USE OF LOCAL HEMOSTATIC MATERIAL BLOOD STOP DURING EMERGENCY CESAREAN SECTION IN A PATIENT WITH SEVERE PREECLAMPSIA AND PREMATURE PLACENTAL ABRUPTION: A CASE REPORT

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Abstract. *Background. Severe preeclampsia combined with placental abruption increases the risk of emergency delivery, intraoperative bleeding, coagulopathy, and adverse perinatal outcomes. In cases of diffuse or diapedetic bleeding, local hemostatic materials may be used as an adjunctive component of comprehensive surgical hemostasis. Objective. To present a clinical case of Blood Stop application during emergency cesarean section in a high-risk obstetric patient. Materials and methods. A retrospective analysis of a single clinical case was performed. Medical records, ultrasound findings, Doppler assessment, laboratory tests, operative report, and postoperative management data were reviewed. Case report. A patient with her third pregnancy at 31 weeks and 3 days of gestation, severe preeclampsia, mild premature placental abruption, increased body mass index, and chronic tubulointerstitial nephritis underwent emergency cesarean section. Ultrasound examination revealed a retrochorial hematoma measuring 52.3×42.4 mm and uterine hypertonus. Intraoperatively, a placental abruption area measuring 6.5×6.0 cm was identified. After uterine wound closure and uterine vessel ligation, diapedetic bleeding from the wound surface persisted; therefore, Blood Stop No. 2 was applied. Complete hemostasis was achieved, and total blood loss was 700 ml. A live premature male newborn weighing 1694 g was delivered, with Apgar scores of 6/7. Conclusion. Blood Stop may be considered an adjunctive hemostatic material during cesarean section in high-risk obstetric patients. However, its clinical effectiveness and safety require further investigation in prospective comparative studies.*

Keywords*: severe preeclampsia, placental abruption, preterm delivery, cesarean section, obstetric hemorrhage, local hemostasis, Blood Stop, case report.*

Introduction. Obstetric hemorrhage remains one of the most urgent problems in modern obstetric practice and is one of the leading causes of maternal mortality worldwide. According to the World Health Organization, approximately 70,000 maternal deaths are associated with severe postpartum bleeding each year [1]. Current WHO guidelines emphasize early diagnosis, prevention, objective assessment of blood loss, pharmacological therapy, surgical hemostasis, and multidisciplinary management [2]. Premature placental abruption and placenta accreta spectrum are important causes of obstetric hemorrhage and emergency operative delivery. Placental abruption is partial or complete separation of the placenta before fetal delivery and may be associated with retroplacental or retrochorial hematoma, uterine hypertonus, impaired uteroplacental blood flow, fetal hypoxia, and coagulopathy [4]. Placenta accreta spectrum, including placenta accreta, increta, and percreta, is characterized by abnormal placental attachment or invasion into the myometrium. Its main risk factors include previous cesarean section, placenta previa, repeated uterine surgery, and abnormal implantation. This condition is associated with massive blood loss, transfusion, surgical extension, and, in severe cases, hysterectomy [5, 6]. During cesarean section in patients with placental abruption, placenta previa, or placenta accreta spectrum, standard hemostatic methods — suturing, vessel ligation, compression, electrocoagulation, and uterotonic therapy — remain the basis of treatment. However, diffuse or diapedetic bleeding from the wound surface may require additional local hemostatic materials. Blood Stop may be used as an adjunctive hemostatic material after standard

surgical methods. In the presented case, diapedetic bleeding persisted after uterine wound closure and uterine vessel ligation. After application of Blood Stop No. 2, complete hemostasis was achieved, which helped avoid extension of the operation. However, this should be considered a clinical observation rather than proof of independent effectiveness.

Material and methods of research. This study is a retrospective description of a single clinical case. The source of information was inpatient medical documentation, including: obstetric medical record, ultrasound examination of the fetus and placenta, doppler assessment of uteroplacental and fetoplacental blood flow, laboratory blood, urine, biochemical, and hemostasiological tests, operative report of emergency cesarean section, postoperative prescriptions and recommendations.

The case was prepared in accordance with the CARE guidelines for case reports, which include description of patient information, clinical findings, diagnostic assessment, timeline, therapeutic intervention, outcomes, discussion, and limitations [7].

The main analyzed parameters were gestational age, severity of obstetric pathology, presence of risk factors for bleeding, ultrasound and Doppler findings, laboratory signs of anemia and coagulation changes, surgical volume, character of intraoperative bleeding, use of Blood Stop, achievement of hemostasis, total blood loss, and immediate obstetric-surgical outcome.

Results and discussion. A reproductive-aged pregnant patient was admitted to a specialized obstetric hospital with her third pregnancy. The gestational age was 31 weeks and 3 days. During admission and subsequent examination, the following diagnosis was established: third pregnancy, 31 weeks and 3 days of gestation; severe preeclampsia; mild premature abruption of a normally located placenta; increased body mass index; chronic tubulointerstitial nephritis.

According to anthropometric data, the patient's height was 160 cm and body weight was 78 kg. The calculated body mass index was approximately 30.5 kg/m². Considering pregnancy, this parameter was regarded as an additional operative, anesthetic, infectious, and thrombotic risk factor.

The patient was under medical supervision during pregnancy. Chronic tubulointerstitial nephritis was of clinical importance, as kidney disease may aggravate hypertensive disorders of pregnancy, contribute to proteinuria, disturb water-electrolyte balance, and increase the risk of adverse obstetric outcomes.

The ultrasound conclusion indicated a progressive pregnancy at 31 weeks and 5 days according to fetal biometry and signs of placental abruption. The presence of a retrochorial hematoma in the setting of severe preeclampsia was clinically important because it indicated a high risk of progression of placental abruption and deterioration of fetal status.

Doppler assessment of uteroplacental and fetoplacental blood flow revealed grade IA uteroplacental blood flow impairment. These findings indicated predominantly uteroplacental circulation impairment, which was clinically consistent with preeclampsia and signs of placental abruption.

Laboratory Findings.

Initial laboratory examination revealed mild anemia: hemoglobin 104 g/L, red blood cells 3.1×10^{12}/L, and hematocrit 25.7%. Platelet count was 178×10^{9}/L, which was within the reference range. However, later platelet counts decreased to 146×10^{9}/L and 142×10^{9}/L, requiring dynamic monitoring.

Daily proteinuria was 2.4 g/day, with subsequent values of 1.3 g/day, 0.275 g/day, 1.92 g/day, and 0.6 g/day. Significant proteinuria was diagnostically important in the context of severe preeclampsia and concomitant chronic renal disease.

Urinalysis showed proteinuria, leukocyturia, microhematuria, and bacteriuria in several tests. Urine bacteriological culture showed no microbial growth; however, bacteriuria was included in the postoperative diagnosis, which justified antibacterial prophylaxis.

Biochemical blood analysis showed decreased total protein level of 55.3 g/L and albumin level of 25.3–27 g/L. Hypoproteinemia and hypoalbuminemia in severe preeclampsia may reflect increased vascular permeability, urinary protein loss, and increased risk of edema.

Hemostasiological parameters indicated activation of the coagulation system: fibrinogen 4.44 g/L, soluble fibrin-monomer complexes 6.0 mg%, and antithrombin III 74%. Later, fibrinogen remained elevated or at the upper limit of normal, while soluble fibrin-monomer complexes remained above the reference range. These data are important because preeclampsia and placental abruption may be associated with multidirectional hemostatic disorders: on the one hand, hypercoagulation and thrombotic risk; on the other hand, progression of abruption and blood loss may lead to consumptive coagulopathy.

Clinical Rationale for Surgical Management.

The decision to perform emergency operative delivery was based on a combination of several high-risk factors: severe preeclampsia; ultrasound signs of placental abruption (retrochorial hematoma measuring 52.3×42.4 mm, increased uterine tone); risk of progression of placental abruption and fetal deterioration.

According to modern approaches, management of severe preeclampsia depends on gestational age, severity of maternal condition, presence of organ dysfunction, fetal status, and the possibility of prolonging pregnancy without threatening maternal and fetal life [3]. In the presented case, the combination of severe preeclampsia with signs of placental abruption created a high risk of sudden clinical deterioration; therefore, emergency cesarean section was justified.

Surgical Procedure

The operation was performed on an emergency basis. The surgical approach was Joel-Cohen laparotomy. A lower-segment cesarean section was performed, with excision of the old skin scar and ligation of uterine vessels. The operative field was treated three times with povidone-iodine solution. The anterior abdominal wall was opened layer by layer above the scar, the old scar was excised, and the wound was widened. A pregnant uterus was exposed in the wound. During revision, the previous uterine scar was found to be intact. A transverse incision approximately 1.5 cm long was made on the anterior uterine wall above the scar and bluntly extended laterally. Approximately 200 ml of clear amniotic fluid was released. The fetus was delivered by the head without technical difficulty. A live premature male newborn weighing 1694 g and measuring 46 cm in length was delivered, with Apgar scores of 6/7. No visible trauma or malformations were observed. The newborn was handed over to neonatologists. The placenta was delivered by controlled cord traction. The umbilical cord insertion was central. On examination of the placenta, an abruption area measuring 6.5×6.0 cm was detected at the placental margin. The placental bed was located on the posterior uterine wall. The uterus contracted well. The wound in the lower uterine segment was closed with a two-layer continuous Vicryl suture. To prevent progression of bleeding, uterine vessel ligation was performed. The adnexa were examined on both sides and were without pathological findings. After the main stages of hemostasis, diapedetic bleeding from the wound surface persisted. Therefore, Blood Stop No. 2 was locally applied to the bleeding surface for hemostatic purposes. After application of the material, complete hemostasis was achieved. The abdominal cavity was irrigated with 250 ml of 0.9% saline solution. The count of instruments, needles, and gauze swabs was complete. The anterior abdominal wall was closed layer by layer. Urine through the catheter was clear, 200 ml. Donati skin sutures No. 4 were placed, and an aseptic dressing was applied.

Intraoperative blood loss was 600+100 ml; total blood loss was 700 ml.

After surgery, the patient received comprehensive postoperative treatment considering obstetric, surgical, infectious, thrombotic, and nephrological risks.

Considering the increased body mass index, chronic tubulointerstitial nephritis, and bacteriuria, antibacterial therapy was continued to prevent purulent-septic complications: cefazolin 1.0 g intravenously twice daily for 3 days.

Due to increased thrombotic risk, thromboprophylaxis was prescribed: enoxaparin 0.4 ml subcutaneously once daily, starting 8 hours after surgery, under control of the coagulation system. Elastic compression of the lower extremities and adequate fluid intake were also recommended.

For blood pressure control, antihypertensive therapy with methyldopa 250 mg, 2 tablets 3 times daily, was continued under blood pressure monitoring. Maintenance magnesium sulfate therapy was continued for seizure prophylaxis. Diclofenac intramuscularly was recommended for pain relief when required.

Thus, postoperative management was aimed at prevention of infectious complications, control of blood pressure, prevention of seizures, prevention of thromboembolic complications, and dynamic monitoring of hemostasis.

Table 1.

Main Clinical Data of the Patient

Parameter	Data
Pregnancy	Third
Gestational age	31 weeks and 3 days
Main diagnosis	Severe preeclampsia
Obstetric complication	Mild placental abruption
Concomitant pathology	Chronic tubulointerstitial nephritis
Additional risk factor	Increased body mass index
Ultrasound finding	Retrokhorial hematoma 52.3×42.4 mm
Doppler finding	Grade IA uteroplacental blood flow impairment
Hemoglobin at admission	104 g/L
Daily proteinuria	Up to 2.4 g/day
Surgery	Emergency cesarean section
Intraoperative finding	Placental abruption area 6.5×6.0 cm
Additional hemostasis	Blood Stop No. 2
Hemostatic outcome	Complete hemostasis
Total blood loss	700 ml
Newborn	Male, 1694 g, 46 cm, Apgar 6/7

The presented clinical case demonstrates a typical but clinically complex obstetric situation: the need for emergency delivery in a patient with severe preeclampsia and signs of placental abruption. The most important feature of this case is the combination of several factors increasing the risk of bleeding and perioperative complications.

The first significant factor was severe preeclampsia. This condition is associated with systemic endothelial dysfunction, impaired vascular tone regulation, increased vascular permeability, and activation of inflammatory and coagulation mechanisms. Clinically, it manifests as arterial hypertension, proteinuria, edema, organ dysfunction, and increased risk of complications involving the central nervous system, kidneys, liver, hemostatic system, and placenta [3].

The second factor was placental abruption. In placental abruption, bleeding occurs between the placenta and the uterine wall, which may lead to formation of a retroplacental or retrochorial hematoma. Even mild placental abruption may progress rapidly. Its clinical danger is related not only to external blood loss, but also to possible concealed bleeding, uterine hypertonus, acute fetal hypoxia, preterm delivery, and coagulopathy [4].

The third important factor was chronic tubulointerstitial nephritis. Chronic renal pathology during pregnancy may aggravate preeclampsia, complicate differential diagnosis of proteinuria, and

increase the risk of impaired renal function, water-electrolyte imbalance, and infectious complications. In this case, proteinuria, changes in urinary sediment, ultrasound signs of chronic renal pathology, and the need for nephrological caution were observed.

Special attention should be given to the character of bleeding during surgery. According to the operative report, after uterine wound closure, good uterine contraction, and uterine vessel ligation, diapedetic bleeding from the wound surface persisted. Diapedetic bleeding differs from bleeding from a large arterial or venous vessel. It is diffuse and associated with blood oozing from small vessels and capillaries. In such cases, additional suturing is not always effective, while excessive coagulation may increase tissue trauma.

It is precisely in this type of bleeding that the use of a local hemostatic material may be clinically justified. In this case, Blood Stop was used not instead of standard surgical hemostasis but after the main surgical measures had been completed: uterine suturing, uterine vessel ligation, assessment of uterine contraction, and adnexal revision. This corresponds to the modern principle of using topical hemostatic agents as adjunctive tools rather than replacements for surgical control of the bleeding source [5, 6].

Total blood loss was 700 ml. For emergency cesarean section in a patient with placental abruption, severe preeclampsia, and multiple high-risk factors, this volume of blood loss may be regarded as clinically controlled. It is important that complete hemostasis was achieved after Blood Stop application and that extension of the operation to more traumatic procedures was not required. However, it should be emphasized that a single observation does not allow us to state that Blood Stop was the only factor responsible for the favorable outcome. Hemostasis was achieved through a combined approach involving uterine contraction, uterine incision closure, uterine vessel ligation, and local hemostatic action.

From a scientific point of view, this case may serve as a basis for further investigation of local hemostatic materials in obstetric surgery. A prospective comparative study would be particularly relevant, evaluating not only blood loss volume but also time to hemostasis, need for additional sutures, vessel ligation, uterotonics, blood transfusion, relaparotomy, infectious complications, length of hospital stay, and condition of the postoperative scar.

Possible Mechanism of the Clinical Effect of Blood Stop

Local hemostatic materials generally act through several mechanisms:

1. Mechanical compression of the bleeding surface.
2. Formation of a matrix for platelet aggregation.
3. Acceleration of primary blood clot formation.
4. Local limitation of blood spread across the wound surface.
5. Support of natural hemostatic mechanisms in the area of tissue injury.

In this case, Blood Stop was applied for diapedetic bleeding from the wound surface. Therefore, the most likely clinical effect was associated with formation of a local barrier and matrix for clot formation. However, the exact mechanism of action should be described only in accordance with the official instructions for the specific registered medical device used in clinical practice. For publication in a journal, the manufacturer, form of release, registration status, and official instructions for medical use should be specified.

Practical Significance.

This clinical observation is of practical importance for obstetricians and gynecologists working in emergency obstetric surgery. It demonstrates that in patients with severe preeclampsia and placental abruption, the risk of bleeding should be predicted in advance and a comprehensive hemostatic algorithm should be prepared.

The most important practical conclusions are:

1. Patients with severe preeclampsia and placental abruption require early assessment of bleeding risk.

2. Before surgery, it is advisable to assess hemoglobin, platelet count, fibrinogen, activated partial thromboplastin time, prothrombin index/INR, soluble fibrin-monomer complexes, antithrombin III, and other hemostatic parameters.

3. During emergency cesarean section, readiness for extended hemostasis is essential.

4. Local hemostatic materials may be considered as an additional method for diffuse or diapedetic bleeding.

5. Blood Stop should not replace uterine suturing, vessel ligation, uterotonic therapy, or other standard methods.

6. The operative report should clearly indicate the reason for using the hemostatic material, its application site, quantity, achieved effect, and blood loss volume.

7. After surgery, monitoring of anemia, hemostasis, infection, thromboprophylaxis, and wound healing is required.

Limitations of the Case Report.

The main limitation of this study is the single-case nature of the observation. A case report does not allow establishing a causal relationship between Blood Stop application and reduction of blood loss. It is also impossible to evaluate the comparative effectiveness of the method in relation to standard hemostasis or other local hemostatic materials.

The second limitation is that hemostasis was achieved through a combined approach. The patient underwent uterine suturing, uterine vessel ligation, assessment of uterine contraction, and only then Blood Stop application. Therefore, the positive outcome cannot be attributed exclusively to one component of the intervention.

The third limitation is the absence of long-term postoperative follow-up in the presented material. For a complete safety assessment of a local hemostatic material, it is necessary to analyze the frequency of infectious complications, inflammatory reactions, adhesions, pain syndrome, wound healing disorders, and postoperative scar condition.

The fourth limitation is the need to clarify the registration status and instructions for the specific Blood Stop form used. For publication in an international journal, only verified data on composition, manufacturer, and approved method of application should be included.

Conclusion. This clinical case demonstrates the successful use of local hemostatic material Blood Stop No. 2 as an adjunctive method of hemostasis during emergency cesarean section in a patient with severe preeclampsia, mild placental abruption, increased body mass index, and chronic tubulointerstitial nephritis.

The patient had several high-risk factors for bleeding: severe preeclampsia, retrochorial hematoma, placental abruption, anemia, hypoproteinemia, signs of coagulation activation, and concomitant renal pathology. After fetal delivery, placental delivery, uterine wound closure, and uterine vessel ligation, diapedetic bleeding from the wound surface persisted. Local application of Blood Stop No. 2 was associated with complete hemostasis. Total blood loss was 700 ml.

The obtained result allows Blood Stop to be considered a potentially useful adjunctive component of comprehensive surgical hemostasis during cesarean section in high-risk obstetric patients. However, further prospective comparative studies are required to confirm the effectiveness and safety of this method.

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