Clinical Investigation

Appropriateness of perioperative blood transfusion in patients undergoing cancer surgery: A prospective single-centre study

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Access this article online

Website: www.ijaweb.org

DOI: 10.4103/0019-5049.98763

Quick response code

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ABSTRACT

Background: Allogenic blood transfusion is associated with several potential complications, especially in patients with cancer. The objective of this prospective single-centre study was to identify the rates of perioperative blood transfusion and overtransfusion in a tertiary-level cancer hospital. **Methods:** Between March and May 2008, we studied all adult patients undergoing elective major cancer surgery under anaesthesia and recorded intra- and immediate post-operative (within 24 h) blood transfusions and post-operative investigations. Overtransfusion was defined as post-transfusion haemoglobin (Hb) exceeding 10 g/dL. **Results:** One hundred and eighty-six of 1175 (16%) patients received perioperative blood transfusion. The main trigger for intraoperative transfusion was blood loss exceeding the patient's maximum allowable blood loss (92, 49%). Ninety-five (51%) transfused patients had post-transfusion Hb more than 10 g/dL. The rate of overtransfusion was not higher in patients who received single-unit transfusions. **Conclusion:** The perioperative transfusion rate in patients undergoing cancer surgery was 16%. More than half of these patients were overtransfused. Following this audit, point-of-care facilities for intraoperative haemoglobin measurement have been introduced.

Key words: Blood transfusion, neoplasms, perioperative period

INTRODUCTION

The hazards of allogenic blood transfusion include transmission of infection and immunological reactions.[1,2] In cancer patients, there is additional concern about the effects of transfusion-related immunomodulation on tumor recurrence and survival.[1,3] A recent metaanalysis suggests an association between perioperative transfusion and colorectal cancer recurrence.[4] Studies have looked at perioperative blood transfusion practice and have identified inappropriate transfusion rates between 19 and 53%.[5-10] It has been shown that such audits may help to identify problems in transfusion practice, and regulate and decrease rates of inappropriate transfusion.[6,8,11-13] There is a scarcity of published literature worldwide on the prevalence of inappropriate transfusions after cancer surgery. Therefore, we conducted a prospective audit to examine the perioperative blood transfusion practices in our tertiary referral cancer hospital. The objectives of the study were to identify the rates of perioperative blood transfusion and overtransfusion in adult patients undergoing elective cancer surgery.

METHODS

The study was approved by the Institutional Review Board. We prospectively collected data of all consecutive adult patients undergoing elective major cancer surgery between 1 March and 31 May 2008. Individual patient consent was waived as the study involved only the use of anaesthesia charts, anonymised patient records and records from the Department of Transfusion Medicine.

Operation theatre (OT) anaesthesiologists completed a form for each patient, which included details of pre-operative history and investigations, intra-operative

How to cite this article: Ranganathan P, Ahmed S, Kulkarni AP, Divatia JV. Appropriateness of perioperative blood transfusion in patients undergoing cancer surgery: A prospective single-centre study. Indian J Anaesth 2012;56:234-7.

blood loss and fluid therapy, blood and blood products transfused (if any) and any intraoperative investigations. Intra-operative blood loss was calculated by measuring the volume of blood in the suction bottle, by weighing mops and gauze pieces used during surgery and by visual estimation of loss in the field. The existing practice at the time of the study was to transfuse patients whose blood loss exceeded the maximum allowable blood loss (MABL) {[MABL = (pre-operative Hb – target Hb)/average Hb] * blood volume}. To avoid any influence on the decision to transfuse, the form did not include a list of possible acceptable indications for transfusion. However, OT anaesthesiologists were encouraged to document their reasons for transfusing patients. Intra- and post-operative investigations were carried out at the discretion of the attending anaesthesiologist/surgeon.

In patients having massive intraoperative bleeding (defined as loss of more than 80% circulating blood volume), estimation of blood loss and its replacement is likely to be inaccurate – such patients were excluded from subsequent analysis. All patients were followed-up for 24 h after surgery to identify transfusions in the post-operative period. Records were cross-checked each day with the electronic database of the Department of Transfusion Medicine to capture transfusions that might have been inadvertently missed. The case files and electronic medical records of all patients on the database were checked on the day after surgery to gather results of these investigations. Where reasons for transfusion were not documented, anaesthesia charts and patient investigations were reviewed to identify potential reasons.

Statistical analysis was carried out using SPSS 18.0 (SPSS, USA). Perioperative blood transfusion was defined as transfusion of RBCs (packed cells or whole blood) during or within 24 h after surgery. A patient was considered to be overtransfused if the post-transfusion Hb was more than 10 g/dL. This cut-off was based on the ASA guidelines, which suggest that patients with Hb more than 10 g% almost never need transfusions.[14] For convenience of analysis, a team of two senior anaesthesiologists classified surgeries into three categories based on their likelihood of needing transfusion – low (e.g., breast, modified radical neck dissection, parotidectomy), moderate (e.g., colectomy, pancreatectomy, oesophagectomy) and high (e.g., major pelvic bone resections, liver resections, open prostatectomy). Data was expressed as percentages for categorical variables and mean (with standard deviation) or median (with interquartile ranges, IQR) for continuous variables. *P*-value less than 0.05 was considered significant for all comparisons and no adjustment was made for multiple comparisons.

RESULTS

During the study period, 1195 patients underwent elective surgical procedures. The demographic characteristics of these patients are shown in Table 1. The median intra-operative blood loss was 250 ml. (IQR: 100; 562). The median intra-operative blood loss was 150 mL, 500 mL and 512 mL in surgeries classified as low, moderate and high likelihood of needing transfusions, respectively. Six procedures involved massive blood loss; there was incomplete data and follow-up in 14 cases; therefore, 1175 patients were included in the final analysis. Of these, 186 patients (16%) had at least one unit of blood or blood products transfused. Single- and two-unit transfusions accounted for 40% each of total transfusions, with the remaining receiving three or more units. The most common reasons for transfusion were blood loss exceeding the MABL (49%), intraoperative Hb less than 8 g/dL (14%), haemodynamic instability (5%) and anticipation of further blood loss (5%). However, in 20% (38) of the transfused patients, there was no documented reason for transfusion and examination of the patient's records did not reveal any particular indication for transfusion. Ninety-five of the 186 patients (51%) had post-transfusion Hb more than 10 g/dL and were considered overtransfused. The rate

Table 1: Demographic characteristics of patients

Sex	
Male	593 (49.6%)
Female	602 (50.4%)
Age (in years)	
Mean (±SD)	48.6 (±13.4)
Weight (in kg)	
Mean (±SD)	56.6 (±10.8)
ASA status	
I	64%
II	34.6%
III	1.4%
Hb (g%)	
Mean (±SD)	12.0 (±1.7)
Less than 8	9 (0.8)
8.1–10.0	165 (13.4)
More than 10.1	1021 (85.8)
Likelihood of needing transfusion (%)	
Low	799 (67)
Moderate	348 (29)
High	48 (4)

of overtransfusion was highest in patients receiving 2 units of blood [Table 2]. Among the 38 patients who received transfusions for unknown reasons, 24 (63%) were overtransfused. Forty-nine patients had intraoperative Hb testing done; of these, 39 patients received transfusions.

DISCUSSION

The impact of allogenic blood transfusion on long-term outcomes in patients undergoing cancer surgery is still unclear. While the results of a metaanalysis suggest a "moderate association" between allogenic blood transfusion and early recurrence in patients with colorectal cancer, a causal relationship has not been established.[4] Further work in this area and in other types of cancer surgery is needed. However, other hazards of blood transfusion, such as transfusion reactions, transmission of infection and risks of mistransfusion, are better defined and it is an accepted fact that the transfusion of blood should be limited to those situations where it is deemed necessary.[1] A recent metaanalysis also confirms that the restrictive allogenic transfusion strategy reduces perioperative infection rates with no increase in the rate of complications like cardiac events or mortality.[15] Moreover, blood being a precious and scarce resource, every attempt should be made to transfuse blood and blood products only when essential. In this setting, transfusion audits have an important role in identifying and correcting inappropriate practices.

In this prospective audit of perioperative blood transfusion during elective cancer surgery, the overall red cell transfusion rate was 16%. More than half of these transfusions resulted in post-transfusion Hb more than 10 g/dL, and could be considered overtransfusions either in terms of the decision to transfuse or in terms of the volume of blood transfused. Previous audits in surgical patients have found perioperative blood transfusion rates between 16.7 and 34%.[7-9] The incidence of overtransfusion in these studies varied between 19 and 53%.[7,9] This could be due to the differences in patient populations, type of surgeries performed and criteria used to define overtransfusion. The most common indications for perioperative transfusion in our study were blood loss exceeding the MABL and low intraoperative Hb. Other studies have found low Hb, blood loss and hypovolaemia to be indicators for perioperative transfusion.[5,7] Twenty percent of the transfusions in our study had no documented indication for transfusion. This group of patients had the highest rate of overtransfusion (63%). Spencer found that insistence on documentation of reason for transfusion resulted in a significant decrease in the incidence of inappropriate transfusions.[6]

Table 2: Number of units of blood transfused and appropriateness

Units transfused	Total number	Appropriate	Overtransfused
1	74	41 (55)	33 (46)
2	75	28 (37)	47 (63)
3 or more	37	22 (60)	15 (40)
Total	186	91 (49)	95 (51)

Figures in parenthesis are in percentage

The use of single-unit transfusions was earlier seen as an index of inappropriateness of transfusion practice. However, it is now accepted that transfusions should be limited to the smallest amount of blood needed to raise the patient above the transfusion threshold and that transfusions of single units of blood actually increase when quality improvement programs are instituted.[8] In our study, the proportion of overtransfusion was not higher in single- versus multiple-unit transfusions. However, the rate of overtransfusion was highest in two-unit transfusions, suggesting that transfusion of a single unit may have sufficed in these patients. The second unit might have been given in some of these patients due to a persistent belief among some anaesthesiologists that a single-unit transfusion was inappropriate. It was also interesting that in patients who were transfused for unspecified reasons, single-unit transfusions were more common, and most of these resulted in overtransfusion. It has been suggested that the use of point-of-care techniques for intraoperative Hb testing may decrease unnecessary transfusion.[7,8,16] In our study, 49 cases had intraoperative Hb testing done and 39 of these got transfused – these numbers were too small to allow meaningful analysis.

Our study had some limitations. Pre-operative Hb values used for MABL calculations were not always recent. This was because we wanted our study to reflect actual clinical practice and have no additional interventions. Secondly, we included only red cell transfusions in our audit. Inappropriate transfusion of other blood products like fresh frozen plasma and platelet concentrates is also a serious issue. However, less than 1% of the patients in our study received fresh frozen plasma and/or platelet transfusions – these numbers were not adequate for analysis. This could possibly be the subject of a future study. Finally, we did not differentiate between packed red cell and whole blood transfusions.

The accuracy of transfusion audits, especially retrospective ones, has been questioned.[17] However, it appears that audits of transfusion practice and transfusion guidelines do have a role in identifying and decreasing the rates of inappropriate transfusion.[11-13] Spencer studied patients undergoing elective joint replacement surgery and found that enforcement of local transfusion algorithms reduced overall transfusion rates by half, with no adverse outcomes and with sustained effect.[6] Similarly, Mallett found a 43% decrease in transfusions following the implementation of transfusion guidelines after an initial audit.[8] It seems logical that the first step towards improving quality of individual aspects of patient care is to first identify the problem, and audits such as this are mandatory in this process. Following this audit, certain steps have been taken to improve perioperative transfusion practices in our hospital. Facilities for bedside Hb estimation (HemoCue™) have been introduced. We propose to increase awareness about transfusion guidelines among departmental staff and repeat this audit at a later stage to assess the impact of these interventions.

CONCLUSIONS

The perioperative transfusion rate in patients undergoing cancer surgery was 16%. More than half of these resulted in overtransfusion. The incidence of overtransfusion was not higher in patients receiving single-unit transfusions. The impact of this audit on perioperative transfusion practice in our hospital remains to be assessed.

Previous presentation

The results of this study were presented as a poster at the American Society of Anesthesiologists' Annual Conference in San Diego, California, in 2010.

ACKNOWLEDGMENTS

The authors would like to acknowledge the technical help received from the Department of Transfusion Medicine, Tata Memorial Hospital, during this study.

REFERENCES

1. Madjdpour C, Heindl V, Spahn DR. Risks, benefits, alternatives and indications of allogenic blood transfusions. Minerva Anestesiol 2006;72:283-98.
2. Goodnough LT, Brecher ME, Kanter MH, AuBuchon JP. Transfusion medicine. First of two parts--blood transfusion. N Engl J Med 1999;340:438-47.
3. Dellinger EP, Anaya DA. Infectious and immunologic consequences of blood transfusion. Crit Care 2004;8:S18-23.
4. Amato A, Pescatori M. Perioperative blood transfusions for the recurrence of colorectal cancer. Cochrane Database Syst Rev 2006;1:CD005033
5. Choy YC, Lim WL, Ng SH. Audit of perioperative blood transfusion. Med J Malaysia 2007;62:299-302.
6. Spencer J, Thomas SR, Yardy G, Mukundan C, Barrington R. Are we overusing blood transfusing after elective joint replacement? A simple method to reduce the use of a scarce resource. Ann R Coll Surg Engl 2005;87:28-30.
7. Niraj G, Puri GD, Arun D, Chakravarty V, Aveek J, Chari P. Assessment of intraoperative blood transfusion practice during elective non-cardiac surgery in an Indian tertiary care hospital. Br J Anaesth 2003;91:586-9.
8. Mallett SV, Peachey TD, Sanehi O, Hazlehurst G, Mehta A. Reducing red blood cell transfusion in elective surgical patients: The role of audit and practice guidelines. Anaesthesia 2000;55:1013-9.
9. Sudhindran S. Perioperative blood transfusion: A plea for guidelines. Ann R Coll Surg Engl 1997;79:299-302.
10. Hallissey MT, Crowson MC, Kiff RS, Kingston RD, Fielding JW. Blood transfusion: An overused resource in colorectal cancer surgery. Ann R Coll Surg Engl 1992;74:59-62.
11. Tinmouth A, Macdougall L, Fergusson D, Amin M, Graham ID, Hebert PC, *et al.* Reducing the amount of blood transfused: A systematic review of behavioral interventions to change physicians' transfusion practices. Arch Intern Med 2005;165:845-52.
12. Toy P. The transfusion audit as an educational tool. Transfus Sci 1998;19:91-6.
13. Toy P. Guiding the decision to transfuse. Arch Pathol Lab Med 1999;123:592-4.
14. American Society of Anesthesiologists Task Force on Perioperative Blood Transfusion and Adjuvant Therapies. Practice guidelines for perioperative blood transfusion and adjuvant therapies. Anesthesiology 2006;105:198-208.
15. Carless PA, Henry DA, Carson JL, Hebert PP, McClelland B, Ker K. Transfusion thresholds and other strategies for guiding allogeneic red blood cell transfusion Cochrane Database Syst Rev 2010;10:CD002042.
16. Goodnough LT, Despotis GJ. Future directions in utilization review: The role of transfusion algorithms. Transfus Sci 1998;19:97-105.
17. Kanter MH. The transfusion audit as a tool to improve transfusion practice: A critical appraisal. Transfus Sci 1998;19:69-81.

Source of Support: Nil, **Conflict of Interest:** None declared