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Estimation of blood loss during Caesarean Section: an audit

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Abstract

Objective: To evaluate the blood ordering practice and blood transfusion for Caesarean sections at our institution and to compare the estimated blood loss between anaesthetists and obstetricians.

Methods: A review of 126 patients undergoing both elective and emergency Caesarean section was undertaken in 2002. Information collected included the number of blood units cross-matched preoperatively, type of surgery (emergency or elective), type of anaesthesia, parity of the patient, estimated blood loss by both anaesthetists and obstetricians, intraoperative and postoperative transfusion within 48 hours and pre and post operative haemoglobin (Hb) and haemocrit (Hct).

Results: A total of 215 units were cross-matched for 126 patients undergoing Caesarean section delivery. A small amount (9.5%) were transfused intraoperatively and 5.5% postoperatively. The average blood loss estimated by anaesthetists was 498 ± 176 ml and that by obstetricians was 592 ± 222 ml. The calculated blood loss based on patients blood volume and drop in Hct was 787 ± 519 ml. The cross-match transfusion ratio was 9.7.

Conclusion: Only 13% of our patients needed blood transfusion. The mean blood loss was estimated to be more by the obstetricians as compared to the anaesthetists. We recommend that the practice of routine cross-match practice prior to Caesarean section should be re-looked by institutions practicing obstetric anaesthesia (JPMA 56:572;2006).

Introduction

The management of bleeding in Caesarian Section (C Section) is a shared responsibility between obstetricians

and anaesthetists. Major haemorrhage continues to be one of the most common causes of direct maternal death in obstetric practice.¹ In the confidential enquiry into maternal

deaths 2000-2002 in UK, 17 deaths were reported due to haemorrhage out of which 5 deaths were labeled as anaesthesia contributing due to substandard care.²

Different figures varying from less than 500 ml to more than 1000 ml have been quoted as estimation of blood loss associated with Caesarean section.³ There is also a wide variation in blood ordering practices for this surgery.⁴ Several factors like habit, training and medico legal concerns may be responsible in addition to difficulty in blood loss assessment in C sections.⁵ Over the last few years there has been growing concern for safety, cost and adequacy of blood utilization. Audits on blood utilization needed to identify problem areas which can be then corrected. The first step when reviewing transfusion practice is to see whether accurate assessment of blood loss is being done. This was the rationale for our audit.

The objective was to review the blood ordering practice for C section in our institution, to correlate it with the estimated intra-operative blood loss by both anaesthetist and obstetrician and to find the percentage of transfusion during caesarean section. A crossmatch transfusion (CT ratio) was also calculated.

Methods

This was a clinical audit. Ethical committee approval was not required for the purpose of audit. The data of 126 female patients who underwent both elective and emergency C section at the obstetric unit of Aga Khan University Hospital in 2002 was included. Patients with known disorder of haemostasis or on anticoagulant therapy were excluded. The data included the pre C section haemoglobin (Hb) and haematocrit (Hct) as noted on the preoperative assessment form, the indication of C section, patient's age, weight and American Society of Anesthesiology (ASA) status, the number of blood units crossmatched preoperatively, the intraoperative blood loss estimated by the anaesthetist and the obstetrician (by visual estimation), whether a transfusion was given intraoperatively and the number of units transfused. If the difference between estimated blood loss between obstetrician and anaesthetist was less than 100ml, the estimation was considered similar. If the difference in visual estimation of blood exceeded by or was under estimated by 100 ml, the estimation was taken as over or under estimation by the obstetrician compared to the judgement of the anaesthetist.

ASA classification is a universally acceptable method for anaesthesia risk assessment. Routine cross-matching at the institution requires screening of all recipients but not donors for atypical antibodies. The type of surgery whether elective or emergency, the level of anaesthetist

providing anaesthetic care, the parity of patient and the type of anaesthesia given i.e. general, spinal, epidural or combined spinal or epidural was also noted.

The blood bank's computerized records were used to provide information regarding preoperative crossmatching. A postoperative Hb/Hct was done at 48 hours post C section and any blood transfusion given postoperatively during this period was also noted. The anaesthetist then calculated the blood loss based on the drop of Hb from preoperative to postoperative period. The following formula was used.

$$\text{Calculated Hb} = \frac{\text{Hb (p)}}{\text{Total Hb}} \times [\text{EBL} - \frac{\text{EBL} \times \text{Hb (p)}}{100}]$$

Hb (p): Preoperative Hb

$$\text{Total Hb: } \frac{\text{Hb (p)} \times \text{patients blood volume (70 ml kg}^{-1}\text{)}}{100}$$

EBL: Estimated blood loss

Cross match transfusion ratio (CT ratio) was calculated by dividing the number of units of blood cross matched to the number of units transfused.

Results

One hundred and twenty six patients undergoing C section delivery at the institution were included in the audit. Sixty six percent patients underwent elective and 34% underwent emergency procedures. The indications for C section in these patients were the presence of a previous scar (35%), non-progression of labour (16%), placenta praevia (2%) and other miscellaneous causes (47%).

The mean age of patients was 28.4 + 4.7 years (SD) with age range 22 to 40. The mean weight was 72.4 + 12.2 kg. Eighteen percent patients were labeled ASA 1, 72% labeled as ASA 2 and 9% as ASA 3. Sixty five percent underwent general anaesthesia, 6% spinal, 2% epidural and 26% received combined spinal and epidural anaesthesia (CSE). All surgeries were completed within 2 hours. Two patients had 4 units of blood crossmatched (1.5%), 93 had two units crossmatched (74%), 21 had 1 unit crossmatched (1.5%) and for 11 patients no crossmatch was ordered (9%) prior to delivery. A total of thirteen patients had a Hb value less than 10 gms/dl preoperatively and only one patient had a preoperative value of < 8 gm/dl. The lowest recorded Hb level was 6.8 gm/dl-1 in one patient for whom 4 units of blood were ordered preoperatively.

A total of 215 units were cross-matched. Only 12 patients were transfused intraoperatively (9.5%) with 12 units of blood. Seven patients were transfused postoperatively with a total of 10 units of blood. Three of these were the same who required intraoperative transfusion. None of

the transfused patients needed uncrossmatched blood.

The average preoperative Hb of patients was 11.84 gm/dl \pm 7.7 (Hct 33.3 \pm 3.4). The average postoperative Hb was 10.3 \pm 6.4 gm/dl (Hct 28.9 \pm 4.1). The blood loss estimated by anaesthetist varied from 200 to 1200 ml, mean 498 \pm 176 ml and that by obstetrician ranged between 100 to 1050 mls, mean 592 \pm 222 ml. The average calculated blood loss based on Hb drop came out to be 787 \pm 519 ml.

In 54% of C section cases the difference between estimation of blood loss by both anaesthetists and obstetricians independently, was less than 100ml. In 36% surgical estimation was more than the anaesthetist estimation and in 10% it was less. Figure shows the relationship between the estimated blood loss by the anaesthetists and the obstetricians. Blood loss assessment by the anaesthetist is plotted on the x axis and the difference in ml between the anaesthetists and obstetricians estimation on the y axis. Each symbol represents the relationship in one patient.

The ratio of the number of patients typed and cross matched to patients transfused (CT ratio) was 7:1. The ratio of units of blood typed and cross matched to units transfused was 9.7 (22 out of 215). The ratio of total units transfused (n = 22) to the total caesarian section patients (n = 126) was 0.17 unit per patient.

The blood loss recorded by anaesthetist in the 12 patients who were transfused intra-operatively varied from 200 ml to 1000 ml. Fifty eight percent were emergency sections. In 50% of the patients, the blood loss was estimated to be less than 500 ml. Twelve patients received a single unit transfusion.

Discussion

The ability of pregnant women to withstand blood loss at the time of delivery depends on the haemoglobin level, the blood volume, the volume of blood lost, any associated co-existing disease and complications.⁶ Accurate estimation of blood lost at the time of C section delivery is important in transfusion practice. It is difficult to estimate the blood loss accurately in this surgery because of dispersion of blood lost and secondly due to blood being mixed with amniotic fluid. Studies done in the 60's using various techniques^{7,8} have mentioned the average blood loss between 930 and 1106 ml. Duthie et al.⁶ used alkaline haematin method to measure blood loss in forty women with singleton pregnancies undergoing lower segment C section and general anaesthesia. The mean measured blood loss was found to be 487 ml (range 164 - 1438) and was estimated by the observer by reasonable accuracy. They found the observer error in estimating blood loss higher if measured loss exceeded 600 ml. The mean estimated loss in

Estimated blood loss (mls) by anaesthetist

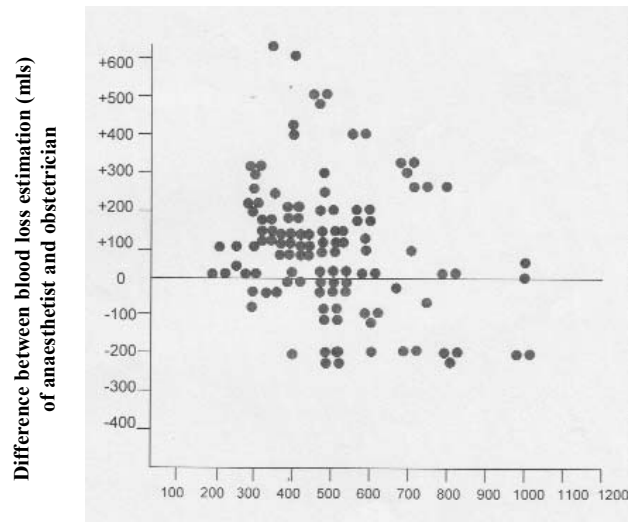


Figure. Difference between anaesthetic and obstetric estimation of blood loss.

our audit was calculated as 498 \pm 176 ml by the anaesthetist and 592 \pm 222 ml by the obstetrician. We did not measure blood volume in our audit but looked at the variation in the estimation of blood loss between the obstetricians and the anaesthetists. In 52% of cases the estimation of loss by both matched within a 100 ml error but in 36% cases the obstetricians overestimated the volume of blood loss compared to anaesthetists. This is in contrast to Brant⁷ who reported that surgeons underestimated the volume of blood loss. In a recent study⁹ it was observed that the anaesthetists were using smaller Hb values as threshold for transfusion compared to gynaecologists. Over the last several years with better knowledge of tissue oxygenation and fear of transmitting infectious disease (HIV, hepatitis) have led the doctors to use blood only when strictly needed.

Blood was crossmatched preoperatively in majority of our patients but only 22 blood units were transfused in 15 patients. This practice was reflected when the cross match transfusion ratio (CT ratio) was calculated. This ratio is used internationally to measure the efficiency of blood bank ordering practice.¹⁰ A CT ratio of 2.5 is considered optimal for most elective surgery.¹¹ The CT ratio in our audit is far above the recommended. A wide variation in blood ordering has been seen in UK practice. In one survey of 89 maternity units, 56% cross-matched for elective and 64% for emergency C sections, the remainder used group and screen only.⁴

It has been suggested that group and screen is appropriate and safe for procedures where average numbers of units transfused per patient is 0.5 or less and blood if ordered should meet the requirements of 90% patients.¹² It

has also been shown that women tolerate post-haemorrhagic anaemia with haematocrit levels of 20% without significant complications if they are stable and without medical illness.¹³ Transfusion may be appropriate when Hb is 7-10 g dl-1 and there is active bleeding or cardiac dysfunction.

A review of 1111 C sections by Cousins et al indicated that the presence of placenta praevia, accreta, haemorrhage, anaemia and/or preeclampsia and HELLP Syndrome were all associated with a transfusion risk of 11-63%.¹⁴ In another retrospective study of 1610 patients who underwent C section, only 103 received blood.¹⁵

Nine percent of our patients required intraoperative transfusion. Other studies have also found that a significant proportion of RBC transfusions given to peripartum women were inappropriate.¹⁶ The incidence of transfusion in other studies is documented as 9.4%¹⁷, 2.4%¹⁸ and 1.7%.¹⁴

Current literature supports that in the absence of significant risk factors, blood type and screen testing for C section should be eliminated.^{14,19,20} Following this audit we changed the blood ordering practice for C sections in our institution in 2004. In majority of young healthy parturients with preoperative Hb above 10 gms/dl only group and hold order are given. If urgent transfusion is required, O negative blood is available.

A major critique on the findings of our audit is that our recommendations may not be applicable to clinical settings in our country, where a larger proportion of patients present from lower socio-economic groups with a higher incidence of anaemia. There is a need to do similar audits in these settings, looking at their blood ordering practice and crossmatch transfusion ratios. It has been recommended that every obstetric unit have protocols available to deal with haemorrhage and risk factors for haemorrhage should be identified antenatally.²¹

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