REVISTA DE INVESTIGACIÓN CLÍNICA

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PERMANYER

Rev Inves Clin. 2016;68:314-8 ORIGINAL ARTICLE

Usefulness of Gum Chewing to Decrease Postoperative Ileus in Colorectal Surgery with Primary Anastomosis: A Randomized Controlled Trial

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ABSTRACT

Background: Postoperative ileus generates a high impact on morbidity, hospital stay, and costs. **Objective:** To study the efficiency and safety of chewing gum to decrease postoperative ileus in colorectal surgery. **Method:** A randomized controlled trial was performed including 64 patients who underwent elective colorectal surgery with primary anastomosis in a tertiary referral center. Patients were divided in two groups: (i) A: gum chewing group (n = 32), and (ii) B: patients who had standard postoperative recovery (n = 32). **Results:** Postoperative ileus was observed in 6% (2/32) of the gum-chewing group and in 21.8% (7/32) in the standard postoperative recovery group, with an odds ratio of 0.167 (95% CI: 0.37-0.75; p = 0.006). Vomiting was present in two patients from group A and in eight from group B (6.25 vs. 25.0%; p = 0.03). Passage of flatus within the first 48 hours was present in 30 patients from group A and in 20 from group B (94 vs. 63%; p = 0.002). There was earlier oral feeding (96 ± 53 vs. 117 ± 65 hours; p= 0.164) and a shorter length of hospital stay (7 ± 5 vs. 9 ± 5 days; p= 0.26) in the gum-chewing group (p N.S.). **Conclusions:** The use of chewing gum after colorectal surgery was associated with less postoperative ileus and vomiting, and with an increased passage of flatus within the first 48 hours after surgery. Since gum chewing is an inexpensive procedure and is not associated with higher morbidity, it can be safely used for a faster postoperative recovery in elective colorectal surgery. (REV INVES CLIN. 2016;68:314-8)

Key words: Postoperative ileus. Chewing gum. Colorectal surgery. Postoperative recovery.

INTRODUCTION

Postoperative ileus (POI) is a state of gastrointestinal transit arrest secondary to an abdominal surgical procedure. It is characterized by abdominal distention, absent bowel sounds, and inability to tolerate oral intake[1-3]. POI is considered a common issue in colorectal surgery, with a prevalence of up to 15%[4]. Due to its high frequency, POI may impact on morbidity and hospital stay, with increased costs[4,5].

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Received for publication: 19-09-2016
Accepted for publication: 22-12-2016

The etiology of POI is multifactorial. The exposure of the peritoneal cavity and intestinal manipulation provokes systemic and local inflammatory responses in the intestinal muscular wall due to sympathetic activation in response to surgical stress. This favors the action of proinflammatory mediators, such as vasoactive intestinal peptide, neurotensin, and nitric oxide, and an increase in leukocytes levels at the surgical site, promoting gastrointestinal hypomotility[6-8]. Gastric motility usually recovers approximately 24-48 hours after an abdominal surgical procedure; however, the colon has a slower recovery pattern, ranging from 48 to 72 hours[9,10].

Several studies have shown that inhibiting the inflammatory response reduces postoperative ileus. Some of the procedures that have been used to reduce the POI include regional blocks, early mobilization, early oral feeding, avoiding nasogastric tubes, minimally invasive surgery, less intestinal handling, normothermia, prokinetic drugs, and nutrition with lipid-rich supplements. It has been suggested that opioid analgesics used in the perioperative period reduce the time required to restore normal intestinal motility[2,4,11].

Sham feeding is a procedure where food and drink are not actually digested, but a regional cephalic-vagal response is activated, promoting an increase in plasma gastrin levels, substance P, and pancreatic polypeptide. Gum chewing has shown this same response[4,12,13].

Several studies have evaluated the usefulness of chewing gum in colorectal surgery, showing discordant results. In two controlled studies, the benefit of chewing gum to reduce POI was not established [14,15]; however, a meta-analysis showed that the passage of the first flatus, time for the first evacuation, and hospital stay were all reduced[16].

The aim of the present was to analyze the benefits and security gum chewing in patients undergoing elective colorectal resection with primary anastomosis.

MATERIALS AND METHODS

This was a prospective randomized trial that included 64 patients who underwent elective colorectal surgery in a tertiary referral center during the period from July 2010 to December 2011. The study was reviewed and approved by the ethical committee of the hospital, and written informed consent was obtained for all patients. Our local Ethical Committee does not require registering clinical trials in foreign databases.

All patients older than 18 years old, operated for benign or malignant colonic diseases, were electively included. Exclusion criteria were emergency surgery, patients requiring a stoma, and those admitted to the intensive care unit. Certified colorectal surgeons performed all surgeries. Postoperative analgesia was performed with acetaminophen and ketorolac in all patients; neither prokinetic drugs nor opioid analgesics were used after surgery. Ciprofloxacin (400 mg) was administered intravenously to both groups 30 minutes before the skin incision; an additional dose was given every three hours during the surgery. After the surgery, no additional antibiotics were given to the patients. No antiemetic drugs were used in any patient.

Diet was initiated when each patient had had passage of flatus and peristalsis was present. The progression of the diet was gradually changed from liquids during 24 hours to solids, and was continued until the discharge of the patient. Surgical residents and the nurses in charge supervised chewing gum administration and data was registered in a prospective database.

Patients were divided in two groups: (i) A: gum-chewing group, and (ii) B: patients who had standard postoperative recovery. Group A patients began to chew sorbitol-free gum within the first 24 hours after surgery, for 15 minutes every four hours throughout their hospital stay, with six resting hours at night. Nurses of each patient supervised the chewing gum administration protocol, whenever it was indicated. Patients from group B received no further intervention. Both groups were compared in terms of serum albumin levels, hemoglobin, ASA scale (American Society of Anesthesiology), and comorbidities. The primary endpoints were the presence of ileus, time for the first flatus, and hospital stay. The presence of nausea, vomiting, abdominal distension, oral tolerance at 72 hours, postoperative complications, and mortality were also analyzed. Patients were deemed to have POI when they had absence of adequate bowel function on postoperative day 5, or the need for the insertion of a nasogastric tube because of abdominal distension, nausea, and emesis after having started a liquid diet, in the absence of mechanical obstruction[17]. The passage of

flatus was recorded by directly asking the patients, and it was measured in hours from the day of surgery until its appearence. Flatus passage at 48 hours was dichotomously reported as positive or negative. Abdominal distension was subjectively recorded by asking the patients whether the symptom was present or not. The results were analyzed according to the group assigned.

Anastomotic leaks were defined by the presence of signs of peritoneal irritation and were corroborated by computed tomography scan of the abdomen with contrast or by surgical findings. The hospital stay was defined as the number of days in the hospital including the admission day until patient discharge. Patients were discharged when they tolerated oral feeding, and evacuation was achieved. Surgical site infections were defined according to the guidelines issued by the Centers for Disease Control and Prevention[18]. A research assistant performed the group allocation with sealed envelopes.

Continuous variables are expressed as means plus/minus standard deviation (SD) and were assessed using the student *t* test. Categorical variables were analyzed using Chi-square test or Fisher's exact test, as appropriate. All tests were two-tailed, and a value of $p< 0.05$ was considered statistically significant. The sample size was calculated with the statistical software G*Power 3.1. Based on a previous study[13], the time to the first bowel movement was estimated to be 3.7 days in the gum group and 4.5 days in the other group, with a SD of 2.4 in both groups. It was determined on the basis of power (80%) and a two-sided α of 0.05. Thus, 32 patients were required in each group. We did not create models for multivariate analysis to evaluate independent variables since patient numbers were too small for parameters identified by the univariate analyses. The analysis was performed using SPSS v21.0 for Windows (SPSS, Chicago, IL).

RESULTS

Sixty-four patients were included, 32 in each group. The mean age was 56 and 50 years in groups A and B, respectively (18-96 years). The male to female ratio was 1.46. Comparisons between groups are shown in table 1.

Table 1. Comparison between groups

Variables	Group A (n = 32)	Group B (n = 32)
Albumin (g/dl)	3.4 ± 0.47	3.5 ± 0.5*
Hemoglobin (g/dl)	13.2 ± 1.4	13.1 ± 1.4*
ASA 1/2/3/4	16/16/0/0	16/15/1/0*
Comorbidities (Y/N)	3/29	2/30*
Surgical procedures		
Right colectomy	13	16
Sigmoid colectomy	12	12
Left Hemicolectomy	5	2
Total colectomy	2	2

*p = NS. Standard deviation = ±.
ASA: American Society of Anesthesiology.

Surgical indications for group A were colon cancer in 22 patients, diverticular disease in six, one stenosis of colorectal anastomosis, one recto-vaginal fistula, one Crohn's disease, and one Hartmann reversal procedure. Surgical indications for group B were colon cancer in 17 patients, diverticular disease in eight, two colocutaneous fistulas, two colovesical fistulas, one appendicular mucocele, one lymphoma, and one chronic colonic variceal bleeding. The types of surgery are summarized in table 1. Fifty percent of the patients in each group were operated by minimally invasive surgery. Stapled anastomoses were used in 91% and 94% in groups A and B, respectively (p = 0.64). There was no difference in surgical bleeding between groups (Group A = 162 ml ± 169 vs. Group B = 223 ml ± 217; p = 0.21).

Postoperative ileus was confirmed in two patients of group A and in seven of group B (6.0 vs. 21.8%; p = 0.006), with an odds ratio of 0.167 (95% CI: 0.37-0.75). Nausea was reported in six patients from group A and 11 from group B (18.7 vs. 34.3%; p = 0.15). Vomiting was present in two patients from group A and in eight from group B (6.2 vs. 25.0%; p = 0.03). Bloating was reported in four and seven patients in groups A and B, respectively (12.5 vs. 21.8%; p = 0.32). Passage of first flatus within the first 48 hours was present in 30 patients of the chewing gum group and in 20 from the other group (94 vs. 63%; p=0.002).

Oral feeding within the first 72 hours was initiated in 27 patients from group A, and 21 from group B (84.4 vs. 65.6%; p= 0.08). There was earlier oral feeding (96 ± 53 vs. 117 ± 65 hours; p = 0.164) and a shorter length of hospital stay (7 ± 5 vs. 9 ± 5 days; p = 0.26)

Table 2. Overall outcomes

Variables	Group A		Group B		P
	n = 32	%	n = 32	%	
Postoperative ileus	2	6	7	22	0.006
Nausea	6	19	11	34	0.15
Vomiting	2	6	8	25	0.03
Abdominal bloating	4	13	7	22	0.32
Flatus passage at 48 hours	30	94	20	63	0.002
Oral feeding before 72 hours	27	84	21	66	0.08
Hospital stay (days)	7.5 ± 5.1		9 ± 5.7		0.26

Table 3. Postoperative complications

Postoperative complications	Group A	Group B*
Pneumonia	3 (9.3%)	2 (6.2%)
Surgical site infections		
Superficial incisional	5 (16%)	5 (16%)
Organ or space		
With anastomotic leakage	1 (3.1%)	1 (3.1%)**
Without anastomotic leakage	2 (6.2%)	3 (9.3%)***

*Overall complication rates: 34.3 vs. 34.3%; p = 0.58.
**Required re-laparotomy. ***Required radiological intervention.

in the gum-chewing group, without statistical significance for the differences observed. Overall results are shown in table 2. Overall morbidity in each group was 34%.

There was one anastomosis leakage in each group (3.1%). Surgical site infections were 16% in both groups (Table 3). Mortality was nil.

DISCUSSION

Postoperative ileus is defined as the physiological arrest of gastrointestinal transit in response to surgical stress. The POI arises from autonomic nervous and hormonal mechanisms. Its origin is multifactorial as operating time, intestinal manipulation, inflammatory response, administration of opioids, or anxiolytic medications play a role in this physiological response[11,12,19].

A meta-analysis of 158 patients reported a reduction in the time of passage of flatus (20.8 hours), bowel movements (33 hours) and hospital stay (2.4 days) in patients receiving gum for elective colorectal surgery, with a trend to lower postoperative complications (OR: 0.45; 95% CI: 0.20-1.00; p = 0.05)[16]. Similar to this study, we reported more flatus passage in the first 48 hours and a trend towards shorter hospital stays (7 ± 5 vs. 9 ± 5 days; p= 0.26) in patients who chewed gum. In another meta-analysis of 272 patients, it was observed that the use of gum decreased POI after gastrointestinal surgery, without a significant reduction in the hospital stay[20]. The authors conclude that the results are not significant in gastrointestinal laparoscopic surgery. However, we found a lower POI and shorter length of hospital stay in patients who chewed gum, considering that half of our patients were operated by minimally invasive surgery.

Lim, et al. [4] reported a clinical trial of 161 patients, where patients who chewed gum and were subjected to a fast-track program in colorectal surgery showed no differences in the mean time of passage of first flatus and bowel movements, with similar percentages of nausea (77.5 vs. 83.1%), vomiting (43.8 vs. 46.8%) and abdominal bloating (72.5 vs 70.1%) compared to controls. In contrast, our study showed that the gum-chewing group had lower vomiting events and a trend toward lower nausea and abdominal bloating.

In another prospective study, Van Den Heijkant, et al.[2] found a trend toward shorter hospital stay (9.5 vs. 14 days) and decreased POI (27 vs. 48%). This study found that the levels of interleukin 8 and tumor necrosis factor were lower in patients who chewed gum, who also presented lower postoperative complications. In our study, we found lower POI with the same percentage of postoperative complications in both groups (34%). The presence of POI in our study was similar to that reported globally in colorectal surgery (17.4 %)[1].

In another meta-analysis that included 244 patients, Vazquez, et al.[11] reported a decrease in time for passage of flatus and for first fecal evacuation, without differences in hospital stay (p = 0.10).

A British meta-analysis with 256 patients showed favorable results when chewing gum for a prompt passage of flatus and decreased time for fecal evacuation, with no significant differences in hospital stay[21].

Yiu, et al.[22] evaluated the use of chewing gum in another meta-analysis of 612 patients, from which 271 patients belonged to enhanced recovery after surgery protocols (ERAS). In this study, a significant decrease of 31 minutes was seen for the passage of the first flatus, 30 minutes for the passage of stool, and a shorter hospital stay; however, when evaluating the subgroup of patients included in the ERAS group, no significant difference was found when chewing gum was used additionally[22].

Finally, in a Cochrane review of 81 studies with 9,072 patients undergoing abdominal surgery [23], the subgroup of patients who underwent colorectal surgery was analyzed. This review found favorable results in gum chewing for a prompt recovery of gastrointestinal motility. The results showed a decrease of 12.5 hours for the start of flatus, 18.1 hours for the first bowel movement, and a slight decrease of hospital stay (one day). There was no difference in mortality, risk of infections, and readmissions among groups and the gum was well tolerated by patients. In our study, we found that patients in the gum group had less vomiting episodes and passed more flatus at 48 hours, with lower POI.

Based on our results, we wanted to compute our achieved statistical power *post hoc* with POI (6 vs. 22%). Given a type 1 error of 0.05, with a sample size of 32 patients, our achieved power (1-β error probability) resulted in 0.85 or 85%.

In conclusion, the use of chewing gum after colorectal surgery was associated with less POI and vomiting, with an increased passage of flatus within the first 48 hours after surgery. Since it is an inexpensive tool and is not associated with higher morbidity, it can be safely used for a faster postoperative recovery in elective colorectal surgery.

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