# Effectiveness of Standard Nursing Care with Gum Chewing to Reduce Bowel Ileus in Post-operative Gynecologic Patients: Randomized Controlled Trials

**Kunyarat Chuamor, B.N., Jiraporn Thongdonjuy, B.N.**
*Nursing Department, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand.*

## ABSTRACT

**Objective:** To compare the additional use of gum chewing with standard post-operative care in management of post-operative bowel ileus in Thai gynecological patients undergoing abdominal surgery.
**Methods:** A total of 128 patients were recruited in this study. Eligible patients were randomly assigned to one of two groups; group A received standard post-operative care and group B received gum chewing with standard post-operative care. Each patient was asked to complete a questionnaire on demographic data. Data about diagnosis, operation, anesthetic method, blood loss, analgesic drugs, and antiflatulants were obtained from operative notes, anesthetic notes, and medical records.
**Results:** The first passage of blenching and flatus was noted post-operatively at hours 14.7 and 16.1 in group B, and 19.2 and 19.9 in group A, respectively. Patients in group B had significantly higher number of blenching, flatus, and bowel sound than those in group A in every time point assessment, except the number of flatus in post-operative day 3 which was not significantly different. Patients in group A had significantly higher abdominal distention score than those in group B in every time point assessment. Increased waist circumference was significantly higher in group A than group B in post-operative days 2 and 3. Patients in group A had significantly more severity of ileus than those in group B in post-operative days 1-3. Patients in group B had higher satisfaction and overall satisfaction score than those in group A.
**Conclusion:** Gum chewing provides a simple method for early recovery from post-operative ileus. Patients can tolerate gum chewing as early as the first operative day. It is a physiological method for stimulating bowel motility. Gum chewing should be added as an adjunctive treatment in post-operative care in gynecologic surgery.

**Keywords:** Gum chewing, bowel ileus, gynecologic surgery

**Siriraj Med J 2014;66:33-38**
***E-journal: http://www.sirirajmedj.com***

## INTRODUCTION

Post-operative bowel ileus is a common consequence of abdominal surgery.[1-3] It is one of the major causes of prolonged hospital stay.[1-4] The pathophysiology of post-operative bowel ileus is multifactorial. A prolonged inhibition of coordinated bowel activity causes accumulation of secretions and gas, resulting in nausea, vomiting, abdominal distension, and pain. The duration of post-operative bowel ileus correlates with the degree of surgical trauma and is most extensive after colonic surgery.[5-8] However, post-operative bowel ileus can develop after all types of surgery. The previous report in Thai gynecological patients receiving abdominal surgery found that more than half of the patients had moderate to severe abdominal distention after surgery.[2] A variety of treatment options have been used to decrease the duration of post-operative ileus. Currently, the important factors that could affect the duration and recovery from post-operative ileus include limitation of narcotic use by substituting alternative medications such as nonsteroidals and placing an epidural with local anesthetic when possible, and gum chewing.[1,5,6,9-11]

Gum chewing is a form of sham feeding which stimulates the cephalic phase of digestion. Most randomized

*Correspondence to: Jiraporn Thongdonjuy*
*E-mail: j-jeeja@hotmail.com*
*Received 24 October 2013*
*Revised 12 November 2013*
*Accepted 25 November 2013*

clinical studies reported that gum chewing reduces post-operative ileus after colorectal surgery.[9-11] Up to date, no reported study has investigated the effect of gum chewing on ileus after elective abdominal gynecologic surgery. This study aimed to compare the additional use of gum chewing with standard post-operative management in Thai gynecological patients undergoing abdominal surgery.

## MATERIALS AND METHODS

The present randomized controlled trial was carried out in the gynecologic ward named Phrasri 12/2, Department of Obstetrics and Gynecology, Faculty of Medicine Siriraj Hospital, Mahidol University, a tertiary care hospital from July 2010 to June 2011. The study was conducted in accordance with the ethical principles of the Helsinki Declaration and the study protocol was approved by the Siriraj Institutional Review Board.

The study population was women with benign gynecologic diseases and who were scheduled for abdominal surgery, excluding the patients who have intra-operative complication such as adjacent organ injuries, massive blood loss, and performed oncologic surgery. Eligible patients were informed about the study protocol and invited to participate in the study without coercion. A signed informed consent was obtained prior to operation and before taking demographic data.

Each patient was asked to complete a questionnaire on demographic data. Data about diagnosis, operation, anesthetic method, blood loss, analgesic drugs, and anti-flatulants were obtained from operative notes, anesthetic notes, and medical records.

### Treatment allocation

All patients underwent abdominal surgery. Eligible patients were randomly assigned to one of two groups; group A received standard post-operative care and group B received gum chewing with standard post-operative care by an investigator (investigator A). Patients in group B receive gum chewing for 15 minutes three times per day for 3 days. Treatment allocation was by simple randomization. Experiment codes were produced using a computer-generated list of random numbers. The codes were individually contained in sealed opaque envelopes, which were sequentially numbered and then chronologically opened after an eligible patient was identified.

### Assessment

The patients' post-operative progress was assessed by an independent investigator (investigator B) who was blinded to the assigned treatment. After surgery, waist circumference was measured when the patient arrived at ward, and then at day 1, 2, and 3 post-operatively. The first time and number of blenching and flatus were recorded. The number of bowel movements was assessed at 12 and 24 hours post-operatively and at 2 p.m. for 3 days. The abdominal distention score was assessed using visual analog scale which is a 10-cm horizontal line with two descriptors, i.e. "no symptom" at the left end, and "intolerable symptom" at the right end. The severity

**TABLE 1.** Baseline and operative characteristics.

| | Group A | Group B | P |
|---|---|---|---|
| Age (year) | 43.7±9.3 | 43.5±7.1 | 0.856** |
| Body mass index (kg/m$^2$) | 23.6± 4.1 | 22.8 ±3.8 | 0.209** |
| Diagnosis | | | 0.865* |
| Myoma uteri | 39 (60.9) | 39 (60.9) | |
| Adenomyosis | 8 (12.5) | 11 (17.2) | |
| Ovarian tumor | 6 (9.4) | 3 (4.7) | |
| Ovarian cyst | 6 (9.4) | 7 (10.9) | |
| Other | 5 (7.8) | 4 (6.3) | |
| Previous abdominal surgery | 20 (31.3) | 23 (35.9) | 0.575* |
| Operation | | | 0.633* |
| TAH | 21 (32.8) | 15 (23.4) | |
| TAH with bilateral SO | 22 (34.4) | 26 (40.6) | |
| TAH with unilateral SO | 10 (15.6) | 11 (17.2) | |
| Myomectomy | 6 (9.4) | 7 (10.9) | |
| Ovarian cystectomy | 4 (6.3) | 4 (6.3) | |
| Left SO | 0 (0) | 1 (1.6) | |
| Tuboplasty | 1 (1.6) | 0 (0) | |
| Operative time (hour) | 1.2 ±0.4 | 1.4 ±0.8 | 0.102** |
| Blood loss (mL) | 111.6± 82.7 | 224.2 ±103.3 | 0.011** |
| Anesthetic methods | | | 0.224* |
| Spinal anesthesia | 59 (92.2) | 53 (82.8) | |
| Epidural anesthesia | 0 (0) | 1 (1.6) | |
| General anesthesia | 5 (7.8) | 10 (15.6) | |

Data was presented as number (%) and mean ± S.D.
TAH= total abdominal hysterectomy, SO = salpingo-oophorectomy
*Chi-square test, **T-Test

of post-operative ileus symptom divided to mild (1-10 points), moderate (10-15 points), and severe (16-20 points) using Abdominal Distention Assessment Record for Gynecological Patient Receiving Abdominal Surgery[2]. The patient satisfaction for post-operative ileus management was evaluated using numeric rating scale (0-10) i.e. 0 = very unsatisfied, and 10 = very satisfied. The overall satisfaction was evaluated using a 5-point Likert scale, i.e., very satisfied, satisfied, uncertain, dissatisfied, and very dissatisfied.

**Outcome measures**

The baseline characteristics being collected included age, parity, body mass index, diagnosis, operation, operative time, blood loss. The primary outcome was the prevalence of post-operative ileus. The secondary outcome was the overall satisfaction of the post-operative ileus management.

**Statistical analysis**

The sample size was calculated using a formula to compare two proportions. With alpha = 0.05, power = 90%, and proportion of post-operative ileus from the pilot study in the control group = 0.6 and in the treatment group = 0.3, the sample size in each group plus 10% dropouts was 64.

Statistical analyses were performed with SPSS 17.0 for Windows (SPSS Inc, Chicago, IL). Data were

**TABLE 2.** Post-operative characteristics.

| | Group A | Group B | P |
|---|---|---|---|
| Time to first blenching (hour) | 19.2 ± 3.5 | 14.7 ± 3.7 | <0.001** |
| Time to first flatus (hour) | 19.9 ± 3.8 | 16.1 ± 4.7 | <0.001** |
| Post-operative analgesic drug requirement | 36 (56.3) | 39 (60.9) | 0.590* |
| Post-operative antiflatulance requirement | 21 (32.8) | 14 (21.9) | 0.165* |
| Blenching (number in past 4 hours) | | | |
| within 12 hrs | | | < 0.001* |
| 0 | 62 (96.9) | 40 (62.5) | |
| 1-5 | 2 (3.1) | 24 (37.5) | |
| Day 1 | | | 0.003* |
| 0 | 4 (6.3) | 0 (0) | |
| 1-5 | 60 (93.8) | 58 (90.6) | |
| 6-10 | 0 (0) | 6 (9.4) | |
| Day 2 | | | < 0.001* |
| 0 | 1 (1.6) | 0 (0) | |
| 1-5 | 59 (92.2) | 37 (57.8) | |
| 6-10 | 4 (6.3) | 25 (39.1) | |
| >10 | 0 (0) | 2 (3.1) | |
| Day 3 | (N=45) | (N=39) | 0.025* |
| 0 | 0 (0 ) | 1 (2.6) | |
| 1-5 | 33 (73.3) | 20 (51.3) | |
| 6-10 | 12 (26.7) | 14 (35.9) | |
| >10 | 0 (0) | 4 (10.3) | |
| Flatus (number in past 4 hours) | | | |
| within 12 hrs | | | < 0.001* |
| 0 | 64 (100) | 46 (71.9) | |
| 1-5 | 0 (0) | 17 (26.6) | |
| 6-10 | 0 (0) | 1 (1.6) | |
| Day 1 | | | < 0.001* |
| 0 | 5 (7.8) | 3 (4.7) | |
| 1-5 | 58 (90.6) | 45 (70.3) | |
| 6-10 | 1 (1.6) | 16 (25) | |
| Day 2 | | | < 0.001* |
| 0 | 1 (1.6) | 0 (0) | |
| 1-5 | 41 (64.1) | 12 (18.8) | |
| 6-10 | 22 (34.4) | 48 (75.0) | |
| >10 | 0 (0) | 4 (6.3) | |
| Day 3 | N ( 45) | N ( 39) | 0.102* |
| 0 | 0 (0 ) | 0 (0) | |
| 1-5 | 4 (8.9) | 4 (10.3) | |
| 6-10 | 41 (91.1) | 31 (79.5) | |
| >10 | 0 (0) | 4 (10.3) | |

Data was presented as number (%) and mean ± S.D.
*Chi-square test, **T-Test

**TABLE 3.** Post-operative characteristics: Abdominal distention score and bowel sound.

| | Group A | Group B | P |
|---|---|---|---|
| Abdominal distention score (0-100) within 12 hrs | | | 0.013* |
| 0-25 | 20 (31.3) | 35 (54.7) | |
| 26-50 | 38 (59.4) | 22 (34.4) | |
| 51-75 | 6 (9.4) | 7 (10.9) | |
| Day 1 | | | < 0.001* |
| 0-25 | 0 (0) | 0 (0) | |
| 26-50 | 30 (46.9) | 58 (90.6) | |
| 51-75 | 34 (53.1) | 6 (9.4) | |
| Day 2 | | | < 0.001* |
| 0-25 | 2 (3.1) | 34 (53.1) | |
| 26-50 | 29 (45.3) | 28 (43.8) | |
| 51-75 | 33 (51.6) | 2 (3.1) | |
| Day 3 | N ( 45) | N (39) | < 0.001* |
| 0-25 | 5 (11.1 ) | 26 (66.7) | |
| 26-50 | 34 (75.6) | 12 (30.8) | |
| 51-75 | 6 (13.3) | 1 (2.6) | |
| Bowel sound (number/min) within 12 hrs | | | < 0.001* |
| 0 | 46 (71.9) | 15 (23.4) | |
| 1-2 | 14 (21.9) | 45 (70.3) | |
| 3-5 | 2 (3.1) | 4 (6.3) | |
| >5 | 2 (3.1) | 0 (0) | |
| Day 1 | | | < 0.001* |
| 0 | 0 (0) | 0 (0) | |
| 1-2 | 59 (92.2) | 23 (35.9) | |
| 3-5 | 5 (7.8) | 37 (57.8) | |
| >5 | 0 (0) | 4 (6.3) | |
| Day 2 | | | < 0.001* |
| 0 | 0 (0) | 0 (0) | |
| 1-2 | 4 (6.3) | 0 (0) | |
| 3-5 | 56 (87.5) | 41 (64.1) | |
| >5 | 4 (6.3) | 23 (35.9) | |
| Day 3 | N (45) | N (39) | 0.009* |
| 0 | 0 (0) | 0 (0) | |
| 1-2 | 0 (0) | 0 (0) | |
| 3-5 | 37 (82.2) | 22 (56.4) | |
| >5 | 8 (17.8) | 17 (43.6) | |

Data was presented as number (%).
*Chi-square test

presented in mean and standard deviation (SD), number (n) and percent (%), as appropriate.

All tests of hypotheses were conducted as 2-sided and 0.05 level of significance. Continuous data were tested for normality using histogram, Kolmogorov-Smirnov test, and normal Q-Q plot. The normal Q-Q plot graphically compares the distribution of a given variable to the normal distribution represented by a straight line. The closer the squares are to the line, the more normally distributed the data looks.[12] The Student t-test and the chi-square test (or Fisher exact test) were used to analyze normally distributed continuous data and categorical data, respectively.

## RESULTS

A total of 128 patients were recruited over 6 months period. Both groups were comparable in terms of baseline characteristics and operative characteristics, except for blood loss. Patients in group B had more amount of blood loss than those in group A (Table 1). Myoma uteri was the most common indication for surgery in both groups. Eighty percent of cases received hysterectomy with or without salpingo-oophorectomy. Nineteen patients in group A and 25 patients in group B could be discharged in post-operative day 2. The first passage of blenching and flatus was noted post-operatively at hours 14.7 and 16.1 in group B, and 19.2 and 19.9 in group A, respectively. Patients in group B had significantly higher number of blenching, flatus, and bowel sound than those in group A in every time point assessment, except the number of flatus in post-operative day 3 which was not significantly different (Table 2). Patients in group A had significantly higher abdominal distention score than those in group B in every time point assessment (Table 3). Increasing waist

**TABLE 4.** Post-operative characteristics: Increasing of waist circumference.

| Increasing of waist circumference (cm) | Group A | Group B | P |
|---|---|---|---|
| Within 12 hr | | | 0.766* |
| 0-1.3 | 56 (87.5) | 58 (90.6) | |
| 1.4-2.6 | 5 (7.8) | 4 (6.3) | |
| 2.7-3.9 | 2 (3.1) | 2 (3.1) | |
| >3.9 | 1 (1.6) | 0 (0) | |
| Day 1 | | | 0.468* |
| 0-1.3 | 31 (48.4) | 36 (56.3) | |
| 1.4-2.6 | 19 (29.7) | 17 (26.6) | |
| 2.7-3.9 | 8 (12.5) | 9 (14.1) | |
| >3.9 | 6 (9.4) | 2 (3.1) | |
| Day 2 | | | <0.001* |
| 0-1.3 | 15 (23.4) | 39 (60.9) | |
| 1.4-2.6 | 22 (34.4) | 13 (20.3) | |
| 2.7-3.9 | 14 (21.9) | 8 (12.5) | |
| >3.9 | 13 (20.3) | 4 (6.3) | |
| Day 3 | | | <0.001* |
| 0-1.3 | 11 (17.2) | 28 (43.8) | |
| 1.4-2.6 | 20 (31.3) | 6 (9.4) | |
| 2.7-3.9 | 6 (9.4) | 5 (7.8) | |
| >3.9 | 8 (12.5) | 0 (0) | |

Data was presented as number (%).
*Chi-square test

circumference was significantly higher in group A than group B in post-operative days 2 and 3 (Table 4). Patients in group A had significantly more severity of ileus than those in group B in post-operative days 1-3 (Table 5). Patients in group B had higher satisfaction and overall satisfaction scores than those in group A (8.09 versus 6.45, p<0.001). (Table 6).

## DISCUSSION

Post-operative bowel ileus is a common problem after abdominal surgery. The etiology of post-operative ileus remains controversial. Bowel motility is decreased post-operatively due to sympathetic hyperactivity and increased levels of catecholamine.[13] Bowel manipulation, electrolyte imbalance, peritoneal irritation, and narcotic analgesia effects may contribute to post-operative ileus.[14,15] Vasoactive intestinal peptide directly inhibits smooth muscle contraction in the intestine and its levels are increased after surgery.[16] In addition, pain increases the release of substance P, which inhibits bowel motility.[17,18]

Sham feeding, such as gum chewing, can accelerate return of bowel function. It stimulates the cephalic-vagal mechanism and produces the release of mediators that subsequently increase gastrointestinal motility and glandular secretion.[6,14,17,19] These events may clinically translate into a faster recovery of gas and feces transit, as well as a better tolerance to oral ingestion and a shortening of the length of hospital stay.[3,5,6]

The present study shows that gum chewing enhances bowel function after elective gynecologic surgery. Patients who received gum chewing had significantly shorter time

**TABLE 5.** Severity of ileus.

| Severity of ileus | Group A | Group B | P |
|---|---|---|---|
| Within 12 hr | | | 0.206* |
| Mild | 0 (0) | 0 (0) | |
| Moderate | 56 (87.5) | 61 (95.3) | |
| Severe | 8 (12.5) | 3 (4.7) | |
| Day 1 | | | 0.002* |
| Mild | 0 (0) | 4 (6.3) | |
| Moderate | 57 (89.1) | 60 (93.8) | |
| Severe | 7 (10.9) | 0 (0) | |
| Day 2 | | | <0.001* |
| Mild | 3 (4.7) | 34 (53.1) | |
| Moderate | 60 (93.8) | 16 (41.0) | |
| Severe | 1 (1.6) | 0 (0) | |
| Day 3 | | | <0.001* |
| Mild | 8 (17.8) | 23 (59.0) | |
| Moderate | 37 (82.2) | 16 (41.0) | |
| Severe | 0 (0) | 0 (0) | |

Data was presented as number (%).
*Chi-square test

**TABLE 6.** Patient satisfaction.

| | Group A | Group B | P |
|---|---|---|---|
| Satisfaction | | | <0.001* |
| Very dissatisfied | 0 | 0 | |
| Dissatisfied | 0 | 0 | |
| Uncertain | 0 | 0 | |
| Satisfied | 55 (85.9) | 20 (31.3) | |
| Very satisfied | 9 (14.1) | 44 (68.8) | |
| Overall satisfaction score (0-10) | 6.45 ± 0.94 | 8.09 ± 1.30 | <0.001** |

Data was presented as number (%) and mean ± S.D.
*Chi-square test, **T-Test

to the first passage of blenching and flatus compared to those who received standard care alone. Post-operative characteristics of ileus, defined as blenching, flatus, abdominal distention score, bowel sound, and increasing of abdominal girt, were significantly improved in patients receiving gum chewing compared to those receiving standard care only. These finding were consistent with other previous studies in open colorectal surgery, laparoscopic colectomy, and cesarean section.[20-23] Patients who received gum chewing had significantly lower severity of post-operative ileus than those who received standard care only after 12 hours post-operatively. There was a non-significant trend towards a shorter post-operative hospital stay. Twenty five patients with gum chewing discharged in post-operative day 2, while 19 patients with standard care only did. This finding was consistent with the result from a systemic review and meta-analysis of randomized studies.[10,11] In addition, this present study showed that patients who received gum chewing had significantly more satisfaction in management of post-operative ileus than those who received standard care only. To the best of our knowledge, this is the first randomized-controlled trial studying the effectiveness of gum chewing in Thai women undergoing gynecologic surgery.

In conclusion, bowel function after open gynecologic surgery was enhanced by gum chewing. Gum chewing provides a simple method for early recovery from post-operative ileus. Patients can tolerate gum chewing as early as the first operative day. It is a physiological method for stimulating bowel motility. Gum chewing should be added as an adjunctive treatment in post-operative care in gynecologic surgery.

## ACKNOWLEDGMENTS

The authors would like to thank Associate Professor Prasong Tanmahasamut, a staff of the Gynecologic Endocrinology Unit, Department of Obstetrics and Gynecology, Faculty of Medicine Siriraj Hospital, Mahidol University and Mrs. Kanjana Thamintorn, a supervisor nurse for suggestion and advice about study protocol and Miss Juraporn Pool-iam, a statistician of the Clinical Epidemiology Unit, Faculty of Medicine Siriraj Hospital, Mahidol University, for statistical analysis and comment on methodology of the study.

## REFERENCES

1. Basse L, Jakobsen DH, Bardram L, Billesbølle P, Lund C, Mogensen T, et al. Functional recovery after open versus laparoscopic colonic resection: a randomized, blinded study. Ann Surg. 2005 Mar;241(3):416-23.
2. Ngamprasert M, Ruanthong R, Wattanatavekit S, Inthasorn P, Pleumjitt C, Pimpakana D, et al. Preliminary study of abdominal distention management program for gynecological patients receiving abdominal surgery: to define the severity of the symptom. Siriraj Med J. 2005;57:302-7.
3. Wind J, Hofland J, Preckel B, Hollmann MW, Bossuyt PM, Gouma DJ, et al. Perioperative strategy in colonic surgery; LAparoscopy and/or FAst track multimodal management versus standard care (LAFA trial). BMC Surg. 2006 Nov 29;6:16.
4. Delaney CP. Clinical perspective on post-operative ileus and the effect of opiates. Neurogastroenterol Motil. 2004 Oct;16 (Suppl 2):61-6.
5. Mattei P, Rombeau JL. Review of the pathophysiology and management of post-operative ileus. World J Surg. 2006 Aug;30(8):1382-91.
6. Miedema BW, Johnson JO. Methods for decreasing post-operative gut dysmotility. Lancet Oncol. 2003 Jun;4(6):365-72.
7. Augestad KM, Delaney CP. Post-operative ileus: impact of pharmacological treatment, laparoscopic surgery and enhanced recovery pathways. World J Gastroenterol. 2010 May 7;16(17):2067-74.
8. Luckey A1, Livingston E, Taché Y. Mechanisms and treatment of post-operative ileus. Arch Surg. 2003 Feb;138(2):206-14.
9. Vasquez W, Hernandez AV, Garcia-Sabrido JL. Is gum chewing useful for ileus after elective colorectal surgery? A systematic review and meta-analysis of randomized clinical trials. J Gastrointest Surg. 2009 Apr;13 (4):649-56.
10. de Castro SM, van den Esschert JW, van Heek NT, Dalhuisen S, Koelemay MJ, Busch OR, et al. A systematic review of the efficacy of gum chewing for the amelioration of post-operative ileus. Dig Surg. 2008;25(1):39-45.
11. Purkayastha S, Tilney HS, Darzi AW, Tekkis PP. Meta-analysis of randomized studies evaluating chewing gum to enhance postoperative recovery following colectomy. Arch Surg. 2008 Aug;143(8):788-93.
12. Wilk MB, Gnanadesikan R. Probability plotting methods for the analysis of data. Biometrika. 1968 Mar;55(1):1-17.
13. Jepsen S, Klaerke A, Nielsen PH, Simonsen O. Negative effect of Metoclopramide in postoperative adynamic ileus. A prospective, randomized, double blind study. Br J Surg. 1986 Apr;73(4):290-1.
14. Basse L, Hjort Jakobsen D, Billesbølle P, Werner M, Kehlet H. A clinical pathway to accelerate recovery after colonic resection. Ann Surg. 2000 Jul;232(1):51-7.
15. Peeters T1, Matthijs G, Depoortere I, Cachet T, Hoogmartens J, Vantrappen G. Erythromycin is a motilin receptor agonist. Am J Physiol. 1989 Sep; 257(3 Pt 1):G470-4.
16. Carr CS, Ling KD, Boulos P, Singer M. Randomised trial of safety and efficacy of immediate postoperative enteral feeding in patients undergoing gastrointestinal resection. BMJ. 1996 Apr 6;312(7035):869-71.
17. Soffer EE, Adrian TE. Effect of meal composition and sham feeding on duodenojejunal motility in humans. Dig Dis Sci. 1992 Jul;37(7):1009-14.
18. Stewart BT, Woods RJ, Collopy BT, Fink RJ, Mackay JR, Keck JO. Early feeding after elective open colorectal resections: a prospective randomized trial. Aust N Z J Surg. 1998 Feb;68(2):125-8.
19. Stern RM, Crawford HE, Stewart WR, Vasey MW, Koch KL. Sham feeding. Cephalic-vagal influences on gastric myoelectric activity. Dig Dis Sci. 1989 Apr;34(4):521-7.
20. Asao T, Kuwano H, Nakamura J, Morinaga N, Hirayama I, Ide M. Gum chewing enhances early recovery from postoperative ileus after laparoscopic colectomy. J Am Coll Surg. 2002 Jul;195(1):30-2.
21. Kafali H, Duvan CI, Gözdemir E, Simavli S, Onaran Y, Keskin E. Influence of gum chewing on postoperative bowel activity after cesarean section. Gynecol Obstet Invest. 2010;69(2):84-7.
22. Schuster R, Grewal N, Greaney GC, Waxman K. Gum chewing reduces ileus after elective open sigmoid colectomy. Arch Surg. 2006 Feb;141(2): 174-6.
23. Shang H, Yang Y, Tong X, Zhang L, Fang A, Hong L. Gum chewing slightly enhances early recovery from post-operative ileus after cesarean section: results of a prospective, randomized, controlled trial. Am J Perinatol. 2010 May;27(5):387-91.