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## OBSTETRICS

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# Gum Chewing for Stimulating Early Recovery of Bowel Function after Postoperative Benign Gynecologic Surgery: A Randomized Controlled Trial

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### ABSTRACT

**Objectives:** To compare gum chewing and routine postoperative care on recovery of bowel function after laparotomy for benign gynecologic surgery.

**Materials and Methods:** Patients who underwent laparotomy for benign gynecologic diseases at Khon Kaen Hospital from May to August, 2015 were randomly allocated into 2 groups: gum chewing (n= 56) and control group (n= 56). Patients chewed sugarless gum for 15 minutes after 6 hours postoperatively then every 4 hours until the first passage of flatus and the control group had the routine postoperative care.

**Results:** Chewing gum was a statistically significant in reducing time to first flatus compare with routine postoperative care ( $20.3 \pm 8.4$  vs  $27.3 \pm 7.9$  hrs, mean difference 6.9 hrs;  $p < 0.001$ ). Time to tolerate regular diet was also significantly shorter in chewing gum group ( $47.5 \pm 10.8$  vs  $49.4 \pm 6.9$  hr, mean difference 1.9 hr;  $p = 0.04$ ). Postoperative vomiting was significantly less in chewing gum group (13 (23.6%) vs 26;  $p = 0.002$ ). There were no significant differences between the groups in time to tolerate liquid diet, postoperative nausea, antiemetic drug requirement and length of a hospital stay.

**Conclusion:** Gum chewing associated with early recovery of bowel function in patients undergo laparotomy for benign gynecologic surgery.

**Keywords:** Gum chewing, Benign gynecologic surgery, Postoperative bowel function, Laparotomy

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## การศึกษาเปรียบเทียบการเคี้ยวหมากฝรั่งเพื่อกระตุ้นการทำงานของลำไส้หลังการผ่าตัดโรคทางนรีเวชที่ไม่ใช่มะเร็ง

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### บทคัดย่อ

**วัตถุประสงค์:** เพื่อเปรียบเทียบการเคี้ยวหมากฝรั่งในการกระตุ้นการทำงานของลำไส้ กับวิธีการดูแลแบบดั้งเดิมหลังการผ่าตัดทางหน้าท้องในโรคทางนรีเวชที่ไม่ใช่มะเร็ง

**วัสดุและวิธีการ:** ผู้ป่วยที่เข้ารับการผ่าตัดทางหน้าท้องในโรคทางนรีเวชที่ไม่ใช่มะเร็งที่โรงพยาบาลขอนแก่น ระหว่างเดือนพฤษภาคม ถึง เดือนกันยายน พ.ศ.2558 แบ่งอาสาสมัครออกเป็นสองกลุ่มๆ แรกจำนวน 56 ราย เคี้ยวหมากฝรั่งหลังผ่าตัด 6 ชั่วโมง เป็นเวลา 15 นาที ทุก 4 ชั่วโมง กลุ่มที่สองจำนวน 56 ราย ดูแลรักษาหลังผ่าตัดแบบดั้งเดิม

**ผลการวิจัย:** การเคี้ยวหมากฝรั่งหลังผ่าตัดสามารถลดระยะเวลาผายลมครั้งแรกได้อย่างมีนัยสำคัญทางสถิติ เมื่อเทียบกับการดูแลหลังผ่าตัดแบบดั้งเดิมลดระยะเวลาได้ 6.9 ชั่วโมง ( $20.3 \pm 8.4$  vs  $27.3 \pm 7.9$  ชม.;  $p < 0.001$ ) การรับประทานอาหารปกติได้ครั้งแรกเร็วกว่ากลุ่มที่ดูแลหลังผ่าตัดแบบดั้งเดิมอย่างมีนัยสำคัญทางสถิติ ( $47.5 \pm 10.8$  vs  $49.4 \pm 6.9$  ชม.;  $p = 0.04$ ) และลดอุบัติการณ์ของการอาเจียนหลังผ่าตัดในกลุ่มเคี้ยวหมากฝรั่ง (13 (23.6%) vs 26;  $p = 0.002$ ) ส่วนระยะเวลาการรับประทานอาหารเหลวครั้งแรกอาการคลื่นไส้หลังผ่าตัด การใช้ยาแก้คลื่นไส้อาเจียนหลังผ่าตัด และระยะเวลานอนโรงพยาบาลไม่มีความแตกต่างอย่างมีนัยสำคัญทางสถิติ

**สรุป:** การเคี้ยวหมากฝรั่งช่วยกระตุ้นการทำงานของลำไส้หลังการผ่าตัดทางหน้าท้อง ในโรคทางนรีเวชที่ไม่ใช่มะเร็ง

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## Introduction

The laparotomy for benign gynecologic surgery is the major procedures in female patients. Hysterectomy is the second most common procedure next to cesarean section<sup>(1)</sup>. This procedure may lead to postoperative ileus and is characterized by abdominal pain, clamping, nausea and vomiting<sup>(2)</sup>. Prolonged postoperative ileus contribute to delayed early feeding, restricted mobilization, prolonged hospital stays and increase cost for hospital stays<sup>(3)</sup>. The exact mechanism was not clearly understood but it may cause by multiple mechanisms such as disorganized electrical activity, inflammatory mediators and effect of opioid analgesic drugs, intraoperative blood loss and prolonged surgical time<sup>(4-5)</sup>. Difference methods have been suggested to prevent postoperative ileus including early oral intake of fluids and food<sup>(6)</sup>, early ambulation<sup>(7)</sup> and prokinetic pharmacologic drugs using<sup>(8)</sup>.

Previous study showed that gum chewing postoperatively was a safe method for reduce postoperative ileus in elective colorectal surgery<sup>(9)</sup>. The mechanisms of gum chewing are activating cephalo-vagal pathway, enhancing the secretion of gastrointestinal hormone, saliva and pancreatic juices<sup>(10-11)</sup>. Studies of postoperative gum chewing in cesarean sections<sup>(12-15)</sup>, gynecologic laparoscopic surgery<sup>(16)</sup>, complete staging surgery for gynecologic malignancies<sup>(17)</sup> reported that gum chewing reduces mean times to first flatus and postoperative ileus.

Nowadays, there is insufficient data to determine the effect of gum chewing on recovery of bowel function after laparotomy for benign gynecologic surgery. The aim of this study was to investigate the effect of postoperative gum chewing compare with routine postoperative care for early recovery of bowel function in laparotomy for benign gynecologic surgery.

## Materials and Methods

This randomized controlled trial was conducted at the Department of Obstetrics and Gynecology, Khon Kaen Hospital, Thailand from May to August, 2015. This study was approved by the Khon Kaen

Hospital Institute Review Board in Human Research. All participants were informed about study and signed the consent forms before enrollment.

We included patients who underwent laparotomy for benign gynecologic surgery such as myoma uteri, adenomyosis, endometrioma, benign ovarian tumor, endometrial hyperplasia and precancerous lesion of cervix. Patients with dental problems, prosthetic teeth, abdominal or pelvic organ malignancies, adjacent major organ injury, previous pelvic or abdominal irradiation, underlying bowel diseases and denied to participate to the study were excluded.

Eligible participants were randomly assigned into two groups; gum chewing group and routine postoperative care group. The random numbers were sealed in opaque envelopes. The gum chewing group was received sugarless gum at 6 hours after post-operation. Patients were chewing gum for 15 minutes every 4 hours except the bed time until first passage of flatus. The sugarless gum in this study was Xylitol®. Patients of both groups were received same pre-operative care and post-operative care; the first postoperative day we start by drinking water then liquid diet and soft diet, respectively as patients tolerate, and regular diet on the second postoperative day. All patients were received general anesthesia and surgical procedures were performed by staffs or residents that under supervision of staff. The types of surgical incision and procedures were based on the patient diseases. Patients in both groups received same intravenous morphine postoperatively every four hours for pain control.

The baseline characteristics, types of incision, details of operation, estimated blood loss, length of hospital stays and histopathological diagnosis were recorded. The primary outcome was the time to first flatus. The secondary outcomes were time to tolerate for liquid and regular diet, postoperative nausea and vomiting, anti-emetic drugs requirement. Time to first flatus, time to tolerate liquid and regular diet was defined as time to events minus time of the end of surgery. Post-operative nausea, vomiting and anti-emetic drugs requirement was defined as number of

patients who had these events regardless frequency of events. The data were collected by nurse note and progress note that health care providers asked patients about time of first flatus, time of toleration of diet, nausea, vomiting and anti-emetic drugs requirement. The sample sizes was calculated based on the study of Jernigan et al<sup>(18)</sup>. Mean time to first flatus and standard deviation were  $30.8 \pm 17.7$  hours and  $42.2 \pm 17.1$  hours in gum chewing group and the control group, respectively. We used formula for test of difference in two independence means with alpha of 0.05, power of 90% and 10% dropouts. The sample size of each group was 56 cases.

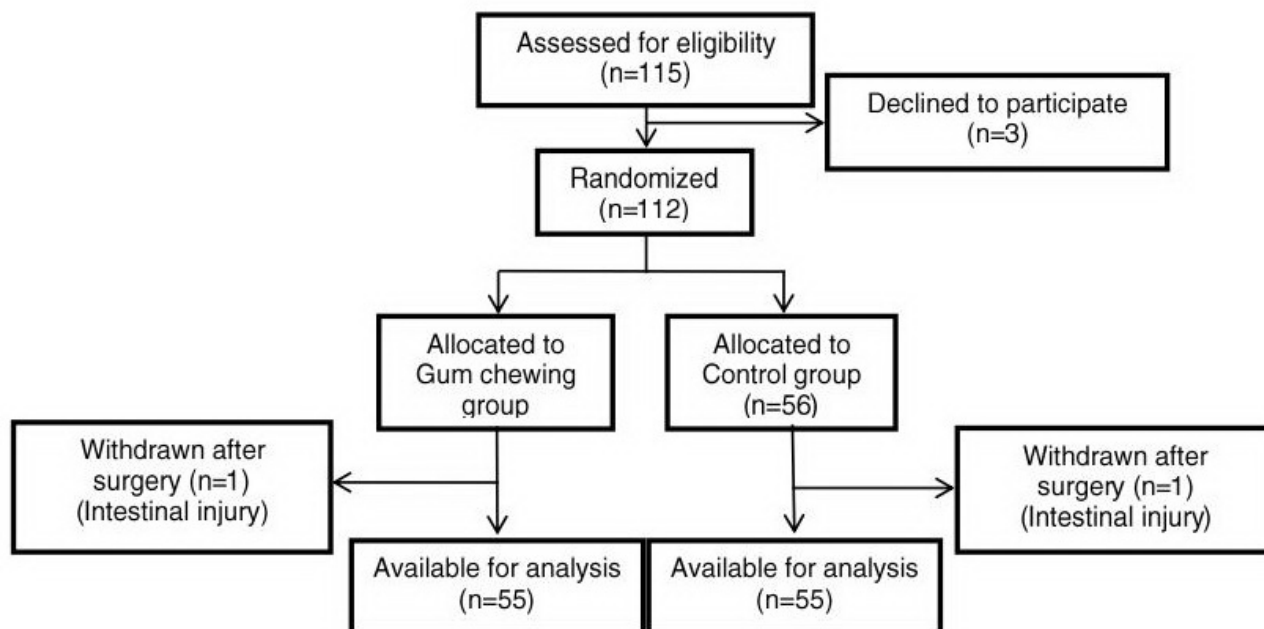
Statistical analysis was performed using STATA 10 software. Analyses of the effect of gum chewing were based on the intention to treat analysis. Continuous variables with normal distributed were analyzed by Student t-test and data with not normally distributed were analyzed by Mann-Whitney U-test. Categorical variables were analyzed by Chi-square test. Hazard ratio with 95% confidence interval was calculated. Time of first flatus and time to tolerate for

liquid and regular diet were analyzed by time to event analysis with the use of Kaplan-Meier methods. P value less than 0.05 was represented statistical significance.

## Result

One hundred and fifteen patients were assessed for eligibility. Three patients declined to participate (one patient was uncontrolled hypothyroidism and two patients were acute respiratory tract infection). A total of 112 patients were included; 56 patients were randomly to gum chewing group and 56 patients in the control group. One patient in each group was withdrawn from this study because they had intestinal injury during operation. Total of 55 patients from each group were analyzed (Fig. 1).

Baseline characteristics were similar between gum chewing and the control group (Table 1, 2). Myoma uteri was the most common diagnosis. The most common procedure was hysterectomy with adnexal surgery such as salpingectomy or salpingo-oophorectomy.



**Fig. 1.** Flow diagram.

**Table 1.** Demographic characteristics.

	<b>Gum chewing (N=55)</b>	<b>Control (N=55)</b>	<b>p value</b>
	<b>Mean ± SD or n (%)</b>	<b>Mean ± SD or n (%)</b>	
Age (yr)	44.8 ± 9.3	44.7 ± 8.9	0.98
BMI (kg/m <sup>2</sup> )	24.6 ± 3.8	24.2 ± 4.4	0.63
Diagnosis			0.58
Myoma uteri	31 (56.3)	24 (43.6)	
Adenomyosis	6 (10.9)	7 (12.7)	
Ovarian tumor	16 (29.0)	22 (40.0)	
Others	2 (3.6)	2 (3.6)	
Previous abdominal surgery			0.65
Yes	14 (25.4)	11 (20.0)	
No	41 (74.5)	44 (80.0)	

SD, standard deviation; n, number; yr, year; kg, kilogram; m<sup>2</sup>, square metre

**Table 2.** Surgical characteristics.

	<b>Gum chewing (N=55)</b>	<b>Control (N=55)</b>	<b>p value</b>
	<b>Mean ± SD or n (%)</b>	<b>Mean ± SD or n (%)</b>	
Incision			0.34
Low midline	23 (41.8)	29 (52.7)	
Pfannenstiel	32 (58.1)	26 (47.2)	
Operation			0.13
Hysterectomy only	4 (7.2)	2 (3.6)	
Adnexal surgery only	12 (21.8)	20 (36.3)	
Hysterectomy with adnexal surgery	38 (69.1)	31 (56.3)	
Uterine surgery	0	2 (3.6)	
Adhesiolysis only	1 (1.8)	0	
Surgical time (min)	79.8 ± 37.4	84.6 ± 31.8	
EBL(ml)	378.5 ± 506.0	270.1 ± 268.1	
Surgeon			0.37
Staffs	44 (80.0)	39 (71.0)	
Residents	11 (20.0)	16 (29.0)	

EBL, estimated blood loss; SD, standard deviation; n, number; min, minute; ml, millilitre

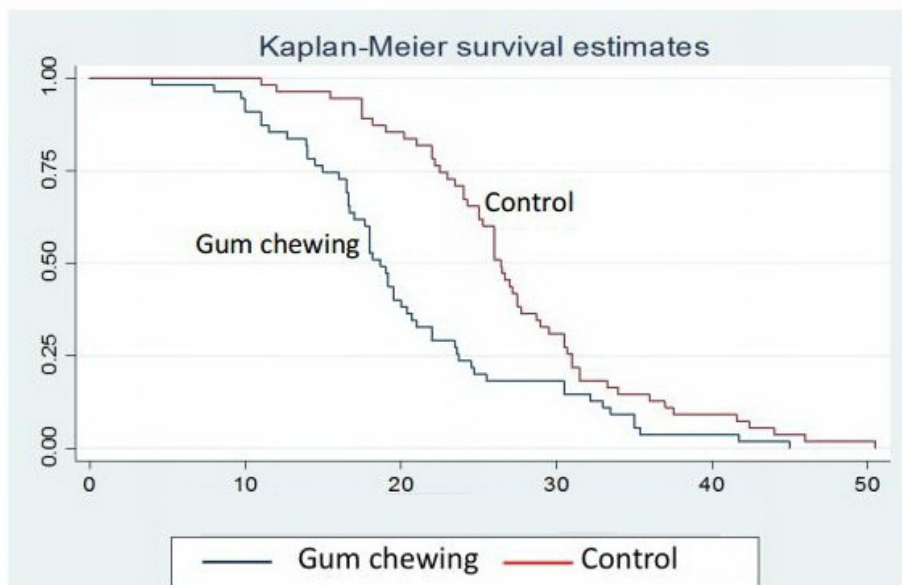
There was statistically significant difference in time to first flatus in gum chewing compare with routine postoperative care (20.3 ± 8.4 versus 27.3 ± 7.9 hours, mean difference 6.9 hours hazard ratio (HR)=0.50 (95% CI= 0.34- 0.73); p <0.001). Time to tolerate of regular

diet was also significantly reduced in gum chewing group (47.5 ± 10.8 versus 49.4 ± 6.9 hours, mean difference 1.9 hours, HR= 0.67 (95% CI= 0.45-0.98); p = 0.04). Postoperative vomiting in gum chewing group was significantly less than the control group

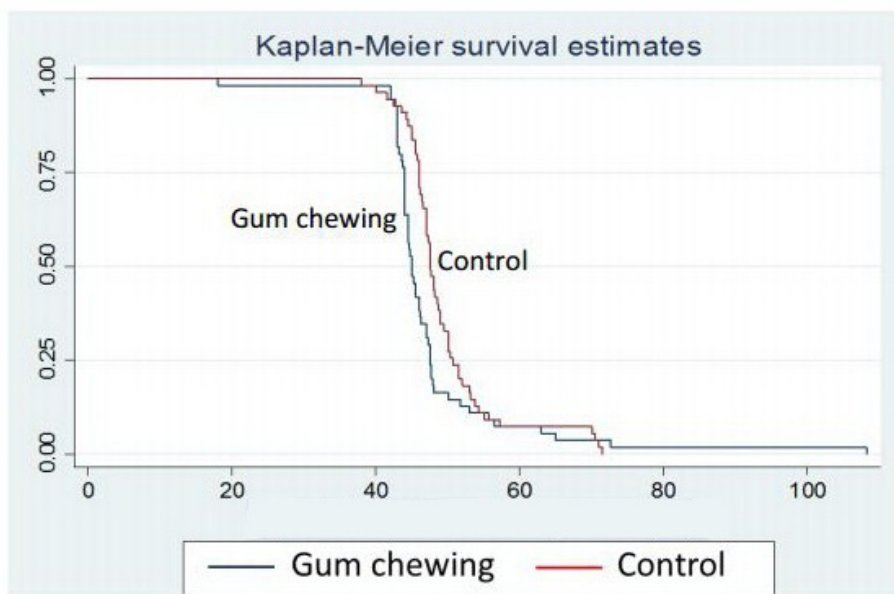
(13 (23.6%) versus 26 (47.2%);  $p=0.002$ ) (Table 3).

Kaplan-Meier curves of the time to first flatus and time to tolerate regular diet were analyzed time to events (Fig. 2, 3). Time to tolerate liquid diet was shorter in gum chewing group, but no statistically

significance ( $25.7 \pm 6.1$  versus  $27.8 \pm 6.8$  hours;  $p = 0.11$ ). Postoperative nausea and requiring of anti-emetic drug were similar in both groups (Table 3). There were no adverse events related to gum chewing.



**Fig. 2.** Time to first flatus (hr.)



**Fig. 3.** Time to tolerate regular diet (hr.)



**Table 3.** Outcomes.

	Gum chewing (N=55) Mean $\pm$ SD or n (%)	Control (N=55) Mean $\pm$ SD or n (%)	Hazard ratio (95%CI)	p value
Time to first flatus (hr)	20.3 $\pm$ 8.4	27.3 $\pm$ 7.9	0.50 (0.34 - 0.73)	< 0.001
Time to tolerate of liquid diet (hr)	25.7 $\pm$ 6.1	27.8 $\pm$ 6.8	0.73 (0.50 - 1.07)	0.11
Time to tolerate of regular diet (hr)	47.5 $\pm$ 10.8	49.4 $\pm$ 6.9	0.67 (0.45 - 0.98)	0.04
Length of hospital stay (days)	6.1 $\pm$ 0.3	6.1 $\pm$ 0.4	-	0.37
Use of post-op antiemetic drug	11 (20.0)	16 (29.0)	-	0.17
Post-op nausea	33 (60.0)	34 (61.8)	-	0.16
Post-op vomiting	13 (23.6)	26 (47.2)	-	0.002

CI, confidence interval; SD, standard deviation; n, number; hr, hour

## Discussion

This study found the efficacy of gum chewing for reducing time to first flatus, time to tolerate regular diet and reduced the incidence of post-operative vomiting in patients underwent laparotomy for benign gynecologic surgery.

Time to first flatus in our study was 20 hours which slightly longer than Chuamor et al<sup>(19)</sup>, which showed that time to first flatus was 16 hours. It might be explained that all of our patients were performed laparotomy under general anesthesia while most patients in Chuamor et al., were received regional anesthesia. Type of anesthesia might have impact on recovery of bowel function. Jørgensen et al., reported in Cochrane review in 2000<sup>(20)</sup> that the use of epidural local anesthesia in patients performed laparotomy could be reduced post-operative gastrointestinal paralysis when compare with systemic opioid in general anesthesia.

The results of our study differ from Jernigan et al<sup>(18)</sup>, which found that no statistically significant difference in time to first flatus (30.8 versus 42.2 hours ; p = 0.08 ), time to tolerate regular diet (P = 0.70) and incidence of post-operative vomiting (P = 0.56) in chewing gum and routine care. This might be resulted from their small sample size.

There were many previous studies about gum chewing in other obstetrics and gynecologic surgeries. Heinrich et al<sup>(16)</sup>, reported time to first flatus in

gynecologic laparoscopic surgery was shorter than our study 14 hours (6 versus 20 hours). Meta-analysis<sup>(21)</sup> demonstrated gum chewing in cesarean section could reducing time to first flatus for 6.42 hours which similar to our study had shown reducing time 6.9 hours. Time to first flatus of chewing gum in our study was shorter than Ibrahim et al<sup>(17)</sup>, which performed on complete surgical staging for gynecologic malignancies (20 versus 34 hours). Types of operation might have impact on bowel recovery. Most randomized controlled trial shown laparoscopic surgery more rapidly of bowel function than laparotomy<sup>(22-23)</sup>.

The methods of the study such as timing to start, duration, interval and amount of gum chewing in the previous studies were varied. Our study was started gum chewing at 6 hours post-operatively for 15 minutes then every 4 hours until first passage of flatus while Chuamoret et al<sup>(18)</sup>, started chewing gum at 12 hours, this duration was longer than our study. However, Heinrich et al<sup>(16)</sup>, started gum chewing early at 2 hours after post-laparoscopic surgery. The duration of chewing gum was longer in Ledari et al<sup>(14)</sup>, that performed in cesarean section, they chewed at least 1 hour while other studies were chewed 15 minutes. Nowadays, there is inconclusive evidence of the appropriate dose of gum chewing, further study was needed to evaluate this outcome.

The strength of this study was adequate sample sizes. Our limitation was the schedule of food distribution

in our institute. Patients received exact time of food distribution regardless time of the end of surgery these contribute to whom finished the operation in the morning had longer time for evaluating time to toleration of diet than those who finished in the evening.

In summary, this study supported that postoperative gum chewing was significantly effective in early recovery of bowel function in laparotomy for benign gynecologic surgery.

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## Potential conflicts of interest

The authors declare no conflict of interest.

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