Can low carbohydrate preoperative oral rehydration solution reduce the perioperative stress in patients undergoing SSRO?

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Mami Sasao-Takano DDS PhD, Hideki Taniguchi MD PhD*§, Toru Yamamoto DDS PhD,
Kaoru Ashigaki-Sogabe DDS PhD, Masayuki Suzuki DDS, Izumi Noguchi DDS PhD, Hiroshi Kawahara DDS PhD

Tsurumi University School of Dental Medicine, Department of Dental Anesthesiology, Yokohama, Japan
* Kanagawa University of Human Services Faculty of Health & Social Services, Department of Nutrition & Dietetics, Yokosuka, Japan
§ Kanagawa Cancer Center, Department of Anesthesiology, Yokohama, Japan

[Aim]

The impacts of low concentration carbohydrate of preoperative oral rehydration solution were investigated on perioperative stress in patients undergoing sagittal split ramus osteotomy (SSRO).

[Methods]

The investigation was approved by the Research Ethics Committee at Tsurumi University. Before entering the study the purposes and procedures of the study were fully explained to and agreed upon by each patient. [UMIN-CTR000013554]

A randomized controlled clinical trial was performed. The subjects were ASA-PS1 patients, and were divided into three groups depending on the preoperative oral ingestion components (Fig 1, Table 1). Anesthesia was induced and maintained with TIVA (propofol and remifentanil).

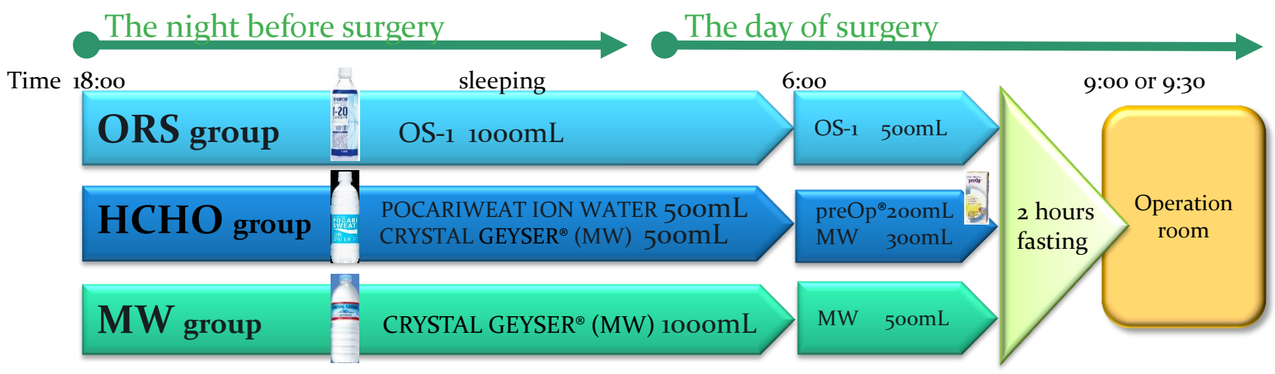

Fig 1 Schedule of Preoperative Oral Intake

Patients fasted from food from 18:00 the night befoe surgery. However, a specified 1500mL of preoperative oral ingestion was permitted up to 2h prior to general anesthesia.
ORS group (carbohydrate 37.5g): oral rehydrataion solution; 2.5% carbohydrate beverage (OS-1, Otsuka Fharmaceutical Factory, Inc., Tokushima, Japan)
HCHO group (carbohydrate 39.2g): ion supply water (POCARISWEAT ION WATER, Otsuka Pharmaceutical Co., Ltd., Tokyo, Japan) + low penetration pressure high concentration carbohydrate (12.6%) drink (preOp®, NUTRICIA, UK) + mineral water (CRYSTAL GEYSER®, Otsuka Pharmaceutical Co., Ltd., Tokyo, Japan)
MW group (no carbohydrate): mineral water(CRYSTAL GEYSER®, Otsuka Pharmaceutical Co., Ltd., Tokyo, Japan)

Table 1 Components of Beverages

Components / Trade name	Na^+ (mEq/L)	K^+ (mEq/L)	Cl^- (mEq/L)	Carbo hydrate (%)	Osmic pressure (mOsm/L)	energy (kcaL/ 100mL)	pH
OS-1	50	20	50	2.5	270	10	3.9
preOp®	50	122	6	12.6	240	50	4.9
POCARIWEAT ION WATER	23	5	16.5	2.8	203	11	3.9
CRYSTAL GEYSER®	0.49	0.046	-	0		0	

Oxidative stress (d-ROMs; derivartves of reactive oxygen metabolites), antioxidant potentials (BAP; biological antioxidant power), and cortisol in serum, and insulin resistance (HOMA-IR; insulin(μIU/mL)×glucose(mg/dL)/405) were measured at six different times: ①entrance, ②after osteotomy, ③wound closure, ④the first postoperative day, ⑤third day, and ⑥the next day of oral ingestion of food. The amount of organic hydroperoxides was spectrophotometrially measured using the d-ROMs test. The d-ROMs and the BAP assays are performed on a FRAS 4 analyzer (Wismerll Co. Ltd., Tokyo, Japan).

Results were considered statistically using two-way factorial analysis of variance (repeated withTukey and non repeated with Scheffé) in Ekuseru-Toukei 2015 (Social Survey Research Information Co., Ltd., Tokyo, Japan). A *P* value of < 0.05 was considered significant.

[Results and Discussion]

Patients characteristics are shown in Table 2.

At the time of wound closure, values BAP in ORS group and HCHO group did not drop, but that in MW group did (Fig 2, ③). There were significant differences between these two groups and MW group at the time of ③. Due to the influence of propofol and remifentanil, the values of d-ROMs (Fig 3)and cortisol (Fig 4) during surgery were lower. The values of d-ROMs in the postoperative measuring phrase rose above the standard zone. However, there were no significant differences among the groups. Variations of oxidative stress and cortisol in the perioperative period were difference. The maximum value of HOMA-IR in MW group was at the third postoperative day, but there were no significant differences among the groups(Fig 5, ⑤).

Table 2 Patients Characteristics and Intraoperative Variables

	ORS group	HCHO group	MW group
Number (m:f)	8 (2:6)	8 (4:4)	9 (3:6)
Age (yr) [range]	26±7 [18～40]	26±6 [18～35]	25.4±8.9 [18～44]
Height (cm)	163.4±5.3	168.4±7.0	163.1±4.5
Weight (kg)	55.0±5.7	61.6±12.4	55.9±7.9
BMI (kg/m²)	20.6±2.2	21.6±2.9	20.8±2.3
Time of Surgery (min)	141±53	146±35	151±29
Time of Anesthesia (min)	196±59	202±37	207±37
Crystalloid fluid solution (mL/kg/hr)	5.8±2.1	5.6±1.8	4.7±1.4
Urinary output (mL/kg/hr)	2.8±1.6	1.8±0.8	2.5±1.0
Bleeding (g)	147±85	152±91	159±138

Values are expressed as mean ± standard deviation, and no significant differences in these values among the three groups.

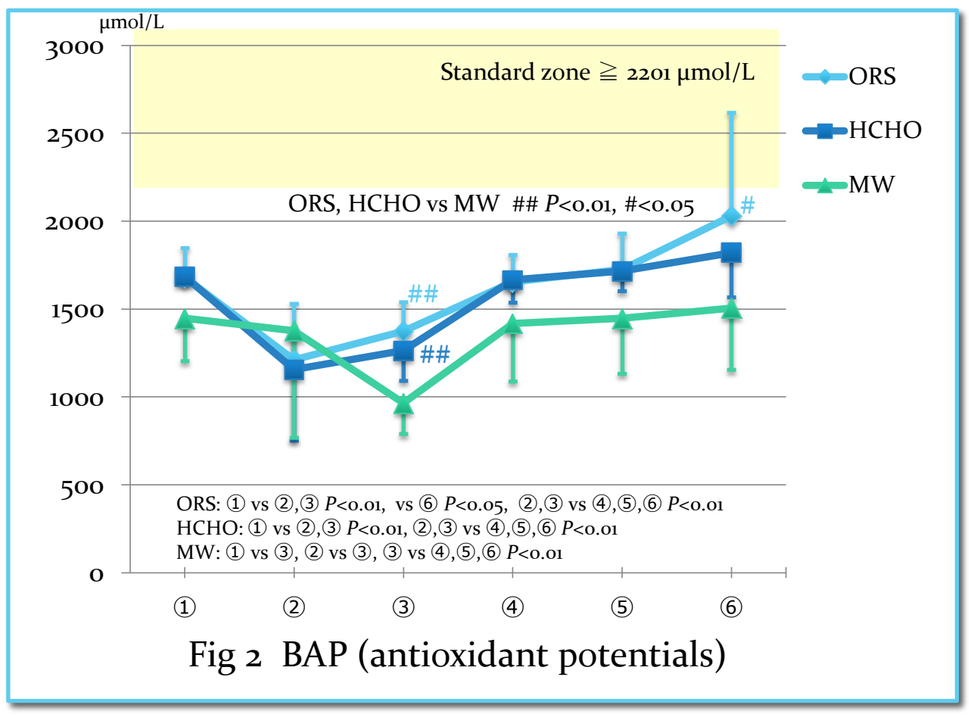

Fig 2 BAP (antioxidant potentials)

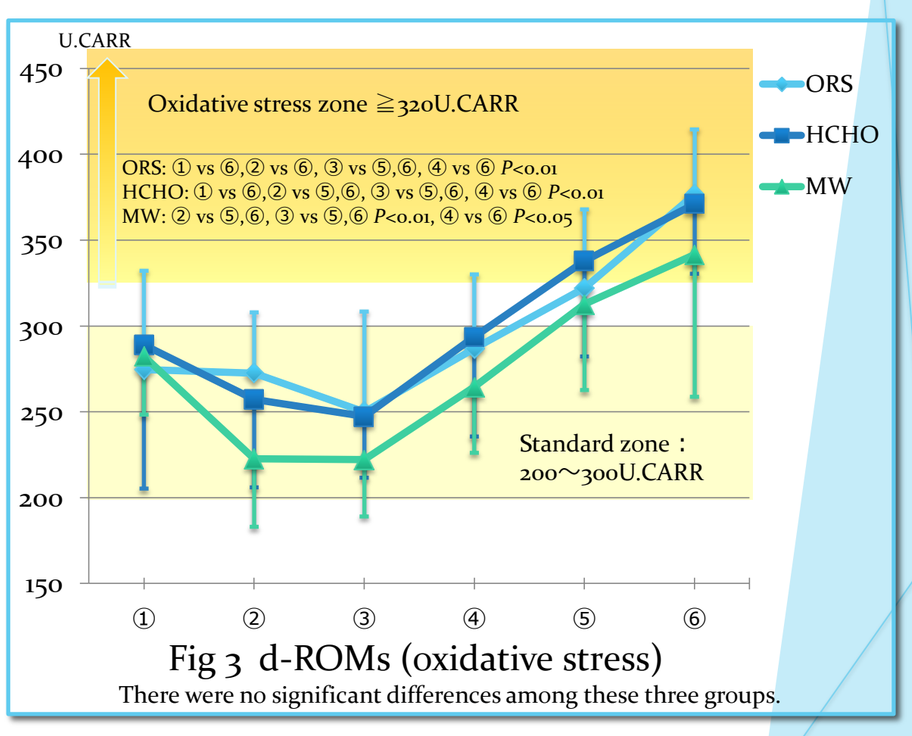

Fig 3 d-ROMs (oxidative stress)

There were no significant differences among these three groups.

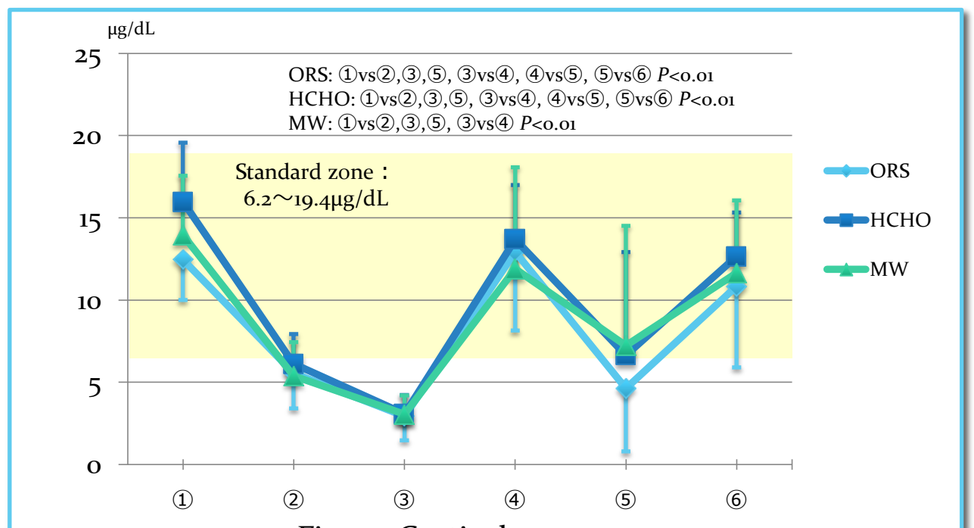

Fig 4 Cortisol

There were no significant differences among these three groups.

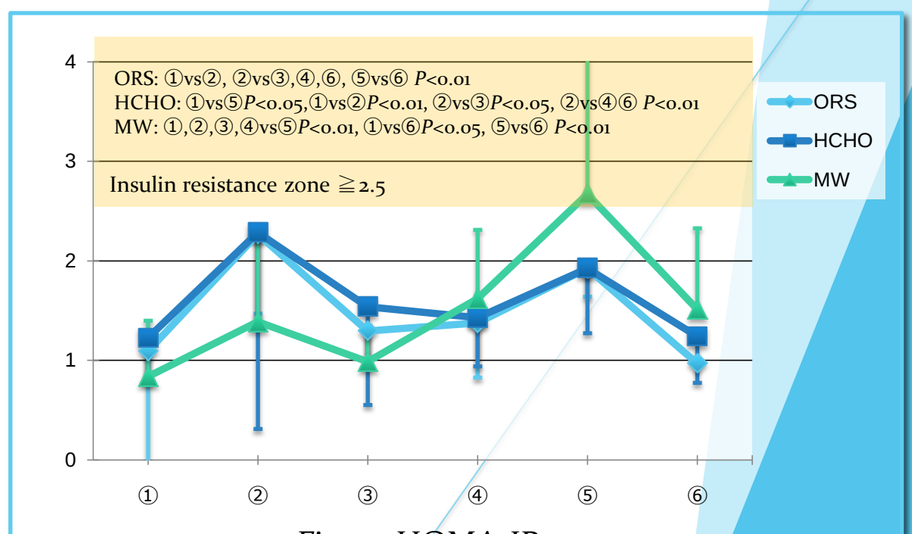

Fig 5 HOMA-IR

There were no significant differences among these three groups.

[Conclusion]

It is suggested that preoperative oral rehydration solutions containing of low concentration of carbohydrate could prevent the deterioration of antioxidant potentials during surgery in patients undergoing SSRO. However, surgical stress of SSRO was considered not to be strong enough to affect d-ROMs, cortisol, or HOMA-IR.

[Disclosure]

The authors have declared no conflicts of interest.