

# Blood Loss During Caesarean Section: Review Article

Ali El-Shabrawy Ali , Sherin Attia El-Shazly , Yahya Zakaria Mahdy Nada

Department of Obstetrics and Gynecology, Faculty of Medicine, Zagazig University, Egypt

**\*Corresponding author: Yahya Zakaria Mahdy Nada**

**Email: ya7ya.zakaria@gmail.com**

## **Abstract:**

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. 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.

**Keywords:** Blood Loss, Caesarean Section, Hemorrhage.

## **Introduction:**

Caesarean section delivery is associated with severe maternal morbidity. Among these operative morbidities associated with CS, obstetric hemorrhage is the leading cause of maternal mortality worldwide. Because of both the potential maternal risks and financial concerns, the increase in the caesarean rate is a serious public health problem (1).

It is a major cause of maternal morbidity, and one of the top three causes of maternal mortality in both high and low income countries, however, PPH may be the most preventable cause of maternal mortality (2)

Excessive bleeding at caesarean section may be caused by local causes and systemic causes.

## **Local causes**

### **Uterine Atony:**

Uterine atony is the most common cause of postpartum haemorrhage (3).

Because haemostasis associated with placental separation depends on myometrial contraction, atony is treated initially by bimanual uterine compression and massage, followed by dugs that promote uterine contraction, massage is performed by placing one hand in the vagina and pushing against the body of the uterus while the other hand compresses the fundus from above through the abdominal wall (4).

Uterotonic agents include oxytocin, ergot alkaloids, and proslaglandins. Oxytocin stimulates the upper segment of the myometrium to contract rhythmically, which constricts spiral arteries and decreases blood flow through the uterus (5).

### **Trauma**

Trauma refers to uterine tears and lacerations. Trauma may be caused by a difficult delivery of the baby; an impacted fetal head after prolonged second-stage of labor, or obstructed labor. In addition, caesarean section for transverse lie and large baby may be associated with uterine tears and surgical extension of the incision. (6).

## **Abnormal placentation**

### **Placental site bleeding**

Bleeding most commonly occurs with placenta previa and morbidly adherent placenta, but may also occur with an excessively large placental site (i.e. for multiple pregnancies and diabetic mothers), with higher caesarean section rates, this cause is becoming more frequent. (6).

### **Abruptio placentae**

The term abruptio placentae denote separation of a normally implanted placenta prior to the birth of the fetus. The reported incidence varies from 0.49% to 1.29% with a mean incidence of 0.83% or one per 120 deliveries). (7).

If complicated by a large retro placental clot and couvelaire uterus, however, adequate uterine contraction does not occur, resulting in severe hemorrhage. (6).

### **Adhesions**

Caesarean section with extensive adhesions requires sharp dissection and causes more intra- operative hemorrhage. (6).

## **Systematic causes**

### **Coagulopathies**

Coagulopathies can be hereditary or acquired. These disorders include idiopathic thrombocytopenic purpura, thrombotic thrombocytopenic purpura, Von Willebrand's disease, and hemophilia (8).

### **HELLP syndrome**

HELLP (hemolysis, elevated liver enzyme and low platelet levels). The incidence of HELLP syndrome has been suggested at approximately 20% of severe pre-eclampsia. HELLP syndrome has been described as first appearing from the mid second trimester till several days postpartum, and the maternal mortality has been reported as high as 24% (9)

### **Disseminated intravascular coagulation**

Risk factors for disseminated intravascular coagulation include severe preeclampsia, amniotic fluid embolism, sepsis, placental abruption, and prolonged retention of fetal demise.(10)

### **Other risk factors**

Maternal risk factors in general are increasing age, high body mass index (BMI), previous uterine scar and pregnancy-related conditions, as well as slow progress in labor, emergency caesarean section, and general anaesthesia, as well as fetal risk factors like high birth weight and multiple pregnancies. Indications and many medical conditions at delivery differ much between women scheduled for elective and emergency caesarean delivery. (11).

## **Methods of estimation blood loss**

### **Clinical Methods:**

Clinical assessment of blood loss remains the primary way to evaluate blood loss and to act directly in obstetric field

Clinicians are able to approximate blood loss based on changes in pulse and blood pressure and other vital signs changes according to graded body response.

**Table 1:** Classes of hemorrhage.

	Class I	Class II	Class III	Class IV
% blood loss	15	15-30	30-40	>40
Pulse (beats/min)	Normal	100	120	140
Systolic blood pressure (mmHg)	Normal	Normal	70-80	60
Mean arterial pressure (mmHg)	80-90	80-90	50-70	50
Tissue perfusion	Postural hypoperfusion	Peripheral vasoconstriction	Pallor, restlessness, oliguria	Collapse, anuria, air hunger.

**Quantitative Methods:**

**Visual assessment:**

The visual estimation of blood loss by clinicians is not only one of the most widely used methods, but also the most examined one. This includes the estimation of blood volumes in sponges and suction containers but also the recording of external blood losses. Forty-eight studies dealt with the accuracy and improvement of visual assessment and 29 of these were performed in obstetrics. The study results are heterogeneous, so there are different results about the influence of different factors of professional experience, gender, age on the accuracy of the estimate. Even the use of pictograms and other measures does not lead to clear improvements(12).

**Gravimetric method:**

The gravimetric method is an indirect measurement of blood loss. Blood loss can be deduced by weighing the surgical material contaminated with blood and subtracting the dry weights. By summing up the measured weight of the blood and estimating the amount (ml) of mixed liquids (e.g. blood, rinse liquid) in the suction container, the blood loss can be calculated with a conversion of 1 g = 1 ml blood. (13) The study results for gravimetric methods show a higher degree of correlation but are nevertheless heterogenic. Especially by the factor of increased dilution by amniotic fluid or rinsing are relevant factors that lead to inaccuracy in the calculation. (12)

**Direct method**

The direct measurement of blood loss is a simple and long-established method that is mainly used in the field of obstetrics. Nine studies focused on calibrated collection bags specially designed for vaginal deliveries. The collector bag is placed under the woman's buttocks immediately after the birth of the child and collects all mixed liquids (e.g. blood or amniotic fluid). At the bottom of the plastic foil there is a calibrated collector bag with a scale on which the current blood loss can be read. This method is easy to use and, especially in resource-poor areas, in combination with a visual assessment can somewhat improve the quantification of the total blood volume, e.g. during a birth. However, study results still show significant deviations from real blood volume when used (14).

### **Colorimetric measurement of hemoglobin:**

A smartphone application (Triton™) developed by Gauss Surgical Inc. is able to calculate blood loss by taking photographs of used surgical gauze and canisters. The colorimetric technique analyses photographic and geometric information from relevant areas, with the aim of automatically filtering out the effects of non-blood components mixed in each sponge and canister and calculating the Hb mass present in the gauze or canister from the image. By entering the preoperative Hb-level, the blood loss can then be calculated. In the studies analyzed, high degrees of correlation with the reference blood volumes were found. (15)

### **The Actual Blood Loss (ABL):**

Currently, various mathematical approaches are used in clinical practice to evaluate blood loss. To calculate the most exact intraoperative blood loss, the formula has been modified over time. Thus, three different formulas are used in the literature to calculate the total blood volume of patients. The Moore formula (16) which, like Nadler's formula (17) takes into account height, weight and sex for the calculation, and the ICSH formula which uses gender and body surface area to calculate the total blood volume. The formula according to Nadler was used most often in the literature. All blood loss estimation formulas showed a significant tendency to overestimate blood loss. (16)

### ***Reduce blood loss during caesarean section***

The following steps should be taken to minimize hemorrhage associated with caesarean section and to ensure early detection when it does occur. (6)

### **Correct management of labour**

Correct management of labour using the partogram is necessary to avoid prolonged labour or obstructed labour. (6)

### **Indication of surgery**

Unnecessary caesarean section should be avoided. (6)

### **Experience and training**

A caesarean section, which is high risk, should be carried out at the appropriate level of care by the most experienced surgeon. (6)

### **Optimising haemoglobin**

Haemoglobin optimization before delivery can minimize haemorrhage associated with caesarean section (6)

### **Surgical techniques**

Surgical techniques that have been shown, by available evidence, to reduce Blood loss should be used. Such as the use of blunt dissection rather than sharp dissection for abdominal entry and controlled cord traction rather than manual removal to deliver the placenta have both been shown to reduce blood loss at caesarean section. (18).

### **Prophylactic uterotonics and medication at caesarean section**

#### **Oxytocin:**

Oxytocin is usually given as a first-line, and is often already administered prophylactically as part of active management of the third stage of labor. The recommended dose is 10 IU intravenously/intramuscularly [IV/IM]. (19)

**Ergot alkaloid:**

They have direct stimulating action on smooth muscle, especially that of uterus, It causes prolonged uterine spasm followed by strong uterine contraction. its action lasts 3-4 hours. So they must never be given before fetal delivery, otherwise they cause intrapartum fetal death and ruptured uterus **(20)**

**Prostaglandins (PGs):**

As misoprostol cause strong uterine contraction, but shivering and pyrexia may follow misoprostol administration. **(18)**.

**Tranexamic acid**

Recently, preliminary trials show that, given prophylactically at caesarean section, TXA does reduce blood loss and the need for additional uterotonics. **(21)**

**Vigilant post-caesarean section monitoring**

Early detection of ongoing vaginal bleeding can be detected by deteriorating vital signs measured in the recovery area. In addition the attendant health workers need to have high index of suspicion for ongoing intra-peritoneal bleeding when vital signs are deteriorating in the absence of vagina bleeding **(6)**

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