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Jelly-type carbohydrate supplement in healthy subjects suppresses the catabolism of adipose tissue and muscle protein and improves their satisfactions[☆]

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SUMMARY

Background & aims: Many studies have reported the effects of preoperative clear fluid carbohydrate supplements; however, few studies have reported the effects of preoperative jelly-type carbohydrate supplements. This study aimed to assess the effect of a jelly-type oral nutritional supplement (ONS) on metabolism, redox balance by using various surrogate markers and to evaluate its excretion from the stomach.

Methods: This study was conducted according to a crossover design. Participants underwent a control experiment whereby they fasted after dinner and only ingested water until the experiment. The remaining participants underwent an ONS experiment whereby they ingested 400 g of ONS before bed and another 400 g at 7:00 am. Blood samples were collected at 9:00 am. After a break of at least 24 h, participants underwent the alternate experiment.

Results: Thirty minutes after intake of jelly, the gastric antrum appeared flat (the same result as that at baseline) on ultrasonography. The ONS group showed significantly lower serum free fatty acid levels (100 $\mu\text{Eq/L}$, $p = 0.027$, vs. 327 $\mu\text{Eq/L}$, $n = 6$), total ketone bodies levels, 3-MH/creatinine levels, and oxidative stress surrogate

[☆] This study was approved by the Human Research Ethics Committee of the University of Tokushima and registered in a clinical trials database (UMIN000024024).

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markers. Serum insulin levels were significantly higher and participant's satisfaction was improved in the ONS group.

Conclusions: We have the limitations of our methodologies as surrogate markers, compared with direct measurement of lipolysis, proteolysis and redox balance regulation. But Jelly-type ONS suppresses the catabolism of adipose tissue and muscle protein, decreases oxidative stress and improves patient satisfaction in healthy participants, without any increased risk of aspiration.

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1. Introduction

The Enhanced Recovery After Surgery (ERAS) program is a multimodal perioperative care pathway aimed at improving patient prognosis. Preoperative carbohydrate loading is included in the ERAS protocol [1]. Carbohydrate intake has been shown to enhance patient comfort prior to surgery and reduce postoperative discomfort, while preventing muscle wasting and loss of nitrogen and protein [2–4].

The ERAS protocol recommends an orally administered 12.6% carbohydrate supplement before surgery [1]. Previous studies have demonstrated that administration of liquid carbohydrate supplements before surgery can improve insulin resistance [5] and clinical outcomes [6]. There are a few studies regarding the preoperative ingestion of jelly as a clear liquid [7,8]. In these studies, jelly was included in the clear liquids and was ingested 2 h before surgery with no additional risk of aspiration of gastric contents in normal healthy children [7]. However, it is unclear whether there is any nutritional improvement from this ingestion. In the present study, we created a jelly-type oral nutritional supplement (ONS) with a carbohydrate concentration of 12.6%. There may be various factors which influence post-surgical conditions. First of all we explored whether the intake of this supplement could improve the starvation status, oxidative stress surrogate markers, and patient satisfaction in healthy participants who did not undergo a surgery.

2. Materials and methods

Written informed consent was obtained from all participants included in this study. This study protocol was approved by the Human Research Ethics Committee at the Tokushima University and was registered in a clinical trials database.

Six healthy male participants were included in the study. Obese [body mass index (BMI) > 30 kg/m²], emaciated [BMI < 17 kg/m²], smokers, diabetics, and patients on prescription medication were excluded. The study was conducted with a crossover design.

The participants underwent two experiments with more than 24-h rest in between each experiment. In experiment 1 (control group), the participants fasted after dinner on the day before the experiment and only ingested water. On the day of the experiment, the participants drank water until 7:00 am and a blood sample was collected at 9:00 am (Fig. 1).

In experiment 2 (ONS group), the participants fasted after dinner on the day before the experiment and ingested 400 g of a jelly-type oral nutritional supplement with a carbohydrate concentration of 12.6% before they went to bed. Participants then ingested 400 g of the jelly at 7:00 am on the morning of the experiment and blood sample was collected after 2 h (Fig. 1). The order in which participants underwent two experiments was decided randomly. The jelly-type supplement (12.6% carbohydrate) was made by adding glucose to an OS-1 jelly (Otsuka Pharmaceutical Co. Ltd., Tokushima, Japan). An OS-1 jelly was goods on the market, but it wasn't equal to Preop (Nutricia, Zoetermeer, The Netherlands) in the concentration of carbohydrate. So we mixed glucose as additional carbohydrate

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