

# The Most Dangerous Complication of Pregnancy Complicated by Placenta Previa And Placenta Accreta Is the Optimal Solution for Delivery with Massive Bleeding

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**Abstract:** In many countries of the world, including the Russian Federation, hysterectomy is recommended if the blood loss exceeds 1500–2000 ml and methods such as uterotonic agents, blood components, clotting factors, and uterine artery ligation do not give the expected result. According to world statistics, deep penetration of the placenta into the uterine wall (placenta accreta spectrum) is one of the main reasons for hysterectomies performed in obstetric practice (Dandolu V., 2012; Daskalakis G., 2007, Wu S., 2005). Avoiding hysterectomy and preserving reproductive potential in patients with placental invasion is one of the important tasks of modern obstetrics. One of the innovative methods proposed by Japanese specialists is the cesarean section performed through the uterine fundus (Kotsuji F., 2013; Nishida R., 2013). Many researchers are also discussing the effectiveness of endovascular methods in reducing intraoperative bleeding. These include methods such as embolization of uterine arteries, stenting of vessels, and temporary balloon occlusion of vessels in the common iliac artery system (Khasanov A.A., 2011; Ballas J., 2012; Poujade O., 2012; Elagamy A., 2013). In addition, the use of auto-erythrocyte reinfusion systems, in particular the LivaNova Autotransfusion XTRA autohemotransfusion device, which allows the reuse of blood lost during surgery, is also considered of great importance.

**Keywords:** LivaNova Autotransfusion XTRA autohemotransfusion device, cesarean section, autologous erythrocyte reinfusion.

**Introduction:** The number of pregnant women with placenta previa and placenta accreta has increased 1.5-fold over the past decade. This condition is a high-risk group for developing massive obstetric hemorrhage and has a significant impact on maternal morbidity and mortality.

**Relevance:** Placenta accreta is divided into three types depending on the depth of penetration of the placenta into the uterine muscle layer: placenta accreta, placenta increta, and placenta percreta. Placenta increta is characterized by deep penetration of the placenta into the myometrium and can be accompanied by severe, life-threatening bleeding as a result of incomplete separation of the placenta. Currently, the incidence of placental abruption is significantly increasing due to the increasing number of cesarean sections. The main blood supply to the uterus

is provided by the internal iliac arteries. Theoretically, ligation or embolization of both internal iliac arteries could effectively reduce uterine blood flow and reduce uterine bleeding. However, the additional blood supply formed by the existing collateral circulation in the uterus, including the inferior epigastric artery, which is a branch of the ovarian artery or the external iliac artery, may reduce the effectiveness of internal iliac or uterine artery embolization. In cases where there is pathological hyperplasia of blood vessels at the site of placental attachment, arterial bleeding is very difficult to control. In addition, newly formed thick and dense venous tangles are also important. In such a situation, hemostasis is difficult to achieve by ligation or embolization of the internal iliac artery or uterine artery alone. Many hospitals around the world do not have the capacity to perform prophylactic vascular embolization or ligation before surgery. There are also

insufficient facilities to perform temporary balloon occlusive surgery of the internal iliac artery or uterine artery embolization. However, after delivery, placenta increta can become exposed and cause severe, uncontrollable bleeding. This can impair visualization of the surgical site and complicate bilateral iliac artery ligation. Massive obstetric hemorrhage remains one of the most critical complications in pregnancies complicated by placenta previa and placenta accreta spectrum disorders. Therefore, timely and effective control of bleeding and reduction in the number of hysterectomies are of great clinical importance. Unfortunately, hysterectomy still remains one of the main methods for managing severe intraoperative hemorrhage. Such an operation results in the loss of a woman's reproductive function. In many countries worldwide, including the Russian Federation, hysterectomy is recommended when blood loss exceeds 1500–2000 mL and conservative measures such as uterotonic agents, transfusion of blood components, coagulation factors, and ligation of uterine arteries fail to achieve adequate hemostasis. According to global statistical data, abnormal placental invasion into the uterine wall (placenta accreta spectrum) is one of the leading causes of obstetric hysterectomy (Dandolu V., 2012; Daskalakis G., 2007; Wu S., 2005). Avoiding hysterectomy and preserving reproductive potential in patients with placental invasion is considered one of the major goals of modern obstetrics. One of the innovative techniques proposed by Japanese specialists is fundal cesarean section (Kotsuji F., 2013; Nishida R., 2013). Many researchers have also discussed the effectiveness of endovascular techniques in reducing intraoperative blood loss, including uterine artery embolization, vascular stenting, and temporary balloon occlusion of vessels within the common iliac artery system (Xasanov A.A., 2011; Ballas J., 2012; Poujade O., 2012; Elagamy A., 2013). In addition, the use of autologous blood reinfusion systems that allow reutilization of blood lost during surgery, particularly the "LivaNova Autotransfusion XTRA" autotransfusion device, is considered highly important.

### Objective

To evaluate the clinical application and outcomes of the "LivaNova Autotransfusion XTRA" autotransfusion system in the management of delivery complicated by massive hemorrhage in pregnancies with complete placenta previa and placenta accreta spectrum disorders.

### METHODS

The study and control groups were formed based on medical records and direct observations of operative

deliveries conducted at the Khorezm branch of the Republican Specialized Scientific and Practical Medical Center for Mother and Child during 2020–2025. A total of 212 patients were diagnosed with complete placenta previa and placental invasion. Among them, in the retrospective group, massive hemorrhage occurred in 13 out of 131 patients and bleeding was managed using conventional methods. In the prospective group, all 31 patients experienced massive hemorrhage, and direct autotransfusion was performed in 27 patients. The control group consisted of 50 patients without massive hemorrhage. The following demographic and obstetric parameters were analyzed: maternal age, number of pregnancies (gravida), parity, obstetric history and delivery outcomes, gestational age at delivery, placental localization and invasion into the uterine wall, number of previous cesarean sections and related complications, as well as history of massive hemorrhage and blood transfusion. Analysis revealed differences between the study and control groups in parity, number of pregnancies, gestational age at delivery (25–36 weeks in the study group versus 37 weeks in the control group), number of uterine scars, intrauterine manipulations including abortions and manual uterine curettage, as well as somatic and obstetric pathologies associated with the current pregnancy. No cases of amniotic fluid embolism or adult respiratory distress syndrome were recorded in either the study or control groups. Statistically significant differences between groups were identified regarding infectious complications, need for mechanical ventilation, disseminated intravascular coagulation syndrome (DIC syndrome), and duration of postoperative hospitalization. During the study, an average of 61.3% of transfused erythrocyte mass in surgeries complicated by massive hemorrhage consisted of processed autologous erythrocytes collected using the "LivaNova Autotransfusion XTRA" system.

### RESULTS

The study included clinical data from 31 patients in the prospective group. The duration of hospitalization, clinical course, and effectiveness of therapeutic interventions were evaluated. Analysis of hospital stay demonstrated that the average duration of inpatient treatment was  $3.48 \pm 3.19$  days, with a minimum of 3 days and a maximum of 11 days. Distribution analysis showed that 26 patients (83.9%) were hospitalized for up to 5 days, while 5 patients (16.1%) required treatment for more than 5 days.

The presence of uterine scars and duration of surgical intervention were also analyzed in the prospective group. Results showed that uterine scars were present after one previous cesarean section in 5 patients (16%),

after two cesarean sections in 19 patients (61%), after three cesarean sections in 6 patients (19%), and after four cesarean sections in 1 patient (3.2%). Analysis of operative duration demonstrated that most procedures were completed within a relatively short period. In the majority of cases, surgical duration remained within the standard operative timeframe of approximately 30–60 minutes. Regarding the relationship between placental invasion and massive hemorrhage, in the retrospective group massive bleeding occurred in patients diagnosed with placenta accreta in 2 cases (15.3%), placenta increta in 1 case (7.69%), and placenta percreta in 10 cases (76.9%). In the prospective group, massive hemorrhage was observed in placenta accreta in 3 cases (10%), placenta increta in 8 cases (26.7%), and placenta percreta in 19 cases (63.3%). Placenta previa without invasive placentation was identified in 9 patients in the retrospective group and in 1 patient in the prospective group, and no massive hemorrhage occurred during

surgery in these cases. In both groups, prophylactic ligation of three pairs of major blood vessels was performed in all patients before placental separation according to the standard surgical protocol. When combined with metroplasty, rapid hemostasis was achieved. Hysterectomy, ligation of iliac arteries, and other complex surgical interventions were performed after intraoperative multidisciplinary consultation depending on the severity of hemorrhage caused by abnormal placental invasion and the patient's hemodynamic condition. Among patients with intraoperative placental invasion into the scar area and uterine wall, effective hemostasis was achieved in 13 cases of placenta accreta and 4 cases of placenta increta using ligation of three pairs of major vessels combined with metroplasty. However, in 1 patient with placenta percreta, these methods were ineffective, and total hysterectomy was performed (Figure 1).

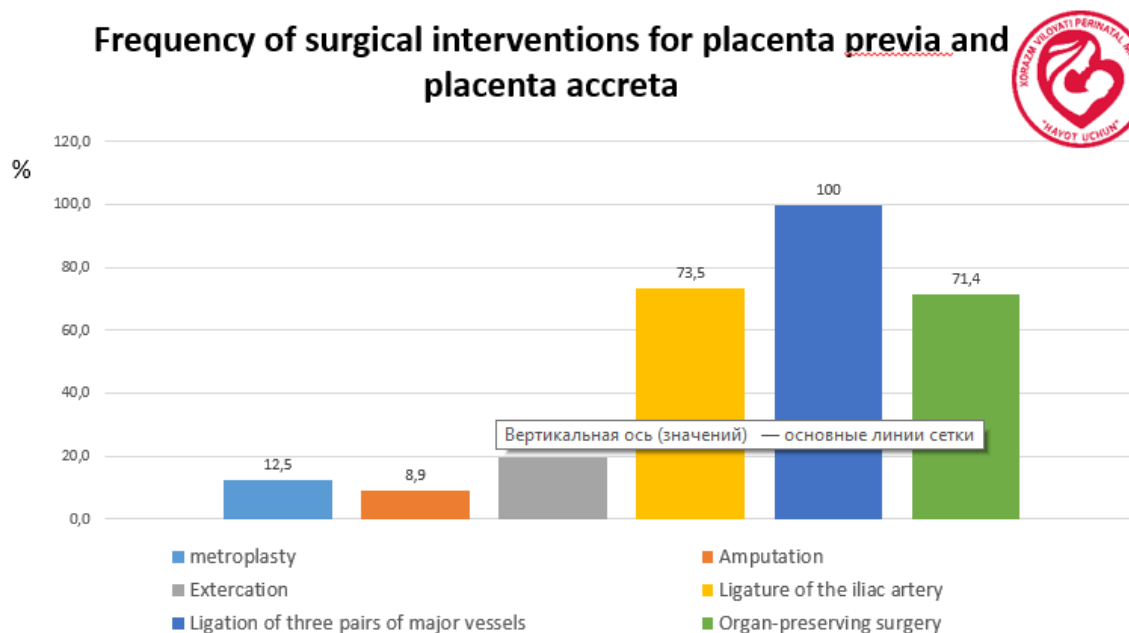


**Figure 1. Analysis of the extent of surgical interventions performed during cesarean section in patients with complete placenta previa and placenta accreta spectrum disorders.**

According to the volume of blood loss, in the main group grade II hemorrhage (2000–2500 mL) was observed in 16.1% of cases, grade III hemorrhage (2500–3000 mL) in 38.7%, and grade IV hemorrhage in 9.7% of cases. Massive hemorrhage was observed in a total of 44 cases across both groups. Among these, hemodynamic stability was achieved using only autologous hemotransfusion in 27 cases, whereas donor blood transfusion was required in 17 cases. No cases of massive hemorrhage were recorded in the

control group. In the comparison group, grade II hemorrhage (2000–2500 mL) accounted for 5.3% of cases, grade III hemorrhage (2500–3000 mL) for 3.05%, and grade IV hemorrhage for 1.26% of cases. Comparison of hemodynamic parameters between the groups demonstrated that patients who underwent autotransfusion maintained stable hemodynamic indicators without significant deviations from normal values. In contrast, patients receiving donor blood components often required vasopressor support to maintain normal blood pressure.

## Hemodynamic parameters

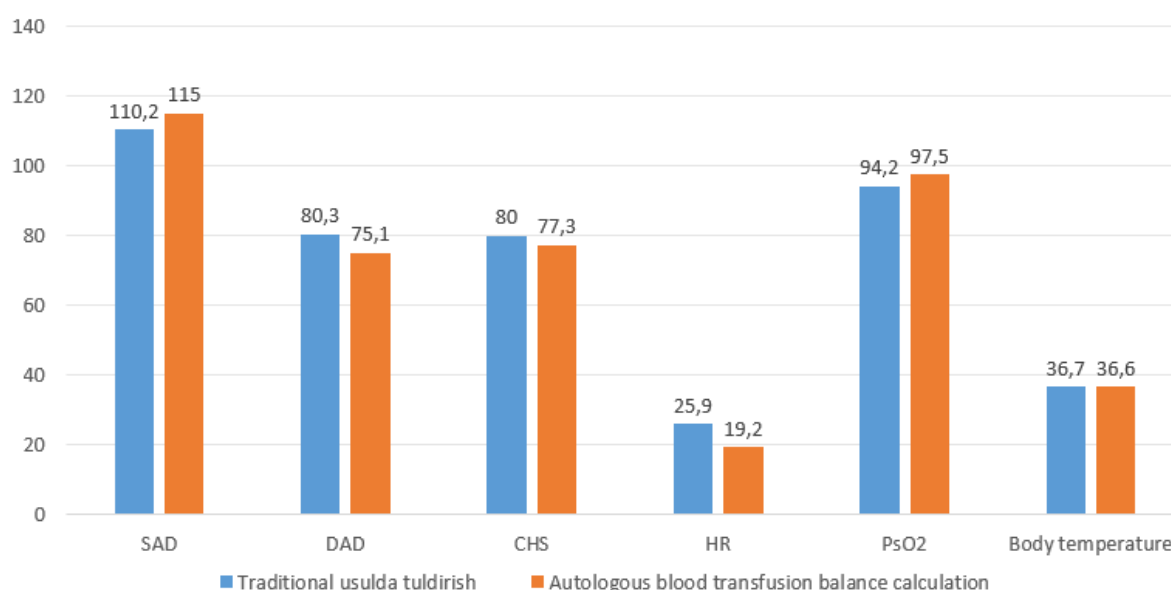


**Figure 2. Hemodynamic differences in compensation of blood loss between autologous hemotransfusion and traditional donor blood transfusion methods.**

## Result



1st day after cesarean section Placenta previa and placenta accreta! Blood loss replenished using traditional donor blood. 7 doses of erythrocyte mass, 4 doses of SZP. AKB vasopressor.  
**Ochilova Dilnoza**



1 day after cesarean section Placenta previa and placenta accreta! Blood loss compensated by autologous blood transfusion. Er.mass 1 dose, SZP 2 doses  
**Kuchkora Diyonat**

**Figure 3. Differences between conventional blood transfusion and autotransfusion in compensating for blood loss.**

### CONCLUSION

This study is one of the first to systematically evaluate the safety of autotransfusion technology in obstetric practice. Currently, there is insufficient clinical evidence regarding autotransfusion of erythrocytes collected during obstetric surgical bleeding. However, it has been reported that large-volume autotransfusion may in some cases be associated with the development of clinically significant coagulopathy. Despite the

theoretical risks associated with cesarean section, many authors have discussed their clinical experience with intraoperative blood collection and reinfusion. Several scientific reports, clinical observations, and retrospective analyses of patients with placenta previa suggest that the "LivaNova Autotransfusion XTRA" autotransfusion system is a useful adjunctive method for the management of hemorrhage during severe obstetric surgery. The incidence of amniotic fluid embolism in the general obstetric population is

estimated to range from approximately 1:8,000 to 1:80,000 deliveries. In addition, considering that the baseline rate of postoperative infectious complications after cesarean section is around 20%, this study had sufficient statistical power to detect at least a 25% increase in infectious complications. Therefore, our study may be considered adequately powered to identify clinically significant adverse outcomes associated with the use of the "LivaNova Autotransfusion XTRA" autotransfusion system in obstetric practice. There are also several conditions that may limit the use of the "LivaNova Autotransfusion XTRA" system. These include situations associated with severe bacterial contamination, such as bowel perforation, as well as confirmed malignant diseases. Since there is currently insufficient scientific evidence regarding the safety of this technique in such conditions, they are regarded as relative contraindications. According to our experience, intraoperative autologous blood collection and autotransfusion during cesarean section represent a safe supportive method for managing severe intraoperative obstetric hemorrhage. Furthermore, the possibility of rapid and relatively inexpensive reinfusion of large blood volumes during cesarean section has contributed to the broader implementation of this technology in obstetric and delivery practice. In remote hospitals with limited blood bank resources, the use of autologous blood collection and autotransfusion during cesarean delivery may, in some cases, play a life-saving role. In large specialized obstetric centers, it may represent one of the safest methods for managing massive hemorrhage during cesarean section.

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