Objectives

- Discuss the nutritional consequences of bariatric surgery
- Discuss dietary stages after bariatric surgery
- List strategies to improve diet tolerance
- Review specific nutrition deficiencies possible after bariatric surgery
Considerations

- Malnutrition
  - Nutritional status as a result from a deficiency of nutrient intake, impaired nutrient absorption or over nutrition
Considerations

- Surgical treatment of morbid obesity can have significant implications on nutritional status
- How does surgery in general affect nutrition?
Considerations

- Restrictive surgical procedures has less complications related to malabsorption.

- Lets review:
  - What are the weight loss procedures that are purely restrictive in nature
Considerations

- What are procedures that are purely malabsorptive which are not typically performed anymore due to severe complications
Considerations

- What are the procedures that combine malabsorptive and restrictive techniques which are commonly performed in the US.
Considerations

- Factors that influence postoperative nutritional status
  - Preoperative nutritional status
  - Type of bariatric procedure performed
  - Postoperative complications
  - Ability to modify eating behaviors
  - Compliance with prescribed vitamin and mineral supplements
Considerations

- Short term postoperative nutrition considerations
  - Adequate hydration
  - Adequate protein
  - Prevention of vomiting
  - Prevention of dumping syndrome
Considerations

- Postoperative diet stages for bariatric patients involves the progression of foods starting with clear liquids through low-fat solid foods
Stage I

- Typically the first 24 hours after surgery
  - 30ml of water an hour
Stage 2

- Typically the next (2nd) 24 hours after surgery
  - No added sugar clear liquids
- Clear fluids should be non caloric, decaffeinated and non carbonated
Stage 3

- If no complications on the 3rd postoperative day
  - No added sugar full liquids
  - Typically patents will be discharged home on stage 3 diet unless complications occur during or after surgery
Examples of Full Liquids

- Nonfat or low fat milk
- Low fat creamed soups
- Blended or strained sugar free pudding or custard
- Blended low fat cottage or ricotta cheese
- Additional protein can be added with powdered skim milk or powdered eggs.
Stage 4

- Typically 3 weeks after surgery
- Based on surgeon and dietician recommendations
- Soft solid high protein diet
- Typically patients are recommended to stay on stage 4 diet for 1 month
Soft Solid Food

- Meats and poultry blended or pureed
- Fish
- Tofu
- Dairy products
- Some fruits or vegetables depending on program
- Avoid starches, ground beef and shellfish
Stage 5

- After demonstrated tolerance to soft solid diet
- Low fat solid which continues indefinitely and may be modified to tolerance
Difficult food to tolerate after surgery

- Milk or dairy products
- Red meat
- Dry or tough poultry or pork
- Bread or doughy starches including rice or pastas
- Vegetables high in insoluble fiber
- Popcorn kernels, nuts or seeds
Strategies to tolerate problematic foods

- Peel fresh vegetables or fruits
- Hard starches such as crackers or toast may be tolerated better than soft breads
- Eat protein first
Support

- The aims of nutritional support after bariatric surgery includes adequate nutrition and hydration.
- Why are these important?
H2O Requirement

- Factors used to estimate water requirements after bariatric surgery
  - Energy expenditure
  - Age
  - Body Weight (adjusted)
Gastrointestinal Tract

- Responsible for absorption of nutrients
- What are the nutrients that would be considered macronutrients?
Strategies to improve diet tolerance

- Eating slowly (10 minutes per ounce of food)
- Chewing foods thoroughly
- Avoid tough-textured meats
- Drinking fluids 30-60 minutes before or after meals depending on type of food
Protein absorption occurs in the duodenum through the mid-jejunum of the small intestine.

What complications might cause protein malnutrition in patients after gastric restrictive procedures?
Promoting Protein

- Protein intake after surgery is promoted to aid healing, maintain visceral protein stores and conserve loss of lean body mass.
- What are some strategies to maintain adequate protein intake.
Current recommendations for protein Intake

- Roux-en Y gastric bypass
  - 40-60 grams per day

- Biliopancreatic diversion and duodenal switch
  - 60-90 grams per day
Protein

- Once weight stable, protein is still an area of focus after surgery.
- Why would protein still be necessary?
Carbohydrates

- Body’s quick energy source
- Begins in the duodenum and is complete in the first part of the small intestine.

- What is a side affect of eating foods with a high sugar content
Dumping Syndrome

- Results in rapid emptying of the stomach into the small intestine, most commonly after a high sugar intake
- More common in the first year after surgery
- Symptoms depend on when “dumping” occurs early (10-20 minutes), intermediate (20-60 minutes) or late (1-3 hours) after eating
Symptoms of Dumping

- **Early**- abdominal bloating, tachycardia, diaphoresis, flushing, and lightheadedness.
- **Intermediate**- abdominal bloating, cramping, flatulence, and diarrhea
- **Late**- diaphoresis, nervousness, lethargy, shakiness, decreased concentration and increased hunger
Lipids and Fat

- Lipids and fat are typically absorbed in the proximal 2/3 of the jejunum but can occur throughout the length of the small intestine.

- Why are small amounts (10 grams) of lipids and fats recommended at each meal after GB?
Fat Intake

- Current recommendation for fat intake for a health diet after bariatric surgery is:
  - Less than 25% of total kilocalories
  - Research is still needed to determine evidence based recommendations for long term success
Micronutrients

- **Vitamins**
  - Fat soluble - A, D, E, K
  - Water soluble B1, B2, B3, B6, B12, biotin, pantothenic acid, folate, C

- **Essential Minerals**
  - Iron, folic acid, calcium
  - Trace elements zinc, copper, cobalt, selenium, magnesium
Micronutrient Deficiencies

- Decreased acid environment in the gastric pouch (pH and secretion)
- Impaired protein binding for nutrient transport
- Decreased capacity to release food-bound micronutrients
- Decreased absorption surface in the small bowel
- Overall decreased intake volume of nutrients
Nutritional Deficiencies

- Due to anatomic changes after surgery
  - Thiamin (B1)
  - Folate
  - Cobalamin (B12)
  - Iron
  - Calcium
  - Vitamin A
  - Vitamin D
Thiamine (B12)

- Rare but potentially serious mal-absorptive condition.
- Involved with carb metabolism and nerve conduction.
- Severe cases can develop Wernicke’s encephalopathy or polyneuropathy.
- What are contributing factors to thiamine deficiencies?
Thiamine Supplementation

- Most commonly - in daily multivitamin
- B complex vitamins typically contain thiamine
- Dose is typically 10mg daily
- Doses of 100mg daily may be used for 7-14 days or until symptoms resolve in patients with severe deficiency
Folate

- Is a B vitamin
- Critical to prevent macrocytic anemia and neural tube defect during pregnancy
- Common deficiency following GB due to decrease in gastric pH
- How is folate supplemented?
Cobalamin (B12)

- Necessary for normal metabolism of cells*
- Common after GB due to decreased intake, decreased gastric acidity and loss of intrinsic factor.
- Usually noted after first year due to recycling of vitamin B12 and release of hepatic stores.
B12

- Supplemented or replaced:
  - Intramuscular monthly injection – 1000mcg
  - Oral daily dose- 350 mcg
  - Sublingual daily dose- 500 mcg
  - Increase dietary sources which include- dairy, meat and eggs
Iron Deficiency

- May take years to develop and results in microcytic anemia
- Caused by decreased intake, decreased gastric acid (which converts iron to an absorbable form and decrease absorption in the duodenum and proximal jejunum.
- When should supplementation be considered after surgery?
Iron Supplements

- Type of procedure (higher risk or iron deficiency after gastric restrictive and intestinal bypass)
- Menstruating women
- Vit C
- Once microcytic anemia occurs, replacement levels should be within the range of 180-220 mg of elemental iron daily
Calcium

- Most common element in the body with the largest reservoirs being the bones.
- Structural component of bones and teeth
- Other functions of calcium include:
  - Aides in blood clotting
  - Necessary for nerve function and chemical transmission
  - Essential in muscle contraction including cardiac and skeletal muscles.
Calcium

- Deficiencies common after surgery leading to hypocalcaemia, metabolic bone disease, and osteoporosis.
Causes of CA deficiency after GB

- Absorbed in the duodenum and proximal jejunum which is decreased after GB
- Decrease intake of calcium and cit D due to decrease capacity or intolerance
- Vit D is decreased related to malabsorption of fat-soluble vitamins as it is absorbed in the duodenum and proximal jejunum
- Calcium needs Vit D to be absorbed
- Increased gastric pH after surgery decreases calcium absorption
Considerations for Calcium Supplementation

- Serum calcium levels do not reflect calcium status
- Calcium citrate is better absorbed than calcium carbonate when gastric pH is increased
- Current recommendation is 1200-1500 mg daily in divided doses
- Supplement of vitamin D is necessary for absorption
Laboratory Testing

- Used as markers of metabolic bone disease
  - Alkaline phosphate level
  - Serum calcium level (iodized level if low albumin)
  - Phosphorus
  - Vitamin D levels
Vitamin A

- Aft soluble vitamin- plays a role in vision and health of epithelial cells.
- Deficiency may be caused by decreased intake and malabsorption
- Clinical findings:
  - Night blindness
  - Cornea scarring
  - Skin problems
  - Found in the infant if it occurs during pregnancy
Supplementing Vitamin A

- 25,000-50,000 units daily
- 1 mg daily
Vitamin D

- Critical in absorption of calcium and bone health
- Absorbed in the duodenum however the greatest amount is absorbed in the ileum
- Why would Vit D deficiency be seen in patients with strictly restrictive bariatric surgery?
Vitamin D Supplementation

- Can be prevented in daily supplements of 800 IU (5mcg)
- Replacement may require 10,000-50,000 IU weekly based on laboratory tests
- Severe deficiency with higher mal-absorptive procedures may require doses of 400,000 IU per month
Trace Elements

- Also absorbed in the GI tract
- Several elements or essential elements that need considered after GB surgery:
  - Zinc
  - Copper
  - Cobalt
  - Selenium
  - Magnesium
Multivitamin

- Supplements of trace elements and other essential minerals are given daily in multivitamins.
- What element may contribute to hair loss after bariatric surgery?
Fluid Recommendation

- Limit Fluid intake to 8 oz per hour during the first 2 months due to pouch swelling
- Avoid drinking fluids 30 minutes before or after soft solid meals
- Avoid drinking fluids 1 hour after low fat meals are started (helps to avoid dumping)
Some feel that caffeinated beverages can increase gastric secretions which may cause reflux although this may not be significant.

Carbonated beverages can cause cramping, bloating, nausea and vomiting especially during the first 6 months.
High Quality, Nutrient-dense Foods

- Stomach pouch is about 2 oz after surgery- overtime that increases to 2.5-9 oz.
- Patients report not only decrease stomach capacity but early satiety.
TPN

- If pt is kept NPO for > 3-5 days, TPN should be considered
  - Protein is dosed at 1-2 grams of protein per Kg of ABW
  - Lipids should not be dosed over 1 gram of fat per kilogram of ABW
  - Careful monitoring of serum electrolytes, K+, Phos, Mag and fluid balance for refeeding syndrome.
Team Approach

- Team members need to coach and support compliance with post-operative nutrition plan.
- Ongoing education is needed for nutritional deficiencies, hydration, and monitoring for disordered eating patterns.
References

- *Nutrition After Bariatric Surgery, Allergan 2010*
- *The Experts Guide to Weight Loss Surgery, Garth Davis, MD*