inserted into an antecubital vein in the controlateral arm for administration of glucose and insulin infusions. After collection of three baseline blood samples over 30 min, a primed continuous infusion of crystalline human insulin (NOVO NORDISC HELLAS Ltd., Athens, Greece) was started at a constant rate (40 mU/m² body surface area/min) via an infusion pump for 180 min to increase plasma insulin levels to approximately 574.4 µmol/l while maintaining plasma glucose at the basal level (4.44-4.94 mmol/l) by sampling every 5 min. Plasma glucose was clamped at this level by periodically adjusting a variable infusion of a 35% dextrose via an Abbott Lifecare infusion pump (Abbott Laboratories, Inc., Chicago, IL). Insulin levels were measured in blood samples withdrawn at 20 min intervals.

**Hormone assays**

At each sampling time-point, 10 ml free-flowing blood was withdrawn after discarding the first 2ml, in lithium-heparin tubes and centrifuged immediately at 4°C. Plasma was immediately refrigerated at -70°C for assay of catecholamines and -20°C for assay of insulin. Blood glucose was assayed immediately.

**Calculations**

**Clamp-based index of insulin sensitivity (SI):** The steady-state period of the insulin clamp was defined as the final 30-min period (i.e. 150-180 min) during which the coefficient of variation for blood glucose, plasma insulin and glucose infusion rate (GIR) was less than 7% and the correlation of each variable with time was not significant. Mean value was defined as the GIR corrected for the glucose added or removed from the glucose space (space correction) as previously described. The glucose clamp-derived index of insulin sensitivity (SIclamp) was calculated as follows: 

\[ SI_{clamp} = \frac{GIR_o/G_s}{\Delta I_o} \]

where GIRo is the steady-state glucose infusion rate (mg/kg per min), Gs is the steady-state blood glucose concentration (mg/dl) and ∆Io is the difference between steady-state and basal insulin concentration (µU/ml).

**Statistical analysis**

To compare SI mean values as well as glucose and insulin mean values during OGTT among the four different stages of the study, the ANOVA method was employed. In order to apply the ANOVA method, normality of data was examined by quantile quantile plots, histograms, boxplots and Jarque-bera statistic which revealed that the distribution of the recorded data at each of the four stages of the study approximated the normal. Subsequently, ANOVA tables were applied and the t and f tests regarding comparisons of means between all possible pairs of glucose and insulin and among mean values of SI at each of the four stages of the study were calculated. The level of significance α was set at 0.05.

**RESULTS**

**Glucose response during OGTT (Figure 1)**

Before treatment, fasting blood glucose levels and OGTT were pathologic in all patients. Mean glucose levels of the OGTTs performed in all three preoperative stages of the study were significantly higher than those of the OGTT performed postoperatively in all patients (ANOVA, α<0.05) (Table 2). In addition, mean glucose levels of the OGTT performed preoperatively without any medication were significantly higher than those post alpha and beta blockade (ANOVA, α<0.05). Mean glucose levels of the OGTT post alpha blockade did not differ from those post alpha and beta blockade (ANOVA, α>0.05).

**Insulin response during OGTT (Figure 2)**

Insulin levels during the OGTTs performed preoperatively peaked at 90 min while postoperatively

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**Table 1.** Mean value±SEM of plasma catecholamines and urine VMA and metanephrine values.

<table>
<thead>
<tr>
<th>STAGES</th>
<th>EPINEPHRINE (0.07-0.6) nmol/l</th>
<th>NOREPIHPRINE (0.48-1.91) nmol/l</th>
<th>VMA (&lt;50) µmol/24h</th>
<th>METANEPHRINE (&lt;5.46) µmol/24h</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>0.86±0.67</td>
<td>5.49±1.68</td>
<td>121±34.95</td>
<td>11.56±3.34</td>
</tr>
<tr>
<td>II</td>
<td>0.87±0.68</td>
<td>5.30±1.92</td>
<td>102±24</td>
<td>12.88±3.06</td>
</tr>
<tr>
<td>III</td>
<td>0.82±0.64</td>
<td>5.29±1.47</td>
<td>97±14.12</td>
<td>11.19±2.24</td>
</tr>
<tr>
<td>IV</td>
<td>0.27±0.09</td>
<td>7.34±1.42</td>
<td>18±5.7</td>
<td>1.07±0.23</td>
</tr>
</tbody>
</table>