

Accuracy of Clinical vs Quantitative Methods in Assessment of Intraoperative Blood Loss during Caesarean Section

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Abstract

Objective: The study was conducted to assess the accuracy of clinical and quantitative methods against haemtocrit for estimation of intra operative blood loss during caesarean section.

Study design: Comparative cross sectional study.

Place and Duration: Department of Obstetrics and Gynecology-unit II Pakistan institute of medical sciences Islamabad from July 2012 till December 2012.

Methodology: The study included 312 informed and consented term pregnant women who underwent caesarean section under spinal anaesthesia. Women receiving intra operative or postoperative blood transfusion and general anaesthesia were excluded. Blood loss estimation by clinical method was done by attending anaesthetist. Blood loss was estimated by quantitative method including visual assessment by attending obstetrician, gravimetric method by weighing of sponges and by change in hemoglobin using Flordal formula. All methods were compared against blood loss estimated through haemtocrit (gold standard), done 24hrs after surgery.

Results: The mean blood loss estimated through clinical method was 809.142 ± 595 ml. Blood loss estimated through quantitative methods by visual estimation was 593.08 ± 155.5 ml, by gravimetric method was 577.35 ± 165.7 ml and estimation through hemoglobin was 546.2 ± 165.7 ml respectively when compared against haemtocrit, with estimated blood loss 341.01 ± 338.9 ml.

Conclusion: The clinical method showed a significantly higher blood loss as compared to quantitative method. Both clinical and quantitative methods showed over estimation of blood loss when compared with haemtocrit. All Quantitative methods were comparable with each other. Large scale study is recommended before the generalization of results.

Key words: Blood loss, Caesarean section, Clinical method, Quantitative method.

Introduction

Operative blood loss during caesarean section is a major issue when dealing with obstetrical morbidity and mortality and is usually underestimated. Delivery by caesarean section is one of the most commonly performed obstetrical procedures.¹ It exposes women to the inherent risk of abdominal surgery, the major risk being excessive blood loss due to massive hyper perfusion as part of physiological process. Intra operative blood loss is an important indicator for surgical quality as it influences various aspects of clinical care including blood transfusion, post operative morbidity and recovery. Inaccurate assessment of blood loss may result in significant adverse sequelae. It's under estimation may lead to delayed treatment while overestimation may result in unnecessary and costly intervention. Intraoperative estimation of blood loss though easy to perform is difficult to implement.

Over the years different methods have been used for estimation of blood loss. The clinical method is commonly adopted by the anaesthetist while quantitative methods are used by the obstetrician. Judicious estimation of blood loss is crucially important. However it is poorly reproducible and typically an underestimated and varies from one institution to another and from one obstetrician to another.² Flordals methods for pre and post operative haemoglobin estimation is worthwhile.³

Methodology

The study included 312 informed and consented term pregnant women who underwent caesarean section under spinal anaesthesia. Women receiving intra or post operative blood transfusion and general

anaesthesia were excluded. For each patient blood loss was estimated by clinical and quantitative methods and was compared against the estimation through haematocrit levels individually and collectively.

In clinical method blood loss estimation was done through monitoring of vital signs usually done by obstetrician and anaesthetist. The classification of hemorrhage was based on graded physiological response to the loss of circulating blood volume.

The quantitative method included visual estimation, gravimetric method and estimation by Hemoglobin levels. In visual assessment blood loss estimation was based on what obstetrician noticed during the surgery. In gravimetric method blood loss was estimated through weighing of swabs and calculating the difference in their weight pre and post operatively and by adding up blood in suction bottle. Estimation through hemoglobin levels was done by calculating decrement in pre and post operative hemoglobin levels using Flordals method.

Numeric variables were measured in mean $\pm$ SD and categorical variables were presented in frequencies and percentages. Chi-square test was used to compare relative frequencies of categorical variables. Collective comparison of all tests was done by Post hoc tuckey's test and ANOVA test. All data was entered and analysed through SPSS version 15. P value < 0.05 was considered statistically significant.

Results

During six month study period a total of 312 informed consented patients with mean age of 27.2 ± 4.5 yrs and mean Gestational age of 37.68 ± 3.2 wks were included. Majority of women were booked 73.1%

with mean weight 69.25 ± 9.210 kg and mean height 160.4 ± 77.3 cm (Table I).

Table I. Demographic Features

Weight(mean $\pm$ SD)	69.95 $\pm$ 9.210 kg
Height(mean $\pm$ SD)	160.40 $\pm$ 77.385 cm
Gestational age (mean $\pm$ SD)	37.86 $\pm$ 3.278 wks
Age(mean $\pm$ SD)	27.28 $\pm$ 4.599yrs

The mean blood loss estimated through clinical method was 805.11 ± 546 ml (p0.00). The mean blood loss estimated through quantitative methods

which included visual estimation was 589.10 ± 150.699 ml and by gravimetric method was 573.36 ± 159.48 ml and estimation through hemoglobin was 528.3 ± 862.173 ml against haematocrit that was 342.142 ± 339.152 ml, (p0.00).

Referring table II, the clinical estimation showed a significantly higher blood loss when compared individually with all the gravimetric method. However both clinical and quantitative methods showed significantly higher levels when compared with haematocrit.

Table II. Comparison of all methods using Post Hoc Tukey's Test

Group I	Group II	Mean Difference	Std. Error	P-Value
Clinical Estimation	Visual Estimation	216.01126(*)	38.33575	.000
	Gravimetric Estimation	231.74844(*)	38.33575	.000
	Estimation by Hb	276.73239(*)	40.03770	.000
	Estimation by Haematocrit	464.09594(*)	40.20394	.000
Visual Estimation	Clinical Estimation	-216.01126(*)	38.33575	.000
	Gravimetric Estimation	15.73718	38.30497	.994
	Estimation by Hb	60.72113	40.00823	.551
	Estimation by Haematocrit	248.08468(*)	40.17459	.000
Gravimetric Estimation	Clinical Estimation	-231.74844(*)	38.33575	.000
	Visual Estimation	-15.73718	38.30497	.994
	Estimation by Hb	44.98395	40.00823	.794
	Estimation by Haematocrit	232.34750(*)	40.17459	.000
Estimation by Hb	Clinical Estimation	-276.73239(*)	40.03770	.000
	Visual Estimation	-60.72113	40.00823	.551
	Gravimetric Estimation	-44.98395	40.00823	.794
	Estimation by Haematocrit	187.36355(*)	41.80174	.000
Estimation by Hematocrit	Clinical Estimation	-464.09594(*)	40.20394	.000
	Visual Estimation	-248.08468(*)	40.17459	.000
	Gravimetric Estimation	-232.34750(*)	40.17459	.000
	Estimation by Hb	-187.36355(*)	41.80174	.000

* The mean difference is significant at the .05 level.

Discussion

Over the years various methods have been adopted for estimation of blood loss during caesarean section. Estimation of blood loss through clinical method is done by monitoring of vital signs and it remains a primary means to diagnose the extent of bleeding and to direct interventional therapy. It is the most commonly used method by anesthetists and is considered to be accurate due to the fact that it is dependent on physiological response.⁴ However it varies from individual to individual due to different levels of hemodynamic states and haemoglobin levels at the time of surgery. As our population has high incidence of anaemia, the expected changes in hemodynamic status, reflected by changes in vital signs occur at a much earlier stage, thus showing an over estimate. Our study results also prove this hypothesis where in the blood loss estimated through clinical method was significantly higher than quantitative methods. These findings are in concordance with a study conducted by B.S kodkonsy and RJ derman⁵ who also concluded that clinical symptoms of blood loss remain the primary indicator for intervention and only means available for birth attendants in developing countries.

The quantitative methods, including Visual estimation, Gravimetric method and estimation by Hemoglobin levels have also been found to have low accuracy when compared with hematocrit. Of these, visual estimation is the most commonly used method due to its non-laborious nature and has been adopted by majority of the obstetricians. However, it is a crude method with supposedly low accuracy due to its subjective nature and it varies from one individual to another. The conducted study showed

that blood loss estimated through visual estimation was comparable with other quantitative methods. However it was also observed in one of these studies that visual estimation are volume dependent being more accurate with larger volumes of blood loss and these findings are in contrast to study conducted by Peter J.T and colleagues⁶ where visual estimation gave an underestimate when compared with hematocrit. However it showed an overestimation when compared with hematocrit. These findings are in contrast to other studies which showed that blood loss was measured with reasonable accuracy through visual estimation by vigilant observers including obstetricians and anaesthetists.⁷

Another study by Ashraf and H M Ramdani⁷ and by Villeneuve M G⁸ concluded that visual estimation gave the lowest value of estimated blood loss.

The other commonly used quantitative method is the gravimetric method where blood loss is estimated through weighing of swabs and calculating the difference in their weight pre and post operatively and by adding up blood in suction bottle. The method is considered as a gold standard by some authors as it is neither dependent on personal bias (visual) nor on hypothetical values (mathematical models).⁹ Our study showed contrasting findings in this regard showing significantly higher estimation than hematocrit. Similar inaccuracies in estimation of blood loss through Gravimetric methods have been found in other studies.¹⁰ The accuracy of this method can be improved by standardization with the use of single collecting container and fixed size gauze pads and training through use of simulator based scenarios. Such standardization techniques have been found to significantly reduce the error in

blood loss assessment using visual estimation thus making this method as useful tool in low resource settings.¹¹⁻¹⁴

It has also been observed in some studies¹⁵⁻¹⁸ that visual estimation may be more accurate in estimating blood volume in containers such as kidney dishes, bedpans compared to swabs and linen, a factor needs to be taken into account in clinical practice where pregnant women are more likely to bleed onto pads.

Hemoglobin estimation apparently an objective and mathematical tool for assessment of blood loss also showed an overestimation in our study probably due to dilutional effect because of intravenous fluids infused peri operatively. For similar reasons estimation through haematocrit is preferred over estimation through haemoglobin because of being less influenced by dilutional effect. Similar concerns have been raised by other investigators regarding role of intravenous hydration used perioperatively.¹⁹⁻²¹

Limitation of the Study: Our study is limited by the fact that haematocrit at 24hrs was used as gold standard. Though used in many studies, this method is not 100% ideal as its values are changed overtime. Besides, the best time for estimation of haematocrit is day 3 postoperatively and not 24 hours as done in our study. The justification for this deviation was that majority of our patients are discharged 24-36 hrs of surgery due their logistic issues and rapid turnover of patients. The other major limitation of our study was the estimation of blood loss done through multiple providers with high probability of bias.

Conclusion

Based on study results clinical method shows overestimation of blood loss making it less reliable tool of estimation compared with quantitative methods. All quantitative methods are comparable with each other thus one can be used in favor of the other. Since blood loss estimation is a serious issue and patient's subsequent management is based on this, large scale studies with standardization of different methods and limited number of trained data collectors using stringent criteria are needed for generalization of results.

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After all Caesarean derived its name from saesar of Italy- and blood loss at it must have been tremendous and continues to be significant, at times even now



Colosseum at Rome depicts an arena of blood shed, intentionally arranged!