



Medical Nutrition Therapy for Bariatric Surgery with a review of Renal Literature

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Obesity and Renal Disease:

- Obesity = chronic disease
- Obesity – a risk factor for CKD related to co-morbidities:
 - Diabetes
 - Hypertension
 - Metabolic Syndrome
 - Cardiovascular Disease
 - Obesity-related glomerulopathy (ORG)



Obesity-related Glomerulopathy (ORG):

- Kambham et al (2001):
 - 6818 participants; obesity def BMI>30
 - ORG determined by renal bx:
 - 1986-1990: ORG = 0.2% bx
 - 1996-2000: ORG = 2% bx
 - Conclusion: Bx results indicate 10 fold increase in ORG over 15 yr suggests a newly emerging epidemic associated w/ increased rate of obesity. Heightened MD awareness needed to promote appropriate dx.



ADA Adult Weight Management Evidence-Based Nutrition Practice Guideline:

“Treatment of obesity should be based on a comprehensive weight management program to produce weight loss, prevent further weight gain and maintain weight loss over a prolonged period.”

ADA Nutrition in Bariatric Surgery
Evidence Analysis Project – currently
under development



ADA Adult Weight Management Evidence-Based Nutrition Practice Guidelines:

BMI-Classification of Overweight & Obesity:

“Body mass index (BMI) and waist circumference should be used to classify overweight and obesity, estimate risk for disease, and to identify treatment options. BMI and waist circumference are highly correlated to obesity or fat mass and risk of other diseases (NHLBI report).”

Evidence: Fair, imperative



Obesity and BMI:

	BMI = kg/m ²
Underweight =	< 18.5
Ideal BMI range =	18.5 – 24.9
Overweight =	25 – 29.9
Class I Obesity =	30 – 34.9
Class II Obesity =	35 – 39.9
Class III Obesity =	>/= 40



Waist circumference:

- High-risk (w/ or w/o BMI > 25):
 - -- men
 - > 102 cm (OR > 40 inches)
 - -- women
 - > 88 cm (OR > 35 inches)



Shapes of Obesity:

- Type I-overall distribution of body fat (ovoid)
- Type II-subcutaneous the fat in the trunk and abdomen (android/apple shape)- mostly males; assess risk for CVD & CKD
- Type III-abdominal visceral fat; mostly males; assess risk for CVD & CKD
- Type IV-fat distribution in the thighs and buttocks (gynoid/pear shape); mostly in females



% Body Fat:

- Appropriate % body fat –
 - 20-25% females
 - 12-15% males
- Some fat is essential -- necessary for normal physiologic function
 - 12% of female body fat
 - 3% of male body fat
- % body fat < level of essential fat is not healthy (i.e. anorexia nervosa)
- Morbid obesity = body wt \geq 100% IBW



Adipose tissue:

- Fat mass increases by:
 - growth in the size of available fat cells or
 - addition of fat cells
- Average person = 25-35 billion fat cells
- Morbidly obese = 100-125 billion fat cells



Regulation of Body Weight:

- Short-term: satiety vs. hunger
- Long-term:
 - “set-point theory”
 - thermic response to food
 - resting metabolic rate (RMR)
 - Per ADA AWM NPG = use indirect calorimetry, if available
 - Or Mifflin-St. Jeor equation w/ ACTUAL wt for overweight & obese indiv.
 - hormones (i.e. ghrelin, leptin, peptide YY3-36)



Mifflin-St. Jeor Equation:

Male*:

$$\text{RMR} = \{(9.99 \times \text{wt}) + (6.25 \times \text{ht}) - (4.92 \times \text{age})\} + 5$$

Female*:

$$\text{RMR} = \{(9.99 \times \text{wt}) + (6.25 \times \text{ht}) - (4.92 \times \text{age})\} - 161$$

Please note: wt in kg, ht in cm, age in years

*Must be multiplied by an activity factor:

1.2 (little or no activity) – 1.9 (extreme exercise/ physical job)

Consider KDOQI™ dialysis recommendations:

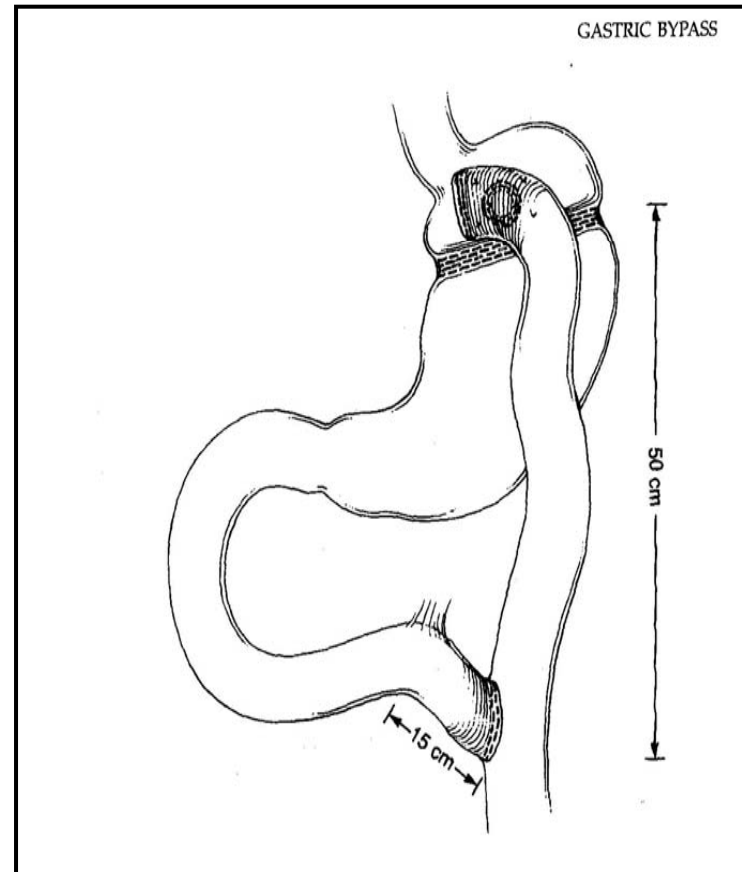
$$\text{Adj BW}^1 = \text{edema-free BW} + [(\text{standard BW}^2 - \text{edema-free BW}) \times 0.25]$$

¹Adjust when pt's wt is <95% or >115% of standard body wt² (BW).

²Standard body wt = median body wt of normal Americans of the same ht, gender, skeletal frame size, & age from the NHANES II data.

Roux-en-Y Gastric Bypass:

- Gastric pouch 15-30 mL
- Varied distance between gastrojejunostomy and jejunostomy
- Restrictive and malabsorptive

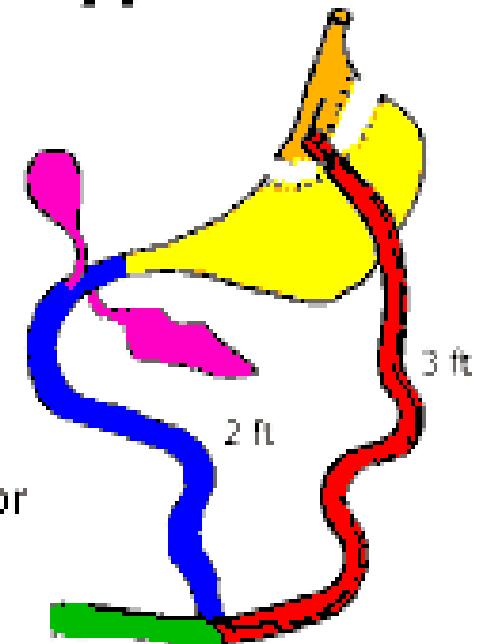


How Does it Work?

- Reduces food intake
- Absorption decreased
- Negative feedback from dumping symptoms
- ?disruption of Ghrelin production

Gastric Bypass

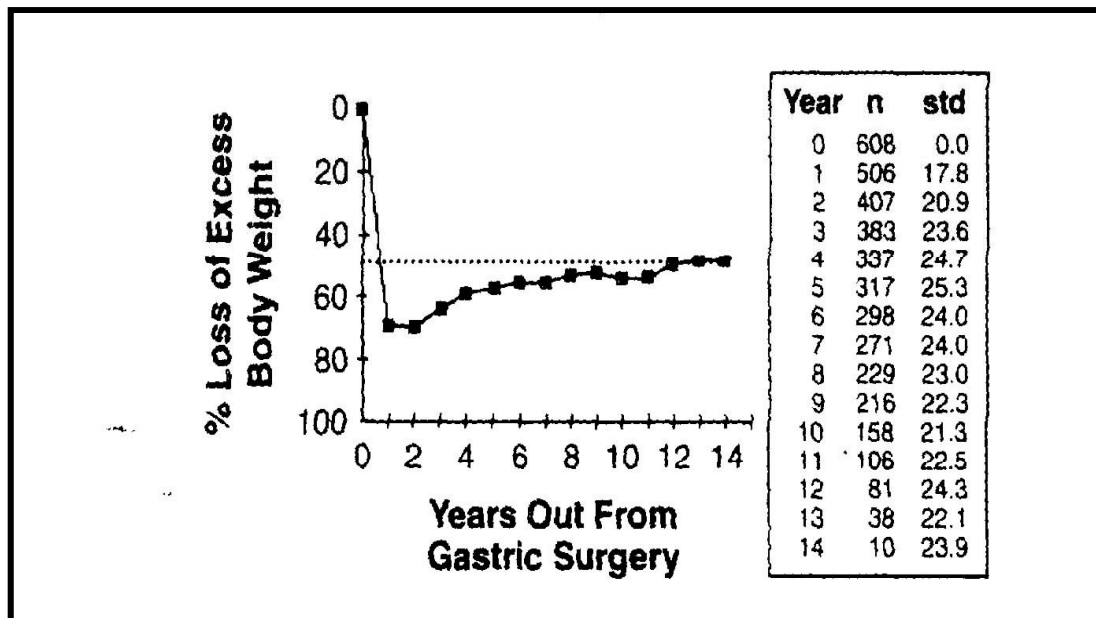
- gastric pouch
- bypassed stomach
- food channel
- digestive juices
- digestive organs
- common channel for nutrient absorption



● ● ● path of food through GI tract

Expected Weight Loss:

- Weight loss peaks between 12 and 18 months
- 65% - 80% excess weight loss
- Five year data shows excess wt loss of 50%-60%





Dietitian's Role on Bariatric Surgery Team

- Pre-op evaluation
- Education on new diet and lifestyle
- Monitoring & treatment of post-op diet related complications



Dietitian's pre-op nutrition assessment:

- Anthropometrics
- Weight hx
- Weight loss attempts
- Intake pattern/Environmental factors
- Assess motivation & stage of change



Management of Obesity:

- Nutritional management interventions:
 - Reduced calorie diet
 - Eating Frequency & Pattern
 - Portion Control
 - Meal Replacements
 - Individualized nutrition education
- Nutritional Dietary Approaches:
 - Low Glycemic Index Diets - not recommended
 - Dairy/Calcium & Wt Mngmt – 3-4 svg low fat dairy/d
 - Low Carbohydrate Diet - <35% kcal x 6 mo
- Physical Activity
- Behavior Therapy Strategies
- Weight Loss Medications
- Bariatric Surgery



Education on Post-op Progression of the Diet:

- Clear liquids
- Full liquids
- Pureed foods
- Soft foods
- Regular diet



Post-op dietary guidelines:

- Adequate protein intake
- Limit fat and sugar
- Make behavioral changes re: intake
- 5-6 small meals/day
- Portion control (1-2 oz. meals)
- No fluids with meals.
- Individualized daily supplements as needed (i.e. chewable multivitamin with iron, calcium, vitamin B12, folate)



Possible Post-op Dietary Complications:


- Nausea and/or vomiting
- Dehydration
- Dumping Syndrome
- Food aversions and intolerances
- Nutrient deficiencies
- Refeeding syndrome
- Regaining weight



Possible causes of Post-op Nausea/vomiting:

- Food intolerance
- Lack of portion control
- Rate of intake
- Dehydration
- Mechanical complication/blockage of the outlet

Prolonged vomiting may cause a thiamine deficiency → give 100 mg thiamine IV or IM for 7-14 days then 10 mg/day PO until pt fully recovered.



Tips for combating Post-op Dehydration:

Post-op, recommend individuals sip low calorie, noncarbonated beverages throughout the day.

-- no drinking approximately $\frac{1}{2}$ hour before the meal, during the meal, and not until $\frac{1}{2}$ hour after the meal.



Combating Post-op Dumping Syndrome:

- Caused by consuming sugar or carbohydrate containing foods
- Symptoms: shaky, sweaty, dizzy sensation with rapid heartbeat, nausea, diarrhea.
- Patients should eat slowly and avoid concentrated sweets, high carbohydrate beverages, and be careful with sweetened condiments/sauces.



Possible Post-op Food Aversions and Intolerances:

- Meats – red meat, hamburger
 - Dairy – lactose intolerance
 - Fruits and vegetables
 - Bread or doughy starches
 - Problem textures: dry, sticky, gummy, stringy
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- Instruct individuals to add foods back slowly to facilitate identifying problem foods.



Nutrient Deficiency – Protein:

- Related to reduced food intake, possible intolerance of protein foods
- Recommendation:
 - 60-80 g protein/day
 - 1 gm protein/kg IBW
 - protein powder/supplement may be recommended
 - Choose low sugar variety



Nutrient Deficiency – Iron:

- May affect 33-50% patients S/P Roux-en-Y Gastric Bypass (RYGB)
- Related to bypassing the acid environment of the stomach and the absorptive surface of the duodenum and proximal jejunum.
- Iron Recommendation:
 - 50-65 mg elemental iron/day
 - 325 mg ferrous sulfate/day
- Vitamin C rec., if supplemental iron rx:
 - 500 mg/day taken w/ iron



Nutrient Deficiency–Calcium/Vitamin D:

- Potential to affect all post-op patients
- Related to reduced intake of calcium containing foods (lactose intolerance) and bypassing the duodenum and proximal jejunum
- Recommendation: 1200-1500 mg/day calcium citrate in divided doses (i.e. 500 mg calcium citrate/200 IU vit. D 3 x day)
- Vit. D Recommendation, if deficiency: 50,000 IU/wk x 8 weeks (then recheck)



Nutrient Deficiency - Vitamin B12:

- May affect > 30% patients @ 1-9 years S/P RYGB
- Related to decreased stomach acid, pepsin, and intrinsic factor available to liberate and bind vitamin B12 from food
- Recommendation:
 - Oral: 350-500 mcg B12/day (175xRDA)
 - Injection: 1000 mcg B12/month



Nutrient Deficiency – Folate:

- May affect up to 38% patients S/P RYGB
- Main site of absorption is proximal third of the small intestine; although folate can be absorbed from the entire length of the small bowel.
- Deficiency may resolve over time.
- Recommendation: 1 mg folate/day



Combating Refeeding Syndrome:

- S/P surgery – alternate nutr. started within same time frame as for normal wt pt
- TF/Parenteral nutrition – initiate at 50% estimated needs x 24 hours
- Use Mifflin St.-Jeor Equation to calculate kcal/protein needs.
- * Check K^+ , PO_4 , Mg^{++} daily x 3 days – replete as needed.



Culprits of Regaining weight:

- Grazing
- Excessive portions
- High caloric density



Morbid Obesity & Kidney Transplant:

Concern: pt w/ BMI >35 (Class II Obesity) have worse transplant outcomes than non-morbidly obese pt

Marks et al. Am J Surg. 2004; 187:635-638.

3 yr graft survival:

Cadaver: 75% morbidly obese vs 90% non-obese

Living donor: 100% morbidly obese vs. 91% non-obese

Neither finding was statistically significant.

Conclusion: Morbidly obese pt have 3-yr graft & pt survival similar to non-morbidly obese pt



Bariatric Surgery and CKD

Reluctance to perform Bariatric surgery in CKD:

1. Perceived risk of procedure itself – post-op risk of complications & death
2. “Reverse epidemiology” – better survival rate of moderately obese dialysis pt than their underwt counterparts – more research needed.



Bariatric Surgery and CKD:

*Alexander JW, et al. Transplantation.
2004; 78: 469-474.*

Subjects: 30 morbidly obese pt w/ CKD or
s/p renal transplant had bariatric surgery

- 19 w/ CKD at time of bariatric surgery
- 8 w/ renal transplant followed by bariatric surgery
- 3 w/ bariatric surgery & then transplant

Results: ~70% excess wt loss at 1 yr –
comparable to pt w/o CKD or transplant



Bariatric Surgery and CKD:

Cuda SP, et al. SOARD. 2005;1:64-66.

Case study: 36 yo woman, BMI = 36.2, HTN, Dyslipidemia, stage I CKD w/ macroalbuminuria

- Underwent GBS w/ BMI = 20.2
- Resulted in d/c of all blood pressure medications, microalbuminuria
- Further research recommended



Bariatric Surgery and CKD:

Zalesin KD, et al. ACKD. 2006; 13: 403-417.

“Substantial weight loss in the obese population can be effectively achieved and maintained through bariatric surgery, which confers major health benefits by producing resolution or improvement of obesity-related comorbidities...Future research is needed to describe the clinical course and risks and benefits of bariatric surgery in the CKD population.”



Bariatric Surgery and CKD:

Navaneethan SD, et al. SOARD. Published online January 29, 2009.

Subjects at baseline: 25 stage III CKD pt's (mean GFR = 47.9 ml/min/1.73m²) w/ average BMI @ bariatric surgery 49.8 kg/m²

	6 months s/p GBS	12 months s/p GBS
BMI = kg/m ²	38.4 kg/m ²	34.5 kg/m ²
eGFR = ml/min/1.73m ²	56.6 ml/min/1.73m ²	61.6 ml/min/1.73m ²



MNT goals S/P bariatric surgery:

- Prevent/limit dietary complications
- Prevent/reverse nutrient deficiencies
- Achieve and maintain a desired/healthy weight
- Maintain patient's health



The potential Bariatric Surgery patient needs to know:

- Bariatric surgery is not a quick fix
- Eating/exercising habits must change
- Lifelong medical follow-up will be necessary
- The patient must be involved in their pre- & post-surgery treatment plan for ideal results



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