Original Article

# Efficacy and Safety of Gum Chewing in Adjunct to High-Dose Senna for Bowel Cleansing Before Colonoscopy: A Single-Blind Randomized Controlled Trial

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## ABSTRACT

**Background/Aims:** Inadequate bowel cleaning leads to a suboptimal colonoscopic examination. Gum chewing has been reported to have a favorable effect on postoperative bowel functions. We conducted this study to establish if gum chewing added to high-dose senna before colonoscopy promotes bowel cleaning. **Patients and Methods:** In this randomized controlled study, consecutive outpatients scheduled for elective colonoscopy were randomized into two groups. Group 1 patients ($n$ = 65) used senna solution 150 mL (300 mg senna) the night before colonoscopy. The patients also used sennoside tablet 80 mg daily for 3 days before the colonoscopy. Patients in group 2 ($n$ = 64) were additionally advised to chew sugarless gum half an hour three-times daily after meals for these 3 days. The overall quality of colonoscopy cleaning was evaluated using the Aronchick scale by a single endoscopist who was blinded to the intervention. Difficulty of procedure, patients' tolerance, and adverse events were also evaluated. **Results:** A total 129 patients were enrolled in the study. Superior cleaning was found in gum chewing group when compared with other group particularly in the cecum and ascending colon. Cecal intubation time was significantly shorter in the gum-chewing group (8.6 ± 5.1 and 7.1 ± 2.8 min, $P$ = 0.03). Adverse events were more common in group 1 compared to the gum-chewing group. **Conclusions:** Gum chewing enhances colonoscopy bowel preparation quality. Moreover, it is a physiologically sound, safe, and an inexpensive part of the colonoscopy bowel preparation. Gum chewing could be advised in addition to high-dose senna containing bowel preparation.

**Key Words:** Bowel cleansing, colonoscopy, chewing gum, senna

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Adequate bowel preparation is essential for a thorough and accurate examination of the bowel during colonoscopy. Suboptimal preparation can lead to missed polyps, increased costs, and safety issues.[1,2] Polyethylene glycol (PEG)-based formulas are currently most widely used and recommended colonoscopic preparation in the world. However, due to some marketing problems, PEG-based formula is not available in some parts of the world. That is why senna is still used in some countries, even though it is an issue of concern in some recent research. For example, high-dose senna (300 mg) was shown to be an effective alternative compared to PEG-based formulas.[3] Additionally, high-dose senna is superior to PEG-based formulations for patient compliance and tolerance.[4] Although high-dose senna seems to be effective, patient discomfort especially abdominal pain and cleaning effectivity are still major issues of concern for physicians.[5] Recent reports showed a favorable effect of gum chewing on postoperative bowel functions.[6-8] This is mediated by a cephalic phase stimulus and the release of neurohormonal mediators. Therefore, gum chewing is suggested to increase bowel motility.[9] In this regard, we aimed to evaluate the effect of gum chewing in addition to high-dose senna for bowel cleaning before colonoscopy.

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## PATIENTS AND METHODS

A randomized controlled trial was performed in Ankara Education and Research Hospital. Patients admitted to our

gastroenterology department due to several gastrointestinal symptoms were recruited in the study by a single physician (L.F.) [Table 1]. Exclusion criteria were age under 18 years, previous abdominal surgery, major psychiatric disorders, pregnancy, presence of any contraindications for colonoscopy (eg, severe heart failure), and recent inadequate colonoscopy history. Consecutive patients were randomized into 2 groups. Group 1 patients ($n$ = 65) used senna solution (X-M diet, Yenisehir, Ankara, Turkey) 150 mL (300 mg senna) for bowel cleaning the night before colonoscopy. The patients also used Sennoside tablets (X-M, Yenisehir, Ankara, Turkey) 80 mg daily for 3 days before the colonoscopy. Sennoside tablets of 20 mg were used, given in two doses at 1 p.m. and 9 p.m. and the solution was used at 8 p.m. the night before the colonoscopy. Patients in group 2 ($n$ = 64), in addition to the above-mentioned sennoside drugs, were advised to chew sugarless gum without additional substances such as menthol, peppermint oil, fruit aromas, and so on, half an hour thrice daily after meals for these 3 days. Detailed instructions regarding the assigned bowel preparation were given to all patients. Colonoscopy was performed under conscious sedation (midazolam + meperidine) by the same blinded endoscopist (B.E.).

The primary outcome in the study was quality of the overall bowel preparation; this was assessed with a 5-point rating modified Aronchick scale (1 = excellent, 2 = good, 3 = fair, 4 = inadequate, 5 = poor) that has been used several times in previous studies for the same purpose.[10] Secondary outcomes included cecal intubation time, difficulty of the procedure, patients' tolerance and compliance, and adverse events. The endoscopist rated the difficulty of the procedure as 1 = easy, 2 = fairly easy, 3 = difficult, and 4 = failure to complete the examination. Patients' tolerance was determined using a questionnaire. They were asked to rate their tolerance from 1 to 4 (1 = very comfortable, 2 = comfortable, 3 = uncomfortable, 4 = very uncomfortable). Compliance of the patients to the dietary instructions and bowel preparation was assessed by asking the patients if they consumed the drugs as prescribed and in order to assess safety, patients were asked if they had side effects such as abdominal pain, vomiting, or dizziness during the preparation period. Informed consents were obtained from all patients and the protocol was approved by the local ethical committee.

Statistical analyses were performed using the statistical software SPSS 15.0. (Chicago, IL, USA). Comparisons between groups were done by Mann–Whitney, Chi-square, and $t$-tests as needed. Statistical difference was considered significant if the $P$ value was $< 0.05$.

## RESULTS

A total number of 129 patients (78 male, 51 female) were enrolled into the study. The demographic features of the patients included in the study are summarized in Table 1. Patients' compliance with bowel preparation and dietary instructions were similar in both groups. There were no significant differences between group 1 and group 2 with respect to age, gender, weight, height, or body mass index [Table 1].

The cecal intubation time was significantly shorter in group 2 compared with group 1. The mean cecal intubation time was 8.6 ± 5.1 min in group 1 and 7.1 ± 2.8 min in group 2 patients ($P$ = 0.03) [Table 2].

Cecal intubation rate was 71.9% in patients in group 1 and 82.8% in group 2. Although the differences between two

**Table 1: Demographic characteristics of the patients in the two groups**

| | Group I ($n$=65) | Group II ($n$=64) | $P$ |
|---|---|---|---|
| Age (year) | 53.29±14.6 | 50.26±13.3 | 0.2 |
| Male/female | 40/25 | 38/26 | 0.8 |
| Body mass index (kg/m$^2$) | 27.2±4.1 | 27.3±4.1 | 0.9 |
| Weight (kg) | 78.07±13.9 | 76.51±11.8 | 0.4 |
| Height (m) | 1.64±7.8 | 1.65±7.9 | 0.4 |

**Table 2: The comparison of two groups according to indications, findings and results of the colonoscopic examination**

| | Group 1 | Group 2 | $P$ |
|---|---|---|---|
| Cecal intubation (%) | 44/65 (71.9%) | 53/64 (82.8%) | 0.1 |
| Median time of colonoscopy (min) | 8.6±5.1 | 7.1±2.8 | 0.03 |
| Gut cleaning scores | | | |
| Excellent | 3 (4.6%) | 19 (29.7%) | <0.001 |
| Good | 15 (23.1%) | 24 (37.5%) | <0.001 |
| Fair | 25 (38.5%) | 10 (15.6%) | <0.001 |
| Inadequate | 5 (7.7%) | 3 (2.4%) | <0.001 |
| Poor | 17 (26.2%) | 8 (12.5%) | <0.001 |
| Indications (%) | | | |
| Constipation | 12 (18.5%) | 11 (17.2%) | |
| Anemia | 23 (35.4%) | 14 (21.9%) | |
| Rectal bleeding | 9 (13.8%) | 11 (17.2%) | |
| Abdominal pain | 4 (6.2%) | 3 (4.7%) | |
| Diarrhea | 8 (12.3%) | 6 (9.4%) | |
| CRC screening | 2 (3.1%) | 6 (9.4%) | |
| Change in bowel habits | 7 (10.8%) | 13 (20.3%) | |
| Findings | | | |
| Normal | 41 (64.1%) | 36 (55.4%) | |
| Polyp | 12 (18.8%) | 18 (27.7%) | |
| Diverticulosis | 1 (1.6%) | 1 (1.5%) | |
| IBD | 1 (1.6%) | 1 (1.5%) | |
| Angiodisplasia | 1 (1.6%) | 1 (1.5%) | |
| Hemorrhoid | 8 (12.5%) | 7 (10.8%) | |

CRC: Colorectal cancer, IBD: Inflammatory bowel disease

groups was not statistically different, the cecal intubation rate was slightly higher in the chewing-gum group [Table 2].

While 22 patients' bowel cleaning scores were Aronchick 4 and 5 (33.9%) in group 1, 11 patients' bowel cleaning scores were Aronchick 4 and 5 (16.9%) in group 2. Superior cleaning was found in the gum-chewing group when compared with the other group, particularly in the cecum and ascending colon [Table 2]. There was no difference between the two groups regarding indication for colonoscopy and colonoscopic findings [Table 2].

The frequency of adverse events related to drugs was compared in both the groups. Adverse events were more common in group 1 compared with the gum-chewing group. The results of the side effects are shown in Table 3.

The difficulty of colonoscopic examination and patients' tolerability was also compared in the two groups. There were no significant differences between the two groups according to these parameters. However, in the chewing-gum group the difficulty of colonoscopy and patients' tolerability were slightly better than the other group. Detailed data are summarized in Table 3.

## DISCUSSION

PEG, Na-phosphate, senna, or magnesium containing preparations have been widely used for colon cleaning before colonoscopy. However, suboptimal preparation is still a problem leading to missed lesions. That is why prokinetics (metoclopramide, domperidon, sisapride, mosapride) have been added in several studies to these purgatives to overcome suboptimal preparation leading to missed lesions, increased costs, and safety issues.[11,12] However, adverse effects limit the common use of the prokinetics.[13,14] Gum chewing is a form of sham feeding, which stimulates the cephalic phase of digestion. This leads to the release of neurohormonal mediators and the increase of gastrointestinal motility and glandular secretion (salivary, gastric, biliopancreatic).[15] Additionally, sugar-free gum may have osmotic effect, which may be why it is beneficial in inducing diarrhea and bowel cleansing. These events may clinically translate into a faster recovery of gas and feces transit leading to more effective bowel cleaning, as well as a better tolerance to colonoscopy. More effective cleaning and less discomfort of patients may lead to shortened cecal intubation time in gum-chewing group ($P < 0.05$). Similarly, cecal intubation rate was significantly higher in a similar mechanism in the gum-chewing group in our study [Table 1]. For this reason, inadequate colonoscopy necessitating further repeated colonoscopic examinations was significantly less in the gum-chewing group ($P < 0.05$). In our study, relatively low rate of cecal intubation can be explained by colonic spasm. Because it is known that spasm, as it is known that is among the reasons for low colonoscopy performance. In the present study, a vast majority of the study patients had constipation and predominant irritable bowel disease [Table 2]. However, new trials are needed to explain this association.

**Table 3: The difficulty, tolerability, and side effects of colonoscopic examinations in two groups**

| | Group 1 (%) | Group 2 (%) |
|---|---|---|
| The difficulty of examination | | |
| Easy | 12 (18.5) | 21 (32.8) |
| Fairly easy | 33 (50.8) | 32 (50) |
| Difficult | 18 (27.7) | 10 (15.6) |
| Incomplete | 2 (3.1) | 1 (1.6) |
| Patient tolerability | | |
| Very comfortable | 6 (9.2) | 16 (25) |
| Comfortable | 33 (50.8) | 28 (43.8) |
| Uncomfortable | 23 (35.4) | 19 (29.7) |
| Very uncomfortable | 3 (4.6) | 1 (1.6) |
| Side effects | | |
| Abdominal pain | 6 (9.2) | 3 (4.7) |
| Fatique | 1 (1.5) | - |
| Dizziness | 3 (4.6) | 1 (1.6) |
| Nausea | 5 (7.7) | 2 (3.2) |
| Vomiting | 1 (1.5) | 1 (1.6) |

Recent studies have indicated that chewing gum offers several health benefits. Gum chewing has a potential role in memory improvement, stress reduction, alertness and concentration, weight management, and oral health.[16-19] Beyond these, chewing gum had stimulatory effects on bowel motility after abdominal surgery.[20] Gum chewing was shown to reduce the risk of postoperative ileus.[21-23] Bowel cleaning before colonoscopy may lead to fatigue due to volume deprivation. Our patients in the gum-chewing group felt significantly less tiredness. Nausea, vomiting, and lightheadedness were seen significantly less in the gum-chewing group. This leads to a more comfortable pre- and postcolonoscopy period as well. Another issue is saliva stimulation. Our patients suffered less dry mouth the day before colonoscopy. High-dose senna (300 mg) was shown to have better outcomes regarding both effectiveness and patient tolerance. Although high-dose senna seems to be effective, patient discomfort especially abdominal pain is still a problem affecting the colonoscopic examination success. In our study, we observed the alleviation of abdominal discomfort in patients in the gum-chewing group.

In conclusion, patients who were instructed to chew gum during the colonoscopy bowel cleansing period demonstrated better bowel cleaning and lower discomfort after elective colonoscopy than patients who did not chew gum. The effect of gum chewing on bowel functions and exact mechanism remain to be elucidated with further studies.

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