

Early versus delayed oral feeding after cesarean delivery under different anesthetic methods – a randomized controlled trial

Anesthesia, feeding in cesarean delivery

Wczesne versus opóźnione odżywianie po cięciu cesarskim z różnymi metodami znieczulenia – badanie randomizowane

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Abstract

Objective: The aim of the study was to evaluate the safety and efficacy of early feeding after cesarean delivery under different anesthetic methods.

Study design: Two hundred women with elective cesarean delivery were randomly assigned to early oral feeding (EOF) or routine oral feeding (ROF) groups. EOF patients were informed that they could begin taking fluids orally (regime I) as soon as 2 hours after the delivery and then gradually progress to solid foods (regime III), if tolerated. ROF patients were informed that they could start regime I right after bowel sounds were heard on examination and then gradually move on to regime III. Hospitalization time and total time to ambulation (primary outcomes), gas-stool discharge time and onset of bowel sounds (secondary outcomes) were compared in groups A [EOF patients after regional anesthesia (n=49)], B [EOF patients after general anesthesia (n=48)], C [ROF patients after regional anesthesia (n=47)] and D [ROF patients after general anesthesia (n=48)].

Results: There were significant differences in primary and secondary outcomes between group A and the remaining groups, especially group D. The status of patients from group B was not better than group C. In fact, the latter were discharged home sooner and passage of gas, as well as initiation of regime I occurred earlier as compared to the former.

Conclusions: Cesarean section under regional anesthesia and encouragement of oral feeding 2 hours after the operation should be recommended in order to achieve postoperative recovery and early hospital discharge. Routine oral feeding (right after bowel sounds are heard on examination) after cesarean section under general anesthesia should be the last choice.

Key words: **ambulation time / cesarean delivery / early oral feeding / general anesthesia /**

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Streszczenie

Cel: Celem badania była ocena bezpieczeństwa i skuteczności wczesnego włączenia odżywiania po cesarskim wykonanym przy różnych metodach znieczulenia.

Do badania włączono 200 kobiet po elektywnym cięciu cesarskim. Po randomizacji pacjentki przydzielano do grupy wczesnego odżywiania dojelitowego (EOF) lub grupy zwykłego włączania jedzenia (ROF). Pacjentkom z grupy EOF pozwolono pić płyny już 2 godziny po porodzie (reżim I) a następnie stopniowo przechodzić do pokarmów stałych (reżim III). Pacjentki z grupy ROF mogły rozpocząć odżywianie wg reżimu I gdy w badaniu osłuchiwanym obecna była perystaltyka a następnie stopniowo przechodzić do reżimu III. Czas hospitalizacji, całkowity czas do uruchomienia (pierwotny punkt końcowy), czas do oddania gazów i stolca i czas do rozpoczęcia perystaltyki (wtórny punkt końcowy) porównano pomiędzy grupami A [pacjentki EOF ze znieczuleniem przewodowym, n=49], B [EOF ze znieczuleniem ogólnym, n=48], C [ROF ze znieczuleniem przewodowym, n=47] i D [ROF ze znieczuleniem ogólnym, n=48].

Wyniki: Zaobserwowano istotne różnice pomiędzy grupą A a pozostałymi grupami, zwłaszcza grupą D, w odniesieniu do pierwotnego i wtórnego punktu końcowego. Status pacjentek z grupy B nie był lepszy niż z grupy C. W rzeczywistości pacjentki z grupy C były zwalniane do domu wcześniej, również pasaż gazów i włączenie diety wg reżimu I następowały wcześniej niż w grupie B.

Wnioski: Cięcia cesarskie ze znieczuleniem przewodowym i włączeniem odżywiania 2 godziny po operacji powinny być zalecane ze względu na szybszą rekonwalescencję oraz wczesny wypis ze szpitala. Jako ostatnie powinno się wybierać cięcia cesarskie ze znieczuleniem ogólnym i rutynowym włączeniem odżywiania po usłyszeniu perystaltyki jelit.

Słowa kluczowe: **czas uruchomienia / cięcie cesarskie / wczesne odżywianie /
/ znieczulenie ogólne / czas hospitalizacji / znieczulenie przewodowe /**

Introduction

Cesarean delivery is a type of laparotomy and decades-old approaches are used in many obstetric clinics concerning initiation of oral feeding after the operation. Normal diet is not begun until bowel movement is heard or gas discharge occurs [1, 2]. However, from a surgical point of view, bowel manipulation during cesarean delivery almost never takes place and peritoneal irritation occurs significantly less often as compared to other laparotomy procedures. Besides, mothers should be discharged from the hospital as soon as possible for reasons such as fewer nosocomial infections, faster bonding of the newborn with the family members, and lastly, economic advantages due to lower costs of the hospital stay [3]. Randomized controlled trials (RCTs) showed that hospitalization was significantly shorter in case of women after early hydration [4, 5]. Not only early hydration, but also early initiation of oral nutrition was found to be related to early hospital discharge and less need for injectable narcotics for relieving postoperative pain [6]. Also, early nutrition has been reported to decrease post-operative metabolic stress response, regress ileus symptoms and to lower the morbidity rates [7].

Unfortunately, study populations were not ideally homogeneous in previous RCTs as patients with history of cesarean sections and unprogressive vaginal labor were also included.

Previous cesarean deliveries or long, unprogressive period before cesarean section may affect time to ambulation and time to hospital discharge [4, 5]. Some studies evaluated only patients who underwent cesarean delivery under general anesthesia [8], while others included only patients after cesarean delivery under regional anesthesia [4].

The aim of our study was to evaluate the effects of early oral feeding on time to ambulation, length of hospitalization and

to determine the impact of early feeding on the development of complications such as wound infection and gastrointestinal symptoms in a relatively homogeneous patient population, i.e. only in patients with elective cesarean delivery. The effects of anesthetic methods (regional vs. general) on these variables were also evaluated in order to determine optimal anesthetic method and optimal oral feeding time in elective cesarean deliveries. To the best of our knowledge, the literature offers no other reports on types of anesthesia vs. oral feeding time and their influence on postoperative patient recovery.

Material and methods

This prospective-randomized study was carried out at the Dokuz Eylul University, Medical Faculty Hospital, Department of Obstetrics and Gynecology, between June 2007 and July 2010. A total of 452 cesarean procedures were performed at the time of the study.

Inclusion criteria were: elective cesarean for cephalopelvic disproportion and no history of surgical operations (including cesarean sections). Exclusion criteria were the following: additional systemic diseases (diabetes mellitus, thyroid dysfunction, heart and kidney disorders, etc.), labor pains, pregnancy induced hypertension, preeclampsia, and high-risk placental anomalies (placenta previa and ablation placenta).

Informed consent was obtained from 200 patients deemed eligible for the study at 38-39 weeks gestation. The women were randomly assigned to one of the two study groups, 'early oral feeding' (EOF) or 'routine oral feeding' (ROF) at 37 weeks of gestation after establishing cesarean section as the birth plan. EOF patients were informed that they could begin taking fluids orally (regime I) any time after being taken to their rooms and then gradually progress to solid foods (regime III), if toler-

ated. ROF patients were informed that they could start regime I right after bowel sounds were heard on examination and then gradually move on to regime III. Both groups were again computer randomized so that 50 patients in each group underwent surgery under general anesthesia and 50 patients were subjected to regional (spinal) anesthesia. All patients underwent elective cesarean delivery after 8 hours of fasting. The cesarean section was performed with the Pfannenstiel incision and the uterus was transacted with the lower segment incision. Single-dose prophylactic cephazolin -sodium 1g (Cefamezin[®], Eczacibasi, Istanbul, Turkey) was administered after the newborn was taken out. Placenta and annexes were delivered and oxytocin 2IU (Synpitanfort[®], Deva, Istanbul,

Turkey) and methylergobasine 0.2 mg im (Metiler[®], Abbott Ilac, Istanbul, Turkey) was given at that time. The uterine incision was sutured continuously within the abdominal cavity, without taking out the uterus. All patients were monitored in the IC room during the first 2 hours postoperatively. Patients with no additional problems or complications were transferred to a normal ward and received instructions on early or routine oral feeding, according to their randomized group. Bowel sounds were checked every 30 minutes over the 4 quadrants by a doctor and gas-stool discharge was also monitored.

All patients were interviewed about the onset of bowel sound, gas-stool discharge time, time to ambulation (movement in and outside the hospital room), hospitalization period, regime I and regime III tolerance time, occurrence of nausea/vomiting, distension and development of wound infection. Out of 200 patients, 3 in the EOF group and 5 in the ROF group were excluded from the study as they failed to meet the inclusion and exclusion criteria. Intraoperative bleeding was >1000 ml in 6 patients and high degree of pelvic adhesions was found in 2 patients who were excluded from the analysis.

Patients in the EOF and ROF groups were examined for the investigated variables. IBM SPSS 20 program was used during the examination. Mann Whitney-U test was used since constant variables were not distributed normally according to the Shapiro-Wilk test. Median (quartiles) values were given as definitive statistics. For the categorical variables, Pearson, Continuity Corrective and Fisher's Exact Chi-Square tests were used. Numbers (n) and percentages (%) of cases were given. EOF patients with regional anesthesia (n=49) constituted group A, EOF patients with general anesthesia (n=48) - group B, ROF patients with regional anesthesia (n=47) - group C, and ROF patients with general anesthesia (n=48) - group D. Patients in groups A, B, C and D were investigated using Kruskal Wallis Test. P- value of <0.05 was considered as statistically significant. Figure 1 shows the CONSORT E- flowchart. Dokuz Eylul University Ethics Committee approved the study protocol. All participants gave their fully informed consent.

Results

No difference was detected between EOF vs. ROF patients in terms of age, body mass index (BMI), cesarean indication and gestational age (Table I). Passage of gas (17h vs. 20.5h), passage of stool (30h vs. 35h), initiation of regime I (4.5 vs. 10), and initiation of regime III (31h vs. 33h) occurred significantly earlier in EOF patients ($p<0.001$). Also, ambulation and discharge from hospital occurred earlier (14h vs. 15h, $p=0.001$ and 31h vs. 34.2 h,

$p<0.001$, respectively) in EOF patients. No significant difference was detected between the two groups in terms of wound infection, rate of gastrointestinal symptoms (nausea, vomiting, abdominal distension) and duration of surgery (Table II).

Regional anesthesia was administered to 49 of the 97 patients from the EOF group. In order to determine only the role of oral feeding time in patients after cesarean delivery under regional anesthesia, results of the 49 patients who were administered regional anesthesia in the EOF group were compared with those of the 47 patients who received regional anesthesia in the ROF group. Thus, when only the patients after underwent cesarean delivery under regional anesthesia were evaluated, return of the bowel movements ($p<0.001$), passage of stool ($p=0.01$), time to ambulation ($p=0.01$), initiation of regime I ($p<0.001$) and regime III ($p=0.003$) occurred significantly earlier in EOF patients (Table III).

Cesarean delivery under general anesthesia was performed in 48 of the 95 patients in the ROF group. In order to determine only the role of oral feeding time in patients after cesarean delivery under general anesthesia, results of the 48 patients who were administered general anesthesia in the ROF group were compared with those of the 48 patients who received general anesthesia in the EOF group. Thus, when the results of patients who received only general anesthesia during cesarean delivery were taken into account, return of bowel movements, passage of gas and stool occurred later ($p<0.001$) in ROF patients. Regime I ($p=0.003$) and regime III ($p=0.007$) initiation, as well as the hospitalization period ($p=0.02$) were also delayed (Table IV).

Statistically significant results related to the investigated variables in patients from groups A, B, C and D are also shown in Table V.

Discussion

Cesarean delivery rates increase gradually, especially in the developed countries. Prevalence of cesarean delivery in the United States in 2009 was reported to be 32.3%, with a 2% increase as compared to the previous year [9]. Since cesarean is a surgical type of delivery and necessitates laparotomy, the duration of the hospitalization period, adaptation of the mother and the newborn and return to normal life differ as compared to normal deliveries [10]. On the other hand, in elective as well as emergency cesarean sections the costs increase with the length of the hospitalization period. Therefore, early normal feeding, early mobilization and self-sufficiency as soon as possible is encouraged in patients after cesarean delivery. A steadily growing number of studies suggest earlier oral feeding after cesarean delivery in spite of the classic view, i.e. 'starting oral feeding after return of bowel movement following an uncomplicated surgery' [1]. There are reports recommending oral feeding initiation as early as 2-8 hours after the surgery [4, 11, and 12].

However, returning to normal life for patients after cesarean delivery is not only related to oral feeding time. 'There is marked loss of tonus and almost complete inhibition of both rhythmic and peristaltic contractions in gastrointestinal system after operations done under general anesthesia' - that phrase is one of the first teachings every surgeon encounters [13]. Besides, bowel functions can be delayed and hospital stay can be prolonged due to intra- abdominal adhesions that may develop after previous surgeries [1].

Figure I. Consort E-flowchart.

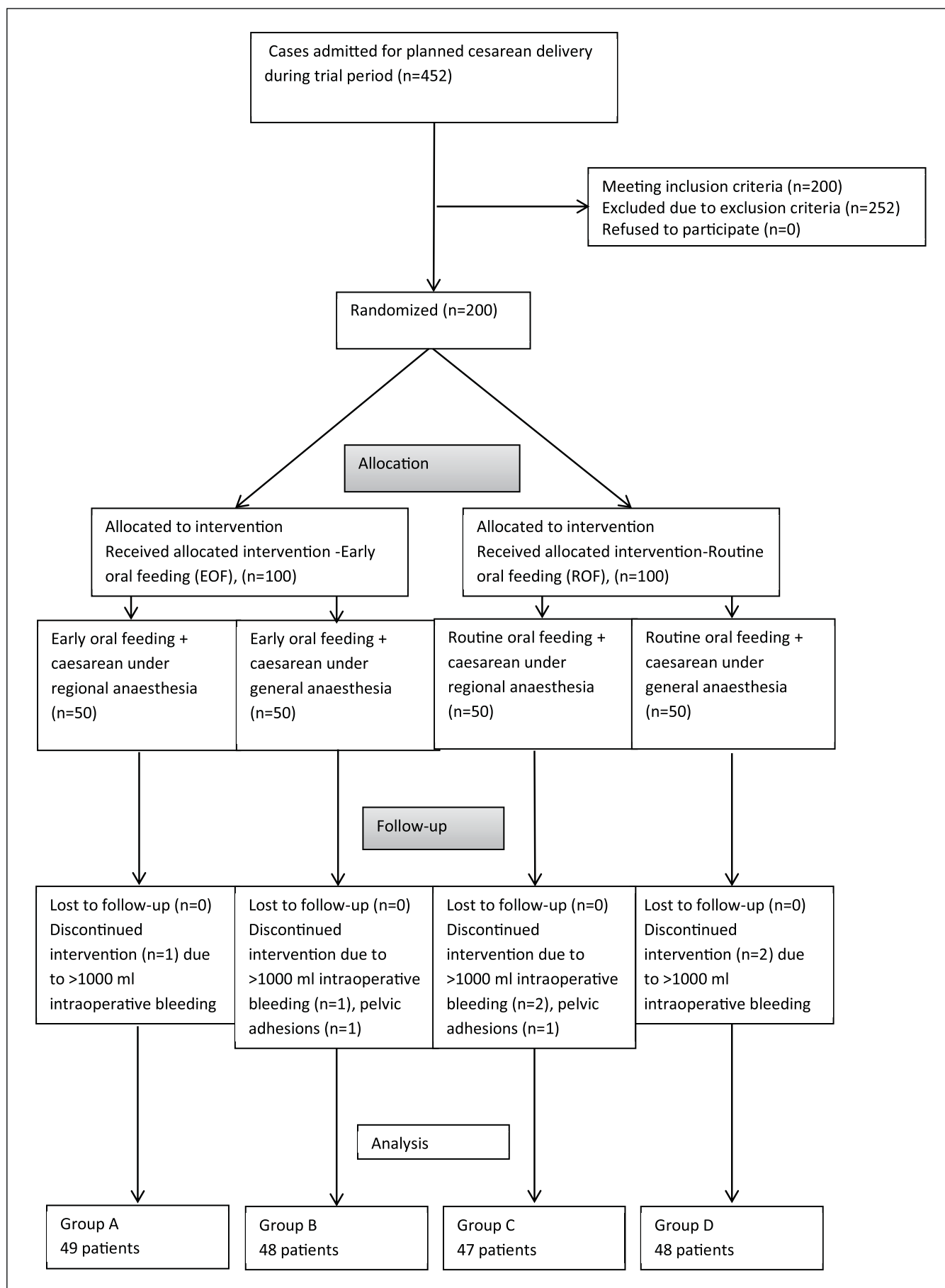


Table I. Demographic characteristics of patients in the EOF and ROF groups.

	EOF group (n:97)	ROF group (n:95)	P value
Age (years)	29 (26-31)	28 (26-30)	0.900
Body mass index, (kg/m ²)	25.5 (24-27)	25 (24-27)	0.800
Gestational week	39 (38-40)	39 (38-40)	1.000
Cesarean indication			
1. Elective	55	53	0.900
2. Cephalopelvic disproportion	42	42	1.000

Values are given as median (quartiles), P-value <0.05 was considered statistically significant.
Abbreviations: EOF – early oral feeding; ROF – routine oral feeding

Table II. Clinical characteristics of patients in EOF vs. ROF groups during and after cesarean delivery.

	EOF group (n:97)	ROF group (n:95)	P value
Duration of surgery, min.	48 (37-56)	52 (36-63)	0.800
Return of bowel movements, hour	6 (5-8)	10.5 (8.6-11.5)	<0.001
Passage of flatus after surgery, hour	17 (16-18)	20.5 (18-22)	<0.001
Passage of feces after surgery, hour	30 (27.5-31)	35 (31-37)	<0.001
Time to ambulation after surgery, hour	14 (13-15)	15 (14-16)	0.001
Regime I initiation after surgery, hour	4.5 (4-5)	10.5 (8.6-11.5)	<0.001
Regime III initiation after surgery, hour	31 (28.1-33)	33 (31-34)	<0.001
Length of hospital stay, hour	31 (28-34)	34.2 (33-36)	<0.001
Wound infection	2 (2)	2 (2)	1.000
Gastrointestinal symptoms:			
Nausea	19 (20)	13 (13)	0.300
Vomiting	8 (8)	5 (5)	0.500
Distension	6 (6)	3 (3)	0.500

Continuous values are given as median (quartiles), categorical values are given as number (percentage); P-value <0.05 was considered statistically significant. Abbreviations: EOF - early oral feeding; ROF - routine oral feeding

Table III. Clinical characteristics of patients in the EOF vs. ROF groups during and after caesarean delivery under regional anesthesia.

	EOF group A (n:49)	ROF group C (n:47)	P value
Duration of surgery, min.	47 (38-61)	48 (36-57)	0.900
Return of bowel movements, hour	5.1 (4.5-6)	8 (6.8-9)	<0.001
Passage of flatus after surgery, hour	17 (15.3-18)	17 (16.3-18)	0.200
Passage of feces after surgery, hour	29 (26-30.6)	30 (28-33)	0.010
Initiation of ambulation after surgery, hour	13 (12.5-15)	14 (13.3-16)	0.010
Regime I initiation after surgery, hour	4 (4-5)	5 (4.5-6)	<0.001
Regime III initiation after surgery, hour	29.5 (26-33)	32 (30.7-34)	0.003
Length of hospital stay, hour	31 (26.7-34)	32.5 (28.5-34)	0.100
Wound infection	0 (0)	1 (2)	0.300
Gastrointestinal symptoms:			
Nausea	9 (20)	6 (13)	0.100
Vomiting	3 (6)	2 (4)	0.500
Distension	2 (4)	1 (2)	0.500

Mann Whitney-U test; Continuous values are given as median (quartiles), categorical values are given as number (percentage); P-value <0.05 was considered statistically significant. Abbreviations: EOF, early oral feeding; ROF, routine oral feeding

Table IV. Clinical characteristics of patients in the EOF vs. ROF groups during and after caesarean delivery under general anesthesia.

	EOF group B (n:48)	ROF group D (n:48)	P value
Duration of surgery, min.	45 (38-57)	43 (36-53)	0.800
Return of bowel movements, hour	8.7 (7.8-9.6)	11.2 (10.5-12.5)	<0.001
Passage of flatus after surgery, hour	19 (17-21)	21 (20-22.1)	<0.001
Passage of feces after surgery, hour	31 (30-36)	36 (33.8-36)	<0.001
Initiation of ambulation after surgery, hour	14.5 (13-15.6)	13 (14-16)	0.100
Regime I initiation after surgery, hour	9.1 (7.8-9.9)	11.4 (10.8-12.7)	0.003
Regime III initiation after surgery, hour	32 (29.8-34)	33 (32-35)	0.007
Length of hospital stay, hour	34 (32-35)	35 (34-37)	0.020
Wound infection	2 (4)	1 (2)	0.400
Gastrointestinal symptoms:			
Nausea	10 (20)	7 (14)	0.300
Vomiting	5 (10)	3 (6)	0.400
Distension	4 (8)	2 (4)	0.500

Mann Whitney-U test; Continuous values are given as median (quartiles), categorical values are given as number (percentage); P-value <0.05 was considered statistically significant. Abbreviations: EOF - early oral feeding; ROF - routine oral feeding.

Table V. Statistical differences in groups A, B, C, D related to each other during and after caesarean delivery.

Groups	Group A (n=49)	Group B (n=48)	Group C (n=47)	Group D (n=48)
Duration of surgery, min	-	-	-	-
Return of bowel movements, hour	B	<0.001		
	C	<0.001	ns	
	D	<0.001	<0.001	<0.001
Passage of flatus after surgery, hour	B	<0.001	0.005	
	C	ns		
	D	<0.001	0.004	<0.001
Passage of feces after surgery, hour	B	<0.001		
	C	ns	ns	
	D	<0.001	0.01	<0.001
Initiation of ambulation after surgery, hour	B	ns		
	C	ns	ns	
	D	<0.001	ns	ns
Regime I initiation after surgery, hour	B	<0.001		<0.001
	C	ns		
	D	<0.001	0.002	<0.001
Regime III initiation after surgery, hour	B	0.030		
	C	0.040	ns	
	D	<0.001	0.040	0.030
Length of hospital stay, hour	B	<0.001		0.010
	C	ns		
	D	<0.001	ns	<0.001
Wound infection	ns	ns	ns	ns
Gastrointestinal symptoms:				
Nausea	ns	ns	ns	ns
Vomiting				
Distension				

Kruskal Wallis Test; P-value <0.05 was considered statistically significant.

In light of that fact, we investigated only patients with no history of abdominal surgery, including cesarean section. This homogeneous study population is one of the greatest advantages of our study.

After investigating the effect of EOF and ROF first, we evaluated also the effect of anesthetic method (regional vs. general) on return to normal life and postoperative recovery following cesarean delivery. Our aim was to detect optimal time for initiating oral feeding and optimal anesthetic method in patients deemed to undergo their first cesarean delivery. Therefore, we not only compared time to oral feeding after the delivery but also compared the effect of anesthesia on the investigated variables, hoping to obtain the most suitable time for oral feeding with the most optimal anesthetic method in cesarean deliveries.

Unlike other studies in the literature [5, 8], EOF patients were informed that they could begin regime I any time after being taken into their rooms and then gradually progress to regime III, if tolerated. The goal was for the patients to transition to regime III as soon as possible. In a study by Soriano et al. [12], transition to normal diet and return of bowel movement was reported to occur earlier in patients who started high protein diet 6 hours postoperatively. Patolia et al. [11], started early oral feeding 8 hours postoperatively following cesarean section and noted earlier hospital discharge in these patients. In our study, return of bowel movements (6h vs. 10.5h), passage of gas (17h vs. 20.5h), passage of stool (30h vs. 35h), initiation of regime I (4.5h vs. 10.5h), and initiation of regime III (31h vs. 33h) occurred earlier and length of hospital stay (31h vs. 34.2h) was shortened after early oral feeding (Table II).

In order to exclude the effect of the anesthetic method, results obtained from 96 patients who underwent cesarean section under regional anesthesia (49 patients in EOF and 47 patients in ROF) were evaluated separately (Table III).

Our results in that group of patients were similar to those obtained by Mulayim et al. [4], i.e. return of bowel movement occurred in a shorter period and hospital discharge was earlier. When results of 96 patients who delivered by cesarean section under general anesthesia, (46 patients in EOF and 46 patients in ROF) were evaluated, return of bowel movement, passage of gas, passage of stool, and initiation of regimes I and III in the EOF occurred earlier. Also, hospital discharge took place earlier in the EOF group (Table IV).

Our results were similar to those reported by Orji et al. [5], who examined early oral feeding after cesarean delivery under general anesthesia. However, Orji et al., initiated oral feeding at a later time than we did, i.e. 8 hours after the delivery, and they included patients with history of cesarean sections or abdominal operations. Therefore, our study group consisted of more homogenous patients and the decision about time of oral feeding was left to the patient, approximately 2 hours after the operation. Patients in the EOF group started regime I at 9.1h on average and regime III at 32h on average. Hospital discharge time in the EOF group was 34 hours in our study and 4.8 days in the study by Orji et al. [5].

In light of the literature data and our findings, the question remains what should be the optimal type of anesthesia and time of oral feeding initiation after cesarean delivery in order to quicken the postoperative recovery. Groups A, B, C and D were compared in an attempt to answer that question.

The results are shown in Table V Results in patients from group A were more favorable as compared to the remaining 3 groups. The results allow us to conclude that normal diet (regime III), gas-stool discharge, hospitalization time and self-sufficiency seem more likely to occur earlier if cesarean section is carried out under regional anesthesia and early oral feeding is started. On the other hand, worst results were observed in group D patients, longer hospital stay, prolonged return to normal life occurred more often in patients who underwent cesarean section under general anesthesia and if oral feeding started after normal bowel sounds were found on examination.

One of the most interesting findings of our study is that the condition of patients in group B was not better than in group C. Passage of gas as well as initiation of regime I occurred earlier and patients were discharged sooner in group C as compared to group B. As stated earlier, being self-sufficient does not depend on initiation of early oral feeding alone. Patients who underwent cesarean section under regional anesthesia but initiated routine oral feeding seem to be at an advantage than those who took general anesthesia and initiated early oral feeding.

Conclusions

With regard to postoperative recovery and early hospital discharge after cesarean delivery, regional anesthesia and EOF encouraged 2 hours after the operation should be recommended. Initiating routine oral feeding (right after bowel sounds are heard) in patients after cesarean section under general anesthesia should be the last choice.

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Authors' Contribution:

1. Yunus Aydin – concept, study design, analysis and interpretation of data, article draft, corresponding author.
2. Sabahattin Altunyurt – study design, assumption, revised article critically.
3. Tufan Oge – acquisition of data, revised article critically.
4. Fezan Sahin – analysis and interpretation of data, revised article critically.

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