Metabolic and Glycemia Improvements Occur 3-Months Post Bariatric Surgery in Youth with Type 2 Diabetes

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Introduction

• Background: Rates of obesity and its related co-morbidities in youth such as youth-onset type 2 diabetes (Y-T2D) continue to rise in youth.
• Gastric bypass surgery improved dysglycemia in Y-T2D in the teen-LABS study at 1 year and beyond, but the effect on metabolism and glycemia and underlying mechanisms in Y-T2D is unclear.
• Few data exist on the now more commonly performed vertical sleeve gastrectomy (VSG).

Research Aim:

• To determine the early effect of VSG on metabolism, hormone response to feeding and glycemia in Y-T2D.

Methods

Participants and Study Design:

• Adolescent youth with T2D ages 12-19 years undergoing VSG were recruited (n=14).
• Glycemic control, insulin sensitivity and secretion were assessed before and 3 months after VSG.
• Study visits occurred in the morning following an overnight fast.

Detailed Methods:

• Body mass and height were measured, BMI and BMI percentile calculated.
• A 4-hour liquid mixed meal tolerance test (MMTT, 45g CHO, 14g fat, 14g protein) was performed with the following labs frequently sampled throughout the MMTT: glucose, insulin, c-peptide, free fatty acids, GLP-1, and PYY.
• Calculations included fasting HOMA-IR, Matsuda Index, oral disposition index, and MTTT area under the curve (AUC) for each lab.
• Statistical analyses were performed via GraphPad Prism 9.0. Changes in outcomes were tested using paired t-tests. AUC was calculated using the trapezoidal rule. p < 0.05 was considered statistically significant.

Results

<table>
<thead>
<tr>
<th>Variable (units)</th>
<th>Baseline</th>
<th>3-Month Post Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>17±1</td>
<td>17.2±1.5</td>
</tr>
<tr>
<td>Sex (m/f)</td>
<td>7/7</td>
<td>-</td>
</tr>
<tr>
<td>Race/Ethnicity</td>
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<td>-</td>
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<tr>
<td>Hispanic</td>
<td>11</td>
<td>-</td>
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<tr>
<td>Non-Hispanic</td>
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<tr>
<td>White</td>
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</tr>
<tr>
<td>African American</td>
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<td></td>
</tr>
<tr>
<td>Height (cm)</td>
<td>169.5±7.3</td>
<td>169.9±7.3</td>
</tr>
<tr>
<td>BMI Mass (kg)</td>
<td>134.8±8.7</td>
<td>107.4±15.7*</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>46.8±5.5</td>
<td>37.2±4.7*</td>
</tr>
<tr>
<td>BMI (% of 95th %ile)</td>
<td>161.8±21</td>
<td>127.7±20.1*</td>
</tr>
</tbody>
</table>

Table 1: Participant demographics. Baseline and 3-month characteristics are presented as mean ± SD. *p<0.05.

Conclusions

• Within 3 months, VSG induced notable weight loss and improvements in glycemic control in youth with T2D.
• 80% of participants were no longer taking diabetes medications at 3 months.
• Changes were accompanied by improved insulin sensitivity and β-cell function.
• First phase insulin secretion appears to be the driver of improved insulin action, as demonstrated by the oDI and insulin and c-peptide kinetics during the first 30 minutes of the MMTT.

Future Directions

• Assess durability of improvements (1-year and 2-year follow up).
• Investigate underlying mechanisms driving improvements (MMTT incretin response)

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