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Original Article

Abdominal irrigation during cesarean section: is it beneficial for the control of postoperative pain and gastrointestinal disturbance? A randomized controlled, double-blind trial

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Abstract: Objectives: We aimed to investigate the efficacy of intraabdominal irrigation with warm saline on pain management and gastrointestinal functions in the postoperative period among patients that underwent cesarean section under spinal anesthesia. Material and methods: Ninety-one women who underwent cesarean section under spinal anesthesia were enrolled in our study. Patients were allocated to either the intraabdominal saline irrigation (n: 46) or the no-irrigation (n: 45) groups by simple randomization prior to cesarean section. A standard surgical technique was used for cesarean delivery. After closure of the hysterotomy, routine abdominal cleansing was performed in both of the groups. Irrigation was performed in the experimental group, not simultaneously but after the routine abdominal cleansing, paying strict attention to avoiding contact with the bowels. The patients were questioned regarding complaints of nausea, vomiting, time of passing gas and highest pain scores at the postoperative time periods of 0 to 3, 3 to 6, 6 to 12 and 12 to 24 hours. Results: Intraabdominal irrigation performed in patients after cesarean delivery exhibited statistically significant shorter postoperative flatulence times and longer operation times in our study. Although there is not a statistically significant difference, we found increased nausea-vomiting rates and a greater need for antiemetic drugs in the saline irrigation group compared to the control group. The postoperative VAS scores were similar in the two groups. Conclusions: We do not suggest routine intraabdominal saline irrigation during cesarean section for postoperative pain control and relief of gastrointestinal disturbance. Irrigation may be performed for the purpose of removing the fetal debris in cesarean deliveries with meconium and dense vernix caseosa to avoid meconium/vernix caseosa peritonitis, which have been widely mentioned in the literature.

Keywords: Irrigation, nausea, postoperative pain, spinal anesthesia

Introduction

Cesarean delivery is the most common major operation performed worldwide in daily obstetric practice. Cesarean deliveries account for up to 60% of all births in some countries [1]. The surgical techniques used in cesarean delivery may vary between surgeons. The CORONIS trial is the largest randomized trial evaluating those variates for cesarean section [2]. The following surgical technique pairs were assessed in the CORONIS trial: *(1)* a blunt versus a sharp opening of the peritoneum for abdominal entry; (*2*) extraabdominal versus intraabdominal repair of the uterus; (3) single-layer versus double-layer closure of the uterus; (*4*) closure versus non-closure of the visceral or parietal peritoneum; and (*5*) chromic catgut versus delayed absorbable synthetic (polyglactin-910) sutures for uterine repair. Among the five elements of the cesarean delivery techniques in the intervention pairs, there was no significant difference for the primary outcome, which included maternal death, infectious morbidity, further operative procedures, blood transfusion of more than 1 unit of whole blood or packed cells up to a postpartum period of 6 weeks. Postoperative infections, pain management and gastrointestinal functions are widely investigated in mortality and morbidity research in cesarean delivery using different practices, such as anesthesia techniques [3], skin preparation, local anesthetic wound infiltration [4] vaginal cleansing with povidone-iodine, timing of prophylactic antibiotic administration according to placental delivery time, changing gloves [5, 6], intraabdominal irrigation with saline, and irrigation of subcutaneous tissues. The ineffectiveness of intraabdominal irrigation with saline for postoperative morbidity and pain management was shown in previous studies [7, 8]. In these studies, the results consisted of patients with both general and spinal anesthesia.

In our study, we aimed to investigate the efficacy of intraabdominal irrigation with warm saline on pain management, nausea, vomiting and gastrointestinal functions in the early postoperative period among cesarean-delivered patients only under spinal anesthesia to develop a more homogeneous group compared with prior related articles.

Materials and methods

This randomized study was conducted at the Department of Obstetrics and Gynecology of Fatih Sultan Mehmet Training and Research Hospital between September 2014 and June 2015. The study protocol was reviewed and approved by the human ethics committee of the hospital. All study participants' submitted written informed consent.

Ninety-one pregnant women who were to undergo a lower segment cesarean section with a Pfannenstiel skin incision under spinal anesthesia were enrolled in our study. The exclusion criteria for participations were premature pregnancies (<37 weeks); multiple pregnancies; pregnancy with premature membrane rupture; placenta previa, complicated pregnancies, such as severe preeclampsia; gestational diabetes mellitus; ablatio placenta; intrauterine growth retardation; and oligohidramnios. Patients with any conditions that were contraindicated for spinal anesthesia, such as cardiac diseases, were also excluded. Patients with diabetes mellitus, neurological diseases, systemic vascular disease and a mental disability that may have altered their pain perception were also excluded.

Patients were allocated to one of two groups by simple randomization prior to cesarean section: the intraabdominal saline irrigation (n: 46) or the no irrigation (control, n: 45) group. All of the participants received i.v. cefazolin (1 gr) for antibiotic prophylaxis (Clindamycin was preferred in cases of allergy to penicillin) prior to the start of surgery and 1000 ml of Ringer Lactate solution to prevent hypotension prior to anesthesia induction. Prophylactic antiemetics were not administered to any participants.

Spinal anesthesia was performed by an anesthesiologist in the sitting or lateral decubitus position. Between 7.5 and 10 mg of bupivacaine and 20 mg of fentanyl were administered with a 25-27 G gauge spinal needle into a lumbar (L3-L4 or L4-L5) interspace until it reached the subarachnoid space. Before the injection, the catheter was gently aspirated and checked for the presence of blood or cerebrospinal fluid. All of the patients received routine monitoring, including continuous electrocardiogram, pulse oximetry, and automatic blood pressure.

A standard surgical technique was used for cesarean delivery as described: The Pfannenstiel skin incision was performed, subcutaneous tissues were dissected bluntly with fingers, and the fascia was opened with a scalpel (for a small transverse incision) and scissors (to extend the fascial incision laterally). Separation of the rectus muscles and opening of the peritoneum were made by blunt dissection. The bladder was reflected inferiorly if needed. The hysterotomy was performed with a transverse incision along the lower uterine segment. A small medial transverse incision was made through the myometrium with the scalpel and extended laterally, curving upward with blunt finger dissection. The fetus was extracted with external fundal pressure. Oxytocin was administered, and the placenta was removed after spontaneous separation with gentle traction on the cord. The uterus was exteriorized and the full thickness myometrial incision was closed with a single-layer delayed absorbable synthetic continuous locking suture. After closure of the hysterotomy, all blood clots and other debris, such as vernix caseosa, were manually removed from the anterior and posterior cul-de-sacs and bilateral paracolic areas with the help of sponge-holding forceps. In previous studies, blood clots and other debris were removed simultaneously with the intraabdominal irrigation. However, we performed the intraabdominal irrigation with 1000 ml of warm

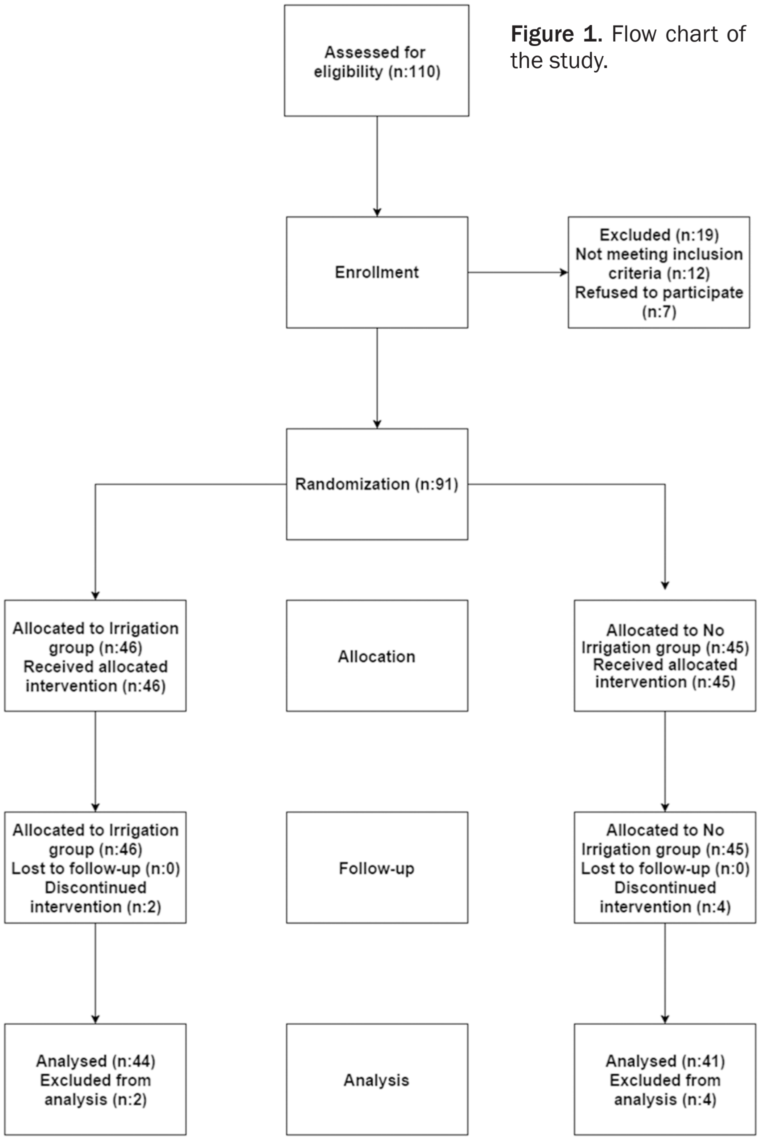

Figure 1. Flow chart of the study.

saline in the experimental group not simultaneously but after the routine abdominal cleansing. A nurse delivered 1000 ml of warm saline to the surgeon, who was blind to the study design and the group assignment, after completion of the routine abdominal cleansing. Thus, we aimed to reduce bias by avoiding extra bowel manipulation by the surgeon during the routine abdominal cleansing. Our study design differed from previous studies in this aspect. Sterile warm saline was poured into the vesicouterine space and aspirated as much as possible by only using an aspirator in the reverse Trendelenburg position, while paying strict attention to avoiding contact with the bowels. Irrigation after routine abdominal cleansing was not performed in the control group.

All of the patients underwent the standard surgical closure technique of the abdominal fascia, with a continuous non-locking synthetic absorbable suture. The subcutaneous adipose layer was closed with absorbable sutures to eliminate the dead space if it had a depth ≥2 cm. The skin was closed with absorbable sutures.

Patients who had perioperative hypotension, hypotension induced nausea, and vomiting were excluded from the study. The presence of perioperative nausea and vomiting was recorded by direct questioning in the recovery room by an independent obstetrician who was blind to the study protocol.

Blood pressure, heart rate, uterine tone, vaginal and incisional hemorrhage, and urine output were monitored closely in the postoperative period, and parenteral nonsteroidal anti-inflammatory drugs were administered every six hours. Patients were informed about the Visual Analog Scale (VAS) Pain Scoring by another independent clinician who was blind to the study protocol. All of the patients were questioned for complaints of nausea and vomiting and the highest pain scores at postoperative time periods of 0 to 3, 3 to 6, 6 to 12 and 12 to 24 hours.

We included only spinal anesthesia patients in our study to assess the most proper pain score beginning from the earliest postoperative period. Previous studies have included patients undergoing both spinal and general anesthesia. All of the patients were encouraged to take adequate oral intake at 2 hours and started mobilization at 6-8 hours post operation. Patients who did not have adequate oral intake and early mobilization were excluded from the

Table 1. Demographic and clinical data of the patients

	Abdominal Washing with Saline		
	Washed (n=44)	Not Washed (n=41)	P
Age (years)	28.68±4.37	29.34±5.05	0.523
BMI (kg/m^2)	30.59±4.21	30.68±2.91	0.908
Gravidity	2.25±0.81	2.51±1.03	0.198
Parity	0.98±0.66	1.05±0.71	0.632
Abortion	0.27±0.50	0.46±0.67	0.140
Gestational Age (weeks)	39.34±0.91	39.46±0.90	0.535
Birth Weight (g.)	3571±409	3407±386	0.062
Pre-op Hb	12.0±0.99	11.9±1.06	0.586
Post-op Hb	11.3±1.00	11.0±1.02	0.265
Pre-op WBC	14.7±3.03	15.4±2.99	0.294
Post-op WBC	14.7±3.03	15.4±2.99	0.294
Operation Time (min.)	41.36±7.12	37.90±7.63	0.033*
Post-op Flatulence Time (hours)	12.93±3.143	16.07±3.677	0.000*

Student's T test, *: P<0.05.

study. Pain during mobilization and postoperative passage of flatus time were questioned. Flatus time was recorded as before or after the mobilization. Return of bowel action was defined as the passage of flatus and tolerance of oral intake of a general diet. A complete hemogram was performed on the first postoperative day.

For statistical analysis, the SPSS 20.0 statistical package was used. Statistical significance was calculated using the Pearson Chi Square test or the Student T test for differences in qualitative variables. Fisher's exact test was used to compare the incidence of nausea, vomiting, need for antiemetic and flatulence before mobilization. Student's T test was used to compare the continuous variables. The 95% Confidence intervals (CIs) are reported throughout. P<0.05 was considered to be statistically significant.

Results

Patients were recruited from September 2014 and June 2015. A total of 110 eligible patients were enrolled, of which 91 met the inclusion criteria and agreed to participate in the study (**Figure 1**). Twelve patients were excluded according to the exclusion criteria: Severe preeclampsia (n: 2), premature membrane rupture (n: 3), gestational diabetes mellitus (n: 3), oligohidramniosis (n: 2), transvers fetal lie (n: 1), and thrombophilia (n: 1). Seven patients refused to participate to our study. Ninety-one patients undergoing cesarean delivery were randomized into the no irrigation group (n: 45) and the irrigation (n: 46) group. Six patients with perioperative hypotension induced nausea and vomiting (n: 3), less than adequate oral intake (n: 1) or early mobilization (n: 2) discontinued the intervention. The remaining 85 patients were included in the statistical analysis.

The demographic and clinical data of the patients are given in **Table 1**. The baseline characteristics of the participants were similar, and no statistically significant difference was found between the groups. The clinical data and operative factors were similar for both of the groups except the operation time and postoperative flatulence time.

The operation time was found to be statistically longer in the saline irrigation group (41.36±7.12 min) than in the control group (37.90±7.63 min). The postoperative flatulence time was found to be statistically shorter in the saline irrigation group (12.93±3.143 hour) than in the control group (16.07±3.677 hour) (**Figure 2**).

There were no significant differences in the distribution of indications for the cesarean delivery between the two groups (**Table 2**).

The postoperative VAS scores of the two groups are summarized in **Table 3**. There were no significant differences between the groups.

Intraoperative and postoperative emesis, vomiting and the need for antiemetic drugs were shown in **Table 4**. In the study group, intraoperative and postoperative maternal gastrointestinal disturbances and the need for antiemetic drugs were higher than in the no irrigation group. However, this difference did not reach statistical significance.

Flatulence before postoperative mobilization was found to be similar in both groups.

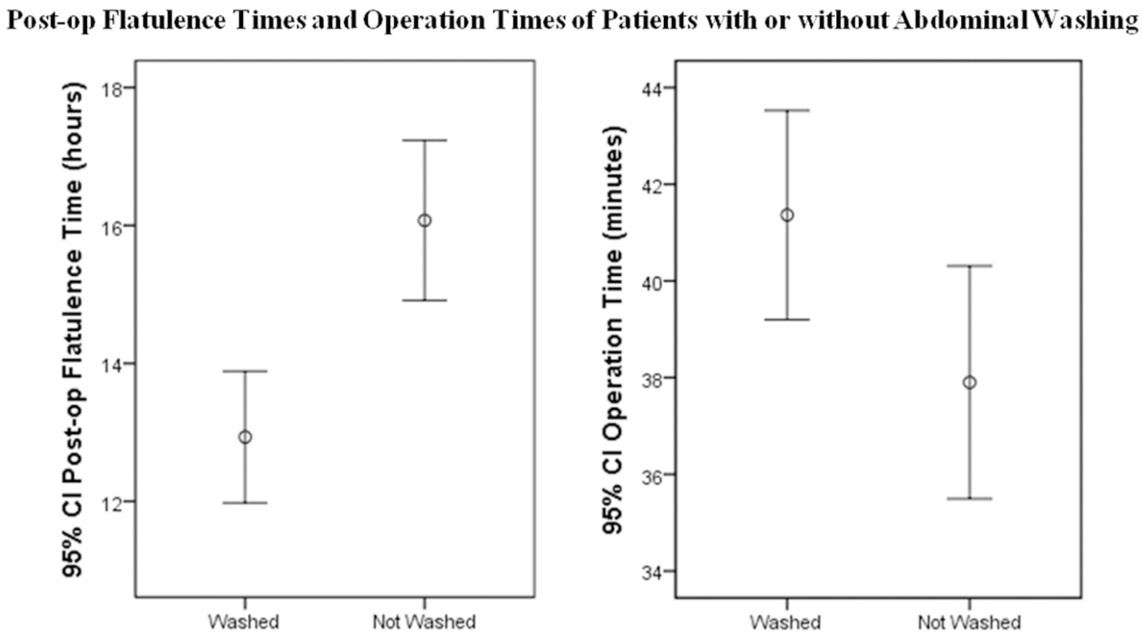

Figure 2. Post-op flatulence times and operation times of the study group and control group.

Table 2. Indications of cesarean section and abdominal washing cross tabulation

	Abdominal Washing with Saline		
	Washed	Not Washed	Total
Previous Cesarean	29	25	54
Dystocia	2	4	6
Breech Presentation	5	3	8
Macrosomia	8	5	13
Failed Induction	0	4	4
Total	44	41	85

Pearson Chi Square test, P=0.195.

Table 3. VAS scores of the patients with or without abdominal washing

	Abdominal Washing with Saline		
	Washed (n=44)	Not Washed (n=41)	P
VAS 0-3	3.45±1.130	3.32±.934	0.544
VAS 3-6	4.20±.851	3.95±.773	0.156
VAS 6-12	5.14±.979	5.29±1.101	0.490
VAS 12-24	3.20±.795	3.39±.833	0.296
VAS 24-48	2.50±.849	2.54±.840	0.842
VAS MOB	4.98±1.438	5.29±1.365	0.303

Student's T Test.

Discussion

Intraabdominal irrigation with warm saline in cesarean deliveries with spinal anesthesia exhibited statistically significant shorter post-operative flatulence times and longer operation times in our study. Although there is not a statistically significant difference, we also found increased nausea-vomiting rates and the need for antiemetic drugs in the saline irrigation group compared to the control group. The post-operative VAS scores were found to be similar in the two groups.

Postoperative pain management is very important regarding the early recovery of bowel functions, paralytic ileus prevention, managing intraabdominal and incisional surgical site infection, avoiding pulmonary, thromboembolic complications and even maternal morbidity and mortality. Prevention of postoperative complications, particularly pain, ileus and infections, are widely researched in the literature. Intraabdominal irrigation with normal saline; antibiotics; antiseptic solutions, such as chlorhexidine and povidone-iodine; preoperative mechanical bowel preparation; elective postoperative nasogastric tube decompression; early oral intake; and chewing gum are the studied methods for the prevention of postoperative pain, intraabdominal and skin infec-

Table 4. Intra/Post-operative nausea, vomiting, need for antiemetics and flatulence before post-op mobilization

	Abdominal Washing with Saline			
	Washed	Not Washed	RR	P
Intra-op Nausea	13 (29.5%)	8 (19.5%)	1.514	0.284‡
Intra-op Vomiting	12 (27.3%)	7 (17.1%)	1.597	0.259‡
Intra-op Need for Antiemetic	13 (29.5%)	8 (19.5%)	1.514	0.284‡
Post-op Nausea	13 (29.5%)	7 (17.1%)	1.731	0.176‡
Post-op Vomiting	6 (13.6%)	4 (9.8%)	1.398	0.740†
Post-op Need for Antiemetic	10 (22.7%)	4 (9.8%)	2.330	0.107‡
Flatulence Before Mobilization	3 (6.8%)	1 (2.4)%	2.795	0.617†

‡Pearson Chi-Square Test; †Fisher's Exact Test.

tions, and recovery of bowel functions [9-13]. Cesarean section is the main surgery performed in obstetric departments [1]. The cesarean delivery rates in many parts of the world are increasing due to various causes, including advanced maternal age, maternal request, socioeconomic status of the community, and doctor preference to avoid the complications of vaginal delivery because of legal issues in the obstetric departments [14]. Although cesarean section seems to be an innocent surgery or delivery method by the patients, obstetricians know that it is a major cause of maternal morbidity and mortality. Cesarean deliveries were preferred in our study for the following reasons: First, cesarean section is the most common operation in obstetric clinics. Second, management of postoperative complications has become more important with the increased cesarean rates. In our study, normal saline was preferred as the intraabdominal irrigation solution because it is easy to provide, cost effective and the most commonly used solution among surgeons [11]. Unlike in previous studies, the irrigation process was not performed simultaneously, but immediately after the routine removal of the blood clots and other debris by tampon monte. Aspiration was performed by an aspirator in the reverse Trendelenburg position with strict attention being paid to avoid contact with the bowels. In the literature, it is shown that intraabdominal irrigation with saline has no beneficial effect on postoperative pain, morbidity and intestinal passage [7, 8, 15-17]. Keblawi et al. (n=21, study group; n=19 control group) showed that saline irrigation had no effect on morbidity and the need for postoperative analgesia. Moreover, it caused an increase in body temperature [7]. Harrigill et al. (n=97, study group; n=99, control group) showed that saline irrigation had no effect on estimated blood loss, operation time, incidence of intrapartum complications, hospital length of stay, return of gastrointestinal function, incidence of infectious complications, or neonatal outcomes. They do not suggest performing abdominal saline irrigation on the low-risk population [8]. Similar to the literature, we showed a statistically significant prolonged operation time in the saline irrigation group [8, 15]. We conclude that a prolonged operation time may result in an additional irrigation and changing the position of the patient for proper aspiration. This result is one of the disadvantages of abdominal saline irrigation. Viney et al. (n=110, study group; n=126, control group) determined intraoperative nausea in 46% of the study group and postoperative nausea in 22.7% of the study group. Saline irrigation increased nausea by peritoneal irritation, but showed no benefit for morbidity. Therefore, saline irrigation is not routinely recommended [15]. Similarly, Temizkan et al. showed no benefit of saline irrigation, considering increased nausea in both the intraoperative and postoperative periods, in their large study including 430 patients [16]. In these studies, patients who underwent both general anesthesia and spinal anesthesia were included. It is previously shown that postoperative nausea is more common in patients who underwent general anesthesia (particularly with volatile anesthetics, such as sevoflurane or desflurane) compared to other anesthesia methods [18, 19]. Therefore, our study included patients who underwent only spinal anesthesia to for a homogenous group to compare nausea-vomiting rates and pain scores. The intraoperative nausea rate was 28%, and the postoperative nausea rate was 20% in our study. We think that this relatively lower nausea rate compared to previous studies may be correlated to the preference for spinal anesthesia alone and to paying strict attention to avoid contact with the bowels. Lower nausea rates may be achieved by using less saline than 1000 ml by diminishing the mechanical bowel impulse that arises from a redundant volume burden. The irrigation volume may be adjusted to the features of the patient, such as weight or body mass index. In our study, the postoperative nausea and vomiting rate was 25%, similar to previous studies in the literature [20, 21]. Postoperative pain management is important for patient comfort. We also aimed to assess the effect of intraabdominal irrigation on pain scoring at postoperative sequential time intervals and during mobilization. In our study, all of the patients in both groups had routine abdominal cleansing from blood clots and other debris after uterine closure. In addition, we aimed to remove blood clots and other debris that remained after the routine cleansing (meconium, vernix caseosa and residual amniotic fluid) at higher rates by intraabdominal saline irrigation. Postpartum abdominal pain cases relevant to meconium, vernix caseosa and residual amniotic fluid were reported in the literature [22, 23]. It has previously been described that there is no difference between spinal anesthesia and general anesthesia for postoperative pain scores [24]. Including patients who underwent only spinal anesthesia in our study provided the opportunity to have higher patient compliance and a better assessment for VAS scoring from the beginning of the early postoperative period. We also did not reveal statistically significant differences in the postoperative pain scores, similar to the literature [7, 15]. The highest pain scores in the first 6 hours of the early postoperative period were slightly higher in the saline irrigation group. However, there was no statistically significant difference compared with the control group. Despite observing an increase in the highest VAS scores at 6-12 hours post operation in both groups, there was no significant difference. We conclude that the increase in pain scores may be due to the eventual disappearance of the spinal anesthesia effect. In our study, there was no significant difference in the highest pain scores during the first moment of mobilization between the groups. We did not encounter any significant results regarding pain scores during the first postoperative mobilization. There was no statistically significant difference between the highest pain scores beginning from the 6th postoperative hour and the pain scores during the first mobilization among the groups. However, the saline irrigation group showed slightly lower pain scores. Postoperative ileus is a common complication among all abdominal surgical procedures. It causes discomfort, anxiousness and pain in the patients and also increases the direct cost of hospitalization and duration of the hospital stay. The beneficial effects of early adequate oral intake [25] and gum chewing [26] after cesarean delivery on restoring postoperative bowel activity have been shown previously. Bowel functions recover earlier in patients receiving spinal anesthesia than in those receiving general anesthesia. It is previously reported that intraabdominal saline irrigation during cesarean delivery has no significant effect on recovering the bowel functions [15, 16]. All patients were started on early oral intake in our study. We found that the time of first flatus was significantly shorter in the saline irrigation group than in the control group. In our opinion, the shorter first flatus time in the saline irrigation group was the consequence of paying strict attention to avoiding contact with the bowels to prevent paralytic ileus and of using a warm irrigation solution close to body temperature. A literature comparison revealed that the first flatus time of both groups in our study was shorter than in prior studies [25, 27, 28]. In our opinion, the shorter time of flatus passage may be associated with choosing spinal anesthesia as the anesthesia method and not using opioid agents as an analgesic. The strengths of this study include the randomized, double-blind, controlled design and the consistency resulting from the administration of only one type of anesthesia. The weaknesses of this study were the small sample size and irrigation without adjustments of the saline volume based on body structures, such as body mass index or weight of the patients.

In conclusion, we do not suggest routine intraabdominal saline irrigation during cesarean delivery for postoperative pain control. Irrigation may be performed for the purpose of removing the fetal debris in cesarean deliveries with meconium and dense vernix caseosa to avoid meconium/vernix caseosa peritonitis, which have been widely mentioned in the literature. Perioperative nausea and vomiting can be observed during intraabdominal irrigation. Administration of a prophylactic antiemetic drug and forewarning the anesthesiologist of pulmonary complications due to potential intraoperative vomiting may be important for improved clinical morbidity.

Disclosure of conflict of interest

None.

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