

# Does coffee affect the duration of postoperative ileus following elective laparoscopic colectomy? A randomized prospective single-center study

**Kavos poveikis žarnyno veiklai po žarnyno laparoskopinės rezekcinės operacijos: perspektyvusis atsitiktinių imčių tyrimas**

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## Background / objective

Postoperative ileus is a common problem after colorectal surgery. A positive effect of coffee on the bowel motor activity has been described. It is still unclear whether coffee consumption decreases the risk of postoperative ileus. The aim of the study was to determine whether consuming an 8-ounce cup of coffee is effective in preventing or reducing postoperative ileus.

## Patients and methods

From January 1<sup>st</sup>, 2013 to December 31<sup>st</sup> 2014, a prospective study is being performed at the Institute of Oncology of Vilnius University. Patients with a malignant or benign disease, undergoing elective laparoscopic colectomy, are assigned randomly before surgery to receive either coffee with caffeine (group 1), coffee without caffeine (group 2), or water (group 3) (100 ml three times daily) after the procedure. The primary endpoint is the time to first bowel movement, and the secondary endpoints are the time to the first flatus and the time to solid food tolerance.

## Results

A total of 48 patients have been randomized, 16 to each group. Six patients were excluded: four due to a change in the surgical procedure, and two refused to participate. Patients' demographic characteristics were similar in all groups. The time till the first bowel movement was significantly ( $p < 0.05$ ) shorter in the decaffeinated coffee (3.23; SD 1.36) and coffee with caffeine (3.64; SD 1.29) groups versus the water group (3.90; SD 0.99). The time till the tolerance of solid food (1.63 and 2.42 versus 2.85;  $p < 0.05$ ) and the time till the first flatus (1.44 and 1.66 versus 1.92;  $p < 0.05$ ) showed a similar trend.

## Conclusions

Coffee consumption after colectomy has been safe and associated with a reduced time to the first bowel action. Caffeine consumption does not decrease the length of postoperative ileus. Note: these are the preliminary data which should be evaluated as a trend of the future final results.

## Tikslas

Pooperacinis žarnų nepraeinamumas – dažnai pasitaikantis žarnyno rezekcinių operacijų padarinys. Nustatytas teigiamas kavos poveikis žarnyno motorikai sveikiems tiriamiesiems. Lieka neaišku, ar kava galėtų sumažinti pooperacinio žarnyno nepraeinamumo riziką. Tyrimo tikslas – nustatyti kavos ir kofeino poveikį žarnyno veiklai po žarnyno rezekcinių operacijų.

## Ligoniai ir metodai

Vilniaus universiteto Onkologijos institute 2013 01 01–2014 12 31 atliekamas atsitiktinės atrankos kontroliuojamas perspektyvusis tyrimas. Įtraukti pacientai, kuriems atlikta laparoskopinė storosios žarnos operacija. Prieš operaciją ligoniai paskirstyti į tris grupes: pooperaciniu laikotarpiu gaunančių vandens (100 ml 3 kartus per dieną), dekofeinizuotos kavos ir kavos su kofeinu. Pirminės svarbos tikslas – laikas iki pirmojo pasituštinimo. Antrinės svarbos tikslai – laikas, iki išėjo dujos, ir laikas iki maisto toleravimo.

## Rezultatai

Ligoniai buvo suskirstyti į tris grupes po 16 kiekvienoje. Šeši buvo atšaukti: keturi – dėl operacijos pasikeitimo, du atsisakė dalyvauti. Demografiniai pacientų rodikliai buvo panašūs visose grupėse. Ligoniai, kurie gėrė dekofeinizuotą kavą bei kavą su kofeinu, pasituštino anksčiau negu vandenį gėrusios grupės ligoniai:  $3,23 \pm 1,36$  ir  $3,64 \pm 1,29$  paros vs  $3,9 \pm 0,99$ ,  $p < 0,05$ . Laikas iki maisto toleravimo –  $1,63$  ir  $2,42$  paros vs  $2,82$ ,  $p < 0,05$ , laikas, iki išėjo dujos, –  $1,44$  ir  $1,62$  vs  $1,92$ ,  $p < 0,05$ .

## Išvados

Kavos vartojimas po kolektomijos yra saugus ir sumažina laikotarpį iki pasituštinimo. Kofeinas žarnų funkcijos neskatina.

## Introduction

Postoperative ileus (POI) is a common problem after colorectal resection, which can prolong the hospital stay. Symptoms include abdominal distension, pain, nausea, vomiting, and intestinal cramps [1]. An additional treatment may be necessary. Although a variety of clinical strategies have been proposed to reduce primary POI, such as early feeding, ambulation, epidural analgesia, fluid restriction, and minimally invasive surgery, none has been completely successful in prevention [2–7].

Coffee is a popular beverage, and its effects on general wellbeing, the central nervous system and the cardiovascular system are well known [8, 9]. Although coffee may stimulate bowel function in certain healthy volunteers, there is a limited scientific evidence regarding its effects on the gastrointestinal function. Studies with healthy volunteers showed a positive effect of coffee on the sigmoid colon motor activity: it is increased in 4 minutes. Drinking water had no similar effect [10]. There has been no prospective evaluation of its mechanisms of action and impact on intestinal function after elective laparoscopic colectomy [11, 12].

## Materials and methods

### *Study design and randomization*

This was a single-center prospective RCT assessing the effect of coffee and caffeine on POI. Patients were allocated to different groups by the simple envelope method. All of them had been informed about the treatment assignment before surgery. Neither the physician nor the patients had been blinded to the treatment assignment.

### *Patients*

A prospective study was performed at the Institute of Oncology of Vilnius University. So far, 48 patients were included. Patients over 18 years, scheduled for elective laparoscopic colonic resection for malignant or benign diseases, were eligible for inclusion in the study. Their written informed consent was obtained. Patients were excluded if a stoma was required, multivisceral resection was planned, their hypersensitivity to or distaste of coffee had been known, a lack of compliance had been expected, and their impaired mental state had been known. The study had been approved by the Lithuanian Bioethics Committee.

### ***Objectives and endpoints***

The primary objective of this study was to investigate whether coffee (with or without caffeine) intake reduces the duration of POI after elective laparoscopic colectomy.

The primary endpoint was the time to the first postoperative bowel movement (time from the end of surgery till the first passage of stool recorded by the patient). Secondary endpoints were time to solid food tolerance (no vomiting) and time to the first flatus. The time to the first postoperative bowel movement, the tolerance of solid food, and the first flatus were recorded in hours after the end of the operation.

### ***Study interventions***

The patients were randomly allocated into group I, II, and III. Group I patients had to drink three cups of coffee with caffeine daily (100 ml at 08.00, 12.00 and 16.00 hours), beginning in the morning after surgery. In group II, coffee was without caffeine, and in the control group III coffee was replaced by water. Patients randomized to water were not allowed to drink coffee until the first bowel movement had occurred. The patients were asked to drink the entire volume within 10 min under the supervision of a nurse. Patients were free to drink any amount of still mineral water but no more coffee or black tea. No other restrictions on food consumption or smoking were imposed. Coffee was prepared with a conventional coffee machine using the same brand and two types of coffee capsules (Lavazza Qualita Oro and Lavazza Caffe Decaffeinato, 8 g of coffee per capsule).

After enrolment, the same evidence-based protocol of perioperative management was applied to all patients, following the principles of fast-track surgery [13]. In brief, patients underwent a mechanical bowel preparation with enemas: two in the night before the operation, and two in the morning just before the operation. All patients received a single dose of antibiotic prophylaxis consisting of 0.5 g metronidazole and 1g of cefazolin at the time of anaesthesia induction. Low-molecular-weight heparin had been administered and venous compression stockings used starting in the night before surgery. For pain control, patients received 50 mg of pethidine two times a day for 3 days; later,

non-steroidal analgesics (ketolgan or paracetamol) were administered. All operations were performed by one surgeon (NES) using hand-assisted laparoscopy or straight laparoscopy. A circular stapler was used to achieve end-to-end colorectal anastomosis. End-to-end handsewn anastomosis was performed for right hemicolectomy. Nasogastric tubes were removed during extubation. The postoperative feeding regimen was standardized. In summary, water was offered the next day after surgery, liquid food from the second day, and solid food from the third day after surgery. The postoperative feeding regimen was determined by the patient's ability and willingness to consume food and was not dependent on the intestinal function, such as the passage of flatus or bowel movements. In the event of postoperative nausea and vomiting, patients received parenteral fluids and metoclopramide (10 mg in 2 ml of injection solution). The postoperative mobilization schedule was standardized and was the same for the three study groups. Criteria for hospital discharge included stable vital signs with no febrile morbidity for at least 24 h, passage of stool, toleration of a regular diet, and the absence of other complications.

### ***Statistical analysis***

The continuous variables are expressed as a median (range). The data collected were analysed using the Statistical Package for the Social Sciences, SPSS Inc., Chicago, IL, USA;  $p < 0.05$  was considered statistically significant.

### ***Results***

A total of 48 patients were randomized, 16 to each group, by the checkpoint for the intermediate results represented in this review. Six patients were excluded: four had a change in the surgical procedure, and two refused to participate (Figure 1). The basic demographic characteristics of patients and the procedures they underwent are represented in Table 1, 2.

We compared the time measured in days among the three groups. The time till the first bowel movement was significantly ( $p < 0.05$ ) shorter in the decaffeinated coffee (3.23; SD 1.36) and coffee with caffeine (3.64; SD 1.29) groups than in the water group (3.90; SD 0.99) (Figure 2).

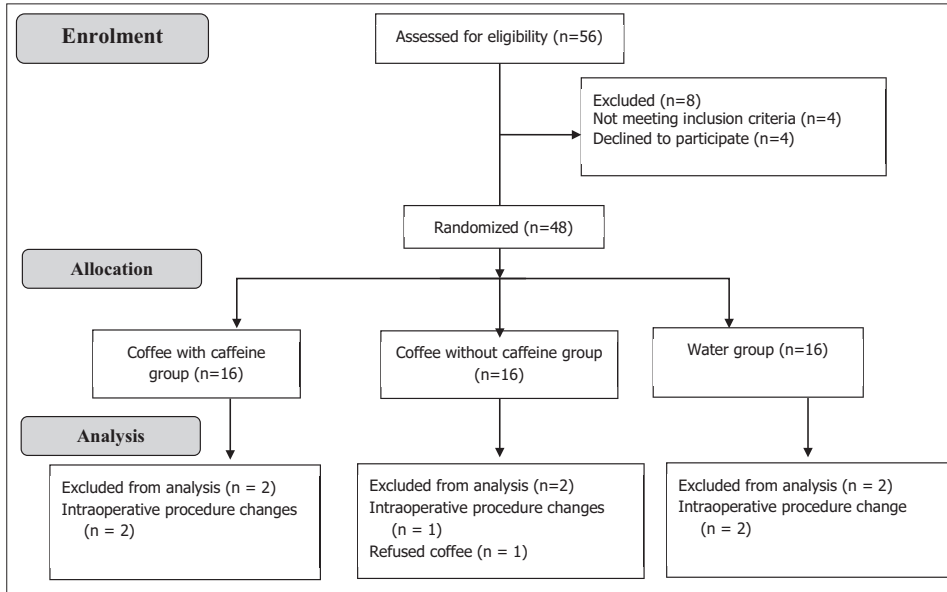


Figure 1. A CONSORT diagram of the trial

Table 1. Patients and procedures

Procedure	Women	Men	Total	Mean age
HALS* subtotal colectomy		1 (2.4%)	1 (2.4%)	52
HALS sigmoidectomy	5 (11.9%)	5 (11.9%)	10 (23.8%)	68,70
HALS left hemicolectomy	4 (9.5%)	5 (11.9%)	9 (21.4%)	65,78
HALS patial TME**	11 (26.2%)	10 (23.8%)	21 (50%)	63,67
Laparoscopic right hemicolectomy	1 (2.4%)		1 (2.4%)	70
Total	21 (50%)	21 (50%)	42 (100%)	65,19

HALS\* – hand-assisted laparoscopic surgery.

TME\*\* – partial mesorectal excision.

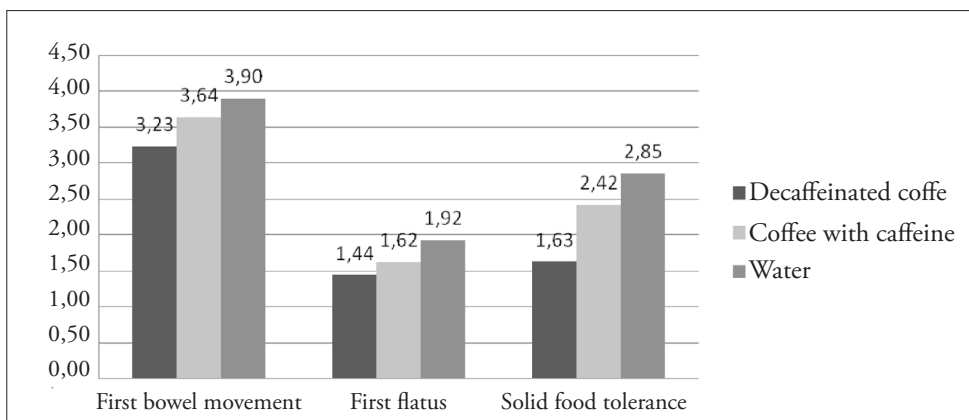


Figure 2. Postoperative day for the selected criteria, p < 0.05

**Table 2.** Comparison of demographic data on three groups

	Coffee with caffeine	Coffee without caffeine	Water	P
Gender				
Male, n (%)	6 (42.9%)	7 (50%)	8 (57.1%)	>0.05
Female, n (%)	8 (57.1%)	7 (50%)	6 (42.9%)	>0.05
Age	63.5 ± 11.4	64 ± 9.2	62.4 ± 8.3	>0.05
Operative time (min)	101 ± 39.2	103 ± 40.5	98 ± 35.8	>0.05
Comorbidities, n (%)	6 (42.9%)	8 (57.1%)	8 (57.1%)	>0.05
Smokers, n (%)	3 (21.4%)	2 (14.3%)	2 (14.3%)	>0.05
Operative procedure:				
anterior rectal resection with partial TME	7 (50%)	8 (57.1%)	6 (42.9%)	>0.05
left hemicolectomy	4 (28.6%)	2 (14.3%)	3 (21.4%)	>0.05
sigmoid colectomy	3 (21.4%)	3 (21.4%)	4 (28.6%)	>0.05
subtotal colectomy		1 (7.1%)		>0.05
laparoscopic right hemicolectomy			1 (7.1%)	>0.05
Complications (%)	0	0	0	
Total	14	14	14	

The time till the tolerance of solid food (1.63 and 2.42 versus 2.85;  $p < 0.05$ ) and till the first flatus (1.44 and 1.66 versus 1.92;  $p < 0.05$ ) showed a similar trend (Figure 2).

## Discussion

Postoperative ileus is a common postoperative complication after colon surgery [1]. POI is related to extrinsic and intrinsic factors and must be dealt with in a multimodal manner [1]. Nowadays, fast-track protocols are used for accelerating the recovery of the gastrointestinal function [13]. Opiates used as a painkiller delay colonic transit in postoperative patients, an effect that can be reversed by the narcotic antagonists. This inhibitory effect is mediated by peripheral mu-opioid receptors. In a study of patients undergoing colectomy, the more morphine had been given, the longer was the time to the return of bowel sounds and flatus and the first bowel movement [14]. These observations have led to a search for selective opiate antagonists that allow narcotics to continue relieving pain while counteracting their effect on bowel motility. The latest studies of *alvimopan*, a peripherally acting mu-opioid receptor antagonist, have shown promising results [15, 16]. Other alternative, nonopioid-based pain management options or different routes of administration are being investigated as well. Epidural analgesia has been shown to minimize

the systemic opioid use and effect on POI. Zingg et al. in a study of 75 patients showed that thoracic epidural anaesthesia had a significant benefit in terms of less analgesic consumption, better postoperative pain relief, and faster recovery of gastrointestinal function in patients after laparoscopic colorectal resection as compared with systemic opioids [17]. For patients not suitable for epidural anaesthesia, Herroeder et al. used lidocaine intravenously. They concluded that the use of lidocaine not only significantly improved gastrointestinal motility but also shortened the length of hospital stay [18]. Nonsteroidal anti-inflammatory drugs, such as COX-2 inhibitors, are attractive alternatives to opiate analgesics, both for their anti-inflammatory effect and for their opiate-sparing properties [19].

The early introduction of diet is a component of all multimodal and fast-track care pathways [13], although there is no proof that this is the factor that accelerates the recovery. Indeed, in a recent randomized, controlled trial by Han-Geurts et al. who evaluated the effect of the early introduction of diet, this intervention did not shorten the time to the passage of flatus or stool [20]. It may be that offering diet early simply saves patients from waiting an extra day or two for bowel function before starting to eat.

It has been proved that gum-chewing stimulates bowel recovery after surgery. The presumed mechanism of action is the vagal cholinergic (parasympathetic)

stimulation of the gastrointestinal tract, similar to oral intake but with a theoretically less risk of vomiting and aspiration. In trials with patients undergoing colon resection, gum-chewing shortened the time until the first flatus and bowel movement, but had no significant effect on the length of stay [4–6].

More recently, studies have shown that using carbohydrate-rich liquids within hours prior to surgery shortens the bowel recovery time postoperatively. Noblett et al. compared 36 patients of which one third had been given a carbohydrate drink prior to surgery. They found that this group showed a significant decrease in hospital stay as compared with those that had fasted or had been given an equivalent amount of water prior to surgery [21].

Some studies have proven that restriction of intravenous fluid administration reduces the length of ileus [22], although others investigators do not confirm this fact [23].

In the literature sources, there are studies presenting a better effect of coffee on POI prophylaxis [10, 12]. However, it remains a question of discussion what is the determinant agent of this action: is it caffeine or some other coffee component? To find out whether caffeine plays the main role in stimulating the peristalsis, we randomized patients into three groups: “water” as a control group, and two groups where patients received coffee with caffeine and decaffeinated coffee. Furthermore, the preliminary results of this study show that decaffeinated coffee has shown better results in stimulating the bowel movements.

There are studies which count the effect of coffee for bowel movement hourly [8]. However, the fact that coffee is more effective than water in stimulating the bowel movements, represented in statistically proven results comparing the hours, seems to be only mathematically

convincing. It is a questionable result important for a patient whether he opens his bowels in a less than a 12 h time variable. This is why we took a day (24 h) as a counting unit which was not as accurate as counting the hours, but could be valued beneficial for a patient if the first defecation occurs a day earlier and the patient can be discharged safely from the hospital.

Nevertheless, this study confirms the hypothesis that coffee reduces the time to the first bowel movement postoperatively [12]. This fact can be interpreted as a decreased risk of postoperative ileus, which is a common complication after colonic surgery. Postoperative ileus increases the hospital stay and further treatment expenses; thus, keeping in mind that three cups (100 ml each) of coffee a day should not cost a lot, we can state the fact that the use of coffee as an ileus-preventing factor should be very cost-effective. At present, coffee is not included in routine postoperative patients’ diet. They receive tea, fruit drink or water, but not coffee.

On the other hand, coffee is not a medication and has only a few side effects considering the taste or an over-stimulating effect on the nervous or cardiovascular system, which is determined by the caffeine action [8, 9]. Thus, if the final results of the study will prove decaffeinated coffee to be as good as coffee with caffeine, decaffeinated coffee could be safely added to the patients’ postoperative menu.

## Conclusions

Coffee consumption after colectomy has been safe and associated with a reduced time to the first bowel action. Caffeine consumption does not decrease the length of postoperative ileus. However, these are just a preliminary data which should be evaluated as a trend in the future final results.

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