International Surgery Journal
Kumar A et al. Int Surg J. 2018 Aug;5(8):2808-2812
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: http://dx.doi.org/10.18203/2349-2902.isj20183196

Original Research Article

Effect of chewing gum on bowel motility in post operative patients following abdominal surgery: a clinical outcome based study

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Received: 17 May 2018
Accepted: 27 June 2018

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ABSTRACT

Background: One very important complication of abdominal surgeries is postoperative ileus which results in severe patient discomfort, prolonged hospitalization, and enhanced treatment cost. This study was conducted with an aim to analyze the clinical outcome of effect of chewing gum mainly to avoid post-operative paralytic ileus in post-operative patients of abdominal surgeries.
Methods: In this study total 200 patients were included, 100 were cases and remaining were controls. The cases were given chewing gum to chew after the surgery while the controls were allowed to heal without chewing gums in conventional style and both were observed hourly for clinical outcome.
Results: Among cases the mean duration of first sound heard was 26.3 hours while among controls this was 38.8 hours ($p<0.001$), the mean duration of first flatus passed among cases was 50.7 hours while that among controls was 68.5 hours, the mean duration of first Bowel passed among cases was 92.4 hours while that among controls was 128.3 hours ($p<0.001$). On comparing cases of routine with emergency surgeries, gastric with small bowel surgeries, and traumatic with pathological bowel surgeries it was observed that the first bowel sound, first flatus and first bowel passed appears significantly earlier in routine surgeries, gastric surgeries and traumatic surgeries respectively.
Conclusions: It was observed that chewing gum has significant effect over bowel motility as bowel sounds appeared significantly earlier in cases than control and time for first flatus passed and first bowel passed were also noted significantly earlier in cases than controls. Hospital stay of cases were found significantly lesser than control hence simple intervention like chewing can decrease the burden of disease of paralytic ileus from community.

Keywords: Abdominal surgery, Bowel function, Chewing gum, Effectiveness

INTRODUCTION

Normal bowel motility results from complex interactions among the enteric nervous system, central nervous system, hormones, and local factors affecting smooth muscle activity Motility in the stomach and small intestine varies based on whether one is in the fasting or fed state. Compared with fasting, the fed pattern consists of continuous low varying-amplitude, ungrouped contractions whose number, intensity, and duration depend on the food ingested (amount and physical and chemical composition).[1]

However, between meals, the migrating motor complex (MMC) dictates the contractile pattern of the bowel. The MMC, first described by Szurszewski, is believed to serve a "housekeeper" function by propelling intraluminal contents distally during the fasting state.

Pathophysiology of postoperative ileus

The pathophysiology underlying postoperative ileus is complex and multifactorial, consisting of endogenous and pharmacological characteristics. It has been described into 2 distinct phases in which the first phase, or neural phase, results from activation of mechanoreceptors and nociceptors by stimuli, such as incision of the skin and, more importantly, by direct manipulation of the intestine. Activation of these receptors initiates a neural reflex, which is dependent on release of mediators, such as α-calcitonin gene-related peptide and substance P, which inhibit gastrointestinal motility and result in generalized intestinal hypomotility.[2] The neural phase of postoperative ileus lasts minutes to hours and resolves after closure of the wound when the noxious stimuli have ceased. The motility of the colon in particular depends heavily on input from the autonomic nervous system, which might explain colonic susceptibility to isolated and prolonged ileus.[3]

The second, more protracted, inflammatory phase is caused by formation of an inflammatory infiltrate in the muscular layers of the intestine. Manipulation of the intestine initiates an inflammatory cascade starting with activation and degranulation of mast cells.[4] Subsequently, resident macrophages are activated either via mast cell-derived mediators or by luminal antigen. These activated macrophages produce cytokines and chemokines, which attract neutrophils to the muscular layer of the intestine. Invaded neutrophils directly impair intestinal smooth muscle cell contractility via release of nitric oxide and prostaglandins. The formation of an inflammatory infiltrate not only impairs motility in the manipulated areas, but also leads to generalized hypomotility of the gastrointestinal tract via activation of inhibitory adrenergic neural pathways.

The use of chewing gum chewing has emerged as a new and simple modality for decreasing POI. It acts by stimulating intestinal motility through cephalic vagal reflex and by increasing the production of gastrointestinal hormones associated with bowel motility.[5] Recently, it has been proposed that hexitols present in sugarless chewing gums might also be playing a role in the amelioration of POI because these are known to cause gastrointestinal symptoms such as gas, bloating, and abdominal cramps in a dose-dependent manner. The published literature reveals that gum chewing in the postoperative period is a safe method to stimulate bowel motility and it has been shown to reduce ileus and helps to resume early bowel functions normally.[6]

Aims and objectives

Analysis of clinical outcome of effect of chewing gum on bowel motility in post-operative patients following abdominal surgery. To assess the effectiveness of chewing gum chewing in early return of bowel function after abdominal surgery in AIIMS, Patna and to assess the return of bowel function with and without chewing gum after abdominal surgery and compare different variables.

METHODS

The study was conducted in AIIMS, Patna from September 2013 to November 2014. Total 200 patients were enrolled, 100 were cases gum chewing and 100 were controls. This is an interventional (Experimental) prospective study. The intervention was very simple, it was allowing the cases to chew chewing gums after surgery. This study was a randomized and controlled clinical trial.

Inclusion criteria

- age ≥18 years
- satisfactory consciousness (i.e., alertness)
- cooperativeness toward chewing
- underwent abdominal surgery
- any gender
- any BMI
- informed consent.

Exclusion criteria

- age <18 years
- unconsciousness after surgery
- no teeth or defective or incomplete chewing movement
- need of long-term fasting and having received total parenteral nutrition
- pyloric obstruction
- remnant of gastric cancer
- recurrence of gastric cancer
- palliative surgery for advanced gastric cancer
- refusal to participate in the trial
- muscular and neurological disorders
- history of drug addiction
- especially opioids
- severe water and electrolyte disturbances.

The participants were given a thorough description of the research approach before entering the study. After eligibility had been established and patients provided written informed consent, patients were randomly allocated by a 1:1 ratio to the gum-chewing (Gum) or control (No gum) groups using a computer-generated randomization sequence in our coordinating office. The sequence was then provided to the participating nurses by telephone after the operation. The same surgical group, to ensure technical replication, performed all the operations. All patients remained enrolled until the end of the study.

Statistical analysis

Summarized data were analyzed using SPSS (version 19.0; SPSS Inc, Chicago, IL). Continuous variables, such

as age, duration of surgery, analgesic drug consumption, time to first flatus, and defecation, were presented as the mean±standard deviation. Categorical variables, such as sex, ASA grade, comorbidities, postoperative complications, pain scores, and nausea and vomiting scores were expressed as frequencies.

Student t tests were used to compare the means of continuous variables with normal distribution, whereas Mann-Whitney U tests were used for those with nonparametric distribution. Categorical variables were compared using the $\chi 2$ test. For small samples, we used Yate correction for continuity, as appropriate. A probability value ≤ 0.05 ($P \leq 0.05$) was considered significant.

RESULTS

Bowel sound (mean duration of first sound heard) in hours is 26.3, 38.8 in cases and control groups respectively.

Table 1: Hospitalization duration compared between cases and controls.

Patients	Mean duration of hospitalization (days)	±SD
Cases (100)	11.9	2.2
Controls (100)	12.67	2.4
P value	0.035	

Table 2: Indicators compared between cases and controls.

	Bowel sound (mean duration of first sound heard) in hours	± SD	Flatus (mean duration of first flatus passed) in hours	± SD	Motion (mean duration of first bowel passed) n hours	± SD
Cases (100)	26.3	1.2	50.7	0.75	92.4	2.3
Controls (100)	38.8	1.5	68.5	11	128.3	1.75
P Value	<0.001		<0.001		<0.001	

Table 3: Indicators compared between cases in routine and emergency surgeries.

Cases	Bowel sound (mean duration of first sound heard) in hours	±SD	Flatus (mean duration of first flatus passed) in hours	±SD	Motion (mean duration of first bowel passed) n hours	±SD
Cases of routine surgery (40)	20.4	1.8	48.6	0.75	90.5	2.1
Cases of emergency surgeries (60)	34.2	2.4	66.4	1.2	118	0.75
P value	< 0.001		< 0.001		< 0.001	
Significance	Significant		Significant		Significant	

Table 4: Indicators compared between cases of gastric and small bowel surgeries.

Cases	Bowel sound (mean duration of first sound heard) in hours	±SD	Flatus (mean duration of first flatus passed) in hours	±SD	Motion (mean duration of first bowel passed) n hours	±SD
Cases of gastric surgeries (45)	36.9	3.1	69.9	6.7	122.7	6.7
Cases of small bowel surgeries (66)	38.7	3.6	72.8	3.5	124.8	4.6
P value	0.005		0.011		0.019	

Flatus (mean duration of first flatus passed) in hours is 50.7, 68.5 in cases and control groups respectively. Motion (mean duration of first bowel passed) in hours is 92.4, 128.3 in cases and control groups respectively (Table 2). Mean duration of hospitalization (days) is 11.9, 12.67 in cases and control groups respectively (Table 1). Bowel sound (mean duration first sound heard) in hours is 20.4, 34.2 in cases of routine surgery, emergency surgeries respectively. Flatus (mean duration of first flatus passed) in hours 48.6, 66.4 in cases of routine surgery, emergency surgeries respectively. Motion (mean duration of first bowel passed) n hours 90.5, 118 in cases of routine surgery, emergency surgeries respectively.

Bowel sound (mean duration first sound heard) in hours is 22.2, 36.8 in cases of traumatic surgery, pathological surgeries respectively. Flatus (mean duration of first flatus passed) in hours 52.4, 68.1 in cases of traumatic surgery, pathological surgeries respectively. Motion (mean duration of first bowel passed) in hours 100.9, 112.8 in cases of traumatic surgery, pathological surgeries respectively.

Table 5: Indicators compared between cases in traumatic and pathological surgeries.

Cases	Bowel sound (mean duration of first sound heard) in hours	±SD	Flatus (mean duration of first flatus passed) in hours	±SD	Motion (mean duration of first bowel passed) n hours	±SD
Cases of traumatic surgeries (33)	22.2	2.9	52.4	3.6	100.9	5.4
Cases of pathological surgeries (62)	36.8	3.8	68.1	4.1	112.8	2.8
P value	<0.001		<0.001		<0.001	

DISCUSSION

The important complication of abdominal surgical procedures is postoperative ileus (Colonic stasis), which results in patient discomfort, prolonged length of hospital stays, and increased cost of treatment. The exact mechanism that produces postoperative ileus is unknown, but possible origins include gastrointestinal inflammatory response, stimulation of the mesenteric plexus, anesthesia, and use of opioid analgesics.[7]

In this study total 200 patients were studied, 100 were cases and 100 were controls. The cases were given chewing gum after the surgery while the controls were healing without chewing gums. Among cases the mean duration of first sound heard was 26.3 hours while among controls this was 38.8 hours (p<0.001), similar finding was observed in the study of Kouba et al where the mean duration among chewing gum users was significantly reduced from 3.9 to 3.2 days in cases.[8]

In present study the mean duration of first flatus passed among cases was 50.7 hours while that among controls was 68.5 hours, similar was the finding s in the study of Kouba et al where the time to flatus was shorter in patients who received gum compared with controls (2.4 versus 2.9 days; P <0.001).[8]

In present study the mean duration of first Bowel passed among cases was 92.4hours while that among controls was 128.3 hours (p<0.001). The finding was similar to the study of Terzioglu F et al of Turkey in which the first defecation occurred earlier in the 1st group of women who chew gum, were hydrated orally and were mobilized early after surgery than the other groups.[9]

In this study total 200 patients were operated out of which 100 were given chewing gum and 100 were not given [controls], it was found that among cases the mean duration hospitalization (11.9 days) was reduced than controls (12.67 days), p value 0.035 (less than 0.05) which is significant. This finding was similar to the study of Kouba et al, in which the chewing gum cases had less duration of hospitalization.[10]

In this study 40 cases had routine surgeries and 60 cases had emergency surgeries, among them the cases of routine surgeries the mean duration of first bowel sound heard (20.4 hrs), mean duration of first flatus passed (48.6hrs) and mean duration of first Bowel passed (90.5 hrs) was much earlier than the cases of emergency surgeries (first bowel sound-34.2 hrs, first flatus passed -66.4 hrs, first bowel passed-118 hrs). p value less than 0.001 which is significant, this finding was similar to the study of Watson et al in which the cases of routine surgeries recovered early.[7]

In this study 45 cases had gastric surgeries and 66 cases had small bowel surgeries, among them the cases of gastric surgeries the mean duration of first bowel sound heard (36.9 hrs), mean duration of first flatus passed (69.9 hrs) and mean duration of first Bowel passed (122.7 hrs) was much earlier than the cases of small bowel surgeries (First bowel sound-38.7 hrs, first flatus passed -72.8 hrs, first bowel passed-124.8 hrs). p value of 0.005, 0.011 and 0.019 respectively which is significant. This finding was similar to the study of Matros et al in which the cases of gastric surgeries recovered early.[6]

In this study 33 cases had surgeries after traumatic causes and 62 cases had surgeries after pathological causes among them the cases of traumatic surgeries the mean duration of first bowel sound heard (22.2 hrs), mean duration of first flatus passed (52.4 hrs) and mean duration of first Bowel passed (100.9 hrs) was much earlier than the cases of pathological surgeries (first bowel sound-36.8 hrs, first flatus passed -68.1 hrs, first bowel passed-112.8 hrs). p value, (p<0.001) this finding was similar to the study of McCormick et al in which the cases of traumatic surgeries recovered early.[11]

CONCLUSION

This study was conducted over 200 patients 100 were cases who were given chewing gum chewing four times a day post operatively and 100 were controls who were not fed with chewing gum selected randomly. All patients were observed hourly for appearance of first bowel sound. First flatus passed, and first bowel passed and were analysed. It was found that chewing gum have significant effect over bowel motility as bowel sound appear significantly earlier in cases than control and time for first flatus passed and first bowel passed were also found significantly earlier in cases than controls.

Also, it was found that similar findings were found among the routine surgeries, emergency surgeries, traumatic surgeries, pathological surgeries, gastric surgeries and small bowel surgeries.

On comparing routine and emergency surgeries it was found that in routine surgeries among the cases, first bowel sound, first flatus and first bowel passed appears significantly earlier than emergency surgeries owing to effect of duration of surgery, effect of anaesthesia and duration of surgery. On comparing gastric surgeries and small bowel surgeries it was found that in gastric surgeries among the cases, first bowel sound, first flatus and first bowel passed appears significantly earlier than small bowel surgeries owing to effect of bowel handling and effect of colonic stasis in small bowel surgeries.

On comparing traumatic surgeries and pathological bowel surgeries it was found that in traumatic surgeries among the cases, first bowel sound. First flatus and first bowel passed appears significantly earlier than pathological surgeries owing to effect of underlying pathology over bowel function and patient condition and immunological status of patients.

Also, it was found that hospital stay of cases was found significantly lesser than control owing to early enteral feeding, early ambulation, and decreased complications and hence decreased burden of disease from community.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Kumar A, Kumari R, Kumar S, Raj P. Effect of chewing gum on bowel motility in post operative patients following abdominal surgery: a clinical outcome based study. Int Surg J 2018;5:2808-12.