

Oral Glucose Combined with Short-Term Intravenous Nutrition for the Prevention of Hypoglycemia after Painless Endoscopic Gastric Polypectomy

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Abstract

Objective: To explore the application effect of oral glucose combined with short-term intravenous nutrition in preventing postoperative hypoglycemia after painless endoscopic gastric polyp resection, and to provide guidance for better management of patients undergoing such procedures. **Methods:** A total of 886 patients who underwent painless endoscopic gastric polyp resection in the Department of Gastroenterology, the First Affiliated Hospital of Yangtze University, from January 2020 to December 2021, were selected as the study subjects. According to the random number table method, they were divided into an experimental group and a control group, with 443 cases in each group. Patients in the control group were subjected to routine fasting and water restriction for 8 hours before surgery, and routine fasting for 24 hours after surgery. Short-term intravenous nutrition support was provided through fluid supplementation, and finger blood glucose levels were monitored at 1 hour, 4 hours, and 8 hours after completion of intravenous infusion, or when symptoms such as palpitations and cold sweats occurred. The experimental group received oral administration of 5% glucose solution (500 ml) 2 hours before surgery based on the procedures of the control group. The incidence of preoperative discomfort (hunger, thirst, and fatigue), residual gastric fluid volume, and postoperative hypoglycemia were compared between the two groups. **Results:** The incidence of postoperative blood glucose < 3.9 mmol/L and hypoglycemia in the experimental group was significantly

lower than that in the control group (4.29% vs. 8.80%, $P = 0.007$; 6.09% vs. 12.42%, $P = 0.001$). There were no significant differences between the experimental and control groups in terms of residual gastric fluid volume and incidence of reflux aspiration (26.36 ± 3.41 ml vs. 24.83 ± 4.66 ml, $P = 0.86$; 0.45% vs. 0.68%, $P = 0.654$). **Conclusion:** Based on the study population, oral glucose combined with short-term intravenous nutrition can effectively prevent the incidence of hypoglycemia in patients undergoing painless endoscopic gastric polyp resection. However, due to the limitations of a single-center study and a small number of cases, its feasibility needs to be further validated with more data from multi-center and large-sample cases.

Keywords

Gastric Polyps, Endoscopic Polyp Resection, Anesthesia, Intravenous Nutrition, Glucose, Hypoglycemia

1. Introduction

Gastric polyps (GPs) are elevated lesions formed by the proliferation of gastric mucosal epithelial cells that protrude into the gastric cavity [1] [2]. The incidence rate is between 0.5% and 23% [3]. Certain pathological types, especially adenomatous polyps, carry a certain risk of malignant transformation and are recognized as precancerous lesions [4]. Currently, painless endoscopic gastric polyp resection is a preferred treatment method, as it can alleviate patient anxiety and discomfort. It offers advantages such as simplicity of operation, minimal invasiveness, rapid recovery, low cost, and suitability for a wide range of patients.

Preoperative fasting and fluid restriction can reduce gastric contents and decrease the risk of complications such as reflux and aspiration during anesthesia and surgery [5]. However, prolonged perioperative fasting and fluid restriction can lead to hypoglycemia and other discomforts like thirst and hunger [6]. Literature review reveals that there is limited research on preventing and reducing postoperative hypoglycemia after painless endoscopic gastric polyp resection, and the available evidence is of low quality. Therefore, this study focuses on 886 patients treated with painless endoscopic gastric polyp resection in the Department of Gastroenterology at the First Affiliated Hospital of Yangtze University. The aim is to investigate the feasibility, safety, and effectiveness of using oral glucose combined with short-term intravenous nutrition to prevent postoperative hypoglycemia after painless endoscopic gastric polyp resection. This study aims to provide valuable insights for clinically reducing the incidence of postoperative hypoglycemia after painless endoscopic gastric polyp resection.

2. Materials and Methods

2.1. Study Population

The study collected data from 886 patients who underwent painless endoscopic

procedures, either argon plasma coagulation (APC) or endoscopic mucosal resection (EMR), for gastric polyps in the Department of Gastroenterology at the First Affiliated Hospital of Yangtze University between January 2020 and December 2021. Using a random number table method, the patients were divided into an experimental group and a control group, each consisting of 443 cases. Inclusion criteria: 1) Patients treated with APC or EMR for gastric polyps between January 2020 and December 2021; 2) Age ≥ 18 years; 3) American Society of Anesthesiologists (ASA) classification of grade I or II; 4) No contraindications for APC or EMR; 5) Patients provided informed consent themselves or through their family members. Exclusion criteria: 1) Patients with poorly controlled diabetes; 2) Allergic to propofol, midazolam, or other anesthesia drugs; 3) Unable to tolerate anesthesia due to severe respiratory, cardiovascular, or cerebrovascular diseases; 4) Patients with upper gastrointestinal obstruction, gastric emptying disorders, or gastroesophageal reflux; 5) Coagulation disorders; 6) Use of antiplatelet or anticoagulant drugs within one week before surgery; 7) Patients with mental disorders unable to cooperate; 8) Refusal of endoscopic treatment, non-compliance with medical instructions, voluntary discharge, or incomplete clinical data. The study was approved by the Ethics Committee of the First Affiliated Hospital of Yangtze University. Exclusion criteria: Withdrawal during the study or postoperative fasting exceeding 24 hours.

2.2. Study Methods

Patients in the control group underwent routine fasting and fluid restriction for 8 hours before the procedure, and the painless endoscopic gastric polyp resection was performed in the endoscopy center between 8:00 AM and 12:00 PM the next day. The endoscopy center nurses recorded patients' discomfort symptoms such as hunger, thirst, and fatigue 10 minutes before anesthesia. They also recorded the amount of gastric fluid aspirated before the endoscopic gastric polyp resection. Anesthesiologists documented complications such as reflux and aspiration during the procedure. After the procedure, patients received short-term intravenous nutrition support through fluid supplementation for 24 hours, with a basic fluid replacement of 2000 ml. This included slow intravenous infusion of 10% glucose solution (500 ml), 5% glucose solution (500 ml), 10% glucose solution (500 ml), and glucose-sodium chloride solution (500 ml). A liquid diet was started after 24 hours, transitioning to a regular diet after one week. Duty nurses monitored finger blood glucose levels in the postoperative period at 1 hour, 4 hours, and 8 hours after completion of intravenous infusion, or when symptoms like palpitations and cold sweats occurred. Hypoglycemia diagnosis criteria [7]: Blood glucose < 3.9 mmol/L or blood glucose ≥ 3.9 mmol/L with symptoms of hypoglycemia such as hunger, palpitations, dizziness, and cold sweats. Patients experiencing hypoglycemia or hypoglycemic reactions during fasting were administered intravenous glucose as directed by the medical team (20 - 40 ml of 50% glucose solution or 250 ml of 10% glucose solution) and had peripheral blood glucose retested after 30 minutes.

In the experimental group, patients underwent an 8-hour preoperative fasting period, followed by a one-time oral administration of 500 ml of 5% glucose solution 2 hours before the procedure. Postoperatively, patients underwent routine fasting for water intake for 24 hours, and short-term intravenous nutrition support was provided through fluid supplementation. The basic fluid supplementation volume was set at 2000 ml and included a combination of intravenous infusions, including 10% glucose injection (500 ml), 5% glucose injection (500 ml), 10% glucose injection (500 ml), and glucose-sodium chloride injection (500 ml). The procedure was similar in the control group.

2.3. Outcome Measures

The study observed and recorded the incidence of preoperative discomfort symptoms (hunger, thirst, and fatigue), residual gastric fluid volume, and the incidence of postoperative hypoglycemia in both groups.

2.4. Statistical Analysis

Statistical analysis was performed using SPSS 22.0 software. Parametric or non-parametric tests were used based on the distribution of quantitative data. Continuous variables were presented as Mean \pm SD. Between-group comparisons were analyzed using analysis of variance or chi-square tests, with a significance level of $P < 0.05$ indicating statistical significance.

3. Results

3.1. Patient Demographics

According to the principles of randomization, the enrolled subjects meeting the inclusion criteria were assigned consecutive numbers based on their visit sequence. Using a random number table method, they were randomly divided into an experimental group and a control group, totaling 886 patients, with 443 cases in each group. In the control group, there were 216 males and 227 females; the age ranged from 26 to 87 years with a mean age of (42.82 ± 10.66) years; 352 cases underwent APC, and 91 cases underwent EMR. In the experimental group, there were 223 males and 220 females; the age ranged from 31 to 83 years with a mean age of (46.36 ± 10.42) years; 348 cases underwent APC, and 95 cases underwent EMR. There were no statistically significant differences in basic demographics between the two groups ($P > 0.05$) (see **Table 1**).

3.2. Comparison of Postoperative Blood Glucose Levels and Hypoglycemia Incidence

The average blood glucose levels in the experimental group were higher than those in the control group at 1 hour and 4 hours after completing the intravenous infusion (8.92 ± 1.21 mmol/L vs. 9.73 ± 1.38 mmol/L, $P = 0.036$; 8.06 ± 0.65 mmol/L vs. 7.80 ± 0.66 mmol/L, $P = 0.043$). Although the average blood glucose level in the experimental group 8 hours after completing the intravenous infusion

Table 1. Basic information of patients in both groups.

Group	No. of cases	Age (years, Mean \pm SD)	Sex (M/F)	Endoscopic resection mode (APC/EMR)
Control	443	42.82 \pm 10.66	216/227	352/91
Experimental	443	46.36 \pm 10.42	223/220	348/95
X ² /t value		0.48	0.221	0.109
P-value		0.66	0.638	0.741

Note: APC: argon plasma coagulation; EMR: endoscopic mucosal resection.

was not statistically significant compared to the control group, it was still slightly higher than the control group (5.36 \pm 0.62 mmol/L vs. 5.15 \pm 0.49 mmol/L, $P = 0.76$). The incidence of hypoglycemic reactions after the procedure was slightly lower in the experimental group compared to the control group, but the difference was not statistically significant (1.81% vs. 3.61%, $P = 0.098$). The incidence of blood glucose < 3.9 mmol/L and hypoglycemia in the experimental group was significantly lower than that in the control group (4.29% vs. 8.80%, $P = 0.007$; 6.09% vs. 12.42%, $P = 0.001$) (see **Table 2**).

3.3. Comparison of Preoperative Discomfort Symptoms, Residual Gastric Fluid Volume, and Complications

The incidence of preoperative hunger and thirst symptoms in the experimental group was significantly lower than that in the control group (7.67% vs. 14.00%, $P = 0.002$; 9.48% vs. 17.38%, $P = 0.001$). Similarly, the incidence of preoperative fatigue symptoms in the experimental group was slightly lower than that in the control group (8.13% vs. 8.58%, $P = 0.808$), but the difference was not statistically significant. There were no statistically significant differences between the two groups in terms of residual gastric fluid volume (26.36 \pm 3.41 ml vs. 24.83 \pm 4.66 ml, $P = 0.86$) or the incidence of reflux aspiration (0.45% vs. 0.68%, $P = 0.654$) (See **Table 3** and **Table 4**).

4. Discussion

Painless endoscopic gastric polyp resection is favored as the primary treatment for gastric polyps due to its advantages such as minimal invasiveness and rapid recovery. However, clinical experience and relevant research [8] [9] have indicated that prolonged fasting and fluid restriction can lead to noticeable discomfort symptoms such as thirst and hunger in patients. The results of this study demonstrate that the incidence of preoperative hunger and thirst symptoms in the experimental group was significantly lower than that in the control group (7.67% vs. 14.00%, $P = 0.002$; 9.48% vs. 17.38%, $P = 0.001$), reaffirming the aforementioned viewpoint. Additionally, extended fasting and fluid restriction can lead to hypoglycemic reactions characterized by dizziness, palpitations, and fatigue, which can significantly affect patient outcomes and recovery. In this

Table 2. Comparison of postoperative blood glucose values and incidence of hypoglycemia between two groups of patients.

Group	No. of cases	Blood glucose 1 h after infusion (Mean \pm SD, mmol/L)	Blood glucose 4 h after infusion (Mean \pm SD, mmol/L)	Blood glucose 8 h after infusion (Mean \pm SD, mmol/L)	Blood glucose < 3.9 mmol/L (cases)	Hypoglycemic reaction (cases)	Incidence of hypoglycemia (%)
Control	443	8.92 \pm 1.21	7.80 \pm 0.66	5.15 \pm 0.49	39 (8.80%)	16 (3.61%)	55 (12.42%)
Experimental	443	9.73 \pm 1.38	8.06 \pm 0.65	5.36 \pm 0.62	19 (4.29%)	8 (1.81%)	27 (6.09%)
X ² /t value		2.326	2.807	1.38	7.380	2.741	10.536
P-value		0.036	0.043	0.76	0.007	0.098	0.001

Table 3. Comparison of preoperative discomfort between two groups of patients.

Group	No. of cases	Hunger (cases)	Thirst (cases)	Lack of energy (cases)
Control	443	62	77	38
Experimental	443	34	42	36
X ² /t value		9.159	11.891	0.059
P-value		0.002	0.001	0.808

Table 4. Comparison of the amount of residual gastric juice and complications in the two groups.

Group	No. of cases	Amount of residual gastric juice (Mean \pm SD, ml)	Reflux misaspiration (Cases)
Control	443	24.83 \pm 4.66	3
Experimental	443	26.36 \pm 3.41	2
X ² /t value		0.78	0.201
P-value		0.86	0.654

study, the experimental group exhibited significantly lower rates of blood glucose < 3.9 mmol/L and hypoglycemia compared to the control group (4.29% vs. 8.80%, $P = 0.007$; 6.09% vs. 12.42%, $P = 0.001$).

Furthermore, there were no significant differences between the experimental and control groups in terms of residual gastric fluid volume and the incidence of reflux aspiration (26.36 \pm 3.41 ml vs. 24.83 \pm 4.66 ml, $P = 0.86$; 0.45% vs. 0.68%, $P = 0.654$). These findings indicate that a one-time oral administration of 5% glucose solution (500 ml) 2 hours before the procedure, combined with short-term postoperative intravenous nutrition, can effectively reduce the occurrence of postoperative hypoglycemia in endoscopic gastric polyp resection without increasing the risk of complications such as reflux aspiration.

However, this study has some limitations. One of them is the relatively small sample size and the single-center nature of this study, which could potentially impact the generalizability and statistical power of the findings. With a limited

number of participants, the study's ability to detect small but meaningful effects may be compromised, and the results may not be fully representative of the broader population. Additionally, the small sample size might lead to a higher susceptibility to random variations, making it challenging to draw robust conclusions and potentially limiting the ability to identify subtle associations or differences. Also, this study lacks post-discharge follow-up data and cost-effectiveness analysis. Thus, assessment of the long-term efficacy as well as the economic implications in comparisons was not ascertained. Therefore, further accumulation of data from larger sample sizes and multiple centers, with longer follow-up post-discharge and cost analysis is needed to verify its long-term efficacy, safety, feasibility and cost effectiveness compared to other preventive strategies.

5. Conclusion

In conclusion, the administration of a one-time oral dose of 5% glucose solution (500 ml) 2 hours before the procedure, combined with short-term postoperative intravenous nutrition, effectively reduces the incidence of preoperative discomfort symptoms such as hunger and thirst, as well as the occurrence of postoperative hypoglycemia after endoscopic gastric polyp resection. This approach does not increase the risk of anesthesia-related complications, providing a strong reference for preventing postoperative hypoglycemia in painless endoscopic gastric polyp resection. However, given that this study was a single-center study with a small number of cases, its feasibility need to be validated by accumulating data from multi-centers and large samples of cases.

Conflicts of Interest

All authors declare no conflicts of interest.

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