Oral Rehydration with 10% Carbohydrate Drink for Preventing Postoperative Nausea and Vomiting (PONV) after Low Dose of Spinal Morphine

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Background: *Preoperative oral carbohydrate (CHO) drink may improve patients' comfort. However, whether it prevents or reduces postoperative nausea and vomiting (PONV) is questionable.*
Objective: *Evaluate the effect of oral rehydration with 10% CHO drink before anesthesia on incidence and severity of postoperative nausea and vomiting (PONV) after spinal morphine injection.*
Material and Method: *One hundred patients scheduled for unilateral total knee replacement (TKR) were randomly divided into two equal groups (n = 50 each). Group I patients received 400 ml 10% CHO drink the preoperative night and 2-hour before anesthesia, whereas Group II patients served as control. Spinal anesthesia for all patients contained 0.5% bupivacaine 2.0 to 3.5 ml plus morphine 0.2 mg. Pain therapy was standardized with femoral nerve block, local infiltration, intravenous parecoxib, and oral paracetamol. Incidence and severity of PONV within 24 hours were recorded. In addition, preoperative intensity of thirst and hunger, dry lips and throat, and anxiety was also recorded.*
Results: *Incidence and severity of PONV (81.2% vs. 72.0%, p = 0.536) as well as preoperative thirst, hunger, dry lips, and throat were not different between the groups.*
Conclusion: *Preoperative oral rehydration with carbohydrate drinks had no positive effect on PONV nor patients' comfort.*

Keywords: *spinal morphine, carbohydrate drink, postoperative nausea and vomiting (PONV)*

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Spinal morphine is widely used in total knee replacement (TKR), providing excellent analgesia but may also lead to postoperative nausea and vomiting (PONV). The incidence is up to 30 to 40%[1-4] even when using low dose (0.1-0.4 mg).

The 'typical' patient for TKR is female, obese, and non-smoker, all of which being risk factors for PONV. Patients assess PONV as very unpleasant, sometimes even worse than pain. PONV may also delay hospital discharge with associated economic consequences. Recently, a multimodal approach, combining several means to minimize PONV, has found wide acceptance as a standard of care[5].

Oral rehydration therapy with carbohydrate (CHO) drink appeared to be useful in preventing PONV in operations such as cholecystectomy[6,7]. It also could enhance bowel function after colorectal surgery[8-10]. Some studies could not demonstrate that kind of benefit, though CHO drink increased patients' comfort[11,12], decreased insulin resistance[13,14], and decrease the need for inotropic support after coronary artery bypass graft surgery[15].

The objective of the present study was to investigate the effect of preoperative carbohydrate drink in terms of preoperative thirst or hunger, perioperative hypotension, and postoperative nausea and vomiting (PONV).

Material and Method

This prospective, randomized, controlled, study was performed between February 2011 and June 2012 at Siriraj Hospital, Mahidol University, Bangkok, Thailand. The study was approved by the Ethical Committee of Siriraj Hospital (764/2553 (EC2)) and registered with Clinical Trials.gov as NCT01301404. One hundred patients 50 to 80 years old with unilateral TKR were enrolled randomly, using closed envelopes, equally allocated to the study group (preoperative CHO drink) and control (no drink). Exclusion criteria

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were revision TKR or bilateral TKR, BMI more than 30 kg/m^2, GI diseases or GI affecting drugs, diabetes, chronic kidney disease (CKD) (defined as creatinine more than 2.0 mg/dl), and congestive heart failure (CHF). All patients were operated during the morning schedule. Patients of the study group were assigned to drink 400 ml of 10% carbohydrate-rich orange juice (Greenmate®) between 18:00 and 24:00 and another 400 ml at about 2-hour before anesthesia (6:00 to 7:00 am). The control group had to starve from midnight.

According to a pilot study, we expected a 25% PONV reduction for the study group with the incidence of PONV 75%, with type I error (α) = 0.05 and type II error (β) = 0.2, the calculated sample size was 45 patients for each group. Assuming a 10% drop-out, we enrolled 50 patients in each group. The calculation formula is shown below.

$$\text{n per group} = \frac{[Z_{\alpha/2}\sqrt{2pq} + Z_{\beta}\sqrt{p_1q_1 + p_2q_2}]^2}{P_1-P_2}$$

In the morning of surgery, no sedative drug but the usual medication was given. In the preoperative holding area, patients were asked by research assistants blinded to group allocation to rate the feeling of thirst, hunger, anxiety and nausea using a 0- (no symptom) to 10- (maximal symptoms) point scale.

In the operating room, intravenous catheter was inserted, and balanced crystalloid solution was given, the amount on discretion of the anesthesiologist. Standard monitoring (NIBP, ECG, SpO_2) were applied. Femoral nerve block injecting 20 ml 0.25% bupivacaine as a single shot was performed using ultrasound guidance or peripheral nerve stimulator. Spinal anesthesia was performed with 10 to 17.5 mg (2-3.5 ml) of 0.5% heavy bupivacaine plus 0.2 mg of morphine. Capillary blood sample was drawn from the toe to measure pre-operative blood glucose level. Vasopressors, if necessary were given on discretion of the anesthesiologist in charge. During the operation, small dose (1-3 mg) midazolam was allowed to relieve anxiety. Antiemetics or other drugs that might affect PONV, such as dexamethasone, ranitidine, or propofol were prohibited. At the end of the operation, periarticular local anesthesia was performed by the surgeon using 20 ml of 0.5% bupivacaine.

In the recovery room, capillary blood glucose was measured again. The patients were asked for the feeling of nausea or vomiting. Intravenous ondansetron (8 mg) was given as the first line anti-emetic drug. This was continued on demand every six hours, adding metoclopramide (10 mg) when necessary.

Postoperative pain control included 40 mg intravenous parecoxib (Dynastat®) every 12 hours (9 to 10 pm and 9 to 10 am the next day), 1 gram of oral paracetamol every 6 hours and additional 3 mg of intravenous morphine every 2 hours if the pain score exceeded 3. Data recorded included patients' characteristics, rating of preoperative thirst and hunger, pain score and amount of intravenous morphine within the first 24 hour, incidence of perioperative hypotension, PONV, volume of perioperative fluid, duration of surgery, amount of blood loss, and perioperative complications.

For data analysis, we used SPSS, version 17. Quantitative variables are demonstrated as mean and standard deviation, qualitative variables as frequency and percentage. Comparison between the two groups was performed using Student's t-test for quantitative, and Chi-square or Fisher's exact tests for qualitative variables.

Results

Two patients of the present study group dropped out due to inadequate spinal block and were switched to general anesthesia. As demonstrated in Table 1, there were no significant differences between the groups regarding demographics, ASA classification, median length of hospital stay (LOS = 6 (1) days), and underlying diseases. Baseline values of hematocrit, glucose, and creatinine levels were normal. Patients in control group had lower baseline blood sugar level, clinically not relevant.

Preoperative scores were not different between the groups regarding hunger, thirst, dry lips, dry throat, and nausea. Only anxiety was slightly more pronounced in the present study group (Table 2).

Intraoperative anesthesia data as shown in Table 3 were not different between the groups. One patient of the study group received 500 ml colloidal solution. No aspiration occurred in both groups.

During the instant postoperative period, incidence and severity of nausea and vomiting were not significantly different although patients of the study group needed less antiemetic medication (16% vs. 22%) and no 2-times vomiting occurred in this group compared to four patients in the control group. There was no hypoglycemia or other problems in the recovery room (Table 4).

Most patients in both groups had a pain-free period for 24 hours, only a few needed morphine one or two doses (3 or 6 mg). Blood loss, blood transfusion,

Table 1. Preoperative patient data

	Study group (n = 48)	Control group (n = 50)	*p*-value
Fermale (n, %)	42 (87.5%)	46 (92.0%)	0.344
Age (year)	69.8±7.3	70.8±8.5	0.165
Weight (kg)	62.2±9.0	60.6±9.5	0.624
Height (cm)	154.3±7.5	151.4±5.5	0.065
ASA physical status I, II, III (n)	2, 39, 7	3, 45, 2	0.186
Length of hospital stay, median (min, max)	6 (4, 15)	6 (4, 15)	0.725
Underlying diseases (n)			
None	10 (20.8%)	11 (22.0%)	0.951
Hypertension	28 (58.3%)	30 (60.0%)	
Dyslipidemia	2 (4.2%)	1 (2.0%)	
Heart disease	2 (4.2%)	3 (6.0)	
Others	6 (12.5%)	5 (10.0%)	
Hematocrit (%)	38.0±3.6	38.1±4.1	0.229
Blood sugar (mg%)	95±8	103±19	0.004
Creatinine (mg%,)	0.86±0.2	0.83±0.2	0.885

Data are presented as (mean ± SD) or number (percentage)
ASA = American Society of Anesthesiologists

Table 2. Preoperative scores (0-10)

	Study group n = 48	Control group n = 50	*p*-value
Hungry	2.6±2.3	2.3±2.4	0.383
Thirsty	2.4±2.4	2.2±2.2	0.808
Dry lips	2.5±1.9	2.7±2.0	0.438
Dry throat	2.5±2.3	2.5±2.2	0.962
Anxiety	3.6±3.0	3.3±3.8	0.043
Nausea	0.1±0.4	0.2±0.9	0.080

Data are presented as mean ± SD

Table 3. Intraoperative data

	Study group n = 48	Control group n = 50	*p*-value
Blood Sugar (mg%)	93±15	98±14	0.805
Bupivacaine (ml)	2.9±0.21	2.9±0.22	0.727
Total fluid (ml)	1,239±310	1,287±323	0.442
Hypotension (n, %)	17 (35.0%)	16 (32.0%)	0.831
Vasopressor (n, %)	17 (35.0%)	16 (32.0%)	0.831
Operative time (min)	107±34	104±39	0.350

Data are presented as mean ± SD or number (percentage)

24 hours fluid were similar in all patients, and so were incidence (81% vs. 72%) and severity of PONV and the need for antiemetic treatment. Most patients needed 12 to 24 hours after operation to start normal eating. (Table 5) One patient in the present study group and two patients in control group complained about dizziness. One patient in each group became delirious for one day.

Table 4. Recovery room data

	Study group n = 48	Control group n = 50	*p*-value
PONV (n, %)	17 (35.4%)	18 (36.0%)	0.244
Severity of PONV			
No	31 (64.6%)	28 (56.0%)	
Nausea	9 (18.7%)	10 (20.0%)	
1-2 vomit	8 (16.7%)	8 (16.0%)	
>2 vomit	0 (0.0%)	4 (8.0%)	
Antiemetic (n, %)	8 (16.0%)	11 (22.0%)	0.446
Blood sugar (mg%)	104±21	109±25	0.589

PONV = postoperative nausea and vomiting

Discussion

From ASA preoperative fasting guidelines[16], the clear fluid can be given safely up to 2 hours before starting anesthesia, but the oral drink is not normally prescribed. Our data are not in accord with studies[11,12] showing benefits of preoperative carbohydrate drink in terms of decreasing thirst, hunger, or anxiety. Subjective unpleasant feelings prior to surgery such as dry lips, or dry throat did not differ between groups

Table 5. Data at ward

	Study group (n = 48)	Control group (n = 50)	*p*-value
Rescue morphine: 0, 3, 6 mg (n)	36, 8, 3	43, 3, 4	0.327
Blood loss (ml)	360±228	344±244	0.645
24 hours fluid (ml)	3,321±975	3,603±808	0.520
Blood transfusion: 0, 1, 2 (unit)	41, 6, 1	46, 3, 1	0.536
PONV (n, %)	39 (81.2%)	36 (72.0%)	0.536
Severity of PONV			
No	9 (18.7%)	14 (28.0%)	
Nausea	5 (10.4%)	6 (12.0%)	
1-2 vomit	19 (39.6%)	14 (28.0%)	
>2 vomit	15 (31.3%)	16 (32.0%)	
Doses of ondansetron: 0, 1, 2, 3 (n)	23, 19, 4, 2	25, 20, 5, 0	0.536
Second antiemetic (n, %)	2 (4.0%)	3 (6.0%)	0.373
Normal eating (n, %)			
<12 hours	17 (35.0%)	16 (32.0%)	0.827
12-24 hours	21 (43.0%)	21 (42.0%)	
>24 hours	10 (22.0%)	13 (26.0%)	

with and without CHO. However, all patients had surgery in the morning, which may have contributed to the results.

Our hypothesis was oral carbohydrate drink can restore patients' fluid status and rehydrate patients from NPO after midnight. It may prevent hypotension after spinal anesthesia. Actually, none of these positive effects was observed in the present study. It may be that 400 ml of carbohydrate drink was too little to prevent hypotension after spinal anesthesia, even with 10 to 20 ml/kg preloading fluid. This method is poorly effective[17].

Our data demonstrated that oral carbohydrate drink is safe regarding the risk of hyperglycemia in non-diabetic patients. In other studies, CHO drink decreased insulin resistance[13,14].

The incidence of PONV, most likely caused by spinal morphine was high (75%). Nearly one-third of the patients had more than two episodes of vomiting and needed antiemetics frequently. The incidence of PONV after spinal morphine is proven to be dose-related[1,4]. In our department, 0.2 mg of spinal morphine is the usual adjuvant for TKR, concordant with Rathmell JP et al and their findings about the optimal dose of spinal morphine for this procedure[18]. PONV started as early as in the recovery room and continued up to 24 hours. Multimodal means are suggested for prophylaxis and treatment of this significant clinical problem[5,19]. Our hypothesis that oral carbohydrate drink could be a simple remedy proved to be untenable. The measure may work in abdominal surgery when PONV is partly a consequence of sluggishness of the bowels, as it was demonstrated in some studies[8,9]. PONV due to spinal morphine is triggered via central nervous system[20]; it seems to be logical that preoperative drinking has no effect on this mechanism. Attempts to solve the problem of PONV after spinal MO may include lowering the dose, abandoning the method or applying alternatives, such as femoral nerve catheter with continuous infusion plus sciatic block and/or periarticular injection of local anesthetics.

The present study has some limitations. First, antiemetics were given on discretion in recovery rooms and nurse wards. Although they were blinded to group allocation, there were no standards for giving the medication. Second, Thai patients are quite often reluctant to reveal their true extent of preoperative discomforts.

Conclusion

In patients having spinal anesthesia with morphine undergoing total knee replacement, oral administration of 400 ml 10% carbohydrate drink the night before and two hours before anesthesia had no positive effect on patients' well-being, perioperative hypotension or PONV. Nevertheless, blood glucose levels were not affected by this measure.

What is already known on this topic?

The incidence of postoperative nausea and vomiting (PONV) after spinal morphine is extremely

high and PONV causes severe discomfort. The patients cannot eat or drink several hours or even a day.

What this study adds?

Oral carbohydrate drink although cannot prevent PONV but it can safely be given without increasing the risk of hyperglycemia or aspiration.

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Potential conflicts of interest

None.

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การดื่มน้ำคาร์โบไฮเดรต 10% ก่อนการผ่าตัดเพื่อการป้องกันการคลื่นไส้อาเจียนหลังการผ่าตัดเนื่องจากการได้รับมอร์ฟีนขนาดน้อยทางช่องน้ำไขสันหลังในผู้ป่วยที่มารับการผ่าตัดเปลี่ยนข้อเข่า

มานี รักษาเกียรติศักดิ์, ฐิติมา ชินะโชติ, อริศรา เอี่ยมอรุณ, ยศ ทับเป็นไทย, ปฐม ห์ลีละเมียร, ศศิยา ศิริรัตนวรางกูร, อารยา วัฒนิตานนท์

วัตถุประสงค์: *การอดน้ำและอาหารก่อนการผ่าตัดมักทำให้ผู้ป่วยหิวและวิตกกังวลมากขึ้น มีการศึกษาว่าการให้ดื่มน้ำคาร์โบไฮเดรตช่วยให้ผู้ป่วยรู้สึกสบายขึ้น ลดความเครียดซึ่งเป็นปัจจัยเสริมให้มีภาวะคลื่นไส้อาเจียนหลังผ่าตัดมากขึ้น การศึกษานี้จึงต้องการศึกษาผลของการดื่มน้ำคาร์โบไฮเดรต 10% เพื่อป้องกันอาการคลื่นไส้อาเจียนหลังการผ่าตัดเนื่องจากการได้รับมอร์ฟีนขนาดน้อยทางช่องน้ำไขสันหลังในผู้ป่วยที่มารับการผ่าตัดเปลี่ยนข้อเข่า*

วัสดุและวิธีการ: *ทำการศึกษาในผู้ป่วย 100 ราย ที่จะได้รับการผ่าตัดเปลี่ยนข้อเข่าโดยแบ่งผู้ป่วยเป็น 2 กลุ่ม ๆ ละ 50 ราย โดยการสุ่ม กลุ่มที่ 1 จะได้ดื่มน้ำคาร์โบไฮเดรต 10% 400 มิลลิลิตร คืนก่อนการผ่าตัด และ 2 ชั่วโมง ก่อนการให้ยาระงับความรู้สึก กลุ่มที่ 2 เป็นกลุ่มควบคุม ทั้งสองกลุ่มผู้ป่วยได้รับมอร์ฟีน 0.2 มิลลิกรัม ร่วมกับ 0.5% bupivacaine 2.0-3.5 มิลลิลิตร เข้าช่องน้ำไขสันหลังเพื่อลดความความปวดหลังผ่าตัด ผู้ป่วยทุกรายได้รับยาระงับปวดแบบเดียวกัน คือ มีการทำ femoral nerve block ร่วมกับการฉีดยาชาเฉพาะที่ที่ข้อเข่า ร่วมกับได้รับยา parecoxib ชนิดฉีด และกินพาราเซตามอล มีการบันทึกอุบัติการณ์และความรุนแรงของการคลื่นไส้อาเจียนใน 24 ชั่วโมง รวมทั้งความหิวกระหาย ปากแห้ง คอแห้ง และความวิตกกังวลของผู้ป่วยก่อนการผ่าตัด*

ผลการศึกษา: *อุบัติการณ์และความรุนแรงของการคลื่นไส้อาเจียนหลังผ่าตัดไม่แตกต่างกัน ระหว่างกลุ่ม (กลุ่มที่ 1 81.2% กลุ่มที่ 2 72%, p = 0.536) ไม่พบความแตกต่างของความรู้สึกก่อนการผ่าตัดระหว่างกลุ่มในแง่ของความหิว กระหาย ปากแห้ง หรือ คอแห้ง*

สรุป: *การให้ดื่มน้ำคาร์โบไฮเดรตไม่ช่วยป้องกันอาการคลื่นไส้อาเจียนหลังการผ่าตัด หรือ ทำให้ผู้ป่วยรู้สึกสบายขึ้นก่อนการผ่าตัด*