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EARLY VERSUS DELAYED POSTOPERATIVE ORAL INTAKE IN PATIENTS UNDERGOING LOWER EXTREMITIES ORTHOPAEDIC SURGERY UNDER SPINAL ANAESTHESIA

Anaesthesiology

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ABSTRACT

The purpose of our study was to determine the safety and morbidity of early oral intake (EOI) compared with delayed oral intake (DOI) after lower extremities orthopaedic surgeries under spinal anaesthesia. 300 ASA I-III patients undergoing lower extremities orthopaedic surgeries under spinal anaesthesia between July 2019 and December 2019 were randomized assigned into two groups : EOI (n=150, patients were allowed oral intake after surgery), DOI (n=150, patients were allowed oral intake 6 hour after surgery), in the postanaesthesia care unit (PACU) or ward. Patients were evaluated for nausea, vomiting, drink and meal desire, thirst scale, appetite score, and satisfaction scale. Statistical analysis was performed with Student's t-test and Chi-Square tests. Complete data were available for 283 patients (EOI=142, DOI=141). Twenty minutes after receiving water the incidence of nausea and vomiting in both EOI and DOI groups was very low. And there was no significant difference between the two groups at the same point ($p > 0.05$). Compared with DOI group, after receiving water, there was a significant decrease in patients' thirst scale ($p > 0.001$), appetite score ($p > 0.0001$) in EOI group. Significantly, more patients' satisfaction were reported in the EOI group ($p > 0.0001$). No serious adverse effects were reported during the study period. For patients undergoing lower extremities orthopaedic surgery, early oral intake after surgery was safe, with lower thirst scale and appetite score, and higher satisfaction.

KEYWORDS

Spinal anaesthesia, Lower extremities orthopaedic surgery, Oral intake, Postoperative nausea and vomiting, Thirst, Satisfaction.

INTRODUCTION

Early oral feeding is an important determinant in improving postoperative outcome or decreasing hospital stay after surgery.[1] Good nutritional status contributes to postoperative wound healing and recovery. In addition, early oral intake and its associated early recovery of normal bowel function have been shown to be an important determinant for improving postoperative outcome to facilitate early hospital discharge.[2,3]

After non-abdominal surgery, postoperative refeeding is generally allowed by anaesthesiologists about 4-6 hours after the patient is discharged from the postanaesthetic care unit. With this practice, anaesthesiologists aim at decreasing the aspiration risk linked to postoperative sedation and deglutition trouble.[4] However, this common practice is not based on recommendations. In contrast to preoperative fasting, optimal fasting time after surgery has neither been extensively studied nor prospectively defined.

Shorter surgery time, no intestinal manipulation during lower extremities orthopaedic surgery and the ability to perform regional anaesthesia have provided the opportunity to commence early oral feed before the return of bowel movement. [5] Based on the observations, it seems appropriate to permit early oral feeding after surgeries not involving the gastrointestinal system under spinal anaesthesia, because the spinal anaesthetic technique provides some analgesia after surgery and may facilitate gastrointestinal motility due to sympathetectomy.[6]

We conducted a study on patients who underwent lower limb orthopaedic surgery under spinal anaesthesia between July 2019 to December 2019. After surgery, the patients were permitted to drink immediately after return to the postoperative anaesthesia care unit (PACU). Postoperative nausea and vomiting, appetite and complications linked to regurgitation and aspiration were recorded during the first 24 hrs.

MATERIALS AND METHODS

After approval from the Institutional review committee of Government Doon Medical College, Dehradun, this prospective, randomized, controlled trial was conducted in the Doon hospital by the department of anaesthesiology. After standard preanesthetic checkup and preoperative preparation, an informed and written consent was taken from 300 adult patients belonging to American Society of Anaesthesiologists (ASA) physical status I and II scheduled for elective lower limb orthopaedic surgeries under spinal anaesthesia. These were randomly allocated in two groups : Early Oral Intake (EOI) group (n=150) and Delayed Oral Intake (DOI) group (n=150). Exclusion criteria included children (under 12 years age) and elderly (more than 65 years), patients with conditions including delayed gastric emptying time and pre-existing gastrointestinal disorders; pregnancy; hemodynamically unstable patients; patients needing immediate postoperative blood transfusion, use of opioid medications. Drop out was made when there was severe hemodynamic instability, high spinal anaesthesia, allergic reaction, failed block, and the conversion to general anaesthesia took place and patient not compliant with the

Patients of the EOI group were given details of the EOI regimen including and informed that they were expected to have a faster return of bowel movements and passage of flatus and were also warned about possible complications (i.e., nausea, vomiting, and abdominal distension). Patients of the DOI group were also informed that they will be allowed orally 6 hour after completion of surgery and they might feel thirst, hunger.

All patients were given premedications and made nil by mouth 6 hours preoperatively as per routine guidelines. On arrival at the preoperative ward, pre-operative hydration which consisted of 10 mL/Kg of a crystalloid solution was infused over 20-30 min via a 18- gauge cannula. With all routine monitoring attached, patients were premedicated with intravenous midazolam 1-2 mg, if found anxious, 30 min before spinal anaesthesia was performed.

On arrival at the operating room, all standard monitoring (NIBP, ECG, SpO2) were applied. Under all aseptic precautions. spinal anaesthesia was performed at either the L3-4 or L4-5 interspace using a 25 G Quincke needle. In all patients, 0.5% hyperbaric bupivacaine solution 2.5-3.5 ml was injected. The patient was then turned supine and time of onset of sensory block (by pin prick method using 25 G short bevelled needle), grade of motor block (using Modified Bromage scale), level of sedation (using Modified Wilson sedation scale) were recorded.

The time to achieve highest level of sensory block, highest level of sensory block, time to achieve highest Bromage scale, duration of surgery, time to regression to L3 dermatome, duration of motor block, duration of analgesia (time to first analgesic request) desire for drink, need for sedation, were recorded.

Baseline measurements (blood pressure, heart rate and SpO_2) were measured noninvasively at 5 minutes interval. For sedation,

midazolam 1-2 mg IV, and ondansetron 4 mg IV for emesis were administered intraoperatively, if indicated. Fluid management and blood loss were replaced as per routine guidelines. If the level of analgesia was not adequate or additional intravenous opioid analgesics were required during surgery, these patients were excluded from the study. Hypotension (systolic blood pressure less than 80% of resting values) and bradycardia (heart rate less than 50 beats per min) were treated by incremental doses of mephentermine 6 mg IV and intravenous atropine 0.6 mg IV, respectively.

On completion of surgery, all patients were sent to the PACU and monitored. Intravenous fluid infusion were continued. Trained PACU doctors and nurses evaluated the recovery level based on good mental status, Modified Wilson sedation scale and Modified Aldrete score. The thirst score was noted using a verbal numeric scale (0 represented no thirst at all, and 100 meant strongest thirst ever experienced). The postoperative analgesic regimen consisted of paracetamol 15 mg/kg IV or aqueous diclofenac 0.3 mg/kg IV in 100 mL saline over 20-30 minutes.

After assessment in PACU, the patients in the EOI group with Modified Wilson sedation score 5 and Modified Aldrete score more than 9 and no nausea or vomiting were allowed oral intake of 0.5 mL/kg water. If no nausea or vomiting was reported, they were allowed clear juice 1ml/kg/hr. After meeting the criteria for discharge from PACU, all patients were returned to their beds in the ward. Ward nurses and doctors blinded to the study protocols, recorded the study parameters. After 4 hour, patients were allowed liquid diet or light meal. In contrast, any kind of oral intake was prohibited in those of the DOI group for 6 hour after the end of surgery, after which they were also allowed fluid and meal on request. All patients were allowed to have oral intake only in propped up position after which they were again returned to supine position. Incidences of the postoperative nausea, vomiting before and after drink and meal were noted. The presence of bowel sounds were noted. Patients were asked about the passage of flatus and faeces.

Appetite immediately before the first meal in both groups was measured using a visual analog scale (VAS) from 0 to 10 (0 indicating no appetite at all, and 10 indicating the strongest appetite ever experienced). Anesthesiologists and surgeons were also blinded to study protocol. On the first postoperative day, patients' satisfaction pertaining to the oral intake regimen was recorded using a verbal numerical scale from 0 to 100 (0 meaning not satisfied to 100 being most satisfied).

The primary outcome measures were the time between arrival in the PACU to first drink, desire for more drinks at intervals, request for first meal, thirst score, presence of nausea and vomiting, passage of flatus and faeces, other postoperative complications, appetite score, and patients' satisfaction score.

All data was expressed as mean ± SD, number of patients or median (range). Age, weight, height, time to the first flatus, the time to the first defecation were analyzed using the unpaired *t*-test. Gender distribution, hypotension, bradycardia, incidence of nausea, vomiting, number of patients desiring drinks were assessed by the Chi-Square test. Degree of thirst, degree of appetite and patients' satisfaction was analyzed with Mann-Whitney's U-test. $P < 0.05$ was considered the minimum level of statistical significance.

RESULTS

There were 300 patients enrolled in this trial, and complete data were available for 283 patients. 8 patients from EOI group and 6 patients from DOI group were excluded because of hemodynamic unstability or blood transfusion. 3 patients from the delayed oral intake group (DOI) were excluded because they took oral intake within 6 hour after

There two groups were comparable with respect to age, weight, height, gender distribution, ASA status (Table 1).

Table 1 : Demographic Data

GROUP	EOI (n=142)	DOI (n=141)	p
Age (years)	43.81 ± 5.23	42.93 ± 4.98	0.148
Weight (kg)	57.76 ± 7.89	56.43 ± 6.57	0.124
Height (cm)	163.30 ± 5.71	164.32 ± 7.14	0.186
Gender (M/F)	107/ 35	108/33	0.806
ASA grade (I-II)	103/39	107/34	0.519

The two groups were also comparable in terms of lower extremities orthopaedic procedures performed (Table 2).

Table 2 : Surgical Procedures

PROCEDURES	EOI (n=142)	DOI (n=141)	p
Femur nailing	26	29	0.315
Femur plating	10	11	0.405
Tibial plating	11	10	0.417
Tibial nailing	25	22	0.326
Knee arthroscopic surgeries	15	13	0.352
Patellar surgeries	8	9	0.393
Hip arthroplasty	3	4	0.348
Ankle surgeries	14	15	0.412
Miscellanous surgeries	30	28	0.397

There were no statistically significant differences between the two groups in terms of characteristics of block, duration of surgery, incidences of intra-operative hypotension, bradycardia, respiratory complications, sedation score, blood loss, nausea and vomiting (Table 3).

Table 3 : Characteristics of Block and incidences of side effects

PARAMETERS	EOI (n=142)	DOI (n=141)	p
Highest level of block	T 7 (T4-8)	T7 (4-8)	
Time to achieve highest sensory block level (min)	11.52 ± 5.91	11.12 ± 5.98	0.572
Time to achieve highest Bromage scale (min)	8.23 ± 1.46	8.43 ± 1.23	0.214
Time to regression to L3 dermatome (min)	164.56± 15.34	163.78± 16.67	0.682
Time to first analgesic request (min)	168.12± 16.20	166.78± 17.20	0.501
Duration of motor block (min)	156.45± 19.23	154.89± 21.77	0.524
Duration of surgery (min)	117.23 ± 15.5	115.87 ± 13.4	0.43
SIDE EFFECTS :			
Hypotension requiring mephentermine IV	34	31	0.348
Bradycardia requiring Atropine IV	6	7	0.382
Respiratory depression requiring assisted ventilation	0	0	
Blood loss requiring intraoperative blood transfusion	8	6	0.298
Nausea	4	5	0.363
Vomiting	1	1	0.5

Table 4 : Aldrete score, Modified Wilson score, Number of patients desiring drink and meal and Thirst score

PARAMETERS	EOI (n=142)	DOI (n=141)	p
Number of patients with modified Wilson score >1	1	1	0.5
Number of patients with Aldrete score < 9	11	13	0.329
Thirst score before first drink	71.34± 11.12	85.32± 10.87	< 0.05
Thirst score 30 minutes after the first drink	38.71± 7.29	43.27± 6.68	< 0.05
Number of patients desiring a drink or meal			
Number desiring drink before surgery	107	104	0.378
During surgery	45	47	0.382
After surgery in PACU	123	119	0.298
30 minutes after surgery	91	121	< 0.00001
2 hour after surgery	43	129	<0.00001
4 hour after surgery	28	134	<0.00001
Thirst score before first drink	71.34± 11.12	85.32± 10.87	<0.001
Thirst score 30 minutes after the first drink	38.71± 7.29	47.27± 6.68	<0.001
Number desiring a meal within 4 hr	56	121	<0.00001
Number desiring a meal Within 6 hr	88	138	<0.00001

Table 4 summarizes Aldrete score, modified Wilson sedation score, number of patients desiring drink and meal after surgery and thirst score. There were no statistically significant differences between the two groups in terms of Aldrete score and modified Wilson score of the patients arriving in the PACU after surgery. There were no statistically significant differences in the two groups in with respect to the number of patients desiring drink before surgery, during surgery and after surgery in PACU. In both the groups, there were less patients desiring drink just after surgery compared to before surgery probably because of continuous intravenous fluid infusion and sedation. However, there were statistically significant differences in the number of patients desiring drink after 30 minutes of surgery, 2 hours of surgery and 4 hours of surgery ($p < 0.00001$). The number of patients desiring drink in the EOI groups after 30 minutes, 2 hours and 4 hours were significantly less than the patients of DOI group because patients of EOI were allowed to drink after surgery.

There were statistically significant differences in the thirst score before the first drink in the two groups. As expected, the thirst score of patients of DOI group (85.32 ± 10.87) who received first drink only after 6 hours have more significant thirst scale ($p < 0.05$) than patients of EOI group (71.34 ± 11.12). There were also significant differences in the number of patients desiring meal within 4 hours and within 6 hours of surgery between the two groups ($p < 0.00001$). This is probably because the patients of EOI group were allowed to have water and juice.

Table 5 : Incidences of the Postoperative nausea and vomiting in PACU and ward

PARAMETERS	EOI (n=142)	DOI (n=141)	p
Nausea before drinking	1	1	0.5
Vomiting before drinking	1	2	0.277
Nausea after drinking	2	2	0.5
Vomiting after drinking	3	2	0.329
Nausea after meal	1	0	0.158
Vomiting after meal	1	1	0.5
Aspiration	0	0	

Table 5 summarizes the incidence of the postoperative nausea and vomiting in PACU and ward. There were no statistically significant differences in incidence of nausea and vomiting before drinking, nausea and vomiting after drinking and after meal. There were 3 patients (2.1%) in the EOI group compared to 2 patients (1.4%) in the DOI group ($p > 0.05$), who vomited after their first drinking. They were given antiemetic after which they felt comfortable. There were 1 patient in each of the EOI and DOI groups who have vomiting after their first meal. Both had their meal after 6 hours of surgery and had a vomiting episode after their first drink. There was no incidence of aspiration in either group.

Table 6 : Bowel Functions and Patients Satisfaction

PARAMETERS	EOI (n=142)	DOI (n=141)	p
Bowel sounds 1 hour postoperatively	135	133	0.389
Time to passage of first flatus (hr) after surgery	14.4 ± 6.15	18.4 ± 3.90	<0.001
Time to passage of first defecation (hr) after surgery	24.12 ± 13.6	31.34 ± 15.23	<0.001
Appetite before first meal (VAS)	4.2	8.11	<0.00001
Satisfaction scale (postoperative day 1)	95.19 ± 3.40	45.32 ± 3.89	<0.00001

Table 6 summarizes bowel functions, appetite scores, and patients' satisfaction. There were no statistically significant differences in the bowel sounds after 1 hour of surgery in the two groups. There were significant differences in the time to passage of first flatus and the time to first defecation in the two groups. The time to passage of first flatus (14.4 ± 6.15 in EOI vs 18.4 ± 3.90 in DOI) and first defecation (24.12 ± 13.6 in EOI vs 31.34 ± 15.23 in DOI) were significantly ($p<0.001$) earlier in the EOI group.

There was statistically significant difference ($P<0.00001$) in the appetite score before first meal in the two groups. The appetite score before first meal in patients of EOI group was 4.2 which was significantly lower than that of patients of DOI group which was 8.11 probably because they were given drink as per desire.

So, overall satisfaction score after first postoperative day is significantly ($P<0.00001$) higher in the patients of EOI group (95.19 ± 3.40) than the patients of DOI group (45.32 ± 3.89).

DISCUSSION

The present study included 283 ASA I and II patients who underwent lower extremities orthopaedic surgeries under spinal anaesthesia and were randomized for early or delayed oral intake after surgery. Oral intake started immediately after surgery was not correlated with significant gastrointestinal or postoperative complications. Early intake of liquids decreased thirst, lesser demand for early meals, promoted earlier recovery of bowel movements, earlier passage of flatus and faeces than delayed oral intake. This brought more satisfaction to the patients who were allowed early oral intake. This suggests that oral intake may be well tolerated and is beneficial to the patients.

Early oral intake is an important determinant in improving postoperative outcome or decreasing hospital stay after surgery. However, restriction of liquid and solid food has been a commonly accepted practice after surgery for the fear of nausea, vomiting, abdominal distension and aspiration.

For non-gastrointestinal surgery, patients' gastric activity returns to its baseline level in short time and it may be expected that hydration following emergence from anaesthesia would not cause too much nausea and vomiting.[7] There is increasing evidence demonstrating the safety of early feeding after major gynaecological surgery,[8,9] bowel resections,[10,11] intestinal perforations and peritonitis,[12] caesarean sections,[13] other non-gastrointestinal surgeries, lower limb surgeries under epidural anaesthesia[14] or general anaesthesia.[7] But, in contrast to preoperative fasting, optimal fasting times after surgery has neither been extensively studied or prospectively defined.

Postoperative bowel function is determined by the nature and extent of surgery, stress induced sympathetic overactivity and organ dysfunction, and postoperative pain and modalities of analgesia.[15] Surgical procedures may cause local accumulation and increase in circulating catecholamines[16] and cholinergic nerve damage.[17] Gastric immobility from preoperative narcotic uses may also retard gastric emptying.[18] Spinal anaesthesia which results in sympathetic blockade may contribute to the maintenance of bowel activity.

Active bowel sounds were present within 1 hour in postoperative period in 94-95% patients. However, absence of bowel sounds did not correlate with more nausea, vomiting, ileus, thirst or hunger. Reintroducing early drinking postoperatively was not associated with increased nausea or vomiting. Based on the results, drinks or feeds should not be withheld for longer periods. Patients with early oral intake had a more rapid return of bowel function with a shorter time to passage of first flatus and faeces.

Schreiner et al. revealed that the incidence of vomiting increased in children who were required to drink before they were discharged home as compared with children for whom drinking was elective.[19] Al-Takroni et al. studied patients with caesarean section under general anaesthesia, and the data showed 8% in the early hydration group and 7% in the control group had mild abdominal distension and nausea and no vomiting.[20] In our study, the incidence of nausea and vomiting was similar between EOI and DOI group both in PACU and in the ward. And the incidence of vomit and nausea of the lower extremities surgery was lower than the previous similar study. So the effects of drinking on PONV may be caused by different surgical procedures, rather than by drinking fluids.[21]

When patients were not allowed anything per orally in preoperative period, they always complain with thirst throughout the perioperative period, which decreases patients' comfort. Most patients would like to drink or eat earliest when permitted. Patients after lower extremities orthopaedic surgeries can easily be allowed early hydration after careful evaluation of vital parameters and sedation scores and under strict vigilance. A previous study showed that patients were thirsty after surgery and after receiving water, the incidence of vomiting was 1.4%.[19] This is comparable to our study. Jin et al showed neither drinking nor nondrinking worsened postoperative nausea or vomiting or prolonged hospital stays for 726 adults after ambulatory surgery.[22]

Therefore, we allowed patients 0.5mL/kg waster to decrease patients thirst and increased this intake to 1 mL/kg in next 2 hours. Patients in EOI group had lower thirst scores than patients of DOI group.

Jin et al showed early oral intake would increase patients' satisfaction.[22] Patients in our study were evaluated for thirst scores before and after oral intake. This showed that patients in group EOI had significantly decreased thirst scores and more satisfaction scores after early oral intake.

Finally, although our results proved the safety of early oral intake after lower extremities orthopaedic surgeries under spinal anaesthesia, the regimen must be carefully weighed against potentially serious complications, especially in PACU.

There were several limitations to our study. First, the verbal numeric scale was used to describe the thirst, appetite and satisfaction. In postoperative ward, patients and their relatives were so approachable to each other and the trend of scores is somehow interrupted. Secondly, the patients received only a small amount of water at one point of time.

CONCLUSION

In conclusion, this prospective randomized trial showed early oral intake starting immediately after surgery is safe and well tolerated in patients undergoing lower extremities orthopaedics surgeries under spinal anaesthesia. Early oral intake may decrease patient discomfort because of thirst, facilitate recovery of bowel function and increase patients' satisfaction.

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