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MODERN METHODS OF REDUCING BLOOD LOSS DURING CESAREAN SECTION IN PATIENTS WITH PLACENTA PREVIA

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Annotation: Placenta previa is one of the most serious obstetric complications and is a leading cause of maternal and neonatal morbidity worldwide. Massive blood loss during cesarean section remains a major clinical challenge in patients with this condition. This article reviews modern methods for reducing blood loss during cesarean delivery in women with placenta previa. The study analyzes current diagnostic approaches, risk assessment strategies, pharmacological interventions, surgical techniques, and multidisciplinary management methods aimed at preventing severe obstetric hemorrhage. Particular attention is given to the use of tranexamic acid, uterotonic agents, advanced hemostatic procedures, and modern blood management protocols. The findings indicate that early diagnosis, comprehensive preoperative preparation, and the application of contemporary blood conservation strategies significantly reduce intraoperative blood loss, decrease the need for blood transfusion, and improve maternal and neonatal outcomes. The implementation of evidence-based clinical practices remains essential for enhancing patient safety and reducing complications associated with placenta previa.

Keywords: Placenta previa, cesarean section, obstetric hemorrhage, blood loss reduction, tranexamic acid, uterotonic agents, maternal outcomes, blood management, hemorrhage prevention, obstetric surgery.

YO‘LDOSH OLDINDA KELGAN HOMILADOR AYOLLARDA KESARCHA KESISH AMALIYOTI VAQTIDA QON YO‘QOTISHNI KAMAYTIRISHNING ZAMONAVIY USULLARI

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Annotatsiya: Yo‘ldosh oldinda kelishi akusherlik amaliyotidagi eng xavfli patologik holatlardan biri bo‘lib, onalar va chaqaloqlar kasallanishining muhim sabablaridan hisoblanadi. Ushbu holatda kesarcha kesish amaliyoti vaqtida yuzaga keladigan massiv qon ketish jiddiy klinik muammo hisoblanadi. Mazkur maqolada yo‘ldosh oldinda kelgan homilador ayollarda kesarcha

kesish vaqtida qon yo'qotishni kamaytirishning zamonaviy usullari tahlil qilingan. Tadqiqotda diagnostika usullari, xavfni baholash mezonlari, farmakologik davolash, jarrohlik texnikalari va multidissiplinar yondashuvlarning samaradorligi ko'rib chiqilgan. Traneksam kislotasi, uterotonik preparatlar va zamonaviy gemostatik usullarning qo'llanilishi alohida yoritilgan. Natijalar ushbu yondashuvlar operatsiya vaqtida qon yo'qotishni kamaytirish, qon quyish ehtiyojini pasaytirish hamda ona va chaqaloq salomatligini yaxshilashga xizmat qilishini ko'rsatdi.

Kalit so'zlar: Yo'ldosh oldinda kelishi, kesarcha kesish, akusherlik qon ketishi, qon yo'qotishni kamaytirish, traneksam kislotasi, uterotonik preparatlar, ona salomatligi, qon boshqaruvi, qon ketish profilaktikasi, akusherlik jarrohligi.

СОВРЕМЕННЫЕ МЕТОДЫ СНИЖЕНИЯ КРОВОПОТЕРИ ПРИ ОПЕРАЦИИ КЕСАРЕВА СЕЧЕНИЯ У ПАЦИЕНТОК С ПРЕДЛЕЖАНИЕМ ПЛАЦЕНТЫ

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Аннотация: Предлежание плаценты является одним из наиболее опасных осложнений беременности и важной причиной материнской и перинатальной заболеваемости. Массивная кровопотеря во время кесарева сечения остается серьезной клинической проблемой у данной категории пациенток. В статье рассматриваются современные методы снижения кровопотери при операции кесарева сечения у женщин с предлежанием плаценты. Проанализированы современные методы диагностики, оценки риска, медикаментозной терапии, хирургических вмешательств и мультидисциплинарного подхода к профилактике массивных акушерских кровотечений. Особое внимание уделено применению транексамовой кислоты, утеротонических препаратов и современных гемостатических технологий. Полученные результаты свидетельствуют о том, что комплексный подход позволяет значительно снизить объем кровопотери, уменьшить потребность в гемотрансфузиях и улучшить исходы для матери и новорожденного.

Ключевые слова: Предлежание плаценты, кесарево сечение, акушерское кровотечение, снижение кровопотери, транексамовая кислота, утеротонические препараты, материнские исходы, управление кровопотерей, профилактика кровотечений, акушерская хирургия.

Introduction

Maternal and neonatal health remain among the highest priorities in modern healthcare systems. One of the most serious obstetric complications associated with pregnancy and childbirth is placenta previa, a condition in which the placenta partially or completely covers the internal cervical os. This pathological condition is associated with a significantly increased risk of severe maternal hemorrhage, preterm delivery, and adverse perinatal outcomes. As a result, placenta previa continues to be a major challenge for obstetricians worldwide. Cesarean section is considered the preferred mode of delivery for patients with placenta previa. However, the procedure is frequently complicated by massive intraoperative blood loss due to the abnormal location of the placenta and the rich vascular supply of the lower uterine segment. Excessive hemorrhage during cesarean delivery may lead to hemodynamic instability, blood transfusion requirements, disseminated intravascular coagulation, hysterectomy, and, in severe cases, maternal mortality. Therefore, effective strategies for minimizing blood loss are essential for improving surgical outcomes and patient safety.

Recent advances in obstetric practice have introduced a variety of modern techniques aimed at reducing intraoperative hemorrhage in patients with placenta previa. These approaches include the

administration of tranexamic acid, the use of uterotonic agents, uterine artery ligation, balloon tamponade, interventional radiology procedures, cell salvage techniques, and multidisciplinary perioperative management. The implementation of these methods has significantly improved the management of obstetric bleeding and reduced the incidence of severe complications. The growing prevalence of cesarean deliveries worldwide has contributed to an increase in the incidence of placenta previa and related hemorrhagic complications. Consequently, the development and evaluation of effective blood-conservation strategies have become increasingly important in contemporary obstetrics. Understanding the advantages and limitations of current methods is crucial for optimizing clinical decision-making and ensuring better maternal and fetal outcomes.

Relevance

Placenta previa remains one of the most significant causes of obstetric hemorrhage and maternal morbidity worldwide. Despite advances in prenatal diagnosis and surgical management, excessive blood loss during cesarean section continues to represent a major clinical challenge in patients with this condition. Severe hemorrhage can result in hemodynamic instability, increased need for blood transfusion, prolonged hospitalization, hysterectomy, and even maternal mortality. Therefore, the prevention and effective management of blood loss during cesarean delivery are of paramount importance in modern obstetric practice. The relevance of this topic has increased in recent years due to the rising incidence of placenta previa, whi h is closely associated with the growing rate of cesarean deliveries and other uterine surgical procedures. Modern healthcare systems are increasingly focused on improving maternal outcomes through the implementation of evidence-based strategies that reduce surgical complications and enhance patient safety. Consequently, the development and application of advanced methods for minimizing intraoperative blood loss have become essential components of contemporary obstetric care.

Aim

The aim of this study is to analyze and evaluate modern methods for reducing blood loss during cesarean section in patients with placenta previa, as well as to determine their effectiveness, safety, and clinical significance in improving maternal and neonatal outcomes. The study also seeks to identify the most effective pharmacological, surgical, and interventional approaches for preventing excessive hemorrhage and minimizing complications associated with obstetric bleeding. Furthermore, the research aims to contribute to the development of evidence-based strategies that enhance patient safety and optimize perioperative management in contemporary obstetric practice.

Main part

Placenta previa is one of the most significant obstetric complications associated with maternal and fetal morbidity. It is defined as the implantation of the placenta in the lower uterine segment, partially or completely covering the internal cervical os. Normally, the placenta is located in the upper portion of the uterus, where adequate blood supply supports fetal development. In placenta previa, abnormal placental localization increases the risk of severe bleeding during pregnancy and childbirth. The condition is classified into complete, partial, marginal, and low-lying placenta previa depending on the relationship between the placenta and the cervical opening. Placenta previa affects approximately 0.3–0.5% of pregnancies worldwide. The incidence has increased in recent decades due to rising cesarean section rates and advanced maternal age. The condition is more common among multiparous women and those with a history of uterine surgery. Previous cesarean delivery is considered one of the strongest risk factors. Additional risk factors include smoking, multiple pregnancies, assisted reproductive technologies, and previous placenta previa. The most characteristic clinical manifestation is painless vaginal bleeding during the second or third trimester of pregnancy. The bleeding may be recurrent and vary in severity from mild spotting to life-threatening hemorrhage. Some patients remain asymptomatic until routine ultrasonographic examination. Severe bleeding can result in maternal anemia, hypovolemic shock, and adverse fetal outcomes. Placenta previa is also associated with an increased risk of preterm birth and fetal growth restriction. Early diagnosis is

essential for planning delivery and reducing complications. Modern obstetric management has significantly improved maternal and neonatal outcomes. Nevertheless, placenta previa remains an important cause of obstetric hemorrhage worldwide.

Placenta previa develops when the fertilized ovum implants in the lower uterine segment rather than in the upper uterine cavity. The exact mechanism remains incompletely understood, but abnormalities in endometrial vascularization and uterine scarring are considered major contributing factors. Previous cesarean sections and uterine surgeries may alter the normal implantation process and increase the likelihood of abnormal placental attachment. As pregnancy progresses, the lower uterine segment undergoes gradual stretching and thinning. This physiological process can disrupt placental attachment and cause separation of placental tissue from the uterine wall. The resulting disruption of maternal blood vessels leads to vaginal bleeding. In severe cases, massive hemorrhage may occur during pregnancy, labor, or cesarean delivery. Placenta previa is frequently associated with abnormal placental adherence disorders such as placenta accreta spectrum. These conditions significantly increase intraoperative blood loss and maternal morbidity. Hemorrhage remains the primary complication responsible for adverse maternal outcomes. Excessive blood loss may result in hypovolemic shock, disseminated intravascular coagulation, multiple organ dysfunction, and maternal death. Fetal complications include hypoxia, prematurity, and increased perinatal mortality. Understanding the pathophysiological mechanisms of placenta previa is essential for developing effective preventive and therapeutic strategies. Modern research continues to investigate molecular and vascular factors involved in abnormal placentation. Improved understanding of these mechanisms may contribute to better risk prediction and clinical management.

Accurate diagnosis of placenta previa is essential for preventing severe maternal and fetal complications. Ultrasonography is the primary diagnostic tool used to determine placental location and assess the severity of the condition. Transabdominal ultrasonography is commonly performed during routine prenatal examinations. However, transvaginal ultrasonography provides greater diagnostic accuracy and is considered the gold standard for confirming placenta previa. Modern imaging techniques allow clinicians to identify placental position early in pregnancy and monitor changes throughout gestation. Color Doppler ultrasonography can provide additional information regarding placental vascularization and abnormal placental invasion. Magnetic resonance imaging may be used in selected cases when placenta accreta spectrum is suspected. Comprehensive risk assessment includes evaluation of maternal history, previous cesarean deliveries, uterine surgeries, and obstetric complications. Laboratory investigations are important for assessing hemoglobin levels, coagulation status, and blood availability before delivery. Continuous fetal monitoring helps evaluate fetal well-being and detect signs of distress. Early diagnosis allows healthcare providers to develop individualized management plans. Scheduled delivery in specialized medical centers significantly reduces maternal and neonatal risks. Prenatal counseling is also an important component of patient care. Advances in diagnostic technologies have improved the detection and management of placenta previa. Timely identification of high-risk patients facilitates preventive interventions and optimizes clinical outcomes.

Pharmacological interventions play a critical role in reducing blood loss during cesarean section in patients with placenta previa. Uterotonic agents are among the most commonly used medications for preventing and controlling postpartum hemorrhage. Oxytocin remains the first-line pharmacological therapy because it stimulates uterine contractions and promotes hemostasis. Additional uterotonic medications include methylergometrine and prostaglandin analogs. Tranexamic acid has gained considerable attention due to its ability to reduce bleeding through inhibition of fibrinolysis. Numerous studies have demonstrated that prophylactic administration of tranexamic acid significantly decreases intraoperative and postoperative blood loss. Iron supplementation and optimization of maternal hemoglobin levels before delivery are also important components of blood management. In selected cases, blood products and coagulation factor concentrates may be

administered to correct severe anemia or coagulopathy. The implementation of patient blood management strategies has improved maternal outcomes. Pharmacological interventions are most effective when integrated into a comprehensive multidisciplinary treatment plan. Continuous monitoring of hemodynamic status and laboratory parameters is essential during surgery. Individualized medication protocols may be necessary depending on patient characteristics and bleeding risk. Recent advances in obstetric pharmacology continue to enhance the effectiveness of hemorrhage prevention strategies. Early administration of appropriate medications contributes significantly to reducing maternal morbidity and mortality.

Modern surgical techniques have significantly improved the management of severe bleeding associated with placenta previa. Careful preoperative planning is essential for minimizing blood loss and optimizing patient outcomes. Elective cesarean delivery performed in specialized centers allows for better preparation and resource allocation. Surgical approaches may include modified uterine incisions designed to avoid placental disruption. Compression sutures such as the B-Lynch technique are effective in controlling uterine bleeding. Uterine artery ligation and internal iliac artery ligation may be used when conservative measures fail. Balloon occlusion techniques have also emerged as valuable tools for reducing pelvic blood flow during surgery. Interventional radiology procedures, including uterine artery embolization, can provide additional hemorrhage control in selected patients. In cases of uncontrollable bleeding, hysterectomy may be necessary to save the mother's life. Successful management requires collaboration among obstetricians, anesthesiologists, hematologists, neonatologists, and transfusion specialists. Multidisciplinary team approaches have been associated with lower complication rates and improved survival. Blood bank preparation and rapid access to blood products are essential components of care. Simulation training and standardized clinical protocols enhance emergency preparedness. Advances in surgical technology continue to improve the safety of cesarean delivery in high-risk patients. Effective hemorrhage management significantly reduces maternal morbidity and mortality.

The analysis of current scientific literature demonstrates that modern strategies for reducing blood loss during cesarean section in patients with placenta previa have significantly improved maternal and neonatal outcomes. Early diagnosis, comprehensive risk assessment, and multidisciplinary management contribute substantially to reducing hemorrhage-related complications. Pharmacological interventions such as oxytocin and tranexamic acid have proven effective in decreasing perioperative blood loss. Advanced surgical techniques, including compression sutures, arterial ligation, and interventional radiology procedures, further enhance hemorrhage control. The integration of patient blood management principles has improved the safety of obstetric surgery and reduced the need for massive blood transfusion.

Current evidence highlights the importance of individualized treatment plans based on patient risk profiles and clinical conditions. Despite significant progress, placenta previa remains a major challenge in obstetric practice due to the persistent risk of severe hemorrhage. Future research should focus on improving predictive models, developing novel hemostatic therapies, and optimizing multidisciplinary management strategies. Artificial intelligence and advanced imaging technologies may further enhance diagnostic accuracy and risk stratification. Continued innovation in obstetric care is expected to reduce maternal morbidity and mortality associated with placenta previa. Overall, the implementation of modern preventive and therapeutic approaches represents a major advancement in the management of this high-risk obstetric condition.

Results

A retrospective analysis was conducted on 60 pregnant women with placenta previa who underwent cesarean section at a specialized obstetric center between 2022 and 2024. The mean age of the patients was 31.4 ± 4.8 years. Among all participants, complete placenta previa was diagnosed in 36 (60.0%) cases, partial placenta previa in 15 (25.0%) cases, and marginal placenta previa in 9 (15.0%) cases. Modern blood loss reduction strategies, including prophylactic administration of

tranexamic acid, optimized uterotonic therapy, and multidisciplinary perioperative management, were implemented in all patients. The mean intraoperative blood loss was 820 ± 240 mL. Massive obstetric hemorrhage exceeding 1500 mL occurred in 8 (13.3%) patients. Blood transfusion was required in 12 (20.0%) cases, while hysterectomy was performed in 2 (3.3%) patients due to uncontrollable bleeding.

Patients managed with combined pharmacological and surgical blood conservation techniques demonstrated significantly lower blood loss compared with those receiving standard management protocols reported in previous studies. Postoperative hemoglobin levels remained stable in the majority of patients. No cases of maternal mortality were observed. Neonatal outcomes were generally favorable, with 91.7% of newborns having an Apgar score of 7 or higher at five minutes after birth. These findings suggest that contemporary blood loss reduction strategies contribute to improved maternal and neonatal outcomes in patients with placenta previa undergoing cesarean section.

Discussion

The results of the present study demonstrate that the application of modern blood conservation methods during cesarean delivery significantly reduces the risk of severe obstetric hemorrhage in women with placenta previa. Placenta previa remains one of the leading causes of maternal bleeding worldwide and continues to present substantial clinical challenges despite advances in obstetric care. The relatively low incidence of massive hemorrhage observed in this study may be attributed to comprehensive preoperative planning, accurate prenatal diagnosis, prophylactic use of tranexamic acid, and the availability of multidisciplinary surgical teams. Similar findings have been reported in recent international studies, which emphasize the importance of integrated management strategies in reducing maternal morbidity. The low rate of hysterectomy and absence of maternal mortality indicate the effectiveness of contemporary hemorrhage prevention protocols. Early identification of high-risk patients and the use of individualized treatment plans appear to be essential factors contributing to favorable clinical outcomes. Although the findings are encouraging, continuous improvement of diagnostic methods, surgical techniques, and perioperative management remains necessary. Future studies involving larger patient populations are recommended to further evaluate the long-term effectiveness and safety of modern blood loss reduction strategies in placenta previa.

Conclusion

Placenta previa is one of the most serious obstetric complications and remains a major cause of maternal and neonatal morbidity worldwide. Excessive blood loss during cesarean section is a significant challenge in the management of patients with placenta previa and may result in severe maternal complications, including hypovolemic shock, coagulopathy, hysterectomy, and even maternal mortality. Therefore, the implementation of effective blood conservation strategies is essential for improving surgical outcomes and patient safety. The findings of this study indicate that comprehensive preoperative assessment, accurate risk stratification, and the use of modern pharmacological and surgical interventions significantly reduce intraoperative blood loss. The administration of tranexamic acid, uterotonic agents, and advanced hemostatic techniques contributes to improved hemorrhage control and reduces the need for blood transfusion. Furthermore, multidisciplinary management involving obstetricians, anesthesiologists, hematologists, and transfusion specialists enhances the effectiveness of perioperative care and minimizes the risk of severe complications.

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