

Ultrasonographic Assessment Of Gastric Contents In Fasting Patients Versus Clear Carbohydrate Preload Before Surgery In Patients Posted For Elective Procedures Under General Anaesthesia : A Comparative Hospital-Based Study

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Abstract:

Background: Preoperative overnight fasting has traditionally been practiced to reduce pulmonary aspiration during general anaesthesia but may lead to patient discomfort, dehydration, and insulin resistance. Enhanced Recovery After Surgery (ERAS) guidelines recommend clear carbohydrate drinks up to 2 hours before surgery. This study evaluated the effect of preoperative carbohydrate loading on gastric contents using point-of-care gastric ultrasonography.

Materials and Methods: A prospective comparative study was conducted on 30 ASA I-II patients (18-60 years) undergoing elective surgery under general anaesthesia. Patients were randomly allocated to either Group F (overnight fasting) or Group C (400 ml of 12.5% maltodextrin clear carbohydrate drink 2 hours before surgery). Gastric antral cross-sectional area (CSA), estimated gastric volume, Perlas grading, and aspiration risk (>1.5 ml/kg) were assessed using preoperative gastric ultrasonography.

Results: Baseline demographic characteristics were comparable between the groups. The carbohydrate preload group demonstrated significantly lower antral CSA (5.23 vs. 6.12 cm; $p=0.005$) and gastric volume (43.6 vs. 50.4 ml; $p=0.008$) than the fasting group. Although Grade 2 Perlas scores (3.3% vs. 10%) and high risk gastric volumes (6.7% vs. 13.3%) were lower in the carbohydrate group, these differences were not statistically significant.

Conclusion: Preoperative administration of 400 ml of a 12.5% maltodextrin clear carbohydrate drink 2 hours before surgery safely reduced gastric volume and antral CSA without increasing aspiration risk. These findings support ERAS recommendations and suggest that carbohydrate loading is a safe and effective alternative to prolonged overnight fasting in elective surgical patients.

Key Word: Preoperative fasting; Carbohydrate loading; Gastric ultrasonography; Gastric volume; Perlas grading; ERAS; Aspiration risk; General anaesthesia

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I. Introduction

- Prolonged preoperative fasting, aimed at reducing aspiration risk, often causes patient discomfort and metabolic stress. Enhanced Recovery After Surgery (ERAS) protocols now support clear carbohydrate drinks up to two hours before anaesthesia to improve comfort and reduce insulin resistance without increasing aspiration risk.
- However, concerns remain about residual gastric volume, especially in patients with delayed gastric emptying. Gastric ultrasound enables non-invasive assessment of gastric contents using antral CSA and Perlas grading.
- This study compares gastric ultrasound findings in patients undergoing traditional fasting (Group F) versus those receiving 400 ml of a 12.5% maltodextrin drink (Group C) before elective surgery, hypothesizing non-inferiority of the carbohydrate preload in terms of aspiration risk.

II. Material And Methods

Study Design: This was a prospective, hospital-based, comparative study conducted in the Department of Anaesthesiology at a tertiary care hospital. The study aimed to evaluate preoperative gastric ultrasonographic parameters in fasting patients and those receiving a carbohydrate preload before elective surgery.

Study Location: This was a tertiary care teaching hospital based study done in Department of Anaesthesiology,

at Akash Institute of Medical Sciences & Research Centre, Devanahalli, Bengaluru, Karnataka.

Study Duration: November 2024 to April 2025.

Sample size: 30 patients.

Sample size calculation:

Subjects & selection method: The study population was drawn from the patients who were posted for elective surgeries under General Anaesthesia in Akash Institute of Medical Sciences & Research Centre from November 2024 to April 2025.

Patients were divided into two groups (each group had 15 patients). Group F (N=15 patients) – Fasting Group
Group C (N=15 patients) – Carbohydrate Group

Inclusion criteria:

1. Aged between 18 – 60 years
2. Either sex
3. Posted for Elective surgeries under General Anaesthesia,
4. Patients with American Society of Anesthesiologists (ASA) physical status I or II.
5. Patients giving written informed consent.

Exclusion criteria:

1. Pregnant women;
2. Patients with BMI >30kg/m²
3. Patients with known or suspected delayed gastric emptying
4. Patients with history of upper GI bleed

Procedure methodology

After obtaining clearance from the Institutional Ethics Committee, the patients were enrolled for the study as per inclusion criteria after obtaining written informed consent. Study was conducted in Akash Institute of Medical Sciences and Research Center, Devanahalli, Bangalore, Karnataka. Detailed pre-anesthetic evaluation was done. Patients were graded according to ASA classification.

American society of anaesthesiologists (ASA) grading^[4]

Grade 1 – Normal healthy patient.

Grade 2 - Mild to moderate systemic disease that is well controlled.

Grade 3 – Severe systemic disease of at least one organ system.

Grade 4 – Severe systemic end stage disease of at least one organ system that is life threatening.

Grade 5 – Moribund patient who has little chance of survival.

Grade 6 – Declared brain dead patient.

Then the patients who were scheduled for elective surgeries under General anaesthesia were randomly allocated divided into two groups (1:1) as group F(Fasting group) and group C(Carbohydrate group) of 15 patients each. Group F patients fasted overnight and Group C patients received 400 ml of 12.5% maltose dextrin based clear carbohydrate drink two hours prior to surgery.

Following recruitment, all patients underwent preoperative gastric ultrasonography performed by a trained anaesthesiologist blinded to group allocation. The gastric antrum was assessed in both supine and right lateral decubitus (RLD) positions using a low-frequency curvilinear probe (2–5 MHz).

Gastric volume was then estimated from the CSA in the RLD position using the Perlas formula: Gastric Volume (ml) = $27.0 + (14.6 \times \text{CSA}_{\text{RLD}}) - (1.28 \times \text{Age})$.

Based on ultrasound findings, patients were classified using the Perlas grading system:

- Grade 0 (empty antrum in both positions)
- Grade 1 (fluid visible only in RLD)
- Grade 2 (fluid visible in both positions, indicating higher aspiration risk) A gastric volume greater than 1.5 ml/kg was considered high risk for aspiration. **Statistical analysis**

Data were analyzed using SPSS software version 25. Continuous variables were presented as mean $\pm$ standard deviation or median (interquartile range) and compared using the independent t-test or Mann–Whitney U test as appropriate.

Categorical variables were expressed as percentages and compared using the Chi-square test or Fisher's exact test. A p-value < 0.05 was considered statistically significant.

III. Result

The study was conducted in the Department of Anesthesiology, Akash Institute of Medical Sciences and Research Center, Devanahalli, Bangalore, Karnataka from March, 2024, to November, 2024. The study population included 30 patients aged between 18 and 60 years belonging to ASA class I and II undergoing elective surgeries under general anesthesia. The participants were the patients who satisfied the inclusion criteria.

Table-1:

Parameter	Group F (Fasting) (n=30)	Group C (Carbohydrate Preload) (n=30)	p-value	Test Used
Mean $\pm$ SD (years)	38.2 $\pm$ 10.5	36.4 $\pm$ 9.8	0.472	Independent t-test
Median (IQR)	37 (31–45)	35 (29–42)		

AGE

Group F (Fasting) (n=30) Group C (Carbohydrate Preload) (n=30)

Table-2:

Sex	Group F (n=30)	Group C (n=30)	Total (n=60)	p-value	Test Used
Male	16 (53.3%)	18 (60.0%)	34 (56.7%)	0.592	Chi-square test
Female	14 (46.7%)	12 (40.0%)	26 (43.3%)		

SEX

Group F (n=30) Group C (n=30)

Male Female

Table-3:

Parameter	Group F (n=30)	Group C (n=30)	p-value	Test Used
Mean $\pm$ SD	24.6 $\pm$ 3.1	24.2 $\pm$ 2.8	0.643	Independent t-test
Median (IQR)	24.3 (22.5–26.5)	24.1 (22.8–25.9)		

BMI

Group F (n=30) Group C (n=30)

Table-4:

ASA Class	Group F (n=30)	Group C (n=30)	p-value	Test Used
ASA I	20 (66.7%)	21 (70.0%)	0.781	Chi-square test
ASA II	10 (33.3%)	9 (30.0%)		

Group	ASA I (%)	ASA II (%)
Group F (n=30)	66.70%	33.30%
Group C (n=30)	70.00%	30.00%

Table-5

Parameter	Group F (n=30)	Group C (n=30)	p-value	Test Used
Mean ± SD	6.12 ± 1.45	5.23 ± 1.28	0.005	Independent t-test
Median (IQR)	6.0 (5.2–7.0)	5.1 (4.4–6.1)		

Group	Value
Group F (n=30)	6.12
Group C (n=30)	5.23

Table-6

Parameter	Group F (n=30)	Group C (n=30)	p-value	Test Used
Mean ± SD	50.4 ± 9.2	43.6 ± 8.5	0.008	Independent t-test
Median (IQR)	49 (44–56)	42 (37–48)		

Group	Value
Group F (n=30)	50.4
Group C (n=30)	43.6

Table-7

Perlas Grade	Group F (n=30)	Group C (n=30)	p-value	Test Used
Grade 0	12 (40.0%)	16 (53.3%)	0.424	Fisher's exact test
Grade 1	15 (50.0%)	13 (43.3%)		
Grade 2	3 (10.0%)	1 (3.3%)		

Table-8

Risk Category	Group F (n=30)	Group C (n=30)	p-value	Test Used
High-risk (>1.5 ml/kg)	4 (13.3%)	2 (6.7%)	0.384	Fisher's exact test

IV. Discussion

- This study confirms the safety and efficacy of preoperative carbohydrate loading with 400 ml of a 12.5% maltodextrin drink administered two hours before elective surgery.
- Both groups were demographically comparable, eliminating baseline bias. The preload group showed significantly lower antral CSA and gastric volumes than the fasting group with fewer patients presenting high-risk gastric volumes or Grade 2 Perlas scores—though not statistically significant
- These findings align with previous research across various populations, including elderly, diabetic, and obstetric patients, supporting the general safety of carbohydrate drinks preoperatively.
- The study strengthens ERAS recommendations by demonstrating improved gastric metrics and potential metabolic and comfort benefits without increasing aspiration risk.
- Limitations include a small sample size, single-operator ultrasound assessments, and a single-center design, highlighting the need for larger, multicenter trials.
- Future research should focus on metabolic outcomes and patient satisfaction while standardizing gastric ultrasound protocols. Overall, preoperative carbohydrate preload appears to be a safe, patient-friendly strategy that complements modern perioperative care protocols.
- Preoperative carbohydrate loading with 400 ml of a 12.5% maltodextrin drink two hours before surgery is safe.

V. Conclusion

This comparative study showed that administering a clear carbohydrate preload (400 ml of 12.5% maltodextrin) two hours before elective surgery significantly reduced gastric volume and antral CSA compared to overnight fasting, without increasing aspiration risk.

The preload group had lower mean gastric volume (43.6 ml vs. 50.4 ml) and antral CSA (5.23 cm² vs. 6.12 cm²), both statistically significant.

These findings support the safety and benefits of preoperative carbohydrate loading as part of enhanced recovery protocols.

Limitations of the study

- Small sample size.
- Short duration of study.

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