Disclosure

- Medtronic - Speaker/Research Grant/Robotics Advisory Board
- Gore - Education Grant/Speaker
- Teleflex - Consultant
- Da Vinci - Proctor
- Mederi - Speaker
- Novadaq - Advisory Board
- Levita Magnetics - Advisory Board
Figure 1. Trends in obesity among children and adolescents: United States, 1963–2008

NOTE: Obesity is defined as body mass index (BMI) greater than or equal to sex- and age-specific 95th percentile from the 2000 CDC Growth Charts.

2014: Percent of adults aged 18 years and older who are overweight †

Footnotes
† Overweight is defined as body mass index (BMI) ≥ 25.0 but <30.0; BMI was calculated from self-reported weight and height (weight [kg]/ height [m²]). Respondents reporting weight < 50 pounds or ≥ 650 pounds; height < 3 feet or ≥ 8 feet; or BMI: <12 or ≥ 100 were excluded. Pregnant respondents were also excluded.

Weight Loss Variation among Patients

- Diet (Low Carbohydrate)
- Drug (Liraglutide)
- Device (Duodenal Liner)
- Surgery (Gastric Bypass)
Weight Loss distribution

RYGB Skewed Right

Band Skewed Left

Fig. 1. %EWL at 1 year postoperatively.
Effects of Bariatric Surgery on Mortality in Swedish Obese Subjects

Lars Sjöström, M.D., Ph.D., Kristina Narbro, Ph.D., C. David Sjöström, M.D., Ph.D., Kristjan Karason, M.D., Ph.D., Bo Larsson, M.D., Ph.D., Hans Wedel, Ph.D., Ted Lystig, Ph.D., Marianne Sullivan, Ph.D., Claude Bouchard, Ph.D., Björn Carlsson, M.D., Ph.D., Calle Bengtsson, M.D., Ph.D., Sven Dahlgren, M.D., Ph.D., Anders Gummesson, M.D., Peter Jacobson, M.D., Ph.D., Jan Karlsson, Ph.D., Anna-Karin Lindroos, Ph.D., Hans Lönnroth, M.D., Ph.D., Ingmar Näslund, M.D., Ph.D., Torsten Olbers, M.D., Ph.D., Kaj Stenlöf, M.D., Ph.D., Jarl Torgerson, M.D., Ph.D., Göran Ågren, M.D., and Lena M.S. Carlsson, M.D., Ph.D., for the Swedish Obese Subjects Study

BACKGROUND
Obesity is associated with increased mortality. Weight loss improves cardiovascular risk factors, but no prospective interventional studies have reported whether weight loss decreases overall mortality. In fact, many observational studies suggest that weight reduction is associated with increased mortality.

METHODS
The prospective, controlled Swedish Obese Subjects study involved 4047 obese subjects. Of these subjects, 2010 underwent bariatric surgery (surgery group) and 2037 received conventional treatment (matched control group). We report on overall mortality during an average of 10.9 years of follow-up. At the time of the analysis (November 1, 2005), vital status was known for all but three subjects (follow-up rate, 99.9%).

RESULTS
The average weight change in control subjects was less than ±2% during the period of up to 15 years during which weights were recorded. Maximum weight losses in the surgical subgroups were observed after 1 to 2 years: gastric bypass, 32%; vertical-banded gastroplasty, 25%; and banding, 20%. After 10 years, the weight losses from baseline were stabilized at 25%, 16%, and 14%, respectively. There were 129 deaths in the control group and 101 deaths in the surgery group. The unadjusted overall hazard ratio was 0.76 in the surgery group (P=0.04), as compared with the control group, and the hazard ratio adjusted for sex, age, and risk factors was 0.71 (P=0.01). The most common causes of death were myocardial infarction (control group, 25 subjects; surgery group, 13 subjects) and cancer (control group, 47; surgery group, 29).

CONCLUSIONS
Bariatric surgery for severe obesity is associated with long-term weight loss and decreased overall mortality.
<table>
<thead>
<tr>
<th>Procedure</th>
<th>10 Years After Surgery</th>
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<tbody>
<tr>
<td></td>
<td>Nonsuccessful</td>
</tr>
<tr>
<td>Gastric Bypass</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td><em>(34% if BMI &gt;50)</em></td>
</tr>
<tr>
<td>Duodenal Switch</td>
<td>6%</td>
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<tr>
<td>Sleeve Gastrectomy</td>
<td>unknown</td>
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</table>

*(higher than gastric bypass after 1 year)*

BMI/Weight scale:
- High: 1024.0x768.0
- Low: 90x21 to 1238x768

Day of Surgery: 6 months
Time: 20%

10 Years After Surgery:
- 50% EWL
How many bariatric surgeries are taking place?

The fast growth in weight-loss surgeries has ended. Though numbers are not available beyond 2009, most in the field believe the number of procedures is going down.

Source: American Society for Metabolic & Bariatric Surgery

Published April 23, 2012, in American Medical News. www.amednews.com

Published July 2016

<table>
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<tr>
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<tr>
<td>Total</td>
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<td>RNY</td>
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<td>Band</td>
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<td>20.2%</td>
<td>14%</td>
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<td>Sleeve</td>
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<td>2.7%</td>
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<tr>
<td>Balloons</td>
<td>~700 cases</td>
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<td></td>
<td></td>
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<tr>
<td>V-Bloc</td>
<td>18 cases</td>
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Drive Growth in Bariatrics

- Risk Reduction
- Expand Access to care

- Push Metabolic Syndrome with obesity just one of the co-morbidities improved
- Change our messaging around obesity
Recent Experiences of Weight-based Stigmatization in a Weight Loss Surgery Population: Psychological and Behavioral Correlates

Kelli F. Friedman¹, Jamile A. Ashmore² and Katherine L. Applegate¹

Objective: This study evaluated the association between experiences of weight-based stigmatization (e.g., job discrimination, inappropriate comments from physicians) within the past month, psychological functioning, and binge eating among a sample of individuals seeking weight loss surgery.

Methods and Procedure: Ninety-four obese adults (25 males and 69 females) seeking weight loss surgery underwent a diagnostic clinical interview and completed a battery of self-report questionnaires measuring experiences of weight-related stigmatization, psychological adjustment, and binge eating behavior.

Results: Weight-based stigmatization was a common experience within the past month among participants. Frequency of stigmatizing experiences was negatively associated with self-esteem and positively associated with depression, anxiety, body image disturbance, and emotional eating. Recent experiences of stigmatization were associated with a diagnosis of binge eating disorder.

Discussion: Weight-based stigmatization is a common experience among obese individuals seeking weight loss surgery, and these experiences are associated with deleterious consequences. It appears that environmental barriers (e.g., chairs too small, not being able to find medical equipment in an appropriate size) and interpersonal attacks are the most common stigmatizing experiences. These data justify future studies to better understand causal relationships and efforts to design and test interventions aimed at reducing weight-based stigmatization and the associated negative consequences.
Complex Mechanistic Pathways

Diabetes

Obesity
Gastric Bypass Surgery Leads to Long-term Remission or Improvement of Type 2 Diabetes and Significant Decrease of Microvascular and Macrovascular Complications

Yijun Chen, MD,*, Leonor Corsino, MD, MHS,† Prapiporn Chatranukulchai Shantavasinkul, MD,‡§ John Grant, MD,† Dana Portenier, MD,‡ Laura Ding, PhD,¶ and Alfonso Torquati, MD, MSCI\|.

ABSTRACT

Objectives: The aim of the study was to compare long-term outcomes of 2 groups of morbidly obese patients with type 2 diabetes mellitus—1 managed by Roux-en-Y gastric bypass surgery and a comparable group managed medically.

Methods: The present study was a single-institution retrospective study. Of the 173 obese patients with type 2 diabetes mellitus undergoing gastric bypass surgery between January 2000 and July 2004, 78 patients (45%) were followed for at least 10 years. The control group consisted of 80 diabetic obese patients from the same period with similar body mass index, age, race, and severity of diabetes. The median follow-up was 11 years for both the groups.

Results: The group undergoing gastric bypass surgery had greater percentage of excess weight loss than the control group—66% versus 1.6%, respectively. Forty-one patients (52.6%) in the surgery group had complete remission of diabetes and 5 (6.4%) had partial remission. Twelve patients (15.4%) had diabetes recurrence after initial remission. No patient in the control group had remission of diabetes. Compared with the control group, the group undergoing gastric bypass surgery had a significantly reduced incidence of microvascular complications—46.3% versus 11.5%, and macrovascular complications—20.3% versus 5%, respectively (P < 0.01).

Conclusions: In this study, we demonstrated that after 10 years of follow-up, Roux-en-Y gastric bypass surgery, compared with nonsurgical medical management, resulted in significantly greater weight loss, reduction in HbA1c, and use of antidiabetic medications, and very importantly a lower incidence of both microvascular and macrovascular complications in obese patients with type 2 diabetes.

Keywords: bariatric, diabetes mellitus, diabetes vascular complications, long term, Roux-en-Y gastric bypass


FIGURE 1. Diabetic outcome in surgery group.
Gastric Bypass Surgery Leads to Long-term Remission or Improvement of Type 2 Diabetes and Significant Decrease of Weight.

Yijun Chen, MD
John Grant, MD

ABSTRACT

Objectives: The aim of this study was to assess the outcomes of weight loss and diabetes remission after laparoscopic Roux-en-Y gastric bypass surgery in patients with type 2 diabetes mellitus (T2DM).

Methods: This was a retrospective study of 173 patients diagnosed with T2DM who underwent laparoscopic Roux-en-Y gastric bypass surgery at the Duke University Medical Center between January 2000 and June 2004. The primary outcomes were weight loss and diabetes remission, measured by a 3-year follow-up period.

Results: A total of 146 patients (84.3%) achieved weight loss of at least 30% of initial body weight (IBW) and 123 patients (71.1%) achieved diabetes remission, defined as a fasting plasma glucose level of less than 100 mg/dL without the need for diabetes medications. The average weight loss was 46.8 kg (34.7% of IBW).

Hypothesis: Weight loss and diabetes remission are outcomes of Roux-en-Y gastric bypass surgery in patients with T2DM.

Methods and Results: This was a single institution retrospective study of 173 patients with T2DM who underwent laparoscopic Roux-en-Y gastric bypass surgery at Duke Center for Metabolic and Bariatric Surgery between January 2000 and June 2004. The primary outcomes were weight loss and diabetes remission, measured by a 3-year follow-up period.

Conclusion: Roux-en-Y gastric bypass surgery is an effective treatment for T2DM, leading to significant weight loss and diabetes remission.

FIGURE 1. Diabetic outcome in surgery group.
Complex Mechanistic Pathways

Diabetes

Obesity
Dr. Viktor Henriksson (1952) credited with first operation to induce weight loss

Resected a 105 cm segment of small intestine
Restrictive Malabsorption
>90% searches were for weight loss surgery or bariatrics

Only 2% searches were for **metabolic surgery**
Drive Growth in Bariatrics

- Risk Reduction
- Expand Access to care

- Push Metabolic Syndrome with obesity just one of the co-morbidities improved

- Change our messaging around obesity
Set Point or Set Range
• **2 Models of Energy Balance Equation**

  • Purposeful behavior (how much you eat and exercise drives) the physiology

  • The physiology drives the behaviors
WHO defines obesity as abnormal or excessive fat accumulation that may impair health.
Fat is the Bodies Fuel
Thermostat
Set Point

Influences on Set Point
- Genetics
- Environment
- Developmental

Homeostasis
Homeostasis
• CNS regulates set range
• Receives Signals from hormones
• Signals sent from fat, muscle, bone, GI track….

4k of our 22k genes are involved in body composition and metabolism
Set Range

Energy Intake

Energy Expenditure

BMI

(+ Energy Balance)

(- Energy Balance)

**Diet and exercise in management of obesity and overweight**

Kwong Ming Fock* and Joan Khoo†

Journal of Gastroenterology and Hepatology 2013; 28 (Suppl. 4): 59–63

**Type of diets**

In general, there are four types of dietary regimens used in the treatment of the overweight or obese persons: (Table 1)

1. Low-calorie diet (LCD)
2. Low-fat diet
3. Low-carbohydrate diet
4. Very low-calorie diet (VLCD)

The first three diets are 800–1500 kcal/day while VLCD is < 800 kcal/day.

---

2200 kcal/day - Average calories we consume daily

- 1300 kcal/day - Average calories we need daily

900 kcal/day - Excess daily
Type of diets

In general, there are four types of dietary regimens used in the treatment of the overweight or obese persons: (Table 1)

1. Low-calorie diet (LCD)
2. Low-fat diet
3. Low-carb diet
4. Very low-calorie diet (< 800 kcal/day)

- 2200 kcal/day - Average calories we consume daily
- 1300 kcal/day - Average calories we need daily
- 900 kcal/day - Excess daily
• CNS regulates set range
• Receives Signals from hormones
• Signals sent from fat, muscle, bone, GI track…. 
• CNS regulates set range
• Receives Signals from hormones
• Signals sent from fat, muscle, bone, GI track....

Less Calories won't work
Altering what you eat might
• **Chronic Exposure:**
  • Unhealthy Foods
  • Stress
  • Lack of Sleep
  • Medications that cause weight gain
Genetic Influences on Set Range
Weight Loss Variation among Patients

- **Diet (Low Carbohydrate)**
- **Drug (Liraglutide)**
- **Device (Duodenal Liner)**
- **Surgery (Gastric Bypass)**
Obesity isn't one disease. It's 59—at least.

Genetics play a role in obesity, experts say

11:00 AM - December 15, 2016

Until scientists build a comprehensive understanding obesity's many causes, the best way to find a weight-loss strategy that works for you may be trial and error, Gina Kolata reports for New York Times.

The solution to obesity seems obvious: Exercise more and eat less. And that's largely good advice. But when you dig into the science, things quickly get complicated.

No single cause

Consider a study conducted by Frank Sacks, a professor of nutrition at Harvard University, which randomly divided 811 overweight and obese adults into four groups. Each group followed a different diet derived from popular approaches, such as a low-fat, high-protein diet and a high-fat, average-protein diet.

On average, no diet produced much weight loss—but within each group, some people lost significant amounts of weight.
EveryOne Responds Differently due to differences in Genetics
BMI

- Baseline
- Healthy Lifestyle
- Weight Regain
- Restrictive Dieting
- Rebound Weight Gain
- Recurrent Dieting
- Rebound Weight Gain
Long-Term Persistence of Hormonal Adaptations to Weight Loss


BACKGROUND
After weight loss, changes in the circulating levels of several peripheral hormones involved in the homeostatic regulation of body weight occur. Whether these changes are transient or persist over time may be important for an understanding of the reasons behind the high rate of weight regain after diet-induced weight loss.

METHODS
We enrolled 50 overweight or obese patients without diabetes in a 10-week weight-loss program for which a very-low-energy diet was prescribed. At baseline (before weight loss), at 10 weeks (after program completion), and at 62 weeks, we examined circulating levels of leptin, ghrelin, peptide YY, gastric inhibitory polypeptide, glucagon-like peptide 1, amylin, pancreatic polypeptide, cholecystokinin, and insulin and subjective ratings of appetite.

RESULTS
Weight loss (mean ±SE, 13.5±0.5 kg) led to significant reductions in levels of leptin, peptide YY, cholecystokinin, insulin (P<0.001 for all comparisons), and amylin (P=0.002) and to increases in levels of ghrelin (P<0.001), gastric inhibitory polypeptide (P=0.004), and pancreatic polypeptide (P=0.008). There was also a significant increase in subjective appetite (P<0.001). One year after the initial weight loss, there were still significant differences from baseline in the mean levels of leptin (P<0.001), peptide YY (P<0.001), cholecystokinin (P=0.04), insulin (P=0.01), ghrelin (P<0.001), gastric inhibitory polypeptide (P<0.001), and pancreatic polypeptide (P=0.002), as well as hunger (P<0.001).

CONCLUSIONS
One year after initial weight reduction, levels of the circulating mediators of appetite that encourage weight regain after diet-induced weight loss do not revert to the levels recorded before weight loss. Long-term strategies to counteract this change may be needed to prevent obesity relapse. (Funded by the National Health and Medical Research Council and others; ClinicalTrials.gov number, NCT00870259.)
Lower Set Point with Surgery

Aging and Environmental Influences (No Intervention)

Fat Mass Set Point

Surgery

Aging and Environmental Influences (Post Intervention)

Time (years)
BMI 40

Example for a 6 foot 0 inches 300 lbs Patient

High BMI/Weight

Day of Surgery

Time

Lap Band

11 lbs 10% EWL

10% EWL

More Patients

Lap Band

88 lbs 80% EWL

Sleeve

64 lbs 40% EWL

40% EWL

More Patients

Sleeve

88 lbs 80% EWL

Gastric Bypass

66 lbs 60% EWL

60% EWL

Even

Gastric Bypass

88 lbs 80% EWL

Duodenal Switch

56 lbs 60% EWL

60% EWL

More Patients

Duodenal Switch

110 lbs 100% EWL

Ideal

BMI 25
Expect Lifelong:

- Need for optimization of modifiable environmental factors
- Need for medications
- Need for revisional surgery
- Avoid medications causing weight gain
Lifelong Multi-Modal Therapy

Treatment
- Unhealthy Foods
- Stress
- Lack of Sleep
- Medications that cause weight gain
- Exercise

Weight (lbs)

Time After Surgery

Surgery

Rx1

Medication #1

Rx2

Medication #2
Weight loss at first postoperative visit predicts long-term outcome of Roux-en-Y gastric bypass using Duke weight loss surgery chart

Alessandro Mor, M.D., Lindsey Sharp, M.D., Dana Portenier, M.D., Ranjan Sudan, M.D., Alfonso Torquati, M.D., M.S.C.I.*

Department of Surgery, The Duke Center for Metabolic and Weight Loss Surgery, Duke University Medical Center, Durham, North Carolina

Received May 21, 2009; accepted June 30, 2012

Abstract

Background: Roux-en-Y gastric bypass has been used for >3 decades. However, no normative data are available on which to judge whether the weight loss observed in an individual patient is within the normal range of expected outcomes.

(Surg Obes Relat Dis 2012;8:556–560.) © 2012 American Society for Metabolic and Bariatric Surgery. All rights reserved.
Weight Loss Curve

- 3/2015 Phentermine
- 5/2015 Added Topiramate
- 8/2015 Stopped and started Contrave
- Back on Track Program

Mari 2015

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>3/2015</td>
<td>Phentermine</td>
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<tr>
<td>5/2015</td>
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</tr>
<tr>
<td>8/2015</td>
<td>Stopped and started Contrave</td>
</tr>
</tbody>
</table>

No Follow Up

Dx Fibromyalgia
Several Courses of Steroids

Regular Followup

Medications

Revision Surgery

Nadir
Fig. 3. Weight loss chart for preoperative BMI ≥50 kg/m². Total number of patients at 1, 3, 6, 9, 12, and 36 months was 485, 434, 464, 471, and 114, respectively.
Conclusion

• Obesity is effectively treated by lowering the set point
• For Bariatric Surgery to continue to grow likely needs to focus on metabolic syndrome of which weight is valued no more than other co-morbidities
• We need to change the expectation that surgery will finally fix the obesity problem. Aligning patients and primary care doctors to the chronic nature of the disease.