Section: General Surgery

Original Research Article

EFFICACY OF CHEWING GUM IN REDUCING THE INCIDENCE OF POSTOPERATIVE ILEUS IN PATIENTS UNDERGOING OPEN ABDOMINAL SURGERIES

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Received : 03/02/2025
Received in revised form : 01/04/2025
Accepted : 16/04/2025

Keywords:
Ileus, chewing, post operative.

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DOI: 10.47009/jamp.2025.7.3.30

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2025; 7 (3); 157-162

ABSTRACT

Background: Theoretically, sham feeding with products like chewing gum can reduce the incidence and time to resolution of postoperative ileus. The use of mixed study populations has contributed to the conflicting findings in the literature on this subject, making it difficult to assess the effectiveness of sham feeding in alleviating this condition. The aim of this study is to evaluate the efficacy of postsurgical gum chewing in restoring normal bowel movement in patients who had undergone abdominal surgeries. **Materials and Methods:** We used a randomized controlled trial to examine the time to first postoperative flatus and defecation. On the first day after the surgery, the intervention group (n = 8) received xylitol chewing gum, one piece for 15 minutes, three times daily, until they experienced their first postoperative flatus and defecation. Both the intervention and control groups (n = 8) received standard postoperative care and were encouraged to walk as soon as possible after surgery. Patients reported the time to the first flatus. **Result:** The time to first flatus and defecate in the intervention group was significantly shorter than that in the control group (39.13 ± 15.66 vs. 52.92 ± 21.97 hours and 54.55 ± 18.90 vs. 77.98 ± 34.59 hours, respectively). However, after adjusting for age and surgical duration, only time to first flatus was significantly shorter in the intervention group. Both groups showed significantly positive correlations between the time to first flatus and the time to first defecation. **Conclusion:** This study demonstrated a positive effect of gum chewing on the time to first postoperative flatus and defecation. We may recommend this inexpensive and noninvasive intervention to reduce the time to resolution of postsurgical ileus in individuals who have undergone open abdominal surgeries.

INTRODUCTION

Postoperative ileus is the lack of bowel movement after surgery, which is assessed using the time to first passage of flatus and defecation as well as the restoration of tolerance for eating.[1] After open abdominal surgeries, disordered electrical activity in the gastrointestinal tract and a lack of coordinated propulsive action typically lead to postoperative ileus, which normally lasts approximately 4–5 days.[2] Although the pathophysiological mechanism of postoperative ileus after abdominal surgeries remains an issue of debate in the literature, three mechanisms, including sympathetic nervous system overreaction, activation of the inhibitory neural reflex reaction, and inflammatory response processes, have been proposed.[3-5] The most dreaded and avoidable cause of death happens due to the septicemia.[6] Jayalal et al. have concluded in their studies that prophylactic antibiotics have a positive response in the inflammatory response process.[7] Factors associated with postoperative ileus after any surgery include the surgical method used, use of analgesics, presence of an underlying disease, and type of postoperative care provided. Use of the laparoscopic approach and younger age have been associated with lower rates of postoperative ileus,[8,9] found that patients undergoing laparoscopy had superior bowel peristalsis compared with those undergoing open abdominal surgery. Dhinesh et al.also stated that there is less paralytic ileus in laparoscopy compared to open surgeries.[10]

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Although postoperative analgesic drugs such as morphine have analgesic effects, they inhibit presynaptic excitatory neurons, which block smooth intestinal muscle function and lead to postoperative ileus.[11] After abdominal surgeries a nasogastric tube that helps stomach decompression is routinely placed postoperatively in a patient's stomach for a few days until the recovery of intestinal peristalsis. Patients with postoperative nasogastric tube decompression will recover bowel peristalsis,[12] as well as eat earlier, but their probability of abdominal bloating, nausea, and vomiting is significantly higher than in patients without postoperative nasogastric tube decompression.[13] Current practice guidelines recommend that postoperative nasogastric tubes do not necessarily need to be routinely placed after elective abdominal surgery.[14] Studies have confirmed that early food intake reduces the time of first flatus and defecation significantly,[4] and reduces hospitalization days compared with traditional care.[15]

Sham feeding refers to promoting gastrointestinal peristalsis by viewing, smelling, chewing, and tasting without ingesting food into the gastrointestinal tract. Postoperative sham feeding uses chewing gum to promote the recovery of gastrointestinal peristalsis. Although not completely understood, the physiologic theory that underpins gum chewing (sham feeding) with regard to stimulating peristalsis and reducing the time to postoperative intestinal recovery includes the concept that oral and masticatory stimulation provided by gum chewing imitates food ingestion sufficiently to stimulate a neurohumoral reflex that increases gastrointestinal fluid secretion. This in turn promotes gastrointestinal motility. In addition, oral stimulation and chewing may stimulate the vagus nerve, which is also involved in promoting peristalsis. Finally, none of the current theories sufficiently explain the effect of mastication/gum chewing on reducing postoperative inflammation in the gut, which may lead to a lower incidence of postoperative infection. In prior studies, the physiologic changes associated with chewing gum seem to promote normal gastrointestinal function and, subsequently, postoperative/anesthetic recovery.[16,17] Gum chewing itself seems to exhibit paradoxical physiologic responses. For instance, one study showed that, during a stressful experience, chewing flavorless gum stimulated the sympathetic nervous system, which was seen in subjects as an increased heart rate.[18] Conversely, another study showed a parasympathetic response to gum chewing that led to increased peristalsis and the secretion of gastrin.[19] Although the findings have been inconsistent, postoperative gum chewing has been explored in the literature most commonly in the context of recovery from surgical procedures such as resection for colorectal cancer,[17,20] cesarean section,[21,22] and bladder cystectomy.[23]

Some studies have revealed that gum chewing reduces the time to first postoperative flatus and defecation,[16,20] as well as reduce the risk of postoperative ileus.[20] By contrast, some studies of patients undergoing open abdominal surgery or laparoscopy have indicated that chewing gum has no effect on time to first postoperative flatus and defecation,[24-26] no significant effect on reducing average hospitalization days,[24] and no significant effect on preventing postoperative nausea, vomiting, or bloating.[20] A meta-analysis of gum chewing after abdominal surgeries from 2002 to 2013 indicates that gum chewing reduces the time to first postoperative flatus by approximately 31 minutes, time to first postoperative defecation by approximately 30 minutes, and number of hospitalization days by 0.5 days and decreases the incidence rate of comorbidities by 0.687-fold. However, early food intake was not found to significantly improve the postoperative recovery of gastrointestinal peristalsis.[27] A possible reason for the inconsistent results of sham feeding using chewing gum to reduce the incidence of postoperative ileus may be the differences in the underlying types of heterogeneity among surgical and postoperative care methods.

Although many studies have been conducted to examine the efficacy of chewing gum in patients undergoing open abdominal surgeries, conclusions have remained inconsistent. This may be attributable to differences in intestinal injuries affecting intestinal function, differences in length of time under anesthesia, and differences in anesthetic or pain control agents used in pain control affecting intestinal function and time to recovery of peristalsis. Considering the multiple factors known to affect postoperative ileus, chewing gum as an intervention remains a safe, accessible, and inexpensive option that should continue to be explored. This study offers experimental evidence that contributes to a body of literature that supports the practice of chewing gum to alleviate postoperative ileus in a well-defined sample.

Therefore, it is vital that we continue to evaluate and examine current practices. This demands empirical data with rigorous sampling criteria and randomized study designs from the global health community. The effect indicators were time to first postoperative flatus and time to first postoperative defecation. The research hypothesis was that the times to first postoperative flatus and defecation would be shorter in participants who performed the gum-chewing intervention than in their non-gum-chewing peers.

MATERIALS AND METHODS

Inclusion Criteria

All patients undergoing open abdominal surgeries in the department of general surgery, Kanyakumari government medical college from Age 18-60 who are willing to participate in the study

Exclusion Criteria

- Patients not cognitively intact
- Pediatric Age group
- Patients not willing to participate in the study

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Methods: This study was a prospective, single-blind, randomized controlled trial conducted in the surgical ward of Government medical college hospital in Asaripallam, Kanyakumari, Tamil Nadu. Recruitment was conducted from September to November 2024.

A commercially available mint-flavored, sugar-free xylitol chewing gum containing 1.2–1.37 grams of xylitol per piece was used in the intervention. The participants in the intervention group began to chew gum on the first day after surgery and chewed one piece of gum for 15 minutes, 3 times daily at 9:00 a.m., 2:00 p.m., and 7:00 p.m., respectively. The gum was regularly provided to participants by a resident doctor until the time of first reported flatus.

Data were analyzed using IBM SPSS Statistics Version 20.0, with statistical significance defined as one-tailed $p < .05$. An independent t test was performed to examine the effects of time to first flatus between the two groups. The Mann–Whitney U test was performed to examine the effects of time to first defecation between the two groups. An analysis of covariance (ANCOVA) using the covariates of age and surgical duration based on the study findings of Fesharakizadeh et al. (2013) was performed to examine the differences in times to first flatus and to first defecation between the two groups. In addition, Spearman's rank correlation was examined to identify significant correlations between time to first flatus and time to first defecation.

To test for homogeneity, differences in baseline characteristics were evaluated using independent t tests for continuous variables and chi-square tests for categorical variables. Although no differences in basic attributes indicated adequate randomization and equivalent homogeneous groups, there remained a potential risk of inference error. To ensure analysis rigor, the factors identified in previous studies as influencing the effect of the intervention indicators were included in the analysis as potential confounders.

RESULTS

[Table 1] shows the demographic characteristics of participants in the intervention (n = 8) and control (n = 8) groups. There were no significant differences between the groups in mean age ($p = 0.543$), gender ($p = 0.750$), surgical history ($p = 0.550$), or type of surgery ($p = 0.482$). Additionally, mean hemoglobin, albumin, and serum potassium levels were similar between groups. The groups also had comparable surgical duration ($p = 0.190$) and length of hospital stay ($p = 0.340$).

Table 1: Demographic Characteristics of Study Participants.

Variable	Intervention group (n=8)	Control group (n=8)	P Value
Mean Age (years)	42.88 ± 18.15	33.88 ± 27.01	.543
Gender			.750
Male	5 (62.5%)	6 (75%)	
Female	3 (37.5%)	2 (25%)	
Surgical History (Abdominal)			0.550
No	7 (87.5%)	7 (87.5%)	
Yes	1 (12.5%)	1 (12.5%)	
Mean Hemoglobin (Hb, g/dL)	11.55 ± 1.39	11.60 ± 1.58	0.321
Mean Albumin (g/dL)	3.73 ± 0.32	3.74 ± 0.37	0.246
Mean Serum Potassium (mEq/L)	4.03 ± 0.26	3.88 ± 0.19	0.42
Type of Surgery			0.482
Laparotomy	3 (37.5%)	3 (37.5%)	
Open Appendicectomy	3 (37.5%)	3 (37.5%)	
Cholecystectomy	1 (12.5%)	1 (12.5%)	
Resection and Anastomosis	1 (12.5%)	1 (12.5%)	
Postoperative Information			
Type of Analgesics			0.450
Nonsteroidal Anti-inflammatory	3 (37.5%)	3 (37.5%)	
Strong Opioid	5 (62.5%)	5 (62.5%)	
Surgical Duration (Minutes; M ± SD)	160.33 ± 71.89	185.23 ± 73.51	0.190
Length of Hospital Stay (Days; M ± SD)	7.48 ± 2.31	9.57 ± 10.43	0.340

Table 2: Effects of Time to First Postoperative Flatus and Defecation Between the Intervention and Control Groups (n = 16)

Variable	Median (hours)	Mean (hours)	SD (hours)	T	p	η^2
Time to first postoperative flatus (hours)						
Intervention	38.5	39.13	15.66	2.80	0.004	0.119
Control	52.5	52.92	21.97			
Time to first postoperative defecation (hours)						
Intervention	54.0	54.55	18.90	2.25	0.025	0.034
Control	71.0	77.98	34.59			

[Table 2] presents the effects of time to first postoperative flatus and defecation between the intervention (bubble gum chewer) and control (non-bubble gum chewer) groups (n = 16). The intervention group passed flatus significantly earlier (mean = 39.13 hours) compared to the control group (mean = 52.92 hours), with a significant difference ($t = 2.80$, $p = 0.004$) and medium effect size ($\eta^2 =$

ISSN (O): 2687-5365; ISSN (P): 2753-6556

0.119). For time to first defecation, the intervention group also experienced defecation earlier (mean = 54.55 hours) than the control group (mean = 77.98 hours), with a significant difference (t = 2.25, p = 0.025) and small effect size ($\eta^2 = 0.034$).

Table 3: Effects of Time to First Postsurgical Flatus and Defecation Between the Intervention and Control Groups (n = 16) after adjusting for age and surgical duration

Variable/Covariance	Intervention	Control	Mean	SE	F	P	Partial η^2
Time to first postoperative flatus (hours)	39.07	52.98	7.64	3.53	6.00	0.027	.100
Age	-	-	1.19	0.280	-	-	-
Operation duration	-	-	0.42	0.522	-	-	-
Time to first postoperative defecation (hours)	62.74	79.79	3.34	6.55	2.60	0.120	.040
Age	-	-	0.86	0.357	-	-	-
Operation duration	-	-	3.21	0.079	-	-	-

[Table 3] shows the effects of time to first postoperative flatus and defecation between the intervention (bubble gum chewer) and control (non-bubble gum chewer) groups (n = 16), adjusting for age and operation duration. The intervention group passed flatus significantly earlier (mean = 39.07 hours) than the control group (mean = 52.98 hours), with a significant F-value of 6.00 (p = 0.027) and moderate effect size ($\eta^2 = 0.100$). For time to first defecation, the intervention group (mean = 62.74 hours) also passed stool earlier than the control group (mean = 79.79 hours), but the difference was not statistically significant (F = 2.60, p = 0.120, $\eta^2 = 0.040$).

DISCUSSION

The main findings of this study showed that the gum-chewing intervention after abdominal surgeries reduced times to first postoperative flatus and defecation significantly compared with those who did not receive the intervention. For patients who received the intervention, the first postoperative flatus and defecation were 13.91 and 17.05 hours earlier, respectively, in the intervention group than in the control group. We performed a single t test, and the results showed that the intervention group's average time to first flatus in this study was significantly earlier than in the comparison study (p =.014), while the average time to first defecation did not significantly differ between the two studies (p =.751). The literature generally agrees that chewing gum after open abdominal surgeries greatly speeds up the times between the first flatus and defecation after surgery.[16,20] This result backs this up. An analysis of studies that did not show significant effects for gum chewing found that those studies included patients with laparoscopy and open abdominal surgery.[25,28] Laparoscopy, which causes less tissue damage than open abdominal surgery and requires less time under anesthesia, results in a postoperative flatus time that is 29 hours earlier than that of open abdominal surgery.[29]

A crucial finding of this study is that, after adjusting for patient age and surgical duration, the gum-chewing intervention had a significant effect on reducing time to the first postoperative flatus. Fesharakizadeh et al,[30] reported that the duration of an open colorectal resection operation can predict the time of first postoperative flatus, with longer operation times linked to longer wait times before the first postoperative flatus. Therefore, when a patient undergoes a longer operation, the first postoperative flatus may be delayed, which may be improved by gum chewing. Interestingly, inconsistent results on the effects of time to first postoperative defecation between the intervention and control groups suggest that age and surgical duration are important factors in the recovery of bowel function. The study found no significant difference in surgical duration between the two groups, but the control group's mean surgical duration was nearly 25 minutes longer than the intervention group's. This finding supports the important link between the risk of postoperative ileus and the length of the procedure and/or the anesthesia,[31,32] and shows how important it is to find a way to improve bowel function that works. additional explanations may be that chewing mimics food intake and thus stimulates patient motivation to eat, which in turn increases appetite and promotes a general sense of recovery after a major surgery. Finally, consistent with the findings of previous reports of no significant difference in length of hospital stay between gum chewing and control groups,[16,25,26] this study found that patients in the intervention group were discharged 2.09 days earlier than their control group peers. The gum-chewing intervention for postoperative ileus may be suitable for patients who are cognitively intact and able to safely chew gum.

Limitations

- No quantitative monitoring or recording of postoperative physical activities was performed.
- During the study, xylitol chewing gum was distributed 3 times a day. Patients were monitored by the same researcher as they chewed the gum for 15 minutes before spitting it out. Patients' chewing methods and speeds varied and could not be standardized. Thus, the influence of differences in chewing speed on the results was not assessed.
- Each piece of gum contained 1.2–1.37 grams of xylitol, and 3.6–4.11 grams of xylitol were consumed per day (considered a very small

ISSN (O): 2687-5365; ISSN (P): 2753-6556

amount) by the intervention group participants. Although xylitol was not the focus of this study, this ingredient conceivably may influence gastrointestinal system functions.

- Bowel movement functions are associated with age and digestive capability, both of which may affect speed of recovery from surgery.

CONCLUSION

The results of this study supports the positive effects of gum chewing on recovery from postoperative ileus after abdominal surgeries and confirm that postoperative gum chewing significantly improves the times to first postoperative flatus and defecation. Moreover, the sooner that participants passed their first postoperative flatus, the faster they passed their first postoperative defecation. These findings enhance clinical knowledge regarding the relationship between flatus and defecation and provide evidence for noninvasive interventions that promote postoperative ileus recovery in patients with who have undergone open abdominal surgeries. The results further strengthen past empirical data regarding the use of gum chewing in sham feeding strategies to improve postoperative ileus in middle-aged and older patients who have undergone open abdominal surgeries.

Clinically, the noninvasive nature of the gum-chewing intervention achieved a high acceptance rate among participants. Saliva secretion increases during gum chewing, which moistens the oral mucosa and throat, and improves comfort. In this study, no cases of serious complications or death have occurred as a result of postoperative gum chewing. The average length of hospitalization in the intervention group was shorter than that in the control group. Finally, the results of this study support gum chewing as a safe, inexpensive, and noninvasive intervention worthy of widespread clinical application.

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