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Original research article

Gastric emptying time after a standardised light breakfast using ultrasound imaging in healthy adult patients posted for surgical procedure under regional anaesthesia.

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Abstract

Due to the risk of pulmonary aspiration in patients undergoing procedural sedation, the ASA continues to state that practitioners should follow preoperative fasting guidelines based on general consensus as there is insufficient studies and data to base the guidelines on. This is to ensure the safety of patients from major pulmonary complications; but it fails to take into account the post-operative complications due to prolonged fasting. The preoperative fasting guidelines recommended by the ASA are of a shorter duration than the duration recorded for many patients. In this study, data was collected from patients between 18 to 60 years of age who were undergoing elective surgery under under spinal anesthesia. The patients were selected based on the inclusion and exclusion criteria during the study period and a written informed consent was obtained from all the study participants. Antral CSA in supine D1 ranged between 3.52-5.67 and the mean value was 4.27 ± 0.45 Antral CSA in RLD D2 ranged between 3.55-5.97 and the mean value was 4.56 ± 0.50 Gastric antral area ranged between 10.69-26.83 and the mean value was 15.65 ± 3.43 Gastric volume in ml at 4th hour ranged between 16.05-63.08 and the mean value was 39.37 ±13.03 GASTRIC VOLUME </>1.5Ml/kg ranged between 0.27-1.47 and the mean value was 0.65 ±0.26. Antral CSA in supine D1 ranged between 3.22-5.44 and the mean value was 4.02 ± 0.43 Antral CSA in RLD D2 ranged between 3.41-5.87 and the mean value was 4.28 ± 0.46 Gastric antral area ranged between 9.34-25.07 and the mean value was 13.68 ± 2.98 Gastric volume in ml at 6th hour ranged between 11.96-61.23 and the mean value was 35.27 ±13.38.

Keywords: Gastric emptying time, regional anaesthesia, ultrasound imaging technique

Introduction

Current guidelines recommend 6 h of fasting for solids before anaesthesia. However, prolonged fasting may lead to discomfort, hunger, thirst, misbehavior and lipolysis. To prevent this, a more liberal fasting regimen has been empirically implemented for allowing a shorter fasting time of 4 h for a standardized light breakfast [1]. However, even when fasting time is elucidated, patients tend to fast for longer periods due to operation delays. As a result, patients are put at an increased risk for the complications listed above.

Preoperative fasting, also known as nil per os (NPO), is defined as no food or fluids by mouth before a procedure [1]. Expert opinion suggest that fasting is warranted to help ensure patient safety by reducing the risks of vomiting and pulmonary aspiration during an elective surgery requiring sedation. Pulmonary aspiration is defined as aspirating stomach contents after administration of anesthesia, during the surgical procedure or the period immediately following the procedure [1].

The American Society of Anesthesiologists current guidelines for an elective surgery requiring sedation are, a minimum NPO status of six hours for solid foods, four hours for non-clear fluids, and two hours for clear fluids (also known as the "6-4-2 regimen") [1, 2], These guidelines replace outdated pre-surgical guidelines that recommended when NPO status began. [3].

Studies have found that a prolonged fast, such as NPO after midnight, led to increased risks of electrolyte imbalances, insulin resistance, dehydration and patient discomfort [2]. The shorter preoperative fasting period, recommended by the new ASA guidelines, has demonstrated similar patient safety without increasing risks associated with prolonged fasting. However, even when fasting time is elucidated, patients tend to fast for longer periods due to operation delays. As a result, patients are put at an

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increased risk for the complications listed above [4].
Airway related death due to pulmonary aspiration is relatively rare and occurs in about one in 350,000 [5]. Due to the rarity of this serious complication, studies have failed to properly assess the risk of aspiration during procedural sedation [6]. Currently, NPO guidelines are based upon a few studies, but mostly expert opinion and general consensus because there are not enough published studies to base the guidelines on.
Due to the unknown risk of pulmonary aspiration in patients undergoing procedural sedation, the ASA continues to state that practitioners should follow perioperative guidelines, despite the insufficient evidence. This is to ensure the safety of patients from major airway complications; but fails to take into account the post-operative complications mentioned previously. The NPO guidelines recommended by the ASA are a shorter duration than the NPO duration recorded for many patients. ASA recommends no solids for at least 6 hours; however, many patients are either told to go much longer than this or end up fasting longer due to delayed procedures [4].
Despite studies that contradict the need for prolonged fasting, surgeons still continue to recommend an NPO status greater than the current preoperative fasting guidelines of two hours for clear liquids and six hours for solids. An unnecessary extended fast puts the patient at risk for increased mortality and other complications [4].
The aim of this study would be to determine if an NPO status greater or less than six hours by assessing ultrasound assisted gastric content.

Methodology
Source of data
The data was collected from patients between 18 to 60 years of age who was undergoing elective surgery for under spinal anaesthesia.

Study design: An observational study.

Study setting: Hospital based study.

Study population: The data was collected from patients between 18 to 60 years of age who were undergoing elective surgery for under spinal anesthesia. The patients were assessed for the inclusion and exclusion criteria during the mentioned period of study, after obtaining a written informed consent from the study population.

Sample size: 85.

Sampling method: Systematic random sampling method.

Method of collection of data
Inclusion criteria
1. Patients posted for elective surgeries under spinal anaesthesia.
2. Patients in the age group of 18 to 60 years of age.
3. American society of anesthesiologist's physical status I and II.

Exclusion criteria
1. Patients not willing to participate in the study.
2. Patients posted for emergency surgeries.
3. Patient with gastrointestinal disturbances.
4. Patients with spinal deformities.
5. Pregnant women and patient unable to turn and lie in lateral position.
6. Patients having absolute contraindication for spinal anaesthesia.
7. Local infection.
8. Patients diagnosed to have diabetes mellitus and renal diseases.

Methodology:
This study was conducted in the department of Anesthesia at KVG Medical College and Hospital Sullia a tertiary care teaching hospital in Dakshina Kannada District of Karnataka over a period of 18 months from 1st November 2019 to 30th April 2021. Those who fulfil the inclusion criteria and the patients undergoing elective surgery under spinal anaesthesia for any indication during the mentioned period of study were selected as study population. Data was collected after taking written informed consent. First, thorough history as per proforma was taken along with Patient's age, height, body weight, ASA grading. Then the number of hours of fasting were noted and clinical examination was done. All information were duly documented. Patients were given a light breakfast 8 hours prior to surgery. Ultrasound examinations of the gastric antrum was then performed as described by Van de Putte [9]. Briefly, using a standard convex ultrasound probe (C5-2

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wireless transducer, mindray) the gastric antrum was scanned in a sagittal plane between liver and pancreas, at first in the supine and then in the right lateral position (RLP), and two orthogonal diameters (D1 and D2) of gastric antrum including the gastric wall were determined in each position. The gastric antral area (GAA), which correlates with gastric volume was then calculated (GAA¼ p_D1_D2/4). This was repeated three times in each position and then averaged. All ultrasound examinations were planned to conduct by a single expert examiner.

Statistical Analysis: -

Data Entry was done using Microsoft excel 2013 and analysis done using SPSS V 16. Qualitative data was expressed in frequencies and percentages and Quantitative data in mean and standard deviation. Nonparametric statistics i.e., Chi-square test/ Fishers exact test was used to find the significant association between the two qualitative variables. Unpaired t test was used to find the statistical significance between quantitative variables. Bar diagrams and pie chart were used to represent the data. p value of <0.05 was considered statistically significant.

Results

Table 1: Age distribution in years

Age in years	Frequency	Percentage
18-30	18	21.2%
31-40	16	18.8%
41-50	23	27.1%
51-60	28	32.9%
Total	85	100%
Mean ± SD	42.43 ± 11.51	

In the present study mean age of the participants was 42.43 ± 11.51 years. 21.2% of the subjects were aged 18-30 years, 18.8% were aged 31-40 years, 27.1% were aged 41-50 years, 32.9% were aged 51-60 years.

Table 2: 4th Hour

	Minimum	Maximum	Mean ± SD
4th hour Avg CSA in supine D1	3.52	5.67	4.27 ± 0.45
4th Hour Avg CSA in RLD D2	3.55	5.97	4.56 ± 0.50
4th Hour Gastric Antral Area	10.69	26.83	15.65 ± 3.43
Gastric Volume in Ml at 4th Hour	16.05	63.08	39.37 ±13.03
Gastric Volume </>1.5Ml/kg	0.27	1.47	0.65 ±0.26

Table 3: 6th Hour

	Minimum	Maximum	Mean ± SD
6th hour Avg CSA in supineD1	3.22	5.44	4.02 ± 0.43
6th Hour Avg CSA in RLD D2	3.41	5.87	4.28 ± 0.46
6th Hour Gastric Antral Area	9.34	25.07	13.68 ± 2.98
Gastric Volume in Ml at 6th Hour	11.96	61.23	35.27 ±13.38
Gastric Volume </>1.5Ml/kg at 6th hour	0.20	1.36	0.59 ±0.26

Table 4: Comparison between parameters at 4th hour and 6th hour

	4th hour	6th hour	Mean difference	Paired t test	P value
Avg CSA in supineD1	4.27 ± 0.45	4.02 ± 0.43	-0.25	12.39	<0.001*
Avg CSA in RLD D2	4.56 ± 0.50	4.28 ± 0.46	-0.28	18.44	<0.001*
4 Gastric Antral Area	15.65 ± 3.43	13.68 ± 2.98	-1.96	18.98	<0.001*
Gastric Volume in Ml	39.37 ±13.03	35.27 ±13.38	-4.10	18.44	<0.001*
Gastric Volume </>1.5Ml/kg	0.65 ±0.26	0.59 ±0.26	-0.066	18.37	<0.001*

In the present study a significant difference in all the mean gastric emptying parameters has been observed across 4th hour and 6th hour.

Discussion

A full stomach prior to general anaesthesia has been widely recognised as a cause for concern ever since Mendelson, in 1946, described his dreaded ‘Mendelson's syndrome’ or acid aspiration syndrome. This can lead to severe aspiration pneumonia with a mortality of up to 5%, representing up to 9% of all

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anaesthesia-related deaths [7].

Patients presenting for urgent surgical procedures are usually not fasted and they may have significant gastric content despite long periods of fasting. Aspiration and the severity of the resulting respiratory compromise is thought to be related to both the volume and nature of the aspirate (content), with particulate matter carrying the highest risk.

In the absence of data, it was considered safer to assume a 'full stomach' in emergency situations leading to either surgical cancellations, re-scheduling in elective cases or modification of interventions to prevent aspiration, such as a rapid sequence induction and tracheal intubation. In elective cases, preoperative fasting guidelines help limit the risk in patients with minimal co-morbidities. Most people believe that fasting a patient for more than 6 h places them in the 'safe' category for aspiration risk stratification [8].

Many techniques have been described to assess the contents of the stomach like paracetamol absorption, electrical impedance tomography, radio-labelled diet, polyethylene glycol dilution and gastric content aspiration these methods are not suitable in the perioperative period and none of these methods have proved fool proof or easy to use. However, with the advent of the newer portable ultrasound machines, one can accurately diagnose the presence of unsafe stomach contents non-invasively. It can help clinicians individualize aspiration risk at the bedside and guide anaesthetic management more appropriately.

At 4th hour

An empty stomach may appear flattened, liquid is seen as hypo-echoic, liquid and air as a 'starry sky' appearance and solids as frosted glass with blurring of the posterior wall. Once learned, we found that the ultrasound is an easy non-invasive tool to use.

For proper risk stratification, scanning in both the supine and right lateral positions in all patients is very important. The antrum may appear empty in the supine position but will appear fuller in the right lateral position. This apparent increase in gastric volume in the right lateral position is probably due to the gastric contents gravitating towards the gastric outlet [9].

ACSA(Antral CSA) in supine D1 ranged between 3.52-5.67 and the mean value was 4.27 ± 0.45 ACSA in RLD D2 ranged between 3.55-5.97 and the mean value was 4.56 ± 0.50 Gastric antral area ranged between 10.69-26.83 and the mean value was 15.65 ± 3.43 Gastric volume in ml at 4th hour ranged between 16.05-63.08 and the mean value was 39.37 ±13.03 GASTRIC VOLUME </>1.5Ml/kg ranged between 0.27-1.47 and the mean value was 0.65 ±0.26.

At 6th hour

ACSA in supine D1 ranged between 3.22-5.44 and the mean value was 4.02 ± 0.43 ACSA in RLD D2 ranged between 3.41-5.87 and the mean value was 4.28 ± 0.46 Gastric antral area ranged between 9.34-25.07 and the mean value was 13.68 ± 2.98 Gastric volume in ml at 6t^{h} hour ranged between 11.96-61.23 and the mean value was 35.27 ±13.38.

Correlation at 4th hour and 6th hour

In the present study a significant difference in all the mean gastric emptying parameters has been observed across 4th hour and 6th hour.

In the study conducted by Sharma G *et al.* [10]. They have also found a statistically significant difference in the gastric emptying parameters across 4th hour and 6th hour irrespective of the comorbidities and this finding was in consonance with the present study.

Conclusion

Regurgitation and aspiration is a serious threat to the safety of patients and the risk could be decreased by a long fasting time. While with the development of ERAS, anaesthesiologists have gradually realized that the many disadvantages (such as hunger, thirst and insulin resistance) are due to the inappropriate fasting time. As a result, fasting protocol recommended by ASA will provide a balance between decreasing the risk of aspiration and keeping a normal physiological function. However, it is not carried out ideally due to the concerns that the reduced fasting time could increase risk of aspiration. Current studies have shown that bedside ultrasound can provide reliable information about the volume and nature of gastric contents. With this technology, anaesthesiologists can make individual decision to minimize the risk of perioperative aspiration as an even a 4 h NPO status after a light breakfast have significantly less gastric volume which can cause aspiration but its more as compared to 6 h. I-AIM framework directed by ultrasound also provided a standard procedure to diagnose and treat the patients with high risk of aspiration. It will benefit the implementation of proper fasting protocol. However, a best fasting protocol still remains to be answered by more clinical studies in the future.

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