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Is Postoperative Consumption of Coffee Effective in Reducing Postoperative Ileus?

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A SELECTIVE EVIDENCE BASED MEDICINE REVIEW

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ABSTRACT

OBJECTIVE: The objective of this selective EBM review is to determine whether or not "Is postoperative consumption of coffee effective in reducing postoperative ileus?"

STUDY DESIGN: Review of three randomized controlled trials written in the English language and were published in 2017, 2015, and 2012.

DATA SOURCES: Three randomized control trials were found via PubMed.

OUTCOMES MEASURED: Time in days from the end of surgery until the first passage of stool recorded by patient, or time measured in hours reported by nursing staff.

RESULTS: Dulkskas, et al. (2015) found that the time until the first bowel movement (measured in days) was significantly ($p < 0.05$) shorter in the coffee group (3.75 ± 1.53) and water groups (4.14 ± 1.14). Muller et al (2012) found that the time to the first postoperative bowel movement was significantly shorter in the coffee arm than in the water arm ($p = 0.006$). Finally, Gungorduk, et al. (2017) stated the mean time to defecation in patients who consumed coffee postoperatively vs the control group was significantly reduced (43.1 ± 9.4 vs 58.5 ± 17.0 hours; $P < .001$).

CONCLUSION: Postoperative consumption of coffee is a well-tolerated and cheap method of therapy to prevent and reduce the likelihood of prolonged postoperative ileus. All three studies demonstrate that coffee consumption after intraperitoneal surgery significantly ($p<0.05$) reduced time to first defecation after surgery compared to the control group that consumed only water postoperatively.

KEY WORDS: Coffee, ileus

INTRODUCTION

Postoperative ileus (POI) is a phenomenon that commonly affects patients and their gastrointestinal tract following surgery. It refers to a disruption in the normal peristalsis and motor activity of the bowel resulting in obstipation and intolerance of oral intake. This disruption is thought to be due to a number of etiologies including inflammatory, hormonal and pharmacologic influences. Inflammation is the result of direct manipulation of the bowel in surgery causing an immune response leading to a decrease in bowel motility. The hormonal aspect of ileus is due to a response from trauma that is mediated by corticotropin-releasing hormone.[2] Pharmacologic management of pain postoperatively includes the use of opioids which in turn has an inhibitory effect via stimulation of μ-opioid receptors that are present in the bowel.[2] This multifactorial etiology of POI causes symptoms such as abdominal distention, bloating, diffuse persistent abdominal pain, nausea, vomiting, inability to pass flatus, and inability to tolerate an oral diet.[1]

The incidence of POI in the US is common. When patients have an intraperitoneal operation, it is a likely complication that they face. In an observational study of 17,000 patients that underwent a colectomy, POI occurred in 17.4%.[1] Additionally, in a study of 27,560 patients undergoing elective colon resection during 2012 to 2013, POI occurred in 12.7%.[1] Ileus not only has a clinical impact on the patients undergoing surgery, but also an economic impact on US healthcare system. It has been estimated to account for $750 million US dollars per year.[3] Muller et al. reports hospital stay is 3 days longer for patients with POI, leading to increased costs of the US of $4000-9000 per stay.[3] While there is no cure of POI, effective preventative measures play an important role in the efforts to reduce healthcare costs and improve patients' recovery.

There are few data from designed trials to guide therapy to help decrease the incidence of

POI. Once POI is established, scarce therapies are truly effective. Supportive care is the current treatment of choice for this patient population, which includes bowel rest, bowel decompression, and TPN. With that said, there is emphasis on the prevention of ileus. Methods of prevention include the replacement of postoperative opioid pain management with intraoperative methods like midthoracic epidural anesthesia, or transverse abdominis plane block.[4] Peripheral acting μ-opioid receptor antagonists can be used to reverse the effects of opioid induced ileus or constipation. Antagonists approved by the FDA for this treatment are alvimopan and methylnaltrexone.[4] Another effective form of prevention of ileus is gum-chewing. It is known that chewing gum stimulates intestinal motility by activating the cephalic vagal reflex which increases production of gastrointestinal hormones that are associated with bowel motility.[3] Unfortunately, these mentioned treatments have not gained acceptance in clinical practice.

Coffee differs from pharmacologic treatment for POI being that it is a common beverage consumed by many Americans. There is limited evidence regarding its effects on the GI system, but it is thought to be due to various physiochemical properties. With that said, in a study of healthy volunteers, authors found an increase in colonic motor activity 4 minutes after the ingestion of coffee using multiport manometry.[3] Although the mechanism is unclear, this supported the hypothesis that drinking coffee after surgery may help stimulate bowel movement and prevent or reduce the effects of the common condition of POI.

With limited options known to be effective in the treatment of POI, it is important that more studies are conducted on affordable, accessible and tolerable methods of prevention. The mechanisms of which coffee has an effect on bowel motility is unknown. It was thought to be caffeine, although studies show that decaffeinated coffee also has effects on peristalsis. Coffee is viewed as a prospective option for preventing POI and promoting early activation of gut motility.

OBJECTIVE

The objective of this selective EBM review is to determine whether or not "Is postoperative consumption of coffee effective in reducing postoperative ileus in adults?"

METHODS

The studies chosen in this selective evidence based medicine review include 3 randomized controlled trials. More specifically, there was a multicenter parallel open-label randomized clinical trial, a single-center prospective randomized clinical trial, and a randomized controlled trial. The population evaluated were male and female postoperative patients greater than or equal to 18 years of age. The intervention used was 100 mL of caffeinated coffee 3 times daily starting the morning after surgery. The comparisons made consisted of the treatment group that was given coffee and the control group that was given water. The outcome measured in each study was time to defecation, differing in whether or not it was measured in days vs hours, and whether it was patient reported or reported by nursing staff.

The key words "coffee" and "postoperative ileus" were used to search the studies in PubMed and Cochrane Library. The articles were chosen based on their relevance to the clinical question mentioned above. In addition to that, each study was required to have patient oriented outcomes (POEMs). All articles were published in the English language and are peer reviewed. Inclusion criteria required the articles to be randomized controlled trials. Exclusion criteria included patients whom did not have intraperitoneal surgery. The summary of statistics reported were explained by p values and the change in the mean from the baseline.

Table 1 – Demographics & Characteristics of Included Studies

Study	Type	#Pts	Age (yrs)	Inclusion Criteria	Exclusion Criteria	W/D	Interventions
Muller[3] (2012)	Multicenter parallel open-label randomized clinical trial	80	>18 yo	Adult patients (aged at least 18 years) scheduled for elective open or laparoscopic colonic resection for malignant or benign diseases	rectal resection intended, stoma required, multi-visceral resection planned, coffee allergy, expected lack of compliance, no surgery done, impaired mental state	23	100 mL coffee 3x daily
Dulkskas[6] (2015)	single-center, prospective, randomized clinical trial	96	>18 yo	Patients >18 years of age who were scheduled for elective laparoscopic left-sided colonic resection for malignant diseases (distal to and including the splenic flexure of the colon)	stoma required, multi-visceral resection planned, coffee allergy, expected lack of compliance, no surgery done, impaired mental state	9	100 mL coffee 3x daily
Gungorduk[9] (2017)	Randomized controlled trial	118	>18 yo	Female patients who had received a diagnosis of cervical, endometrial, or ovarian cancer and scheduled for comprehensive staging surgery (hysterectomy and systematic PPL)	Coffee allergy, thyroid disease, compromised liver function, arrhythmia, constipation, PMH bowel surgery, previous abdominal XRT/chemo, post-op ICU, post-op NGT, bowel anastomosis, use of upper abdominal multivisceral surgical approach for debulking surgery	4	100 mL coffee 3x daily

OUTCOMES MEASURED

The outcomes measured in the selected trials were based on POEMs that evaluated the effects of coffee consumption and time to defecation after surgery.

In Muller et al. and Dulskas et al., both had primary endpoints as the time to defecation reported by nursing staff. Muller et al. measured their outcome in hours, and Dulskas et al. measured in days. Secondary endpoints included time to tolerance of solid food, and time to first passing of flatus. For the purpose of this review, the primary endpoint was the one analyzed.

In Gungorduk et al., the primary outcome measured was time to first flatus after surgery and the secondary outcomes were the time to defecation and time to tolerate a solid diet. For the purposes of this review, the secondary outcome of time to defecation in hours was used for comparison. Patients were instructed to report immediately after first occurrence of flatus, bowel movement, or defecation. The signs and symptoms of ileus were evaluated 3 times daily and bowel sounds were checked 6 times daily.

RESULTS

In this review, consumption of coffee and the effects on postoperative ileus are analyzed in 3 randomized controlled trials. The settings of all 3 studies were inpatient hospital setting with adults > 18 years of age whom underwent intraperitoneal surgery. Each study compared time to first bowel movement after consumption of water (the control group) vs consumption of coffee (experimental group).

Muller et al.[3] is a multicenter open-label randomized clinical trial that selected patients scheduled for elective open or laparoscopic colectomy with benign or malignant disease. They

selected a total of 80 patients prior to surgery and assigned them to a group that was either the control arm that consumed water (100 ml three times daily) or the treatment group that consumed coffee (100 ml three times daily). Eighty patients were placed on a list with an allocation ratio of 1:1, and were randomized via SAS version 9.1 software without stratification by centre. Patients on the day of surgery were informed of their treatment assignment. It was impossible to blind the patient and the physician from the assignment therefore objective measures were obtained. The primary endpoint of time to first bowel movement was analyzed on an intention-to-treat basis (ITT). In the ITT analysis, only 1 patient was excluded in the control arm due to intraoperative change to bypass surgery. None were excluded in the coffee arm. Furthermore, in a per-protocol (PP) analysis, 5 patients in the control arm were excluded due to intraoperative change to bypass (n=1), and non-compliance (n=4). Noncompliance in the water arm was measured by off protocol coffee consumption. In the PP analysis of the coffee arm, 5 were excluded due to refusal of coffee (n=2), partial refusal of coffee (n=2) and an allocation error (n=1). The outcome measured to determine if coffee reduced time of postoperative ileus was time (in hours) until first bowel movement after surgery. The continuous data were presented as means (s.d.) and were assessed via *t*-test and ANOVA as appropriate. The time to first bowel movement was significantly shorter in the coffee arm compared to the water arm in both the ITT and PP analyses. In the ITT analysis, p=0.006 with an absolute difference of 13.6 hours (95% CI of 4.0-23.2). In the PP analysis, p=0.028 with an absolutely difference of 11.6 hours (95% CI of 1.3-21.9). Refer to Table 2. Consumption was well accepted by the patients, and no adverse effects were noted.

Dulkas et al.[6] is a prospective, single-center, randomized controlled study that evaluated whether or not consumption of 100 mL of coffee postoperatively is effective in preventing or

reducing ileus. They selected their patient population by randomizing 105 patients aged 18 or older that were scheduled for elective laparoscopic left sided colectomy at the National Cancer Institute between January 2013 and December 2014. This patient population was also divided into two arms: those who received coffee or water. Patients were allocated to their groups by using the envelope method. It was impossible to blind the patients or physicians, so the data collected was objective. Fifteen patients were excluded due to either not meeting the inclusion criteria, a change occurred in the surgical procedure, and 6 refused to participate. The data was expressed as mean change from the baseline. The time until first bowel movement was significantly ($p<0.05$) reduced in the decaffeinated coffee group (3.00 ± 1.50) vs coffee with caffeine (3.75 ± 1.53) vs the water group (4.14 ± 1.15). Refer to Table 2.

Gungorduk et al. is a randomized controlled trial of 114 female patients >18 years of age that were scheduled for TAH-BSO with systematic pelvic and paraaortic lymphadenectomy. The patients were randomized and allocated based on envelope randomization with use of a computer-generated code. In total, 118 were enrolled, but due to exclusion, 114 patients were available for ITT analysis. One group consisting of 58 patients that consumed coffee postoperatively (100 mL 3 times daily), and another consisting of 56 patients that did not consume coffee. Complete blinding was not possible. The data collected was continuous, and a t test was used to compared the variables. The time to first defecation was significantly shorter ($p<0.001$) in the coffee group (42.0 ± 6.8 hours) vs the control group (59.8 ± 14.6 hours). Refer to Table 2. Coffee was well tolerated and no adverse events were observed in the context of coffee consumption.

Table 2: Outcome data displaying time to first bowel movement from Muller et al.[3], Gungorduk et al.[9] and Dulkas et al.[6]

Study	Water	Coffee with caffeine	Absolute Difference	p value
Muller, et al. (ITT analysis)	74 (21.6) hrs	60.4 (21.3) hrs	13.6 (4.0-23.2) hrs	0.006
Muller et al. (PP analysis)	73.7 (22.0) hrs	62.1 (21.5) hrs	11.6 (1.3-21.9) hrs	0.028
Dulkas et al.	4.14±1.15 days	3.75±1.53 days	0.39 days	<0.05
Gungorduk et al.	59.8±14.6 hrs	42.0±6.8 hrs	17.8 hrs	<0.001

Values are means (standard deviation) and in parenthesis are 95% confidence intervals

DISCUSSION

Coffee is a popular drink and the effects on organ systems are well known. Such as, the cardiovascular system, central nervous system, and even skeletal muscle. According to Dirks-Naylor, "Coffee has been shown to induce autophagy, improve insulin sensitivity, stimulate glucose uptake, slow the progression of sarcopenia, and promote the regeneration of injured muscle,".[7] Coffee also reduces the risk of alcoholic cirrhosis, colorectal and endometrial cancer, the incidence of gout, and Parkinson's disease.[8]

On the contrary, coffee may also have detrimental effects. Caffeine in coffee can raise

blood pressure of individuals, which is why it is significant to note that Dulsksas et al. studied the effects of caffeinated coffee vs decaffeinated coffee. His study demonstrated that decaffeinated coffee contributed to even less time to first defecation compared to caffeinated. See results section. Coffee can also increase heart rate, dehydrate patients, and cause anxiety. It is the role of the provider to cater to the specific needs of their patient, and to decide if administering coffee as part of the post op regimen is more beneficial than harmful.

All three studies had limitations that could have affected their outcomes measured. Although it was desired, blinding was not feasible in any of these clinical scenarios which leaves room for bias. Muller et al. and Dulskas et al. both assumed sample sizes, and their calculations were reported to be arbitrary. This was due to lack of available previous studies to rely on. Muller, et al. had heterogeneity of patient population, although randomization and results of the multivariable and subgroup analyses make it unlikely. In Muller, et al. patients in the control arm had free access to coffee, which provided the opportunity for failed compliance. Factors in Limitations reported in Gungorduk, et al. include question on the best type of coffee to use and the optimal amount of coffee are unknown.

CONCLUSION

The three RTCs mentioned in this review demonstrate that postoperative coffee consumption is an effective therapy for reduction of time to first bowel movement after an intraperitoneal operation. All three studies obtained a p value of <0.05, supporting a statistically significant hypothesis. According to Gungorduk, et al. "patients who drank coffee after surgery were less likely to have POPI (21.6% vs 64.9%; $P<0.001$)".[9] POI increases hospital stay, patient dissatisfaction, and expenses. It is proven and understood that postoperative coffee consumption

contributes to reduced time to first bowel movement after surgery, so therefore it should become a part of the postop regimen. Currently it is not included, and patients are being given tea, juice or water. In conclusion, coffee is a safe and inexpensive way to prevent POI.

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