

## **Introduction**

As the worldwide obesity “epidemic” continues, there are over 97 million obese adults in the United States. Diet and exercise can lead to 5-10% excess body weight loss, but often with weight regain. Weight loss surgery has been recognized as the most effective treatment available at this time, and is being more widely practiced as the safety profile improves. The most common weight loss procedure performed in the United States is the Roux en Y Gastric Bypass (RYGB). Purely restrictive procedures which are also currently commonly performed are the Laparoscopic Adjustable Gastric Band (LAGB) and the Sleeve Gastrectomy. It is estimated that within the next few years, over 250 000 weight loss procedures will be performed yearly in the United States. This large cohort of patients will need life long surveillance for nutritional deficiencies, and for short and long term surgical complications.

## **Early post op complications**

- Discuss with bariatric surgeon or refer urgently to bariatric center

## **Early complications**

### Vomiting

- Occurs in 30%
  - May lead to dehydration, protein-calorie malnutrition, and thiamine deficiency
  - Usually self limited, improves with dietary modification
  - May need admission for hydration
  - Consider work up for stenosis (RYGB, or sleeve), marginal ulcer (RYGB), tight band or slippage (LAGB), cholelithiasis

### Mid-long term complications:

#### Abdominal pain/vomiting

- Same as above, but strongly consider internal hernia

#### Biliary disease

- Incidence: 3-20%
- Timing: >6 months post op
- RUQ US +/- CCK HIDA
- Some groups use ursodiol post op and which may decrease rates

### Gastrojejunal stricture

- Incidence: 0.5-30%
- Timing: 3-10 weeks
- May obtain UGI but it is usually unnecessary since endoscopy can be therapeutic in terms of dilation

### Marginal Ulcer

- Incidence: 1-16%
- Timing: anytime
- May be associated with preop helicobacter pylori prevalence
- Diagnosed by upper endoscopy
- Treatment: cessation of smoking, NSAIDs, ETOH, oral PPIs, H2 blockers, sucralfate
- Check for healing endoscopically, and remove all foreign material

### Internal Hernia

- 1-3%
- Timing: following significant weight loss
- More frequent following laparoscopic surgery
- CT, UGI: false negative in 20%
- May rarely present with closed loop obstruction or ischemia → need urgent attention

## Nutrition

### Protein

- 50 % of protein absorption occurs the duodenum
- Most protein absorption is complete by mid jejunum

### Carbohydrates

- Absorbed from duodenum to 100cm into the jejunum

### Fat

- Majority absorbed in proximal 2/3 of the jejunum
- Absorption continues through the small bowel

### Vitamins

#### Fat soluble:

- Absorbed in similar areas to areas of fat absorption
- Deficiencies occur due to decreased intake or malabsorption

#### Water soluble:

- Absorption mainly occurs in the proximal small bowel
- Deficiencies rare if there is a high enough oral intake (except B12)

#### B12:

- Pepsinogen (secreted from chief cells) and intrinsic factor (secreted from parietal cells) and pancreatic lipases needed to allow B12 to bind to intrinsic factor and be absorbed in the terminal ileum
- Severe deficiencies seen when fundus/body of the stomach (where chief and parietal cells) are found is resected or excluded

#### Iron:

- Dietary iron broken down by gastric proteases, solubilized by conversion from ferric to ferrous by gastric acid then absorbed in duodenum/proximal jejunum
- Deficiencies common due to decreased intake, menstrual losses

#### Folic acid:

- Absorption mainly occurs in the proximal 1/3 small bowel
- Deficiencies occur due to decreased intake or malabsorption

#### Calcium:

- Absorbed mainly in duodenum and proximal jejunum
- Deficiencies occur due to decreased intake or malabsorption (of calcium and/or vit D)
- Replace with calcium citrate with vitamin D

#### Trace elements:

- Zinc, copper, cobalt, selenium, magnesium absorbed in the small intestine

#### Deficiencies in restrictive procedures

Following purely restrictive procedures, such as VBG (vertical banded gastroplasty), LAGB, or sleeve gastrectomy, deficiencies are less common, but can occur due to decreased total intake and intolerance to specific food group. Folic acid deficiency is the most common consequence.

#### Deficiencies in combined restrictive/malabsorptive procedures

Deficiencies of vitamin D, calcium, vitamin B12, and iron are common.

#### Follow up of bariatric patients:

Routine blood work to assess for nutritional deficiencies at 3 months, 6 months, 12 months, then yearly