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REPEAT CESAREAN SECTION: CICATRICIAL CHANGES OF THE ANTERIOR ABDOMINAL WALL, INFECTIOUS RISKS, AND OUTCOMES OF SURGICAL MANAGEMENT

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REPEAT CESAREAN SECTION: CICATRICIAL CHANGES OF THE ANTERIOR ABDOMINAL WALL, INFECTIOUS RISKS, AND OUTCOMES OF SURGICAL MANAGEMENT

MONOGRAPH

Compilied by

Sh.N. Valiev

Samarkand – 2026

This monograph focuses on the selection and optimization of the surgical approach for emergency cesarean section, primarily in patients undergoing repeat procedures and presenting with pronounced postoperative cicatricial changes of the anterior abdominal wall. The book substantiates and describes in detail the author's modification of surgical access, based on wide excision of the previous postoperative scar during cesarean delivery, with a discussion of indications, limitations, and the technical steps of the procedure. Data are presented on complication rates, prevention and treatment strategies, as well as author-developed algorithms aimed at reducing the risk of intraoperative and postoperative complications (based on studies from the last 10 years).

Intended for obstetrician-gynecologists, surgeons, anesthesiologists–intensivists, and other specialists.

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Repeat cesarean section: cicatricial changes of the anterior abdominal wall, infectious risks, and outcomes of surgical management

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LIST OF ABBREVIATIONS

ALD — abnormalities of labor

VAS — visual analogue scale

WHO — World Health Organization

ART — assisted reproductive technologies

SMCs — smooth muscle cells

GI tract — gastrointestinal tract

IUGR — intrauterine growth restriction

DWLWG — delayed weight gain in the newborn

IIDs — infectious and inflammatory diseases

STIs — sexually transmitted infections

HEOAH — highly burdened obstetric and gynecologic history

LII — leukocyte intoxication index

US — urinary system

SDCs — small decidual cells

BAH — burdened obstetric history

BOGH — burdened obstetric and gynecologic history

CS — cesarean section

ECS — emergency cesarean section

PAIP — premature abruption of a normally implanted placenta

PROM — premature rupture of membranes

VDS — vegetative dystonia syndrome

CVS — cardiovascular system

FPI — fetoplacental insufficiency

US — ultrasound examination

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CHAPTER I. INTRODUCTION

1.1. § Relevance of the problem

The quality of maternal and child health care has traditionally been regarded as one of the most sensitive composite indicators of health system performance. Outcomes of pregnancy, childbirth, and the early neonatal period shape not only the individual health trajectories of women and children, but also, in aggregate, determine the human potential of the population, socio-economic losses from preventable complications, the burden on inpatient and outpatient services, the demand for blood and blood components, intensive care, repeat hospitalizations, and rehabilitation [WHO, 2025]. In the structure of preventable causes of maternal deaths and “near miss” events (life-threatening complications), the leading positions are still occupied by hemorrhage, infectious complications, hypertensive disorders, and thromboembolic events; at the same time, the relative contribution of specific causes varies by region, the level of care organization, and access to a high-quality obstetric facility [WHO, 2025]. Therefore, any technologies and organizational solutions capable of reducing the frequency of massive blood loss, infections, repeat operations, and prolonged disability have not only clinical, but also pronounced demographic and economic significance.

Against the backdrop of overall progress in perinatal medicine, one of the key phenomena of recent decades has been a steady increase in the proportion of deliveries by cesarean section (CS) in many countries worldwide and in regions with different income levels [Ye J. et al., 2021; Betrán A.P. et al., 2016]. It is important to emphasize that the rising CS rate is an ambiguous phenomenon. On the one hand, the operation remains life-saving in a number of conditions (clinically significant placental pathology, threatened fetal hypoxia, severe preeclampsia/eclampsia, certain variants of dystocia, placenta previa with bleeding, selected cases of multiple pregnancy, uterine scarring, etc.) [NICE, 2021; ACOG, 2019]. On the other hand, the expansion of indications beyond strict medical necessity leads to a “paradox of availability”: at the same time, timely CS remains inaccessible where it is truly needed, while excessive use of the operation develops where safe vaginal delivery is possible [WHO, 2015; Ye J. et

al., 2021]. This creates a dual problem: underprovision of life-saving surgical care in some groups and an increase in surgery-associated morbidity in others.

Cesarean section is not an “alternative mode of childbirth,” but a major abdominal operation with all classical surgical risks. Early complications include intra- and postoperative blood loss, injury to the urinary bladder/ureters/bowel, wound complications, endometritis, thromboembolic complications, as well as adverse reactions to anesthesia and infusion–transfusion therapy [NICE, 2021; ACOG, 2018]. The long-term perspective is no less significant: formation of adhesions, chronic pain syndrome, scar deformities of the lower uterine segment (including a “niche”/isthmocele), reduced reproductive potential, and an increased frequency of complications in subsequent pregnancies (including placental disorders and the risk of uterine rupture) [Silver R.M. et al., 2006; Jauniaux E. et al., 2018]. Therefore, under conditions of increasing CS rates, a key task of modern obstetrics is not only to justify indications for surgery, but also to optimize surgical technique, abdominal entry, and perioperative management to minimize early and late complications.

Special attention should be paid to the “cumulative” risk effect in repeat cesarean sections. As the number of operations increases, the probability rises of dense adhesions, technically difficult dissection, prolonged operative and anesthesia time, injury to adjacent organs, the need for transfusion, and peripartum hysterectomy [Silver R.M. et al., 2006]. Within this logic, the uterine scar is now considered not as a local anatomical feature, but as an independent clinical and organizational risk factor that requires standardized assessment, stratification, and planning of the delivery strategy. In parallel, the clinical significance of placental pathology, closely associated with scarring changes of the endometrium and myometrium, is increasing. Placenta accreta spectrum (PAS) is one of the most dangerous causes of massive obstetric hemorrhage, and its frequency increases against the background of a growing proportion of uterine surgery; when placenta previa is combined with previous CS, the risk of PAS increases manyfold, which requires a specialized level of care, a multidisciplinary team, and readiness for massive transfusion [ACOG, 2018]. These provisions lead to a fundamentally important conclusion: in an era of high prevalence of uterine scarring, any improvement in operative technique and management algorithms can potentially make a meaningful contribution to reducing severe hemorrhagic outcomes.

The increasing prevalence of uterine scarring reinforces the need to unify approaches to analyzing the causes and structural drivers of rising CS rates at the institutional and regional levels. The most widely recognized tool for comparable audit is the 10-group Robson classification, which standardizes CS reporting, identifies groups that make the "main contribution" to the CS rate, and supports targeted management decisions (changes in induction strategy, management of labor in women with a scar, adjustment of approaches to breech presentation, etc.) [Robson M.S., 2001; WHO, 2015]. However, even with an ideal audit system, an inevitable proportion of clinically justified CS remains, especially emergency procedures. For this reason, the second "layer" of the problem—the quality of the operation itself and perioperative management—acquires independent significance.

Emergency cesarean section occupies a special place because it is performed under time deficit, limited tissue preparedness, unfavorable hemodynamic and coagulation shifts, and often in the presence of several risk factors simultaneously (bleeding, infection, hypertensive complications, fetal hypoxia). In an emergency, the cost of additional minutes and technical difficulties when entering the abdominal cavity and exposing the lower uterine segment increases manyfold. Consequently, the choice of surgical access (type of anterior abdominal wall incision), dissection technique, hemostasis and suturing methods, as well as anesthesia and infusion protocols have a direct impact on blood loss volume, the incidence of wound and infectious complications, operative time and length of hospital stay, the need for antibacterial and transfusion therapy, the speed of recovery, and quality of life in the postpartum period [Hofmeyr G.J. et al., 2008/2014; Abuelghar W. et al., 2013].

The problem of surgical access in cesarean section has historically been regarded as a "technical detail"; however, contemporary evidence shows that modifications of the abdominal entry and operative technique (including variants of transverse incisions, the Joel-Cohen/Misgav-Ladach approaches, nuances of fascial dissection, and peritoneal closure strategies) can influence operative duration, the intensity of postoperative pain, time to mobilization, and selected indicators of infectious morbidity [Hofmeyr G.J. et al., 2008/2014]. In real-world clinical practice, the choice of incision is often driven not by a standardized protocol but by the surgeon's individual experience, institutional tradition, and a

subjective appraisal of case complexity. Such variability leads to heterogeneous outcomes, complicates inter-hospital comparisons, and reduces the reproducibility of best practices. Accordingly, a current priority is the development of clear criteria for selecting the surgical approach according to the clinical scenario (elective vs emergency CS, anticipated severity of adhesions based on history, suspicion of PAS/placenta previa, obesity, fetal presentation, the need for rapid fetal extraction, etc.), and the integration of these criteria into algorithms and checklists.

A third key domain, closely linked to surgical technique, is perioperative management and the concept of enhanced recovery (Enhanced Recovery After Surgery, ERAS/Enhanced Recovery After Cesarean). Modern ERAS pathways in obstetrics include preoperative counseling, optimization of nausea/vomiting prophylaxis, rational antibiotic prophylaxis, multimodal analgesia with opioid-sparing strategies, early mobilization and early feeding, fluid management, thromboembolism prophylaxis, and standardized discharge criteria [Macones G.A. et al., 2019; Bollag L. et al., 2021]. In practice, this means that even with identical surgical technique, differences in anesthesia, analgesia, fluid protocols, and mobilization can substantially alter complication rates and recovery timelines. Therefore, contemporary optimization of cesarean delivery should be viewed as an integrated “surgery + anesthesiology + organization” bundle rather than an isolated improvement of a single operative step.

In clinical reality, women with a uterine scar and concomitant placental pathology represent a particularly complex group. Suspicion of PAS or placenta previa requires not only diagnostic vigilance but also a predefined operative plan: the appropriate level of facility, team composition, availability of blood and blood products, readiness for massive transfusion, and the possibility of escalation in operative scope up to cesarean hysterectomy, with leaving the placenta in situ being the most widely accepted approach in confirmed PAS [ACOG, 2018]. Under these circumstances, the choice of access to the uterus (including justification for an extended approach when difficult dissection is

anticipated) becomes not a matter of convenience but an element of strategy to prevent catastrophic hemorrhage. Consequently, local protocols that formalize incision selection and link it to risk assessment may improve safety.

Finally, the relevance of the topic is reinforced by the need for data comparability and transparency of clinical decision-making. Systematic quality improvement requires that clinical decisions (indications for CS, incision choice, the scope of hemorrhage prophylaxis, criteria for calling a senior surgeon, etc.) be recorded in a standardized manner, be available for audit, and be linked to outcomes. At the institutional level, this enables identification of modifiable drivers of complications (prolonged dissection, delayed antibiotic administration, untimely thromboprophylaxis, absence of a massive transfusion protocol, inadequate preparation for PAS, etc.). At the regional level, it supports risk-based referral pathways for high-risk pregnancies, strengthening of perinatal centers, and reduction of “unprepared” emergencies that culminate in severe maternal outcomes [WHO, 2025; ACOG, 2018].

Thus, the relevance of a comprehensive analysis of cesarean section as a clinical and organizational challenge is determined by several concurrent factors: (1) the increasing prevalence of the operation and, consequently, a growing population of women with a uterine scar; (2) the substantial contribution of surgery-associated complications to maternal morbidity and resource utilization; (3) the cumulative escalation of risks with repeat cesarean deliveries and the rising frequency of placental pathology, including PAS, which requires specialized management; (4) high variability in surgical technique and incision selection among surgeons and institutions; (5) proven effectiveness of standardizing perioperative care (ERAS concepts) and the need to integrate these pathways with optimal surgical tactics; and (6) the health system’s need for transparent monitoring and audit instruments (e.g., the Robson classification) to manage CS rates and the quality of care [Robson M.S., 2001; Ye J. et al., 2021; Macones G.A. et al., 2019].

Within a monographic format, it is logical to consider sequentially: current trends and indications for CS; the uterine scar as a risk factor in subsequent pregnancy; surgical approaches and techniques (with emphasis on emergencies and placental pathology); principles of standardization and ERAS pathways; and practical algorithms for choosing the incision and perioperative management based on risk category. This approach allows the evidence base, clinical reasoning, and organizational solutions to be integrated into a single system aimed at reducing severe complications and improving maternal and perinatal outcomes.

1.2. § Brief review of the literature

Cesarean section (CS) has, over recent decades, become firmly established as one of the most frequently performed operations in obstetrics, while simultaneously remaining the subject of ongoing debate about the "benefit–risk" balance and the boundaries of rational use. In contemporary literature, CS is viewed not only as a mode of delivery, but also as a complex clinical and organizational technology in which the final outcome is determined by the quality of decision-making (indications, urgency, preparation), the safety of anesthetic management, the choice of surgical strategy (including the abdominal entry), complication prevention, and the quality of postoperative care [WHO, 2015; NICE, 2021/2025].

In the global context, the problem is shaped by divergent trends: in some countries, access to life-saving CS remains insufficient, whereas in others the proportion of operations persistently exceeds what would be expected without an equivalent improvement in maternal and perinatal outcomes. This "double burden" is emphasized in analytical reviews and position statements: a low CS rate may reflect barriers to surgical care, while an excessive rate may indicate potential overdiagnosis of indications and an increase in iatrogenic risks without additional clinical benefit [WHO, 2015; Boerma T. et al., 2018].

A distinct place in the literature is occupied by the question of an "optimal CS rate." Early attempts to link an "ideal percentage" to populations proved

methodologically vulnerable because the need for CS depends on the structure of obstetric risk, the organization of perinatal services, and the quality of antenatal care. Nevertheless, large population-level syntheses show that beyond a certain threshold, increasing CS rates cease to be associated with further reductions in maternal and perinatal mortality, which underpins the widely cited тезеs advocating avoidance of unjustified expansion of indications [Betrán A.P. et al., 2015; WHO, 2015].

The drivers of rising CS rates are multifactorial and are described as medical, social, and system-level. Among medical factors, authors most often highlight an increasing proportion of pregnancies at advanced maternal age, rising comorbidity (obesity, diabetes mellitus, hypertensive disorders), higher rates of labor induction, and the use of assisted reproductive technologies, all of which are associated with a greater burden of complicated pregnancies. Among system-level determinants, the literature discusses changes in clinical protocols, risk-averse institutional behavior, workforce and infrastructure limitations (affecting capacity for prolonged intrapartum monitoring and management of complicated vaginal births), as well as the medico-legal environment and patient expectations [WHO, 2015; NICE, 2021/2025].

However, in many populations the most influential “engine” of increasing operative delivery rates remains the phenomenon of repeat CS. This is often summarized as “CS begets subsequent CS,” because a uterine scar changes the decision-making algorithm, increases vigilance regarding uterine rupture, and is associated with a higher frequency of abnormal placentation in subsequent pregnancies. Clinical guidelines emphasize the need for individualized choice between planned repeat CS and a trial of labor with vaginal birth in selected patients without contraindications, provided that resources are available and the team is ready for urgent intervention [RCOG, 2015; NICE, 2021/2025].

A major methodological step toward standardizing analysis of CS rates was the introduction of the 10-group Robson classification (TGCS). Its value lies in enabling comparison not of the overall “CS percentage,” but of the structure of

deliveries and the proportion of operations within clinically homogeneous groups (parity, uterine scar, gestational age, presentation, multiple pregnancy, onset of labor, etc.). This transforms CS audit into a manageable process: it becomes possible to identify groups in which growth is most pronounced, analyze underlying causes (e.g., induction practices, management of breech presentation, VBAC policies), and assess the effect of management interventions [Robson M.S., 2001; WHO, 2017].

From a practical standpoint, TGCS is particularly useful for hospitals with a high share of emergency interventions because it helps distinguish “objectively high risk” (e.g., scar plus an unfavorable obstetric status) from potentially modifiable contributors. WHO guidance on implementing TGCS emphasizes the quality of source data, the need for uniform definitions, and the importance of interpreting results in light of institutional context (level of care, referral patterns, patient case-mix) [WHO, 2017].

A second major strand of the literature concerns indications and the decision-making process for CS. Contemporary recommendations structure indications by urgency (elective/urgent/emergency) and by the leading clinical problem (fetal compromise, labor dystocia, hemorrhage, preeclampsia/eclampsia, placentation disorders, breech presentation, etc.). It is emphasized that an “indication” is not merely a diagnosis, but also an assessment of the dynamic maternal and fetal condition, the effectiveness of conservative measures, and the safety of alternatives [NICE, 2021/2025].

Differences in risk profile between planned and emergency CS are addressed separately. Emergency intervention is typically performed with less preoperative preparation and more often against an unfavorable obstetric background (prolonged labor, chorioamnionitis, hemorrhage, fetal hypoxia), with limited time to correct coagulopathy and stabilize hemodynamics. This affects blood loss, the risk of infectious complications, and operative trauma. Accordingly, some authors consider emergency CS a distinct clinical situation in which the choice of surgical technique (including the abdominal entry) has not a

cosmetic, but a functional and safety-critical meaning [NICE, 2021/2025; Hofmeyr G.J. et al., 2013].

In the context of this monograph, a key role is played by studies focused on surgical access in CS. Classically, comparisons include a longitudinal midline (vertical) approach and transverse suprapubic approaches (primarily Pfannenstiel, as well as Joel-Cohen and its modifications used in a number of "minimalist" techniques). The choice of access is determined by several groups of factors: the need for rapid fetal extraction; anticipated technical difficulty (obesity, adhesions, placenta previa/accreta, prominent venous plexus of the lower segment); hemorrhage risk; the need for extension and exploration; and the predicted postoperative course (pain, wound complications, hernias) [Hofmeyr G.J. et al., 2013].

The transverse Pfannenstiel incision is traditionally associated with better cosmetic outcomes, a lower incidence of postoperative hernias, and an acceptable pain profile when fascial dissection and closure are performed correctly. In emergency settings, its limitations are linked to potentially less "vertical" exposure and the time required for layer-by-layer tissue handling. The longitudinal midline incision, by contrast, is often viewed as more readily extendable and universal when upper abdominal exploration and active hemostatic maneuvers are required, especially when massive hemorrhage is anticipated or complicated placentation is suspected, but it may be associated with a less favorable wound profile and more pronounced postoperative pain in some patients [NICE, 2021/2025; RCOG, 2015].

Systematic reviews focusing specifically on the type of skin–fascial incision emphasize that transverse approaches performed according to principles of minimal tissue trauma may provide advantages in several early outcomes (pain, analgesic requirements, time to mobilization) with comparable safety. At the same time, authors point to heterogeneity across studies: anesthetic protocols, peritoneal entry techniques, uterine closure methods, and infection prevention

differ, complicating a “pure” comparison of access as a single factor [Hofmeyr G.J. et al., 2013].

Particular attention is devoted to the Joel-Cohen entry as a component of the Misgav-Ladach technique and related approaches. The underlying concept is to reduce the number of sharp dissections, use wide blunt tissue separation, and optimize the sequence of steps. Several randomized studies reported shorter time to fetal extraction, reduced total operative time, and lower analgesic requirements compared with classic Pfannenstiel performed with standard technique, although results vary and depend on surgeon experience and adherence to the method [Franchi M. et al., 2002; Hofmeyr G.J. et al., 2013].

In analyses of emergency scenarios, authors emphasize that “speed” of access is not an end in itself: time gains must be weighed against the risks of uncontrolled hemorrhage, bladder injury, wound extension, and compromised quality of subsequent closure. This is particularly relevant with a low-lying placenta, during repeat operations with adhesions, and in the presence of a prominent venous plexus of the lower uterine segment. In such settings, a wider and more readily extendable access may improve operative controllability and reduce the likelihood of critical errors, even if early postoperative comfort is less favorable [NICE, 2021/2025; RCOG, 2015].

The problem of post-cesarean complications is addressed in the literature along two axes: early events (intraoperative and immediate postoperative) and long-term sequelae. Early complications include hemorrhage, injury to adjacent organs, purulent-septic complications, postoperative anemia, thromboembolic events, and postoperative ileus. Emergency procedures are characterized by a cumulative burden of risk factors such as prolonged rupture of membranes, multiple vaginal examinations, chorioamnionitis, and uterine exhaustion after prolonged labor. Accordingly, contemporary guidelines emphasize infection prevention (antibiotic prophylaxis), rational correction of anemia, and active thromboembolism prophylaxis guided by risk stratification [NICE, 2021/2025].

Long-term sequelae include adhesion formation, chronic pelvic pain, cicatricial deformities of the anterior abdominal wall (including incisional hernias), as well as CS-specific uterine scar problems (niche/isthmocele, myometrial changes in the scar zone) with potential effects on menstrual function and outcomes of subsequent pregnancies. Clinical guidelines and reviews highlight the importance of preventing a "cascade of repeat interventions," since an increasing number of repeat CS is associated with a higher frequency of technically challenging procedures, adhesions, and placental complications [RCOG, 2015; NICE, 2021/2025].

A distinct body of literature focuses on abnormal placentation and its relationship with prior CS. Placenta previa and the placenta accreta spectrum (PAS) are regarded as critically important causes of maternal morbidity and massive hemorrhage, while previous uterine surgery (primarily CS) is considered one of the leading risk factors. This directly affects incision choice and operative planning: when complicated placentation is suspected, the priority becomes maximal controllability of the surgical field, readiness to extend the incision, and the capacity to perform staged hemostatic interventions [ACOG, 2018; NICE, 2021/2025].

Studies analyzing repeat CS demonstrate that as the number of prior operations increases, overall maternal morbidity rises: dense adhesions become more common, the risk of bladder injury increases, transfusion requirements grow, and the probability of life-saving hysterectomy increases. These findings shape the modern paradigm: the decision for a primary CS should be maximally justified, and once a uterine scar is present, a structured system of risk stratification and referral pathways is required—especially in settings where the proportion of repeat procedures is high [Silver R.M. et al., 2006; RCOG, 2015].

Thus, the literature supports several consistent conclusions that are important for the logic of this monograph. First, increasing CS rates alone do not guarantee improved outcomes, whereas the appropriateness of indications and process controllability (including Robson-based audit) are key instruments for

rationalization [WHO, 2015; WHO, 2017]. Second, emergency CS constitutes a distinct clinical category with a higher risk profile, in which operative technique and incision choice become safety determinants rather than merely surgeon preference [NICE, 2021/2025]. Third, comparisons of abdominal entry techniques suggest potential advantages of less traumatic transverse approaches for certain early outcomes, but the evidence base is heterogeneous; in complex and critical situations, individualized decision-making is required with priority given to field controllability and the ability to extend the incision when needed [Hofmeyr G.J. et al., 2013; Franchi M. et al., 2002].

Against this background, applied studies increasingly emphasize the need for simple, reproducible clinical-surgical criteria for selecting the abdominal entry in emergency CS, particularly in facilities with a high proportion of repeat procedures and obstetric complications.

1.3. § Methodological foundations and the object of the study

The material of this monograph is based on two complementary components: (1) an analysis of contemporary scientific literature and clinical guidelines addressing cesarean section and the selection of surgical access; and (2) a synthesis of the author's own clinical material followed by clinical and statistical analysis and interpretation of the findings (details of the design, groups, and outcome measures are provided later in Chapter V). This approach, on the one hand, allows reliance on the evidence base and internationally recognized outcome definitions and, on the other, demonstrates the practical applicability of the conclusions within real-world obstetric services.

Sources and literature search strategy. The theoretical section draws on publications from international databases (primarily PubMed/Medline), systematic reviews and meta-analyses, WHO documents, and clinical bulletins/guidelines issued by professional societies. Issues related to the classification of deliveries and monitoring of cesarean section rates were considered within the framework of the 10-group Robson classification,

interpreted and implemented according to the methodology proposed by the WHO [WHO, 2017].

To ensure comparability of terminology, outcomes, and complication definitions, unified criteria were applied both when describing the evidence base and when comparing it with the author's clinical data. Thus, postpartum hemorrhage in this monograph is defined in accordance with contemporary clinical criteria as cumulative blood loss ≥1000 mL or blood loss accompanied by signs/symptoms of hypovolemia within 24 hours after delivery (including intrapartum blood loss) [ACOG, 2017].

When summarizing observational clinical studies and structuring the presentation of the author's material, widely accepted reporting standards were considered: STROBE for observational studies [von Elm E. et al., 2007], PRISMA 2020 for systematic reviews [Page M.J. et al., 2021], and CONSORT 2010 for randomized trials when such studies are cited in the text [Schulz K.F. et al., 2010; Moher D. et al., 2010].

Clinical material and study design. The practice-oriented component of the monograph is based on the examination and management of patients who underwent cesarean section in an inpatient setting, with particular emphasis on emergency delivery and the problem of choosing surgical access. The clinical material included a retrospective review of medical records and prospective follow-up (the exact recruitment period, sample size, group/subgroup allocation, and the proportion of primary vs repeat procedures are presented in final form in subsection 5.1). Methodologically, this design allows, simultaneously: (a) assessment of "real-world practice" and complication structure based on archival data; and (b) acquisition of higher-quality clinical parameters and standardized outcome capture in the prospective component.

The unit of observation was a patient who underwent cesarean section. The primary comparative factor was the type of abdominal entry (longitudinal vs transverse), as well as the operative context (elective vs emergency), because emergency clinical situations more often involve time constraints, variable

conditions, and increased risks of hemorrhage and operative trauma. Potential confounders were additionally considered, including parity and the presence of a uterine scar, estimated fetal weight, fetal lie and presentation, placentation characteristics, extragenital comorbidity, infectious-inflammatory factors, and organizational variables (time of day, team composition, senior surgeon involvement, availability of hemostatic agents).

Inclusion and exclusion criteria. Included were patients who underwent cesarean section for obstetric indications and had sufficient data available for analysis of intraoperative parameters and the early postoperative period. In the prospective component, informed consent for follow-up and scheduled visits/contacts was generally required. Excluded were scenarios in which outcomes were determined predominantly by factors other than the type of access (e.g., rare life-threatening conditions requiring extensive non-standard interventions, massive obstetric hemorrhage necessitating atypical surgical solutions, and other clinical scenarios in which comparing access types would be methodologically inappropriate). In certain analytic models, it is also reasonable to exclude cases in which multiple key technical elements changed simultaneously (e.g., a different uterine incision type, non-standard hemostasis strategy) to avoid diluting the effect attributable specifically to abdominal entry.

Intervention description and standardization of comparison. In this monograph, “longitudinal access” refers primarily to midline (lower midline) laparotomy, used in certain emergency situations as a faster and more universal route into the abdominal cavity, particularly when difficulties are anticipated, in obesity, when extension of the incision may be required, or when visualization is limited. “Transverse access” refers to suprapubic approaches (including modifications of transverse incisions) used in elective procedures and in a subset of emergency operations, emphasizing potential advantages regarding pain, cosmetic outcome, and selected postoperative endpoints. Importantly, “access” is not merely the skin incision line, but a complex of steps including layer-by-layer dissection, tissue separation techniques, the method of entering the peritoneal

cavity, and the ease of exposing the lower uterine segment. Therefore, when comparing groups, not only the incision type was recorded, but also key technical elements: the method of fascial opening, hemostasis techniques, extent of dissection, stage-specific durations, the need for incision extension, and additional maneuvers.

Outcomes and endpoints. To ensure systematic assessment, outcomes were grouped by time horizon.

1. Intraoperative parameters: total operative duration (and/or durations of specific stages if available in the operative record), estimated blood loss (according to the institution's accepted assessment method), need for uterotonics/hemostatic therapy, frequency of technical difficulties (difficult dissection, dense adhesions, need to extend access), injury to adjacent organs, and escalation to an expanded operative scope.

2. Early postoperative period: pain severity and analgesic requirement, time to mobilization, restoration of bowel function, fever, infectious complications, hematomas/seromas, wound dehiscence, and length of hospital stay. Infectious complications were assessed using widely accepted definitions, including a categorical approach to surgical site infection (superficial/deep/organ-space) in line with NHSN/CDC concepts [CDC, 2025].

3. Long-term outcomes: scar status and healing quality, including clinical manifestations (chronic pain in the scar area/pelvis, keloid/hypertrophic scarring, incisional hernias) and, where instrumental follow-up was available, ultrasound markers of scar integrity (lower uterine segment thickness, "niche" features, myometrial heterogeneity) and their clinical correlates. Patient-reported outcomes relevant to quality of life were analyzed separately: limitations in physical activity, persistent tenderness, scar discomfort, repeat consultations, and the need for additional therapy.

Perinatal outcomes included neonatal status indicators (Apgar score, need for resuscitation measures, admission/transfer to the neonatal intensive care unit when indicated) as well as clinical markers of intrapartum fetal distress. In

interpretation, it is emphasized that in emergency situations perinatal outcome is more often determined by the underlying obstetric reason for surgery, gestational age, and the time to fetal extraction, whereas the influence of access is indirect and is manifested mainly through operative speed and technical controllability.

Classification and stratification approaches. For analyzing the structure of cesarean sections and ensuring comparability of samples, the principles of the 10-group Robson classification were used as an instrument for standardized description of the obstetric population and the drivers of CS rates [WHO, 2017]. In the practical chapters of the monograph, this allows separation of cases in which high CS rates are explained by the clinical profile of the group (e.g., uterine scar, breech presentation, multiple gestation) from cases in which increased frequency may be associated with organizational or tactical decisions.

Statistical analysis. Data were processed using descriptive and analytical statistical methods. For quantitative variables, distributional characteristics were assessed; results were then reported as mean and standard deviation or as median and interquartile range, as appropriate. Categorical variables were presented as absolute counts and percentages (within the monograph, the preferred format is "n (%)"). Group comparisons were performed using parametric or non-parametric tests depending on distribution; for categorical variables, chi-square (χ^2) tests or exact methods were used when expected counts were small. To assess the independent contribution of factors (type of access, emergency status, uterine scar, etc.) to complication risk, multivariable models are appropriate (logistic regression or Poisson regression for count-type outcomes), with effects reported as odds ratios/relative risks and 95% confidence intervals. The statistical significance threshold was set at 0.05; however, clinical interpretation was based not only on p-values, but also on effect sizes and confidence intervals.

Ethical and organizational considerations. In the prospective component, general principles of medical ethics were observed, including informed consent, confidentiality of personal data, and use of information exclusively for scientific purposes. In the retrospective component, data were de-identified during

statistical processing. The monograph emphasizes that outcomes after cesarean section are determined not only by the “choice of access,” but also by perioperative standards, preparedness for hemorrhage, infection prevention, and team performance; therefore, organizational elements capable of modifying complication risk were recorded whenever possible.

1.4. § Structure and volume of the work

This monograph is structured according to a problem-oriented analytical principle: from framing the task and refining the conceptual framework to a systematic review of contemporary approaches, then to a detailed consideration of surgical solutions and their clinical consequences, and finally to a synthesis of the author’s own results with the formulation of practical conclusions. This logic was chosen deliberately because cesarean section and the choice of surgical access lie at the intersection of several domains: clinical necessity (speed and safety of delivery), surgical rationale (technical controllability of the entry and the anticipated complication profile), and the organizational realities of an obstetric hospital (team readiness, resources, referral pathways). As a result, the monograph is not limited to describing “two incisions,” but considers the abdominal entry as a clinical decision that must be justified by indications, the emergency context, hemorrhage risk, and expected technical complexity, as well as by anticipated early and long-term outcomes.

Chapter I (Introduction) comprises four interrelated sections. Subsection 1.1 presents the relevance of the problem in the context of current trends in cesarean section rates, the rising proportion of repeat procedures, and the growing number of pregnant women with a uterine scar, and outlines the key clinical and organizational consequences of these processes. Subsection 1.2 is presented as a brief literature review and provides a focused synthesis of the evidence base regarding CS frequency, the effect of decision-making strategies on outcomes, and the role of surgical and perioperative factors in the development of complications. Subsection 1.3 (Materials and methods) establishes the

methodological framework: data sources, adopted outcome definitions, general principles for comparing groups, and the statistical approach. Subsection 1.4 serves a navigational function by explaining why the work is organized in this manner and how the reader should understand the relationship between the review chapters and the applied part.

Chapter II (The current state of the cesarean section problem) addresses the "context" without which any comparative conclusions about surgical access cannot be interpreted correctly. Subsection 2.1 sequentially examines trends and the structure of cesarean section rates, as well as the applied role of the Robson classification as a standardized tool for analyzing the obstetric population and the drivers of increasing CS rates at the level of maternity facilities and regions. This section logically explains why comparing CS frequency and outcomes without stratification by obstetric groups can lead to erroneous managerial conclusions and why implementing a unified classification is a basic prerequisite for an "honest" audit. Subsection 2.2 discusses indications for CS and the decision-making strategy in elective versus emergency contexts, emphasizing that emergency status changes the "cost of time," shifts priorities from cosmetic outcomes and comfort toward speed, exposure, and hemorrhage control, and thereby directly affects the rationale for choosing the surgical entry. Subsection 2.3 systematizes maternal and perinatal risks by distinguishing complications driven by the underlying obstetric situation (e.g., fetal distress, placental abruption, hemorrhage) from those that are more "operation-dependent" and potentially modifiable (blood loss, tissue trauma, infectious complications, wound pathology). This chapter establishes the baseline criteria of clinical feasibility: when the aim is to minimize risk, when it is to minimize time, and how these two principles should be balanced.

Chapter III (Surgical access and operative technique) is central to the surgical logic of the monograph. Subsection 3.1 focuses on the longitudinal (midline/lower midline) approach. It is considered not as "obsolete," but as a tool with clearly defined indications: anticipated difficult dissection, the need for rapid

entry and potential extension of the incision, limited visualization, certain patterns of obesity, specific types of adhesions, and combined scenarios that require improved controllability of the operative field. Subsection 3.2 analyzes the transverse (suprapubic) approach—its advantages and limitations—and the conditions under which it provides an optimal balance between surgical trauma, postoperative recovery, and predictability of wound outcomes. Subsection 3.3 addresses the key practical issue: incision selection in emergency situations. Importantly, the monograph does not replace clinical judgment with a "universal recommendation," but develops a system of criteria: which signs predict a high likelihood of technical difficulty, how to assess hemorrhage risk, what should be regarded as "time deficit," in which emergency scenarios a transverse approach remains justified, and in which situations a longitudinal approach provides advantages in controllability and safety. This chapter also highlights typical practice errors: "habit-based" selection, underestimation of dissection complexity, lack of documented rationale for incision choice, and disconnects between tactical decisions and the team's resource readiness.

Chapter IV (Complications and outcomes: what determines the result) logically links surgical technique with the ultimate clinical effect. Subsection 4.1 examines intraoperative and early postoperative complications, including blood loss, tissue trauma, wound complications, infectious events, postoperative pain, and recovery duration. It emphasizes that part of the adverse outcome profile is "formed" at the access stage: the quality of exposure, the extent of dissection, and the predictability of hemostasis become triggers for subsequent events. Subsection 4.2 focuses on long-term sequelae, including scar quality and chronic problems that are often underestimated in hospital statistics but are significant for patients: persistent pain, unsatisfactory healing, keloid changes, incisional hernias, chronic pelvic pain, and repeat consultations. Subsection 4.3 systematizes risk factors for adverse outcomes and prevention strategies. A key concept of Chapter IV is to separate non-modifiable factors (e.g., the baseline severity of the obstetric situation) from modifiable factors (incision choice, preparedness for

hemorrhage, infection prevention, standardization of operative steps, team communication). This makes Chapter IV a “bridge” to Chapter V, where modifiable factors are tested on the author’s clinical material and translated into a practical algorithm.

Chapter V (Original results and practical solutions) constitutes the clinical-analytic core of the monograph. Subsection 5.1 provides a detailed description of study design, group characteristics, and principles for ensuring comparability, and specifies inclusion/exclusion criteria and the list of analyzed variables. This is the appropriate place to insert the author’s concrete dissertation data: observation period, sample size, allocation between retrospective and prospective components, proportions of primary and repeat CS, indication structure, baseline characteristics, and concomitant factors. Subsection 5.2 presents results for key outcomes with clinical interpretation, between-group comparisons, and risk factor assessment; where relevant, multivariable adjustment models are discussed if they were applied. Subsection 5.3 is designed as the practical product of the monograph: recommendations and an incision selection algorithm anchored to clinical criteria and typical emergency scenarios. Importantly, the algorithm should be implementable rather than declarative, with clear decision points, a list of high-risk features, and a minimal set of parameters that can realistically be assessed during on-call practice.

The monograph concludes with final integrative sections. The Conclusion synthesizes the main points of all chapters into a unified logic chain: “context → surgical decision → outcomes → practical algorithm.” The Conclusions are presented as brief, verifiable statements aligned with the chapter structure and supported either by literature or by the author’s own material. Practical Recommendations are provided separately so that they can function as a standalone working document for a maternity unit; they are formulated in an applied style, without excessive theory, focusing on what should be done preoperatively, during incision selection, and in the early postoperative period.

Regarding volume, the monograph is intentionally oriented toward an expanded format: the review chapters should be sufficiently deep for the reader to understand the evidence base and the reasons for variability in practice, while the applied component should be sufficiently detailed for the conclusions to be perceived as reproducible and implementable. The key principle is that increased volume is achieved not through redundancy, but through clarification of logical links, careful typology of clinical scenarios, comparison of different approaches, and analysis of why a method works under some conditions but not under others. Therefore, subsequent sections (2.1–2.3 and beyond) will be expanded by refining terminology, briefly contrasting major schools/approaches, describing typical clinical situations, and adding transitions that connect evidence with practice.

CHAPTER II. CURRENT STATE OF THE CESAREAN SECTION PROBLEM

2.1. § Trends, incidence, and classification

In recent years, research interest in cesarean section has increased markedly. This is explained, on the one hand, by changes in obstetric strategy and an expansion of indications for operative delivery and, on the other, by a growing number of pregnant women with a uterine scar, whose pregnancy and childbirth require heightened clinical attention.

At present, the rate of abdominal delivery in countries of the European region is reported to be 10–20%, in the United States 26%, and in a number of countries in Latin America, India, Iran, South Korea, Cuba, and Turkey 35–50%. This trend has been facilitated by the development of obstetric science, the introduction into practice of modern methods for assessing maternal and fetal status, improvements in cesarean section technique, advances in anesthesiology and intensive care, blood transfusion services, neonatal resuscitation, pharmacology, the use of medications—particularly broad-spectrum antibiotics—new suture materials, and other factors.

At present, the role of cesarean section in reducing perinatal morbidity and mortality is not in doubt. At the same time, this demonstrates that increasing the frequency of cesarean section alone cannot solve the problem, because this indicator depends on multiple factors (above all, an increasing number of preterm births and deep neonatal prematurity).

In many hospitals and clinical institutions in Uzbekistan, which serve as referral centers for diverse obstetric and extragenital pathology, the rate of cesarean section exceeds 40%. Further increases are not accompanied by a substantial reduction in perinatal losses, but may create a serious threat to women’s health and life, especially when contraindications to cesarean section are underestimated. The risk of complications for pregnant women undergoing abdominal delivery is reported to increase tenfold or more, while the risk of

maternal mortality increases by 5–11 times. At the same time, it should be recognized that for many women the need for cesarean section is associated with baseline health problems, an unfavorable course of pregnancy, or complications during labor.

Expansion of indications for cesarean section is one of the features of contemporary obstetrics. One of the main drivers of increasing cesarean section rates in recent years is the performance of surgery “in the interests of the child,” including breech presentation, transverse and oblique fetal lie, fetoplacental insufficiency, multiple pregnancy, severe preeclampsia and eclampsia, preterm pregnancy, fetal malformations (gastroschisis), and many other conditions. Today, obstetric practice has the necessary diagnostic tools to assess fetal status (ultrasound, cardiotocography, Doppler velocimetry, MRI, and various clinical and laboratory investigations). In recent years, new indications have emerged with a relatively high frequency (10.6%), specifically induced pregnancy after assisted reproductive technologies.

Operative delivery by cesarean section has, to a certain extent, replaced prolonged and traumatic labor managed with stimulation. This should contribute to a reduction in procedures such as breech extraction, vacuum-assisted delivery, and obstetric forceps, although operative vaginal delivery cannot be completely eliminated.

According to many researchers, expanding indications for cesarean section directly leads to a decline in professional skills related to managing labor through the natural birth canal.

Some authors consider that, when deciding on delivery by cesarean section—especially elective cesarean—maternal preference should be taken into account. In England, according to the document Changing Childbirth developed by the Expert Maternity Group (2003) and The Audit Commission Report (2007), a pregnant woman has the freedom to choose the method of delivery. The Ethics Committee of the American College of Obstetricians and Gynecologists indicates that elective cesarean section at maternal request does not contradict the

requirements of medical ethics. In our country, as in many others, there are no regulatory documents that explicitly prohibit or permit cesarean section performed at the request of the pregnant woman or her relatives.

An increase in cesarean section rates creates a new problem: the management of pregnancy and childbirth in women with a uterine scar. At present, the main approach is cesarean section in the lower uterine segment via a transverse uterine incision; discussions about vaginal birth after cesarean section have been ongoing in our country since the 1960s. Synthetic absorbable suture materials are used to restore the uterine wall, which influences scar formation quality. According to various authors, 30–60% of women who have undergone cesarean section may deliver vaginally with favorable outcomes for the mother and the newborn.

In recent years, the question has been raised of performing elective cesarean section to protect the pelvic floor and perineum from trauma during vaginal delivery. Multiple studies confirm the possibility of pelvic floor muscle injury and the development of urinary incontinence after vaginal birth. According to Australian researchers who assessed the degree of “bladder neck descent” using ultrasound, the pattern is as follows: the most pronounced descent occurs after forceps delivery (mean 14.5 mm), followed by vacuum-assisted delivery (9 mm), “normal” vaginal delivery (7.2 mm), cesarean section performed in the second stage of labor (4 mm), and cesarean section performed in the first stage of labor (2.6 mm).

In studies by A.M. Sultan et al. (2009) using anal endosonography, anal sphincter defects after vaginal delivery were detected in 35% of primiparous women and 44% of multiparous women, while clinical symptoms of injury were present in 13% and 23% of cases, respectively.

Particular attention should be paid to the problem of cesarean section in preterm pregnancy. At gestational ages below 34 weeks, cesarean section is not considered the operation of choice and is performed mainly for urgent maternal

indications (severe preeclampsia/eclampsia, decompensation of somatic pathology, placenta previa, or abruption of a normally located placenta).

In many cases, perinatal mortality is determined by birth weight and gestational age at delivery. Research from the D.O. Ott Institute of Obstetrics and Gynecology showed that increasing the proportion of cesarean sections to 49% was associated with a threefold reduction in perinatal mortality in preterm pregnancy.

For the fetus, the type of uterine incision is also important at gestational ages of 26–32 weeks and fetal weight up to 1500 g, when gentle delivery is critically important. Elective abdominal delivery is justified no earlier than 29–30 weeks of gestation when fetal weight is 1000 g or more and neonatal care is well organized.

It should also be emphasized that at these gestational ages the lower uterine segment is insufficiently developed. The outcome of early abdominal delivery for the life and health of the child is determined not only by the modification of lower-segment cesarean section, but also by the skill and experience of the surgeon in extracting the newborn. To reduce the risk of traumatizing the low-birth-weight infant, significant importance is attributed to a vertical uterine incision in the area of the lower segment.

To date, the optimal frequency of cesarean sections has not been established; therefore, it is not entirely correct to speak of “too high” or “too low” cesarean section rates. One of the main criteria for the frequency of abdominal delivery is a low rate of perinatal morbidity and mortality and a favorable maternal outcome.

2.2. § Cesarean section technique in a historical perspective

Improvements in maternal and perinatal outcomes are attributable, among other factors, to advances in surgical technique. At present, multiple modifications of cesarean section are used, differing in the method of access to the uterus, as

well as in the characteristics of uterine incision and closure. Depending on whether the peritoneal cavity is entered, intraperitoneal and extraperitoneal cesarean section are distinguished. Within intraperitoneal cesarean section, uterine incision types are commonly categorized by localization as follows: corporal (classical) cesarean section; isthmico-corporeal cesarean section; lower-segment transverse cesarean section; and lower-segment cesarean section with temporary isolation of the abdominal cavity.

The choice of cesarean section technique is determined both by objective prerequisites—gestational age, fetal presentation and size, the presence of uterine scars and coexisting pathology (uterine fibroids, infectious processes of various types, etc.)—and by the surgeon's qualification, which is influenced by surgical school, institutional practice, and the operator's own experience.

Currently, cesarean section is most commonly performed using a transverse suprapubic incision according to Pfannenstiel, Joel-Cohen, Cohen, or via a lower midline incision.

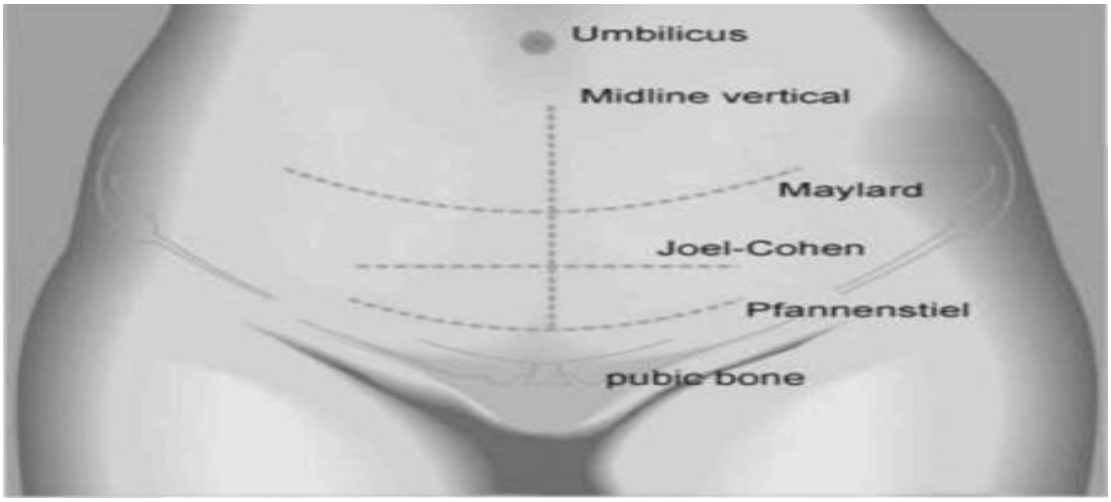

Figure 1. Main types of skin incision for cesarean section

Transverse incisions began to be used at the turn of the 19th–20th centuries after J. Pfannenstiel (1887) demonstrated a reduced rate of postoperative hernia formation with a suprapubic incision.

Many authors consider the Pfannenstiel laparotomy to be appropriate. In this approach, the incision is made along the suprapubic skin crease. The advantages attributed to the Pfannenstiel laparotomy include high scar strength, the possibility of active postoperative management (including pain assessment), a lower incidence of incisional hernias, and a good cosmetic effect. However, the transverse suprapubic laparotomy provides less abdominal exposure than a lower midline incision, and an incision length of less than 15 cm reportedly leads to delivery difficulties in 58% of cases.

Today, there are many proponents of the Joel-Cohen laparotomy, first described in 1972. In this modification, laparotomy is performed through a superficial straight transverse skin incision 2.0–2.5 cm below the line connecting the anterior superior iliac spines.

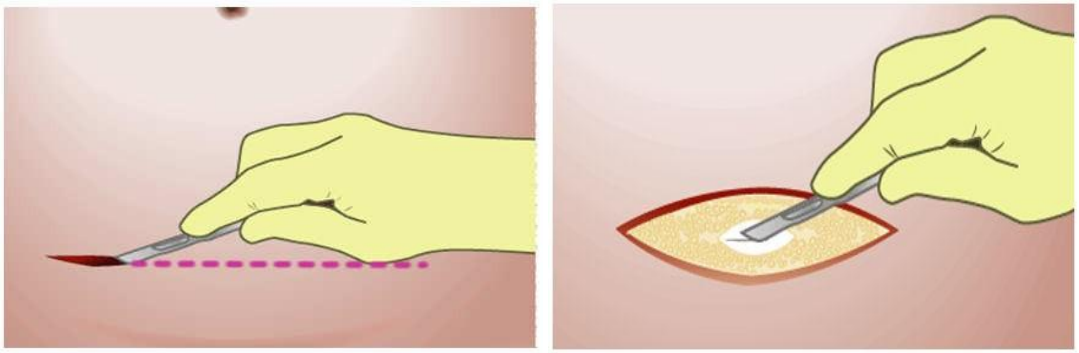

Figure 2. Skin incision to the fascia

With a scalpel, the surgeon deepens the wound along the midline through the subcutaneous fat, incises the fascia, and then extends the fascial incision laterally using the tips of straight scissors beneath the subcutaneous tissue. The surgeon and assistant simultaneously separate the subcutaneous tissue and rectus muscles by bilateral traction along the incision line. The peritoneum is opened with the index finger in the transverse direction to prevent bladder injury.

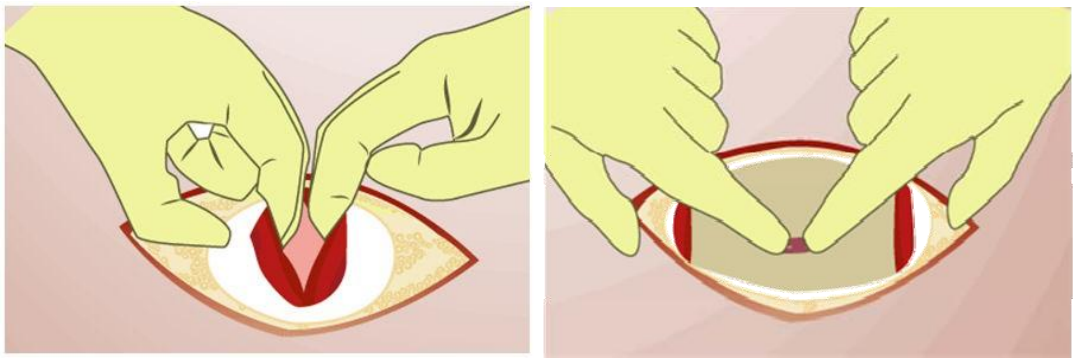

Figure 3. Separation of the abdominal muscles and parietal peritoneum

Compared with the Pfannenstiel incision, the Joel-Cohen incision is placed higher; it is straight rather than curved; it does not involve fascia detachment; and the peritoneum is opened transversely. As a result of the higher incision level and the use of blunt tissue separation, branches of the pudendal and superficial epigastric arteries and vessels penetrating the rectus muscles from the fascia—often injured during Pfannenstiel laparotomy—are more likely to remain intact. As shown in studies by V. Stark (1994), this access can be performed quickly, is practically not accompanied by bleeding, and creates favorable conditions for cesarean section. However, the Joel-Cohen incision is cosmetically less favorable than the Pfannenstiel incision.

Lower midline laparotomy provides good operative exposure, but it results in a less durable surgical scar and is cosmetically inferior to transverse incisions.

At present, when choosing among the suprapubic Pfannenstiel incision, lower midline laparotomy, and laparotomy in the Cohen or Joel-Cohen modification, obstetric surgeons consider not only the size of the surgical access but also the time required to extract the fetus. The Cohen laparotomy, in contrast to Pfannenstiel, involves partially blunt entry into the abdominal cavity (while the fascia is opened sharply).

Opening the vesicouterine fold followed by its downward dissection and displacement of the bladder before the uterine incision is regarded as a preventive measure against bladder injury and creates conditions for peritonization of the uterine wound after uterine closure. This step was introduced into obstetric

practice at the end of the 18th century, when infectious complication rates were high and it was assumed that the peritoneum provided a barrier sufficient to prevent spread of infection.

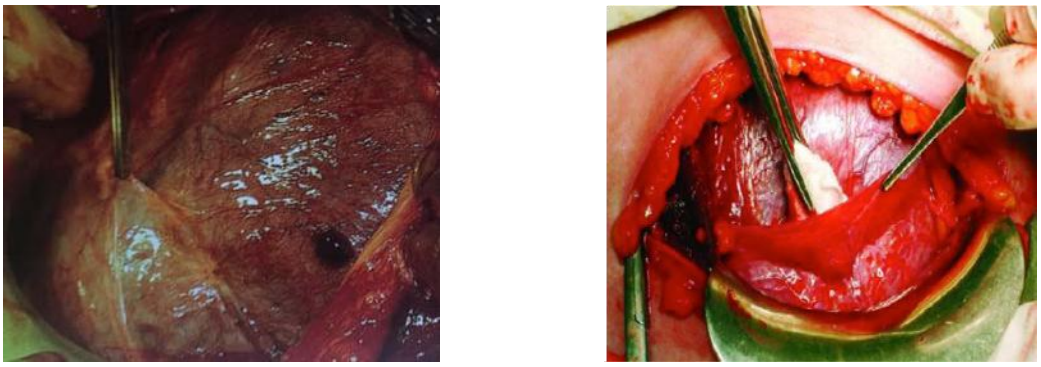

Figure 4. Identification and downward displacement of the visceral peritoneum with the bladder and exposure of the lower uterine segment

To this day, there are no modern studies confirming this assertion. Moreover, it has been shown that omission of this stage of cesarean section does not increase the rate of postoperative infection or adhesions and is associated with shorter operative duration, reduced risk of bladder injury, and decreased requirements for analgesic medications.

In 1912, Kronig proposed a vertical uterine incision for cesarean section, while Kerr in 1926 proposed a transverse incision in the lower uterine segment. In contemporary practice, a transverse incision in the lower uterine segment is considered the most acceptable. It follows the circularly oriented muscle fibers and is therefore more anatomical; in addition, the resulting scar is more robust and is associated with a lower rate of dehiscence in subsequent pregnancies and deliveries. It is often performed after opening the vesicouterine fold and bluntly displacing the bladder. Disagreement has historically concerned the technique for extending the uterine incision laterally: either sharp extension with scissors (Derfler technique) or blunt separation of the myometrium (Gusakov technique).

In the sharp-extension approach to the lower uterine segment after laparotomy, a transverse incision of the peritoneum is made along the vesicouterine fold and the peritoneum with the bladder is displaced downward

bluntly to expose the lower uterine segment. A transverse uterine incision 2–3 cm long is then made approximately 4 cm above the base of the bladder. With fingers inserted into the wound and under the surgeon's control, the incision is then extended with scissors in an arcuate fashion laterally.

Proponents of the Derfler method argue that the advantages of sharp dissection include the ability to accurately calculate the size and direction of the incision, less trauma to uterine tissues, avoidance of injury to uterine vessels, and better access to the fetal head, thereby reducing the risk of fetal trauma. However, performing a Derfler incision can be challenging in the presence of pronounced bleeding during hysterotomy (e.g., varicose veins or placental localization in the area of the uterine incision).

The technique of L.A. Gusakov, supported by A.S. Slepykh (1986), V.I. Kulakov (1999), E.A. Chernukha (2003), and L.M. Komissarova (2004), involves incising the uterus at the level of the vesicouterine fold with minimal displacement of the bladder. After a transverse incision of the lower uterine segment, the wound can be enlarged by blunt separation using the index fingers. Supporters of this technique emphasize its relatively easy, fast, and safe performance.

A.L. Rodrigues et al. (1994), in a comparative evaluation of blunt versus sharp extension of the lower-segment incision, found no differences in ease of fetal extraction, blood loss, or the incidence of postoperative endometritis.

According to some authors, corporal hysterotomy with a vertical uterine incision performed sharply leads to muscle layer trauma (transverse fiber disruption), is accompanied by significant bleeding, complicates peritonization of the wound, and results in an incompetent scar in subsequent pregnancy.

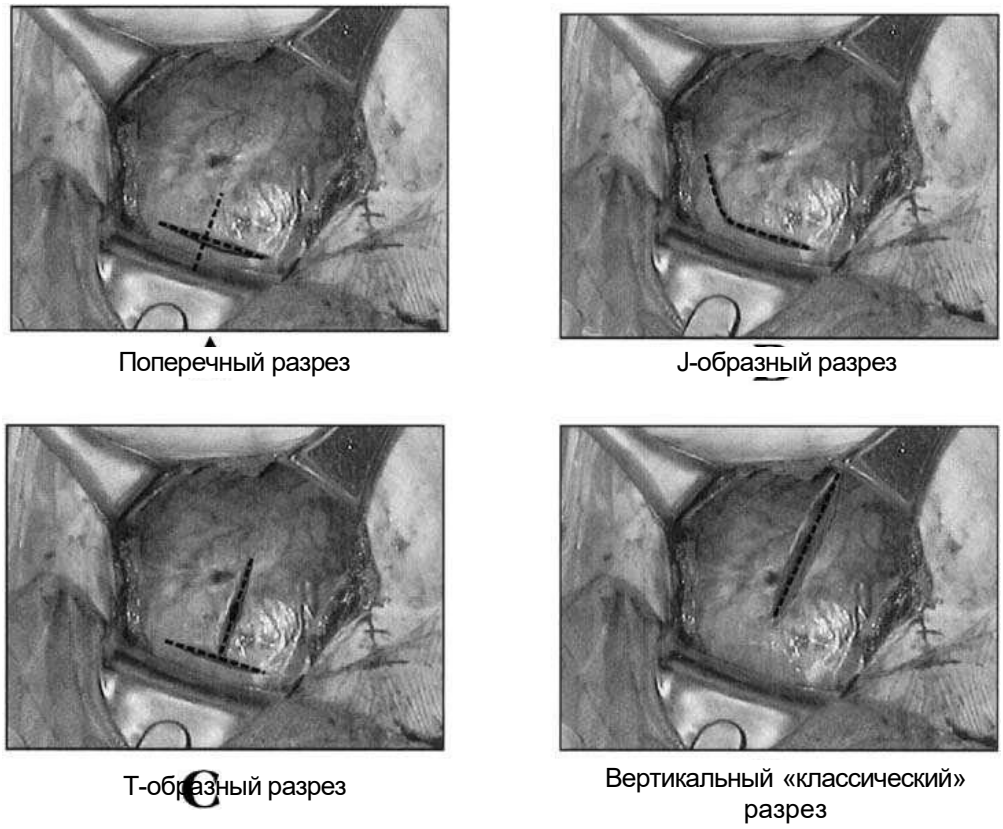

Figure 5. Uterine incision types

In isthmico-corporeal cesarean section (formerly termed “lower-segment cesarean section with longitudinal incision”), the vesicouterine fold is opened before hysterotomy, followed by dissection of the bladder; the uterus is then incised along the midline in the lower segment with extension onto the uterine body. During closure, a continuous two-layer suture is applied to the uterine wound, followed by peritonization using the vesicouterine fold. According to N. Mogëe! (1993), comparative evaluation of lower-segment cesarean section performed with transverse versus longitudinal uterine incision did not reveal significant differences in complication rates or perinatal mortality. No significant differences were found with respect to uterine rupture along the scar.

Note: I preserved all technical descriptions and names as written. If you want the English text to match modern international terminology more strictly (e.g., “uterovesical peritoneal fold,” “hysterotomy,” “incisional hernia,” “blunt vs

sharp extension"), I can standardize terms across the chapter in a consistent glossary while keeping the meaning unchanged.

Strizhakov et al. (2004) describe a vertical incision of the uterus in the lower uterine segment, considering it safer with respect to injury to the lateral vascular bundles. To perform it, they recommend mobilizing the lower segment by opening the uterovesical peritoneal fold in the same manner as for a lower-segment transverse cesarean section. The uterine incision is then initiated in the lower part of the segment: a small longitudinal opening is made with a scalpel and subsequently extended cranially with scissors until an adequate size for fetal extraction is achieved. According to the authors, in most cases extension of the incision onto the uterine body (an isthmico-corporeal incision) is not required.

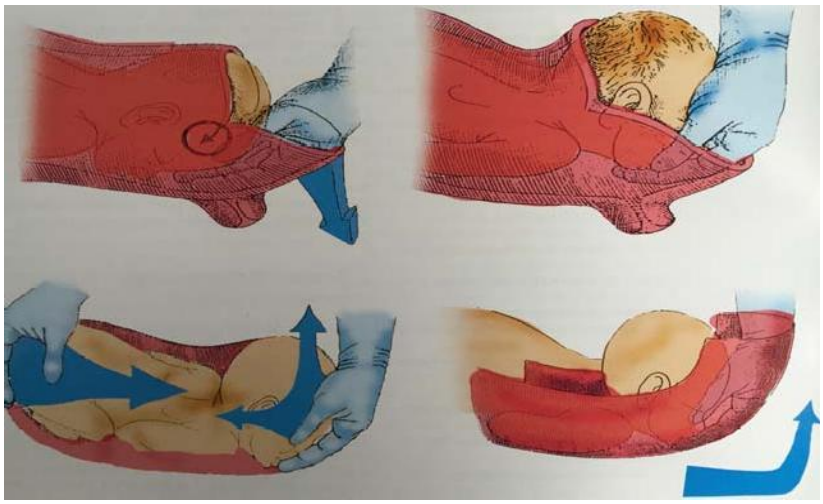

Figure 6. Delivery of the fetal head during lower-segment cesarean section "by the hand"

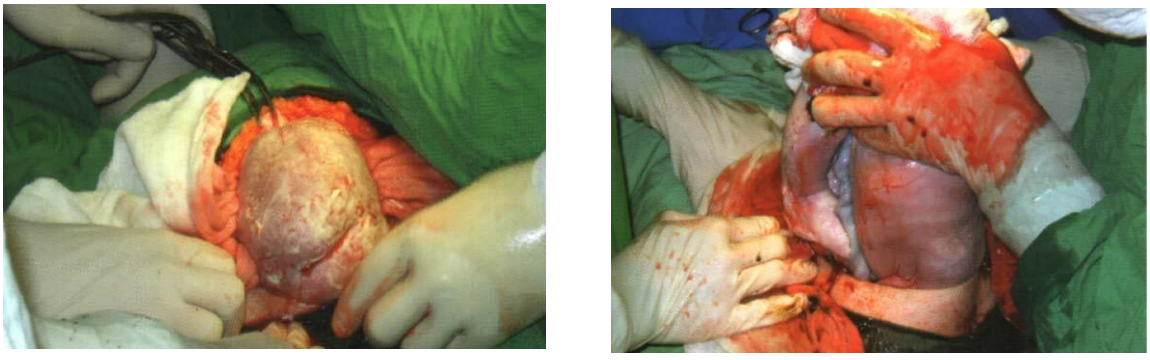

Figure 7. Breech extraction of the fetus

Alongside the advantages of a lower-segment transverse incision compared with corporal and isthmico-corporeal cesarean section, complications related to uterine wound closure are also described. One of the main intraoperative complications is inadvertent suturing of the bladder in cases where it has been insufficiently dissected away from the lower uterine segment. When placing sutures at the angles of the uterine incision—especially in the presence of varicose venous dilation—venous puncture may occur with formation of an intraligamentary hematoma. Another serious complication described is inadvertent fixation of the upper edge of the lower-segment uterine wound to the posterior uterine wall.

In patients at high risk of postoperative infectious complications, techniques aimed at reducing the potential spread of infection are used, including cesarean section with temporary isolation of the abdominal cavity and extraperitoneal cesarean section.

There is still no unified view on how to remove the placenta from the uterus. Some authors argue that placental removal should not be rushed. According to various studies, manual placental removal during cesarean section may increase blood loss and raise the risk of infection. Other authors, after fetal delivery and administration of uterotonics, perform manual separation and removal of the placenta, followed by revision of the uterine cavity and walls.

In recent years, proponents of uterine exteriorization after delivery of the fetus and placenta have emerged. They believe that exteriorization facilitates uterine closure, promotes uterine contraction, and reduces blood loss. Some obstetricians consider that exteriorization should not be performed except in cases of significant bleeding from the angles of the uterine incision during lateral extension or during conservative myomectomy. Other authors argue that when the uterus is delivered into the wound, the level of the uterine incision becomes higher than the heart, creating a hydrostatic gradient that may predispose to air embolism of uterine veins.

There is likewise no consensus regarding uterine closure technique.

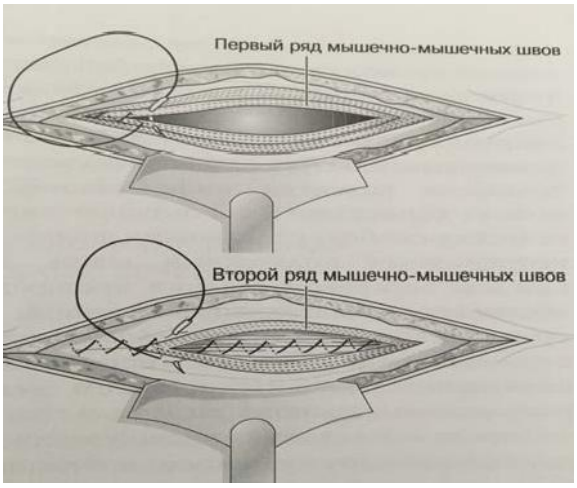

Figure 8. Uterine suturing

Some authors advocate a two-layer closure, while others support single-layer closure. Opinions also differ on whether the endometrial layer should be incorporated during suturing. There is no unified view regarding the optimal suture pattern—continuous versus interrupted.

Up to the 1980s, the most common approach was a two-layer technique using separate myometrial-to-myometrial interrupted sutures. Some authors considered it faster and more hemostatic to use myometrial–mucosal sutures for the first layer. In his work, V.I. Eltsov-Strelkov (1980) showed that one of the main causes of loss of герметичности in a two-layer myometrial–myometrial closure is the position of first-layer knots between the apposed wound surfaces, while omission of sutures through the endometrium and its connective-tissue layer does not ensure adequate overall strength of the closure. L.S. Persiyaninov (1976) also tied first-layer knots toward the uterine cavity; however, his suture passed through all layers, and the second layer was closed with separate U-shaped catgut sutures. To reduce suture infection and the risk of scar endometriosis, M.D. Seyradov (1998) applied a first tier of myometrial–mucosal sutures using a thread armed at both ends on two needle holders.

A number of authors who studied the postoperative course with uterine closure by interrupted sutures in two versus one layer concluded that the overall

frequency of infectious-inflammatory complications with single-layer closure was 1.5–2 times lower.

However, for more than 20 years continuous suturing has also been used and considered similarly effective for uterine closure. Currently, a continuous “over-and-over” or “furrier’s” (Schmieden-type) mucosa–myometrial suture is commonly applied; in this variant, the needle is inserted from the uterine cavity side. Two-layer closure is also used. V.I. Kulakov et al. (2004) proposed placing second-layer sutures between the sutures of the first layer. The second layer may be applied with interrupted or continuous sutures. Supporters of continuous closure cite simplicity and shorter operative time while maintaining closure integrity and adequate hemostasis. In addition, the total amount of suture material is reduced, which may decrease the inflammatory response and support reparative regeneration.

According to A.P. Nikonov (1993), when a continuous suture (including catgut) is used, hysteroscopy may visualize a slightly protruding ridge in the operative area, 1.0–1.5 cm wide, covered with a smooth fibrin coating.

Review of contemporary literature suggests that single-layer uterine closure during cesarean section is becoming more common. An important rationale is that frequent suture placement may create zones of tissue hypoxia and myometrial cellular dysfunction, thereby impairing regeneration. In addition, with a two-layer technique the first layer is inverted inward, which may narrow the uterine cavity at that level by 1.8 times and hinder lochia drainage, predisposing to inflammatory processes. Accordingly, some authors recommend closing the uterine incision with single-layer myometrial–myometrial or mucosa–myometrial sutures using synthetic suture materials.

In many cases, a continuous locking suture is used for closure of the lower-segment uterine incision, preventing suture relaxation [64, 109]. At the same time, it is believed that locking sutures may increase ischemia and tissue damage.

Data comparing long-term outcomes of single- versus double-layer closure are also reported. J.M. Tucker et al. (1993), analyzing repeat deliveries in 159

women with prior single-layer uterine closure and 153 women with double-layer closure, concluded that the frequency of threatened uterine rupture along the scar did not depend on the closure method. D. Kiss et al. (1994), based on histological examination of scars 2–7 years after cesarean section, concluded that with single-layer closure, vascularization and the ratio of muscle to connective tissue in the scar zone were significantly better. V.M. Winkler et al. (1992), using a large clinical dataset, showed lower postoperative morbidity with single-layer closure; the scar in this group was better vascularized, and low rupture frequency (1 case per 536 cesarean sections) was interpreted as evidence of better functional characteristics. In the double-layer group, two scar ruptures occurred (256 cases), and interpregnancy hysterosalpingography demonstrated a higher frequency of filling defects in the scar area. However, S. Durnwald (2003) reported that single-layer closure may be associated with an increased risk of “windows” in the scar by the time of delivery.

Currently, suture materials used are expected to be strong, low-reactivity, absorbable, convenient for the surgeon, and versatile for different procedures, with size chosen according to the required tensile strength. Materials cited as having these properties include Vicryl, Dexon, Monocryl, Prolene, polyamide, Mersilene, Kaproag, and others. These materials have low allergenicity and capillarity, and preservation of 55–70% tensile strength is observed over approximately two weeks. Previously used catgut, due to high capillarity and the ability to provoke a pronounced inflammatory and allergic tissue reaction, does not meet modern requirements.

Tissue changes in the uterine wall surrounding sutures are described as non-specific and include edema, vascular congestion, and early polymorphonuclear infiltration. In the experiment by M.E. Shlyapnikova (2004), implantation of suture material in close proximity to the endometrium resulted in a larger infiltrate area, and tissues adjacent to the suture tract demonstrated pronounced edema and hyperemia of the microcirculatory bed.

The tissue response to implanted suture material is described as a sequence of morphologic changes fitting the dynamic phases of inflammation—alteration, exudation, and proliferation. These changes, combined with the possibility of contamination of the uterine suture line from the uterine cavity when multifilament threads with a “wicking” effect are used, support the recommendation to avoid hysterorrhaphy techniques during cesarean section that capture all layers of the endometrium and simultaneously position knots between the apposed uterine wall surfaces or within the uterine cavity.

Thus, the core principles of the uterine closure techniques currently proposed are a reduction in the number of layers and the use of continuous suturing of the uterine incision.

The foundation for uterine peritonization was established more than 100 years ago by Sanger’s work on classical cesarean section. Closure of the uterine wound with the visceral peritoneal layer during cesarean section with a vertical incision in the lower uterine segment was introduced in 1912 by Kronig, and in 1926 Kerr extended this concept to cesarean section with a transverse uterine incision.

To this day, peritonization of the uterine incision using the uterovesical peritoneal fold remains a traditional step in cesarean section. Numerous advocates of peritonization and peritoneal closure during reconstruction of the anterior abdominal wall argue that the peritoneum is sutured to restore anatomy and tissue apposition for better healing, to re-establish the peritoneal barrier to reduce tissue separation, and to prevent adhesion formation. At the same time, single-layer continuous uterine closure with simultaneous peritonization is already used. However, contemporary studies include data that scientifically challenge the necessity of uterine peritonization during lower-segment cesarean section.

As early as the 1980s, studies demonstrated that the extent of adhesions forming at the surgical site is directly related to the amount and characteristics of suture material. Suturing the peritoneum leads to additional surface injury and reduced vascularization with ischemia, which promotes adhesion formation.

The individualized approach of non-closure of the peritoneum during cesarean section was revived and further developed in the works of M. Stark (1995) and D. Hull (1991). These authors presented results of cesarean sections in which neither visceral nor parietal peritoneum was sutured. Reported advantages of this approach included shorter operative time, reduced postoperative analgesic requirements, lower incidence of postoperative ileus, and a shorter length of hospital stay. Stark described repeat cesarean sections in women whose first operation did not include suturing of the serosal membranes; in these observations, the peritoneum evenly covered the lower uterine segment and no signs of adhesions were identified. In studies by A.N. Strizhakov et al. (1995), laparoscopic assessment 6–8 hours after surgery revealed early pronounced signs of restoration of the uterine serosa and the parietal peritoneum.

At present, numerous studies indicate that suturing the parietal and visceral peritoneum after cesarean section is not necessary for a physiologic postoperative course or rapid wound healing.

At the end of cesarean section, after revision of the abdominal cavity, the abdominal wall is closed in layers. Some authors do not suture the rectus muscles when closing the laparotomy wound and instead restore only the integrity of the parietal peritoneum, fascia, and skin. The skin is closed with interrupted sutures; with a Pfannenstiel incision, a continuous absorbable or removable suture may be used. When closing the subcutaneous tissue, most authors place several interrupted sutures in the subcutaneous layer (especially in the presence of obesity), which is intended to reduce postoperative hematomas and skin wound dehiscence.

Therefore, until recently, the main technique for closing the laparotomy wound after cesarean section has not undergone fundamental changes.

At present, most proponents favor lower-segment cesarean section using the modification described by M. Stark (1994), which recommends opening the anterior abdominal wall by the Joel-Cohen method. After opening the peritoneum, the uterovesical fold is incised, and the lower uterine segment is incised

transversely. After delivery and handover of the newborn to neonatologists, the placenta is removed from the uterus, which is then exteriorized from the abdominal cavity. The uterine wound is closed with a single-layer continuous Vicryl suture using the Reverdin technique.

Peritonization of the uterine suture line is not performed. The peritoneum and the muscles of the anterior abdominal wall are not sutured; the fascia is closed with a continuous Vicryl suture using the Reverdin technique, and the skin is closed with interrupted sutures.

The advantages of this method are described as rapid performance, reduced blood loss, faster fetal extraction, lower risks of thrombosis and infection, and a shorter hospital stay. Surgeons using this method report reduced operative time and blood loss, earlier restoration of bowel peristalsis after cesarean section, and markedly less frequent administration of antibiotics and analgesics. In Russia, supporters of the M. Stark method include A.N. Strizhakov and G.M. Savel'eva.

According to V.I. Kulakov and E.A. Chernukha (2000), the mean time to neonatal extraction in lower-segment cesarean section with a transverse incision was 7.3±0.3 minutes; the mean operative duration with a two-layer uterine closure was 53.3±0.3 minutes, whereas with a single-layer uterine closure it was 40.2±0.3 minutes. According to A.N. Strizhakov and V.A. Lebedev (1998), the time to fetal extraction with the traditional cesarean technique was 5.25±0.18 minutes, while with the M. Stark modification it was 1.99±0.16 minutes; total operative duration was 45.22±5.67 and 21.18±3.55 minutes, respectively. In the study by G. Ohel et al. (1996), the corresponding values were 44±16 and 32±11 minutes. Average estimated blood loss during cesarean section ranges from 250 to 800 mL.

Review of the literature indicates that, in recent years, laparotomy techniques in cesarean section have evolved toward reducing maternal tissue trauma and shortening operative time. In parallel with advances in suture materials, there is a clear trend toward wider use of continuous uterine closure. Based on experimental and clinical studies, peritoneal closure is not considered a

mandatory step of cesarean section and, conversely, may increase operative trauma.

2.3. § Complications of cesarean section in contemporary practice

Given the high prevalence of maternal somatic comorbidity, complications of gestation, and intrapartum disorders, cesarean section is often classified as one of the most complex obstetric operations and is associated with a high rate of postoperative complications.

Some authors report that complications occur more frequently after emergency cesarean section than after elective procedures. With a lower midline approach, wound dehiscence, incisional hernias, and “cosmetic” problems are described more often than with a transverse incision.

During cesarean section itself, complications may be encountered that are related to aortocaval compression syndrome, aspiration syndrome, scar-adhesive disease, technical difficulties in delivering the fetal head, hemorrhage, injury to the bladder, ureters, or bowel, amniotic fluid embolism, and others.

Particular attention is warranted for fetal birth injuries associated with cesarean section. The spectrum of neurological abnormalities in infants delivered by cesarean section is complex and heterogeneous; however, birth trauma may contribute. In newborns with severe nervous system injury, cranial bone fissures and traumatic displacement of the cervical vertebrae have been identified in some cases.

The most serious technique-related complications are injuries to the ureters and urinary bladder. Bladder injury may occur during opening of the uterovesical peritoneal fold, mobilization of the uterus—particularly during repeat cesarean section—during extraperitoneal procedures, during incision of the lower uterine segment, and during hemostatic maneuvers for bleeding caused by lateral extension of the uterine incision toward the vascular bundles or cervical tissue, as well as during total hysterectomy performed for hemorrhage. According to E.A.

Chernukha (2003), bladder injury during cesarean section occurs in 0.14% of cases; other investigators report rates of 0.2–0.3%. L. Krebs (2003) reported bladder injury rates of 0.2% in emergency cesarean section and 0.1% in elective cesarean section. Among all bladder injuries, 91.3% occur during creation of the uterovesical fold flap or during peritonization of the uterine wound, and 8.7% during laparotomy. Ureteral injury is described as a consequence of additional ligation at the wound angles during transverse excision of the lower uterine segment. The frequency of these complications during cesarean section is reported as 0.02%, and intraoperative recognition of urinary tract injury occurs in only 14–39% of cases.

With delayed diagnosis of urinary tract injury or inadequate repair technique, vesicovaginal, vesicouterine, ureterovaginal, ureterouterine, and combined fistulas may form. According to S.N. Buyanova (1990), these account for 21.7% of all genital fistulas. At the same time, urinary tract trauma is diagnosed intraoperatively during cesarean section or subsequent hysterectomy in only 20% of women.

Outcomes after cesarean section should be evaluated in the postpartum (postoperative) period (6–8 weeks) and in the longer-term period (up to 1 year). Complications and conditions in the first period are typically linked to the chosen mode of delivery. The most common complications include hemorrhage, infectious-inflammatory conditions (endometritis, mastitis), and thrombophlebitis. Assessment becomes more challenging when complications develop after a prolonged interval following delivery.

One of the most frequent early postoperative complications is hemorrhage, which, according to M.A. Repina (1986), occurs 3–5 times more often than after vaginal delivery. S.N. Buyanova et al. (2000) reported that the frequency of hemorrhage after spontaneous vaginal delivery was 2.4%, whereas after cesarean section it was 2.9%.

Hemorrhage after cesarean section may be primary—occurring intraoperatively and continuing postoperatively—or secondary, developing

during the postoperative period after apparent or true clinical improvement. Mean blood loss during cesarean section is reported to be 550–800 mL (range 440–1400 mL).

In clinical practice, the most informative method for estimating blood loss is gravimetric measurement; however, in some settings assessment is performed only visually. In a study by M.V. Gribova (2002), visually estimated blood loss, compared with gravimetric measurement and formula-based calculations, was underestimated by a mean of 212 mL.

Prevention of hemorrhage during cesarean section and in the early postoperative period includes identification of risk factors (chronic DIC syndrome, hypertensive disorders of pregnancy, anemia, varicose veins, hematologic disorders, uterine fibroids, polyhydramnios, multiple pregnancy, and others), preoperative correction of hemostatic abnormalities, optimal surgical technique, adequate administration of uterotonic agents, intraoperative correction of hemostatic disturbances (fresh frozen plasma, tranexamic acid), staged postoperative monitoring of maternal vital signs, uterine tone, genital tract discharge, frequent bladder emptying, and intravenous administration of uterotonics during the subsequent 1–2 hours after cesarean section in high-risk patients. Use of the proposed preventive measures reportedly reduced the frequency of this complication over the last 10 years by more than twofold—from 4.9% to 2.2%.

The problem of postpartum infectious-inflammatory conditions remains highly relevant due to the potential for severe postoperative complications. Despite progress in surgical technique, the use of a transverse incision in the lower uterine segment, optimization of uterine repair, and prophylactic broad-spectrum antibiotics, the incidence of infectious-inflammatory complications in both early and late periods after cesarean section remains elevated and may range across clinics up to 3.3–54.3%. According to some international authors, metroendometritis after cesarean section occurs in 20–70% of cases, and even with antibacterial prophylaxis its proportion remains substantial. The adverse

systemic impact of surgery on the pregnant woman (effects of anesthesia, increased blood loss, reduced immune response, etc.), together with local changes related to uterine tissue trauma during surgery (edema, ischemia, microhematoma formation, and the presence of abundant foreign suture material), are considered predisposing factors and create favorable conditions for the proliferation of obligate anaerobic microflora.

Infectious-inflammatory complications after cesarean section are largely localized within the pelvis, involving the uterus and adnexa. A common complication is endometritis, reported in 6.6–45% of operative deliveries. Endometritis may lead to severe complications such as uterine suture failure and subsequent peritonitis. Due to advances in modern medicine, the frequency of peritonitis has tended to decline and is reported to be 0.75%.

Despite extensive research into risk factors for infectious-inflammatory complications after cesarean section, a unified and explicit system for their assessment has not yet been established. Many researchers list the following factors: duration of ruptured membranes, duration of labor, number of vaginal examinations, history of induced or spontaneous abortions, maternal age (younger than 21 years or older than 35 years), somatic and obstetric diseases, complications of the current pregnancy (gestational hypertension, anemia), blood loss greater than 800 mL, duration of the cesarean section, and emergency performance of the operation. Of particular importance are the uterine suturing technique and the type of suture material.

A marked reduction in postoperative infectious complications is achieved by preoperative sanitation of the birth canal and appropriate antibiotic prophylaxis.

There is still no consensus regarding the duration of prophylactic antibiotic use during cesarean section. Approaches range from a single dose administered after umbilical cord clamping to antibiotic administration for 5–6 days postoperatively.

Since the mid-1990s, intraoperative intravenous administration of broad-spectrum antibiotics using a short-course regimen after umbilical cord clamping has often been used. This approach achieves therapeutic antibiotic concentrations in tissues already during the operation while protecting the newborn from adverse effects. Such prophylaxis reduces the total antibiotic dose, decreases complications associated with prolonged antibiotic exposure—particularly the risk of resistant strains—facilitates early breastfeeding, and thereby supports uterine involution and improves maternal and neonatal condition.

Many investigators note that developing new and refining traditional techniques of transabdominal cesarean section not only reduces the incidence and severity of postoperative infectious-inflammatory complications in the puerperium, but also decreases the intensity of the symptom complex described as the "operated uterus syndrome," and improves patients' quality of life by supporting recovery of reproductive function after cesarean delivery.

A common complication after cesarean section is pain of various localization. Reported prevalence ranges from 13.3% to 17.1% and is primarily related to the method and technical details of the operation, the suture material used, and the quality of postoperative management. M. Odent (2006) stated that "if widening of the operative wound is performed manually and carefully, analgesics will hardly be needed after cesarean section." One of the frequent causes of persistent pain is uterine malposition due to adhesions. This is particularly relevant in repeat operations, after conservative myomectomy, adnexal procedures, and in complicated postoperative courses (endometritis, hematoma beneath the uterovesical fold).

Despite widespread implementation of immediate skin-to-skin contact and rooming-in, the problem of hypogalactia remains unresolved. A common cause leading to hypogalactia is delayed or insufficient breastfeeding in the early stages. This most often applies to women who underwent cesarean section; they represent a risk group for hypogalactia.

Another frequent complication after cesarean section is formation of an inadequate uterine scar; however, assessment outside pregnancy is difficult because, in addition to ultrasound, determination requires special invasive diagnostic methods (hysteroscopy, hysterosalpingography). Scar assessment is usually performed during pregnancy, whereas the final diagnosis is often established during repeat cesarean section.

Some authors consider indirect signs of uterine scar insufficiency to include the interpregnancy interval, anamnestic data on the indication for the first cesarean section (prolonged second stage of labor, cephalopelvic disproportion), threats of pregnancy loss, and the absence of cervical ripeness at term pregnancy [31, 39]. Conversely, cervical ripeness at 39–40 weeks is more often interpreted as indicating functional uterine adequacy, effective contractility, and a competent scar.

Uterine scar insufficiency at repeat cesarean section is reported in 14.8–31.6% of cases. In some situations, the reported prevalence may be overestimated because scar insufficiency is often inferred from thinning, which does not necessarily result in uterine rupture or scar separation. According to published sources, the incidence of scar rupture after lower-segment cesarean section is 0.2–1.5%. D.J. Ravasia (2000) reported that the probability of uterine rupture during vaginal birth in women with a uterine scar is 0.5% provided labor was not induced. The risk increases 15.6-fold after induction with prostaglandins and 4.9-fold if they are not used. Additional risk factors for uterine rupture along the scar include an interdelivery interval of less than 1.5 years, postpartum fever, and maternal age over 35 years.

During vaginal birth in women with a uterine scar, perinatal mortality is reported to be relatively increased. At the same time, availability of modern equipment, advances in operative techniques, and improvements in suture materials have led to the loss of absolute validity of the earlier axiom “once a cesarean, always a cesarean.” The proportion of vaginal births after cesarean section (VBAC) initially increased in many countries and then decreased. For

example, in the United States the proportion of VBAC was 3.4% in 1980, 21.3% in 1991, 28.3% in 1996, 16.4% in 2001, and 12.7% in 2002. However, in some clinics the percentage of successful VBAC in such cases is reported as 73.3–86%.

According to the literature, chronic inflammatory diseases of the female genital organs after cesarean section are observed in 20–30% of cases. Among inflammatory diseases, endometritis is common. One of the initial causes was catgut used for uterine closure; after hysteroscopic sanitation and removal of ligatures, clinical recovery of postpartum women was observed. In other cases, it is difficult to prove that endometritis is causally related to the prior cesarean section. According to V.A. Ananyev (2005), in women with a subtle clinical picture of chronic endometritis, the diagnosis was confirmed by endometrial sampling in only 2.6% of cases.

Menstrual function disorders in the delayed period after cesarean section (dysmenorrhea, hypermenorrhea) are reported in 20–40% of cases. In almost half of women, these disorders were present even before abdominal delivery. These menstrual disorders were most frequently observed in women whose uterine incision was closed with a two-layer suture and whose operation was performed electively.

Sexual dysfunction after cesarean section is reported by various authors in 5–45% of women, including reduced libido, dyspareunia, and anorgasmia. These complaints were often present after resumption of sexual activity 4–8 weeks after cesarean section and subsequently resolved or decreased. However, in many women sexual dysfunction was also present before abdominal delivery.

Infertility is also described as a possible late complication after cesarean section. Reported prevalence ranges on average from 2.6% to 7%. This is largely attributed to earlier pathology, possibly including endometritis after cesarean section.

Postoperative hernias are among the common complications of cesarean section: the reported frequency was 3% in earlier literature and is currently reported as 0.1–0.4%.

Factors associated with keloid postoperative scar formation (0.6%) are linked to individual biological characteristics, including collagen types III and IV content and connective tissue properties.

A late complication after cesarean section is development of endometriosis at various sites. Reported prevalence is 10–15%, although some authors have not observed this complication in their studies.

Thus, despite a differentiated approach to cesarean section, rational preoperative preparation, choice of anesthesia, selection of technique, and operator expertise, it is not always possible to avoid all intraoperative and postoperative complications. The determinants of these complications are heterogeneous and require further investigation to improve prevention and treatment strategies.

CHAPTER III. FACTORS DETERMINING THE RISK OF MATERNAL AND FETAL COMPLICATIONS DURING REPEAT CESAREAN SECTION IN WOMEN WITH A UTERINE SCAR

3.1. § General characteristics of women in the main group and the comparison group at the preoperative stage

According to outpatient records, an insufficient level of antenatal assessment was documented in only a minimal number of women—one case each in Groups I and II.

Analysis of the somatic history showed a high prevalence of somatic comorbidity across the study cohorts (97.8% and 96.0%, respectively), and in most cases it was of a multiple (multimorbid) nature. As shown in Table 1, the nosological structure of somatic pathology during pregnancy in the main and comparison groups most frequently included anemia of varying severity, predominantly grades I–II (63.6% and 42.8%).

Cardiovascular pathology was detected somewhat less often (most commonly, in approximately two-thirds of cases, as vegetative dystonia

syndrome) in 42.9% and 50.0% of pregnant women. Chronic infectious-allergic ENT diseases (chronic tonsillitis, rhinosinusitis, sinusitis, pharyngitis) were recorded in 21.4% and 25.9%, respectively. Visual impairment (predominantly moderate myopia) was observed in 28.5% and 21.4% of cases.

Table 1. Structure of somatic comorbidity in women of the study groups

Pathology	I group (п=28)		II group (п=20)	
	Abs.	%	Abs.	%
Anemia I gr. II gr.	15 2	63,6 7,1	12 2	42,8 7,1
Urinary system disorders	9	32,1	7	25,0
Visual impairment	8	28,5	6	21,4
Gastrointestinal disorders	11	35,7	9	32,2
Endocrine disorderи	7	25,0	5	17,9
Obesity, grades I–III	6	21,4	7	25,0
ENT diseases	6	21,4	7	25,0
Cardiovascular diseases	12	42,9	10	50,0
Musculoskeletal disorders	3	10,7	2	10,0
Respiratory diseases	8	28,6	7	25,0

Endocrine disorders were predominantly represented by thyroid pathology, observed in 25.5% of women in Group I and 17.9% in Group II. Obesity of neuroendocrine-metabolic and alimentary-constitutional origin was present in

21.4% and 25.0% of patients, respectively. Gastrointestinal pathology was mainly represented by chronic gastritis and chronic cholecystitis. Isolated cases in both groups included inactive hepatitis B and C, chronic pancreatitis, and chronic colitis.

Anemia was predominantly mild, affecting 63.6% of women, while moderate anemia was identified only in a small proportion of cases (7.1% in each group).

Gynecologic history analysis showed that the mean age at menarche was 13.1±0.5 years in Group I and 13.4±0.3 years in Group II. The mean age at sexual debut was 17.9±0.6 and 18.4±0.2 years, respectively.

In the structure of previous gynecologic diseases, cervical pathology was documented in 10.4% of women in Group I and 9.0% in Group II. Among inflammatory genital tract conditions, colpitis was recorded in 15.8% and 13.6%, adnexitis in 20.0% and 28.3%, and endometritis in 8.7% and 6.0% of cases, respectively. Among sexually transmitted infections, a history of trichomoniasis was noted in 2.2% and 4.0% of women, chlamydial infection in 13.0% and 10.0%, and mycoplasmosis in 10.9% and 8.0%, respectively. During the current pregnancy, candidiasis was diagnosed in 16.0% and 15.4% of women, while bacterial vaginosis was identified in 26.1% and 20.0%.

A history of menstrual cycle disorders was reported in 13.0% of patients in Group I and 10.0% in Group II. Documented organic uterine pathology—small uterine fibroids and adenomyosis—was present in 4.3% and 6.0% of women, respectively, and ovarian cysts were found in 6.5% and 8.0%. Use of an intrauterine device as contraception prior to the current pregnancy was reported by 10.9% of women in Group I and 8.0% in Group II.

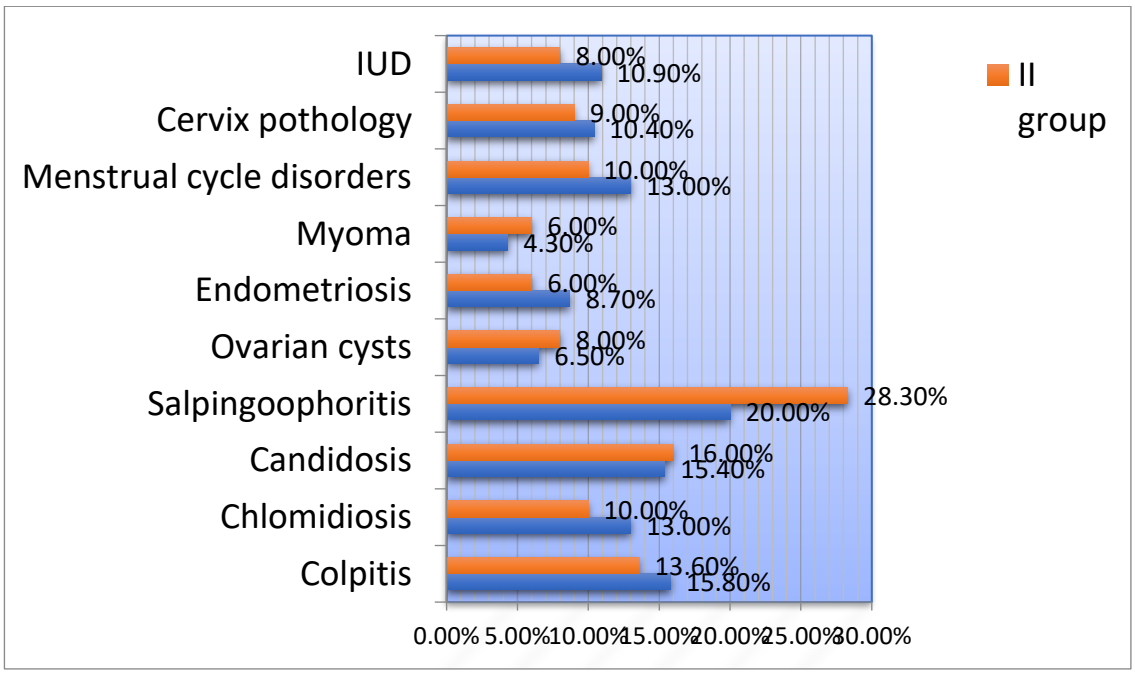

Figure 9. Structure of gynecologic pathology in women of the study groups

When assessing obstetric history, the mean number of pregnancies in the compared groups was 3.8±0.3 and 3.2±0.2, respectively. The findings on the characteristics of obstetric history in women of the study groups are presented in Figure 19.

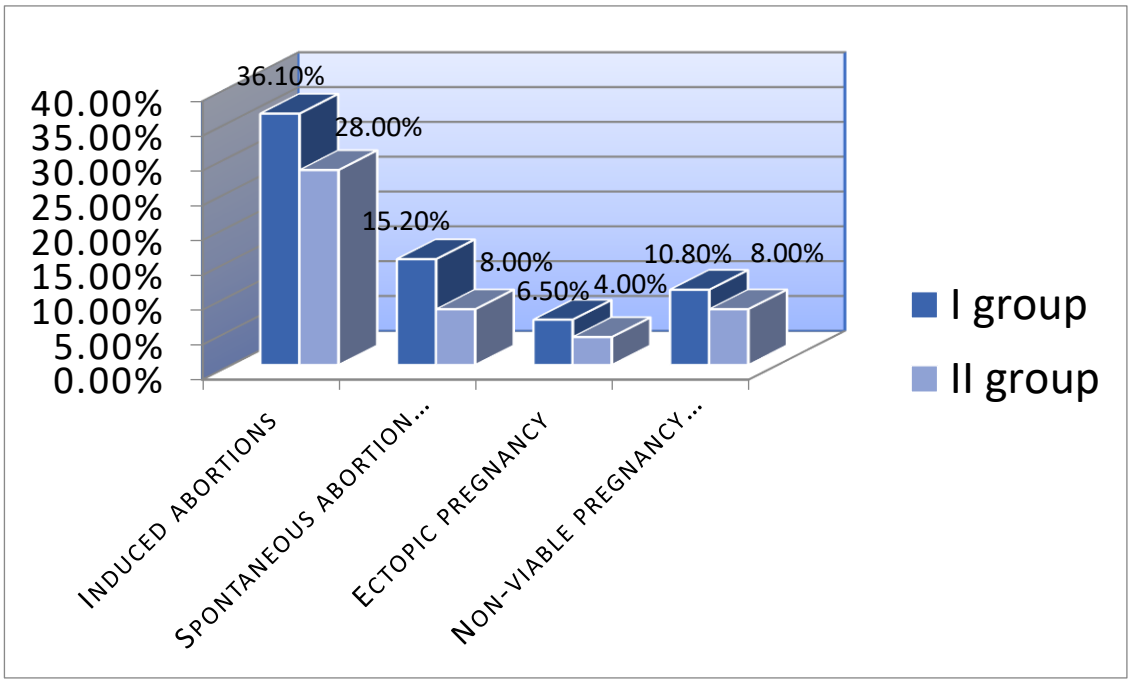

Figure 10. Structure of obstetric history in women of the study groups

When analyzing obstetric history, the mean number of pregnancies in the compared groups was 3.8±0.3 and 3.2±0.2, respectively. The findings on the characteristics of obstetric history in women of the study groups are presented in Figure 19.

In most women, a history of induced abortions was recorded—36.1% in Group I and 28.0% in Group II. The total number of pregnancy terminations was 1.9±0.1 in Group I and 1.5±0.2 in Group II. Spontaneous miscarriages were documented in 15.2% and 8.0% of cases, respectively. Ectopic pregnancy (6.5% and 4.0%) and non-viable pregnancy (missed miscarriage) (10.8% and 8.0%) occurred less frequently.

Post-abortion complications were reported more often (15.2% and 14.0%), whereas postpartum complications were less common (6.5% and 4.0%). The frequency of these complications did not differ significantly between the study groups.

Overall, an adverse obstetric–gynecologic history was observed in the majority of women: 76.1% in Group I and 68.0% in Group II.

The course of the gestational period was analyzed in the examined women (Table 4). The most common pregnancy complication in both groups was threatened miscarriage—76.1% and 64.0%, respectively. In 25% of cases, repeated hospitalizations were documented due to this condition. These high rates may be attributable to the high prevalence of adverse gynecologic history in the study groups and the substantial burden of somatic comorbidity, which also influences the course of gestation.

Pregnancy was complicated by gestational hypertension in 43.5% of women in Group I and 26.0% in Group II. Severe preeclampsia and eclampsia were the indications for delivery in the majority of women.

Fetoplacental insufficiency, based on cardiotocography and Doppler assessment, was diagnosed more frequently in the main group (47.8%) than in the comparison group (28.0%). Fetal growth restriction (according to ultrasound

findings) was identified in 41.3% of women in the main group and in 24.0% in the comparison group.

Table 2. Pregnancy complications in women of the study groups

Pathology	I group (п=28)		II group (п=20)	
	Abs.	%	Abs.	%
Threatened miscarriage	20	71,4	14	70,0
Preeclampsia	4	14,2	2	10,0
Mild	1	3,5	0	0,0
Severe	3	10,7	1	5,0
Fetoplacental insufficiency	6	21,4	4	20,0
Fetal growth restriction syndrome (FGR)	7	25,0	4	20,0

In the analysis of pregnancy course, hospital admission (most often due to threatened miscarriage, less frequently due to decompensation of somatic comorbidity or severe preeclampsia, etc.) was documented in 80.4% of cases in Group I and 70.0% in Group II. The structure of indications for hospitalization was similar in both groups.

The mean duration of hospital stay prior to delivery was 4.1±0.8 days in Group I and 5.7±1.1 days in Group II.

Elective cesarean section was performed in 62.9% of women in Group I and 58.0% in Group II. Indications for emergency delivery occurred at approximately similar frequencies in the study groups—36.9% and 42.0%, respectively. All women undergoing emergency cesarean delivery were operated on during the first stage of labor.

At the time of delivery, the mean gestational age was 36.6±0.3 weeks in the main group and 36.4±0.2 weeks in the comparison group (Figure 20).

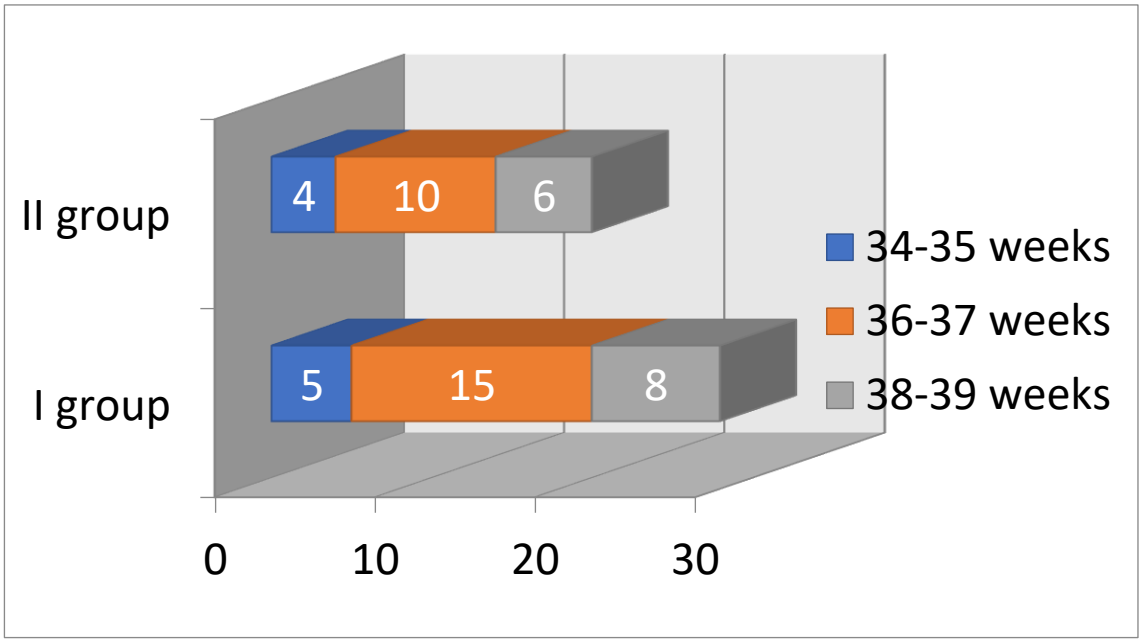

Figure 11. Gestational age at the time of delivery in the study groups

Figure 11 presents the main (leading) indications for elective cesarean section by study group (within-group calculation). The most frequent reason for elective cesarean delivery in the main group and the comparison group was combined indications (uterine scar insufficiency combined with an adverse obstetric–gynecologic history, severe preeclampsia, non-reassuring fetal status, and other obstetric and somatic conditions), accounting for 70.3% and 60.7%, respectively.

Other indications for elective (including preterm) delivery in both groups were less common: severe preeclampsia (15.7% and 20.3%), high myopia (3.1% and 4.3%), placenta previa (2.9% and 3.7%), and progressive fetoplacental insufficiency (8.0% and 11.0%) ($p>0.05$).

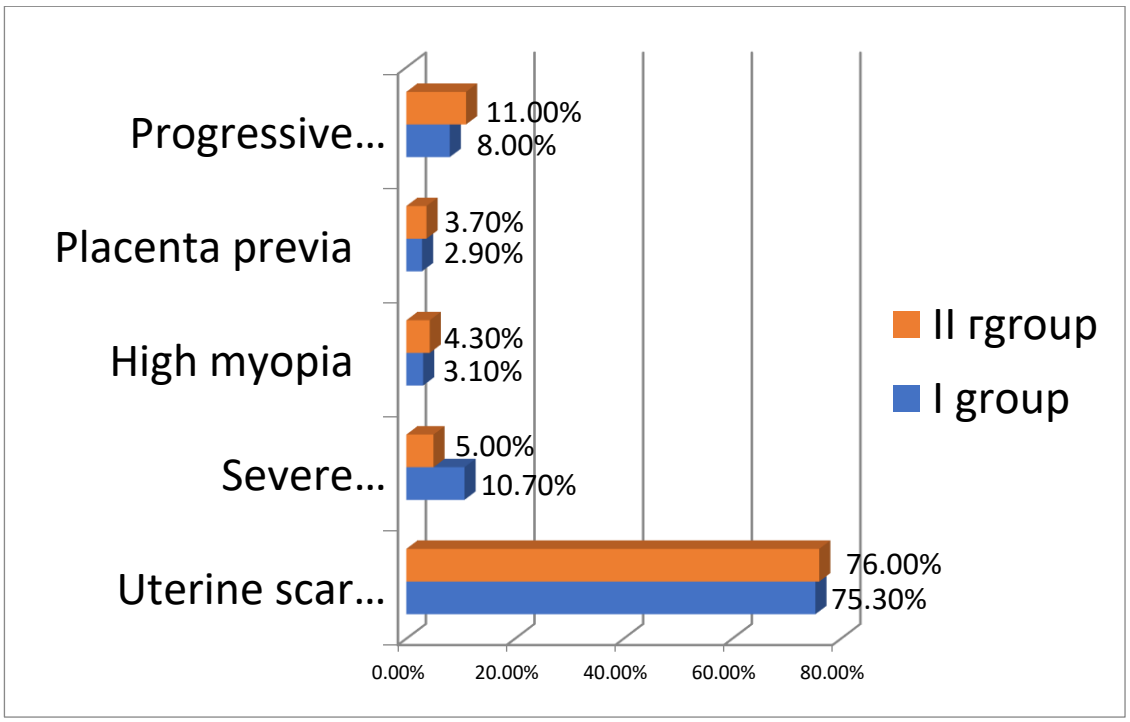

Figure 12. Main indications for cesarean section

In 37.0% of cases in the main group and 42.0% in the comparison group, cesarean delivery was performed on an emergency basis. In both groups, the leading indication for emergency surgery was uterine scar insufficiency in combination with other indications—76.0% and 75.3% of cases, respectively.

Delivery after the onset of labor due to non-reassuring fetal status was indicated in 35.3% and 33.3% of cases (against the background of combined pathology). Less frequently, the indications included abnormalities of labor (AL), primarily uterine inertia, and hypertensive disorders during pregnancy.

Thus, the compared groups undergoing different cesarean section modifications were comparable in terms of age, parity, and obstetric–gynecologic history. No significant differences were found in the course of pregnancy or in the nosological structure of somatic comorbidity between women in the main group and those in the comparison group.

Comparative data on the duration of the first stage of labor and the rupture-of-membranes (ROM) interval before emergency delivery are presented in Table 4. In Group I, the mean duration of the first stage of labor before indications for

emergency surgery emerged was 5.9±0.3 hours, whereas in Group II it was 6.7±0.3 hours.

Table 3. Duration of the first stage of labor and the ROM interval before emergency delivery

Indicators	I group (п=28)	II group (п=20)
Duration of the first stage of labor, h	5,9+0,3	6,7+0,3
Duration of the rupture-of-membranes (ROM) interval, h	4,7+0,1	4,9+0,1

Vaginal examinations during labor were performed in all groups, ranging from one to three assessments as clinically indicated, with adherence to aseptic principles.

3.2. Features of the intraoperative and postoperative course with different cesarean section techniques in pregnant women with 2–3 uterine scars after previous cesarean delivery

The results of the clinical investigation made it possible to identify the following advantages of the proposed surgical access technique in women with multiple postoperative scars after cesarean section.

The mean operative time in Group I was 42.2±4.8 minutes, whereas in Group II it was 40.1±6.0 minutes.

Depending on the pattern of somatic and genital pathology, the presence of acute infection, and characteristics of labor, the infectious risk level of women delivered by cesarean section was assessed. The infectious risk grade before abdominal delivery was evaluated as follows (Logutova L.S., 1996):

Grade I: pregnant women with chronic infectious somatic diseases. Grade II: pregnant women with chronic infectious diseases of the female genital tract.

Grade III: women undergoing emergency surgery, with labor duration up to 15 hours and a rupture-of-membranes (ROM) interval <6 hours. Grade IV: pregnant women with an exacerbation of chronic infectious diseases or acute infectious processes of any localization. Grade V: women with labor duration up to 15 hours and a ROM interval >6 hours.

Table 4. Infectious risk grade in the study groups

Indicators	I group (п=28)	II group (п=20)
I risk grade, %	8,7	12
II risk grade, %	32,6	26
III risk grade, %	37,0	42,0
IV risk grade, %	21,7	20

To prevent postoperative inflammatory complications, puerperal women with a minimal infectious risk grade received one broad-spectrum antibiotic (a cephalosporin) intraoperatively, administered intravenously immediately after umbilical cord clamping, followed by repeat doses at 12 and 24 hours. When clinically indicated, in women with a moderate infectious risk grade, intramuscular antibiotic administration was continued for 48–72 hours. In women with a high infectious risk grade, antibiotics were prescribed starting from the first postoperative day in a full course dose.

In the postoperative period, management included infusion therapy, replacement of blood loss as indicated, administration of uterotonic and antithrombotic agents, prevention of postoperative ileus, and active postpartum management after abdominal delivery.

Small subaponeurotic hematomas without clinical manifestations at the incision site were detected by ultrasound on postoperative day 3 in 2.2% and 6.0% of cases, respectively. For small hematomas located under the vesicouterine fold and beneath the aponeurosis identified on ultrasound, no specific treatment was required.

Small subcutaneous anechoic collections (up to 2 cm) on postoperative day 3 were observed in 4.0% of women in Group I and 10.3% in Group II. In Group II, on postoperative days 5–6, two cases required partial suture separation to drain a seroma.

The general condition of most patients was satisfactory and consistent with an uncomplicated postoperative course. Breast findings in the comparison groups were as follows: nipple cracks were present in 7.6% and 10.0% of women, respectively; no signs of mastitis were observed.

Key hematological parameters in the study groups before and after operative delivery are presented in Table 7. Before surgery, there were no substantial differences between the groups in mean hemogram values.

Table 7. Main hematological parameters in women of the study groups after cesarean section.

Indicator / day	I group n = 28	II group n=20
Erythrocytes, $\times 10^{12}$/L		
Preoperative	3,18+0,44	3,19+0,58
Postoperative day 1	3,09+0,54	3,02+0,41
Postoperative day 3	3,15+0,62	3,10+0,41
Postoperative day 6	3,20+0,41	3,17+0,32

Hemoglobin, g/L		
Preoperative	98,5+9,1	97,7+11,7
Postoperative day 1	95,4+10,1	96,3+9,1
Postoperative day 3	95,3+13,6	96,1+10,2
Postoperative day 6	95,3+9,1	96,2+14,1
Leukocytes, $\times 10^9$/L		
Postoperative day 1	13,2+1,24	13,6+2,11
Postoperative day 3	11,1+0,89	12,6+1,14
Postoperative day 6	7,9+0,91	8,8+1,10
ESR, mm/h		
Postoperative day 1	45,0+4,34	46,5+8,61
Postoperative day 3	35,3+7,65	34,0+11,91
Postoperative day 6	30,5+7,83	29,5+13,12

Thus, the key principles of currently proposed uterine closure techniques are the reduction in the number of suture layers and the use of continuous suturing.

The concept of peritonization of the uterine incision was introduced more than 100 years ago by Sanger in classical cesarean section. Closure of the uterine wound with the visceral peritoneum during cesarean section performed with a vertical incision in the lower uterine segment was introduced by Kronig in 1912, and in 1926 Kerr extended this approach to cesarean section with a transverse incision.

To date, peritonization of the uterine incision using the vesicouterine peritoneal fold remains a traditional step in cesarean section. Numerous proponents of peritonization and peritoneal closure during reconstruction of the anterior abdominal wall argue that suturing the peritoneum restores anatomy and approximates tissues for better healing, re-establishes the peritoneal barrier to reduce the risk of tissue separation, and prevents adhesion formation. At the same time, one-layer continuous uterine closure techniques combined with simultaneous peritonization are increasingly used. However, contemporary

studies include evidence that challenges the necessity of uterine peritonization during low-transverse cesarean section.

Already in the 1980s, studies demonstrated that the extent of postoperative adhesion formation at the surgical site is directly related to the amount and characteristics of suture material. Suturing the peritoneum causes additional injury to its surface, reduces vascularization with ischemia, and thereby contributes to adhesion development.

The selective approach of non-closure of the peritoneum during cesarean section was revived in the works of M. Stark (1995) and D. Hull (1991). These authors reported outcomes of cesarean sections in which neither the visceral nor the parietal peritoneum was sutured. The advantages of this approach included shorter operative time, reduced postoperative analgesic requirements, a lower incidence of postoperative ileus, and a shorter hospital stay. M. Stark also reported findings from repeat cesarean sections in women whose peritoneal layers had not been sutured during the first procedure: the peritoneum uniformly covered the lower uterine segment, and no manifestations of adhesions were identified. In the study by A.N. Strizhakov et al. (1995), laparoscopic assessment showed marked early signs of serosal restoration of the uterine and parietal peritoneum within 6–8 hours after surgery.

Currently, numerous studies indicate that suturing the parietal and visceral peritoneum after cesarean section is not necessary for an uncomplicated postoperative course and rapid wound healing.

At the end of cesarean section, after revision of the abdominal cavity, the abdominal wall is closed in layers. Some authors do not suture the rectus abdominis muscles after cesarean section and restore only the integrity of the parietal peritoneum, the fascia (aponeurosis), and the skin. The skin is closed with interrupted sutures; in Pfannenstiel incisions, a continuous absorbable suture or a removable suture may be used. When closing the subcutaneous tissue, most authors place several interrupted sutures (especially in women with obesity), which is associated with a reduced risk of postoperative hematomas and skin

wound dehiscence. Therefore, the basic technique of closing the laparotomy wound after cesarean section has not undergone major changes until recently.

At present, most supporters advocate performing cesarean section in the lower uterine segment using the modification proposed by M. Stark (1994), which recommends an anterior abdominal wall incision by the Joel-Cohen method. After opening the peritoneum, the vesicouterine fold is excised, and a transverse incision is made in the lower uterine segment. After fetal delivery and transfer to the neonatology team, the placenta is removed from the uterus, which is then exteriorized. The uterine incision is closed with a single-layer continuous Vicryl suture using the Reverdin technique. Peritonization of the uterine suture line is not performed. The peritoneum and the muscles of the anterior abdominal wall are not sutured; the fascia is closed with a continuous Vicryl suture (Reverdin), and the skin is closed with interrupted sutures.

The advantages of this method include faster completion of the procedure, reduced blood loss and shorter time to neonatal delivery, a lower risk of thrombosis and infection, and a shorter length of hospital stay. Surgeons using this technique report reduced operative time and blood loss, earlier restoration of bowel peristalsis after cesarean section, and substantially less frequent prescriptions of antibiotics and analgesics. For example, in Russia, A.N. Strizhakov and G.M. Savelyeva are supporters of the M. Stark method.

According to V.I. Kulakov and E.A. Chernukha (2000), the mean time to neonatal delivery during lower-segment transverse cesarean section was 7.3±0.3 minutes; the mean operative time was 53.3±0.3 minutes with a double-layer uterine closure and 40.2±0.3 minutes with a single-layer closure. According to A.N. Strizhakov and V.A. Lebedev (1998), the time to fetal extraction was 5.25±0.18 minutes with the traditional technique versus 1.99±0.16 minutes with the M. Stark modification, and the total operative time was 45.22±5.67 versus 21.18±3.55 minutes, respectively. In the study by G. Ohel et al. (1996), the corresponding durations were 44±16 and 32±11 minutes. The average blood loss during cesarean section ranges from 250 to 800 mL.

Review of the literature suggests that, in recent years, laparotomy techniques for cesarean section have evolved toward reducing maternal tissue trauma and shortening operative time. In parallel with advances in suture materials, there is a clear trend toward wider use of continuous uterine suturing. Experimental and clinical studies indicate that peritoneal closure is not an обязательный step of cesarean section and, conversely, increases surgical trauma.

Table 8. Comparative assessment of the postoperative period

Complications	I group (п=28)		II group (п=20)	
	Abs	%	Abs	%
Uterine subinvolution	1	3,5	3	15,0
Lochiometra	1	3,5	3	15,0
Endometritis	-	-	1	3,5
Thrombophlebitis	-	-	-	-
Urinary tract infection	2	7,1	3	15,0
Intestinal paresis lasting up to 3 days			1	3,5
Hyperthermia (lasting more than 3 days)	3	10,7	3	15,0
Incisional seroma	-	-	2	10,0
Therapeutic use of antibiotics, %	7	25,0	10	50,0
Mean postoperative length of hospital stay (bed-days)	7,1+0,5		8,85+0,7	

Subinvolution of the uterus in the postoperative period was most frequently observed in Group II—15.0% of cases—compared with Group I—3.5%. Endometritis occurred in Group II in 3.5% of cases. This diagnosis, as well as a number of cases of uterine subinvolution, required therapeutic continuation of antibacterial therapy in the postoperative period.

A wound seroma with partial dehiscence of the postoperative suture on the anterior abdominal wall was noted in 2 patients in Group II (10.0%). Clinical assessment of the postpartum course showed that, in most cases, discharge from hospital after cesarean section occurred earlier in Group I (on postoperative days 6–7), whereas in Group II it occurred on days 8–9. The mean postoperative length of stay was 7.1±0.5 days and 8.85±0.7 days in Groups I and II, respectively.

The relatively low rate of infectious and inflammatory complications in the study groups was associated with rational postpartum management after cesarean section, which, in addition to adequate infusion–transfusion therapy, uterotonics, antithrombotic agents, and measures to prevent postoperative ileus, included appropriately selected antibacterial therapy.

Thus, based on the comparison of the postoperative course in women delivered operatively, it can be concluded that the proposed cesarean section technique has several advantages, contributing to more rapid improvement in overall well-being, restoration of bowel function, a reduction in both the duration and severity of hyperthermia, and less postoperative pain during the first 2–3 days; that is, overall, a more favorable postoperative course.

3.3. Key risk factors for complications in repeat cesarean section in women with a uterine scar and principles of preoperative stratification

Repeat cesarean section in patients with a uterine scar is considered an operation of increased clinical and organizational complexity, because the risk of complications is determined not by a single parameter but by a combination of factors: placentation characteristics, the condition of the scar and the lower uterine

segment, the severity of adhesions, the emergency nature of the intervention, infectious status, comorbidities, and the facility's readiness for massive blood loss. Contemporary literature emphasizes that systematic risk assessment (preoperatively) and surgical planning make the greatest contribution to the prevention of severe outcomes, including hemorrhagic complications, injury to adjacent organs, and neonatal morbidity [RCOG, 2015; NICE, 2021].

A. History of cesarean sections and the patient's "surgical biography"

The first block of factors includes the number of previous cesarean deliveries and the nature of the postoperative course. Clinically important elements are: (1) the number of scars (1; 2; 3 or more), (2) complications of prior procedures (endometritis, wound infection, hematomas, suture dehiscence, repeat interventions), (3) information indicating a "difficult surgery" (pronounced adhesions, difficulties opening the abdominal cavity and dissecting the lower uterine segment, the need to extend the incision), and (4) the duration of the previous operation and the volume of blood loss (from discharge documentation). A history of complicated postoperative recovery after a previous cesarean section indirectly increases the likelihood of dense adhesions and, consequently, the risk of bladder/bowel injury and prolonged time to fetal extraction. Practically, this means that such patients should be considered "potentially difficult" already at the stage of consultation and routing, even when current pregnancy parameters appear satisfactory [RCOG, 2015].

The interpregnancy/interoperative interval is also assessed separately. A short interval after cesarean section is associated with a higher probability of functional insufficiency of the lower uterine segment and an increased risk of complications in a subsequent pregnancy. In the text of a monograph, it is appropriate to document the interval as a mandatory stratification parameter (e.g., <18 months; 18–24 months; >24 months), because it reflects both tissue repair quality and the "strength" of the scar from a clinical standpoint [RCOG, 2015; NICE, 2021].

B. Placentation as the main predictor of massive blood loss and a “difficult operation”

The second (often decisive) block of factors is placental location and the risk of placenta accreta spectrum (PAS). The combination of “placenta previa + uterine scar” is considered in international consensus documents as one of the most clinically significant high-hemorrhage-risk scenarios, requiring enhanced preparedness for blood loss, multidisciplinary planning, and, frequently, delivery in a facility where blood components and resources for surgical hemostasis are available [FIGO, 2018].

In practical terms, this means that the preoperative stratification protocol must include:

1. ultrasound data on placental location (anterior wall/posterior wall; low-lying placenta/previa; projection over the scar area);
2. markers suspicious for PAS (based on expert ultrasound; if necessary, MRI, if adopted in the facility);
3. an anticipated blood loss risk estimate (conventionally: standard / increased / high), which determines blood preparation, team composition, and the set of hemostatic technologies to be available.

For a monograph, it is logical to formulate a rule: patients with anterior placenta previa in the setting of 2–3 scars should automatically be classified as “high operative risk,” even if the pregnancy appears relatively stable clinically. This is not “overcaution,” but a conclusion derived from international approaches to PAS management, where the principal prevention of catastrophic hemorrhage is early recognition and planning [FIGO, 2018].

C. Condition of the uterine scar and lower uterine segment: clinical insufficiency as a driver of emergency surgery

The third block includes signs of clinical scar insufficiency/impending rupture, pain in the scar area, progressively increasing tenderness on palpation, and their combination with ultrasound changes in the lower uterine segment (according to the facility’s local protocol). It is important to emphasize that even

in the absence of “absolute” criteria for rupture, the combination of symptoms of scar insufficiency and nonreassuring fetal status often converts the scenario into an emergency. Emergency surgery itself is an independent amplifier of operative risks: less time for preoperative optimization (anemia, coagulation status, infectious status), fewer opportunities to plan the incision and hemorrhage prevention, and a higher likelihood of technical errors due to time pressure [RCOG, 2015; NICE, 2021].

In a monograph, it is appropriate to explicitly state the thesis that “scar insufficiency” is dangerous not only as a risk of rupture, but also as a factor that increases the proportion of emergency operations and, consequently, the overall complication rate. This makes it possible to methodologically link scar-related clinical features with final maternal and perinatal outcomes.

D. Adhesions and the risk of injury to adjacent organs
The fourth block of factors is the severity of adhesions (peritoneal, vesicouterine, and aponeurotic), which is especially relevant in multiple repeat cesarean sections. The literature emphasizes that adhesions are the key mechanism of bladder injury during repeat surgery and the main reason for prolonged access to the lower uterine segment and delayed fetal extraction. The consequence is an increased risk of intraoperative injury and blood loss, as well as deterioration of neonatal outcomes when the “incision-to-delivery” interval is prolonged (in emergency situations this becomes critical).

For a monograph, it is practical to describe adhesions not abstractly, but through “operative markers of complexity” that can be documented in the surgical record: the need for sharp dissection of the vesicouterine peritoneal fold, difficulty mobilizing the lower uterine segment, inability to create a standard bladder flap, the need to change the planned uterine incision/extend the abdominal incision, and increased time to fetal extraction. These parameters can then be correlated with your outcomes (blood loss, operative time, complications). (This is exactly the point where it is appropriate to insert your own data when you describe the

frequency of predicted/actually difficult dissection and the outcomes associated with it.)

E. Infectious risk and inflammatory complications: the clinical logic of "why risk-group status matters more than a single antibiotic"
The fifth block is infectious risk, which in re-operated patients is shaped by a combination of factors: chronic foci of infection, inflammatory genital tract disease, prolonged rupture of membranes, duration of labor, number of vaginal examinations, emergency surgery, anemia, obesity, diabetes/gestational glucose disorders. The approach to grading infectious risk (including that used in the domestic clinical school) is important because it determines not only antibiotic prophylaxis, but also the strategy of postoperative monitoring and the threshold for initiating therapeutic regimens.

In the monograph, it is useful to fix the cause–effect chain: "infectious risk → probability of endometritis/wound infection/urinary infection → prolonged pain/fever → longer length of stay → higher rate of secondary interventions." This will allow you to interpret differences in hyperthermia, seromas, need for therapeutic antibiotics, and duration of hospitalization as a clinically linked complex rather than isolated endpoints.

F. Comorbidity and obstetric complications of the current pregnancy as amplifiers of operative risk

The sixth block is somatic and obstetric comorbidity. In practice, the most "operatively significant" conditions include:

• anemia (reduces tolerance reserve for blood loss and worsens recovery);

• hypertensive disorders/preeclampsia (effects on hemostasis, risk of preterm delivery, increased likelihood of emergency surgery);

• obesity (technical difficulties of access, higher risk of wound complications);

• diabetes mellitus/glucose intolerance (infectious complications, delayed healing);

• hemostatic disorders (bleeding/thrombosis risks);

• severe placental insufficiency/fetal growth restriction (higher rate of emergency decisions and greater fetal vulnerability to hypoxia).

In a monograph, these factors are best presented as "modifiers of the baseline risk of repeat cesarean section." That is, the scar itself sets the background, while concomitant conditions increase the probability of conversion to an emergency scenario and/or worsen the postoperative course [NICE, 2021].

G. Emergency versus elective surgery as an integral risk factor (and a key analytical variable)

The seventh block is elective versus emergency surgery. This is one of the most convenient integral factors for a monograph: it "captures" clinical severity, time deficit for preparation, a higher likelihood of prolonged rupture of membranes, increased team stress load, and a higher risk of atonic hemorrhage/coagulopathic disturbances in severe obstetric complications. For this reason, modern guidance on women with a uterine scar emphasizes the value of predicting and preventing emergency scenarios through timely routing and planned delivery at optimal gestational ages [RCOG, 2015; NICE, 2021].

For your study/monograph, it is logical here to build a "bridge" to the section on choosing the surgical approach: emergency surgery increases the importance of rapid and safe entry, and therefore makes the choice of access not a "technical detail," but an outcome-related factor.

H. Preoperative stratification: a practical model for implementation (without tables)

To make section 3.3 look like a "working tool" rather than a list of factors, you can describe a three-tier stratification (example logic that you can later adapt to your data):

1. Low risk (a "standard repeat CS"):

— 1 scar; no signs of scar insufficiency;

— placenta not over the scar area; no previa;

— no significant comorbidity or it is compensated;

— elective surgery;

— no history suggesting severe adhesions/complications.

Tactics: standard team; standard blood preparation “as indicated”; baseline antibiotic prophylaxis per protocol; standard hemostatic set.

2. Moderate risk (a “potentially difficult operation”):

— 2 scars or unfavorable history after the previous CS;

— suspected adhesions (from discharge notes/history/indirect ultrasound signs);

— anemia, obesity, hypertensive disorders, infection history;

— possible early gestational-age delivery for obstetric indications;

— limited time reserve (trend toward emergency).

Tactics: involvement of a more experienced surgeon; increased preparedness for blood loss (pre-arranged blood components according to the internal regulation); expanded instrument set; clear plan for alternative access/incision extension.

3. High risk (a “hemorrhagic and technically complex operation”):

— placenta previa and/or suspected PAS, especially anterior placenta over the scar in the setting of multiple scars;

— clear clinical signs of scar insufficiency with high probability of emergency intervention;

— significant comorbidity plus nonreassuring fetal status;

— history of a “difficult operation,” likely dense adhesions.

Tactics: multidisciplinary planning; operating-room readiness for massive blood loss; most experienced team; pre-defined hemostasis algorithm and, if needed, organ-preserving/radical steps in accordance with accepted PAS standards [FIGO, 2018].

CHAPTER IV. INTEGRATED RISK ASSESSMENT AND MANAGEMENT TACTICS FOR REPEAT CESAREAN SECTION

4.1. § Main clinical conclusions based on the study results

The data presented in Chapter III make it possible to formulate a number of clinically important conclusions that have practical value when planning and performing repeat cesarean section in women with 2–3 uterine scars. Importantly, the compared groups were generally comparable in baseline preoperative characteristics and in the structure of the obstetric–gynecologic history, and the observed differences in the intra- and postoperative course should be interpreted primarily as reflecting the specifics of the applied management strategy, the degree of operative trauma, and the комплекс of measures used in patient care.

The first key conclusion is that the overwhelming majority of patients with multiple uterine scars have pronounced somatic burden and combined pathology during pregnancy, which creates an initially high “background” risk of complications. The high prevalence of somatic diseases, predominantly of a multiple nature, as well as the presence of an anemic syndrome in a substantial proportion of pregnant women, emphasizes the need to consider repeat cesarean section not as an isolated surgical intervention but as one stage in the management of a patient with accumulated risk factors. Consequently, even in the absence of marked between-group differences at the preoperative stage, clinical logic requires максимально strict preparation: correction of anemia, санация of chronic infection foci, assessment of the degree of infectious risk, planning of blood-loss prophylaxis and prevention of thromboembolic complications, and selection of the optimal timing and conditions for surgery.

The second conclusion is related to the fact that the structure of indications for delivery in the analyzed groups is predominantly combined. In practical terms, this means that the “leading” indication is rarely the only one and, as a rule, is accompanied by signs of obstetric compromise (threatened miscarriage, hypertensive disorders, uteroplacental blood flow abnormalities, signs of fetal distress). Such a combination worsens the baseline conditions for surgery: the probability of preterm delivery increases, the proportion of emergency interventions rises, and the load on perioperative monitoring grows. As a result, the clinical assessment of indications in women with multiple scars should be built

not on a simple “yes/no” principle, but on a “cumulative risk assessment” principle, with mandatory documentation of factors that may change the choice of surgical access, the level of preparedness for blood loss, and the regimen for prevention of infectious and inflammatory complications.

The third conclusion concerns the role of infectious risk as an integral clinical indicator. Assessment of the degree of infectious risk before abdominal delivery in the setting of repeat surgery is not a formal procedure: it allows, in advance, determination of the intensity of antibiotic prophylaxis and the need for prolonged antibacterial therapy in the postpartum period. Practically important is the fact that the distribution of patients by risk grades reflects not only the condition of the urogenital tract, but also the character of labor (in emergency surgery), the duration of membrane rupture, and the presence of exacerbations of chronic infections. Therefore, in women with multiple scars, the management algorithm should include clear stratification of infectious risk followed by selection of the prophylaxis regimen and criteria for dynamic monitoring in the early postpartum period.

The fourth conclusion is that the course of the early postoperative period in patients after repeat cesarean section is determined not by a single complication, but by a “package” of interrelated adverse events: subinvolution of the uterus, lochiometra, seroma of the postoperative wound, urinary tract infection, more prolonged hyperthermia, and the need for therapeutic continuation of antibiotics. This complex reflects the overall reactivity of the organism, the magnitude of operative trauma, the adequacy of uterotonic support, and the quality of postoperative monitoring and timely correction of deviations. Clinically, this necessitates standardization of daily postpartum assessment in the first days: temperature dynamics, pain syndrome, uterine involution, the character of lochia, the condition of the postoperative wound, laboratory parameters, and urinary symptoms. Early identification of “minor” deviations is important, because именно they, in some cases, drive progression to more pronounced inflammatory complications and prolong hospitalization.

The fifth conclusion is related to interpretation of laboratory dynamics in the postoperative period. Changes in red blood indices and inflammatory markers on day 1 and in follow-up should be regarded as objective reflections of blood-loss volume, the degree of hemodilution in the context of infusion therapy, and the intensity of the inflammatory response. The practical value lies not in recording a single parameter but in evaluating the trajectory: if the decrease in hemoglobin and erythrocytes is more pronounced and persists longer, it requires active correction and careful monitoring of the patient's functional status; if leukocytosis and inflammatory-response indicators persist longer than expected, this becomes an argument to search for an infectious focus, reconsider antibacterial tactics, and deepen diagnostic evaluation. Such an approach is especially important in women with baseline anemia and significant somatic burden, where compensatory capacity is lower.

The sixth clinical conclusion is that assessment of the effectiveness of the proposed strategy or surgical modification should be based on a set of "practical" outcomes that directly affect recovery and hospital resources: severity of pain in the first days, speed of restoration of bowel function, duration of hyperthermia, frequency of seromas and hematomas, need for therapeutic antibiotic prescribing, and mean length of stay. Even in the absence of severe complications, differences in these parameters have substantial clinical and organizational significance, because they determine the quality of early rehabilitation, the risk of late infectious-inflammatory events, and the economic burden on the healthcare system.

The seventh conclusion is important for obstetric tactics: a significant proportion of emergency operations in women with multiple uterine scars are performed in the first stage of labor, and the duration of the first stage and the duration of ruptured membranes (the "waterless interval") become important modifiable risk factors. This underscores the role of timely decision-making regarding the mode of delivery and the need for strict monitoring of fetal and maternal status once labor has begun. In practical terms, when signs of scar

insufficiency are present in combination with other unfavorable factors, prolonging an expectant approach is not appropriate, because it worsens the initial conditions for surgery and increases infectious risks.

Overall, the results of Chapter III allow repeat cesarean section in women with 2–3 uterine scars to be regarded as a clinical situation of high cumulative risk, where outcomes are determined not only by the surgical technique, but also by the quality of preoperative preparation, objective stratification of infectious risk, timely selection of the moment of delivery, and standardized postoperative monitoring. It is precisely this integrated approach that creates conditions for reducing the frequency of early postpartum complications, shortening hospitalization, and improving the clinical recovery of postpartum women.

4.2. § Clinical and pathogenetic rationale for the identified differences and risk factors

The data obtained in Chapter III make it possible not only to describe complication rates and the dynamics of indicators, but also to explain why, in a subset of patients, the early postoperative period is less favorable. For repeat cesarean section in women with 2–3 scars, three interrelated components are fundamentally important: the baseline somatic “risk field,” the obstetric situation at the time of surgery (elective vs emergency; labor conditions; duration of ruptured membranes), and the extent of surgical trauma together with the quality of perioperative management. These components do not operate in isolation; they amplify each other.

The first component is the baseline somatic and infectious-inflammatory burden. Even when groups appear comparable in the structure of somatic pathology, the clinical significance lies in the fact that almost any chronic somatic disease during pregnancy reduces functional reserves, worsens tissue perfusion and tolerance to blood loss, and increases the likelihood of anemia and metabolic disturbances. It is especially important that baseline anemia, even mild, is a factor

that “devalues” small differences in blood-loss volume: what is well tolerated with a normal initial hemoglobin level may, in the presence of anemia, lead to more pronounced weakness, tachycardia, reduced exercise tolerance, delayed recovery, and a longer need for correction.

The second component is the obstetric situation and the urgency of the intervention. An emergency operation in the first stage of labor differs from an elective procedure not only in the timing of decision-making, but also in biological conditions: a higher probability of ascending microbial contamination with a prolonged ruptured-membranes interval, functional changes in the myometrium during contractions, possible maternal exhaustion, and often a more pronounced emotional and hemodynamic instability. Even if the average duration of the first stage and the ruptured-membranes interval do not differ sharply, emergency surgery itself intensifies the risk of infectious-inflammatory deviations and uterine dysfunction (subinvolution, lochiometra), because the intervention is performed under altered labor physiology and limited time for preparation.

The third component is the specifics of surgical trauma in repeat operations. Multiple scars imply a potentially more complex access and tissue dissection stage. Any prolongation of access time, additional manipulations during dissection of the vesicouterine fold, and work within adhesions increase microtraumatization of tissues, the probability of seroma and hematoma formation, and the intensity of the local inflammatory response. This does not necessarily manifest as “major” complications, but it leads to a cascade of minor disturbances: prolonged soreness in the first postoperative day, slower recovery of bowel motility, a more pronounced wound response, and a more frequent need for therapeutic (rather than purely prophylactic) antibiotic use.

It should also be emphasized separately the mechanisms underlying the main postoperative deviations that occur in such groups.

Subinvolution of the uterus and lochiometra. These conditions more often arise when the following are combined: baseline infectious burden, impaired myometrial contractility, and insufficient effectiveness of uterotonic support. In

repeat surgery, the uterus may respond more “inertly” against the background of operative trauma, anemia, metabolic shifts, and prior pregnancy complications. Lochiometra in the early postpartum period is, in essence, a marker of impaired evacuation of lochia and reduced uterine tone; if not corrected promptly, it creates conditions for inflammatory complications of the endometrium. Therefore, the clinical value is in early recognition: assessment of uterine fundal height, tenderness, lochia character, ultrasound signs of retained contents, and immediate correction with uterotonics and an appropriate monitoring strategy.

Seroma and hematomas of the postoperative wound. Their development is related not only to the technique of skin closure, but primarily to the volume of tissue “dead space,” the quality of hemostasis, the degree of trauma to subcutaneous fat and the aponeurosis, and features of local microcirculation. Obesity and anemia increase risk by worsening tissue trophism. Small hematomas can be clinically “silent,” but they prolong the inflammatory reaction and may become a prerequisite for seroma or infiltration. Therefore, systemic measures are important: meticulous hemostasis, minimization of tissue trauma, rational postoperative dressing and observation, and early diagnosis when local complications are suspected.

Urinary tract infection and leukocyturia. In this category of patients, this is a typical “hidden” source of postoperative low-grade fever and discomfort. Catheterization, reduced immune reactivity due to pregnancy and surgery, and comorbid urinary tract disease increase risk. Clinically, it is important that such complications may not produce a striking picture, but they prolong hyperthermia and the need for antibiotic therapy. Therefore, dynamic monitoring of urinary findings and clinical symptoms is practically meaningful, especially if the temperature persists beyond the expected timeframe.

Hematologic dynamics and the inflammatory response. The decrease in hemoglobin and erythrocytes during the first postoperative day is formed by the combined effects of blood loss and infusion-related hemodilution. However, in situations where recovery of these indices is delayed, one should consider a

combination of factors: baseline anemia, occult blood loss, insufficient correction of iron deficiency, and a more pronounced tissue trauma. Changes in leukocytes and inflammatory response indices reflect the balance between a physiological postoperative reaction and the risk of local inflammation (uterine suture line, surgical wound) or an extragenital focus (urinary tract, ENT foci). In practice, the dynamic principle is most useful: if indices decrease as expected, this corresponds to a normal course; if they remain higher than expected and are accompanied by clinical signs, this is a reason to expand diagnostic evaluation.

Here it is important to emphasize that in repeat cesarean section, severe complications may be relatively rare; however, it is the cumulative burden of "minor" deviations that largely determines the duration of recovery and the mean length of hospital stay. More pronounced hyperthermia, the need for therapeutic antibiotics, delayed restoration of bowel function, and seromas/hematomas together shape the clinical profile of a less favorable early postpartum period.

From a practical standpoint, the mechanisms described above make it possible to identify a set of the most sensitive risk factors that are genuinely amenable to control:

1. baseline anemia and the severity of somatic comorbidity (as the background that determines tolerance to surgery);
2. emergency surgery and labor conditions (including the duration of ruptured membranes as a factor of microbial contamination);
3. the extent of surgical trauma during entry and dissection (as a driver of local inflammation and wound complications);
4. adequacy of preventive measures (risk-stratified antibiotic prophylaxis, uterotonic support, thrombosis prevention, correction of blood loss, and early mobilization).

Thus, the clinical and pathogenetic interpretation of the results places the main emphasis on the fact that repeat cesarean section in the presence of 2–3 uterine scars represents a scenario in which the early postoperative course is formed by the interaction of background pathology, obstetric conditions, and

procedural traumaticity, while complication prevention should be built as a system of sequential decisions rather than a fragmented set of measures.

4.3. § Practical model of patient management and controllable prevention points for complications

If Chapter III demonstrates “what” happens (the structure of complications, the dynamics of indicators, and the length of hospitalization), then this section should define “where” and “by what means” these processes can be managed. In repeat cesarean section for women with 2–3 uterine scars, clinical logic should be proactive rather than reactive: to identify a high-risk group in advance and to structure perioperative management around key controllable points. Practically, these points are conveniently divided into the preoperative stage, the intraoperative stage, and the early postoperative period.

Preoperative stage: reducing baseline risk before surgery

1. Assessment of baseline reserve (anemia, somatic status). Even moderate anemia is clinically meaningful in repeat surgery because a relatively small blood loss and hemodilution may translate into a clinically significant deterioration of well-being and a longer recovery. At this stage, the key element is not a formal recording of hemoglobin, but a decision on correction (iron deficiency management, nutritional support) and planning of blood-loss replacement according to indications.

2. Assessment of the probability of infectious complications. In practice, it is essential to identify women with chronic foci of infection and inflammatory genital disease, and also to consider the conditions of the forthcoming delivery: an elective operation and an emergency operation represent different microbial-load settings. The clinical goal is to determine the risk category in advance and tie it to antibiotic prophylaxis and surveillance, rather than “catching up” with an inflammatory process in the postoperative period.

3. Prediction of the complexity of repeat surgical entry. For repeat operations, the critical issue is to understand in advance the likelihood of difficult tissue dissection. This influences organizational decisions: team composition, readiness for longer operative time, the probability of a more pronounced wound reaction, and the need for closer monitoring of the wound and uterus during the first postoperative day.

4. Defining “threshold criteria” for intensified monitoring. Preoperatively, it is important to document in advance which signs will require enhanced postoperative observation: marked anemia, high infectious risk, anticipated emergency surgery, or combined obstetric pathology. This reduces situations in which escalation of therapy occurs with delay.

Intraoperative stage: minimizing trauma and controlling major triggers of complications

1. Control of the magnitude of surgical trauma. In repeat operations, the decisive factor is often not the nominal “technique,” but the precision of the entry and dissection steps. The less unnecessary tissue trauma and “dead space,” the lower the likelihood of seromas, hematomas, infiltration, and prolonged pain. In practical terms, this means gentle tissue handling, stepwise hemostasis control, and a rational technique of layered closure.

2. Management of blood loss and its clinical consequences. It is important not only to document blood loss but also to ensure that the patient does not enter a zone of clinically significant deterioration due to the combination of baseline anemia and operative factors. This includes timely replacement, correction according to indications, and monitoring hemoglobin dynamics in the early postoperative period in patients at risk.

3. Infection prevention as part of the operation, not “afterwards.” Antibiotic prophylaxis should be considered an element of the intraoperative protocol linked to the risk category and operative conditions (elective/emergency). It is essential to distinguish prophylaxis from therapeutic

antibiotic administration: prophylaxis prevents escalation of complications and reduces the subsequent need for “treatment-level” continuation.

4. Prevention of factors that enhance postoperative dysfunction. Key clinical targets are adequate analgesia (so that early mobilization is feasible), prevention of postoperative ileus and thrombotic events, and a rational infusion strategy (to avoid excessive hemodilution and tissue edema).

Early postoperative period: early detection of minor deviations and prevention of progression to overt complications

1. Monitoring uterine involution and lochia drainage. Subinvolution and lochiometra rarely “appear suddenly”; they are typically preceded by clinical signals: uterine fundal height not corresponding to expected postpartum days, tenderness, changes in lochia characteristics, or subfebrile temperature. A practical model should include active assessment of these signs and rapid corrective measures before the situation progresses into endometrial inflammation.

2. Temperature monitoring and differential diagnosis of hyperthermia causes. Hyperthermia lasting more than 3 days is not a diagnosis; it is a marker. The clinician’s task is to promptly identify the likely source: uterus/endometrium, wound, urinary tract, and less often the respiratory tract or other foci. Importantly, some patients may have moderate laboratory deviations without pronounced clinical symptoms; therefore, the value lies in an integrated assessment: symptoms + objective data + dynamics.

3. Surveillance of the postoperative wound (seromas/hematomas). In repeat cesarean patients, wound complications often start with subtle signs: localized tenderness, mild edema, infiltration, or serous discharge. If detected early, management may be minimal yet effective; if missed, the risk of partial wound dehiscence and prolonged healing increases.

4. Control of urinary findings. Leukocyturia and urinary tract infections are often responsible for prolonged subfebrile temperature and discomfort. Therefore, the practical model should include not only a single urinalysis but also

symptom assessment and dynamic follow-up in patients at risk, especially after catheterization and in the presence of baseline urinary tract pathology.

5. Assessment of bowel function recovery and early mobilization. Delayed bowel motility is a typical “amplifier” of discomfort, pain, and delayed mobilization. Practically, it is important that analgesia and the management regimen truly allow early ambulation and oral intake as tolerated, and that ileus prevention is not formal but oriented toward clinical effect.

6. Laboratory dynamics as a management tool rather than a “report.” Monitoring hemoglobin, leukocytes, and other parameters should not be uniform for all patients but risk-based. What matters is not the number in isolation, but its trajectory: persistent hemoglobin decline and a sustained inflammatory profile combined with clinical signs are indications for active correction and targeted search for the source.

Overall logic of the practical model

In repeat cesarean section in women with 2–3 uterine scars, most unfavorable early postoperative courses are driven not by rare catastrophic events but by the accumulation of “minor” deviations: hyperthermia, subinvolution/lochiometra, wound seromas/hematomas, urinary tract infections, and more pronounced postoperative anemia. Therefore, a rational strategy is to:

— identify high-risk patients preoperatively;

— intraoperatively minimize trauma, strictly control hemostasis, and apply risk-oriented prophylaxis;

— during the first postoperative day, actively search for early clinical markers of deviations and correct them before a clinically overt complication develops.

This model makes care predictable and controllable, with the main effectiveness criteria being a reduction in the frequency and severity of early postoperative deviations, a lower need for therapeutic antibiotic administration, and shorter hospitalization.

4.4. § Study limitations and practical applicability of the results

When interpreting the obtained results, it is important to consider a number of circumstances that may influence complication rates, laboratory dynamics, and the length of hospitalization in repeat cesarean section in women with 2–3 uterine scars. A correct description of limitations does not weaken the conclusions; rather, it makes them more professional and applicable by indicating under which conditions the results are reproducible and which factors require control during implementation of the proposed approach.

Sample characteristics and group size
The study is based on a comparison of two groups of patients comparable in key clinical and anamnestic characteristics; however, the group sizes are not large. Under such conditions, even moderate differences in individual complications may fail to reach statistical significance, especially for low-frequency events (e.g., endometritis, significant wound complications, certain thrombotic outcomes). This means that the absence of statistical significance for rare outcomes is not always equivalent to the absence of an effect and should be interpreted cautiously; confirmation in larger samples may be required.

In addition, the structure of somatic and obstetric-gynecologic pathology in women with multiple uterine scars may be heterogeneous. Even when groups appear comparable by key indicators, there remains a possibility of influence from unmeasured factors (for example, the severity of adhesions, characteristics of prior operations, differences in the degree of anemia before pregnancy, or nutritional status). These parameters are difficult to standardize fully, yet they can objectively affect the operative course and the early postoperative period.

Factor of elective versus urgent surgery
An important source of variability in outcomes is the proportion of emergency procedures. Emergency cesarean section, particularly during the first stage of labor, is performed under conditions that differ from an elective operation: a different microbial burden, a different degree of tissue fatigue, often a more

pronounced inflammatory background, and limited time for preoperative optimization. This may increase the likelihood of infectious and inflammatory complications, the need for therapeutic antibiotic administration, and prolong recovery. Therefore, the results should be evaluated with the understanding that comparability of the groups with respect to the emergency nature of delivery is a critical prerequisite for a correct comparison.

Characteristics of antibacterial strategy and postoperative management The incidence of inflammatory complications and the duration of hospitalization are substantially influenced by the antibiotic prophylaxis regimen and the criteria for escalation from prophylaxis to therapeutic antibacterial treatment. In clinical practice, some decisions (prolongation of antibiotic therapy, intensification of infusion therapy, additional examinations) may depend not only on objective signs but also on the clinician's "threshold of alertness" and local hospital protocols. This matters because the same clinical episode (for example, moderate hyperthermia or suspected subinvolution) may lead either to observation or to active therapy. Consequently, when implementing the study results, it is necessary to maintain uniform criteria for treatment initiation and uniform clinical and organizational rules for patient management.

Laboratory parameters as indirect markers Assessment of hemogram dynamics, leukocytosis, ESR, and intoxication index provides useful information; however, these parameters are indirect markers. They are influenced not only by the presence of a complication, but also by physiological postpartum changes, the surgical stress response, infusion therapy, and the severity of baseline anemia. Therefore, laboratory changes should be interpreted only in conjunction with the clinical picture. This is particularly important to avoid both overdiagnosis of inflammatory complications based on laboratory data without clinical evidence and underestimation of complications in the presence of a "moderate" laboratory response.

Discharge criteria and length of hospitalization Postoperative length of stay is a practical integral indicator; however, it depends

not only on the severity of complications but also on organizational factors: the institution's discharge standards, availability of outpatient follow-up, referral and routing features, and social factors. Therefore, differences in hospitalization duration should be considered a composite outcome reflecting both the clinical course and the organizational model of care.

Practical applicability: what can be implemented without additional prerequisites

Despite the limitations listed above, the presented results have high practical value because they address a real clinical task—reducing the frequency of early postoperative deviations and optimizing recovery in women with multiple uterine scars. The following provisions are directly applicable for implementation:

1. Risk-oriented management instead of a "universal" scheme. Patients with signs of increased infectious risk, marked somatic comorbidity, or emergency delivery require a different intensity of monitoring and earlier correction of deviations.

2. Clear differentiation between antibiotic prophylaxis and antibiotic treatment. The practical effect comes from standardization: who is adequately covered by prophylaxis and under which criteria escalation to therapeutic administration is justified.

3. Emphasis on early controllable markers of an unfavorable course. These include hyperthermia persisting for more than 3 days, signs of subinvolution/lochiometra, early signs of wound seromas/hematomas, dysuric symptoms and laboratory-confirmed leukocyturia, as well as clinically significant hemoglobin decline in patients at risk.

4. Organizational readiness for repeat operations. Preoperative assessment of the likely complexity of surgical entry and documenting criteria for team escalation create conditions for stable quality in repeat interventions.

Conditions under which the results are reproducible

For the proposed approach to yield a comparable effect when implemented, three basic conditions must be ensured: group comparability regarding the proportion

of emergency procedures, uniform criteria for antibacterial tactics, and uniform rules for postoperative monitoring (uterus, wound, temperature, urinary syndrome, and risk-based laboratory dynamics). Under these conditions, the study results can be translated into practice in maternity care facilities managing patients undergoing repeat cesarean sections and those with multiple uterine scars.

Overall, the analysis demonstrated that evaluation of repeat cesarean section outcomes in women with 2–3 uterine scars should be based not only on recording individual complications, but also on a comprehensive interpretation of the clinical course of the early postoperative period. Practically, it is most appropriate to consider the outcome as a combination of the dynamics of general condition, the pattern of functional recovery (including bowel function), the severity and duration of hyperthermia and pain syndrome, the status of the postoperative wound, and the need to transition from preventive measures to therapeutic interventions. This approach helps avoid both overdiagnosis of complications based on isolated laboratory abnormalities and underestimation of unfavorable trends in an externally satisfactory course.

The obtained results confirm that controllable factors play a key role in shaping outcomes after repeat surgery: the quality of preoperative risk assessment, rational prevention of infectious and inflammatory complications, standardized monitoring during the first postoperative day, and active correction of early deviations before clinically significant complications develop. The practical significance of these provisions lies in their applicability in routine obstetric hospital practice, as they focus on early markers of an unfavorable course and on decisions that can be implemented without altering the basic structure of care delivery.

CONCLUSION

Repeat cesarean section in women with a uterine scar belongs to the category of interventions in which the clinical outcome is determined not by a single factor, but by a combination of preoperative, intraoperative, and early postoperative circumstances. In practice, the risk of adverse outcomes is formed

long before the operation: it is driven by the baseline somatic status, features of the obstetric and gynecologic history, the course of the current pregnancy, as well as the appropriateness of the timing and delivery strategy. For this reason, preoperative assessment should be viewed as an active risk-management tool rather than a formal step in preparing for surgery.

The analysis showed that most pregnant women with 2–3 uterine scars have a high prevalence of concomitant somatic pathology and a substantial proportion have a burdened obstetric and gynecologic history. The most common background conditions include anemia, cardiovascular disease, gastrointestinal pathology, metabolic disorders and endocrine disturbances, as well as chronic ENT diseases. Even when these conditions are not the direct indication for operative delivery, they reduce physiological reserves, increase the likelihood of complicated pregnancy, and lower tolerance to surgical stress, which requires their mandatory identification and correction within preoperative management.

The course of pregnancy in patients with a uterine scar is often complicated by threatened miscarriage, hypertensive disorders, impaired uteroplacental blood flow, signs of fetoplacental insufficiency, and fetal growth restriction. These complications create a clinical context in which repeat cesarean section is frequently performed preterm and, not rarely, for emergency indications. An important practical point is that a significant portion of emergency procedures are carried out during the first stage of labor, which increases requirements for operative readiness, speed of decision-making, and ensuring safe conditions for the intervention.

The intraoperative stage of repeat cesarean section is a key point of risk realization because it is where the consequences of previous operations (the nature of scar tissue changes, altered anatomic relationships, likelihood of technically difficult dissection) combine with the current circumstances of labor. Therefore, the choice of surgical technique and tactical elements should be aimed not only at achieving delivery, but also at reducing the probability of blood loss, tissue

trauma, prolonged operative time, and creating conditions for infectious and inflammatory complications.

Clinical observations and the comparative assessment of intra- and postoperative courses in the study groups demonstrate that differences in operative management may be accompanied by differences in recovery of general condition, the severity of early inflammatory reactions, laboratory dynamics, and the frequency of certain postoperative complications. In the early postoperative period, the most important factors are objective recovery and inflammatory response markers, clinical dynamics (temperature response, pain pattern, restoration of bowel function), and the need for therapeutic continuation of antibacterial therapy. From a practical standpoint, these parameters reflect not only the quality of the procedure, but also the adequacy of perioperative patient management.

Prevention of complications after repeat cesarean section should be considered a set of measures implemented sequentially: assessment and correction of preoperative status (including anemia and chronic infection), rational evaluation of infectious risk, standardized antibiotic prophylaxis with individualized extension of therapy when indicated, and active postoperative management with control of hemodynamics, blood loss, and early mobilization. The most important prerequisite for successful prevention is not a single measure, but consistency of decisions across all stages—from admission to readiness for discharge.

Thus, the results confirm that, in repeat cesarean section for women with 2–3 uterine scars, decisive importance is held by: completeness of preoperative assessment, timeliness and justification of delivery tactics, technical rationality of intraoperative management, and strict adherence to early postoperative monitoring and complication prevention principles. The practical value of these conclusions lies in the ability to build a more controllable and predictable model of care for such patients, oriented toward reducing maternal complications,

improving neonatal condition, and shortening postoperative rehabilitation without compromising safety.

KEY FINDINGS

1. In pregnant women with 2–3 uterine scars, repeat cesarean section is performed against the background of a high prevalence of concomitant somatic pathology and a burdened obstetric and gynecologic history, which initially creates an increased risk of complicated gestation and perioperative disturbances.

2. At the preoperative stage, the key prognostic factors are anemia, combined chronic diseases, and previous inflammatory diseases of the genital organs; their combination is more often associated with pregnancy complications and the need for inpatient treatment before delivery.

3. Pregnancy in women with a uterine scar is characterized by a high frequency of complications, including threatened miscarriage, hypertensive disorders, signs of fetoplacental insufficiency, and fetal growth restriction, which often determines the need for preterm delivery and increases the share of emergency operations.

4. In the structure of indications for repeat cesarean section, combined causes predominate, where scar insufficiency acts as the main component in combination with obstetric and somatic complications; in emergency delivery, operations are more often performed in the first stage of labor.

5. The intraoperative and early postoperative periods in repeat cesarean section substantially depend on the operative technique and perioperative support tactics; differences in methods correlate with recovery tempo, the severity of early inflammatory reactions, and the frequency of specific postoperative complications.

6. Infectious-risk assessment followed by a differentiated approach to antibiotic prophylaxis and therapy is an obligatory component of care in this patient category and allows infectious and inflammatory complications to be kept at a low frequency provided rational postoperative monitoring is ensured.

7. Comprehensive, stepwise risk management (preoperative correction, rational intraoperative tactics, active postoperative management) provides a more favorable early postoperative course and may contribute to reduced length of hospitalization without compromising safety.

PRACTICAL RECOMMENDATIONS

1. At the preoperative stage in women with 2–3 uterine scars, an expanded assessment of risk factors should be applied: somatic status, severity of anemia, signs of chronic infection, features of obstetric and gynecologic history, complications of the current pregnancy, and the expected mode of delivery (elective/emergency).

2. Anemia should be considered a controllable risk factor: when reduced hemoglobin is detected, targeted correction before surgery is required (if time allows) and preparedness for closer perioperative blood-loss monitoring.

3. When a pregnant woman with a uterine scar is admitted in labor, it is recommended to assess in advance the likelihood of emergency delivery in the first stage of labor and to ensure readiness of the operating team, anesthetic support, and intensified postoperative monitoring.

4. Before surgery, it is advisable to stratify patients by infectious risk and use a differentiated antibiotic prophylaxis regimen with subsequent extension of therapy when indicated, taking into account clinical course and laboratory markers of inflammatory response.

5. In the early postoperative period, mandatory measures include: active management with control of hemodynamics and blood-loss volume, prevention of uterine hypotonia, prevention of thrombotic complications, measures to prevent postoperative ileus, and dynamic assessment of temperature/pain/laboratory parameters.

6. When ultrasound detects small subaponeurotic hematomas or small seromas without clinical manifestations, dynamic observation is recommended;

in case of signs of infection or the need for evacuation, local correction according to clinical indications with subsequent follow-up.

7. To improve reproducibility and quality of care, implementation of a standard post–repeat cesarean observation protocol (days 1–3–6) with documentation of key clinical and laboratory parameters is recommended, facilitating early identification of unfavorable dynamics and justification of therapeutic decisions.

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