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Gum chewing stimulates early return of bowel motility after caesarean section

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Objective To evaluate the efficacy and safety of postoperative gum chewing on the recovery of bowel motility after caesarean section.

Design A randomised controlled study.

Setting Faculty of Medicine, Ain Shams University, Egypt.

Population A total of 200 pregnant women delivered by elective caesarean section (CS) under general anaesthesia.

Methods Women were randomised into two groups; group A (93 women) who received one stick of sugarless gum for 15 minutes every 2 hours after surgery, and group B (107 women) had traditional management (oral intake of clear fluids allowed after passage of flatus and regular diet with the passage of bowel movement).

Main outcome measures Time to first hearing of normal intestinal sounds, time to first flatus, time to first bowel movement and length of hospital stay.

Results The mean duration of surgery was longer in group A (41.3 ± 7.5 versus 38.4 ± 8.1 minutes, $P < 0.05$). The mean postoperative time interval to first hearing of normal intestinal sounds (10.9 ± 2.7 versus 15.6 ± 3.7 hours), passage of flatus (17.9 ± 4.6 versus 24.4 ± 7.1 hours), defecation (21.1 ± 4.7 versus 30 ± 8.2 hours) and discharge from the hospital (40.8 ± 10.6 versus 50.5 ± 8.9 hours) were significantly shorter in group A ($P < 0.001$). Severe ileus occurred only in one woman belonging to group B. All patients in group A tolerated gum chewing beginning on the first postoperative day.

Conclusion Gum chewing after CS is safe, well tolerated, and associated with rapid resumption of intestinal motility and shorter hospital stay; with potential impact on reducing the overall healthcare costs in case of routine implementation.

Keywords Caesarean section, early oral feeding, gum chewing, ileus, postoperative.

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Introduction

Following caesarean section (CS), the traditional practice is to withhold oral feeding until resolution of postoperative ileus (PI), often defined by passage of flatus and/or a bowel movement, with a physician-dictated regimen of gradual expansion of enteral feeding. This has been based upon concern about the possibility that early enteral feeding could exaggerate postoperative ileus, a pervasive problematic condition that ought to be minimised because of its possible serious consequences,[1,2] including significant postoperative morbidity, prolonged hospitalisation and increased healthcare costs.[2,3] The exact aetiology of ileus is unknown, but it is believed to be more common after laparotomy and major abdominal surgical procedures that enter the peritoneal cavity,[1,2] notably those involving the bowel.[3–7] In fact many factors are believed to contribute to the perpetuation of postoperative ileus, including intraoperative bowel manipulation, anaesthetic agents, perioperative narcotics and postoperative sympathetic hyperactivity.[1–3]

Comparative studies have reported earlier resolution of PI with similar rates of gastrointestinal complications after early and delayed feeding following caesarean section,[8–16] gynaecologic surgery[17–20] and colorectal surgery.[21–24] This dispels the classic teaching that postoperative patients may not have oral intake until the return of normal bowel function. However, some investigators reported that early feeding was associated with a high rate of intolerance[24,25]

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and might even lead to complications.[26] Sham feeding has been reported to stimulate bowel motility in humans.[27–29] Following colectomy, postoperative gum chewing, as a form of sham feeding, has been recently suggested as a safe way to provide the benefits of early stimulation of the gastrointestinal tract without the complications seen with feeding.[3–5] The action mechanism of gum chewing in enhancing bowel motility was suggested to be direct stimulation of the cephalic-vagal reflex and indirect triggering the release of gastrointestinal hormones and increasing the secretion of saliva and pancreatic juice.[4] However, two recent randomised studies failed to show a beneficial effect of gum chewing after colectomy.[6,7] On the other hand, a recent randomised study suggests gum chewing to be effective in enhancing the recovery of bowel function after caesarean delivery.[30] In the current study, we tested the hypothesis that gum chewing would enhance rapid return of bowel motility after elective CS.

Methods

This study was a randomised controlled trial that included 200 patients undergoing elective CS under general anaesthesia (GA) in Ain Shams University Maternity Hospital. It was carried out in the period from July 2006 to January 2007 after being approved by the ethical and research committee of council of Obstetrics and Gynecology Department, Ain Shams University. The study was explained to all enrolled subjects and a written informed consent was obtained from each participant. By then, each enrolled subject was allocated the next available number in the concealed sequence in a computer-generated randomisation plan; and only after the end of CS, the assigned intervention was revealed by the first author who played no role in patients' enrolment. Demographic information collected included patient's age, gravidity, parity, medical and surgical histories, gestational age and indications for caesarean section. All operations were carried out in the morning and the operative data were recorded, including the presence of severe adhesions, the occurrence of intraoperative complications, estimated blood loss and duration of surgery. Patients undergoing caesarean hysterectomy or other extensive intra-abdominal surgery as a result of operative complication were excluded from the study. The nature of the study did not allow blinding after application of the assigned intervention postoperatively. Group A (study group) comprised 93 patients who were encouraged to chew one stick of a commercially available sugarless gum (Samarah Foods, Cairo, Egypt) for 15 min every 2 hours, starting 2 hours after surgery—performed in the early morning—and keeping doing that every 2 hours thereafter during day time. During overnight sleep, there was no gum chewing. Compliance was monitored by counting and recording the number of sticks remaining with the patient during recording of vital data observations postoperatively. Gum chewing was stopped when the passage of flatus occurred as oral intake of clear fluids and soft foods were allowed. Group B (control group) comprised 107 patients who were not given anything by mouth postoperatively after caesarean section. All subjects were not given oral or rectal bowel stimulants after CS. The same postoperative rehabilitation programme for ambulation, excluding gum chewing, was used for the control group. Auscultation for intestinal sounds was performed at 4- to 6-hour intervals by two of the authors only (M.I. Ibrahim and D.A.A. Shalaby). The patients were allowed to sip small amounts of water only 12 hours postoperatively. The oral intake of clear fluids and soft foods began when normal bowel sounds were detected and flatus had passed with advancement to a regular diet after passage of first bowel motion. Eligible criteria for hospital discharge included stable vital signs with no febrile morbidity for at least 24 hours, ability to ambulate and urinate without assistance, passage of a bowel motion, ability to tolerate solid food without emesis and absence of unresolved other postoperative complications.

For analgesia, two intramuscular doses of 75 mg diclofenac sodium (Voltaren, Novartis Pharma, Egypt), a nonsteroidal anti-inflammatory medication were routinely given at 2 and 12 hours postoperatively. The need for additional use of narcotics (pethidine, 1 mg/kg) was recorded. Also, postoperative data record included postoperative tolerance of gum chewing, and postoperative complications. Postoperative complications included febrile morbidity (temperature <38°C on two occasions 6 hours apart), re-operation, blood transfusion, PI and hospital readmission.

The time of end of surgery was designated as zero hour. The prospectively defined primary outcome measures were the time to first hearing of normal intestinal sounds, the time to the first passage of flatus, the time to the first bowel movement and the time until the discharge from the hospital. The participants were followed up by the study team until discharge from hospital. However, any side-effects, complication and unexpected events presented by the participants during the postpartum period (until 5–6 weeks after delivery) were to be recorded. The secondary outcome measures included tolerance of gum chewing in the study group, and complications in both group entailing febrile morbidity (temperature >38°C on two occasions 6 hours apart), re-operation, blood transfusion, hospital readmission, the occurrence of mild ileus symptoms (vomiting or abdominal distension felt by the patient and seen on examination) or postoperative paralytic ileus, defined as a group of manifestations persisting longer than 24 hours or requiring nasogastric tube placement. These manifestations include absent or hypoactive bowel sounds,

non-passage of flatus or bowel movement, abdominal distension, more than three episodes of vomiting, with or without generalised crampy abdominal pain.

The estimation of sample size was in fact crucial. All of the studies that addressed gum chewing entailed patients with colonic surgery where the time interval for resumption of intestinal motility is expected to be longer and not applicable to estimate sample size for CS that lacks such major surgical intervention with bowel. The mean time intervals to passage of flatus after CS were reported to range between 32.3 and 62.1 hours.[14–16] In our setting, most of the patients would have already passed flatus by the elapse of about 30 hours postoperatively. We opted to assume the mean time for passage of flatus to be 24 hours. The mean time interval to passage of flatus after gum chewing was proposed to be 18 hours in the study group. This effect—6 hours difference in the mean—was selected as the smallest effect that would be important to detect, in the sense that any smaller effect would not be of clinical significance. Assuming that the common standard deviation is 12 hours, the sample size was calculated to be 86 subjects for each arm with the criterion for significance (alpha) set at 0.05 (two-tailed) and the power set at 90%. Considering this and to avoid the possibility of recruiting a small sample size, we opted to randomise 200 subjects in the present study—via a computer random number generator—to ensure that the number pertaining to each arm would be suffice to detect differences, if any, in the predefined outcome parameters. The randomisation sequence was concealed until interventions were assigned after the end of CS.

Statistical analysis was performed with SPSS (v.12) software for Windows (SPSS Inc., 2003, Chicago, IL, USA). Comparison between both groups was performed using the two-tailed student *t*-test was for continuous variables, and the chi square or Fisher's exact test for categorical variables. Throughout all analyses, $P < 0.05$ was considered statistically significant.

Results

During the study period, 449 patients set for elective CS were interviewed with 249 being excluded as CS was to be performed under regional anaesthesia. None of the initially allocated 200 patients was excluded from analysis as a result of intraoperative complication or non-compliance. Hence, the analysis involved all the patients who were randomly assigned. The demographic characteristics were similar in both groups (Table 1). The only abdominal operation performed—other than CS—was found to be appendectomy. The most common indication for caesarean delivery was previous CS delivery (58.1% versus 60.7% in groups A and B respectively). There were no statistically significant differences between the groups in the indications for primary caesarean section, which included an associated medical condition (hypertension or diabetes), malpresentation, disproportion with refusal of trial of labor, fetal indication or a combination thereof.

Table 1. Demographic characteristics*

	Group A (n = 93)	Group B (n = 107)	P value
Age (yr)	26.2 ± 4.1	26.4 ± 4.6	0.713
Parity	1 (0–7)	1 (0–7)	0.593
Primigravidae	33 (35.5)	38 (35.5)	0.997
Relevant medical history**	12 (12.9)	13 (12.1)	0.872
Type of CS: Primary	39 (41.9)	42 (39.3)	0.7
Repeat	54 (58.1)	65 (60.7)	
Prior abdominal surgery	3 (3.2)	11 (10.3)	0.051
Gestational age (weeks)	38.8 ± 1	38.8 ± 0.9	0.978

*Values are expressed as mean ± SD, median (range) or numbers (%).
**Diabetes mellitus or hypertension or both.

All operations were performed under general endotracheal anaesthesia via low transverse incision (Pfennanstiel's incision). The intraoperative and postoperative characteristics are shown in Table 2. Severe adhesions were met in 15 operations only and adhesiolysis was not difficult and did not entail considerable bowel dissection. Blood loss was above average in five patients with transfusion of 2 units of blood. In the study group, the duration of surgery was longer. Pethidine was necessarily given in 28 patients only. All gum chewing patients tolerated and completed their course of gum chewing until bowel function. There were no reports of any adverse event in relation to gum chewing

Table 2. Intraoperative and postoperative characteristics*

	Group A (n = 93)	Group B (n = 107)	P value
Severe adhesions	5 (5.4)	10 (9.3)	0.288
Extensions of the uterine incision	1 (1.1)	1 (0.9)	0.921
Blood transfusion	4 (4.3)	1 (0.9)	0.128
Duration of surgery (min)	41.3 ± 7.5**	38.4 ± 8.1	<0.05
Febrile morbidity	7 (7.5)	10 (9.3)	0.646
Administration of pethidine	13 (14)	15 (14)	0.994
Abdominal distension	1 (1.1)**	18 (16.8)	<0.001
Postoperative vomiting	1 (1.1)	3 (2.8)	0.384
Postoperative ileus	0 (0)	1 (0.93)	0.35

*Values are expressed as mean ± SD or numbers (%).
**Significantly different from control ($P < 0.05$).

Table 3. Primary outcome measures in the study and control groups*

	Group A (n = 93)	Group B (n = 107)	Difference between means (95% CI)	P value
PO intestinal sounds heard (hr)	10.9 ± 2.7	15.8 ± 3.7	4–5.8	<0.001
PO passage of flatus (hr)	17.9 ± 4.6	24.4 ± 7.1	4.7–8	<0.001
PO passage of motion (hr)	21.1 ± 4.7	30 ± 8.2	7.1–10.8	<0.001
PO hospital stay (hr)	40.8 ± 10.6	50.5 ± 8.9	7–12.4	<0.001

*Values are expressed as mean ± SD, or range.

during the study. One patient in the control group developed severe PI and her symptoms resolved with conservative management, including nasogastric tube decompression for 2 days. No patient in either group required postoperative blood transfusion, re-operation or readmission after hospital discharge.

The time to recovery of gastrointestinal function was significantly shorter in the study group (Table 3). The passage of the first bowel motion occurred within 24 hours from CS in 83 subjects (89.2%) in the study group compared with 40 subjects (37.4%) in the control group. The postoperative hospital stay was significantly longer in the control group; with only three subjects (2.8%) discharged from the hospital within 24 hours after surgery compared with 25 subjects (26.9%) in the study group.

Discussion

The present study documents a further advance in postoperative management of women who have had caesarean delivery. Our data show a beneficial effect of gum chewing in terms of shorter mean time intervals to normal intestinal sounds (10.9 versus 15.6 hours), passage of flatus (17.9 versus 24.4 hours), first motion (21.1 versus 30 hours) and discharge from the hospital (40.8 versus 50.5 hours). Interestingly, the time intervals to passage of flatus or defecation in the present study are generally shorter in comparison with those reported with gum chewing or early enteral feeding after caesarean delivery in previous studies. In a study—which comprised only 32 women—postoperative gum chewing was associated with earlier passage of flatus or defecation by 15.5 hours compared with the control group (28.4 versus 43.9 hours, respectively).[30] With early enteral feeding, the mean time intervals to return of normal bowel sounds were reported to be 10.3 versus 14.5 hours,[8] 24.2 versus 34.2 hours[14] and 25.5 versus 28.7 hours.[15] The mean time intervals to passage of flatus were reported to be 32.3 versus 42.4 hours,[16] 45.3 versus 47.3 hours,[15] and 51.6 versus 62.1 hours.[14] The time intervals to first motion in the study and control groups were reported to be 30 versus 43.3 hours,[11] 34.5 vs. 51 hours,[12] and 67.8 vs. 75.8 hours.[14] Compared to colectomy,[4] the earlier return of post-caesarean bowel function can be attributed to the minimal bowel manipulation,[2,31] relatively short duration of surgery and low rate of peritonitis.[11,31]

In comparison with studies offering early enteral feeding,[10,11] the relative early resolution of PI in the present study can be partly explained by the routine postoperative use of nonsteroidal anti-inflammatory drugs with limited narcotic use, a regimen reported to be associated with a significant decrease in the duration of postoperative ileus.[32–34] The early start of gum chewing (2 hours postoperatively) might also played a role. While the starting time of oral intake (6–8 hours postoperatively) in most of the studies investigating early enteral feeding was rather late,[9,10,12–16] those with earlier start (within 2 hours) were associated with earlier return of normal bowel sounds[8] and passage of first motion,[11] with time intervals being closer to those of our study. So, it seems that although patients typically cannot tolerate full meals, the delay or lack of feeding hinders return of normal bowel function. Chewing without swallowing is apparently an effective intermediate measure. Moreover, the increased frequency of gum chewing in the present study (every 2 hours) might explain the earlier recovery of bowel motility compared with less frequent gum chewing (three times per day) in a previous study.[30] In one study, the reason for this delayed start of feeding (8 hours) was cited to be the possibility of complications such as postoperative haemorrhage,[15] with increased risk of pulmonary aspiration in case of inevitable GA. Gum chewing might be akin to drinking clear liquids, as it has been associated with increased gastric fluid volume in both adults[35] and children[36] prior to induction of GA. However, it is difficult to prove a direct influence of increased gastric contents on the incidence of pulmonary aspirations[35] and future studies are needed to evaluate whether chewing gum should be treated as drinking clear fluids.[36]

In the previous studies addressing early enteral feeding, different types of anaesthesia were used, including GA only,[13] regional anaesthesia only,[12] and either general or regional anaesthesia.[10,11,15,16] In fact, it turned out that the only study on gum chewing after CS entailed those undergoing CS under GA and regional anaesthesia.[30] In our country, GA is still the method of choice for CS because of patients' preference together with shortage of anaesthesiologists experienced to perform regional

anaesthesia. This explains why the authors of the present study opted to include only those CS performed under GA. On the other hand, anaesthetic agents administered via an epidural catheter have been found to be decrease the duration of postoperative ileus,[37–40] possibly as a result of blockade of inhibitory sympathetic reflexes at the spinal cord level.[2] Moreover, because the action mechanism of gum chewing is presumed to be from stimulation of the cephalic-vagal mechanism,[3,4] the possibility that this mechanism being less effective in patients who have had epidural analgesia has been suggested,[41] and this could explain failure to find gum chewing to be efficacious in two previous studies.[6,7] So, in developed countries where CS is mostly performed under regional anaesthesia, postoperative gum chewing—although needing further investigation—might seem less tempting. However, it appears still to have potential benefits in our specialty whenever GA is applied for CS or major abdominal gynaecologic surgery.

Gum chewing was found safe and tolerated by all patients in this study. As noticed in a previous study,[7] most of the women who chewed gum were generally pleased, felt more comfort and reported less dryness of the mouth. Although early consumption of solid food in women is also reported to be well tolerated, with no significantly increased gastrointestinal complications,[10–12,15] it might be associated with decreased tolerance to the first postoperative diet.[16] As with early enteral feeding,[12] we found no difference in mild ileus symptoms, yet abdominal distension was less in the gum chewing group. Prolonged length of surgery in the early fed group was reported to be associated with more likelihood of development of mild ileus symptoms;[12] a finding that we failed to demonstrate in the gum chewing group length of surgery was prolonged. Although severe ileus is rare after CS, it was found by us and others[12] after traditional management in one patient only.

Traditionally, the mother may be discharged from the hospital after CS—in the absence of complications—on the fourth or fifth postpartum day.[42] Early hospital discharge of selected cases after caesarean birth was suggested as a reasonable, safe, feasible and cost-effective option.[30,43] Major determinants of early hospital discharge include postoperative nausea[44] and return of normal bowel function.[30,43] Our data shows a beneficial effect of gum chewing after CS in terms of earlier discharge from the hospital (40.8 hours), that is relatively shorter compared with those reported after early enteral feeding, ranging from 49.5 hours to 5.5 days.[12,14,16]

The findings of the present study, entailing 200 subjects, concur with two recent meta-analyses of five randomised trials, entailing 158 patients undergoing bowel surgery.[45,46] In conclusion, our data show that gum chewing enhances early recovery from PI after elective caesarean section; being a rather safe, well tolerated, acceptable and inexpensive physiologic method for stimulating bowel motility. The economic impact of early dismissal from the hospital after an uncomplicated caesarean delivery can not be overlooked, especially in a developing country with limited resources.

Disclosure of interests
There is no conflict of interest to be disclosed.

Contribution to authorship
All of the authors had substantial contributions to conception and design, acquisition of data, analysis and interpretation of data, drafting and revising the article critically with final approval of the version to be published.

Details of ethics approval
The experiment described has been approved by the OB/GYN Department's research review advisory committee, Ain Shams University. However, supplying a reference number is not adopted.

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