



Enhanced Recovery Pathway as a Tool in Reducing Post-operative Hospital Stay After Caesarean Section, Compared to Conventional Care in COVID Era-A Pilot Study

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Abstract

Objectives To study the implementation of ERAS (Enhanced recovery after surgery) pathway and its effect on duration of post-operative hospital stay and various phases of post-operative care in comparison with conventional care group.

Materials and Method Prospective study conducted in Amrita institute of medical sciences, Kochi, Kerala. Women planned for elective and scheduled caesarean section were included in the study from September 2020 to October 2020 and compared with women who underwent caesarean section in the same period receiving standard perioperative care. Women who underwent emergency and urgent caesarean section and patients with medical or surgical comorbidities were excluded. Surgical procedure was the same in both arms. Intravenous hydration was goal directed. Oral feeding was started with liquids after 2 hours, solids were given after 4 hours. Intravenous paracetamol and diclofenac were given routinely. Intravenous tramadol and fentanyl were given if needed apart from these analgesics. Foleys catheter was removed after 12 hours. Conventional care group observed 6 h of fasting pre- and post-operatively. Catheter was retained for 24 h, 2500 ml IV fluids were infused on the first day followed by 1000 ml on the second day. The duration of hospital stay was based on clinical criteria and care providers decision.

Results In ERAS arm, post-operative hospital stay was significantly reduced in comparison with conventional care group. (53.91 vs 77.71 h-p=0.00) Early feeding, early ambulation, early catheter removal, multimodal and preemptive analgesia all contributed to early recovery of the patient.

Conclusion In ERAS pathway length of post-operative stay was significantly reduced as compared to conventional care.

Keywords Enhanced recovery after surgery (ERAS) · Caesarean section · Early ambulation · Analgesia · Length of hospital stay

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Introduction

Enhanced recovery after surgery (ERAS) involves an evidence-based concept, providing standardised perioperative care to patients for better recovery in less time. ERAS protocols are used widely in surgical specialities including colorectal surgery, orthopaedics, gynaecological oncosurgery, breast surgery and urology. Enhanced recovery after surgery has been found useful in reducing hospital stay, financial expenditure and providing more patient satisfaction.

Need for ERAS After Caesarean Section

In spite of efforts made to decrease caesarean section rate in government and private sectors, rate remains high at 30–40% in private sectors in India [1]. So need for implementation

of ERAS pathways to reduce hospital stay and to improve perioperative care is of prime importance. Women undergoing caesarean delivery are usually healthy, who can recover fast and resume normalcy as early as possible to attend the newborn. Another significant need of the hour in the COVID pandemic era is need of minimal exposure of patient and health care workers to each other. Implementation of ERAS protocol reduces the overall health care cost and has been widely utilised in western countries to improve patient care, but in developing countries, this concept is coming up. After reviewing the existing literature, we could understand that this has been the first prospective study in India to implement this new concept in obstetrics.

It is the concept of improving recovery from the stress response of body to the surgery. Preoperative preparations are patient education, preoperative fluid, calorie intake, haemoglobin optimisation, lactation preparation and support. Intraoperative care includes prevention of hypotension and thereby nausea, vomiting, antibiotic prophylaxis, thromboprophylaxis, oxytocin management, delayed cord clamping. Post-operative elements are early oral intake, regular oral and multimodal analgesia, early mobilisation, early urinary catheter removal and early discharge.

In this study, we focussed on few of these elements—perioperative nutritional care, multimodal analgesia, early catheter removal, ambulation and early discharge. Our objective was to find out by what extent ERAS protocol helped in decreasing the length of post-operative hospital stay and how it helped in improvement of various phases of post-operative care.

Materials and Methods

This is a prospective study conducted in Amrita Institute of Medical Sciences, Kochi, Kerala. Pregnant women, who were planned for elective and scheduled caesarean section according to the Lucas classification of caesarean section, were included in the study from September 2020 to October 2020. These women were compared with women who underwent caesarean section in the same period, having standard perioperative care. Women who underwent emergency and urgent caesarean section were excluded. Patients who require close monitoring for medical or surgical comorbidities (cardiac disease, severe preeclampsia, eclampsia, uncontrolled overt diabetes mellitus, autoimmune diseases and intraoperative complications—postpartum haemorrhage, organ injuries, paralytic ileus, etc.) were excluded. Women who were retained in the hospital for baby's treatment were also excluded. Informed consent was taken after proper counselling about the protocols involved in the study during antenatal visits prior to the surgery.

Women in the study group were given 200 ml of carbohydrate-rich drink two hours prior to the procedure. Caesarean section was done under regional anaesthesia after giving premedications like intravenous metaclopramide 10 mg and ranitidine 50 mg. Simultaneous 500 ml of intravenous crystalloid solution was loaded to prevent spinal hypotension. Preoperative surgical site preparation with chlorhexidine solution and antibiotic prophylaxis with cefuroxime 1.5 gm was done 30 minutes prior to the procedure. Spinal anaesthetic drug included 1.8 ml of 0.5% heavy bupivacaine and 20 microgram of fentanyl. Amount of opioids was the same in both the groups so that the bias of opioids influencing the early recovery was avoided. Surgical procedure was the same in both arms. Surgery was done under regional anaesthesia—spinal, epidural or combined. Oxytocin 3 units bolus was given at the time of placental delivery and 20 units infusion was started immediately at 5 units/hour. Post-operatively, 1500 ml of crystalloids were administered over 24 hours at the rate of 100 ml/hour. Breastfeeding was started in both the groups as early as possible within an hour of shifting the patient to recovery care unit. Oral feeding was started with liquids after 2 hours and after 4 hours with solids. Intravenous paracetamol 1 gm every 8 hours and diclofenac 100 mg rectal suppository every 12 hours were given for 24 hours after surgery. Intravenous tramadol and fentanyl were given if needed apart from these analgesics. From the second day of surgery, oral paracetamol was given for analgesia. Foleys catheter was inserted just before surgery and removed after 12 hours. They were encouraged to initiate ambulation as early as possible. Depending on the pain relief, ambulation and wound healing, discharge was planned after 48 hours of surgery.

Standard perioperative care included six hours of preoperative and post-operative fasting. Oral fluids and solid diet were started after 6 h of surgery. Intravenous paracetamol 1 g 8 hourly was given for analgesia. Diclofenac 100 mg suppository and intramuscular tramadol 75 mg along with promethazine 12.5/25 mg were given as and when required. Foleys catheter was retained for 24 hours after surgery. Liberal use of intravenous crystalloids was given in the standard care protocol—2000–2500 ml of crystalloids for initial 24 hours at the rate of 100 ml/hour followed by 1000 ml on the second post-operative day. Discharge was planned if the clinical condition of the patient was satisfactory.

In both the groups, patient was assessed for pain relief, ambulation, spinal headache, voiding difficulties, delay in bowel movement, pyrexia and status of the wound after which fitness for discharge was decided.

Sample Size and Statistical Analysis

The mean and SD of post-operative hospital stay in ERAS group was 73.67 hours \pm 1.60 and 75.17 hours \pm 1.16 in the

standard recovery group in women who underwent caesarean section in the study by Teigen et al. [2]. With 90% power and 95% confidence, the minimum sample size was 24 in each group. Data were collected using the proforma with demographic details and all the variables of post-operative care. Statistical analysis was done using SPSS software 20.0 version. To test the statistical significance of difference in the mean length of hospital stay between two groups, students t test was used. To test the statistical significance in difference in proportion of categorical variables between groups, chi-square test was used.

Results

In the period of September 2020–October 2020, we had a total of 186 deliveries and 95 women underwent caesarean section at our institution. Among them, 44 were excluded as they met one or more of the exclusion criteria and 51 of them were included in our study. Twenty-seven women underwent LSCS in the ERAS pathway, and 24 women received conventional care. Both groups were similar in regards to

Table1 Demographic details of the study population

Variable	ERAS(<i>n</i> =27)	Standard care(<i>n</i> =24)	<i>P</i> value
<i>Parity</i>			0.64
Primi	14(50%)	14(50%)	
Multi	13(56.5%)	10(43.5%)	
<i>Type of CS</i>			0.148
Elective	17(56.7%)	13(43.3%)	
Scheduled	10(47.6%)	11(52.4%)	
<i>Indication of LSCS</i>			0.147
Previous LSCS	13(65%)	7(35%)	
Dysfunctional labour	10(38.5%)	16(61.5%)	
Breech presentation	2(66.7%)	1(33.3%)	
H/O Myomectomy	2(100%)	0(0%)	
Use of NSAIDS	27(100%)	11(45.83%)	0.00
Need for opioids	0%	4(100%)	0.027

demographic characteristics such as age, parity, gestational age, type of LSCS and indication for LSCS (Table1).

The use of ERAS at caesarean delivery revealed a significant reduction in the post-operative length of stay in ERAS group (48 h) when compared to conventional care group (75 h) [$53.91 \pm \text{SD } 10.80$ vs $77.71 \pm \text{SD } 15.82$ $P = 0.00$]. (Table2).

The intake of a high caloric carbohydrate-rich drink up to 2 h before surgery has shown to reduce preoperative thirst, hunger and anxiety in patients. Patients in ERAS group were given oral feeds 4 h post-surgery and no gastrointestinal complications were reported in both the groups. (4.44 ± 0.97 vs 6.92 ± 0.70 $P = 0.00$).

Urinary catheter placement during caesarean delivery is a widely accepted practice and was retained 24 h post-surgery in conventional care group. For patients in ERAS group, catheters were removed 12 h post-surgery and no complications were reported [$13.90 \pm \text{SD } 2.23$ vs $19.7 \pm \text{SD } 4.40$ $P = 0.00$].

All women received multimodal and preemptive analgesia in ERAS group when compared with the conventional group, 11 of them (45.83%) received NSAIDs on need basis and 4 of them received extra dosage of opioids.

The core components such as early feeding, early removal of urinary catheter and effective post-operative analgesia have significantly reduced the time of ambulation in ERAS group as compared to patients in conventional care ($17.30 \pm \text{SD } 2.23$ vs $21.60 \pm \text{SD } 3.30$ $P = 0.00$).

In conventional care, patients received 2500 ml on the first day followed by 1000 ml on the second day of surgery. Patients in ERAS arm received 1500 ml on the first day and were encouraged to take adequate amount of oral fluids and no incidence of spinal headache was reported in both the groups. [$4.51 \pm \text{SD } 0.90$ vs $6.33 \pm \text{SD } 0.90$ $P = 0.00$].

In ERAS arm, patients had significantly reduced time to resume bowel movement in comparison with conventional group [$36.70 \pm \text{SD } 13.91$ vs $41.31 \pm \text{SD } 17.60$] with contributing factors like early oral intake and preemptive analgesia which led to early ambulation.

Table2 Outcome of the post-operative components of ERAS pathway

Variable	ERAS(<i>n</i> =27)	Standard care(<i>n</i> =24)	<i>P</i> value
Age	30.19 ± 4.86	29.83 ± 4.73	0.795
Gestational age	38.1 ± 0.7	38.0 ± 0.82	0.395
Antibiotic administration(hrs)	24.85 ± 8.38	28.92 ± 9.60	0.113
Starting of solid diet(hrs)	4.44 ± 0.97	6.92 ± 0.70	0.000
Time of CBD removal(hrs)	13.90 ± 2.23	19.7 ± 4.40	0.000
Time of ambulation(Hrs)	17.30 ± 4.47	21.60 ± 3.30	0.000
Total no. of IVF(pints)	4.5185 ± 0.90	6.33 ± 0.90	0.000
First bowel activity (hrs)	36.70 ± 13.91	41.31 ± 17.60	0.020
Post-operative hospital stay (hrs)	53.91 ± 10.80	77.71 ± 15.82	0.000

There was no significant variability in time of administration of antibiotic in both groups and no wound infection was reported in both the groups.

In both the groups, there was no readmission for surgical or medical complications and no woman needed recatheterisation.

Discussion

Main Outcome of the Study

Length of post-operative stay was significantly lesser in the women following ERAS protocol compared to conventional protocol. Multimodal analgesia reduced the requirement of additional use of tramadol. Regular diet was started early and thereby bowel activity resumed early. Early catheter removal by 12 hours post-surgery led to early ambulation in the ERAS arm.

Structured randomised controlled trials by Teigen et al. [2] and Baluku et al. [3] showed reduction in post-operative hospital stay (1.9 hours and 18.5 hours) and many observational studies showed increased number of post-operative day 1 discharges after the introduction of ERAS pathway in obstetric surgeries. Day 1 discharge at the start of implementation was 1.6% and has shown steep rise to 25.2% after 2 years [4]. In the same way, Fast Track pathway introduced by Bowden et al. [5] showed reduction in mean length of stay from 3 days to 1.31 days over the study period. In our study, women in ERAS arm were counselled well and their expectations also matched with service providers regarding discharge timing, apart from their clinical fitness for discharge. In standard care group, prolonged period of catheterisation, intravenous hydration, delayed feeding contributed to longer stay. Following the conventional practice of discharging patients on post-operative day 3 or 4, along with patient expectations would have resulted in significant difference in the length of stay. Fear of acquiring the COVID infection during hospital stay helped in counselling. ERAS pathway along with proper antenatal counselling can lead to further reduction in hospital stay.

Combination of paracetamol and diclofenac as a routine post-operative medication, given even before the effect of spinal anaesthesia wears off (preemptive analgesia), has better efficacy and safety. Both are additive to each other ensuring safety and efficacy for acute control of post-operative analgesia [6]. In our study, 100% of the women in the ERAS group received combination of acetaminophen and diclofenac, whereas 45% only received diclofenac along with acetaminophen in the conventional group. Four of them required tramadol also. Use of opioids in the post-operative period can lead to impaired gastrointestinal motility, nausea and vomiting. Combination of the above two drugs obviates

the side effect of intrathecal or intravenous opioids. Alternative mode of analgesia can be neural blocks-like transverse abdominis plane block which provides lasting relief, reduces the need of opioids, but needs USG guidance and expertise of anaesthesiologist [7]. Acetaminophen and diclofenac combination is cheaper and efficacious compared to other methods.

Caesarean section is done with drainage of bladder just before surgery or with indwelling catheter which is removed at variable timing—immediately after surgery to 24 hours after surgery. ERAS society has recommended immediate removal, but Society for Obstetric Anesthesia and Perinatology (SOAP) guidelines suggest that removal after 6–12 hours of surgery can be done [8]. Indwelling catheter can have the problem of longer time for first voiding, longer time to ambulate and dysuria [9]. Early removal is associated with lesser urinary frequency, lesser haematuria and shorter hospital stay [10]. In our study, catheter was removed after 12 hours and no women in both groups required recatheterisation. But early removal helped in early ambulation in ERAS group. Though patients are made to sit in the bed after 4 hours and mobilised out of the bed after 8 hours, walking for 10 minutes and independent toileting were possible because of early catheter removal.

Limitation of duration of fasting is another key element of ERAS pathway. Carbohydrate-rich drink 2 hours prior to the procedure and early resumption of fluids by 2 hours and solids by 4 hours made much difference to accelerate return of gastrointestinal activity. Regular diet is recommended after 2 hours of surgery by ERAS society. Benefit of early feeding has been well established in various studies. Fluids followed by solids as tolerated had been started from 4 to 24 hours after surgery in different studies. Early feeding has provided improved maternal satisfaction, early return of bowel activity and reduced length of hospital stay [11, 12].

Strength and Weakness of the Study

This is the first prospective study in India following the guidelines of ERAS society for the post-operative care of caesarean section. Questionnaire survey of maternal perspective regarding pain relief, satisfaction and feedback about early recovery if done would have added value to this study.

Conclusion

In the COVID era, implementation of ERAS pathway after caesarean section significantly reduced the length of post-operative hospital stay. Implementation of ERAS pathway

has significantly helped in early recovery by reducing duration of fasting, opioid use, early catheter removal, early resumption of bowel activity and early ambulation.

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Compliance with ethical standards

Conflict of interest The author declare that they have no conflict of interest.

Ethical approval This study was approved by Institutional review board and ethics committee.

Informed consent Informed consent was taken from all the participants in the study.

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