Original Research Article

A study of average requirement of blood in different common surgical procedures

Sachin Lalasaheb Pawar

Professor, Department of Surgery, Institute of Medical Sciences and Research, Mayani, Tq-Khatav, Dist-Satara-415102, Maharashtra, INDIA.
Email: drsachinlapawar@gmail.com

Abstract

Introduction: The evaluation of blood transfusion is a fascinating story, ranging from mysticism and pseudo science to present day ratonal therapy. The therapeutic benefits of blood have been recognized for centuries, however blood transfusion as we know it today, is of comparatively resent vintage. The history is enhanced by the role of a veriety of personages who became famous in other areas, both medical and non-medical, yet all of whom played a role in the dramatic story of transfusion. The event that first kindled interest in blood transfusion was the description of circulation of blood by willian harvey in 1613 which was subsequently published in his de motu cardis in 1628. This accasioned considerable speculation regarding the possibility of blood transfusion **Aims and Objectives:** To study average requirements of blood in different common surgical procedures. **Methodology:** The present series is a study of three hundred and nineteen patients admitted in Krishna hospital, karad and undergone different surgical procedures during the period of two years. (oct.97-sept.99). All the patients undergoing surgery for whom a preoperative cross-match was requested are included in this study. About 18 different procedures from general surgery, oncosurgery are included in this series **Result:** Maximum tranfusion is Required for Splenactomy, Oesophagectomy. The maximum Transfusion Probability was observed in Oesophagectomy, Spleenactomy elective. Spleenactomy emergency (100%), Small and large bowel resection. (Elective) Small and large bowel resection. (Emergency) (87.5% and 85.1%). The TI maximum was foumd in Splenectomy Elective (3.1). CT ratio was highest in 0-5 age group. **Conclusion:** In Major surgical Procedures routinly requiring blood transfusion, Maximum Surgical Blood Order Scheme (MBOS) should be calclulated and followed since this gives a margin of 50% over the average blood lost replacement thus safety margin in cases of un expected haemorrhage.

Keywords: Average Blood Requirement, Transfusion Probablity, Transfusion Index.

[*]**Address for Correspondence:**
Dr. Sachin Lalasaheb Pawar, Professor, Department of Surgery, Institute of Medical Sciences and Research, Mayani, Tq-Khatav, Dist-Satara-415102, Maharashtra, INDIA.
Email: drsachinlapawar@gmail.com
Received Date: 06/07/2015 Revised Date: 10/08/2015 Accepted Date: 26/09/2015

Access this article online

Quick Response Code:

Website: www.statperson.com

DOI: 08 October 2015

INTRODUCTION

The evaluation of blood transfusion is a fascinating story, ranging from mysticism and pseudo science to present day ratonal therapy. The therapeutic benefits of blood have been recognized for centuries, however blood transfusion as we know it today, is of comparatively resent vintage. The history is enhanced by the role of a variety of personages who became famous in other areas, both medical and non-medical, yet all of whom played a role in the dramatic story of transfusion. The event that first kindled interest in blood transfusion was the description of circulation of blood by willian harvey in 1613 which was subsequently published in his de motu cardis in 1628. This accasioned considerable speculation regarding the possibility of blood transfusion[1]. The self life of SFH can be as long as the sterility cab be maintained. The modified hemoglobin solutions are awaiting clinical trials. The type of screen (T and S) has been shown to detect 96.11% of human antibodies. Further more the antigen frequencies corresponding to antibodies detected by type and screen (T and S) was calculated to be 99.99% effective from assuring safety for transfusion of compatible blood. That means in 99.99% cases type and screen (T and S) is effective in preventing incompatible reaction[2,3]. it is documented and proved that single units blood transfusion is unnecessary and without

How to site this article: Sachin Lalasaheb Pawar. A study of average requirement of blood in different common surgical procedures. *International Journal of Recent Trends in Science and Technology.* October 2015; 16(3): 537-541 http://www.statperson.com (accessed 12 October 2015).

any beneficial effect but it increases the chances of transmission of diseases which are transmitted through blood[4,5,6]. A C/T ratio of >2.5 is suggestive of less than 40% of cross matched blood is transfused and denote over ordering[7,8,9,10] The transfusion index (Ti) signifies the appropriateness of no of units ordered.[11]. Friedman et al[12] addressed this nagging problem associated with surgical blood use, and excessive preoperative cross matching.

AIMS AND OBJECTIVES

To study average requirements of blood in different common surgical procedures.

MATERIALS AND METHODS

The present series is a study of three hundred and nineteen patients admitted in Krishna hospital, Karad and undergone different surgical procedures during the period of two years. (oct.97-sept.99). All the patients undergoing surgery for whom a preoperative cross-match was requested are included in this study. About 18 different procedures from general surgery, oncosurgery are included in this series. The cases were studied according to a definite plan outlined in this special Performa, which includes. Pretransfusion test

For donor blood

ABO grouping and Rh grouping: ABO grouping must be determined by forward (cell grouping), reserve (serum grouping) grouping. Red cells are tested with Anti A, Anti B and Anti AB and serum are tested with group A, B and O cells. Rh grouping must be determine using D serum. If D should be tested for D^U phenotype by indirect anticoagulant test D^U positive units must be labeled as D positive. All donor blood should be tested for presence of clinically significant unexpected antibodies. A sample of donor serum should be tested for VDRL, HbsAg. HIV, HCV.

RESULTS

Table 1: Transfusion profile

Sr. No.	Procedure	Patient Trasfused	Patients Cross-Matched	Units Transfused	Average (Ti)	Range (Units)
1	Oesophagectomy .	11	11	29	2.6	2-3
2	Spleenactomy Elective .	8	8	25	3.1	2-4
3	Spleenectomy Emergency.	9	9	19	2.1	1-3
4	Small and Large Bowel Resection . (Elective)	14	16	19	1.3	0-2
5	Small and Large Bowel Resection. (Emergency)	23	27	31	1.3	0-4
6	Nephrectomy.	4	9	7	1.7	0-2
7	Pylolithotomy – Uretrolithotomy.	2	12	2	1.0	0-1
8	Turp	9	36	9	1.0	0-1
9	Thyroidectomy.	3	12	4	1.3	0-2
10	Du Perforation Closure.	10	49	12	1.2	0-2
11	Intra Abdominal Soft Tissue Tumour Excision.	7	9	15	2.1	0-4
12	Colostomy/Colostomy Closure.	2	12	2	1.0	0-1
13	Mrm.	12	21	13	1.08	0-2
14	Surgery On Oral Malignancy.	21	27	35	1.6	0-3
15	Incisional Hernia	1	5	1	1.0	0-1
16	Cholecystectomy.	2	6	2	1.0	0.1
17	Cholecystectomy C- Cbd Exploration.	6	6	7	1.16	0.3
18	Biliary Entric By Pass.	6	6	11	1.83	1.3
	Total	**150**	**281**	**243**	**1.62**	

Table 2: Transfused Probability

$$\%\ T = \frac{\text{No of unites transfused}}{\text{No of units cross matched}} \times 100$$

Sr. No	Procedure	Patients Tran-Sfused	Patients Sross-Matched	% T
1	Oesophagectomy.	11	11	100
2	Spleenactomy Elective.	8	8	100
3	Spleenectomy Emergency.	9	9	100
4	Small and Large Bowel Resection. (Elective)	14	16	87.5
5	Small and Large Bowel Resection. (Emergency)	23	27	85.1

6	Nephrectomy.	4	9	44.4
7	Pylolithotomy – Uretrolithotomy .	2	12	16.6
8	Turp	9	36	25.0
9	Thyroidectomy .	3	12	8.33
10	Du Perforation Closure.	10	49	20.4
11	Intra Abdominal Soft Tissutumour Excision	7	9	77.7
12	Colostomy/Colostomy Closure.	2	12	16.6
13	Mrm.	12	21	57.1
14	Surgery On Oral Malignancy.	21	27	77.7
15	Incisional Hernia	1	5	20.0
16	Cholecystectomy.	2	6	33.3
17	Cholecystectomy C- Cbd Exploration.	6	6	100
18	Biliary Entric By Pass.	6	6	100

Table 3:

$$\text{Transfusion Index (Ti)} = \frac{\text{No of units transfused}}{\text{No of units patients matched}}$$

Sr. No	Procedure	Units Tran-Sfused	Patients Cross Matched	Ti
1	Oesophagectomy.	29	11	2.6
2	Spleenectomy Elective.	25	8	3.1
3	Spleenectomy Emergency.	19	9	2.1
4	Small and Large Bowel Resection. (Elective)	19	16	1.2
5	Small and Large Bowel Resection. (Emergency)	31	27	1.14
6	Nephrectomy.	7	9	0.8
7	Pylolithotomy – Uretrolithotomy	2	12	0.16
8	Turp	9	36	0.25
9	Thyroidectomy.	4	12	0.33
10	Du Perforation Closure.	12	49	0.24
11	Intra Abdominal Soft Tissue Tumour Excision.	15	9	1.66
12	Colostomy/Colostomy Closure.	2	12	0.16
13	Mrm.	13	21	0.6
14	Surgery On Oral Malignancy.	35	27	1.29
15	Incisional Hernia	1	5	0.20
16	Cholecystectomy.	2	6	0.3
17	Cholecystectomy C- Cbd Exploration.	7	6	1.16
18	Biliary Enteric By Pass.	11	6	1.83

Table 4: Distributions of patients as per percentage of blood lost

Sr. No.	Percentage blod loss	No. of patients	percentage	Blood crossmatched		Blood transfused		Average	CT ratio	% T	Ti
				Patients	Units	Patients	Units				
1	0-5	122	38.2	92	127	16	19	1.1	6.6	17.3	0.2
2	5.1 – 10	92	28.8	86	126	38	44	1.15	2.8	44.1	0.5
3	10.1 -15	51	15.9	49	67	42	60	1.4	1.1	85.7	1.2
4	15.1 -20	16	5.0	15	36	14	27	1.9	1.3	93.3	1.8
5	20.1 -25	11	3.4	10	27	10	23	2.3	1.07	100	2.3
6	25.1 -30	8	2.5	8	20	8	19	2.37	1.05	100	2.37
7	30.1 -35	7	2.1	7	7	7	17	2.4	1.0	100	2.4
8	35.1 -40	-	-	-	-	-	-	-	-	-	-
9	40.1 -45	0.9	0.9	3	10	3	9	3.0	1.1	100	3.0
10	> 45	2.5	2.5	8	27	8	26	3.25	1.03	100	3.25

DISCUSSION

The Table No. 1 describes the transfusion profile of this study. In this table for all 18 different procedures number of patient's cross-merged, number of patients transfused and number of units transfused is noted. The average (TI) is calculated for each procedure by dividing units transfused by number of patient's transfusesd. It gives amount of or number of units transfused per patient who has received transfusion for the particular procedure. Range of unit transfused for each procedure is noted. In

procedure like thyroidectomy, closure of duodenal ulcer perforation, transurethral resection of prostate (TURP) cholecystectomy, pylolithotomy and uretrolithotomy, incisional hernia repair and colostomy or closure of colostomy, very few patients received blood transfusion as compared to the number of patients cross-matched and for these procedure the average blood transfusion is also low. That is one unit of blood per transfused patient. The range of units of blood transfused is between 0 to 2. While for procedure like oesophagectomy, spleenectomy elective and emergency, small and large bowel resection elective and emergency, nephrectomy; modified radical mastectom, surgery for oral malignancy, intrabdominal soft tissue tumour excision, biliary entric bypass and cholecystectomy with CBD exploration the average is above I units of blood transfusion per transfused patient. Elective spleenectomy has a maximum average of 3.1 units of blood followed by oesophagectomy with 2.6 units of blood. For oesophagectomy it is 2 to 3 units and for biliary entric bypass between 1 to 3 units and so on. Over all 150 patients received transfusion of 243 units of blood with average of 1.62 units of blood for each transfused patient. The overall range was between 0 to 4 units of blood transfusion. Maximum surgical blood requirement of 1.95 for small and large bowel resection in this study also matches with MSBOS of 1.8 in study by Napier (1985)[13]. This table no.1 gives the overall idea about transfusion pattern and the average (TI) calculated for each procedure is used afterwards for calculation Maximum Surgical Blood Order Schedule (MSBOS) for the procedures which shows significant blood usage. To overcome the drawbacks of the cross match to transfusion ratio (C/T ratio) other indicators are introduced. These indicators were Transfusion Probability and Transfusion Index. We have considered all these indicators together to get to conclusion whether the blood utilization for given procedure awe significant or there is over ordering of blood. Table No. V is prepared to show the Transfusion probability (%T) for the procedure studied. The transfusion probability (%T) was first suggested by mead et al in 1980 as a indicator of significant blood usage .The transfusion probability is the probability with which the cross-mached patient receives blood transfusion. The transfusion probability is calculated by dividing number of patients received transfusion by of patients for whom preoperative cross match was done for a particular procedure or disease. The transfusion probability of more than 30 % is considered to be indicative of significant blood usage, that is more than 30 % of patient who are matched for given procedure received transfusion. In our study procedures like oesophagectomy, spleenectomy (elective or emergency), biliary entric bypass and cholecystectomy with CBD exploration had transfusion probability of 100 %. This shows that for these procedures, each cross-mached patient has received blood transfusion of at least one unit of blood intraoperatively. Whlie other procedures like small and large bowel resection, nephrectomy, intra-abdominal soft tissue tumour excision, modified radical mastectomy and surgery for oral malignancy have a transfusion probability of more than 30% which is significant in term of intraoperative blood usage. The ramaining procedure like pylolithotomy and uretholithotomy, transurethral resection of prostate, closure of duodenal ulcer performation, colostomy or colostomy closure, Incisinal hernia repair have a transfusion probability of less than 30% denoting insignificant blood usage for these procedures. Cholecystectomy has a transfusion probability of 33.3%, which is just above the lower unit of 30% so it is considered to be insignificant, blood use. The above three indicators namely cross-match transfusion ratio, transfusion probability and transfusion index is calculated according to percentage of blood loss. Table No.4 is prepared so that 10 groups are made according to percentage of blood loss. Under each group, number of patients, the cross match and transfusion pattern is noted. The cross-match and transfusion pattern consists of blood cross-matched in terms of patients and units cross-matched and blood transfused in terms of patients and units transfused. The average, C/T ratio, transfusion probability and transfusion index calculated using the same formulae, which were used for the procedure wise study. The percentage of blood loss is calculated for each patient for patient for each procedure. The total blood volume of that patient is calculated using the physiological formula.

Blood volume = weight in kg. X 75 for female

Blood volume = weight in kg. X66 for male

The total blood loss is estimated by taking subjective analysis by anesthetist of intraoperative blood loss and finally percentage of blood loss calculated by using the formula.

$$\text{Percentage of blood loss} = \frac{\text{Blood loss}}{\text{Total blood volume}} X\ 100$$

The Table No.4 gives all detailed information about the using the percentage of blood loss. For group 1 and 2 all the three transfusion indicators are showing insignificant blood usage except for transfusion probability for 2 which is 44.4%. All other groups are showing significant blood usage as indicated by all these indicators. The transmission probability is 100% for all patients who had blood loss of more than 20% of their total blood volume. Patentee with above 20% of blood loss received blood transfusion.

REFERENCES

1. Arth HI, Galena G, Urbaniak SJ. The sustained impact of group and maxium surgical blood ordering schedule policy on the transfusion practice in gynecology and obstetrics. Clin lab Haematol 1995 Jun 17(2): 177 – 181.
2. Boral LJ, SS Hill. The tyoe and antibody screen, revisited.Am J Clin. Pathol. 1979. 578 – 581.
3. Petz, Swisher, Kleinman, Spence, Strauss. Clinical practice of Transfusion medicine Third edition, 1996Churchil Livingstone
4. Fielding LP.(1985) Red for danger - Blood transfusion and colorectal cancer.BMJ 291 : 841-842.
5. Friedman BA. (1979). An analysis of surgical blood use in United States hospitals with application to maximum surgical blood order schedule. Transfusion: 19: 269-278.
6. Kaplan CM, Schulof RS, Goldstein A, Naylor PH, Luban NL, Kelleher JF et al. (1983) Abnormal T- iymphocyte subpoputolions associated with Iran.1 -fusion of blood derived products. Lancet: 1: 991-992.
7. Ammann JA, Cowan MJ, Ware DW, Weintrub P, Dirtz S, Goldman H et al.(1983) AIDS in instant-Possible transmission by means of blood products. Lancet: 1: 956-958.
8. Boral LJ, SS Hill. (1979) The type and antibody screen, revisited. Am J Clin.Pathol. 578 – 581
9. Sharma DP.(1980). Use of blood in elective surgery. JAMA: 243: 1536- 1538.
10. Sheshadri RS, Odel WR, Roxby D, Morley AA.(1979). Effective use of blood in elective surgical procedure. Med. J Aug.:2:575-577.
11. Butia SG, Shrinivasan K, Anantkrishnan N, Jayanthi S, Ravishankar S.(1997) Blood utilization in elective surgery-requirement ordering and transfusion practices. NatMed.J.India July-Aug: 10(4): 164-168.
12. Friedman BA, Oberman HA, Chadwick AR, Kingdom KI.(1976). The maximum surgical blood order schedule and surgical blood use in united state. Transfusion: 16: 380-387.
13. Napier JAF, Biffin AN, Lay D. (1985). Efficiency of use of blood for surgery in south and Mid Wales. British J. Surg. 291 : 799-801

Source of Support: None Declared
Conflict of Interest: None Declared