Case Presentation: Morbidly Obese Adolescent

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Surgical Director, UCLA FIT Program
R.A.

15y/o Adolescent Girl
138kg / 160.8cm – 53.4 BMI
Overweight since age 4.
Gaining 20 lbs/year.

Comorbidities:
Morbid Obesity
Acanthosis Nigricans
Hypertension
Polycystic Ovarian Disease
Sleepiness
Depression
R.A.

Readiness to Change
Patient 4.5/5
Parents 5/5

History
Weight Watchers
Weight MD 15 lb weight loss

Family History
Grandparents, mother, and one of two brothers are overweight. Father is not overweight.
Aunt had bariatric surgery.
R.A.

Home
Mother is a nurse and works nights.
3+ hours qd of screen time. Brother teases her about weight.
Father is truck-driver -> negative interactions.
Mother has at times been critical/hurtful/unsupportive.

Social
Sexually active.
History of drinking and marijuana.

Sleep
7 hours per night (3am to 10am). + Sleepiness scale.
R.A.

School
Independent study; embarassed by appearance.
C & D student.

Physical Activity
Walks. Parks nearby are safe.

Diet
Skips breakfast. No binge-eating. 2 meals/per day.
Rarely drinks soft drinks. 1% milk.
R.A.

Exam
Acne
Acanthosis
Hirsutism
Tanner Stage V

Abnormal Labs
Thiamine - 64 (70-180)
Vitamin D - 7 (30-80)
## R.A.

<table>
<thead>
<tr>
<th>Date</th>
<th>Weight (kg)</th>
<th>Height (cm)</th>
<th>BMI</th>
<th>Blood Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/26/2008</td>
<td>138 (303)</td>
<td>160.8</td>
<td>53.4</td>
<td>130/89</td>
</tr>
<tr>
<td>3/30/2010</td>
<td>146 (321)</td>
<td>161.3</td>
<td>56.0</td>
<td>132/80</td>
</tr>
</tbody>
</table>

**Abnormal Labs**
- Thiamine - 64 (70-180)
- Vitamin D - 7 (30-80)

**Normal Labs**
- Thyroid Panel
- LFTs
- Cholesterol Panel
- PTH/Ca
R.A.

Psychiatric clearance.
>6-month UCLA Fit Program.

**Goals**
Attend 4-hour bariatric class, homework, & quiz.
Reduce weight by 5% (136kg) by limiting diet to 1500 calories & 60 grams proteins.
Increase physical activity from 3 to 7 times per week (45-60 minutes).
Research Study

Outcomes

BOLD (Bariatric Outcomes Longitudinal Database)

Surveys

Epworth Sleepiness Scale
BAROS QOL
SF-36
Obstetrical/Offspring Health and Fertility Survey

Calorimetry, Biomarkers, and Epigenome (GCRC)

Body Composition (CHLA) – Vitamin D / Calcium
CT-scan
DEXA
Carotid Duplex (Intima/Media)
Bariatric Surgery Options

A. Laparoscopic adjustable gastric banding

B. Sleeve gastrectomy

C. Roux-en-Y gastric bypass
Adolescent Outcomes: Band vs. Bypass

2005-2007 California Data: Age <21

2005-2007 California Data: Age <18

### 2005-2007 California Data: Age <21

<table>
<thead>
<tr>
<th></th>
<th>Bypass</th>
<th>Band</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambulatory Surgery Center</td>
<td>0%</td>
<td>46%</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Center of Excellence</td>
<td>71%</td>
<td>37%</td>
<td>&lt;0.01</td>
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<tr>
<td>Children’s Hospital</td>
<td>7%</td>
<td>11%</td>
<td>NS</td>
</tr>
</tbody>
</table>

## 2005-2007 California Data: Age <21

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Private Insurance</th>
<th>Public Insurance</th>
<th>Self Pay</th>
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</thead>
<tbody>
<tr>
<td>Bypass</td>
<td>1</td>
<td>0.89 (0.67-1.11)</td>
<td>0.45 (0.33-0.58)</td>
</tr>
<tr>
<td>Band</td>
<td>0.21 (0.09-0.32)</td>
<td>0.86 (0.01-1.88)</td>
<td>3.51 (2.11-5.32)</td>
</tr>
</tbody>
</table>

Multinomial logistic regression while controlling for year of operation, hospital volume, centers of excellence, age, sex, race and distance travelled.
### 2005-2007 California Data: Age <21

<table>
<thead>
<tr>
<th></th>
<th>Bypass n= 410</th>
<th>Band n=103</th>
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</thead>
<tbody>
<tr>
<td>Mean F/U</td>
<td>18 months</td>
<td>12 months</td>
</tr>
<tr>
<td>Deaths</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>In-Hospital Complications</td>
<td>6%</td>
<td>3%</td>
</tr>
<tr>
<td>Hospital Readmission</td>
<td>11%</td>
<td>5%</td>
</tr>
<tr>
<td>Emergency Room Visits</td>
<td>9%</td>
<td>8%</td>
</tr>
<tr>
<td>Ambulatory Surgery Center Visits</td>
<td>7%</td>
<td>2%</td>
</tr>
<tr>
<td>Reoperation</td>
<td>2.9%</td>
<td>-</td>
</tr>
<tr>
<td>Band Revision/Removal</td>
<td>-</td>
<td>4.7%</td>
</tr>
</tbody>
</table>
Adolescent Indications for Surgery

Physical Maturity (Girls >13; Boys >15)
Emotional and Cognitive Maturity (Informed Assent)
Weight Loss Efforts > 6 Months (Behavior-Based)
Long-Term Follow Up (Nutrition & Psychological Support)
Avoid Pregnancy for > 1 Year

<table>
<thead>
<tr>
<th>New</th>
<th>Old</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI &gt; 40</td>
<td>BMI &gt; 50</td>
</tr>
<tr>
<td>BMI &gt; 35 + Comorbidities</td>
<td>BMI &gt; 40 + Comorbidities</td>
</tr>
</tbody>
</table>

Comorbidities:

- Hypertension
- Diabetes
- Hyperlipidemia
- Sleep apnea
- Severe arthrosis
- Panniculitis
- Venous Stasis Disease
- Urinary Incontinence
- Impaired Quality of Life
- NAFLD

Rationale for Early Intervention

Pre-Op Weight Influences Post-Op Weight

Duration of Diabetes Predicts Failure to Achieve Full Remission Post-Surgery (Beta-Islet-Cell Burnout)

Early Stages of Fatty Liver Disease Respond Better.

Improved Pregnancy and Neonatal Outcomes

Lower Operative Risk (Less Advanced Comorbidities)

Improvement in Life Expectancy & Quality of Life

Decreased Need for Abdominoplasty

Cost Savings?
Study Design

Prospective, Randomized, (Not Blinded) Controlled

Gastric-banding (Free)
Optimal Lifestyle Program (Free)

Population: 50 Adolescents with BMI>35
Location: Melbourne, Australia

Hypothesis: Gastric banding would induce more weight loss and provide greater health benefits and better improvement in quality of life of obese adolescents than optimal application of currently available lifestyle approaches.
Criteria

Age 14-18
BMI >35
Medical Complications
Attempts to lose weight by lifestyle >3 years
Preparation & Randomization

Visit 1 - Patient Information Session
  2-Week Food Diary and Activity Log + Pedometer
  Several Questionnaires

Visit 2 – Consultation (<4 weeks later)
  Clinical assessment
  History / Labs

2-Month Program
  Best practice recommendations (eating and physical activity)

Visit 3 – Consent

Follow Up (7 days later) – Confirmation and Randomization
Lifestyle Program

Individual Diet Plan
Increased Activity
Structured Exercise Schedule
Personal Trainer for 6-weeks
Compliance Monitoring
  Food Diaries
  Step Counts
Q 6 week F/U with:
  Adolescent MD
  Dietitian or Exercise Consultant
  Study Nurse Coordinator
  Sports Medicine Physician
Family Involvement
Group Outings / Outdoor Reunions
Invitation for Educational Programs

Surgery

Diet instructions.
Encouragement Activity 30 min/day
Band adjustments prn.
  Based on weight loss, satiety,
  eating pattern, and symptoms.
Q 6 Week F/U
  Experienced Medical Staff
Statistical Analysis

Powered using Intention-to-treat Analysis

>50% Excess Weight Loss at 2 Years
  Surgery: >60%
  Lifestyle: <10%

17 patients in each group for 80% power & two-sided p<0.05.
Assumed 30% drop-out after randomization (n=25).
Outcomes

Weight loss, % Weight Loss, BMI Change, BMI Z-scores
Neck, Waist, Hip Circumference
Health: Metabolic Syndrome, Hypertension, HOMA
QOL: Child Health Questionnaire (CHQ CF-50)
Adverse Events
163 Adolescents prescreened by telephone

79 Excluded
33 Had body mass index <35,
did not meet age requirements, or lived too remotely
10 Did not attend information seminar
36 Did not wish to proceed

84 Underwent clinical assessment

34 Excluded
8 Did not attend second appointment
4 Had body mass index <35
4 Had medical exclusions
4 Did not adhere to study protocol
1 Lacked parental support
1 Parent refused consent
1 Withdrawed before randomization
8 Refused randomization
3 Were geographically remote

50 Randomized

25 Randomized to receive laparoscopic adjustable gastric banding
1 Refused to return for follow-up

24 Completed study
25 Included in primary analysis

25 Randomized to lifestyle modification
7 Withdrawed from study
1 Family problems
4 Unhappy with progress
1 Refused to return for follow-up
1 Had difficulty attending follow-up

18 Completed study
25 Included in primary analysis
## Table 1. Baseline Characteristics of Participants

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Laparoscopic Adjustable Gastric Banding Group (n = 25)</th>
<th>Lifestyle Group (n = 25)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y</td>
<td>16.5 (1.4)</td>
<td>16.6 (1.2)</td>
<td>.78</td>
</tr>
<tr>
<td>Male sex, No. (%)</td>
<td>9 (36.0)</td>
<td>7 (28.0)</td>
<td>.54</td>
</tr>
<tr>
<td>BMI</td>
<td>42.3 (6.1)</td>
<td>40.4 (3.1)</td>
<td>.18</td>
</tr>
<tr>
<td>BMI percentile</td>
<td>99.25 (0.51)</td>
<td>99.20 (0.43)</td>
<td>.19</td>
</tr>
<tr>
<td>z Score</td>
<td>2.54 (0.31)</td>
<td>2.46 (0.22)</td>
<td>.37</td>
</tr>
<tr>
<td>Weight, kg</td>
<td>120.7 (25.3)</td>
<td>115.4 (14.0)</td>
<td>.37</td>
</tr>
<tr>
<td>Waist circumference, cm</td>
<td>120.8 (14.2)</td>
<td>118.1 (10.6)</td>
<td>.45</td>
</tr>
<tr>
<td>Blood pressure, mm Hg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systolic</td>
<td>122.0 (13.9)</td>
<td>132.8 (15.9)</td>
<td>.01</td>
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<tr>
<td>Diastolic</td>
<td>72.4 (7.5)</td>
<td>76.5 (10.5)</td>
<td>.12</td>
</tr>
<tr>
<td>Plasma glucose, mg/dL</td>
<td>89 (20)</td>
<td>82 (7.2)</td>
<td>.07</td>
</tr>
<tr>
<td>Plasma insulin, µU/mL</td>
<td>23.4 (10.6)</td>
<td>26.1 (13.3)</td>
<td>.43</td>
</tr>
<tr>
<td>HOMA, median (IQR), % Insulin sensitivity</td>
<td>35 (29.9-49.4)</td>
<td>35.5 (23.5-50.6)</td>
<td>.59</td>
</tr>
<tr>
<td>β-Cell function</td>
<td>210 (13.7)</td>
<td>255 (17.1)</td>
<td>.048</td>
</tr>
<tr>
<td>Total cholesterol, mg/dL</td>
<td>173 (27)</td>
<td>178 (27)</td>
<td>.53</td>
</tr>
<tr>
<td>Triglycerides, mg/dL</td>
<td>124 (44)</td>
<td>141 (141)</td>
<td>.50</td>
</tr>
<tr>
<td>HDL-C, mg/dL</td>
<td>46 (12)</td>
<td>46 (8)</td>
<td>.82</td>
</tr>
<tr>
<td>Metabolic syndrome, No. (%)</td>
<td>9 (36)</td>
<td>10 (40)</td>
<td>.77</td>
</tr>
</tbody>
</table>

Abbreviations: BMI, body mass index, calculated as weight in kilograms divided by height in meters squared; HDL-C, highdensity lipoprotein cholesterol; HOMA, homeostasis model assessment; IQR, interquartile range.

SI conversion factors: to convert total cholesterol and HDL-C from mg/dL to mmol/L, multiply by 0.0259 and triglycerides from mg/dL to mmol/L, multiply by 0.0113.

Data are presented as mean (SD), unless otherwise indicated.
Individual Weight Change

- Baseline weight
- Laparoscopic adjustable gastric banding (n = 24)
- Lifestyle modification (n = 18)
<table>
<thead>
<tr>
<th></th>
<th>LAGB - Initial</th>
<th>LAGB - Final</th>
<th>P-value (1)</th>
<th>Lifestyle - Initial</th>
<th>Lifestyle - Final</th>
<th>P-value (2)</th>
<th>P-value (3)</th>
<th>Community Norms</th>
</tr>
</thead>
<tbody>
<tr>
<td>BE - General Behaviour</td>
<td>59.1 (19)</td>
<td>64.0 (21)</td>
<td>.42</td>
<td>58.0 (19)</td>
<td>58.6 (19)</td>
<td>.80</td>
<td>0.27</td>
<td>77.5</td>
</tr>
<tr>
<td>FA - Family Activities</td>
<td>70.5 (23)</td>
<td>85.6 (16)</td>
<td>.006</td>
<td>73.1 (18)</td>
<td>80.2 (23)</td>
<td>.60</td>
<td>0.12</td>
<td>72.5</td>
</tr>
<tr>
<td>FC - Family Cohesion</td>
<td>52.8 (24)</td>
<td>50.8 (32)</td>
<td>.76</td>
<td>62.8 (23)</td>
<td>70.8 (23)</td>
<td>.48</td>
<td>0.52</td>
<td>71.2</td>
</tr>
<tr>
<td>GH - General Health</td>
<td>47.8 (17)</td>
<td>65.7 (21)</td>
<td>.003</td>
<td>47.1 (15)</td>
<td>53.7 (15)</td>
<td>.044</td>
<td>0.37</td>
<td>68.1</td>
</tr>
<tr>
<td>MH - Mental Health</td>
<td>75.0 (65-81)</td>
<td>73.0 (3.3)</td>
<td>.66</td>
<td>65.6 (56-75)</td>
<td>67.0 (2.5)</td>
<td>.90</td>
<td>0.69</td>
<td>74.9</td>
</tr>
<tr>
<td>PF - Physical Functioning</td>
<td>73.1 (18)</td>
<td>94.4 (6.6)</td>
<td>&lt;.001</td>
<td>80.4 (20)</td>
<td>78.1 (24)</td>
<td>.79</td>
<td>.002</td>
<td>94.8</td>
</tr>
<tr>
<td>SE - Self-esteem</td>
<td>55.9 (18)</td>
<td>70.8 (21)</td>
<td>.012</td>
<td>60.5 (15)</td>
<td>62.7 (22)</td>
<td>.94</td>
<td>0.21</td>
<td>74.6</td>
</tr>
<tr>
<td>CH - Change in Health</td>
<td>2.48 (0.8)</td>
<td>4.38 (0.8)</td>
<td>&lt;.001</td>
<td>2.96 (0.8)</td>
<td>3.56 (1.2)</td>
<td>.094</td>
<td>.006</td>
<td>3.54</td>
</tr>
</tbody>
</table>
# Changes in Cardiovascular Risk

<table>
<thead>
<tr>
<th>Change in Variable</th>
<th>Laparoscopic Adjustable Gastric Banding Group (n = 24)</th>
<th>Lifestyle Group (n = 18)</th>
<th>Between-Group Difference, Mean (95% Confidence Interval)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waist circumference, cm</td>
<td>-28.2 (12.4)</td>
<td>-3.5 (14.6)</td>
<td>-24.7 (-33.1 to -16.3)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>P value</td>
<td>&lt;.001</td>
<td>.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blood pressure systolic, mm Hg</td>
<td>-12.5 (17.8)</td>
<td>-20.3 (21.7)</td>
<td>7.8 (-4.5 to 20.1)</td>
<td>.21</td>
</tr>
<tr>
<td>P value</td>
<td>&lt;.002</td>
<td>&lt;.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diastolic, mm Hg</td>
<td>-6.0 (9.4)</td>
<td>-6.9 (12.5)</td>
<td>0.9 (-5.9 to 7.7)</td>
<td>.79</td>
</tr>
<tr>
<td>P value</td>
<td>&lt;.01</td>
<td>&lt;.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plasma glucose, mg/dL</td>
<td>-6.8 (20)</td>
<td>2.8 (9)</td>
<td>-9.6 (-18.6 to 2.3)</td>
<td>.13</td>
</tr>
<tr>
<td>P value</td>
<td>.11</td>
<td>.46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plasma insulin, μU/mL</td>
<td>-15.2 (10.1)</td>
<td>-11.2 (11.0)</td>
<td>-4.0 (-10.8 to 2.8)</td>
<td>.24</td>
</tr>
<tr>
<td>P value</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HOMA insulin sensitivity, %</td>
<td>89 (71)</td>
<td>14.6 (48)</td>
<td>74.6 (116 to 33)</td>
<td>.001</td>
</tr>
<tr>
<td>P value</td>
<td>&lt;.001</td>
<td>&lt;.26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HOMA β-cell function, %</td>
<td>-95.4 (70)</td>
<td>-74.9 (88.5)</td>
<td>-20.5 (31 to -72)</td>
<td>.43</td>
</tr>
<tr>
<td>P value</td>
<td>&lt;.001</td>
<td>.006</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Triglycerides, mg/dL</td>
<td>-52 (36)</td>
<td>-32 (63)</td>
<td>-20 (59 to 18)</td>
<td>.29</td>
</tr>
<tr>
<td>P value</td>
<td>&lt;.001</td>
<td>.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HDL cholesterol, mg/dL</td>
<td>9.3 (14.7)</td>
<td>3.9 (6)</td>
<td>5.4 (3.5 to 14)</td>
<td>.22</td>
</tr>
<tr>
<td>P value</td>
<td>&lt;.005</td>
<td>.18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metabolic syndrome, No.</td>
<td>0</td>
<td>4</td>
<td>78</td>
<td>.03</td>
</tr>
<tr>
<td>P value</td>
<td>.008</td>
<td>.12</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: HDL, high-density lipoprotein; HOMA, homeostasis model assessment.

SI conversion factors: to convert HDL cholesterol from mg/dL to mmol/L, multiply by 0.0259 and triglycerides from mg/dL to mmol/L, multiply by 0.0113.

aData are presented as mean (SD) unless otherwise indicated. See Table 1 for baseline values.

bP values are for the difference between groups. All other P values are for within group differences.
**Adverse Events**

BAND - 7 patients required 8 (33%) revisional procedures.

<table>
<thead>
<tr>
<th>Event</th>
<th>No. of Events (% of Patients)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Laparoscopic adjustable gastric banding group (n = 25)</strong></td>
<td></td>
</tr>
<tr>
<td>Total No. of events/participants (%)</td>
<td>13/12 (48)</td>
</tr>
<tr>
<td>Event</td>
<td></td>
</tr>
<tr>
<td>Proximal gastric enlargements</td>
<td>6 (24)</td>
</tr>
<tr>
<td>Needle stick injury to tubing</td>
<td>2 (8)</td>
</tr>
<tr>
<td>Cholecystectomy</td>
<td>1 (4)</td>
</tr>
<tr>
<td>Hospital admission for depression</td>
<td>1 (4)</td>
</tr>
<tr>
<td>Lost to follow-up</td>
<td>1 (4)</td>
</tr>
<tr>
<td>Unplanned pregnancy</td>
<td>2 (8)</td>
</tr>
<tr>
<td><strong>Lifestyle group (n = 25)</strong></td>
<td></td>
</tr>
<tr>
<td>Total No. of events/participants (%)</td>
<td>18/11 (44)</td>
</tr>
<tr>
<td>Event</td>
<td></td>
</tr>
<tr>
<td>Hospital admission for depression and intracranial hypertension event/No. of participants (%)</td>
<td>8/1 (4)</td>
</tr>
<tr>
<td>Cholecystectomy</td>
<td>1 (4)</td>
</tr>
<tr>
<td>Loss to follow-up</td>
<td>7 (28)</td>
</tr>
<tr>
<td>Unplanned pregnancy</td>
<td>2 (8)</td>
</tr>
</tbody>
</table>
Strengths

Randomized Controlled Trials can be performed in surgery!

Lifestyle interventions may have some health benefits despite unimpressive weight loss.

Level 1 evidence to support bariatric surgery.

Adverse events in adolescents undergoing bands are high (especially for an experienced center).

Conflicts of interest disclosed.
Criticisms

Unbelievable Data:

  Failure to Disclose by Lead Author
  Low attrition rate in both groups.
    Incentives for follow up?
    Free treatment may have influenced study population.
  % EWL 79% for band and % EWL 13% for lifestyle.
  % EWL >50%: 84% band and 12% for lifestyle.

Reproducibility?

  Preparation, Intervention, Attrition (4% and 28%), and Results.
  Adverse events
    BAND: 20.4 visits / 9.5 adjustments of band.
    LIFESTYLE: 15.5 visits; 5 phone consultations; 6 personal trainer sessions

Durability?
Figure 1. Mean Percent Weight Change during a 15-Year Period in the Control Group and the Surgery Group, According to the Method of Bariatric Surgery.
I bars denote 95% confidence intervals.
# Real-World Outcomes: Band vs. Bypass

Michigan Bariatric Surgery Collaborative  
Prospective Clinical Registry  
2006-2008 – 1 Year Follow Up

<table>
<thead>
<tr>
<th></th>
<th>Band</th>
<th>Bypass</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of Cases</td>
<td>35%</td>
<td>54%</td>
</tr>
<tr>
<td>Serious Complications</td>
<td>0.7%</td>
<td>3.4%</td>
</tr>
<tr>
<td>Death</td>
<td>0.04%</td>
<td>0.1%</td>
</tr>
<tr>
<td>EBWL</td>
<td>40%</td>
<td>67%</td>
</tr>
<tr>
<td>Diabetes Resolved</td>
<td>47%</td>
<td>77%</td>
</tr>
<tr>
<td>Hypertension Resolved</td>
<td>25%</td>
<td>55%</td>
</tr>
<tr>
<td>Hyperlipidemia Resolved</td>
<td>30%</td>
<td>66%</td>
</tr>
<tr>
<td>% Very Satisfied</td>
<td>64%</td>
<td>90%</td>
</tr>
</tbody>
</table>

Meta-analysis of 17 RCTs in lifestyle interventions to treat obesity in children.

Results:
Modest weight reduction for up to 12 months.
Weight regain.

Bariatric Surgery Options

C Roux-en-Y gastric bypass

A Laparoscopic adjustable gastric banding

B Sleeve gastrectomy
Adolescents - Diabetes

Number of Patients = 11 Adolescents

10 Oral Hypoglycemic Agents -> Off
1 Insulin & Oral Agents -> Decreased Insulin Requirements

Mean age = 16 years
Mean Weight & BMI = 149 kg and BMI 50
Mean Follow Up = 1 year

Weight Loss = 33 to 99 kg
Mean BMI Drop: 34%
Post-Op BMI%ile: Still >85%ile

Inge et al. Reversal of Type 2 Diabetes Mellitus and Improvements in Cardiovascular Risk Factors After Surgical Weight Loss in Adolescents. Pediatrics 2009;123;214-222.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Surgery</th>
<th>Medical Cohort</th>
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<tbody>
<tr>
<td>Weight</td>
<td>-34%</td>
<td>-0.3%</td>
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<tr>
<td>BMI</td>
<td>-34%</td>
<td>-1.6%</td>
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<tr>
<td>SBP</td>
<td>-7.4%</td>
<td>1.0%</td>
</tr>
<tr>
<td>DBP</td>
<td>-19.5%</td>
<td>-1.1%</td>
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<tr>
<td>HR</td>
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<td>HgA1C</td>
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<td>-0.8%</td>
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<td>Glucose</td>
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<td>diet changes</td>
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<td>Insulin</td>
<td>-81%</td>
<td>meds - minimal change</td>
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<tr>
<td>TGs</td>
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<tr>
<td>Chol</td>
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<tr>
<td>HDL</td>
<td>+14%</td>
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</tr>
<tr>
<td>LDL</td>
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<td></td>
</tr>
<tr>
<td>ALT</td>
<td>-51%</td>
<td></td>
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<tr>
<td>AST</td>
<td>-37%</td>
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</table>
**Adolescent Gastric Band**

Randomized Trial from Australia.

Mean Follow Up = 2 years

<table>
<thead>
<tr>
<th></th>
<th>Band</th>
<th>Lifestyle</th>
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<tbody>
<tr>
<td>Completed Study</td>
<td>24/25</td>
<td>18/25</td>
</tr>
<tr>
<td>&gt;50% EWL</td>
<td>84%</td>
<td>12%</td>
</tr>
<tr>
<td>% Pre Met Sx</td>
<td>36%</td>
<td>40%</td>
</tr>
<tr>
<td>% Post Met Sx</td>
<td>0%</td>
<td>22%</td>
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<tr>
<td></td>
<td></td>
<td>p=0.03</td>
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<tr>
<td>HOMA Ins Sensitivity</td>
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<td>14.6</td>
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<tr>
<td></td>
<td></td>
<td>p=0.001</td>
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<tr>
<td>Waist circumference</td>
<td>-28.2</td>
<td>-3.5</td>
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<tr>
<td></td>
<td></td>
<td>p&lt;0.001</td>
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</table>

Reoperations: 8 (33%) in 7 of 24 patients completing study for pouch dilation (6) and tubing injury (2).
Diet / Medications / Therapy

Adults

$32-40 billion industry.
Relatively small amount of weight loss (10 to 40 lbs)
95% fail to maintain weight loss.
Drug therapy can have side effects.

Children

High dropout rates (29-35%).
Minimal BMI Drop (0.55 to 3.2 units) after 1-year.
(Chanoine – Orlistat JAMA 2005; Savoye – Weight Management Program JAMA 2007; Berkowitz – Behavior Therapy and sibutramine JAMA 2003). Starting BMI was 35.6 to 37.5.
Surgical Outcomes

Weight Loss: 60% Excess Body-Weight in 1 to 2 Years

5’4” Female with BMI of 43
Preoperative Body Weight: 250 lbs
Ideal Body Weight: 125 lb (85%ile is 139 lbs for a 15 year old)
Excess Body Weight: 125 lbs
60% of Excess Body Weight: 75 lbs
Average Expected Postoperative Weight After 2 Years: 175 lbs
Postoperative BMI: 30

Reduction of Comorbidities

75% - Resolution of Diabetes Type 2
80% - Improvement in Blood Pressure & Sleep Apnea
Adolescent - Gastric Bypass

Number of Patients = 11 Adolescents
Mean age = 16 years
Mean BMI = 50
Mean Follow Up = 1 year

Excess Weight Loss = 60%
Improvement in Comorbidities = 70%
Marked improvement:
  Quality of life     Social functioning
  Self-esteem        Productivity

Adolescent Gastric Band

Mean Follow Up = 2 years
Excess Body Weight Loss = 61%
Number of Band Adjustments 1st Year = 6
Complication Rate: 15%

- Band Migration Requiring Repositioning
- Development of Symptomatic Hiatal Hernias
- Wound Infection / Port Leak
- Nutritional Deficiencies (Fe 17%; Asymptomatic Vitamin D 5%)

Laparoscopic Surgical Options

Sleeve Gastrectomy
Roux en-Y Gastric Bypass
Biliopancreatic Diversion

Restrictive
Malabsorptive

Gastric Band

Dysphagia
Gastric Band (Not FDA-approved if <18yrs)

Band Slippage / Infection / Gastric Erosion
Megaesophagus / Esophagitis
Compliance with Port Management
Long-Term Efficacy
Complicates Revisional (RYGB) Surgery
Potential Long-Term Consequences (Esophageal Dysfunction)

47% Complication Rate & 29% Reoperation Rate

52% Complications -> Reoperation 40% BAROS Failure Rate

33% Reoperation Rate at 2 Years
Follow Up – 2 Years. 6 or 24 for pouch enlargement and 2 for tubing injury.
Less consistent % weight loss (>SD than RYGB).
(Dixon – Australian Randomized Control Study – JAMA 2010)
Sleeve Gastrectomy

Metabolic Surgery (Decreased Ghrelin Levels & Reduces Appetite)
Similar Excess Weight Loss and Resolution of Diabetes to RYGB
Reduced Complication and ER Admission Rate
Avoids Malabsorption – Decreased Supplements Post-Op
Avoids Anastomosis (Leak, Stricture, Anastomosis, Intussusception)
Avoids Impaired Medication Absorption (e.g. Seizure Medications)
Avoids Implantation of Foreign Bodies (No Adjustment)
Allows for Endoscopic Surveillance of Distal Stomach & Biliary Tree
‘Easy’ and ‘Safe’ Conversion to RYGB or Biliary Pancreatic Diversion (BPD)

75cc Volume in Gastric Tube

Antrum is Preserved