ORIGINAL ARTICLE

The Effect of Chewing Gum on the Return of Bowel Activity after Colorectal Cancer Surgery

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Abstract

Background: Enhanced recovery after surgery (ERAS) protocols advocate for early enteral feeding to prevent postoperative ileus. Chewing gum acts as a type of sham feeding that triggers the cephalic phase of digestion by stimulating the cephalic vagus nerve. This can enhance gastrointestinal motility and may lead to quicker recovery of gas and bowel movements.

Objectives: To assess how chewing gum during the early postoperative phase affects the duration of postoperative ileus in terms of time to appreciation of first flatus, time to passage of first stools, and duration of hospital stay.

Materials and methods: The study was conducted in our division of colorectal surgery. This is a case-control study carried out over three years (2020–2023). A total of 100 patients were included, the first 50 were allocated to the control group, and another 50 were allocated to the chewing gum group. All patients above the age of 14 years who underwent resection for colorectal cancers were included.

Results: The average age in the control group was 51.44 years and that in the chewing gum group was 50.04 years. The average duration of surgery for the control group was 156.3 minutes (2.6 hours) and 163.8 minutes (2.7 hours) in the chewing gum group. The average time of passage of the first flatus in the chewing gum group was 51.28 hours compared to 66.26 hours in the control group ($p = 0.0002$). The average time to first bowel movement in the chewing gum group was 71.42 hours. In comparison, the time to first bowel movement in the control group was 85.78 hours ($p = 0.000011$). The average hospital stay in the chewing gum group was 6.3 days and that in the control group was 6.4 days ($p = 0.274254$).

Conclusion: Chewing gum as a means of sham feeding is a cost-friendly method that significantly decreases the postoperative ileus but has no effect on postoperative hospital stay.

Keywords: Colorectal cancers, Hospital stay, Sham feeding, Postoperative ileus.

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Introduction

Postoperative ileus is amongst the most common significant early complications of abdominal surgery. Ileus often happens after abdominal surgery, even when the bowel remains intact. It hinders the resumption of enteral nutrition and extends hospital stays, which raises the risk of infections, deep vein thrombosis, costs, and other complications.

Even while ileus is traditionally associated with small bowel dysmotility, postoperative ileus can affect the stomach, small intestine, or large intestine with varying clinical presentations and multiple treatment options.[1]

There is a lack of an internationally accepted standard definition of postoperative ileus. In 2013, Vather et al.[2] proposed a clinical definition for postoperative ileus, which is characterized by the presence of at least two of the following five signs on or after the fourth postoperative day:

1. Nausea and vomiting.
2. Inability to tolerate solid or semi-liquid food in the previous 24 hours.
3. Absence of gas or stool for the last 24 hours.
4. Abdominal distention.
5. Radiological evidence of ileus.

Delayed return of bowel activity can result in the collection of secretions and gases, bringing about queasiness, retching, abdominal distension, and agony. Possible negative effects include heightened postoperative pain, delays in resuming oral intake, impaired wound healing, delay in ambulation, and a greater risk of pulmonary complications such as pneumonia, pulmonary embolism, and lung collapse. Patients may also face a higher risk of deconditioning, longer hospital stays, reduced patient satisfaction, and more healthcare costs.

Historically, postoperative ileus has been thought to be an inevitable consequence of major surgeries, mostly because of a limited understanding of the pathophysiology. Various factors have been attributed to this, the majority of which are thought to

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be outside the surgeon's control. These factors include neurogenic stimulation, the release of inflammatory mediators, or necessary surgical manipulation.[3] There is also the release of endogenous opioid peptides that further exacerbate the effect of opioid analgesia on bowel function.[3,4]

Thus, a narcotic-sparing analgesic regimen can minimize the risk of postoperative ileus. Oral opioid receptor antagonist alvimopan is the only preventive medication that lowers the incidence of postoperative ileus.[5]

During the late 1990s, enhanced recovery protocols were developed which have evolved now into an approach for improved patient-centric care.

Although enhanced recovery after surgery (ERAS) protocol advocates for early enteral feeding to prevent postoperative ileus, chewing gum has also been advocated as an alternate option to reduce postoperative ileus.[6] Being inexpensive and safe makes it an appealing option.

There is evidence that people have been chewing gum since ancient times. Chewing gum is a type of sham feeding that uses cephalon vagal stimulation to promote the cephalic phase of food digestion. Hormonal and neural mediators are released as a result, and glandular secretion (salivary, gastric, and biliopancreatic) and gastrointestinal motility increase. Clinically, these occurrences could result in a quicker recovery of gas and fecal transit, improved oral ingestion tolerance, and a shorter hospital stay.[7–9]

Owing to the adoption of screening modalities, early detection of colorectal cancers has decreased mortality in the developed world. Surgical removal of colorectal cancer represents the only curative option and R0 resection dramatically impacts long-term survival. Considering the incidence and prevalence of colorectal cancers, colorectal surgeries are among the most commonly performed surgeries and postoperative ileus remains a concern not only for the patient but also for the surgeon.

Aims and Objectives

To assess how chewing gum during the early postoperative phase affects the duration of postoperative ileus in terms of:

- Time to appreciate of first flatus.
- Time to passage of first stools.
- Duration of hospital stay.

Materials and Methods

This case-control study was carried out over three years (2020–2023) Clearance was taken from the institutional ethical committee for the conduction of the study. The sample size was calculated using G* power software for this study with a 95% power.

First 50 patients were taken as the control group (C) and the next 50 were taken as the chewing gum (G) group. Every patient in the chewing gum group was given two packs of commercially available chewing gum, each containing twelve pieces. Sugar-free gums were not used as these contain artificial sweeteners that have a laxative effect which would've interfered with the purposes of our study. All gums were chewed till they became tasteless. At 3 hours before the start of surgery, a piece of gum was given to the patients for chewing followed by another gum at 2 hours before surgery. Following surgery, gum was given to patients three times a day (morning, afternoon, and evening) when they had regained consciousness. This was continued till the ileus resolved. Resolution of ileus was defined in our study as the passage of stool or flatus or both in addition to fulfilling the criteria set by the tripartite gastrointestinal recovery postoperative ileus group.

Table 1: Gender distribution

		Control		Chewing gum	
S. No.	*Gender distribution*	*No.*	*Percentage*	*No.*	*Percentage*
1	Male	34	68	26	52
2	Female	16	32	24	48

Table 2: Final diagnosis

		Control		Chewing gum	
S. No.	*Final diagnosis*	*No.*	*Percentage*	*No.*	*Percentage*
1	Ascending colon growth	6	12	7	14
2	Rectal growth	14	28	16	32
3	Sigmoid growth	9	18	9	18
4	Hepatic flexure growth	7	14	5	10
5	Post NACRT Ca rectum	6	12	6	12
6	Rectosigmoid growth	5	10	5	10
7	Descending colon growth	3	6	2	4

Inclusion Criteria

- All the patients above the age of 14 who underwent colorectal surgeries for cancer and had no known medical comorbidities.

Exclusion Criteria

- Patients not giving consent.
- Other causes of ileus like sepsis, hypokalemia, hypothyroidism, severe cardiopulmonary and renal comorbidities.
- Patient developing adverse effects to the use of chewing gum.

A detailed history was obtained including medical comorbidities, the presenting complaints, the duration of symptoms, the severity of symptoms, and any associated complaints. All patients were subjected to a detailed general physical examination and digital rectal examination. In addition, baseline investigations according to our hospital's preoperative workup protocol of colorectal cancers were done. Postoperatively, both groups were checked twice daily (morning and evening) for any signs of return of bowel activity. Bowel sounds were not included as a part of the assessment to eliminate observer bias. Their serum electrolytes were monitored daily during this period. Patients were followed up to their discharge for the development of any complications, which were noted.

Results

Our study comprised 100 patients who underwent colorectal surgeries that were selected as per the inclusion criteria. The patients were divided into two groups: control (C) and chewing gum (G) group with 50 patients in each group.

The average age in the C group was 51.44 years and that in the G group was 50.04 years. Males were more than females (68% in C vs 52% in G group) (Table 1).

Bleeding per rectum was the main presenting complaint across both groups (42% in C vs 44 % in G group) followed by pain abdomen (20% vs 16%). Rectal cancer was the most common diagnosis in both groups. 28% in the C group vs 32% in the G group underwent upfront surgery whereas 12% each in the C and G group were post NACRT Ca rectum. Other diagnoses included sigmoid growth (18% in each group), rectosigmoid growth (10% in each group), hepatic flexure growth (14% vs 10%), ascending colon growth (12% vs 14%), and descending colon growth (6% vs 4%) (Table 2).

The mean preoperative serum Na+ in the C and G groups was 137.80 and 137.34, respectively with a standard deviation of 3.16 and 3.32. The mean preoperative serum K+ in C and G groups was 3.85 and 3.86, respectively with standard deviations of 0.33 and 0.37. Table 3 shows the operative procedures done across both groups.

The average duration of surgery for the C group was 156.3 minutes (2.6 hours) and 163.8 minutes (2.7 hours) in the G group.

The average time of passage of the first flatus in the G group was 51.28 hours compared to 66.26 hours in the C group. A maximum number of patients in the G group (50%) appreciated their first flatus in 24–48 hours. In the C group, the majority of patients (72%) appreciated flatus in 49 to 72 hours. This difference was statistically significant with a *p*-value of 0.0002 (Table 4).

The average time to first bowel movement in the G group was 71.42 hours. In comparison, the time to the first bowel movement in the C group was 85.78 hours.

The majority of patients in the G group (60%) moved their first bowel in 48–72 hours. In comparison, a maximum number of patients in the C group (76%) moved the first bowel in 73–96 hours. The difference was statistically significant with a *p*-value of 0.000011 (Table 5).

The average length of hospital stay in the G group was 6.3 days and that in the C group was 6.4 days. The majority of patients in both groups were discharged on the 6th POD. This difference was not statistically significant (*p*-value of 0.274254).

Two patients in C and 3 in the G group developed surgical site infections which were managed with an antibiotic course and daily aseptic dressings. There was no adverse event associated with the use of chewing gum in any patient.

In addition, two patients in the G group developed a urinary tract infection which was treated with antibiotics. The rate of complications in the two groups was more or less similar.

Table 3: Operative procedure

		Control		Chewing gum	
S. No.	*Operative procedure*	*No.*	*Percentage*	*No.*	*Percentage*
1	LAR	18	36	22	44
2	Anterior resection	11	22	10	20
3	Colostomy take down	1	2	0	0
4	Right hemicolectomy	6	12	7	14
5	Left hemicolectomy	3	6	2	4
6	Right extended hemicolectomy	7	14	5	10
7	Sigmoid colectomy	2	4	3	6
8	Subtotal colectomy with ileosigmoid anastomosis	2	4	1	2

Discussion

Enhanced recovery after surgery society has recognized chewing gum as a form of sham feeding which may help in gastrointestinal recovery in the postoperative period by causing activation of cephalovagal axis. This produces the release of neurohormonal mediators and increases gastrointestinal motility and glandular secretion (salivary, gastric, biliopancreatic). There is ongoing debate on the cause of postoperative ileus. Sympathetic hyperactivity and elevated levels of circulating catecholamines cause postoperative suppression of bowel motility.[10] Postoperative ileus may also be caused by narcotic analgesic effects, peritoneal and/or retroperitoneal inflammation, and electrolyte problems. We aimed to study the effect of chewing gum on postoperative ileus and hospital stay.

Chewing gum stimulates eating and encourages intestinal movement without the dangers of starting orals early. The patient feels better as a result of it. It stimulates the secretion of hormones and digestive juices which may translate into an early appreciation of the first flatus and first bowel movement in the postoperative period.

We observed that the time of passage of the first flatus in the G group was significantly reduced in our study when compared to controls. The mean time of passage of the first flatus in our study was 51.28 hours (2.1 days) in the chewing gum group as compared to 66.2 hours (2.8 days) in the control group. Asao et al.[11] observed the first flatus in the chewing gum group was 2.1 days and that in the control group was 3.2 days which is in concordance with our study. However, our results were in contrast with a study conducted by Kobayashi et al.[12] who found that the time to the first flatus in sham feeding and control group was 53 and 49 hours, respectively which was not significant. The potential reason for different outcomes compared to our study may be because they did not exclude patients who developed other causes of prolonged ileus like anastomotic leak or obstruction. Lim et al.[13] also did not find any significant difference between gum-chewing and control groups concerning the passage of the first flatus. The contrasting results may be because patients were not put on any specific dietary restrictions in our study.

Table 4: Time of surgery to the passage of first flatus

		Control		Chewing gum		
S. No.	*Time of surgery to the passage of the first flatus*	*No.*	*Percentage*	*No.*	*Percentage*	*p-value*
1	24–48 hours	7	14	25	50	**0.0002**
2	49–72 hours	36	72	24	48	
3	73–96 hours	7	14	1	2	

significance of bold value $p < 0.05$

Table 5: The interval from surgery until the first bowel movement

		Control		Chewing gum		
S. No.	*The interval from surgery until the first bowel movement*	*No.*	*Percentage*	*No.*	*Percentage*	*p-value*
1	48–72 hours	7	14	30	60	**0.000011**
2	73–96 hours	38	76	18	36	
3	97 hours or more	5	10	2	4	

significance of bold value $p < 0.05$

Our study found a significant reduction in the time to first bowel movement in the postoperative period in the gum-chewing group as compared to controls. In our study, the mean time of 71.42 hours (2.9 days) for the first bowel movement in the G group and 85.78 hours (3.6 days) in the control group. Schuster et al.[14] in a similar study observed that the first bowel movement in the gum-chewing group occurred at 63.2 hours and at 89.4 hours in the control group, which is close to our results. In another study, the first bowel movement in the chewing gum group was 3.1 days and 5.8 days in the control group which is comparable to our study.[11]

In our study, the average hospital stay in the control group was 6.4 days, and that in the chewing gum group was 6.3 days, which was found to be statistically insignificant. There are many limitations in our study. Our hospital is a tertiary care center and patients come from far-off places. So, some patients often refuse to be discharged early and tend to overstay. It might have influenced the results regarding the length of hospital stay. A wide range of lengths of stay could have resulted from the unexpected array of operations, which included everything from extensive rectal surgery to right hemicolectomy.

Another drawback is that it wasn't possible to standardize the gum chewing due to differences in patient behaviors. The major limitation is that patient allocation was not randomized or blinded amongst the two groups. A further extension of this study is currently underway where the allocation is blinded and randomized. Furthermore, these results pertain to elective colorectal cancer surgeries and it is unknown whether similar observations can be found across other GI surgeries and emergency abdominal operations. Lastly, further studies with larger sample sizes are encouraged to standardize these findings.

We conclude that chewing gum is a cost-friendly method that significantly decreases the postoperative ileus but has no effect on postoperative hospital stay.

Ethics Approval and Dissemination

This study has been approved by the Institutional Ethics Committee (IEC) at SKIMS, Soura.

Contributing Statement

Authors 1, 2, and 3 helped with the conceptualization, methodology, data analysis, manuscript preparation, manuscript editing, and manuscript review. Author 4 contributed to data analysis, manuscript preparation, and manuscript editing. Authors 5 and 6 contributed to the conceptualization and manuscript review.

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