Research Article
Volume 5:3, 2021

Journal of
Clinical Research

Open Access

Time to Cross off Routine Preoperative Blood Crossmatch in Mastectomy!

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Abstract

Purpose: Blood transfusion in breast cancer surgery patients is now quite rare as surgical haemostatic techniques have become very meticulous. In our hospital, all patients planned for mastectomy have a routine blood cross match done preoperatively. The cost of this blood cross match comes down as about 10 United States dollars (USD) per patient. In this study, we looked at our mastectomy patients who required blood transfusion.

Methods: All mastectomy patients from January 2016 to June 2016 were included in our study. The data was derived from a prospectively maintained computerized database. Patient demographics, preoperative and postoperative haemoglobin levels, reasons and timings of blood transfusion were recorded.

Results: 182 patients had mastectomy during 6 months. 170 (93.4%) patients had preoperative blood crossmatch done. 15 patients (8.2%) required blood transfusion preoperatively. This was primarily for building up their haemoglobin levels (range 7.4-9.9 g/dL, mean 9.1 g/dL). 9 out of 15 of these patients underwent neoadjuvant chemotherapy.

Cost of blood crossmatch in these 15 patients needing transfusion was 150 USD compared to 1700 USD cost of cross matching all 170 patients. None of our patients required transfusion intra or post-operatively. Cost of blood crossmatch in 155 patients that never required blood transfusion was 1550 USD.

Conclusion: None of our mastectomy patients required blood transfusion in an emergency situation. 8.2% patients needed transfusion preoperatively, where there was ample time to crossmatch and arrange blood. We recommend that routine preoperative crossmatch in mastectomy patients can be safely avoided (with an additional benefit of saving cost 1550 USD over 6 months).

Keywords: Blood grouping • Crossmatching • Blood transfusion • Breast cancer • Mastectomy • Surgical blood loss

Introduction

In our hospital, patients undergoing elective mastectomy for confirmed breast cancer are usually admitted to the ward one day prior to the surgery. Duty doctors take detailed history and make note of their physical examination. A battery of tests is requested, depending on the patient's past medical history. Such patients are required to routinely have a blood sample sent for preoperative grouping and crossmatching one day before surgery. The blood bank provides 1 unit of packed red blood cells (RBCs), taken as approximately 300 ml, for each mastectomy patient. The next day patients undergo surgery, where some require blood transfusion while others do not. Routine blood crossmatching is one of the commonest tests done by our blood bank laboratory. The cost incurred for this crossmatch is 10 United States dollars (USD) per patient. Like many other institutes, blood over-ordering is a common practice in our hospital. Many surgeons order blood crossmatching only on the basis of habit. This leads to problems in blood bank inventory management. This may lead to extra laboratory work and also incur extra costs [1,2].

In addition to this cost and waste of human resources, blood transfusion carries the additional risks of ABO incompatible transfusions, acute and delayed reactions, post-transfusion complications and infections related to blood transfusions (Hepatitis B, Hepatitis C and HIV) [3-5]. Blood transfusion in breast cancer surgery patients is becoming rare due to meticulous haemostatic surgical techniques. Blood loss during mastectomy depends on multiple factors. The surgical technique and expertise and the available equipment for controlling haemorrhage will all influence the amount of blood loss [6]. The amount of blood loss during mastectomy also depends on certain patient factors, such as inherited disorders of haemostasis, past history of coagulopathies and history of anticoagulant drugs usage [7].

In our hospital, in order to minimize perioperative blood loss in such patients, their blood-thinning medicines are stopped 1-2 week prior to surgery, if it is safe to do so. In addition, surgeons use various techniques to minimize blood loss including monopolar diathermy, ligaclipsTM, vicryl sutures/ties and ligasureTM. A suction drain is secured in mastectomy cavity to monitor volume of blood loss. Postoperatively patients have external compression of mastectomy flaps by a pressure dressing which at times may be covered by an additional crepe bandage. The aim of the study was to see whether we could safely avoid the routine preoperative blood cross-match in some of our elective mastectomy patients.

Patients and Methods

Inclusion criteria

- After receiving approval from the institution review board, data of all patients undergoing mastectomy between January and June 2016, over the age of 18 years was reviewed from a prospectively maintained computerized database.
- Patient demographics, preoperative and postoperative haemoglobin levels, reasons and timings of blood transfusion were recorded.
- Perioperative blood transfusion was defined as transfusion done within a time period of 1 week before and 1 week after the date of surgery.
- The cost of a cross-match was estimated to be approximately 10 USD.

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Received 09 April 2021; **Accepted** 23 April 2021; **Published** 30 April 2021

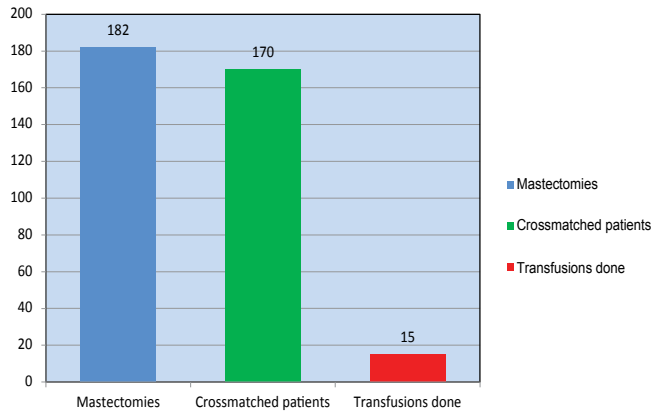

Figure 1. Blood crossmatch and transfusions done in all mastectomy patients.

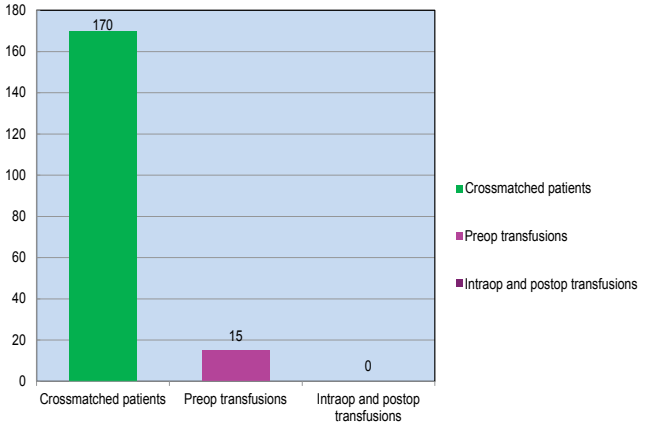

Figure 2. Blood transfusions in cross matched mastectomy patients.

Table 1. Timing of preoperative blood transfusion in mastectomy patients.

Blood transfusion two days before surgery	Blood transfusion one day before surgery	Blood transfusion on the day of surgery
(n=2)	(n=11)	(n=2)

Table 2. Preoperative blood transfusions in mastectomy patients and their preoperative hemoglobin levels.

Number of patients, n	Preoperative hemoglobin level (g/dl)
(n=1)	7.4
(n=1)	7.9
(n=1)	8.5
(n=1)	8.8
(n=2)	9. 0
(n=2)	9.2
(n=1)	9.3
(n=1)	9.5
(n=2)	9.6
(n=2)	9.8
(n=1)	9.9
Total= 15	Mean preoperative hemoglobin level=9.1 g/dL

Table 3. Blood crossmatch and transfusions in mastectomy patients.

Total mastectomies	Total blood crossmatch done	Total blood transfusions done	Crossmatch: Transfusion ratio	Transfusion probability (%)
P	C	T	C:T	T/P × 100
182	170	15	170:15=11.33:1	8.24%

Exclusion criteria

- Patients having bilateral breast surgeries and patients with known inherited disorders of hemostasis

Results

182 patients underwent mastectomy during the study period of 6 months. Out of these, 170 (93.4%) patients had preoperative blood crossmatch done (Figure 1).

15 patients (8.2%) required blood transfusion preoperatively (Table 1) for building up their haemoglobin levels (range 7.4-9.9 g/dL, mean 9.1 g/dL) (Table 2). Out of these 15 patients that were transfused preoperatively, 9 had received neoadjuvant chemotherapy.

Thus out of 182 mastectomies, only 15 patients (8.24%) patients needed transfusion preoperatively (Table 3), where there was ample time to crossmatch and arrange blood.

Crossmatch Transfusion Ratio was found to be 11.33: 1, that is for every 11.33 crossmatch request, only one transfusion was carried out (Table 3).

Cost of blood crossmatch in these 15 patients needing transfusion was 150 USD compared to 1700 USD cost of crossmatching 170 patients.

None of our patients required transfusion intra or postoperatively (Figure 2). Cost of blood crossmatch in 155 patients that never required blood transfusion was 1550 USD. This resulted in extra costs and resources wasted in arranging preoperative blood units.

Discussion

The ordering of blood units needs to be planned and monitored preoperatively by the surgeon and his team. All members of the surgery and anesthesia team need to be aware that such practices can lead to cost savings [1,8].

In our hospital, most mastectomy patients never need postoperative blood transfusion, as excessive blood loss during surgery is very rare. Ideally the surgeon should be able to predict an approximate surgical blood loss along with an approximate need for blood units to be transfused. This can improve efficacy of the blood ordering system and can significantly lower the burden on the blood bank [6,9]. Excessive crossmatch is costly and unnecessarily puts a burden on the limited hospital resources. Malik et al. [10] have suggested revising the hospital's blood grouping and crossmatching policies that add an unnecessary burden on the patients and hospital blood labs.

Lin et al. [2] calculated indices for different types of surgical procedures. Furthermore the number of procedures (P), number of requests for pre-transfusion test (R), and the number of patients transfused (T) were also recorded and certain indices were calculated from these values.

Transfusion probability is a percentage (%) defined by Mead et al. [11] as the number of patients transfused (T) ÷ Number of patients crossmatched (P) × 100 surgical procedures with transfusion probability less than 5% have been considered as rarely requiring transfusion. These procedures are expected to have minimal blood loss and it has been considered safe to disregard a preoperative blood order. If the procedures have transfusion probability greater than or equal to 20%, they are considered as commonly requiring transfusion. A value of greater than 30% has been considered to an indication of significant blood usage [2,11].Palmer et al. [12] have stated that in postoperative surgical and medical patients, red blood cells should only be crossmatched and transfused in response to a demonstrated anemia. If a surgery is expected to involve minimal blood loss, a type and screen order has been recommended for surgical procedures that require blood in less than 10% of cases [2,13].

Mostly, preoperative blood crossmatching is performed in anticipation of a potential need based on the surgeon's own transfusing experience. The actual need for a transfusion may never materialize, and subsequently, many blood units that are crossmatched before surgery are never transfused [12]. Each hospital has its own policies regarding transfusion. Since there is a lack of randomized clinical trials regarding blood transfusion guidelines, worldwide different evidence-based transfusion guidelines and strategies have been introduced. These lead to better utilization of blood products and are cost effective and safe. Some strategies include preoperative risk assessment, optimized preoperative haemoglobin levels and different surgical techniques to minimize blood loss [14-17].

Friedman et al. [18-20] have proposed the use of a Maximum Surgical Blood Order Schedule (MSBOS). This is a measure to limit the number of units held out of circulation and thus limiting the risk of the products getting expired. The MSBOS guidelines are widely accepted and have been shown to reduce unnecessary crossmatching, thus decreasing blood bank costs [12,21-24]. The blood grouping, crossmatch and screening policy means that the patient's blood is grouped and the serum is screened for red cell allow-antibodies. The units are only crossmatched if an actual need for transfusion occurs [2,20]. Auditing of the surgical blood ordering practice can lead to improvement in the use of blood products for transfusion [2,9,14,19-24]. Many blood banks have switched to computer-based crossmatching. This not only reduces the time of grouping and crossmatching to minutes but also has the potential to reduce unnecessary crossmatching [12,25,26].

Lin et al. [2] have recommended that blood crossmatch should be reserved for only those patients whose preoperative haemoglobin levels are less than 10 g/dL and the availability of blood for an emergency situation should be confirmed preoperatively. In selective cases, excessive blood loss can be predicted. For example with large breast sizes [6], and in pre-existing conditions such as hypertension, chemotherapy induced low platelet counts or any known coagulopathies [27]. When crossmatched blood is not transfused, it burdens the blood bank resources. An increased blood inventory has to be maintained. There are also an increased number of blood units that will expire before usage [12,18]. The blood transfusion audit has become an essential aspect in formulating guidelines for surgical blood ordering. Data concerning surgical blood orders should be reviewed periodically. Blood ordering strategies and policies should be revised based on an audit of each individual hospital. Such policies require coordination between surgery, anesthesia and transfusion medicine teams and should also obtain approval of the hospital's transfusion committee [2].

Conclusion

In our study, none of the mastectomy patients required blood transfusion in emergency situation warranting preoperative cross-match in the whole cohort. The 8.2% patients that did need transfusion preoperatively, mostly due to low haemoglobin levels after administration of neoadjuvant chemotherapy, had ample time to get their blood crossmatched and arranged preoperatively. The majority of our mastectomies fall in the category of those procedures that rarely require blood transfusion. Based on our data, we recommend that the routine preoperative crossmatch of all mastectomy patients, irrespective of their hemoglobin levels, is an unnecessary process that adds burden to the limited hospital resources, blood bank, patients and their families. In addition it adds to the workload of the already over-burdened hospital staff. Preoperative blood cross-match should be reserved for only those patients whose preoperative haemoglobin levels are less than 10 g/dL or in selective cases, where excessive blood loss during surgery can be predicted well beforehand due to large breast size, pre-existing bleeding or coagulation disorders and low platelet counts. We can annually save up to approximately 3100 USD by reviewing our blood ordering strategy. The hospital's grouping and crossmatching policy and guidelines need to be reviewed periodically and blood transfusion audits should be made mandatory. This will minimize unnecessary crossmatch requests.

Conflict of Interest

The authors have no conflict of interest to declare.

Declaration

No direct funding was allocated for this study.

References

1. C, Roualt and Gruenhagen J. "Reorganization of Blood Ordering Practices." *Transfusion* 18 (1978): 448-453.
2. Shi Lin, Jeong, Ying Ju Chen, Cheng Hwai Tzeng and Jau-Yi Lyou et al. "Revisiting of Preoperative Blood Ordering Policy-A Single Institute's Experience in Taiwan." *J Chin Med Assoc* 69 (2006): 507-511.
3. Sandeep, Sahu, Hemlata and Verma Anupam. "Adverse Events Related to Blood Transfusion." *Indian J Anaesth* 58 (2014): 543-551.
4. Aisha, Arshad, Borhany Munira, Anwar Nida and Naseer Imran et al. "Prevalence of Transfusion Transmissible Infections in Blood Donors of Pakistan." *BMC Hematol* 16 (2016): 1-6.
5. Williamson, LM, Lowe S, Love EM and Cohen Hannah et al. "Serious Hazards of Transfusion (SHOT) Initiative: Analysis of the First Two Annual Reports." *BMJ* 319 (1999): 16-19.
6. Joe, Nat Clegg Lamptey and Dakubo Jonathan CB. "Mastectomy Blood Loss: Can we Predict the Need for Blood Transfusion?" "*Int J Clin Med* 5 (2014): 1294-1299.
7. Martlew, VJ. "Peri-Operative Management of Patients with Coagulation Disorders." *Br J Anaesth* 85 (2000): 446-455.
8. Herbert, F Polesky. "Cost Containment and Simplification in the Blood Bank." *Clin Lab Med* 5 (1985): 793-799.
9. Vibhute, M, Kamath SK and Shetty A. "Blood Utilization in Elective General Surgery Cases: Requirements, Ordering and Transfusion Practices." *J Postgrad Med* 46 (2000): 13-7.
10. Hassan, Malik, Bishop Hugh and Winstanley John. "Audit of Blood Transfusion in Elective Breast Cancer Surgery-do We Need to Group and Save Preoperatively?" *Ann R Coll Surg Engl* 90 (2008): 472-473.
11. Jay, Mead H, Anthony Cynthia D and Sattler Mildred. "Hemotherapy in Elective Surgery: An Incidence Report, Review of Literature, and Alternatives for Guideline Appraisal." *Am J Clin Pathol* 74(1980): 223-227.
12. Thalia, Palmer, Wahr Joyce A, O Reilly Michael and Greenfield Mary Lou. "Reducing Unnecessary Cross- Matching: A Patient-Specific Blood Ordering System is More Accurate in Predicting Who Will Receive A Blood Transfusion than the Maximum Blood Ordering System." *Anesthesia Analg* 96 (2003): 369-375.
13. Gottshall, J. "Blood Transfusion Therapy: A Physian's Handbook, 8th edition." *American Association of Blood Banks Press* (2005): 57-59.

14. Thomas, C Hall, Pattenden Clare, Hollobone Chloe and Dennison Ashley R et al. "Blood Transfusion Policies in Elective General Surgery: How to Optimise Cross-Match-to Transfusion Ratios." *Transfus Med Hemother* 40 (2013): 27-31.

15. Bridge, Keuhn M. "Guidelines Tighten Transfusion Criteria." *JAMA* 307 (2012): 1788-1789.

16. MF, Leahy and Mukhtar SA. "From Blood Transfusion to Patient Blood Management; A New Paradigm for Patient Care and Cost Assessment of Blood Transfusion Practice." *Intern Med J* 42 (2012): 332-338.

17. Sherman, Carolyn Hyatt and Macivor Duncan C. "Blood Utilisation: Fostering an Effective Hospital Transfusion Culture." *J Clin Anesth*. 24 (2012):155-163.

18. BA, Friedman. "Containing Costs in the Blood Bank by Reducing Unnecessary Crossmatching." *Patholo* 38 (1984):405-410.

19. BA, Friedman. "An Analysis of Surgical Blood use in United States Hospitals with Application of Maximum Surgical Blood Order Schedule." *Transfusion*. 19 (1979): 268-278.

20. BA, Friedman, Oberman HA, Chadwick AR and Kingdon KI. "The Maximum Surgical Blood Order Schedule and Surgical Blood use in the United States." *Transfusion* 16 (1976):380-387.

21. "Guidelines for Implementation for a Maximum Surgical Blood Order Schedule: The British Committee for Standards in Haematology Blood Transfusion Task Force." *Clin Lab Haematol* 12(1990): 321-327.

22. HI, Atrah, Galea G and Urbaniak SJ. "The Sustained Impact of a Group and Screen and Maximum Surgical Blood Ordering Schedule Policy on the Transfusion Practice in Gynaecology and Obstetrics." *Clin Lab Haematol* 17 (1995): 177-181.

23. TA, Lowery and Clark JA. "Successful Implementation of Maximum Surgical Blood Order Schedule." *J Med Assoc Ga* 78 (1989): 155-158.

24. R, Mandai, Kitagawa H, Kuwahara H and Tabuchi Y et al. "Minimizing of the Blood Preparation for Elective Surgery by Maximum Surgical Blood Order Scheduled as well as Type and Screen: Two Year's Experience in Nagahama City Hospital." *Jpn J Anesthesiol* 44 (1995):1715-1721.

25. Suzanne, H Butch and Oberman Harold A. "The Computer or Electronic Cross-Match." *Transfus Med Rev* 11(1997): 256-264.

26. John, W Judd. "Requirements for the Electronic Crossmatch." *Vox Sang* 74 (1998): 409-417.

27. David, Kuter J. "Managing Thrombocytopenia Associated with Cancer Chemotherapy." *Oncology* 29 (2015): 282-294.

How to cite this article: Zaidi , Ambreen, Huma Mannan, Sameen Mohtasham Khan, Ruqayya Naheed Khan, Amina Iqbal Khan, et al. "Time to Cross off Routine Preoperative Blood Crossmatch in Mastectomy!." J Clin Res 5 (2021) 128.