loss and consequently Hb concentration can be unpredictable during surgery, thereby making the intraoperative setting a unique situation. Previous measurements of Hb concentrations may become invalid as Hb values may drop suddenly during surgery. This limits the feasibility of using specific Hb levels to guide RBC transfusion administration in surgical patients (5). It is also important to appreciate that not all intraoperative bleedings are the same, varying from a persistent, slow ooze, to massive, rapid blood loss from a major vessel. Intraoperative hemodynamics of a patient are complex and dependent on multiple variables, such as anesthetic agents, patient positioning, presence of pneumoperitoneum, and neurological stimulation (6). It is also recommended to monitor for the presence of symptoms indicative of inadequate perfusion and oxygenation of vital organs such as decreased level of consciousness, chest pain, or abdominal pain, which is not possible in unconscious patients under general anesthesia. Another unique aspect of a patient under general anesthesia is the inability to identify transfusion reactions (7). The aims of this study were to determine the most common surgery/invasive procedure requiring intraoperative transfusion, various indications for intraoperative transfusion, and the outcomes of patients after intraoperative transfusion.

MATERIALS AND METHODS

A retrospective observational study was conducted at a tertiary care hospital in India from June 2019 to December 2019. A collaborative study was planned by the Department of Laboratory Medicine and Department of Anesthesia. All surgery patients who received intraoperative transfusion during the study period were included in the study. Cases with history of preoperative or postoperative transfusions were excluded from the study. Data were obtained the patients records at the blood bank as well as in registers of Department of Anesthesia. All cases were analyzed for variables such as preoperative Hb values, associated comorbidities, and physiological triggers including hypotension and intraoperative tachycardia that may have necessitated intraoperative transfusion. The study also took into consideration the surgeries and invasive procedures, which commonly required intraoperative transfusion, and the postoperative outcomes of such patients. Blood grouping and cross matching for patients was performed using a commercial diagnostic kit (Tulip Diagnostics Ltd., India). In addition, Hb of patients was measured using an automated hematology analyzer (Beckman Coulter Inc., USA).

RESULTS

A total of 36 cases (age range: 9-80 years) were enrolled in the study. A slight female predominance (60%) was present among the subjects. The data obtained were analyzed for various variables as discussed below.

Type of surgery

Orthopedic surgeries (53%), followed by gynecological surgeries (28%) were the predominant surgeries that required intraoperative transfusion. Other cases that required intraoperative transfusion were cases undergoing gastrointestinal surgeries (intestinal perforation, pediatric intestinal

obstruction, and cholelithiasis) and general surgeries (closed head injury and non-healing ulcer) (Table 1).

Triggers/reasons for intraoperative transfusion

Preoperative anemia (Hb <10 g/dl) alone remained the most common reason for intraoperative transfusion at our center (Table 2). Anemia associated with comorbidities such as coronary artery disease and chronic kidney disease were other triggers for intraoperative transfusion.

Physiological triggers including hypotension, tachycardia, and arrhythmia were also found as the sole reason for intraoperative transfusion. Hypotension accompanied with tachycardia was the most common physiological trigger for intraoperative transfusion (Table 3).

Associated comorbidities

The most common comorbidities seen among cases of intraoperative transfusion were type 2 diabetes mellitus (36.3%) and cardiovascular diseases (27.2%). Other comorbidities were chronic obstructive pulmonary disease and chronic kidney disease (Table 4).

Number of packed RBCs (pRBCs) transfused

In our study, 50% of the cases received two units of pRBC, while 39% of the cases received one unit of pRBC. The remaining 11.1% received more than two units of pRBC.

Outcomes

In our study, 77.7% of the patients were discharged to home within a week, while 16.6% of the patients were discharged after a prolonged hospital stay (> one week). The remaining 5.5% died in the hospital within a week of the procedure/surgery.

Table1- Type of surgeries requiring intraoperative transfusion

Surgery type	Number (%)
Orthopedic surgery	19/36 (52.7%)
Gynecologic surgery	10/36 (27.7%)
Gastrointestinal surgery	04/36 (11.1%)
General surgery	03/36 (8.3%)

Table 2-Reasons/triggers for intraoperative transfusion

Trigger for transfusion	Number (%)
Hemoglobin alone (Hb<10 g/dl)	15/36 (41.6%)
Hemoglobin and physiological trigger	6/36 (16.6%)
Hemoglobin and comorbidity	6/36 (16.6%)
Physiological trigger alone	4/36 (11.1%)
Physiological trigger and comorbidity	2/36 (5.5%)
Physiological trigger plus excessive blood loss	2/36 (5.5%)
Excessive blood loss alone	1/36 (2.7%)

Table 3- Physiological triggers seen in cases of intraoperative transfusion

Physiological triggers	Number (%)
Tachycardia alone	4/13 (30.7%)
Hypotension alone	2/13 (15.3%)
Hypotension and tachycardia	6/13 (46.1%)
Arrhythmia	1/13 (7.6%)

Table 4- Comorbidities seen in cases of intraoperative transfusion

Comorbidities	Number (%)
Cardiovascular diseases	3/11 (27.2%)
Chronic kidney disease	2/11 (18.1%)
Pulmonary disease	2/11 (18.1%)
Gastrointestinal disease	Nil
Type 2 diabetes mellitus	4/11 (36.3%)

DISCUSSION

Transfusion practices may vary greatly among different physicians, centers and even countries. Various factors may affect intraoperative transfusion rate at a hospital or institution. According to the European Transfusion Practice and Outcome (ETPOS) study, gynecological procedures (90%), visceral surgeries (89%), and orthopedic surgeries (88%) were the most common procedures associated with intraoperative transfusion (8). In our study, orthopedic surgeries, followed by gynecologic surgeries were most commonly associated with intraoperative transfusion.

In the present study, the average Hb at which intraoperative transfusion was considered was 8.4 g/dl. According to the European Society of Anesthesiology, Hb level of 7–9 g/dl has been recommended for performing intraoperative transfusion during active bleeding (9). The average preoperative Hb level for intraoperative transfusion in the ETPOS study was found to be 8.1 g/dl (8). This is a far cry from the previously recommended level (10g/dl) as the limit for initiating transfusion. Preoperative anemia is one of the most important determinants of intraoperative transfusion; therefore, it has been recommended that elective surgery of anemic patients should be postponed to enable adequate patient preparation (9). Furthermore, it has been demonstrated that even mild or moderate preoperative anemia is associated with significant morbidity and mortality. Thus, preoperative optimization of Hb is recommended to avoid unnecessary transfusions as per Patient Blood Management guidelines (9). Goodnough et al. reported that in order to detect, evaluate, and manage preoperative cases of anemia, elective orthopedic surgeries must follow the recommendations proposed by the Grading of Recommendations, Assessment, Development and Evaluations. Accordingly, elective orthopedic surgical patients must have their Hb level determined 28 days before the scheduled surgical procedure if possible. It was also suggested that the patient's target Hb before elective surgery should be within the normal range, according to the World Health Organization criteria. Laboratory testing for evaluation of anemia for nutritional deficiencies, chronic renal insufficiency, and/or chronic inflammatory disease as well as treatment of nutritional deficiencies was also recommended in the study by Goodnough et al. (10).

Most cases at our center were taken up on emergency basis or were trauma cases that had to be operated urgently; therefore, there was not enough time for preoperative correction of anemia. However, preoperative optimization of Hb must be considered in elective/planned surgeries.

Other than Hb, the other important determinant for intraoperative transfusion was physiological triggers such as hypotension and tachycardia. However, even with the presence of physiological triggers during surgery, Hb levels proved to be important adjuncts in deciding whether intraoperative transfusion is to be initiated or not.

In our study, 50% of the cases received two units of pRBC, while 39% of the cases received one unit of pRBC. The remaining 11.1% received more than two units of pRBC. It is deciphered from previous studies that often more than a unit of pRBC are transfused once a decision to administer blood has been made, partly because of blood allocation strategies (11). The results of our study are consistent with the results obtained in the ETPOS study wherein more than 40% of patients had two pRBC units transfused. It can be speculated from the ETPOS study that often two units are ordered or demanded together and subsequently transfused as a package. To overcome this problem, Australia initiated a campaign, known as the ‘one unit policy’ where Hb levels are measured after each

pRBC administration, to determine whether further transfusion is necessary or not (8).

Lan et al. conducted a study on postoperative complications of perioperative blood transfusion in patients with Crohn's disease, and found that patients with blood transfusion were older, more likely to have a lower body mass index, and often with an associated concomitant chronic illness. The mentioned study also reported intraoperative blood transfusion as an independent risk factor for complications such as thromboembolism, respiratory failure, renal failure, and cardiac arrest (12). In our study, 77.7% of the patients were discharged to home within a week, while 16.6% of the patients were discharged after a prolonged hospital stay. In addition, 5.5% of the patients died in the hospital within a week of the procedure/surgery.

In a study by Glance et al., there was an association between intraoperative blood transfusion and increased risk of morbidity and mortality in patients undergoing non-cardiac surgery. Patients receiving an intraoperative transfusion were more likely to have pulmonary, septic, wound, or thromboembolic complications, compared with patients not receiving an intraoperative transfusion (13).

CONCLUSION

Transfusion practices might vary among physicians, departments, hospitals, and countries, despite widespread availability of transfusion guidelines. For elective surgery, the hospital might be the most important determinant of the number of transfusions, with some adopting programs to reduce transfusions. Anemia must not be treated as just a laboratory aberration but as a serious and treatable medical condition. Intraoperative transfusion, although lifesaving in most situations, is not completely risk free. Therefore, a restrictive transfusion strategy is preferable in most clinical settings.

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DECLARATIONS

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Ethics approvals and consent to participate

The study was carried out based on ethical guidelines. The present study is a retrospective one which did not require any active intervention on the patients/participants. Consent was taken from the patients or their next of kin prior to surgery and prior to blood transfusion according to institutional guidelines. Identity of the participants/patients has not been disclosed in the present study.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding publication of this article.

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