
Insulin Resistance in Patients Undergoing Abdominal Aortic Surgery with a Fast-track Pathway: The Double-blinded Supplementation of Carbohydrates Oral Pre-operative (Scopre) Study.

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ABSTRACT

Although studies suggest that fasting does not prevent the risk of “ab ingestis” respiratory disease, pre-operative oral maltodextrin seems to help reduce insulin resistance and improve post-operative outcomes in patients undergoing gastrointestinal surgery. In our large series of patients treated with a fast-track pathway, patients were permitted to eat solids until 8 hours before surgery and consume clear liquids 2 hours before surgery, with no gastroenteric or respiratory complications, better psychophysical responses, and good, rapid passage of stools. In this study, we aimed to evaluate the effect of the fast-track pathway on post-operative insulin resistance

Keywords: insulin resistance, abdominal aorta, surgery, glucose, oral carbohydrate loading, fast track surgery

INTRODUCTION

Surgery induces a state of insulin resistance and hyperglycaemia, which increases post-operative morbidity and mortality¹. The extent of insulin resistance is directly related to the magnitude of the surgery².

The usual pre-operative management of patients undergoing major surgery includes a policy of “nil per os (NPO) after midnight” to minimize the risk of intraoperative aspiration. This policy is based more on habit than on solid scientific evidence and it has been questioned extensively

because it augments patient discomfort and perioperative stress³. Some authors have even demonstrated that “NPO after midnight” worsens post-operative insulin resistance and deranges the pattern of metabolic substrate utilization⁴. Pre-operative oral carbohydrate loading (OCL), with the use of a carbohydrate-rich drink ingested up to 2 hours before surgery, has proved to be a safe and effective method to modulate post-operative insulin response⁵⁻⁷. Several studies have also reported the benefit of OCL in improving overall post-operative metabolic responses⁷, ameliorating patient well-being^{8,9}, reducing protein catabolism¹⁰⁻¹² and minimising length of hospital stay¹³.

In our large series of patients treated with a fast-track pathway, patients did not fast. Instead they were permitted to eat solids until 8 hours before surgery and consume clear liquids 2 hours before surgery. We find that patients do not experience gastroenteric or respiratory complications with this pathway, but show better psychophysical responses and good and rapid passage of stool.

The role of OCL has been extensively studied and proven in general and orthopaedic surgery¹⁴, while its role in cardio-vascular surgery has been demonstrated less regularly^{15,16}. In particular, no study has evaluated OCL in abdominal aortic surgery.

We conducted this study to evaluate the effects of the fast-track pathway on post-operative insulin resistance. We specifically designed a randomized controlled trial to investigate the efficacy of OCL in reducing insulin resistance after major abdominal aortic surgery. The secondary outcome of the study was the assessment of a potential benefit of OCL on functional capacity after surgery of the abdominal aorta. Both groups were treated with the fast track pathway, (control group with standard, and OCL group with the addition of maltodextrin) to clarify if post operative results are better with the addition of OCL to the fast track pathway

Materials and methods

The SCOPRE trial (Supplementation of Carbohydrates per Os in the PRE operative period) is a double-blind randomized controlled trial designed to evaluate the role of pre-operative OCL in patients undergoing fast-track surgery for abdominal aortic disease.

The Ethics Committee of the Azienda Ospedaliero-Universitaria Maggiore della Carità reviewed and approved the protocol for the study.

Adult patients scheduled for elective abdominal aortic repair (either for obstructive disease or for aneurysmal disease) were considered for inclusion and their written consent was obtained.

Exclusion criteria included diabetes mellitus or impaired glucose tolerance, impaired gastrointestinal motility (gastroesophageal reflux disease or intestinal obstruction), kidney replacement therapy, hepatic insufficiency, urgent or endovascular treatment and the need for supraceliac aortic clamping.

Randomization was performed using a computerized random number generator and numbered sealed envelopes containing the allocation were prepared. The day before surgery, the envelopes

were opened by a person independent of the study team in the Hospital Pharmacy, and the indicated drink was delivered to the Vascular Surgery ward. Physicians, patients, and nurses were all blind to allocation.

Patients randomized to treatment received 1200 ml of a maltodextrin drink (12.6 g/100 ml-Fantomalt®, Nutricia, Zoetermeer, The Netherlands), while patients randomized to the placebo received the same amount of flavoured water. Maltodextrin and placebo drinks were indistinguishable in taste and the products were provided in identical packaging.

Each patient received three 400 ml bottles, and we suggested they drink 800 ml the night before surgery and the remaining 400 ml between 2 and 3 hours before the scheduled operation.

Design of study

- Excluded (n = 14)
 - Not meeting inclusion criteria (n = 13)
 - Declined to participate (n = 1)
 - Other reasons (n = 0)
- Assessed for eligibility (n = 54)
 - Analysed (n = 20)
 - Excluded from analysis (n = 0)
 - Analysed (n = 20)
 - Excluded from analysis (n = 0)
 - Lost to follow-up (n = 0)
 - Discontinued intervention (n = 0)
 - Lost to follow-up (n = 0)
 - Discontinued intervention (n = 0)
 - Allocated to intervention (n = 20)
 - Received allocated intervention (n = 20)
 - Did not receive allocated intervention (n = 0)
 - Allocated to intervention (n = 20)
 - Received allocated intervention (n = 20)
 - Did not receive allocated intervention (n = 0)
- Randomized (n = 40)

Figure 1

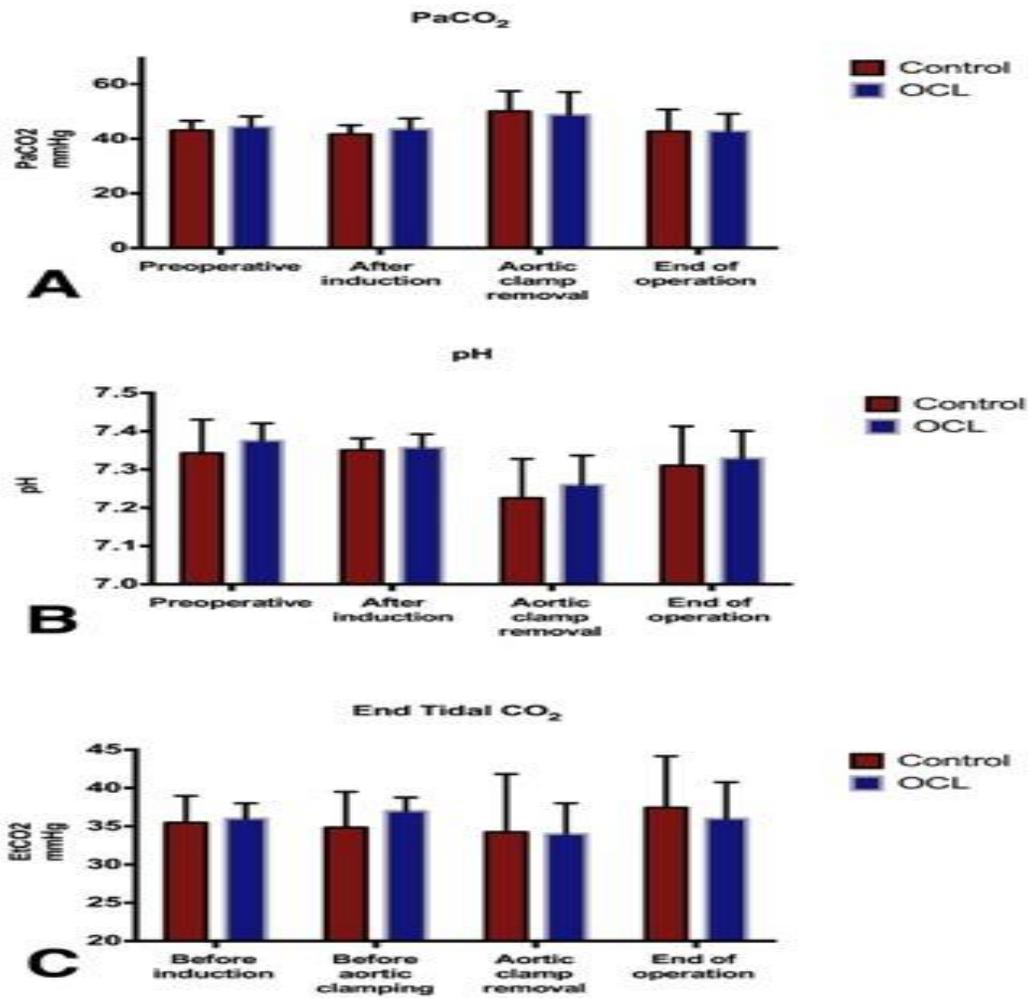


Fig. 2: End tidal CO₂-Blood paCO₂-Blood pH during surgery

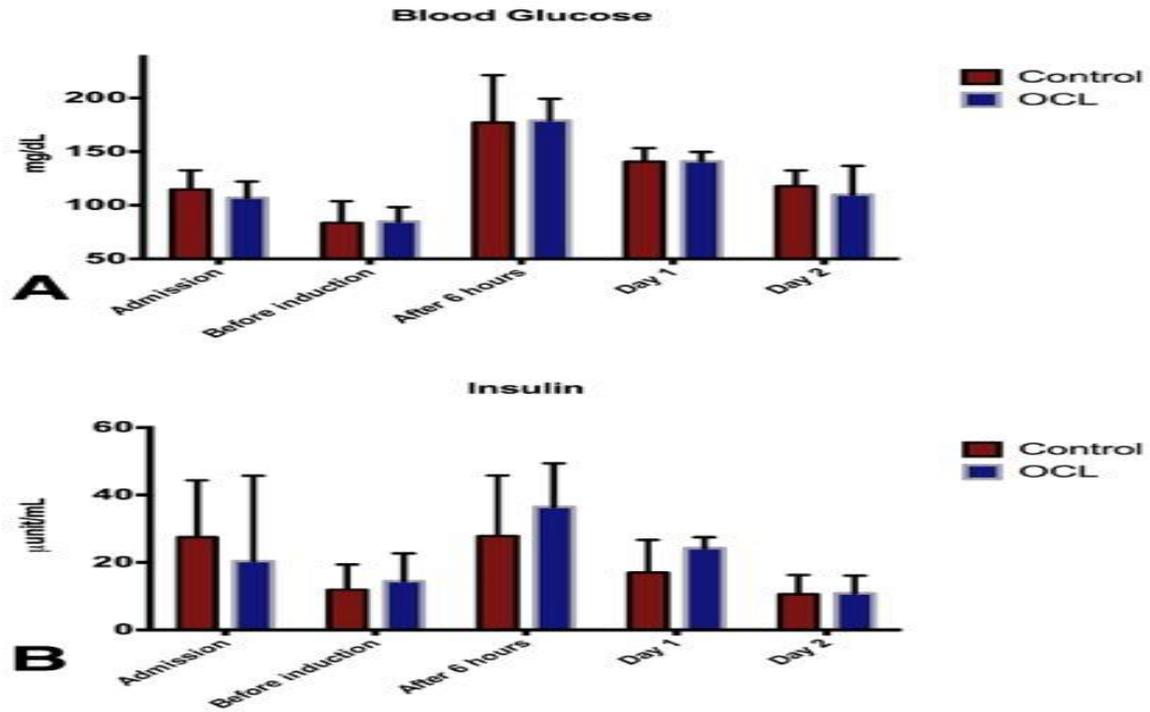


Fig. 3 : Blood glucose and insuline during perioperative period

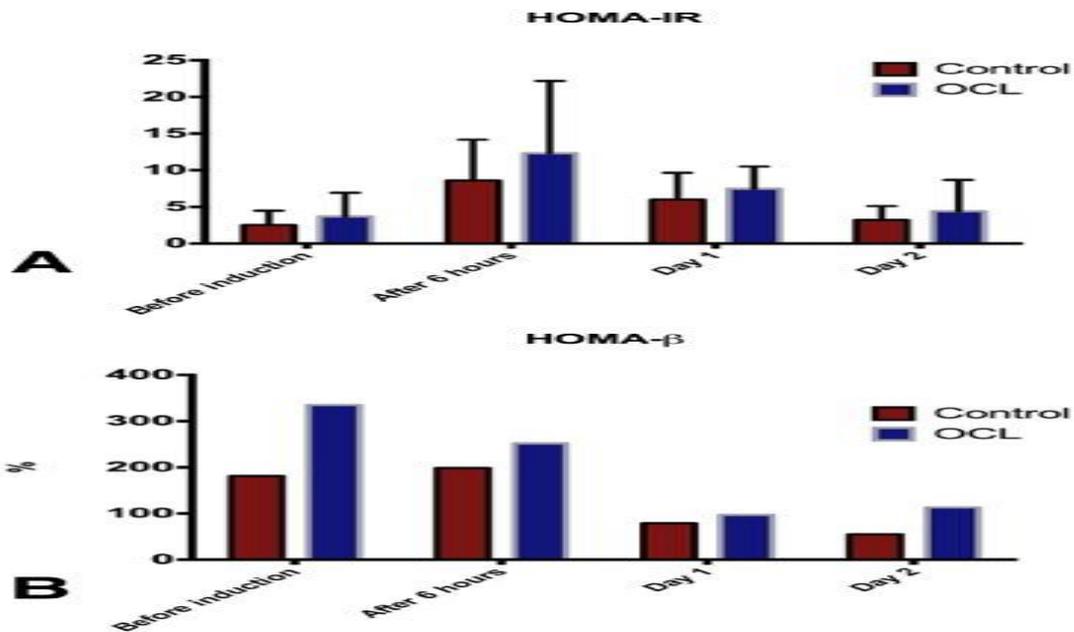


Fig. 4 : Homeostasis assesment model (HOMA-IR) during surgery and postoperative period

Operative management

Patients undergoing open surgical repair of an infrarenal abdominal aortic aneurysm (AAA) were managed according to the fast-track protocol of the Vascular Surgery Department of the “Maggiore della Carità” University Hospital¹⁷.

In brief, the protocol uses a multidisciplinary approach based on left subcostal minilaparotomy, thoracic epidural anaesthesia and analgesia and early post-operative rehabilitation without pre-operative fasting (patients eat a light meal up to 6 hours before surgery and are allowed to drink clear fluids up to 2 hours before surgery)^{17,18}.

Induction was achieved with 0.1 mg/kg midazolam and 1 mg/kg propofol. A laryngeal mask was inserted to protect the airways and ventilation with 80% oxygen was performed while maintaining patients in spontaneous breathing (no curare is administered) when possible.

Anaesthesia was continued with 0.4 MAC sevoflurane. Analgesia was obtained with pre-operative epidural infusion of 15–25 mL of 0.5% bupivacaine and was maintained throughout the operation with continuous epidural bupivacaine infusion (4–5 mL/h)

Access to the peritoneal cavity was achieved with a curvilinear left subcostal incision. Bowels were retracted to the right and kept inside the abdominal cavity. Standard access to the groin was used in the case of aorto-bifemoral bypass. Once interposition grafting was completed using standard techniques, the abdominal wall was closed without any drain.

All patients were woken in the operating room and then transferred to the surgical ward.

In the post-operative period, patients were encouraged to drink as soon as they gained consciousness. A semi-solid diet was permitted between 2 and 6 hours after surgery. Intravenous fluid administration was discontinued when the patients were able to drink freely without nausea. Saline or lactated Ringer’s solution were used for fluid replacement.

Patients were also encouraged to start bed exercises and use a foot-pump.

Patients with stable hemodynamic parameters and no motor block were forced to ambulate with assistance 4 hours after the operation. Epidural infusion of 0.25% bupivacaine was maintained until the third post-operative day (3–6 mL/h) to control pain, supplemented with ibuprofen 600 mg bid. The bladder catheter was removed as soon as an ice-test showed that there was no sacral-nerve block.

Anti-platelet drugs were administered continually. Prophylactic heparin (either unfractionated or low molecular weight) was not administered.

Study parameters

End tidal CO₂, blood PaCO₂, and blood pH were measured sequentially during the operation to exclude excessive blood CO₂ accumulation due to pre-operative carbohydrate loading. Gastric fluid content was measured after induction using a temporary nasogastric tube, which was immediately removed thereafter.

Plasma glucose levels and insulinaemia were measured sequentially at admission and in the operating room, before and after the operation. The same measurements were repeated on the first and the second post-operative day.

For evaluation of insulin resistance, the homeostasis model assessment (HOMA-IR) was used ($HOMA-IR = (\text{blood glucose mmol/L} \times \text{blood insulin } \mu\text{units/mL})/22.5$) using measurements performed before and after the operation, and on the first and second post-operative day. A value of ≥ 2.5 was considered indicative of insulin resistance¹⁰. The index of insulin secretion was calculated as $HOMA-\beta = (20 \times \text{blood insulin } \mu\text{units/mL})/(\text{blood glucose mmol/L} - 3.5)$ ^{10,15}. Measurements were performed after a minimum of 2 hours fasting (day of operation) or after overnight fasting (first and second post-operative day). A physical functional capacity test was performed at admission and the same test was repeated on the second post-operative day. The patient was asked to climb a flight of stairs and the number of steps climbed before muscular fatigue was recorded.

Statistical analysis A sample size of 40 patients (20 for treatment and 20 for placebo) was extrapolated from previous studies on the effects of carbohydrate loading on insulin sensitivity and post-operative plasma glucose^{2,6,13}.

Continuous variables were presented as mean and standard deviation or median and range (min-max), as appropriate. Categorical variables were presented as total count and percentage. Gaussian distribution was tested using the D'Agostino & Pearson omnibus normality test. Insulin levels, HOMA-IR and HOMA- β results were not normally distributed, as previously reported by other authors^{10,15}, and were log-transformed to obtain values that were close to normally distributed¹⁵.

Differences between groups were analysed with the Student t-test (paired or unpaired) for continuous variables while the χ^2 test or the Fisher exact test (when the number in any cell was < 5) was used in the case of categorical data. Differences between 3 or more repeated measures within a group were tested using the Kruskal-Wallis test.

Statistical analysis was performed with Graph Pad Prism® (GraphPad Software Inc., La Jolla, CA, USA) and the level of significance was set at two-tailed $p < 0.05$.

Table 1. Demographic and operation data of the study patients.

	OCL	Control	P
Age, years - mean \pm SD	69.6 \pm 8.7	72.2 \pm 7.1	0.9*
Male, N (%)	20(95%)	20(95%)	1**
Body mass index - mean \pm SD	27.5 \pm 5.0	29.0 \pm 10.3	0.6*
ASA Class 3-4, N (%)	16 (80%)	12 (60%)	0.3**

Baseline functional capacity, number of steps - mean \pm SD	76.7 \pm 39.6	87.7 \pm 33.2	*
Aneurysm diameter, mm - mean \pm SD	52.4 \pm 11.8	55.0 \pm 13.5	0.5*
Aortic occlusive disease, N (%)	1 (5%)	0 (0%)	1**
Type of aortic reconstruction			
• aorto-aortic, N (%)	11 (55%)	9 (45%)	0.7**
• aorto-biiliac, N (%)	3 (15%)	4 (20%)	1**
• aorto-bifemoral, N (%)	5 (%)	4 (%)	1**
• aorto-iliac -femoral, N (%)	1 (%)	3 (%)	0.6**
Operation time, min - mean \pm SD	156.9 \pm 50.3	156.6 \pm 49.7	0.9*
30-day complication	4 (20%)	1(5%)	0.3**
• death, N (%)	0 (0%)	0 (0%)	1**
• gastrointestinal complication****, N (%)	1 (5%)	0 (0%)	1**
• pulmonary complication, N (%)	0 (0%)	0 (0%)	1**
• serum creatinine doubling, N (%)	1 (5%)	0 (0%)	1**
• serium creatinine doubling, N (%)	0 (0%)	1 (5%)	1**
• peripheral arterial occlusion, N (%)	2 (10%)	0 (0%)	0.5**
• wound complication, N (%)			

COPD, chronic obstructive pulmonary disease; ASA, American Society of Anesthesiology; *, Student t-test; **, Fisher exact test; ***, Mann-Whitney U-test; ****, one case of bowel resection due to abnormal dilatation of the colon (present at admission) - no patients experienced intestinal ischemia, occlusion or excessive nausea/vomiting.

Table II. Difference in non-glycemic variables between oral carbohydrate loading and control patients.

	OCL	Control	P
Gastric fluid volume, ml - mean ± SD	22.7 ± 44.8	7.7 ± 11.0	0.2*
Postoperative Hb, g/dL - mean ± SD	11.7 ± 1.1	11.6 ± 1.1	0.8*
Postoperative Na ⁺ , mEq/L - mean ± SD	132.8 ± 2.1	132.1 ± 2.1	0.4*
Postoperative K ⁺ , mEq/L - mean ± SD	4.3 ± 0.8	4.5 ± 0.7	0.6*
Postoperative Cl ⁻ , mEq/L - mean ± SD	103.8 ± 3.0	104.6 ± 2.6	0.4*
Postoperative functional capacity test, number of steps - mean ± SD	51.8 ± 32.1	53.9 ± 47.5	*

*, Student t-test.

Table III. Difference in glycemc variables between oral carbohydrate loading (OCL) and control patients.

HOMA-IR (mean ± SD)				
Glucose (mg/dL, mean ± SD)				
Preoperative blood glucose	83.8 ± 18.3	83.6 ± 20.1	0.97	-12.13 to 12.53
6-hour blood glucose	176.4 ± 25.3*	177.2 ± 44.1*	0.94	-23.92 to 22.40
Day 1 blood glucose	141.3 ± 15.9	140.6 ± 12.8	0.87	-8.53 to 9.93
Day 2 blood glucose	117.7 ± 29.2	117.9 ± 14.7	0.98	-18.09 to 17.81
Insulin (µunits/mL, mean ± SD)				
Preoperative insulin level	17.1 ± 12.3	11.9 ± 7.5	0.11	-1.37 to 11.66
<i>Log(preoperative insulin level)</i>	<i>1.1 ± 0.3</i>	<i>1.0 ± 0.2</i>	<i>0.14</i>	<i>-0.04 to 0.31</i>
6-hour insulin level	39.7 ± 31.3*	27.9 ± 17.9*	0.15	-4.81 to 28.51
<i>Log(6-hour insulin level)</i>	<i>1.5 ± 0.4*</i>	<i>1.3 ± 0.3*</i>	<i>0.24</i>	<i>-0.09 to 0.36</i>
Day 1 insulin level	21.0 ± 7.7	17.0 ± 9.7	0.15	-1.65 to 9.69
<i>Log(day 1 insulin level)</i>	<i>1.3 ± 0.2</i>	<i>1.2 ± 0.2</i>	<i>0.10</i>	<i>-0.03 to 0.25</i>
Day 2 insulin level	13.7 ± 10.1	10.6 ± 5.7	0.30	-2.94 to 9.11
<i>Log(day 2 insulin level)</i>	<i>1.1 ± 0.3</i>	<i>0.9 ± 0.2</i>	<i>0.35</i>	<i>-0.10 to 0.28</i>
Preoperative HOMA-IR	3.7 ± 3.2	2.5 ± 1.9	0.17	-0.54 to 2.88
<i>Log(preoperative HOMA-IR)</i>	<i>0.44 ± 0.34</i>	<i>0.31 ± 0.29</i>	<i>0.19</i>	<i>-0.07 to 0.34</i>
6-hour HOMA-IR	12.3 ± 9.6*	8.6 ± 5.6*	0.15	-1.51 to 8.96
<i>Log(6-hour HOMA-IR)</i>	<i>0.94 ± 0.41*</i>	<i>0.81 ± 0.37*</i>	<i>0.31</i>	<i>-0.13 to 0.38</i>
Day 1 HOMA-IR	7.5 ± 3.0	6.0 ± 3.7	0.17	-0.69 to 3.66
<i>Log(day 1 HOMA-IR)</i>	<i>0.82 ± 0.23</i>	<i>0.71 ± 0.24</i>	<i>0.14</i>	<i>-0.04 to 0.27</i>
Day 2 HOMA-IR	4.4 ± 4.2	3.2 ± 1.9	0.34	-1.37 to 3.74
<i>Log(day 2 HOMA-IR)</i>	<i>0.50 ± 0.35</i>	<i>0.43 ± 0.28</i>	<i>0.56</i>	<i>-0.18 to 0.31</i>
HOMA-β (% , mean ± SD)				

Preoperative HOMA-β	335.1 ± 1323.6	181.1 ± 321.7	0.61	-462.58 to 770.62
<i>Log(preoperative HOMA-β)</i>	2.46 ± 0.50	2.29 ± 0.41	0.30	-0.16 to 0.48
6-hour HOMA-β	251.7 ± 197.1	198.7 ± 157.3	0.36	52.98 ± 57.29
<i>Log(6-hour HOMA-β)</i>	2.27 ± 0.35	2.19 ± 0.30	0.46	-0.14 to 0.29
Day 1 HOMA-β	97.1 ± 37.1	78.9 ± 42.5	0.16	-7.64 to 44.06
<i>Log(day 1 HOMA-β)</i>	1.96 ± 0.17	1.84 ± 0.22	0.07	-0.01 to 0.24
Day 2 HOMA-β	113.4 ± 109.2	55.0 ± 52.3	0.06	-4.35 to 121.08
<i>Log(day 2 HOMA-β)</i>	1.95 ± 0.27	1.80 ± 0.19	0.11	-0.04 to 0.32

*, significantly different from preoperative values; P for Student t-test.

Results

Enrolment in the study was completed between October 2010 and June 2011. There was no crossovers between groups and results were analysed on an intention to treat basis. No patient was excluded or dropped out of the study after enrolment. The CONSORT diagram of the study is shown in Fig. 1. The 2 groups were homogeneous for cardiovascular risk factors, body mass index and American Society of Anesthesiology class and functional capacity (number of steps climbed). All operations were performed according to the aforementioned protocol. Intake of the carbohydrate drink or placebo was tolerated well by both groups and there were no complications related to pre-operative fluid intake (i.e., aspiration pneumonia and/or excessive post-operative nausea and vomiting). Demographic data of the patients and main operative details are summarised in Table I.

Intraoperative blood gas analysis was not statistically significantly different in the 2 groups regarding intra-operative PaCO₂ and pH. Patients in the OCL group had higher mean EtCO₂ (although not reaching statistical significance) at the beginning of the operation, which resolved after aortic clamp removal (Fig. 2).

There were no statistically significant differences between groups for gastric fluid volume, the level of post-operative haemoglobin and blood electrolytes (sodium, potassium and chloride) and functional capacity test outcome (Table II).

Patients in the control group had significantly higher post-operative blood glucose levels (at 6 hours) compared to the pre-operative period (83.6 mg/dL vs. 177.2 mg/dL; 95% CI for difference, 80.8 to 104.4; P < 0.0001) as was the level of insulin (11.9 μunits/mL vs. 27.9 μunits/mL; 95% CI for difference, 7.8 to 26.3; P 0.001). Similarly, patients in the OCL group had a higher glucose level after the operation (83.8 mg/dL vs. 176.4 mg/dL; 95% CI for difference, 29.7 to 49.4; P < 0.0001) as was the level of insulin (17.1 μunits/mL vs. 39.7 μunits/mL; 95% CI for difference, 8.2 to 37.1; P 0.004 (Table III).

There was no difference in the pre- and post-operative plasma glucose and insulin levels in OCLs and controls. In particular, both groups had a similar trend of glycaemic values in the post-operative period, with similar mean levels at each time point (Fig. 3a). The OCL group had higher mean insulin levels, although this did not reach statistical significance (Fig. 3b).

Homeostasis model assessment was calculated for each patient. Considering a cut-off level of 2.4 for insulin resistance⁶, 7 patients (35%) in the control group and 11 patients (55%) in the OCL group had a state of relative insulin resistance at the beginning of the operation (Fisher exact test: P 0.1).

As expected, there was a statistically significant difference in HOMA-IR values for each group with a consistent increase after the operation (Kruskal-Wallis test: OCL P 0.002, control P 0.0004), thus meaning that the operation actually favoured insulin resistance.

Consistent results were obtained when the HOMA- β index was analysed. A decrease in β -cell function was observed in both groups after the operation and it reached statistical significance both in the control and the OCL group (Kruskal-Wallis test: P 0.01 for control and P 0.001 for OCL).

Overall, the OCL group had a higher mean HOMA-IR level compared to the control group, although it did not reach statistical significance (Fig. 4a). The level of HOMA- β was also higher in the OCL group, although it did not reach statistical significance (Fig. 4b).

The rate of post-operative complications did not differ between groups (Fisher exact test: P 0.3). Overall, there were 5 30-day surgical complications (12.5%).

One patient in the control group needed post-operative femoral embolectomy.

In the treatment group, 1 patient needed right hemicolectomy due to abnormal colon dilatation (already evident at admission), 1 patient needed surgical correction of a dehiscence of the abdominal laparotomy, 1 patient suffered from post-operative doubling of serum creatinine and 1 patient had bilateral dehiscence of the inguinal incision, which was treated conservatively (Table I).

Discussion

In this study we aimed to assess whether a fast track pathway with the addition of OCL might yield better results than the standard fast track pathway.

To the best of our current knowledge, our study is the first randomized trial specifically designed to investigate pre-operative OCL in patients undergoing abdominal aortic surgery. Our study failed to demonstrate an additional benefit with regard to post-operative insulin resistance or functional capacity with the addition of OCL to the standard fast-track protocol.

Insulin resistance is a typical feature of the body's response to surgical stress^{2,19}. Its pathologic mechanisms are not thoroughly understood, although it seems dependent both on a reduction of intracellular insulin-receptor signalling^{6,20} and on the development of mitochondrial

disfunction²¹. This derangement in intracellular mechanisms results in a reduced glucose uptake, mainly in skeletal muscle and the liver, with increased glucose release and a state of hyperglycaemia^{11,21,22}.

It is well known that hyperglycaemia increases death and complication rates after surgery^{1,23} and it is an independent risk factor for post-operative infection in patients undergoing vascular surgery²⁴.

Standard preoperative fasting (“NPO after midnight”) reportedly contributes to the development of post-operative insulin resistance²⁵⁻²⁷, without proven decreased risk of aspiration pneumonia³.

These reports led to the idea that patients in a “fed state” could actually better control post-operative insulin resistance. This was first demonstrated using pre-operative insulin-glucose infusions⁴ and then using pre-operative oral carbohydrate supplementation^{5,9}. The benefits of preoperative OCL in reducing post-operative insulin resistance have been reported in several surgical settings^{14,19,27}, although all these studies involved patients undergoing general and orthopaedic surgery.

In a recent meta-analysis, Awad et al. pooled the data of 1685 patients from 21 randomized studies and reported that OCL reduced post-operative insulin resistance, although it did not reduce in-hospital complications, and was associated with shortened length of hospital stay in patients undergoing major abdominal surgery¹⁴. Interestingly, only 2 of these studies were carried out on orthopaedic or general surgery patients, and none involved vascular surgery patients.

Moreover, the 2 studies conducted on cardiac surgery patients, either failed to demonstrate an actual effect of OCL on post-operative insulin resistance¹⁶ or concluded that if glucose is administered during surgery, there is no obvious advantage of pre-operative carbohydrate loading on insulin resistance²⁸.

Our recent review of the English literature found no study on OCL in cardiac surgery patients that actually reported positive results. In addition to the previously mentioned studies, Breuer et al. concluded that pre-operative CHO administration before cardiac surgery does not affect insulin resistance²⁹, while a recent study by Tran et al., involving both cardiac and spinal surgery patients, also failed to demonstrate a positive effect of OCL on insulin resistance¹⁵. Although these latter investigators do not provide separate results for the 2 types of surgery, cardiac surgery patients accounted for the majority of the sample (26/38, 68%)¹⁵, thus implying a possible negative effect of this group on the final results of the study.

Our study had several limitations. Statistical error related to a sample size that was too small to detect differences cannot be completely excluded, although positive results have been demonstrated in several smaller- sample studies^{5,6,11,13,30}. Second, although speculative, it could be implied that a “whole body” ischemic insult, such as one that ensues during extracorporeal

circulation or aortic cross-clamping, might contribute to post-operative insulin resistance through mechanisms that are less responsive to OCL. Moreover, post-operative insulin resistance was estimated using a homeostasis model assessment, which is slightly less sensitive in determining insulin resistance in the carbohydrate-fed state compared to the hyperinsulinemic euglycemic clamp³⁰. Finally, the study did not include an actual “NPO after midnight” group, which may have helped to clarify the role of our fast-track program¹⁸. Taken into account, all these aspects might help to minimize the metabolic changes, which arise after surgery following a long-lasting fasting state²⁷

In conclusion, this study is the first of its kind performed on patients treated for disease of the infrarenal abdominal aorta. We did not demonstrate better post-operative insulin resistance results with the addition of OCL compared to a fast track pathway, probably due to good metabolic results of fast track pathway.

Further multicentre studies are warranted to further investigate the role of OCL in patients undergoing abdominal aortic surgery. Inclusion of a series of patients undergoing standard open surgery without a fast track pathway would also be of benefit.

METHODS

This randomized trial called the SCOPRE (Supplementation of Carbohydrates Oral PRE-operative) study, involved the randomization of 40 patients who were candidates for aortic surgery. These patients were divided into 2 groups (20 in the control group and 20 in the SCOPRE group). Pre-operatively, patients were asked to drink 1200 ml of a liquid beverage: lemon water in the control group and lemon beverage with maltodextrin in the SCOPRE group. We assessed blood glucose and insulin levels, and physical capacity (with a “step” test) pre- and post-operatively.

RESULTS

There were no differences between 2 groups for pre-operative gastric filling, blood CO₂ or blood glucose levels.

Blood insulin levels were almost comparable in the 2 groups and were higher in the control group compared to the SCOPRE group only during the morning of the first post-operative day. There was no difference with regard to the re-start of food intake, ambulation, intestinal transit or length of hospitalization.

CONCLUSIONS

We can confirm that the pre-operative intake of maltodextrin does not increase gastric filling. Furthermore, insulin resistance, re-start of food intake, ambulation, intestinal transit or length of

hospitalization were not significantly different. Therefore, we conclude that OCL does not improve outcomes of fast track pathways.

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