



Eras protocol applications in caesarean surgery

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Received: 08.06.2023

Accepted/Published Online: 11.03.2024

Final Version: 29.03.2024

Abstract

Cesarean section is the most common major obstetric surgery in the world. Although a safe application today, it can cause some complications. Accelerated recovery protocols (ERAS) have been developed to minimize postoperative complications and provide early recovery in patients. Cesarean is the first and only surgical intervention in obstetrics and perinatology using the ERAS protocol. Many studies about the ERAS protocol in cesarean determined that it reduced the duration of hospital stay by 2-3 days and the morbidity and complication rate by 30-50%. Evidence-based studies for preoperative, intraoperative, and postoperative care are included in the guidelines created by the ERAS association specific to the cesarean. This review aims to share evidence-based care and results within the scope of ERAS for cesarean operations and to provide a guide for cesarean care in this context.

Keywords: cesarean section, recovery, ERAS protocol, evidence-based practices,

1. Introduction

Cesarean section is the most common major obstetric surgery in the world. The rate of cesarean in Turkey and the world has increased steadily for the last 20 years and has become the most commonly performed surgical procedure intraperitoneally (1).

Cesarean section is a life-saving delivery method for both the mother and the baby when an unexpected complication occurs during pregnancy or delivery. However, the cesarean section rate in our country and the world is too high, except for medical indications. According to up-to-date data from 150 countries, cesarean delivery accounts for 18.6% of all births. On average, the cesarean delivery rate varies between 6.2% and 27.2% in underdeveloped and highly developed countries (2).

Although The World Health Organization (WHO) indicates that the ideal ratio of cesarean deliveries among all births since 1985 should be around 10-15%, the rate of cesarean deliveries is much higher than the rate indicated by WHO (Karabel, Demirbaş, İnci, 2018). While the worldwide rate of cesarean deliveries is 16%, in Turkey, it is determined to be 13.9% in 1998, 21.2% in 2003, 36.7% in 2008, 48% in 2013, and 52% in 2018, according to the results of Turkey Demographic and Health Survey (2).

Negative experiences of women at the time of birth, considering the birth as a painful, bloody, and scary event and heartbreaking birth scenes shown on social media are among

the reasons for the increase in cesarean delivery preferences and cesarean rates. (3). The factors such as the realization of previous deliveries by cesarean section, the widespread use of assisted reproductive techniques, increase in advanced age pregnancies, decrease in the number of pregnancies and births, advanced imaging techniques, general use of electronic fetal monitor and social reasons are considered as other reasons for the increment in the rate of cesarean deliveries (4). Although cesarean section, a primary surgical intervention, is regarded as safe today, it can cause some complications (5). Among the complications that may be exposed during and after cesarean delivery are injuries that may occur in adjacent organs, infections (endometriosis, wound infections, etc.), anesthesia risks, bleeding and blood transfusion requirement, embolism, damages that may arise in the baby, neonatal respiratory distress syndrome, infant deaths, mental problems in the mother, previous cesarean section and these can be listed related risks (placenta previa, placenta accreta, uterine rupture, abdominal adhesions (6).

It is stated that with new surgical approaches and evidence-based applications, patients can recover faster, mortality rates will decrease, and complications seen in patients can be reduced in the postoperative period. With this in mind, re-evaluation of clinical care standards has come to the fore, and an accelerated surgery protocol (Fast Track Surgery / FTS) was developed in 1990 to improve the care provided in surgical

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clinics (7).

2. Development

2.1. ERAS and caesarian

The purpose of applying the accelerated recovery protocol after surgery is to ensure early recovery by minimizing postoperative complications in patients. Today, many studies on the ERAS protocol reduce the duration of hospital stay by 2-3 days and the morbidity and complication rate by 30-50% (7). The ERAS protocol is generally planned as the preoperative, intraoperative, and things to be done in the postoperative period (8).

Cesarean is the first and only surgical intervention for which the ERAS protocol should be applied in obstetrics and perinatology. ERAS consensus recommendations and a guideline specific to cesarean operations were created, starting 30-60 minutes before the planned or unplanned cesarean section until the mother's discharge (preoperative, intraoperative, postoperative) (9). Applying the ERAS protocol to cesarean section patients is vital to increase mother-infant interaction quickly and reduce labor loss. This review aims to share evidence-based care and results within the scope of ERAS for cesarean operations and to provide a guide for cesarean care in this context.

2.2. Preoperative care in caesarean surgery according to eras protocol

Preoperative ERAS protocol applications include patient counseling and education, preoperative maternal comorbidity optimization, preoperative fasting and oral carbohydrate loading, preoperative optimization, antimicrobial prophylaxis, and skin preparation.

Preoperative patient counseling and training

Patients unfamiliar with the procedures before the surgery will experience anxiety. Although high-quality evidence is lacking, patients must be informed verbally and in writing about the processes before, during, and after cesarean delivery (Low evidence, strong recommendation). The surgeon, anesthesiologist, and nurse should provide this information. It should include details about the practices (preoperative preparation, pain, oral food intake, and early mobilization) during the patient's stay in the hospital. The important thing here is minimizing anxiety by ensuring the patient's active participation in care (9).

In a study conducted in this context, patients who will undergo elective cesarean section were divided into intervention and control groups, and patients were given a patient education brochure, which includes preoperative fasting recommendations and information about the risks and benefits of anesthesia. As a result of the study, it was observed that there was a decrease in preoperative fluid fasting periods in patients in the intervention group (10). In another survey of patient education, it was reported that the choice of patient education method and time management in women who underwent cesarean section under general anesthesia could

affect the study results (11).

Preoperative maternal comorbidity optimization

According to the guide, preoperative optimization covers maternal obesity, hypertension, gestational diabetes, maternal anemia, and smoking (9).

Maternal obesity (body mass index > 40 kg / m²) significantly increases the risk of maternal and infant complications. The guidelines say that weight control and optimal weight gain during pregnancy are essential (strong evidence, strong recommendation) (9). In a study evaluating the effect of obesity on maternal and fetal outcomes in term pregnancies, a significant difference was found in women in the obese group regarding hospital stay after cesarean section and infection development compared to the other. However, no significant difference was found regarding the infant APGAR score (12).

Maternal hypertension should be controlled during pregnancy. Because chronic hypertension significantly increases maternal and infant morbidity and the incidence of cesarean delivery (strong evidence, strong recommendation) (9). In a meta-analysis study in which pregnancy complications were evaluated in women with chronic hypertension, it was reported that complications such as preeclampsia, preterm birth (<37 weeks pregnancy), and low birth weight (<2500 g) increased in hypertensive patients (13).

Maternal gestational diabetes mellitus significantly increases the risk of maternal and fetal morbidity. The guideline recommends timely and effective management of maternal diabetes before and during pregnancy (strong evidence, strong recommendation) (Wilson et al. 2018). Studies have reported that gestational diabetes causes the development of macrosomic babies and increases the possibility of cesarean delivery (14).

Maternal anemia during pregnancy has been reported to cause low birth weight and premature birth, and increased perioperative morbidity and mortality rates. The guide recommends that the cause of anemia should be identified and corrected (moderate level of evidence, strong recommendation) (9). Although the average amount of blood loss during the preoperative period during physiological preparations and cesareans is less than 1000 milliliters (15), 6.8% of women who have cesarean section lose enough blood to need transfusion. The amount of blood loss during cesarean is determined by variables such as the size of the uterus, obesity of the woman, intrapartum oxytocin use, uterine incision location, duration of the operation, placental location, surgeon's experience, infection, medical diseases, and intraoperative complications. In a study conducted, it was found that the assessment of preoperative blood loss will decrease the amount of postpartum bleeding (16).

Preoperative nutrition

According to the guideline, women undergoing cesarean

section should be encouraged to drink clear liquids (pulp-free juice, coffee, or tea) up to 2 hours before surgery (Level of Evidence: High / Grade of Recommendation: Strong). It also recommends a light meal up to 6 hours before surgery (Level of Evidence: High / Recommendation: Strong) (9). In a retrospective study conducted in parallel with this recommendation, the preoperative fasting times and their effects on the newborn were examined. It was determined that the incidence of vomiting, neonatal hypoglycemia, and acidosis was lower in women who received solid food ≥ 6 hours < 8 hours and clear fluids < 2 hours compared to the other groups. Although the incidence of hypoglycemia and acidosis in newborns decreased in shorter periods of fasting (less than 6 hours of solid food), it was found that the risk of vomiting in women increased) (17).

Preoperative carbohydrate loading is a controversial issue and is not acceptable for pregnant women with diabetes mellitus. In a prospective cohort study evaluating preoperative carbohydrate loading in patients with nonpregnant diabetes mellitus, No significant difference was found between the carbohydrate and fasted groups regarding preoperative blood glucose concentration, hyperglycemia, or hospital stay (9).

Preoperative antimicrobial prophylaxis and skin preparation

According to the guideline, intravenous antibiotics should be administered routinely within 60 minutes before the skin incision in cesarean delivery. Prophylaxis has been reported to reduce postoperative infections by adding a first-generation cephalosporin in all women and azithromycin in women with labor pain or with ruptured membranes (High evidence, strong recommendation) (18). In another Cochrane review covering evidence-based practices to prevent surgical site infections, it was reported that prophylactic intravenous antibiotics administered before cesarean section reduced the risk of surgical site infection compared to antibiotics administered after cord clamping and antibiotic prophylaxis reduced the risk of surgical site infections compared to those who did not use antibiotics (19). The guideline recommends chlorhexidine-alcohol treatment over diluted povidone-iodine solution for abdominal skin cleansing before cesarean delivery (low evidence, strong recommendation) (18). A Cochrane study conducted for this purpose determined that preoperative skin preparation with chlorhexidine gluconate prevented the development of infection better than povidone-iodine (20).

2.3. Intraoperative care in caesarean surgery according to ERAS protocol

According to the guideline, intraoperative ERAS protocol applications include pre- and intraoperative anesthesia management, prevention of intraoperative hypothermia, cesarean delivery surgical techniques, and neonatal delayed cord clamping.

Pre and intraoperative anesthesia management

According to the guideline, regional anesthesia is the preferred method for cesarean delivery as part of the ERAS protocol (low

evidence, strong recommendation) (18). It has been reported that in 4874 emergency cesarean section operations where general anesthesia, spinal anesthesia known as regional anesthesia, and spinal + epidural anesthesia were evaluated retrospectively, spinal anesthesia was preferred most, and 1st and 5th minutes APGAR scores were higher compared to general anesthesia (21). In a retrospective study evaluating anesthesia management in cesarean sections, spinal anesthesia is the most preferred method compared to other anesthesia methods because it is easy to apply, has a high chance of success, and its effect starts quickly. It provides sufficient muscle relaxation and lower local anesthesia requirements. In addition, it has been the most preferred method due to its low mother-infant drug toxicity (22). It has been stated that regional anesthesia has fewer side effects on the fetus.

Prevention of intraoperative hypothermia

The guideline recommends forced air warming, intravenous fluid warming, and increased operating room temperature during cesarean delivery to prevent hypothermia (strong evidence, strong recommendation) (18). Hypothermia is more common in women under spinal anesthesia. Hypothermia in the mother causes complications such as wound site infection, myocardial ischemia, changes in drug metabolism, coagulopathy, tremor, decrease in skin integrity and low patient satisfaction, late leaving the recovery unit, and a decrease in baby's body temperature, blood gases and changes in the APGAR score (23).

In other studies on hypothermia, it has been stated that maternal heat can affect neonatal temperature. Consequently, negativities up to respiratory depression can be observed, especially in low birth weight babies (24). Coldness in the hands and feet of babies after birth is the first symptom of hypothermia. If not intervened, symptoms such as coldness in the whole body, decreased sucking and physical activity, and weak crying can be seen. In advanced cases, lethargy, slow/irregular/weak breathing, and slowing heart rate are observed (25). Some studies to prevent maternal hypothermia concluded that the baby's APGAR score and blood gases were positively affected (26, 27). Some study results indicate that intraoperative warming does not affect infant blood gases and APGAR scores (28, 29). According to the study by Cantürk et al. (2019), it was found that giving warmed intravenous fluid prevents hypothermia and is effective in infant blood gas and APGAR score (30). It has been stated that giving only intravenous heated liquid in the intraoperative process is insufficient to prevent hypothermia, and additional methods are needed (31).

Cesarean delivery surgical techniques

The guideline recommends blunt dilation of transverse uterine hysterotomy during cesarean delivery to reduce surgical blood loss (Moderate evidence, Weak recommendation). It has been reported that closure of the hysterotomy 2-fold decreases the rate of uterine rupture (Low evidence, Weak recommendation). In contrast, peritoneal closure does not affect the surgery

results and even causes prolongation in the operation time (Low evidence, Weak recommendation). However, re-approximation of that tissue layer is recommended in women with ≥ 2 cm of subcutaneous tissue (Moderate evidence, Weak recommendation). In women whose skin is closed with staples, it is recommended to close the skin with subcuticular suture in most cases, as removal of clips after the fourth postoperative day causes a decrease in the rate of wound dehiscence in women (Moderate evidence, Weak recommendation) (18). In a randomized controlled study comparing surgical techniques (pelvic peritoneum closure, single or double layer closure of the uterine incision and incision closure) on 3033 women, closure of the pelvic peritoneum only prolongs the operation time and does not contribute to postoperative morbidity (32); In the double layer closure of the uterus, pregnancy interval, vaginal delivery, hospital stay, preterm birth, amnionitis, postpartum endometritis, placental abruption, postpartum hemorrhage, blood transfusion, uterine separation, intraabdominal adhesions, abdominal pain, dyspareunia, constipation, urine It has been reported to provide no difference in terms of symptoms and infertility (33).

In a randomized controlled study evaluating the effect of closing or not closing the peritoneum during cesarean section on postoperative pain, it was reported that not closing both visceral and parietal peritoneum during cesarean section reduced the use of patient-controlled analgesia pumps and provided higher patient satisfaction in the first 24 hours (34).

Neonatal delayed cord clamp

Cord clamping with a delay of at least 1 minute for term babies according to the guideline (moderate evidence, strong recommendation); In preterm delivery, at least 30 seconds delayed cord clamping (low, moderate evidence, strong recommendation) is recommended (18).

In studies evaluating the effect of umbilical cord clamping timing on maternal and neonatal outcomes in term infants, it was reported that the incidence of receiving phototherapy was higher in babies whose umbilical cord was clamped early, and hemoglobin concentration at 24 and 48 hours was lower (35). A randomized controlled study investigated the effects of early clamping versus delayed umbilical cord clamping on anemia in infants 8- and 12-month-old infants. In this study, it was found that there was a significant decrease in the prevalence of anemia by 9% at eight months of age and 8% in anemia prevalence at 12 months of age in babies whose umbilical cord was clamped late (36).

2.4. Postoperative care in caesarean surgery according to ERAS protocol

According to the guideline, postoperative care includes preventing nausea and vomiting, postoperative analgesia, thromboembolism prophylaxis, early feeding, early mobilization, early catheter removal, and discharge counseling (37).

Prevention of nausea and vomiting

In the guideline, it has been reported that antiemetic agents are effective in preventing postoperative nausea and vomiting during cesarean delivery, and a multimodal approach should be used to treat postoperative nausea and vomiting (moderate level of evidence, strong recommendation) (37).

In a Cochrane study involving interventions to prevent nausea and vomiting in women undergoing regional anesthesia for cesarean section, dopamine antagonists (e.g., metoclopramide, droperidol) and sedatives (especially propofol) were reported to be effective in reducing nausea and vomiting during and after surgery. Other effective interventions for nausea and vomiting include corticosteroids (e.g., Dexamethasone), antihistamines (e.g., cyclizine), and anticholinergics (e.g., scopolamine). In addition, acupuncture administration has been reported to be effective in reducing nausea but not vomiting (38). In another study evaluating the effect of aromatherapy in preventing postoperative nausea, peppermint oil was reported to be effective (39).

Postoperative analgesia

According to the guideline, non-steroidal anti-inflammatory drugs and multimodal analgesia with paracetamol are recommended for accelerated cesarean delivery recovery (moderate evidence level, strong recommendation) (37). A randomized controlled study compared the effectiveness of multimodal analgesia in patients predicted to have severe pain after cesarean delivery. Patients in the intervention group were given 300 mcg of spinal prophylactic-free morphine and orally 1 gram of acetaminophen (the first dose was administered in the post-anesthesia care unit) every 6 hours in the first 24 hours postoperatively. Patients in the control group were given 150 mcg of spinal prophylactic-free morphine and a placebo tablet orally (the first dose was administered in the post-anesthesia care unit) every 6 hours for the first 24 hours postoperatively. It was reported that the pain score of the group in which multimodal analgesia was applied was lower (40). A study involving postoperative pain assessment following the application of the multimodal analgesia method in the perioperative period reported that the desired result could not be obtained (41). However, another study found that the need for postoperative pain decreased in patients who underwent preoperative abdominal muscle block (transverse abdominal muscle block / MAP) (42).

Prophylaxis against thromboembolism

According to the guideline, pneumatic compression stockings should be used to prevent thromboembolic disease in cesarean delivery patients (low evidence level, strong recommendation). However, it has been reported that heparin should not be used routinely for venous thromboembolism prophylaxis in postnatal patients (low level of evidence, strong recommendation) (37). It was stated that women who received prophylactic enoxaparin treatment for ten days after cesarean section did not have complications due to DVT, pulmonary embolism, or enoxaparin, but only the prophylactic enoxaparin

group was evaluated, so different studies are needed (43).

Postoperative early nutrition

The guidelines recommend a regular diet within 2 hours after cesarean delivery (high level of evidence, strong recommendation) (37). In a randomized controlled trial of early initiation of oral feeding after cesarean section, women in the early feeding group were encouraged to drink water 8 hours after surgery, followed by 100 mL oral tea. Women in the routine nutrition group were followed up by restricting their oral intake for the first 24 hours and by sipping water 24-48 hours after the operation. As a result of the study, it was found that there was a significant difference in bowel movements and hospital stays between the two groups (44). Another study evaluated the effect of chewing gum, early oral hydration, and early mobilization on intestinal motility after a cesarean section. It was stated that bowel movements were faster in all groups in which early oral hydration was provided, and early mobilization was less effective in accelerating bowel movements than chewing gum and only early oral hydration (45).

Early mobilization after cesarean section

According to the guideline, early mobilization is recommended after cesarean delivery (low level of evidence, weak recommendation) (37). In a randomized controlled study evaluating the effect of abdominal brace use on postoperative

mobilization, pain, and distress after cesarean, it was reported that patients who used corsets increased walking distance and experienced less pain (21). Another study stated that early mobilization is less effective on bowel movements than early nutrition (45).

Early removal of catheters

The guideline stated that if the urinary catheter was placed during surgery, it should be removed immediately after cesarean delivery (low level of evidence, strong recommendation) (37). A prospective randomized study of early or delayed removal of urinary catheters in patients after elective cesarean section operations found a significant difference between the groups in terms of first urination and mobilization. However, no significant difference was found between the groups in terms of urinary retention and bacteriuria (46).

Discharge counseling

According to the guidelines, standard written discharge instructions should facilitate discharge counseling (low level of evidence, weak recommendation) (37). In a study evaluating the effect of discharge training after cesarean delivery on mothers' readiness for discharge, it was concluded that the training provided positively affected the willingness of mothers to discharge (47).

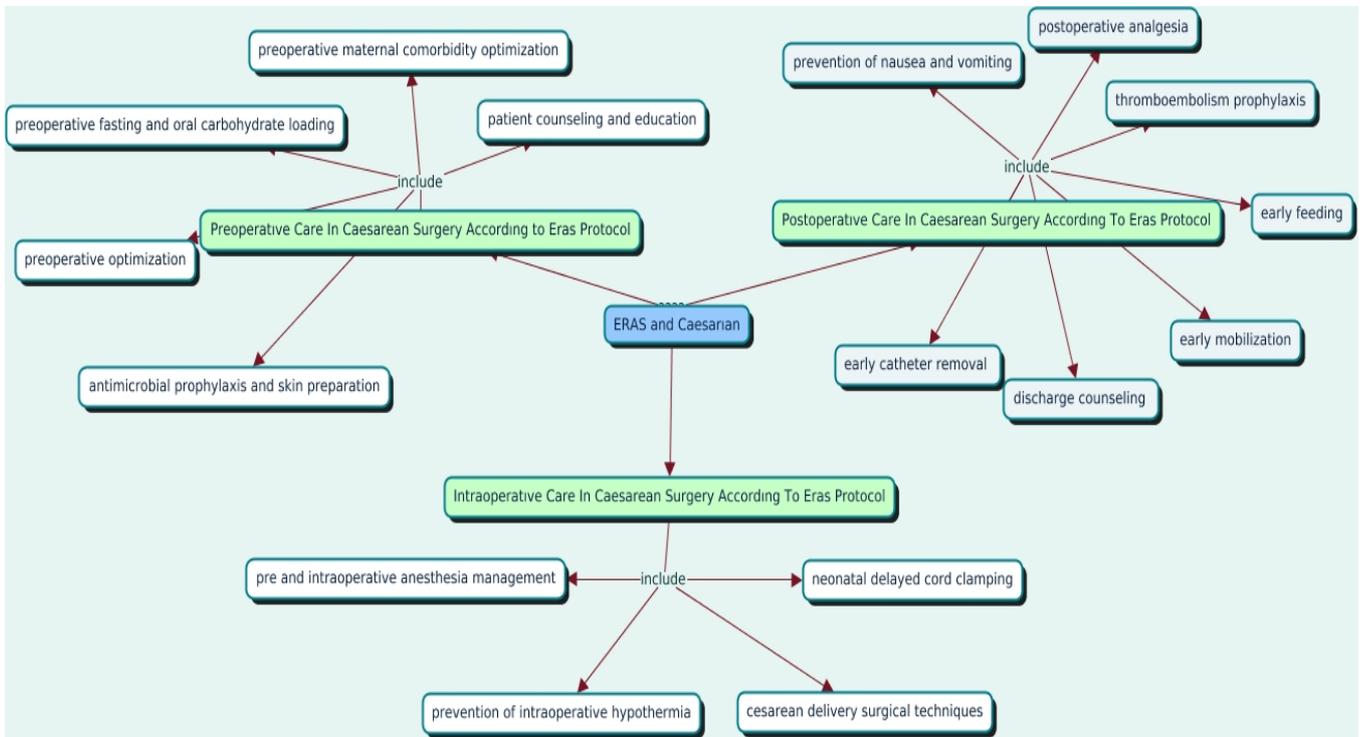


Fig. 1. ERAS protocol applications in cesarean section

3. Conclusion

ERAS protocol applications accelerate postoperative recovery and reduce mortality and morbidity. Because the cesarean delivery rates are increasing worldwide, applying ERAS protocols to this group becomes more critical regarding mother

and baby health. As a result of this review, it is determined that many ERAS protocol applications have positive effects on cesarean section operations. Due to the limited number of studies in this area, more randomized controlled studies may be recommended.

Conflict of interest

The authors have no conflict of interest to declare.

Funding

None to declare.

Acknowledgments

None to declare.

Authors' contributions

Concept: D.T., Design: D.T., Data Collection or Processing: D.T., Analysis or Interpretation: D.T., Literature Search: Ö.C., Writing: Ö.C.

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