



Research article

Gum-chewing speeds return of first bowel sounds but not first defecation after cesarean section

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ABSTRACT

Objective: To evaluate effects of gum-chewing on duration of ileus after cesarean section and differences in effects of sugar-free gum and sugar-substituted gum.

Materials and Methods: Seventy-six women with no prior abdominal or cesarean surgery were consecutively allocated after elective cesarean section under general anesthesia to a) control (no-gum) group, b) sugar-free gum group, or c) sugar-substituted gum group (gum containing xylitol, sorbitol, and aspartame). Beginning 2 hours postoperatively, gum-chewing patients chewed gum for 15 minutes every 2 hours. Times to first bowel sounds, flatus, and defecation were recorded, and means \pm SD compared.

Results: Statistically significant decrease in time to first bowel sounds in sugar-substituted gum group (6.3 ± 2.0 h) compared to sugar-free gum group (8.8 ± 1.9 h, $p < 0.05$). Sugar-substituted group had significantly lower time to first bowel sounds than controls (11.2 ± 1.0 h, $p < 0.05$). No significant difference was noted among groups in times to first flatus or defecation.

Conclusion: In gum-chewing patients without prior abdominal operation who had cesarean under general anesthesia, no difference occurred in timing of first flatus or defecation. Given the previously demonstrated effectiveness of gum-chewing in ileus resolution after laparoscopic colon surgery, gum trials under epidural anesthesia or with medicated gums are warranted.

Key words: Abdominal surgery, cesarean section, postoperative ileus, gum-chewing.

Introduction

Postoperative ileus causes significant patient discomfort and is the main factor determining the length of hospitalization after abdominal surgery [1]. Since there is no practical benefit to the gastrointestinal dysmotility that results from intraoperative peritoneal irritation, investigators have tried variety of methods to shorten its duration [1]. One simple intervention is sham feeding [1, 2]. Several investigators have recently evaluated chewing gum as a sham feeding; notably, gum-chewing after laparoscopic colectomy is associated with earlier flatus, defecation, and hospital discharge [2, 3]. We conducted a prospective trial to evaluate the effects of gum-chewing on gastrointestinal recovery after cesarean section, and to determine whether sugar-free gum or sugar-substituted gum had different effects on postoperative ileus.

Materials and methods

This prospective study recruited 76 women who had had no previous abdominal surgery or cesarean section and who underwent elective cesarean section under general anesthesia. All subjects volunteered for the study. Written informed consent was obtained from all participants, who were consecutively allocated into three groups. The first group, control patients, did not chew gum postoperatively (controls, $N = 23$). The second group of patients chewed sugar-free gum postoperatively (sugar-free group, $N = 28$). The third group of patients chewed sugar-substituted gum postoperatively (sugar-substituted group, $N = 25$).

The same surgeon, who was blinded to group assignment, performed all operations. Due to differences in gum taste and consistency, patients could not be blinded to their group assignment. After surgery, all patients were given nothing by mouth until passage of the first propulsive bowel movement, when they began a liquid diet. A standar-



dized dose of tramadol, which did not differ among the groups, was used for analgesia.

Beginning two hours postoperatively, subjects in the gum-chewing groups chewed the assigned gum for 15 minutes every two hours until the first passage of flatus. All patients were evaluated hourly after surgery by the same resident physicians, who precisely recorded times of first bowel sounds, first flatus and first defecation.

The sugar-free gum group used a commercially available gum with no artificial sweeteners (Falim[®]), manufactured by Dandy A.S., Istanbul, Turkey. The sugar-substituted gum group used another commercially available gum (First[®]), also manufactured by Dandy A.S., which contained the additives sorbitol E420, xylitol E967, and aspartame E951. Both gums are approved by the Turkish Food Codex.

Non-parametric tests, Kruskal-Wallis test and Mann-Whitney U test, were used to compare means and to evaluate differences between groups. Data are reported as mean \pm standard deviation. A *p* value less than 0.05 was considered significant.

Results

Demographic and operative characteristics of patients are noted in **Table 1**. There were no significant differences among groups in age, gravidity or parity, gestational age, duration of surgery, estimated blood loss, injectable opioid analgesic, or timing of hospital discharge. Indications were similar in the both groups.

Outcomes of participants are summarized in **Table 2**. The difference in return of first bowel sounds was statistically significant between the sugar-substituted (6.3 ± 2.0 h) and sugar-free groups (8.8 ± 1.9 h, $p < 0.05$), and between the sugar-free and control groups (11.2 ± 1.0 h, $p < 0.05$). Specifically, patients who chewed sugar-substituted gum

experienced return of bowel sounds more promptly than patients in the sugar-free group ($p < 0.05$). Postoperative timing of first flatus was a median of 18.0 ± 5.3 h in the sugar-free group, 19.7 ± 4.5 h in the sugar-substituted group, and 19.4 ± 5.4 h in the control group ($p > 0.05$). Timing of first defecation was similar in the sugar-free group, sugar-substituted group, and control group (respectively, 34.0 ± 10.0 h, 34.6 ± 12.5 h, and 37.4 ± 13.9 h) with no statistical significance ($p > 0.05$).

Discussion

Recovery of gastrointestinal function after gastrointestinal surgery is clinically important because paralytic ileus may contribute pain, nausea, vomiting, and pulmonary dysfunction. Food intake has been reported to stimulate bowel motility. Gum-chewing is postulated to work because it mimics food intake, i.e. sham feeding. Our study is the first to evaluate the effect of gum-chewing as a sham feeding on duration of ileus following cesarean section. We found no effect on timing of first defecation after cesarean, in contrast to the decreased time to stool passage in gum-chewing patients after laparoscopic colon surgery found by McCormick *et al.* [2] and Asao *et al.* [3] However, we did identify a statistically significant decrease in time to first bowel sounds in patients who used sugar-substituted gum. We noted an inexplicably longer to first bowel sounds in the sugarless gum group compared to controls.

Sham feeding, such as the chewing activity in our study, stimulates gastric, duodenal and rectal motility [3]. Gum-chewing may increase gastrointestinal motility via a combination of cephalic-vagal reflexes, release of gastrointestinal hormones, and increase in salivary and pancreatic secretion [3]. Of note, salivary flow rates with gum-chewing remain above basal rates even after two hours of continuous gum-chewing [4].

Table 1. Demographic and operative characteristics of participants

Characteristic	Control group	Sugar-free chewing	Sugar-substituted	P
	(n=23)	gum group	chewing gum group	
	Mean \pm SD	(n=28)	(n=25)	
		Mean \pm SD	Mean \pm SD	
Age (y)	30.3 \pm 5.9	28.5 \pm 6.6	29.1 \pm 5.3	NS
Gravidity	4.6 \pm 2.9	3.7 \pm 2.7	3.1 \pm 2.4	NS
Parity	2.9 \pm 2.6	2.1 \pm 2.3	1.6 \pm 1.6	NS
Gestational age (wk)	39.1 \pm 4.7	38.7 \pm 2.8	39.3 \pm 3.1	NS
Duration of surgery (min)	42.3 \pm 6.3	43.7 \pm 8.7	41.8 \pm 7.9	NS
Estimated blood loss (ml)	202.1 \pm 141.8	278.5 \pm 164.6	196.8 \pm 123.1	NS
Injectable opioid analgesic (mg)	113.0 \pm 34.4	125.0 \pm 57.7	124.0 \pm 63.4	NS
Hospital discharge (d)	3.0 \pm 0.2	3.2 \pm 0.4	3.0 \pm 0.5	NS

SD, standard deviation; NS, not significant

Table 2. Gastrointestinal outcomes of participants

Outcome	Control group (n=23) Mean ± SD	Sugar-free chewing gum group (n=28) Mean ± SD	Sugar-substituted chewing gum group (n=25) Mean ± SD	P
Return of first bowel sounds (h)	11.2 ± 1.0 ^b	8.8 ± 1.9 ^b	6.3 ± 2.0 ^a	<0.05
First passage of flatus (h)	19.4 ± 5.4	18.0 ± 5.3	19.7 ± 4.5	NS
First defecation (h)	37.4 ± 13.9	34.0 ± 10.0	34.6 ± 12.5	NS

SD, standard deviation; NS, not significant

^{a, b} Statistically significant difference was observed between different superscripts.

The decreased time to return of bowel sounds in our sugar-substituted gum group could be explained by the additives sorbitol and xylitol. These sugar alcohols are absorbed slowly and incompletely from the intestinal tract [5, 6]. Xylitol increases gastric emptying and intestinal transit time [7]. Osmotic effects and colonic fermentation may cause diarrhea if individuals ingest more than 10mg of sorbitol, or more than 0.5g/kg body weight of xylitol, per day [6, 8].

Of interest as a comparison to sham feeding, Patolia *et al.* conducted a trial of early feeding after cesarean section under regional anesthesia [9]. Their early-fed patients had an earlier first bowel movement and hospital discharge than controls, but there were similar rates of mild ileus in early-fed and control groups, and over 40% of patients with surgeries longer than 40 minutes had mild ileus [9].

Despite Matros *et al.*[10] and our generally negative results, additional trials of gum-chewing as a safe, inexpensive means to hasten resolution of ileus after cesarean section are warranted, given the past success of Asao *et al.*[3] and McCormick *et al.* [2] with gum-chewing after laparoscopic colon surgery. For instance, a trial could evaluate gum-chewing effects on ileus after cesarean section under epidural instead of general anesthesia, since inhalational anesthetic agents and opioids used in general anesthesia may slow intestinal motility [1]. Alternatively, a trial could compare gum-chewing to early feeding after cesarean section, especially considering the evidence from Patolia *et al.* of frequent mild ileus in early-fed cesarean patients who had prolonged operative time [9]. Moreover, laxative-containing chewing gum could conceivably reduce duration of both ileus and hospitalization, since laxatives effectively shorten the duration of ileus [1, 11]. Different trials have shown promising results for the efficacy of gum chewing for the amelioration of postoperative ileus. A recent meta-analysis shows a favorable effect of gum chewing on time to flatus and defecation but no significant effect on the hospital stays [12].

Gum-chewing shortens postoperative ileus probably in a multi-factorial manner and early postoperative sham feeding enhances the recovery of gastrointestinal motility after cesarean section and this may be a safe and acceptable treatment modality in a modern fast-track regimen. We encourage additional trials of gum-chewing to determine whether this simple, economical measure might promote

gastrointestinal recovery after cesarean delivery or other gynecologic procedures.

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