e-ISSN: 0976-822X, p-ISSN:2861-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2023; 15(2); 123-129

Original Research Article

Assessment of the Effect of Ingestion of Clear Water and Glucose Water Over 10 Hours NPO in Elective Laparoscopic Cholecystetctomy Surgery: Analytical Comparative Study

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Received: 04-01-2023 / Revised: 06-02-2023 / Accepted: 26-02-2023
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Conflict of interest: Nil

Abstract

Aim: The aim of this study was to compare the effect of ingestion of clear water and glucose water over 10 hours NPO in elective laparoscopic cholecystetctomy surgery.

Material & Methods: An analytical comparative study was conducted in Department of Anesthesiology, AIIMS, Patna, Bihar, India for eight months. The study included ASA I-II patients undergoing laparoscopic cholecystectomy surgery. Patients undergoing general anaesthesia were included in the study. A total of 60 patients were included and 20 patients each were randomly assigned to one of the 3 groups.

Results: There was no significant difference between the groups with regard to weight, age and sex. Patients who had 200 ml of clear water in Group B had lesser variation in serum K+ level [3.80±0.56; p=0.040] and serum lactate level [1.80±0.80; p=0.001] than that of Group A [4.16±0.54; 2.70±0.70], which was statistically significant. Patients who had 200 ml of glucose water in Group C had lesser variation in serum K+ level [3.60 ±0.30; p=0.01], serum lactate level [1.10±0.40; p<0.001], RBS level [125.75±8.72; p<0.001] and no episode of hypoglycaemia noticed as compared to Group A [4.12 ±0.40; 2.70±0.55; 109.41±21.42], which was statistically significant. Patients in Group C had lesser variation in serum lactate level [1.10 ±0.22; p=0.002], RBS level [142.62 ±8.60; p<0.001] and no episode of hypoglycaemia recorded as compared to Group B [1.75 ±0.80; 112.40 ±12.48] which was statistically significant.

Conclusion: We concluded that it is safe to conduct general anaesthesia in patients who have ingested 150 ml of water 2 h prior to surgery. Prolonged withholding of oral fluid does not decrease gastric fluid volume and pH.

Keywords: Glucose Water, Hypoglycaemia, Laparoscopic Cholecystectomy.

Introduction

Standard preparation for any surgery requires fasting of the patient. As a routine, most of the patients are kept fasting after midnight for both solids as well as clear fluids. Nil per os is necessary to prevent aspiration of gastric contents into the lungs. [1] Mendelson first reported that patients ingesting food just before surgery were prone for regurgitation of gastric contents. [2] Long fasting hours prior to surgery is a great discomfort to the

patient. Despite recent guidelines stating that it is appropriate to reduce the interval of clear fluid ingestion to 2 h prior to surgery, [3] By decreasing the duration of fasting period, enhances the quality and efficiency of anaesthesia care by decreasing the cost, increasing the patient satisfaction. Also, there is a decrease in the risk of dehydration and hypoglycaemia and thereby decrease in the perioperative morbidity. [4]

Shortening of preoperative fasting with a nonparticulate carbohydrate‐rich beverage up to 2h before surgery has shown to reported as an efficient way to minimize insulin resistance and protein loss without affecting gastric emptying and pH [5] and to reduce insulin resistance and surgical stress and, additionally, improved the patient's well‐being. [6] Oral intake of carbohydrate drinks also improves post-operative nausea, vomiting after laparoscopic surgery [7] and preoperative thirst, hunger and anxiety than overnight fasting. [8]

Prolonged fasting results in dehydration leading to enhanced fluid requirement subsequently raises the potential for replacing surgical blood loss as well, [9] which alters the pharmacokinetics of the drugs; leading to further complications. [10] Surgical stress in association with prolonged fasting worsens the catabolic state leading to insulin resistance. Insulin resistance in turn causes hyperglycaemia and exacerbates post-operative catabolism, stimulating various endocrine and inflammatory mediators. [11] Decrease in fasting period found associated with lower risk of dehydration and hypoglycaemia. [12] Ingestion of carbohydrate containing drinks pre-operatively up to 2 hours before surgery has been reported as an efficient way to minimize insulin resistance and protein loss without affecting gastric emptying and pH. [13]

Thus, the aim of this study was to compare the effect of ingestion of clear water and glucose water over 10 hours NPO in elective laparoscopic cholecystetctomy surgery.

Material & Methods

A one-year observational study was performed on patients undergoing laparoscopic cholecystectomy in the Department of Anaesthesiology, AIIMS, Patna, India for eight months. A total of 60 patients were included and 20 patients each were randomly assigned to one of the 3 groups.

Inclusion Criteria

Ninety patients having age > 21 years (both sexes)

Exclusion Criteria

Patients undergoing non-elective surgery, pregnancy, CBD stone or stricture, gastrointestinal obstruction, associated hernia, anticipated difficult airway, routinely taking medications affecting gastrointestinal motility or secretions.

Patients were sub-divided into following 3 groups:

Group A- treated with NPO after midnight.

Group B- given 200 mL free water orally 2 hours before surgery.

(Clear fluids are defined as transparent liquids which doesn't leave behind any solid particulate matter after boiling.)

Group C- given 200 mL of glucose water [12.5 g/100mL] orally 2 hours before surgery.

Procedure

Standard premedication of tablets 0.5mg midazolam to alleviate anxiety, 150 mg ranitidine and 10 mg metoclopramide was given pre-emptively to reduce incidences of nausea and vomiting in all 3 groups. General anaesthesia was given for surgery. Routine monitoring of Heart Rate, Non-invasive Blood Pressure, Pulse Oximetry and EtCO2 was done. After preoxygenation of 3 minutes patients were

induced with 2-3 mg/kg body weight of propofol and 2-3 mcg/kg body weight of fentanyl citrate. 0.1 mg/kg body weight of vecuronium was given for skeletal muscle relaxation. Igel was placed. 0.1-0.2 mg/kg body weight of propofol infusion was used for maintenance. Injection Ondansetron 8 mg was given for reduction of post-operative nausea and vomiting. Infusion was stopped just after completion of surgery. Patients were reversed and extubated after eye opening.

Arterial Blood Gas analysis and blood glucose level was done in the immediate post-operative period. Arterial pH, serum electrolytes, serum lactate and blood glucose levels were compared for the 3 groups. Any evidence of side effects was recorded in the immediate post-operative period.

Statistical Analysis

Statistical analyses were done using SPSS version 20.0 for Windows (IBM Corporation, Armonk, NY, USA). Results were given as mean ± SD. Data collected were analysed using Student's t-test. Differences were considered statistically significant if P values were <0.05.

Results

Table 1: Patient demographics

	Group A	Group B	Group C
Age	42.8 ±6.56	45.8 ±6.32	43.87 ±7.10
Male	11	10	8
Female	9	10	12
Weight	56+4.46	57+5.23	55+6.55

There was no significant difference between the groups with regard to weight, age and sex.

Table 2: Comparison of arterial pH, serum electrolytes and blood glucose level in groups A and B

	Group A	Group B	P Value
Arterial pH	7.40±0.10	7.38±0.02	0.32
Extremes	7.50-7.20	7.40-7.25	
Serum Na+	135.95±9.61	138.92±4.66	0.65
Extremes	153.7-120.8	148-132.2	
Serum K+	4.16±0.54	3.80±0.56	0.40
Extremes	5.05-3.37	4.8-3.02	
Serum Cl-	102.42±8.29	102.68±3.70	0.55
Extremes	113.7-88.2	109.9-97.4	
RBS	109.51±21.89	110.20±12.48	0.90
Extremes	170-75.5	130-70	
Lactate	2.70±0.70	1.80±0.80	0.001
Extremes	3.50-1.20	3.60-0.50	

Patients who had 200 ml of clear water in Group B had lesser variation in serum K+ level [3.80±0.56; p=0.040] and serum lactate level [1.80±0.80; p=0.001] than that of Group A [4.16±0.54; 2.70±0.70], which was statistically significant.

Table 3: Comparison of arterial pH, serum electrolytes and blood glucose level in groups A and C

	Group A	Group C	P Value
Arterial pH	7.38±0.02	7.45±0.05	0.25
Extremes	7.50-7.20	7.40-7.25	
Serum Na+	135.85 ±9.61	138.72 ±2.80	0.20
Extremes	150.5-121.6	146.4-135.2	
Serum K+	4.12 ±0.40	3.60 ±0.30	0.01
Extremes	5.10-3.25	4.20-3.22	
Serum Cl-	102.48 ±8.22	104.76 ±3.27	0.10
Extremes	113.7-88.2	108.2-100.1	
RBS	109.41±21.42	125.75±8.72	<0.001
Extremes	175-75.5	150-142	
Lactate	2.70±0.55	1.10±0.40	<0.001
Extremes	3.40-1.42	1.70-0.40	

Patients who had 200 ml of glucose water in Group C had lesser variation in serum K+ level [3.60 ±0.30; p=0.01], serum lactate level [1.10±0.40; p<0.001], RBS level [125.75±8.72; p<0.001] and no episode of hypoglycaemia noticed as compared to Group A [4.12 ±0.40; 2.70±0.55; 109.41±21.42], which was statistically significant.

Table 4: Comparison of arterial pH, serum electrolytes and blood glucose level in groups B and C

	Group B	Group C	P Value
Arterial pH	7.40 ±0.05	7.35 ±0.04	0.40
Extremes	7.43-7.25	7.42-7.28	
Serum Na+	138.22±4.55	139.51 ±2.81	0.18
Extremes	140-130.2	144.6-135.5	
Serum K+	3.75 ±0.54	3.82±0.24	0.70
Extremes	4.6-3.12	4.22-3.22	
Serum Cl-	103.57±3.60	105.75 ±3.32	0.1
Extremes	108.9-96.4	108.2-100.5	
RBS	112.40 ±12.48	142.62 ±8.60	<0.001
Extremes	125-80	150-122	
Lactate	1.75 ±0.80	1.10 ±0.22	0.002
Extremes	3.16-0.55	1.60-0.60	

Patients in Group C had lesser variation in serum lactate level [1.10 ±0.22; p=0.002], RBS level [142.62 ±8.60; p<0.001] and no episode of hypoglycaemia recorded as compared to Group B [1.75 ±0.80; 112.40 ±12.48], which was statistically significant.

Discussion

Although recent guidelines have stated that it is appropriate to reduce the interval of clear fluid ingestion to 2h prior to surgery, [14] as a routine, most of the patients are kept fasting after midnight for both solids as well as clear fluids. By decreasing the duration of fasting period, there has also been a decrease in the risk of dehydration and hypoglycemia and thereby a decrease in the perioperative morbidity. [15] Shortening of preoperative fasting with a non-particulate carbohydrate‑rich beverage up to 2h preoperatively has shown to reduce insulin resistance and surgical stress and, additionally, improved the patient's well‑being. [16]

There was no significant difference between the groups with regard to weight, age and sex. In order to make proper plans for the nutritional support of patients undergoing surgery, it is essential to understand the basic changes in metabolism that occur as a result of injury, and that a compromised nutritional status is a risk factor for postoperative complications. Starvation during metabolic stress from any type of injury differs from fasting under physiological conditions. [17] The success of surgery does not depend exclusively on technical surgical skills, but also on metabolic interventional therapy, taking into account the ability of the patient to carry a metabolic load and to provide appropriate nutritional support. In patients with cancer, management during the perioperative period may be crucial for long-term outcome. [18,19]

Preoperative thirst is a major cause of discomfort among patients which is followed by hunger and anxiety. [20]Intake of clear water 2 hours prior to surgery quenches the thirst of the patients but has no effect on hunger. The traditional practice of overnight fasting patients before surgery causes depletion of hepatic glycogen, increase in gluconeogenesis and development of insulin resistance, [21] which is further augmented by the stress induced by surgery. [22] None of the previous studies have reported any adverse events following ingestion of carbohydrate drinks such as glucose water during or after surgery.

Patients who had 200 ml of clear water in Group B had lesser variation in serum K+ level [3.80±0.56; p=0.040] and serum lactate level [1.80±0.80; p=0.001] than that of Group A [4.16±0.54; 2.70±0.70], which was statistically significant. Patients who had 200 ml of glucose water in Group C had lesser variation in serum K+ level [3.60 ±0.30; p=0.01], serum lactate level [1.10±0.40; p<0.001], RBS level [125.75±8.72; p<0.001] and no episode of hypoglycaemia noticed as compared to Group A [4.12 ±0.40; 2.70±0.55; 109.41±21.42], which was statistically significant. Patients in Group C had lesser variation in serum lactate level [1.10 ±0.22; p=0.002], RBS level [142.62 ±8.60; p<0.001] and no episode of hypoglycaemia recorded as compared to Group B [1.75 ±0.80; 112.40 ±12.48] which was statistically significant. Studies have also shown that giving carbohydrate drinks preoperatively results in increased patient comfort, decreased anxiety and thirst. [23,24]

The time required for solid food to liquefy and enter the small intestine depends on the type of food ingested (being shorter for carbohydrates and proteins than for fats and cellulose) and the food particle size. [25] Complete emptying of solids from the stomach takes 3 to 6 h, but may be prolonged by fear, pain or opioids. [26] So it is appropriate that no solid food be eaten on the day of surgery. However, the gastro-oesophageal emptying of liquids is rapid wherein studies have shown that gastric emptying after intake of a carbohydrate drink is complete within 2 h of ingestion. [27,28]

Conclusion

We concluded that it is safe to conduct general anaesthesia in patients who have ingested 150 ml of water 2 h prior to surgery. Prolonged withholding of oral fluid does not decrease gastric fluid volume and pH. Clinicians should appraise this evidence and adopt the recent ASA guidelines which recommend an evolution from the indiscriminate ‘NPO after midnight’ blanket fasting policy. However, the customary 8 h fasting should be followed for patients at a higher risk of aspiration like in diabetes mellitus, pregnancy, obesity, etc. as more research is necessary to determine the safety in these patients. The risk of unexpected regurgitation cannot be avoided even by overnight fasting, and anaesthesiologists must always be prepared to deal with these complications.

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