Enhanced recovery after elective cesarean sections

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ABSTRACT

Objective: To compare the early recovery after surgery (ERAS) protocol with the conventional one in women undergoing elective CS.

Patients and Methods: The study included 96 women undergoing elective cesarean section for different reasons. They were randomly divided into two groups 48 patients each, Group (A) received the ERAS regimen and Group (B) was managed with the conventional care. Women with major medical or obstetric disorders were excluded.

Results: Cases’ age ranged between 18-35 years without significant difference between groups. Also, gestational age, haemoglobin concentration and platelet count were comparable between groups. Intra and post-operative nausea and vomiting were significantly higher (p value <0.0366) in the control group (8 vs 17). Group A had significantly shorter interval to oral intake, ambulation, first intestinal sound and first motion. Moreover, the need to use opiate for pain control with overall pain scores were significantly lower in study group with significantly better satisfaction rates and shorter hospital stay.

Conclusion: ERAS protocol for women planned for elective CS is effective in controlling perioperative gastrointestinal symptoms, pain control and encourages early ambulation with offering earlier resumption of intestinal motility, higher satisfaction and fewer days of admission.

Key Words: Caesarean section (CS), early recovery after surgery (ERAS)

Received: 26th April 2019, Accepted: 14th June 2019

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ISSN: 2090-7625, November 2019, Vol.9, No. 4

INTRODUCTION

One of the most common major surgeries in the world is Caesarean Section (CS). In many nations, proof exists that an increasing percentage of all CSs account for scheduled or elective surgeries[1]. Despite initiatives to counter this trend, the rate of optional CS continues to grow. CS birth is linked to long hospitalization compared with spontaneous and bulk of females had to remain the hospital for a minimum of two days post a scheduled CS operation[2].

The handling of CS and postoperative care placed a significant strain on the countries’ care and costs. Most of the females in these surgeries are young and fit. They not only have the ability to recover rapidly, but the birth of a fresh child is a distinctive motive to return to ordinary function rapidly. Hospital discharge could possibly halve stay for this women group after the operation and thus significantly reduce care burden and enhance savings for different obstetrical units[3].

The introduction of enhanced recovery (ER) for the scheduled CS to promote early discharge is common. After elective operation, the idea of an enhanced recovery program is not fresh[4]. The purpose of improved recovery is to optimize various patient care elements so that rehabilitation can be improved to facilitate earlier release without decline in patient satisfaction or care quality[5].

The broad acceptance of such management is undoubtedly connected with increasing proof of advantages such as decreased maternal morbidities, shorter hospital admission time and quick return to ordinary daily routine for cases used these improved rehabilitation programs[6]. The National Institute of Health and Care Excellence suggested in UK women recovering well should be freed soon from the hospital (after 24 hours) and followed-up at their homes as this was not connected with further rise of infant or maternal readmissions.

Strategies of ER protocols included trials of the following; good review of pre-conception information to future mothers, proper perioperative hydration as well as nutrition, implementation of minimally invasive surgical techniques wherever applicable, maintain normothermia, avoid postoperative gastrointestinal upset, early urinary catheter removal, adequate pain relief and early postoperative mobilization.
AIM OF THE WORK

The aim of this work is to assess the enhanced recovery protocols versus the standard care in elective cesarean section and to introduce enhanced recovery protocols to Benha University Hospitals to decrease the hospital stay and opioid use.

PATIENTS AND METHODS

This case control study was conducted after being approved from the local ethical committee. All patients enrolled were from those attending Benha University Hospitals for elective caesarean sections in the period between September 2018 and August 2019. The number of patients included in the study was 96 patients presented for elective cesarean section who were classified into 2 groups; the study group included 48 patients who were exposed to the means of enhanced recovery protocols and the control group included 48 patients who were treated with the standard care known in the literature.

Inclusion criteria of pregnant women who attend the assigned hospital for elective caesarean sections and had the following criteria ; primigravida or multiparous women, age between 18 and 35 years old, body mass index (BMI) less than 30, medically free, single intra uterine viable pregnancy and gestational age between 34w+0d and 42w+0d.

Exclusion criteria were age less than 18 or above 35, any maternal medical disease as (diabetes mellitus, hypertension, cardiac diseases, thyroid diseases……etc) either chronic or pregnancy complicated, multiple gestations, any evidence of active maternal or fetal infections, non-sound postoperative history of previous section as post-partum hemorrhage (PPH), history of pulmonary embolism or DVT, history of wound sepsis, history of rupture uterus, ectopic pregnancy or myomectomy and complicated pregnancy as placenta previa or placenta acreta.

All patients will be subjected to thorough clinical evaluation with emphasis on full medical and surgical history will be taken from the patient with special emphasis on the obstetric, gynecological and the menstrual history, general clinical examination, laboratory investigations ; complete blood count (CBC), liver function tests (LFT), kidney function test (KFT), coagulation profile, random blood sugar (RBS) and viral markers (B and C), radiological studies ; trans-abdominal ultrasound examination to assure the dating of the patient and ascertain the gestational age of the fetus and to exclude any abnormalities.

After fulfillment of the above criteria and prerequisites each eligible patient was included in the study either as subject in the study group or control group randomly and after admission to the hospital full pre-operative investigations and blood pressure measurement is done.

Day Before Surgery:

The used protocol was applied on the study group and included; short fasting period (no solid food after midnight or six hours preoperatively), good hydration during the fasting period (drinking two glasses of water before going to bed and two glasses of water before moving to the hospital) and optional carbohydrate loading (for example apple juice). On the other hand, the control group went through complete fasting for 6 hours for solids and fluids of operation time and no carbohydrate loading preoperatively.

Day of Surgery: Preoperative:

The study group received acetaminophen 1 gram orally two hours before surgery, thromboprophylaxis in patients with high risk of DVT and a warming blanket 30 minutes before operation or even wrap the patient in blanket for keeping her warm if active warming blanket is not present, while the control group did not receive pain prophylaxis or warming.

Intra-operative:

Steps of cesarean section are the same for both groups and will be performed as following:

- After aneshtesia, the vagina is washed with iodine and urinary catheterization of the patient was done under complete aseptic conditions as well as TED stocking application.
- Antibiotics administration (Cefazolin 2 gm) prior to skin incision by 15-60 min.
- Skin preparation using chlorhexidine-alcohol preparation.
- Joel Cohen or Pfannenstiel skin incision.
- Sharp extension of the incision through the subcutaneous tissues and the rectus sheath is done as in classical techniques or blunt as in Joel Cohen technique.
- The loose uterovesical peritoneum was identified to create a bladder flap.
- Uterine entry is done by sharp dissection of the lower uterine segment by an incision 23-cm then it is either extended by blunt dissection laterally or sharply by extending the incision by scissors.
- Delivery of the fetus and the placenta.
- Ecbolic is routinely administered after delivery of the baby to minimize the risk of PPH.
Identifying the uterine incision and uterine angles then closure of the uterine layers preferably in 2 layers using Vicryl material sutures in continuous non locking manner. Closure of anterior abdominal wall in layers after achieving adequate haemostasis.

For the study group, we avoided administration of NG tube or it was removed at end of the operation if used. The pre warmed fluids during operation to maintain normothermia throughout operation (at 36.3-38 degrees), short acting anesthetic agents whenever applicable able were used. Dexamethasone 8 mg IV plus Ondansetron 4 mg half hour before incision to guard against post-operative nausea and vomiting were used. Maintenance of euvolemia and minimizing long acting opiates were followed strictly. Injection of subcutaneous tissue and skin and fascia with local bupivacaine was performed for all participants in the study group. All Foley's catheters were removed at end of operation or maximally 3 hours post-operatively.

Postoperative in-patient follow-up:

- VTE risk assessment and thromboprophylaxis by first ambulation within three hours post-operatively for at least six hours per day and following the standard VTE prophylaxis regimens.
- Dietary management: The case was allowed to drink just after exiting OR and food was allowed four hours post-operatively, while the control group started oral fluids after OR discharge by six hours. Ondansetron 4mg IV and/or Promethazine 0.625mg IV was used for nausea and vomiting prevention.
- Pain management: Acetaminophen 1 gm orally or IV every 8 hours. NSAIDS (Voltaren) was given either orally; IM or rectally twice daily if oral intake was not tolerated. In breakthrough pain (defined as pain not responding to treatment for two hours), Morphine 2mg up to 10mg was given IM or IV. Pain score was assessed using the Universal Pain Assessment Tool.
- Early removal of catheter and early ambulation.
- Antibiotics: is given after 12 hours from exiting the or according to the known regimens.

The patient is discharged from the hospital within 24 hours postoperatively after changing the wound dressing and after assessment of her satisfaction score using the satisfaction score assessment tool.
STATISTICAL ANALYSIS

IBM© SPSS© Statistics version 21 (IBM© Corp., Armonk, NY) was used for statistical analysis. The normality of numerically distributed data was tested by Shapiro-Wilk test. Normally distributed ones were shown as mean ± SD and differences between groups were compared using the independent-samples (t-test). Median and inter-quartile range were used to show skewed numerical data and comparisons between groups were performed by the Mann-Whitney U test non-parametrically. Qualitative data were presented in number and frequency. Comparison of the two groups was performed by chi square test or Fisher’s exact test whenever applicable.

RESULTS

The patients are classified into two groups; group A (the study group) included 48 cases who were subjected to means of enhanced recovery after cesarean section and group B (the control group) included 48 cases were offered the standard conventional care used in cesarean section follow-up.

In this study, the comparison between the two groups to find any statistical significance using the following data; demographic data, mean age, mean Hb and platelet count, mean GA, time till 1st oral intake, time till 1st audible intestinal sound, time till 1st ambulation or movement, pain score, satisfaction scores, opiates
used and mean time of hospital stay was carried out. The comparison between both groups showed no statistically significant difference regarding age, gestational age at delivery and preoperative hemoglobin level (Table 1).

The demographic data of the patients in both groups showed that patients’ age ranged from 18-35 years in both groups with statistically non-significant difference regarding the age of both groups. GA at the time of was assessed and showed non-significant statistical difference between the two groups. The preoperative laboratory investigations were done with special concerns were taken towards the patient hemoglobin levels and platelet count and both parameters did not show any significant statistical difference between the two groups. Regarding the type of anesthesia used, the percentage of patient taken spinal anesthesia to those taken general anesthesia was 68.75 %: 31.25 % and 72.9 %: 27.1 % for group (a) and group (b), respectively. (Table 2).

The intra-operative and post-operative nausea and vomiting (IONV and PONV) was significantly less in enhanced recovery after surgery (ERAS) group. Also, the interval time until first oral intake and 1st intestinal sounds was shorter in women who started early oral intake in ERAS protocol. Moreover, women of ERAS program were able to start ambulation in significantly shorter time interval than those conventionally managed.

Regarding the opiates used during the process of recovery for pain control in both groups the overall mean of both groups was 0.25 ± 0.342 amp and 1.156 ± 0.463 amp in group (a) and group (b), respectively, where there was significant statistical difference between the two groups. Furthermore, group A had significantly lower postoperative pain scores, higher satisfaction rates and shorter period of hospital stay.

**Table 1**: Comparison of background characteristics between both groups

<table>
<thead>
<tr>
<th></th>
<th>Group A</th>
<th>Group B</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>25.73 ± 4.79</td>
<td>26.03 ± 5.404</td>
<td>0.735</td>
</tr>
<tr>
<td>Gestational age in days</td>
<td>271.479 ± 6.361</td>
<td>269.229 ± 5.154</td>
<td>0.117</td>
</tr>
<tr>
<td>Hb</td>
<td>10.958 ± 1.122</td>
<td>10.769 ± 0.87</td>
<td>0.358</td>
</tr>
<tr>
<td>Platelet count</td>
<td>240.895</td>
<td>221.542</td>
<td>0.117</td>
</tr>
<tr>
<td>Spinal anaesthesia</td>
<td>68.75 %</td>
<td>72.9 %</td>
<td></td>
</tr>
<tr>
<td>General anaesthesia</td>
<td>31.25%</td>
<td>27.1%</td>
<td></td>
</tr>
</tbody>
</table>

**Table 2**: Comparison between different outcomes of both groups

<table>
<thead>
<tr>
<th></th>
<th>Group (A)</th>
<th>Group (B)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PONV &amp; IONV</td>
<td>0.1667 ± 0.377</td>
<td>0.354 ± 0.483</td>
<td>&lt;0.0366</td>
</tr>
<tr>
<td>Time to 1st oral intake in min</td>
<td>142.083 ± 41.69</td>
<td>375.938 ± 23.94</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Time to 1st intestinal sound in min</td>
<td>249.271 ± 31.72</td>
<td>460.0 ± 54.24</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Time to the first ambulation in min</td>
<td>197.187 ± 35.29</td>
<td>389.27 ± 35.04</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Hospital stay in minutes</td>
<td>841.146 ± 112.5</td>
<td>1356.25 ± 80.43</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Overall pain scores</td>
<td>2.52 ± 0.825</td>
<td>5.146 ± 0.799</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Overall opiate use</td>
<td>0.25 ± 0.342</td>
<td>1.16 ± 0.463</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Overall satisfaction scores</td>
<td>8.229 ± 0.72</td>
<td>5.646 ± 0.76</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>
DISCUSSION

ERAS is an idea that consolidates different proof-based tools of operative care to quicken tolerant recuperation. It equalized perioperative management and accomplished a beneficial enhancement in the nature of care[8].

The particular steps of ERAS regimen vary among responsible caregivers and organizations; however the center standards were always included. These standards include intercessions that are implemented throughout preoperative, intraoperative and postoperative periods. It tends to follow normal reasons that defer understanding convalescence from a medical condition or surgical procedure, for example, insufficient pain management, slow return of gastrointestinal work and deferred ambulation[9].

There has been slower understanding for the advantages of ERAS cesarean delivery. However, with the expanded influence and maternal benefits, a few institutions in Europe started executing ERAS conventions for booked cesarean deliveries, and this idea has as of late begun to pick up fame in USA as well. There are now numerous parts of current routine perioperative considerations for women undergoing CS that matched ERAS components. Obstetric anesthesiologists in UK, in 2013, demonstrated that the idea of ERAS for CS was adapted or about to be executed at their organizations[3].

In the preoperative period, the study participants were told to discard nourishment before admission by six hours preceding the CS and the oral fluid was preceded till two hours before the procedure as the present practice rules for obstetric anesthesia issued by the American Society of Anesthesiologists (ASA). In contrast to the control group where nourishment and fluids were precluded as long as 6 hours before the activity was finished.

The cases were given IONV prophylaxis and PONV prophylaxis where ERAS protocol regimen was given for the study group and with conventional regimen in the control group. Our results revealed significant difference between the two groups; both IONV and PONV were higher in the control group. These results were concordant with what Kumar et al. 2014[10] has published earlier where they also concluded that using ondansetron is better than metoclopramide in preventing PONV with less side effects in contrast to what had Afşargharehbagh et al. 2018[11] published that using ondansetron did not show any superiority over metoclopramide regarding reduction of post CS nausea/vomiting.

In the pre and post-operative care both groups were given antibiotics as guidelines to prevent wound infection as discussed by Smaill et al. 2014[12] and Saeed et al. 2017[13] and the thromboprophylaxis was also administrated as guidelines discussed by Ducloy-Bouthors et al. 2018[14] with no data was drawn to compare between both groups for any significant difference.

According to Huang et al. 2016[15], evidence indicated that early oral hydration promoted the resumption of gastrointestinal functions and early ambulation reduced the infection risk as well as the time interval of breastfeeding start and minimized the length of hospital stay. In the current study, the women were instructed to begin oral intake as soon as possible in the study group and after 6 hours in the control group as conventional maneuver. Our data interpretation showed that the study group participants tolerated well our ERAS protocol with significant reduction in both IONV and PONV, faster resumption in intestinal function activities represented as shorter interval for 1st audible intestinal sounds.

This was in agreement with what Lee et al. 2018[16] published earlier that early postoperative resumption of oral intake raised from 17% to 57% (p 0.001) when ERAS protocol was implemented on cases without adverse outcomes, while according to Teoh et al. 2007[17] they found that earlier solid intake resulted in more nausea (10.2 % versus 2 %, with p-value of 0.033), which was self-limiting. Guo et al. 2015[18] published earlier about comparing delayed oral feeding and early oral feeding, they found that early oral feeding promoted a rapid resumption of intestinal sounds, flatus, bowel motion, and regular oral intake (P<0.001 for all) where they stated that “There are no obvious advantages in withholding fluid and food after cesarean. Indeed, early oral feeding offers some short-term benefits”. These are in contrast to what Mangesi and Hofmeyr, 2002[19] have published earlier in their study where they found no significant differences between time to bowel action/passing flatus between early and late oral intake groups.

Early mobilization improved pulmonary functions, tissue oxygenation and insulin resistance. Moreover, it reduced risks of thromboembolism and length of hospital stay as discussed by Fearon et al. 2005[20]. In the current study, ERAS protocol allowed early mobilization in a significantly shorter interval after OR discharge than the control group. The results drawn from this study were in agreement with the results of Lee et al. 2018[16] who found that the early ambulation raised significantly (p 0.001) from 33% to 51% when ERAS protocols were implemented on women undergoing elective CS.
For post-operative pain analgesia in the study group multi-modal analgesia consisting of NSAIDs, paracetamol with opiates, whenever needed, used in breakthrough pain episodes not responding to analgesia for two hours, in addition of local infiltration of the incision line with bupivacaine, while in the control group opiates analgesia with either NSAIDs or paracetamol only was used.

The mean amount of opiates used was significantly higher in the control group with significantly lower pain score among women included in the case group who received local infiltration anaesthesia as a step of our ERAS protocol. Lee et al. 2018 published similar information that showed that opioid dosage decreased significantly (p < 0.001) from 13.1 mg morphine to 7.7 mg. On the other hand, the use of multimodal analgesia increased (p < 0.001) from 5% to 87%. Furthermore, according to Adesope et al. 2016 revealed that local anesthetic wound infiltration significantly reduced opioid consumption at 24 hours.

Elgohary et al. 2017 compared the pain score between ERAS and conventional care in elective colorectal surgery where they also found significant difference between both groups of their study (p < 0.001), while Meyer et al. 2018 found no significant difference in the pain score with and without ERAS protocols implementation (P value = 0.80).

Satisfaction scores of the patients were done using a scale from 0-10 where 0 was not satisfied at all and 10 was very satisfied, from which the overall mean satisfaction score was significantly higher in ERAS cases than those of conventional one. Nelson et al. 2014 where in their study they concluded also significant difference in satisfaction score between the two groups of study in contrast to what Polle et al. 2007 concluded that the patients’ satisfaction scores were comparable (p = 0.84) between studied groups.

Hospital stay reduction is also one of the goals of ERAS protocols where in this study the mean hospital stay time was found to be 841.14 ± 112.54 min with range from 660 min (11 hours) to 1110 min (18.5 hours) in group (A) and 1356.25 ± 80.43 min with range from 1125 min (18.75 hours) to 1495 min (24.97 hours) in group (B) indicating a significant difference between the two groups of patients. These results were supported by those results published by Pilkington et al. 2016 which showed a decline in the length of hospital stay from three to six days pre-ERAS protocols to be one to five days post use with an average of 2.5 days after implementation of those protocols. Also, Wrench et al. 2015 study has similar results where the percentage of patients sent home on the 1st postoperative day (Day 1) raised from 1.6% in the 1st quarter of 2012 to reach 25.2% in the 1st quarter of 2014.

**CONFLICT OF INTEREST**

There are no conflict of interests.

**REFERENCES**


