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Original Research Article

Determining the Effect of Ingestion of Clear Water and Glucose water Over 10 Hours NPO in Elective Laparoscopic Cholecystectomy Surgery: A Retrospective Study

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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 cholecystectomy surgery.

Material & methods: A retrospective study was conducted in Department of Anaesthesia and Critical Care, A. N. Magadh Medical College and Hospital, Gaya, Bihar, India from October 2020 to September 2021. The study included ASA I-II patients undergoing laparoscopic cholecystectomy surgery. Patients undergoing general anaesthesia were included in the study. A total of 90 patients were included and 30 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 and serum lactate level than that of Group A which was statistically significant. Patients who had 200 ml of glucose water in Group C had lesser variation in serum K+ level, serum lactate level, RBS level and no episode of hypoglycaemia noticed as compared to Group A, which was statistically significant. Patients in Group C had lesser variation in serum lactate level, RBS level and no episode of hypoglycaemia recorded as compared to Group B 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

The practice of medicine seeks to continually improve the care that is provided to patients. Optimizing fluid therapy in the perioperative setting improves patient outcomes and reduces complications and length of stay (LOS). [1-4] The primary goal of any physician is to optimize patient health to prevent future disease and to treat existing diseases to improve outcomes. Surgery is a complex treatment method, where tissue insult is an expected part of patient care, with the idea that controlled short-term injury is an acceptable risk in the face of long-term health benefits. With a focus on improving patient outcomes and recovery, fluid management plays an important role in enhanced recovery pathways (ERPs) now being used in many hospitals. [5] Perioperative physicians have multiple goals that can be divided into three categories. First, they seek to optimize the preoperative health status of the patient, including preexisting conditions and comorbid diseases, so as to maximally decrease the risk of perioperative complications. Secondly, intraoperative management of patients is planned with the goals of improving patient recovery. Finally, postoperative care is designed to maximize recovery from the tissue injury. Similarly, perioperative fluid therapy can be divided into three components, namely, preoperative, intraoperative, and postoperative management.

Management of intraoperative fluids has been the subject of much debate through the years. Early on, some recommended that patients be given very little fluids intraoperatively, as fluids were thought to increase the risk of postoperative complications.

[6,7] As more patients were undergoing surgical procedures, it became clear that not providing intraoperative fluids had major adverse effects on the postoperative period, including complications such as prerenal acute tubular necrosis. [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 cholecystectomy surgery.

Material & Methods

A retrospective study was conducted in Department of Anaesthesia and Critical Care, A. N. Magadh Medical College and Hospital, Gaya, Bihar, India from October 2020 to September 2021. The study included ASA I-II patients undergoing laparoscopic cholecystectomy surgery. Patients undergoing general anaesthesia were included in the study. A total of 90 patients were included and 30 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 mg/kg body weight of propofol and 2 mcg/kg body weight of fentanyl citrate. 0.1 mg/kg body weight of vecuronium was given for skeletal muscle relaxation. Patients intubated with appropiate size of endo-tracheal tube. 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.

Statastical 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	43.7 ±7.53	46.4 ±6.34	44.86 ±7.13
Male	20	22	16
Female	10	8	14
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	0.42
Extremes	7.50-7.20	7.40-7.25	
Serum Na+	135.95±9.61	138.92±4.66	0.72
Extremes	153.7-120.8	148-132.2	
Serum K+	4.16±0.54	3.80±0.56	0.48
Extremes	5.05-3.37	4.8-3.02	
Serum Cl-	102.42±8.29	102.68±3.70	0.75
Extremes	113.7-88.2	109.9-97.4	
RBS	109.51±21.89	110.20±12.48	0.80
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 and serum lactate level than that of Group A 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	0.32
Extremes	7.50-7.20	7.40-7.25	
Serum Na+	135.85 ±9.61	138.72 ±2.80	0.28
Extremes	150.5-121.6	146.4-135.2	
Serum K+	4.12 ±0.40	3.60 ±0.30	0.02
Extremes	5.10-3.25	4.20-3.22	
Serum Cl-	102.48 ±8.22	104.76 ±3.27	0.18
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, serum lactate level, RBS level and no episode of hypoglycaemia noticed as compared to Group A 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	0.48
Extremes	7.43-7.25	7.42-7.28	
Serum Na+	138.22±4.55	139.51 ±2.81	0.27
Extremes	140-130.2	144.6-135.5	
Serum K+	3.75 ±0.54	3.82±0.24	0.78
Extremes	4.6-3.12	4.22-3.22	
Serum Cl-	103.57±3.60	105.75 ±3.32	0.2
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, RBS level and no episode of hypoglycaemia recorded as compared to Group B 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 hypoglycaemia 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 and serum lactate level than that of Group A which was statistically significant. Patients who had 200 ml of glucose water in Group C had lesser variation in serum K+ level, serum lactate level, RBS level and no episode of hypoglycaemia noticed as compared to Group A which was statistically significant. Patients in Group C had lesser variation in serum lactate level, RBS level and no episode of hypoglycaemia recorded as compared to Group B 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]

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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