

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

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Abstract

Objective: To investigate the effect of oral glucose combined with short-term intravenous nutrition on the prevention of hypoglycemia after endoscopic colorectal polypectomy and to provide guidance for better management of such patients. **Methods:** 860 patients who underwent endoscopic colorectal polypectomy for colorectal polyps in the Department of Gastroenterology of the First Affiliated Hospital of Yangtze University from January 2020 to December 2021 were selected for the study. The patients were divided into experimental and control groups according to the random number table method, with 430 patients in each group. In the control group, 3 L of polyethylene glycol electrolyte dispersion was used for preoperative intestinal preparation and postoperative fasting was performed routinely for 24 h. Short-term intravenous nutrition support was provided by rehydration, and finger blood glucose was monitored at 1, 4, and 8 h after intravenous infusion or when there were symptoms such as panic and cold sweat; in the experimental group, oral glucose intervention was implemented on the basis of the control group. The incidence of postoperative hypoglycemia, quality of bowel preparation, and tolerance of patients during bowel preparation were compared between the 2 groups. **Results:** The incidence of postoperative blood glucose < 3.9 mmol/L, incidence of hypoglycemic reaction, and incidence of hypoglycemia in the experimental group were significantly lower than those in the control group, and there were no significant differences in intestinal cleanli-

ness and tolerability between the experimental and control groups. **Conclusion:** Based on the present study population, oral glucose combined with short-term intravenous nutrition can effectively prevent the incidence of hypoglycemia in patients after endoscopic colorectal polypectomy; however, this was limited to a single-center study and the number of cases was small.

Keywords

Colorectal Polyps, Endoscopic Polypectomy, Intravenous Nutrition, Glucose, Hypoglycemia

1. Introduction

Colorectal cancer (CRC) is a major cancer that threatens the life and health of the population [1]. Colorectal polyps are bulging lesions that protrude from the surface of colorectal mucosa into the intestinal lumen [2]. Studies have shown that surgical removal of colorectal polyps that are prone to malignant transformation helps reduce the incidence and mortality of colorectal cancer [3]; therefore, early removal of colorectal polyps is crucial for the prevention of colorectal cancer [4]. Currently, colorectal polypectomy through endoscopy is the preferred treatment modality for colorectal polyps because of its advantages of simple operation, minimal trauma, rapid recovery, low cost, and wide applicability to the population [5]. However, in long-term clinical practice, while endoscopic colorectal polypectomy has achieved good results, postoperative hypoglycemia is a complication with a high incidence, which adversely affects the postoperative recovery of patients. Therefore, it is important to prevent and reduce the occurrence of postoperative hypoglycemia after endoscopic colorectal polypectomy. A review of the literature reveals that there are no relevant guidelines or expert consensus regarding specific measures. Therefore, this study was conducted to investigate the feasibility, safety, and efficacy of oral glucose combined with short-term intravenous nutrition for the prevention of hypoglycemia after endoscopic colorectal polypectomy in 860 patients admitted to the Department of Gastroenterology of the First Affiliated Hospital of Yangtze University to reduce the incidence of hypoglycemia after endoscopic colorectal polypectomy in clinical practice. We aim to provide a certain reference for reducing the incidence of hypoglycemia after endoscopic colorectal polypectomy.

2. Materials and Methods

2.1. Study Population

This study included 860 patients who underwent argon plasma coagulation (APC) or endoscopic mucosal resection (EMR) for colorectal polyps in the Department of Gastroenterology of the First Affiliated Hospital of Yangtze University between January 2020 and December 2021 as study subjects. The patients were divided into experimental and control groups according to the random

number table method, with 430 patients in each group. The inclusion criteria were as follows: 1) colorectal polyps treated with APC or EMR and 2) informed consent from patients and their families and signed the informed consent form. Exclusion criteria were as follows: 1) patients with diabetes; 2) patients with obvious bleeding tendency; 3) patients with mental disorders and serious cardiovascular diseases who could not cooperate; 4) patients who refused to undergo endoscopic treatment, refused to follow medical advice, were automatically discharged from the hospital, and had incomplete clinical data. The study was approved by the Ethics Committee of the First Affiliated Hospital of Yangtze University. Exclusion criteria: Those who withdrew midway or fasted for more than 24 h after surgery.

2.2. Study Methods

Patients in the control group were administered 3 L of polyethylene glycol electrolyte bulking regimen in divided doses for preoperative bowel preparation [6], that is, a clear liquid diet 1 d before surgery, 1 L at 8:00 pm. 1 d before surgery, and 2 L 6 h before surgery until the patient passed clear watery stools and then underwent endoscopic surgery at the endoscopy center between 8:00 am and 12:00 pm. Bowel preparation quality was rated by the operator using the Boston bowel preparation scale (BBPS) [7]. After the operation, the patients fasted for 24 h. Short-term intravenous nutritional support was provided in the form of rehydration fluids, with a basal rehydration volume of 2000 ml, specifically, a low-rate intravenous drip of 10% dextrose injection 500 ml + 5% dextrose injection 500 mL + 10% dextrose injection 500 ml + 500 mL dextrose sodium chloride injection. After 24 h, the fluid diet was opened and the mice were transitioned to a normal diet after 1 week. The nurses on duty monitored the patients' finger blood glucose at 1, 4, and 8 h after the completion of postoperative intravenous infusion or when there were symptoms such as panic and cold sweat, respectively. Diagnostic criteria of hypoglycemia [8]: blood glucose < 3.9 mmol/L was considered as hypoglycemia, or blood glucose \geq 3.9 mmol/L, but there were hypoglycemic reactions such as hunger, panic, dizziness and cold sweat. Those who had hypoglycemia or hypoglycemic reaction during the fasting period were administered 50% glucose injection 20 - 40 ml intravenously or 10% glucose injection 250 ml intravenously, and the terminal blood glucose was retested after 30 min.

The patients in the experimental group were administered oral glucose intervention on the basis of the control group, that is, 1 d before the operation, 1 L of polyethylene glycol electrolyte dispersion plus 40 ml of oral 50% glucose solution at 8 pm on the first day, 2 L of polyethylene glycol electrolyte dispersion plus 60 ml of oral 50% glucose solution 6 h before the operation, and the rest was the same as the control group.

2.3. Observation Index

To observe the incidence of postoperative hypoglycemia, the quality of bowel

preparation, and tolerance of patients during bowel preparation in the two groups.

2.4. Statistical Analysis

SPSS 22.0 software was used for statistical analysis of the data. Mean \pm SD was used to describe the data of continuous variables, and ANOVA or chi-square test was used for comparison between groups, and $P < 0.05$ was considered a statistically significant difference.

3. Results

3.1. Basic Information of Patients

A total of 860 patients were divided into the experimental and control groups according to the random number table method ($n = 430$). Seven patients were withdrawn in the middle of 860 cases: four cases of postoperative gastrointestinal bleeding and fasting time of more than 24 h in the control group, 426 cases were included; three cases of postoperative gastrointestinal bleeding and a fasting time of more than 24 h in the experimental group, and 427 cases were included. In the control group, there were 216 males and 210 females, aged 24 - 86 years, with a mean of (44.83) years, 348 cases undergoing APC and 78 cases undergoing EMR. In the experimental group, there were 209 males and 218 females aged 32 - 83 years, with a mean of (47.33) years, 344 cases of APC, and 83 cases of EMR. There was no statistically significant difference between the baseline data of the two groups ($P > 0.05$) (See **Table 1**).

3.2. Comparison of Postoperative Blood Glucose Values and Hypoglycemia Incidence

The mean blood glucose values at 1 h and 4 h after infusion in the experimental group were higher than those in the control group (9.23 mmol/L vs. 8.82 mmol/L, $P = 0.046$; 7.36 mmol/L vs. 7.1 mmol/L, $P = 0.048$); the mean blood glucose values at 8 h after infusion in the experimental group were higher than those in the control group. Although the difference was not statistically significant, it was still slightly higher than that of the control group (5.53 mmol/L vs. 5.35 mmol/L, $P = 0.69$). The incidence of postoperative blood glucose < 3.9 mmol/L,

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	426	44.83 \pm 11.72	216/210	348/78
Experimental	427	47.33 \pm 10.41	209/218	344/83
X ² /t value		0.38	0.26	0.18
P-value		0.63	0.61	0.67

Note: APC: Argon Plasma Coagulation; EMR: Endoscopic Mucosal Resection.

the incidence of hypoglycemic reaction, and the incidence of hypoglycemia were significantly lower in the experimental group than in the control group (3.75% vs. 10.09%, $P = 0.000$; 1.17% vs. 3.29%, $P = 0.036$; 4.92% vs. 13.38%, $P = 0.000$) (See **Table 2**).

3.3. Comparison of Intestinal Cleanliness and Tolerability of Patients

The Boston Bowel Preparedness Scale scores the colon into three segments (cecum and ascending colon, hepatic flexure, transverse colon and splenic flexure, descending colon, sigmoid colon, and rectum), with a score of 0 to 3 for each segment and a total score of 0 - 9. A score > 2 for each segment of the colon indicated adequate bowel preparation; a total score < 6 or a score < 2 for any segment of the colon was considered inadequate bowel preparation [7]. The difference in BBPS scores between the experimental and control patients was not statistically different (6.46 vs. 6.34, $P = 0.729$). In terms of tolerability, adverse reactions (such as nausea, vomiting, abdominal pain, bloating, cold sweats, hunger, dizziness, fatigue, and palpitations) during bowel preparation were recorded using a questionnaire after completion of bowel preparation in the two groups. Again, there was no statistical difference in the overall incidence of adverse reactions between patients in the experimental and control groups (12% vs. 16%, $P = 0.09$).

4. Discussion

Endoscopic colorectal polypectomy has the advantages of minimal trauma and rapid recovery and is currently the preferred treatment for colorectal polyps. However, clinical experience and relevant literature reports [9] [10] [11] have shown that due to preoperative bowel preparation and general fasting during the perioperative period, the incidence of postoperative hypoglycemia, such as dizziness, panic, and weakness, is as high as 8.98% - 12.50%, which seriously affects the efficacy and recovery of patients. Chen *et al.* [12] showed that age ≥ 60 years, combined type II diabetes, no preoperative rehydration, preoperative fasting time ≥ 10 h, preoperative waiting time ≥ 12 h, preoperative mental stress, and

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	426	8.82 \pm 1.02	7.10 \pm 0.63	5.35 \pm 0.29	43 (10.09%)	14 (3.29%)	57 (13.38%)
Experimental	427	9.23 \pm 1.08	7.36 \pm 0.53	5.53 \pm 0.58	16 (3.75%)	5 (1.17%)	21 (4.92%)
X^2/t value		2.027	2.007	0.28	13.34	4.38	18.38
P-value		0.046	0.048	0.69	0.000	0.036	0.000

preoperative late sleep time < 6 h were independent risk factors for hypoglycemia in patients after colonoscopic polypectomy. Effective nursing interventions can reduce the occurrence of postoperative hypoglycemia in patients with colon polyps.

In this study, the incidence of postoperative blood glucose < 3.9 mmol/L, incidence of hypoglycemic reaction, and incidence of hypoglycemia in the experimental group were significantly lower than those in the control group, and there was no significant difference between the experimental and control groups in terms of intestinal cleanliness and tolerance. The incidence of hypoglycemia in patients who underwent endoscopic colorectal polypectomy was reduced.

The major limitation of this study is the fact that it was carried out in a single-center thus, a small number of cases. Therefore, we recommend future study to validate its feasibility by accumulating data from multi-centers and large sample sizes.

5. Conclusion

As has been demonstrated in this paper, oral glucose combined with short-term intravenous nutrition can effectively reduce the incidence of hypoglycemia in patients after endoscopic colorectal polypectomy, without affecting the intestinal cleanliness and tolerance of patients. This provides a strong reference for us to better prevent the occurrence of hypoglycemia after endoscopic colorectal polypectomy, and a basis for future multi-center study.

Conflicts of Interest

The authors declare no conflicts of interest.

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