Introduction to Bariatric Surgery

- Obesity is a life-threatening disease affecting 34% of the adults in the US and nearly 67% of the adults in the US are either overweight or obese. (ASMBS, 2007)
- Between 2000 and 2005, obesity (BMI > 30) increased by 24%, morbid obesity (BMI > 40) increased by 53%, and super obesity (BMI > 50) increased by 75%. (ASMBS, 2007)

Why Bariatric Surgery?

- Most effective intervention for severe obesity
- Majority of bariatric surgery patients maintain loss of >50% of excess weight
- Non-surgical treatments of obesity typically results in an average weight loss of 5-10% of initial body weight
- High rates of remission of many obesity-related co-morbidities.
Criteria for Bariatric Surgery

- BMI ≥40 without comorbidities
- BMI ≥35 with comorbidities
  - Diabetes, obstructive sleep apnea, chronic joint pain, coronary heart disease, hypertension, NAFLD, etc.
- Failed previous attempts at diet and exercise
- No current drug and alcohol dependence
- Free from substantive psychological disease
- Some insurance companies require pre-surgical participation in supervised weight management program.

Gastric Bypass Roux-en-Y

- Gold standard (EWL 60-70%)
- Primarily restrictive with some malabsorption
  - Modulation of gut hormones
    - Decreased Ghrelin
    - Effects on GLP-1, PYY, Leptin
- Strongest potential for improving Type II Diabetes
- Longer-term studies available
- Potential Complications
  - Obstructive symptoms
  - Malabsorption
  - Micronutrient Deficiencies
  - Rise of Ulcers (NSAIDS/smoking)
  - Anastomotic Ulcers

Sleeve Gastrectomy

- Primarily restrictive with some malabsorption
- Modulation of gut hormones
  - Potential change in Ghrelin and other gut hormones
- Less complicated surgery with no intestinal involvement
- Shorter term studies available
- Weight loss appears to be somewhere between the Roux-en-Y and the gastric band
- Potential Complications
  - Gastro-esophageal Reflux Disease
  - Nausea/vomiting
  - Gastric Ulcers

Adjustable Gastric Band

- Purely Restrictive Procedure
- Major marketing promoting surgery
- Less significant weight loss
- Adjustments made via subcutaneous port
- Should be considered permanent if long-term weight loss is to be achieved.
- Potential Complications
  - Obstruction
  - Ulcers
  - Gastro-esophageal Reflux Disease
  - Staple/fragmentation
  - Erosion
Biliopancreatic Diversion with Duodenal Switch

- Primarily malabsorptive with some restriction
- Complicated surgical procedure
- Rarely done at this time
- Significant complications

Bariatric Food Guide Pyramid

General Diet Progression Guidelines

Stage 1: Clear liquids
- Duration: 1-3 days (hospitalization)
- Low calorie beverages, no sugar, no carbonation, no caffeine

Stage 2: Full liquids
- Duration: Weeks 1-2
- Aim for high protein, low sugar (<15gm) beverages
- Protein shakes, sugar-free pudding, yogurt, and other fuller liquid type foods should be included to provide appropriate texture, healing, and gut mobility
- Goals:
  - Aim for 4-6oz fluids every hour
  - 60-80gm protein
  - 45-64oz fluids total daily
General Diet Progression Guidelines

- **Stage 3A: Puréd diet**
  - Durations: Weeks 3-4
  - Always consume protein foods first
  - Do not drink fluids for 30 minutes before and after meals
  - Foods to include: protein shakes, puréd meats/poultry, yogurt, cottage cheese, puréd/poached fruit and vegetables, sugar-free pudding, cream of wheat/rice

- **Stage 3B: Soft diet**
  - Duration: Weeks 5-6
  - Foods to include: ground lean meat, ground skinless poultry (moist!), fish, cottage cheese, yogurt, low-fat cheese, well-cooked vegetables, fruit (start with peeled)
  - Continue with 4-5 small meals per day

Risk of Protein Malnutrition in Bariatric Patient

- **Importance of protein**
  - Preserves lean muscle mass
  - Plays role in satiety
  - Helps with wound healing

- Malabsorption from surgical procedure
  - Rare
  - Length of intestinal limb
  - Re-routing of intestine

- Inadequate protein intake
  - Decreased quantity of food due to pouch size
  - Diarrhea or intolerance to quality protein sources

- Clinical Signs of Protein Malnutrition
  - Alopecia; Anemia; Impaired wound healing; Edema

General Diet Progression Guidelines

- **Stage 4: Regular diet**
  - Maintenance phase
  - Continue with 4-5 small meals per day
  - Balanced Meals: protein first, vegetables/fruit, starchy (whole grains), and healthy source of fat
  - Avoid rice, bread, and pasta until patient is comfortably consuming at least 60gm protein
  - Chew food thoroughly to the consistency of applesauce
  - Take at least 30 minute to complete meals
  - Long-term Goal: Reduction of fat mass while maintaining lean body mass and body composition

Protein Requirements for the Bariatric Patient

- **ASMBS recommend at least 60-80 gm protein per day**
- **1.1 – 1.3 g/kg for body weight at BMI of 25**
  - Example Calculation:
    - 40 y/o female
    - Ht: 5’6”
    - Wt: 198 lbs/ 90 kg
    - BMI at 25: 155 lbs/ 70.45kg
    - 1 – 1.3 g/kg X 70.45kg = 70-90 g of Protein/ day
Treatment and Prevention of Protein Malnutrition

- **Diet**
  - Determine protein needs
  - Identify high-quality protein sources
  - Food
    - Always include protein at every meal and snack
  - Protein supplements
  - Deficiency may occur within 3-6 months after surgery
  - Degree of PM may require hospitalization (rare)
  - Enteral nutrition
  - Parenteral nutrition

Protein Supplements

- **Considerations when recommending a protein supplement**
  - Protein source should be the main ingredient in the product
    - Whey protein (isolates and concentrate)
    - Soy protein isolates
    - Egg
    - Collagenic protein
  - Nutrition profile of product should include:
    - Less than 200 calories
    - Less than 6 g of sugar
    - Less than 4 g of fat
    - Between 20 - 30 g of protein

Potential Nutrition-related Complications

- **Dumping Syndrome**
  - Usually post-vagotomy/splenectomy
  - Symptoms include: diarrhea, nausea, dizziness, weakness, rapid pulse, cold sweats, fatigue, and cramps
  - Prevention: avoid high-sugar foods, chew food well, eat slowly, watch portion sizes, and avoid liquids with meals

- **Nausea and vomiting**
  - Most likely eating/drinking related (meal size, chewing, speed of eating, fluids with meals)
  - Less likely: stenosis, pregnancy, obstruction

- **Dehydration**
  - Signs: dark urine, dizziness, nausea, fatigue
  - 46-64 oz fluids daily

- **Diarrhea**
  - Lactose intolerance
  - Food sensitivity
  - Dumping Syndrome

Micronutrient Deficiencies

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Preoperative (Obese)</th>
<th>SG</th>
<th>LAGB</th>
<th>RYGB</th>
<th>IPV-DS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thiamine (B1)</td>
<td>0% – 20%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Pantothenic Acid (B5)</td>
<td>0% – 20%</td>
<td>0%</td>
<td>14%</td>
<td>10%</td>
<td>NA</td>
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<tr>
<td>Riboflavin (B2)</td>
<td>3% – 8%</td>
<td>2%</td>
<td>10%</td>
<td>10%</td>
<td>5%</td>
</tr>
<tr>
<td>Niacin (B3)</td>
<td>5% – 8%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>22%</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>43%</td>
<td>NA</td>
<td>48%</td>
<td>20%</td>
<td>20%</td>
</tr>
<tr>
<td>Folate ( &lt; 20 mg/dL)</td>
<td>17%</td>
<td>NA</td>
<td>17%</td>
<td>25%</td>
<td>10%</td>
</tr>
<tr>
<td>Vitamin D ( &lt; 30 ng/mL)</td>
<td>10% – 60%</td>
<td>13%</td>
<td>20% – 40%</td>
<td>50% – 50%</td>
<td>0% – 100%</td>
</tr>
<tr>
<td>Niacin K</td>
<td>0%</td>
<td>NA</td>
<td>0% – 14%</td>
<td>0% – 22%</td>
<td>0% – 9%</td>
</tr>
<tr>
<td>Iron</td>
<td>20%</td>
<td>14%</td>
<td>1% – 3%</td>
<td>3%</td>
<td>5%</td>
</tr>
<tr>
<td>Zinc</td>
<td>3% – 35%</td>
<td>35%</td>
<td>NA</td>
<td>35%</td>
<td>35%</td>
</tr>
<tr>
<td>Calcium</td>
<td>9%</td>
<td>NA</td>
<td>NA</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Copper</td>
<td>9%</td>
<td>NA</td>
<td>NA</td>
<td>5%</td>
<td>5%</td>
</tr>
</tbody>
</table>

Strohmeier 2010
Vitamin and Mineral Deficiencies

- Postoperatively, 25%–50% of all types of bariatric surgical patients report symptoms of micronutrient deficiency, including hair loss, dry skin, muscle pain, and fatigue, within the first year after surgery.
- Onset is often insidious.
- Persistent lifelong surveillance for deficiencies is needed.
- Prevalence: 33-75% after surgery. Able to store in large amounts so deficiency may not show up for years.
- Incomplete digestion and release of B12 from food and lack of hydrochloric acid
- Intrinsic factor is produced by parietal cells of the stomach and impaired production with bariatric surgery.
- Must rely on passive absorption of B12: sublingual and IM
- Deficiency often presents with non-specific symptoms such as weakness, fatigue, and irritability. May progress to paresthesias in the hands or feet.

Folic Acid (Folate)

- Depletion within a few months after surgery. Decreased intake of folic acid-fortified foods.
- Deficiency can lead to macrocytic anemia, leukopenia, thrombocytopenia, and glossitis.
- Less common than B12 deficiency because adequate amounts are found in most multivitamins.
- Pregnant, and those thinking about becoming pregnant, need to be especially aware of folic acid.

Vitamin B1 (Thiamin)

- Generally considered rare, but has been reported in a number of bariatric surgery patients.
- Essential coenzyme in carbohydrate metabolism and deficiency can result in impaired nerve conduction.
- Stored in small amounts in the body. Requires daily replenishment. Acute deficiencies can occur as soon as 1 to 3 months after surgery.
- Most common among all surgical patients with frequent vomiting.
- Early symptoms may include anorexia, gait ataxia, muscle cramps, or irritability. Untreated deficiency can lead to beriberi, peripheral neuropathy, Wernicke encephalopathy, and/or Korsakoff psychoses.
**Vitamin A**
- Involved in immunological activity, cellular proliferation and plays a role in visual acuity
- Potential deficiency in gastric bypass and duodenal switch patients r/t bypassing upper small intestine where fat-soluble vitamins are primarily absorbed.

**Calcium**
- Increased long-term risk of metabolic bone disease has been well documented in gastric bypass patients.
- Fewer studies have been done with sleeve and band patients.
- Symptoms of deficiency include leg cramping, osteoporosis, and neuromuscular hyperexcitability.
- Calcium citrate is more effectively absorbed than calcium carbonate by 22-27%.

**Vitamin D**
- Most common deficiency prior to surgery. Deficiency appears to be related to morbid obesity.
- Deficiency linked to increased risk of osteoporosis, cancers (colon, breast, prostate), chronic inflammatory diseases, metabolic disorders, and peripheral vascular disease.

**Iron**
- Most common deficiency
- Reports of deficiency range from 20%-50% of post-op bariatric patients.
- Cause: decreased absorption and decreased intake of high iron foods after surgery.
- Symptoms: fatigue, palpitations, anemia, koilonychia (spoon nails), pica, and brittle hair.
Zinc, Selenium, Copper

- Rare deficiencies
- Zinc is absorbed in both the duodenum and proximal jejunum and is involved in over 200 enzyme systems, including wound healing and immunity.
- Selenium is a part of the enzyme glutathione peroxidase which protects cells from free radical damage.
- Copper is a trace metal that is absorbed in the stomach and proximal duodenum. Deficiency is rare and symptoms often mimic B12 deficiency.

Vitamin and Mineral Supplementation

<table>
<thead>
<tr>
<th></th>
<th>RYGB</th>
<th>Sleeve</th>
<th>Band</th>
<th>Long Bypass*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-vitamin (include iron, folate, selenium, copper, and zinc)</td>
<td>Twice serving size daily</td>
<td>One serving size daily</td>
<td>One serving size daily</td>
<td>Twice serving size daily</td>
</tr>
<tr>
<td>Thiamine (B-1)</td>
<td>50 mg for all</td>
<td>Twice daily for first 6 months</td>
<td>Twice daily for first 6 months</td>
<td>Twice daily for first 6 months</td>
</tr>
<tr>
<td>B-12</td>
<td>Sublingual 1,000mcg for all</td>
<td>1,000mcg for all</td>
<td>1,000mcg for all</td>
<td>1,000mcg for all</td>
</tr>
<tr>
<td>Calcium Citrate (Divide Doses; separate from iron)</td>
<td>1,800-1,700mg daily</td>
<td>1,800-1,700mg daily</td>
<td>1,800-1,700mg daily</td>
<td>1,800-1,700mg daily</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>1,200 units daily includes MVI</td>
<td>1,200 units daily includes MVI</td>
<td>1,200 units daily includes MVI</td>
<td>1,200 units daily includes MVI</td>
</tr>
<tr>
<td>Vitamin A (Beta Carotene)</td>
<td>20,000 IU weekly divided 5x weekly for all</td>
<td>20,000 IU weekly divided 5x weekly for all</td>
<td>20,000 IU weekly divided 5x weekly for all</td>
<td>20,000 IU weekly divided 5x weekly for all</td>
</tr>
</tbody>
</table>

Post-op Labs

Yearly Post-op Labs
- CBC
- Creatinine
- BUN
- Electrolytes
- Calcium
- PTH
- Liver Panel
- Fasting Glucose
- Lipid Panel

- Iron panel
- Albumin
- Thiamine
- Vitamin A
- Vitamin D (25 OH)
- Vitamin B-12
- Thiamine
- Folic Acid

Role of the Dietitian

- Essential member of bariatric team.
- Educate and counsel patients on what to expect after surgery.
- Help patients set reasonable weight loss goals.
- Assess and monitor dietary intake and determine whether patient is meeting nutrient goals.
- Assist in selection of foods that decrease gastrointestinal symptoms and maximize weight loss.
- Assist patient with food tolerance difficulties by customizing the diet progression.
- Monitor for signs of micronutrient deficiencies.
Current Issues in Bariatric Treatment

- Pregnancy within the first year post-op
- Renal and/or dialysis patient and bariatric surgery
- The bariatric patient and weight regain
- Reactive hypoglycemia after bariatric surgery
- The bariatric patient and eating disorders
- Bariatric surgery and the impact on co-morbid conditions
- The bariatric patient and cross addiction
  - Alcohol
  - Opiates
- Hospitalization and the bariatric patient
  - Improving continuity of care by increasing awareness and knowledge of medical professionals

Conclusion

- Dietitians are an important member of the bariatric team
- It is important that all dietitians have a general understanding of bariatric surgery and the post-op needs.
- With an ever-growing weight loss surgery population the RD is going to play a vital role in guiding the care team in terms of diet and supplementation.

References


References


References


