Bariatric Nutrition:
An Overview

A brief on who, what and what to do

Objectives

• Recognize the bariatric surgery options.
• Describe how the specific surgery options can impact nutritional status.
• Understand and apply unique nutritional needs for the post-bariatric individual.
Bariatric Surgery

- Surgical operation options
  - “bariatric and metabolic”
- Intended to impact the physiologic regulation of body weight
- With positive outcomes
  - Reduced morbidity and mortality rates

Prevalence* of Self-Reported Obesity Among U.S. Adults by State and Territory, BRFSS, 2013

*Prevalence estimates reflect BRFSS methodological changes started in 2011. These estimates should not be compared to prevalence estimates before 2011.
Who is the bariatric surgery candidate?

• BMI >40
  • ≥30 with co-morbidities

• Lifestyle Modification ... “failed”

• Pharmacotherapy ... “failed”

<table>
<thead>
<tr>
<th>Obesity Group</th>
<th>BMI</th>
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<tbody>
<tr>
<td>Class 1</td>
<td>30-35</td>
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<td>Class 2</td>
<td>35-40</td>
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<tr>
<td>Class 3</td>
<td>40-50</td>
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<tr>
<td>Class 4</td>
<td>50-60</td>
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<tr>
<td>Class 5</td>
<td>&gt;60</td>
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Pre-Surgery

• Comprehensive assessment:
  • Medical / Surgical
  • Psychological
  • Nutritional

• Preparation focus:
  • Nutrition
  • Psychological
    • ...bariatric surgery is not a “quick fix”

<1% of those with BMI over 40 have surgery²

Surgical Options

• Vertical Banded Gastroplasty (VBG)
• Laparoscopic Adjustable Gastric Band (LAGB)
• Roux en Y Gastric Bypass (RYGBP)
• Vertical Sleeve Gastrectomy (VSG)
• Biliopancreatic Diversion w/ or w/o the Duodenal Switch (BPD/DS)

Which Procedure Is Best?

That depends....

• Surgeon / Surgical Center expertise

• Patient preference
  • Weight loss expectations

• Risk stratification
  • Patients medical / psychological situation
# Surgery Risk versus Benefit

<table>
<thead>
<tr>
<th><strong>risks</strong></th>
<th><strong>benefits</strong></th>
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<tbody>
<tr>
<td>• Allergic reaction to meds</td>
<td>• Weight loss</td>
</tr>
<tr>
<td>• Blood clots</td>
<td>• Improved health</td>
</tr>
<tr>
<td>• Blood loss</td>
<td>• Increased energy</td>
</tr>
<tr>
<td>• MI or stroke after surgery</td>
<td>• Increased mobility</td>
</tr>
<tr>
<td>• Infection</td>
<td>• Self-satisfaction</td>
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<tr>
<td>• Nutrient deficiencies</td>
<td>• Extended life expectancy</td>
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Vertical Banded Gastroplasty

• VBG popular in 1970-80's
• Restrictive (vs. malabsorptive)

Band and staples are used to create a small stomach pouch
Pouch holds ½ ounce

Band slows passage of food to stomach

Vertical Banded Gastroplasty

• Advantages
  • Anatomy is not altered
  • Absorption is not impacted
  • No dumping syndrome
  • Reversible

• Disadvantages
  • Requires strict diet compliance
  • Foods high in fiber / nutrient dense can be difficult to eat
  • Processed “junk” foods tend to be easier to eat
  • Reversing the operation can be a very complex
  • Compromised staple lines could leak stomach fluid causing infection
  • The band could dilate over time, break, or move enlarging the outlet => weight gain.
Roux-en-Y Gastric Bypass

- Roux-en-Y (RYGB)
  - Most common; gold standard
  - Combination of restrictive and malabsorption
  - Procedure goal: reduce calories absorbed

Roux-en-Y stomach bypass: large portion of stomach and duodenum are bypassed

Roux-en-Y Gastric Bypass

- Advantages
  - Less invasive option (laparoscopic)
  - Low mortality rate (0.2% to 1%).
  - Excellent weight loss when compared to other surgeries
  - Resolution or elimination of co-morbidities (e.g., type II diabetes, sleep apnea, HTN...)

- Disadvantages
  - Disruption of staple line can lead to leakage or infection
  - Possible malnutrition or anemia
  - Possible obstruction of the GI tract
  - Risk of a hernia
  - Risk of chronic vomiting and diarrhea, or dumping syndrome
Laparoscopic Adjustable Gastric Band

- LAP-Band or AGB
  - Introduced in 1990’s
  - Restrictive
  - Less invasive; done by laparoscope
  - Procedure goal: reduce amount of food eaten

Advantages

- Least invasive (and painful) procedure
- Reduced risk for nutritional deficiencies
- No dumping syndrome
- Band is adjustable (or removable)

Disadvantages

- Major complications occur at a rate of 3-10% requiring additional surgery
- Additional surgery to correct:
  - Slipping of the band
  - Band becomes infected
  - Erosion over time
Vertical Sleeve Gastrectomy

• VSG for short:
  • Restrictive
  • Removes a portion of the stomach
  • Procedure goal: reduce amount of food eater

Vertical Sleeve Gastrectomy

• Advantages
  • Less invasive procedure
  • Less risk for malnutrition with proper diet
  • Reduces intake through restriction and ↓ghrelin levels
  • Less risk for ulcers, obstructions

• Disadvantages
  • Slower weight loss
  • Gastritis (inflamed stomach lining), heartburn, or stomach ulcers
  • Non-reversible
  • Leaking from the staple line
  • Scarring that could lead to future bowel blockage
Biliopancreatic Diversion

Without Duodenal Switch  With Duodenal Switch

- Advantages
  - Produces the greatest amount of weight loss when
  - Less restrictive food intake
  - Great success with compliance

- Disadvantages
  - ↑ chance of side effects / long-term problems than with traditional surgeries
  - Strict vitamin regimen must be followed
  - Excessive bloating can occur with high fat intake. This can be accompanied by foul smelling flatulence and BMs.
  - Initially BMs can be frequent with a watery consistency while the intestinal tract is adapting. Can fade over time but for some remains permanent.
  - Reflux and ulcers can occur as a result of the bile, pancreatic and digestive juices being re-routed.
Biliopancreatic Diversion

With the duodenal switch

• **Advantages**
  - Ability to eat normally
  - Long-term weight loss (BMI of 55+)
  - Reduced risk for ulcer
  - The intestinal bypass portion of the surgery is partially reversible
  - Intact pyloric valve

• **Disadvantages**
  - Higher chance of chronic diarrhea and foul smelling flatulence
  - Inability to absorb adequate vitamins and minerals
  - Risk of nutritional deficiencies leading to possible anemia, protein deficiency, or metabolic bone disease.
  - Complications due to the complexity of the surgery

**In Common**

• **Lifestyle change**
  - Wise food choices – nutrient dense
  - Increased activity
  - V/M supplementation as directed
  - Adequate sleep
  - Relaxed eating
  - And so on...
First Steps Post-Op

• Clear Liquids (day 1 or 2)
• Clear/Full Liquids
  • 2-3 days post-op
  • 2+/- weeks duration
• Soft foods
  • Small pieces (chop, mince, grind)
  • Well-cooked vegetables
• Advance as tolerated
• Focus: adequate hydration; quality protein; fruits/vegetables; v/m

In common:

**Smaller Stomach Capacity**

• Biliopancreatic Diversions
• Vertical Sleeve
• Roux-en-Y
• Lap-band
• Vertical Band

Mealtime tips:
• Relax; be mindful
• Chew slowly /well
• Smaller meals
• More frequent meals
• Liquids [~30 min.] after meals
Intake Issue:

• Dumping Syndrome
  • Happens mainly when pylorus, pyloric valve or duodenum is removed / altered
    • Sudden distention of jejunum by hypertonic solids or fluids
  • Symptoms:
    • Vomiting or diarrhea
    • Dizzy/lightheaded, sweating, nausea, lethargy
  • Occurs in 50% who:
    • Eat or drink too fast
    • Drink fluids with meals
    • Eat too much sugar or too much protein at once
      • <25g sugar per serving helps
Post-Surgery Malnutrition

- Common
- Prevalence ~80%+
- “Routine” deficiencies:
  - Protein
  - Vitamins B₁₂ and D
  - Calcium
  - Iron
- Additional concerns:
  - B vitamins
  - Vitamins A and K
  - Essential fatty acids
  - Zinc and Copper
- Deficiencies can increase over time


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Post-Surgery Malnutrition

Roux-en-Y

- Decreased appetite, increased satiety
  - ↓ Ghrelin and ↑ hormones GLP-1 & PYY
  - ↓ stomach secretions → capacity for digestion
- Unbalanced diet (↑ CHO and Fat) → dumping
- GI discomforts may trigger food intolerances / avoidance.
  - Meat, milk, high-fiber food
- Nutrient concerns:
  - Protein and fatty acids, iron, thiamin (B₁), B₁₂, calcium & vitamin D, zinc, copper

Post-Surgery Malnutrition

Adjustable Gastric Band

- Tightness of band = +/- discomforts
  - Reflux, nausea, vomiting
  - Be alert for consistent vomiting
- Softer foods better tolerated
  - Avoidance of meat, whole fruits/veg, course foods
  - 2/3 report avoiding certain foods
  - 1/3 report regurgitation multiple times/week
- Nutrient concerns
  - Protein, fiber, calcium/vit D


Post-Surgery Malnutrition

Sleeve Gastrectomy

- Early satiety
  - Small pouch
  - ↓ ghrelin and ↑ PYY
  - ↓ gastric emptying and transit
    - Limits digestion and availability of some nutrients
- Food difficulties similar to RYGB
- Nutrient concerns:
  - Protein and fatty acids, iron, thiamin (B₁), B₁₂, calcium & vitamin D, zinc, copper

Post-Surgery Nutrition

Biliopancreatic Diversion
• Malabsorptive → difficult to treat nutrition issues
• Nutrition concerns:
  • Similar to others
  • Fat and fat-soluble vitamins

Common Deficiencies

<table>
<thead>
<tr>
<th>Deficiency</th>
<th>Risk Factors</th>
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</table>
| Thiamin (B1) | - Pre-existing deficiency  
- Low nutrient intake  
- Malabsorptive procedure  
- Chronic nausea/vomiting |
| Vitamin B12 | - post-surgery B12 not fully digested / absorbed from protein foods (small pouch = less stomach acid)  
- Rare with gastric banding; and less common in BPD w/DS  
- Vegan diet  
- Ulcers  
- Some Rx (e.g. metformin, PPI's, cholchicines) |
| Folic Acid   | - Inadequate dietary intake  
- Noncompliance with V/M supplementation  
- Malabsorptive procedures  
- Some Rx(e.g. anticonvulsants, oral contraceptives) |

Common Deficiencies

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| Iron       | - RYGB and BPD are high risk; also VSG (malabsorptive)  
- Reduced intake of iron rich foods (meats) |
| Calcium & Vitamin D | - Often preexisting  
- Post surgery -> lowered gastric acidity  
- Insufficient supplementation |
| Vitamin A, E, K | - Lacking data  
- Highest risk with BPD w/ or w/o DS due to decrease in fat absorption |
| Zinc       | - Preexisting deficiency  
- Higher risk with malabsorptive procedures  
- Use of antacids  
- Avoidance of meat |
| Copper     | - Higher risk with malabsorptive procedures  
- Use of antacids  
- High zinc supplementation (including zinc lozenges) |


Typical Supplementation*

<table>
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<tr>
<th>Nutrient</th>
<th>Standard Amount</th>
<th>Malabsorptive Procedures**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-vitamin</td>
<td>1-2 / day</td>
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<tr>
<td>Vitamin B₁₂</td>
<td>300 – 500 mcg/d</td>
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</table>
| Iron (elemental) | 18-27 mg/d  
40-65 mg/d menstruating | 150 - 200mg/d |
| Calcium (citrate) w/ Vitamin D | 1,200 - 2,000mg  
400-800 IU  
2-3 / day in divided dose |  |
| Vitamin D | 3,000 IU / d | 50,000 IU/week |
| Zinc (elemental) | 8 - 15mg /d (matched to 1 mg Copper) |  |
| Copper | 2 – 8 mg/d |  |

*Does not account for individualized additional needs  
**Roux-en-Y, biliopancreatic diversion, sleeve gastrectomy
Protein

• Exact needs not defined
• 1.1g/kg IBW or ~60 - 80g
  • After BPD/DS x 30% (~1.4g/kg IBW) or ~90g
• High quality sources important
  • Whey sources preferred
  • Prevent lean muscle loss


Prognosis

• Follow-up care is critical to long-term success
  • Gastric banding – more wt. lost w/ fup compared to inconsistent / no-shows.
  • Continued monitoring for deficiencies
  • Encouragement for intake, activity, behavior changes
  • Participation in support groups helps with greater wt. loss
Prognosis

• Cure for T2 diabetes?
  • 67% of pts. demonstrated remission 1 yr. post surgery
  • 96% in remission w/o prior insulin or reduced pancreatic function
• With no diabetes dx
  • Protective for up to 7 years post-surgery
  • DM dx of 4.3% vs. 16.2% dx in matched controls


2015 Study Findings

• Post BPD or RYGB
  • RCT; 5+ yr Hx of Type 2 DM
  • 50% maintained DM remission at 5 yrs. vs. standard DM medical care
    (p=0.0007)
  • Weight change did not predict remission or relapse

2015 Study Findings

• Retrospective on LSG
  • 241 subjects 1yr follow-up; 128 @ 3 yr; 39 @ 5 yr.
  • Avg. 77% excess weight lost after 1 yr.
    • Down to 56% at the 5 yr. mark
  • DM remission 51% at 1 yr.
    • Down to 20% at 5 yr.
  • Results at 5/3/1 year:
    • Excess wgt lost: 76.8% / 69.7% / 56.1%
    • Remission HTN: 46.3% / 48% / 45.5%
  • SG not as effective long-term as gastric bypass


Closing Nuggets

• Surgery is not magic, serious business
• All procedures will change gut-brain messaging but not the surrounding external environment
• Everyone responds differently
  • Comorbidity reductions to adverse outcomes to weight lost / regained
• Success is linked to full awareness going in and compliance with post-surgical instructions after
Thank you for participating in today’s session!

This presentation is intended to provide general information about bariatric surgeries and nutritional concerns but is not intended to provide medical advice.

Presentation Author: Debra Zwiefelhofer, RDN, LD

Post Test

• Mark an X for surgery type

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Restrictive</th>
<th>Malabsorptive</th>
<th>Combo</th>
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<tbody>
<tr>
<td>Adjustable Laparoscopic Band</td>
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<td>Biliopancreatic Diversion w/DS</td>
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<tr>
<td>Biliopancreatic Diversion without DS</td>
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Post Test

• List the typical nutrients of concern for deficiency

Suggested References