Evaluation of Preoperative Oral Carbohydrate Administration on Hospital Length of Stay and Perioperative Complications in Laparoscopic Cholecystectomy: A Randomized Controlled Study

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Background

Prolonged preoperative fasting may aggravate catabolic metabolism in the presence of surgical stress, and lead to considerable patient discomfort[1-3]. Over the last decade, oral carbohydrate loading before surgery has been gaining supporting evidence demonstrating its safety and potential benefits in enhancing patient's well-being and recovery times[4, 5]. However, studies examining its role in intermediate outpatient surgical procedures have remained largely inconclusive[6-8].

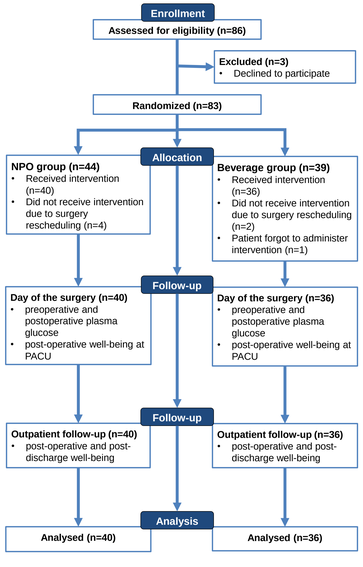
This study investigated the effect of preoperative carbohydrate oral (CHO) hydration on hospital length of stay (hLOS) and perioperative complications and recovery in laparoscopic cholecystectomy (LC), compared with the traditional nil per os (NPO) protocol.

Methods

- A single-center, randomized controlled study (RCT) conducted between January 2016 and December 2019.
- Participants consist of 76 patients between 18 to 75 years of age who were scheduled for an elective LC under general anesthesia.
- Exclusion criteria:
  - American Society of Anesthesiologists (ASA) class IV
  - Age less than 18 years or greater than 75 years
  - Emergent surgery
  - Surgical interventions involving main biliary tract or other combined operative procedures
- Intervention group (n = 36) received 355mL of a carbohydrate-rich beverage (44 g maltodextrin) on the day of surgery, at least 2 hours prior to anesthesia induction.

  Control group (n = 40) was made NPO from midnight until anesthesia induction.
- Primary endpoint was the length of hospital stay (hLOS).

  Secondary endpoints include intraoperative vaso-vagal events, preoperative and postoperative plasma glucose, postoperative nausea and vomiting (PONV), postoperative pain, and patient well-being based on the quality of recovery 40-item (QoR-40).



Results

- Patient demographics were similar between the groups, except for ASA class (Table 1).
- The mean hLOS was not significantly different between the control group (4.8 ± 7.1 hr) and the intervention group (6 ± 9.1 hr), as shown in Figure 2.
- The control group demonstrated a statistically significant fluctuation in preoperative and postoperative plasma glucose, compared to the intervention group. In addition, the percentage variance of preoperative and postoperative plasma glucose was significantly lower in the intervention group (Table 2a and 2b).
- No significant difference was detected between the two groups with regards to select perioperative parameters of recovery (Table 3).
- The global scores for QoR-40 did not vary significantly between the two groups (Table 4).

Table 1. Patient demographics and characteristics

	Control (n = 40)	Intervention (n = 36)
Demographics		
Age	51.1 ± 12.0	50.1 ± 15.6
Gender	32 (80%) Female 8 (20%) Male	26 (72%) Female 10 (28%) Male
Perioperative characteristics		
ASA Class	30 (80%) Class I-II 9 (23%) Class III	34 (94%) Class I-II* 2 (5.6%) Class III*
Fasting time (hr)	13.3 ± 3.9	13.7 ± 2.5
Intubation time (min)	64.2 ± 13.2	64.2 ± 19.1
Aldrete score	1 (2.5%) score 4-7 34 (85%) score 8-10	2 (5.6%) score 4-7 31 (86%) score 8-10
Comorbidities		
Diabetes mellitus	7 (17.5%)	1 (2.8%)
Hypertension	9 (22.5%)	5 (14%)
Heart disease	3 (7.5%)	0 (0%)
Obstructive lung disease	4 (10%)	0 (0%)
Obesity (BMI >30)	11 (27.5%)	8 (22%)
Current or hx of tobacco use	2 (5%)	1 (2.8%)

Table 2. Preoperative and postoperative plasma glucose, and percentage of variation

Table 2a.

	Preoperative	Postoperative	% Variation
Control	111.6 ± 45.8	138.4 ± 55.0[¥]	-22.2%
Intervention	121.4 ± 57.0	121.7 ± 47.0	-3.3%

Table 2b.

	Control	Intervention
% Variation	-22.2%	-3.3%*

* *p-value* < 0.05 for comparison between two groups
* *p-value* < 0.05 for comparison within the same group

Figure 2. Hospital length of stay

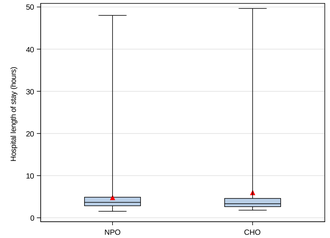


Table 3. Intraoperative and postoperative recovery parameters

	Control	Intervention
Vaso-vagal episodes requiring hypertensives	13 (32.5%)	9 (25%)
PONV	0 (0%)	1 (2.8%)
Postoperative pain rating (0-10)	4.7 ± 2.75	5.4 ± 1.90
Postoperative analgesic use	25 (62.5%)	24 (66.7%)

Table 4. QoR-40 score

	Control	Intervention
Comfort	51.6 ± 5.6	51.7 ± 5.7
Emotions	40 ± 4.5	40 ± 4.6
Physical Independence	22.7 ± 2.5	22 ± 2.7
Patient Support	34 ± 1.8	34 ± 1.6
Pain	29.3 ± 5.0	30.2 ± 3.1
Total Points	177.7 ± 13.5	178 ± 11.5

Abbreviations: ASA, American Society of Anesthesiologists; BMI, body mass index; hx, history hr, hour; min, minutes; PACU, post anesthesia care unit; PONV, postoperative nausea and vomiting QoR-40, quality of recovery-40 item questionnaire

Discussion

- The results of our study did not demonstrate a marked benefit of preoperative CHO therapy on the duration of hospital stay or select perioperative parameters of recovery.
- One explanation is that the biochemical and clinical implications of carbohydrate loading is significantly less pronounced in minimally invasive surgeries such as LC, which involves a relatively shorter fasting period and surgical time.
- Our plasma glucose results highlight the fundamental role of preoperative CHO loading in maintaining insulin sensitivity and decreasing the body's stress response, even in minor to moderate surgeries. An abbreviated preoperative fasting may therefore improve outcomes in surgical care by optimizing patient's perioperative metabolic state.
- Limitations include lack of blinding and loss-to-follow up of QoR-40 questionnaires.
- Future studies should compare the effects of varying time, route, and dose of carbohydrate loading on surgical outcomes in a preoperative fasting patient.

Conclusion

Compared to conventional overnight fasting, preoperative oral intake of CHO fluids did not reduce hLOS in patients undergoing outpatient elective LC.

While no significant improvements were observed in select perioperative outcomes, the impact of preoperative carbohydrate loading on surgical stress response in relation to insulin resistance may have essential implications and warrants further investigations.

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