Radiology of Bariatric Surgery: Anatomy and Complications

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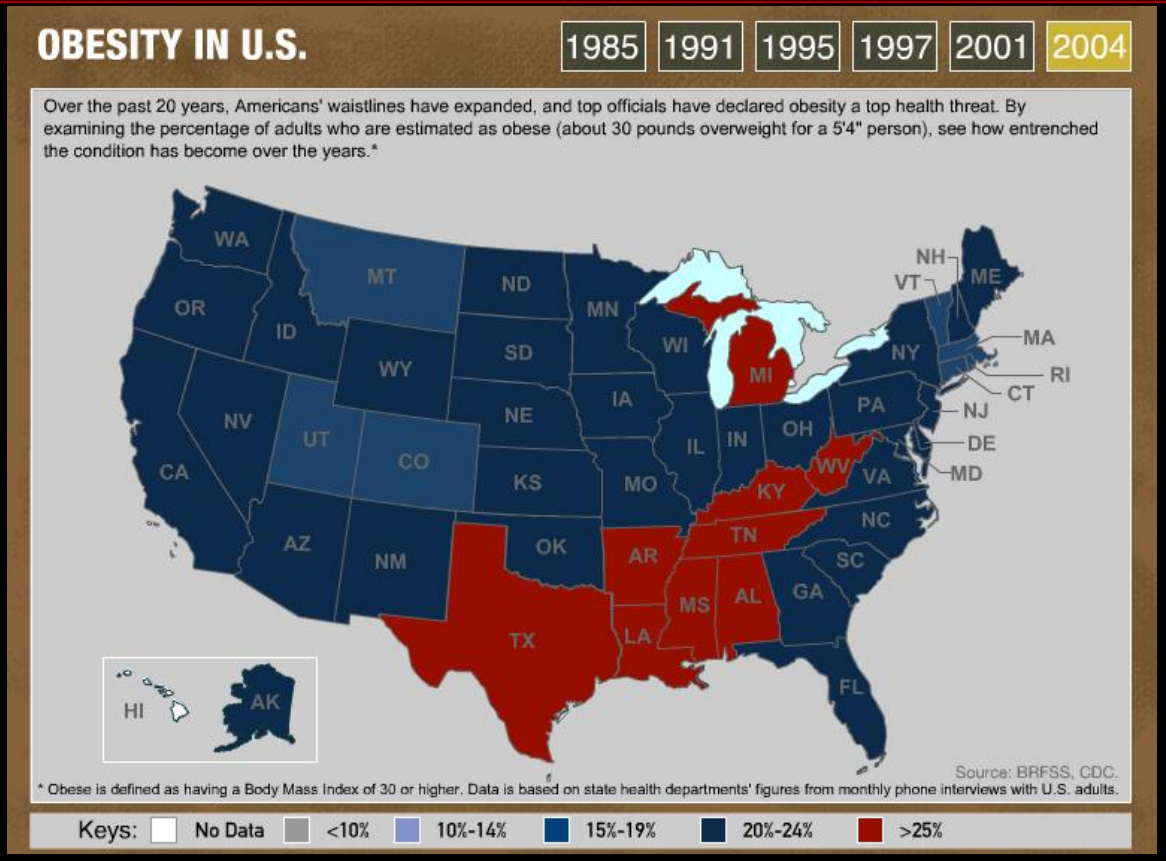
Agenda

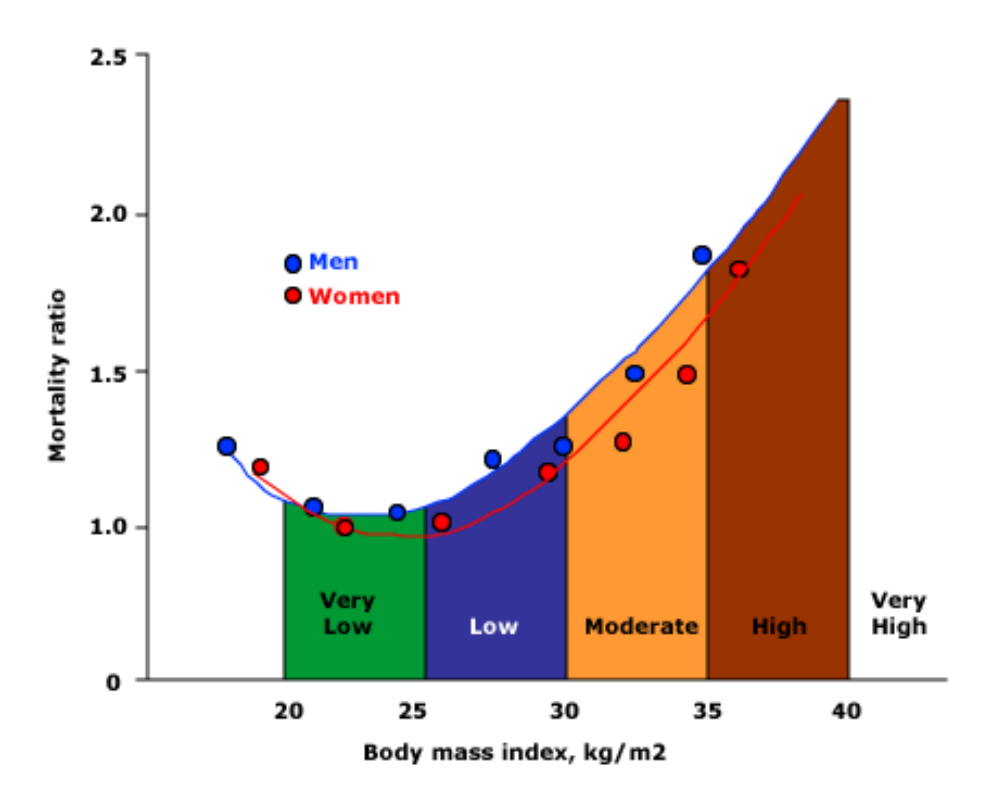
- Indications for bariatric surgery
- Normal anatomy of bariatric surgery
- Common complications of bariatric surgery
- Four interesting cases

Epidemiology of Obesity in the US



http://www.cdc.gov/nccdphp/dnpa/obesity/trend/maps/

Obesity and Mortality



UpToDate: "Overview of Therapy for Obesity in Adults"

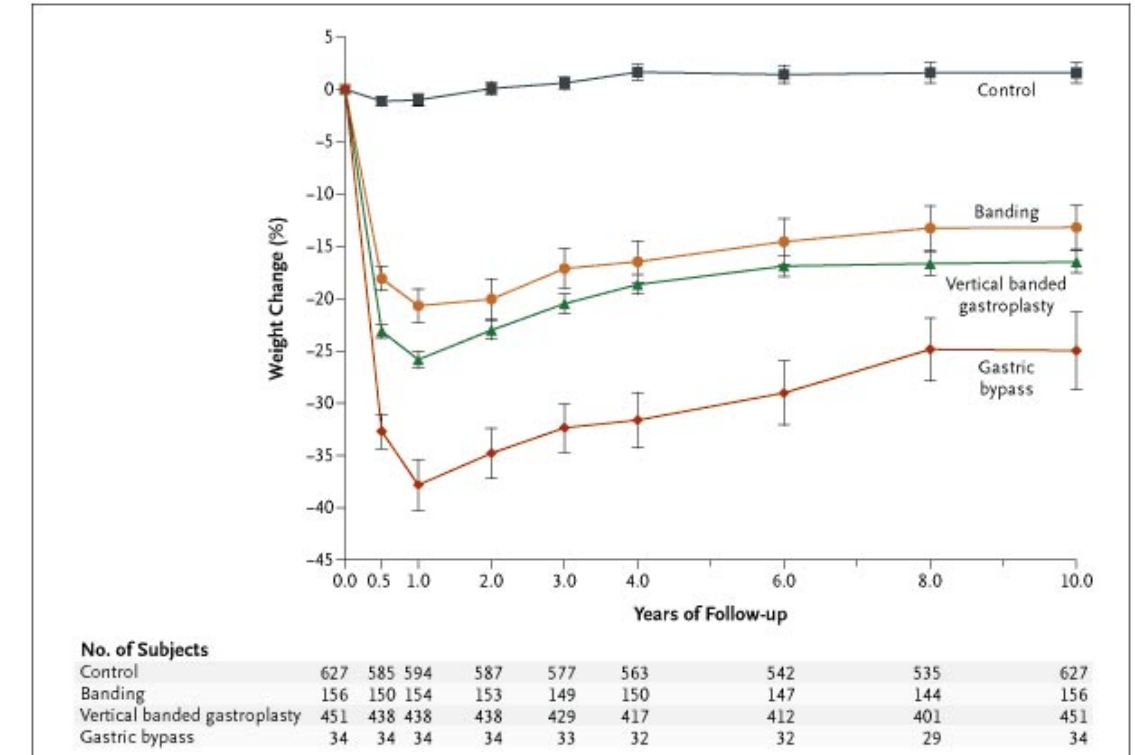
- Obesity, measured by body mass index (BMI), is an independent predictor of mortality.
- The Framingham Heart Study concluded: "If everyone were at optimal weight, we would have 25 percent less coronary heart disease, and 35 percent less congestive failure and brain infarctions."

Bariatric Surgery is a Treatment for Morbid Obesity

- NIH Guidelines support bariatric surgery as therapy for morbid obesity:
  - Have a BMI >40 kg/m^2
  - Have a BMI 35-39.9 kg/m^2 and an associated major comorbidity (i.e. DM, HTN, OSA)
  - Are refractory to other weight management strategies
- Number of surgeries increased from 72,177 to 171,200 procedures per year between 2002 and 2005.

Long-term Results of Bariatric Surgery

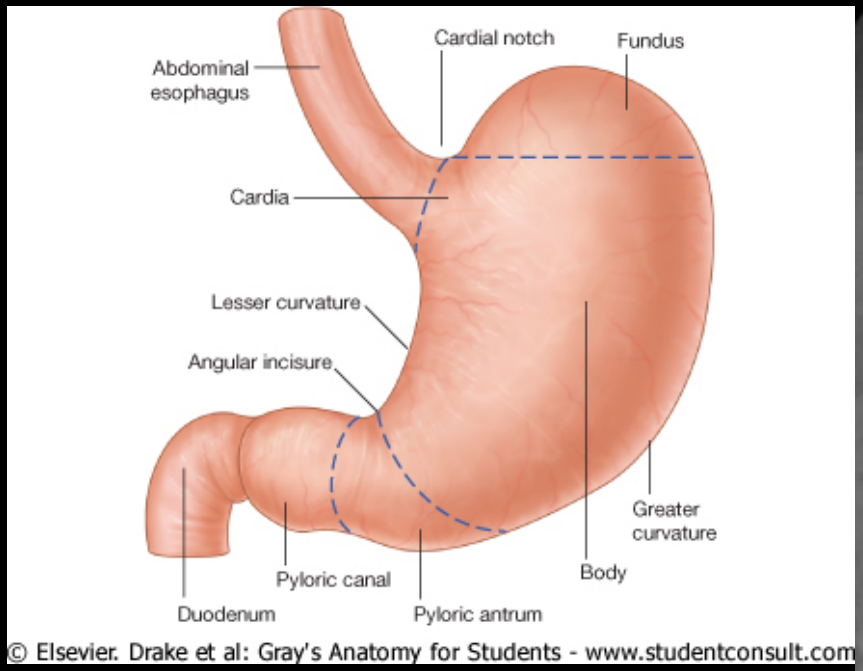
- Patients who undergo bariatric surgery have significantly more weight loss at 10 years than matched control subjects.

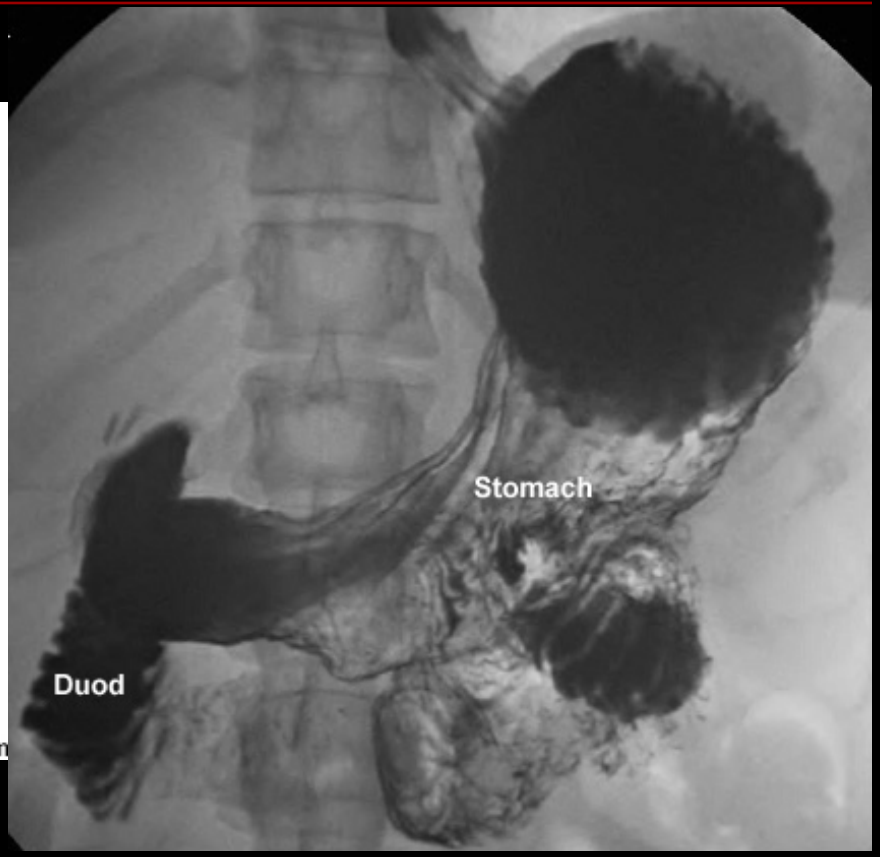


No. of Subjects								
Control	627	585	594	587	577	563	542	535	627
Banding	156	150	154	153	149	150	147	144	156
Vertical banded gastroplasty	451	438	438	438	429	417	412	401	451
Gastric bypass	34	34	34	34	33	32	32	29	34

NEJM **2004**

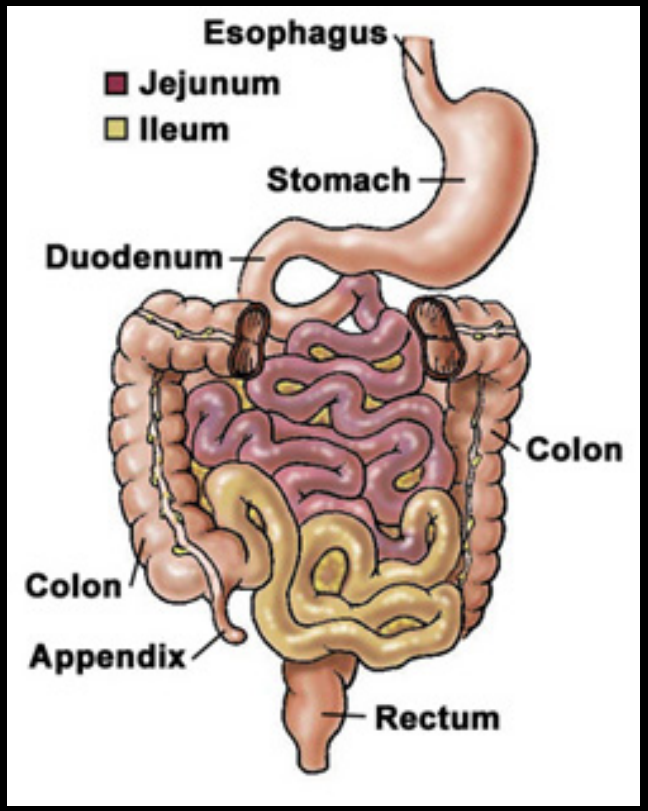
Normal Anatomy I





www.lahey.org/images/Radiology/fluoroscopy_UGI.asp

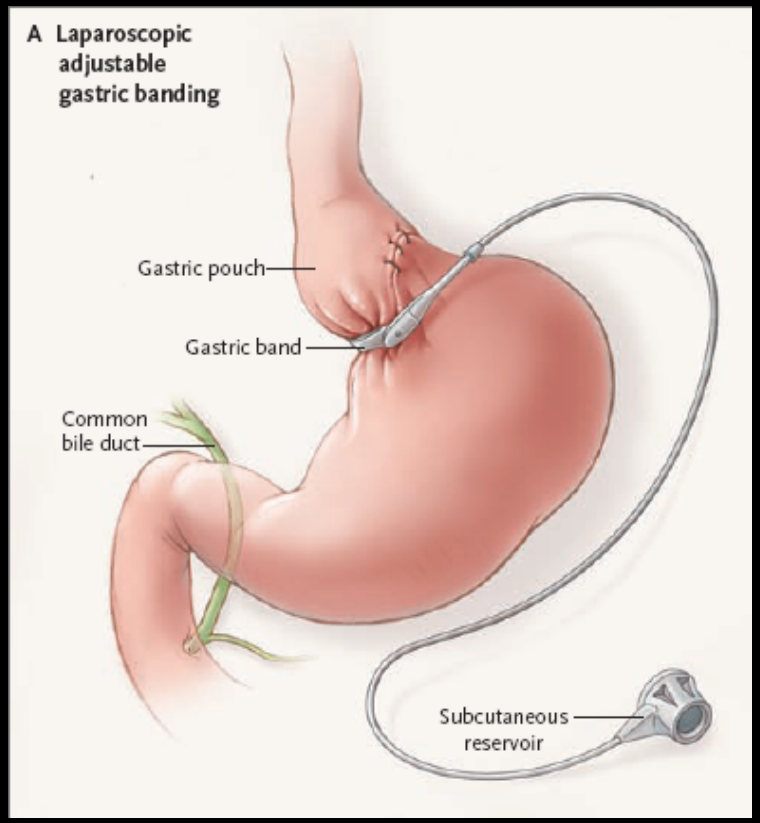
Normal Anatomy II



www.yoursurgery.com/.../images/SmBowelAnat.jpg

www.lahey.org/images/Radiology/fluoroscopy_UGI.asp

Restrictive Surgery: Laparoscopic Adjustable Gastric Banding

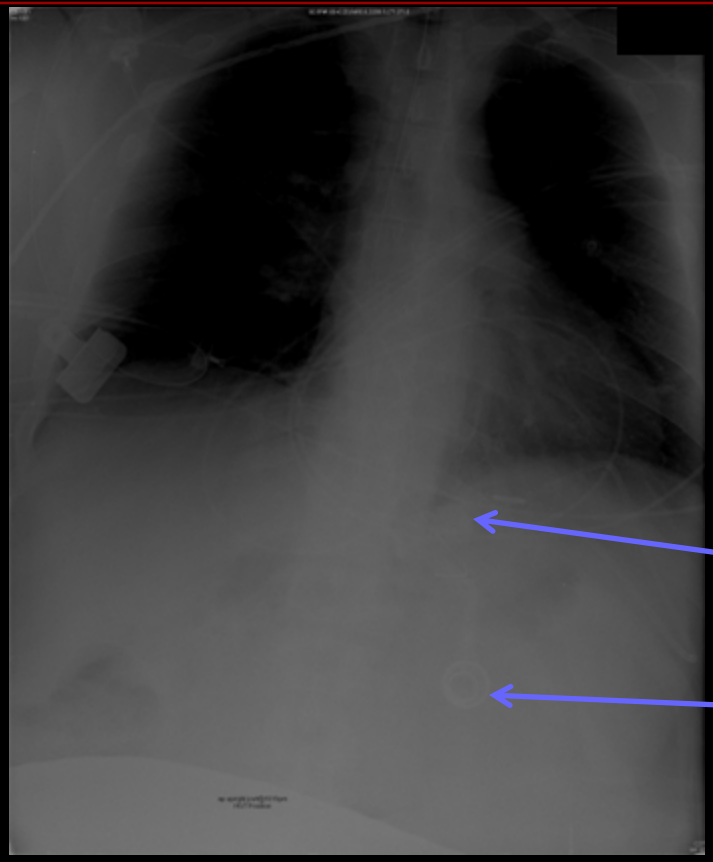


NEJM 2007

- Adjustable band is placed around the upper part of the stomach, ~2cm from the gastroesophageal (GE) junction, forming a small gastric pouch or neo-stomach.
- Limits food intake when the stomach fills and stretches.
- Access port is placed outside peritoneal cavity, sewn into the surrounding fascia.

Normal Appearance of Lap Band on Chest X-Ray

- Laparoscopic adjustable bands can be seen on chest X-ray (CXR).
- CXR is not the modality of choice for evaluating lap band.
- This study was taken to evaluate the placement of an NG tube.



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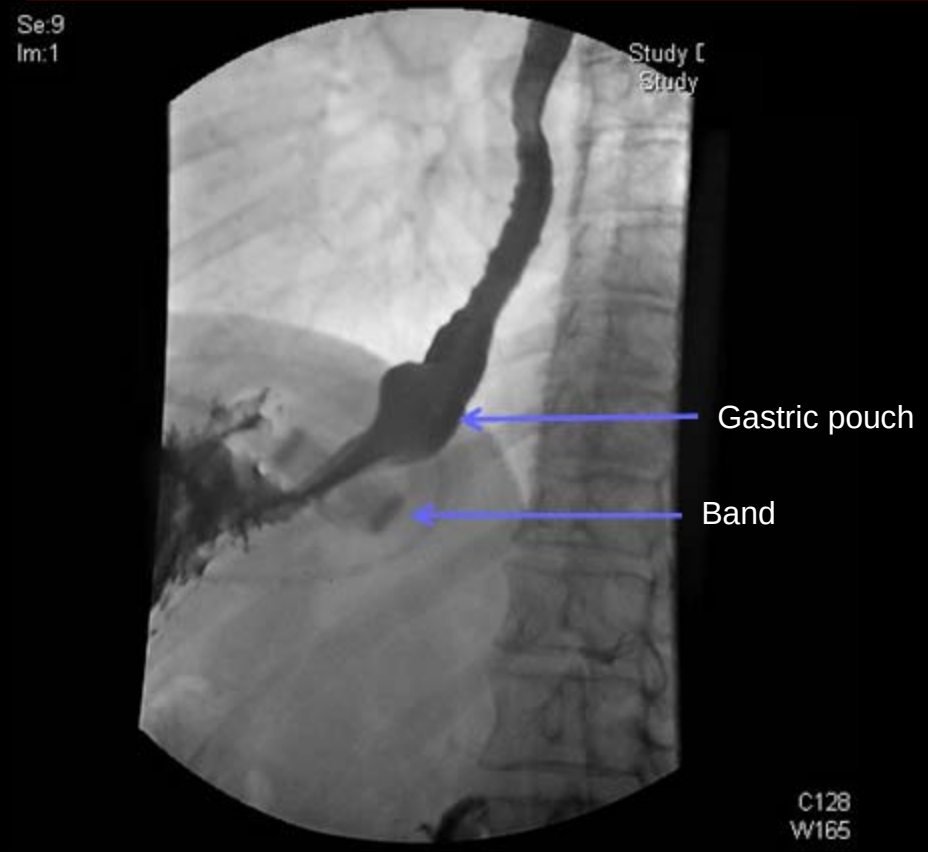
Normal Appearance of Lap Band on Fluoroscopy



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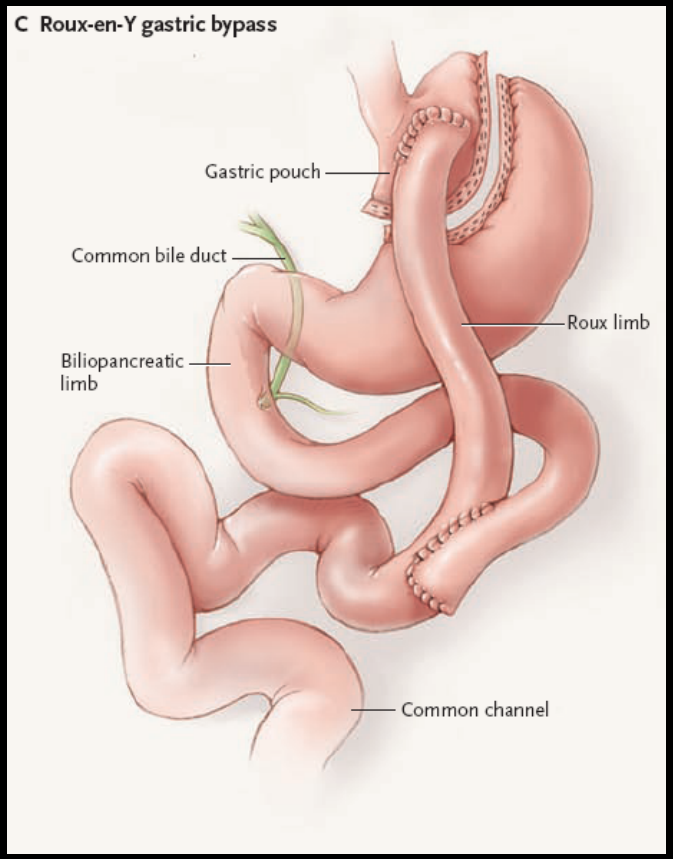
- Upper GI fluoroscopy with barium swallow is the modality of choice to evaluate the proper placement and function of a lap band.
- Stoma should be 3-4mm, allowing emptying of the gastric pouch within 15 to 20 minutes.

Common Complications of Gastric Banding

Complication	Incidence	1st month vs Later
Stomal Stenosis	8-11%	Early or Late
Band Misplacement	2-3%	Early
Band Slippage	2-13%	Late > Early
Pouch Dilation	3-8%	Late > Early
Band erosion in stomach	3%	Late
Port rotation/inversion	1-5%	Late > Early
Tubing disconnection/Leak	1-5%	Late

Restrictive/Malabsorptive Surgery: Roux-en-Y Gastric Bypass



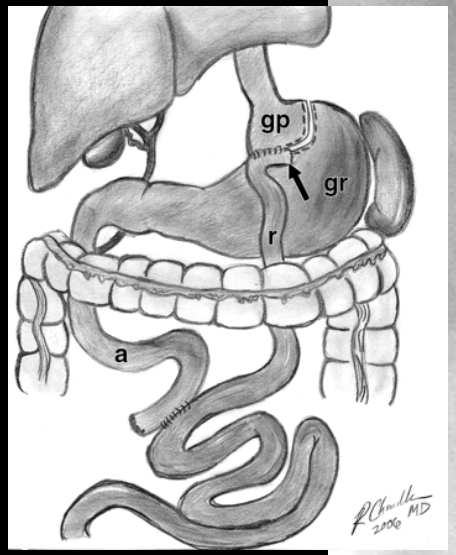
NEJM 2007

- Stomach is stapled to create a small ~30ml gastric pouch. Small intestine divided in mid-jejunum. The distal portion (alimentary/Roux limb) is anastamosed to the stomach. Remaining stomach and biliary tract (the biliopancreatic limb) is anastomosed further down the jejunum.

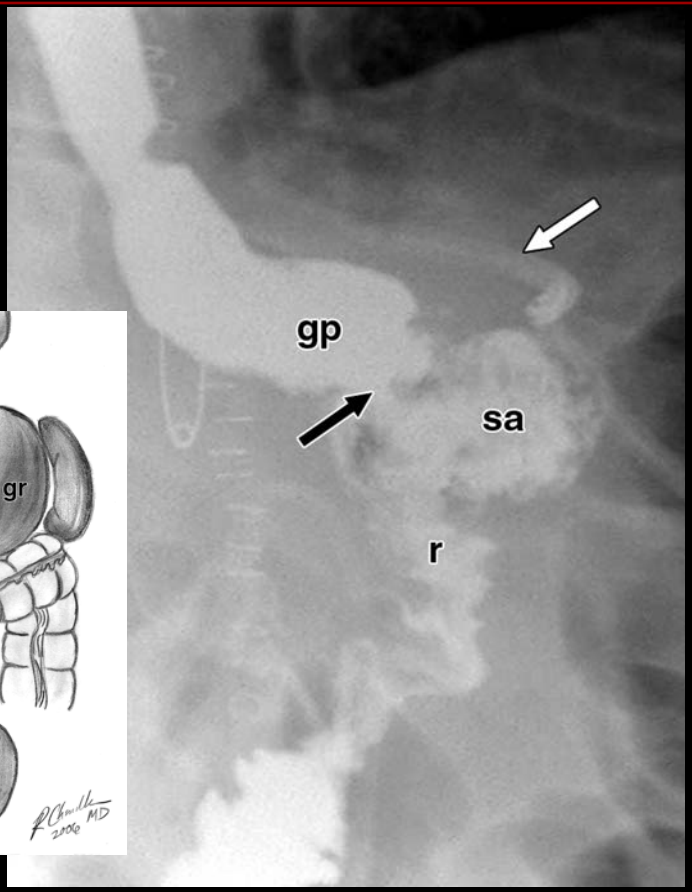
- The stomach is smaller, causing restriction. Shorter 'common channel' to restrict absorption.

- This surgery remains the 'gold standard' of weight-loss surgeries.

Normal Appearance of Gastric Bypass on Upper GI

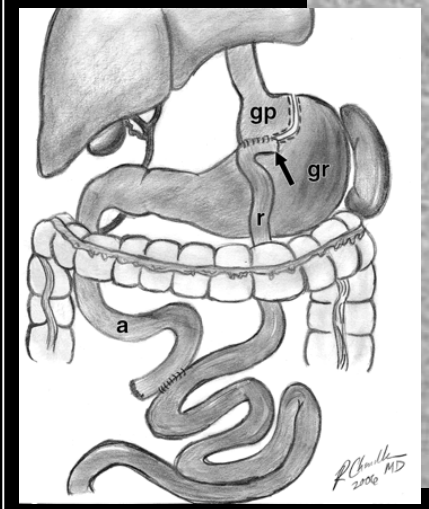


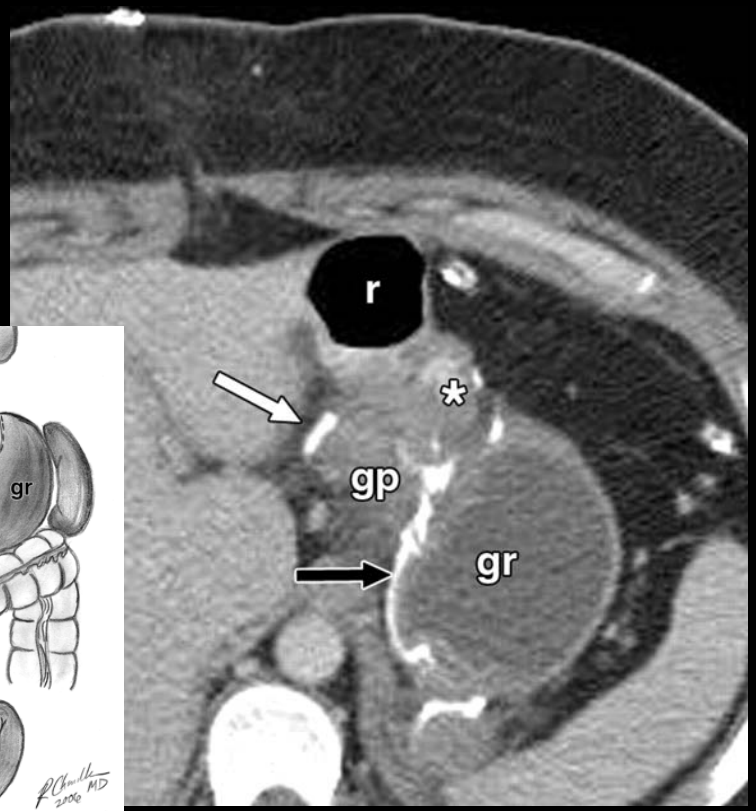
AJR 2008



- Post-op day 1 a Gastrograffin swallow is performed to assess the anastamoses for leaks.
- Here you can see the gastric pouch (gp), the Roux limb (r), the small blind afferent limb (sa), gastrojejunal anastamosis (black arrow), and a surgical drain (white arrow).
- Fluoroscopy is ideal for assessing a suspected leak.

Normal Appearance of Gastric Bypass on CT





AJR 2008

- Here is normal post-op anatomy on CT. The gastric pouch (gp), gastric remnant (gr), the Roux limb w/ air (r), the gastric suture line (black arrow), gastrojejunal anastamosis (white arrow), and the small blind afferent limb (star).

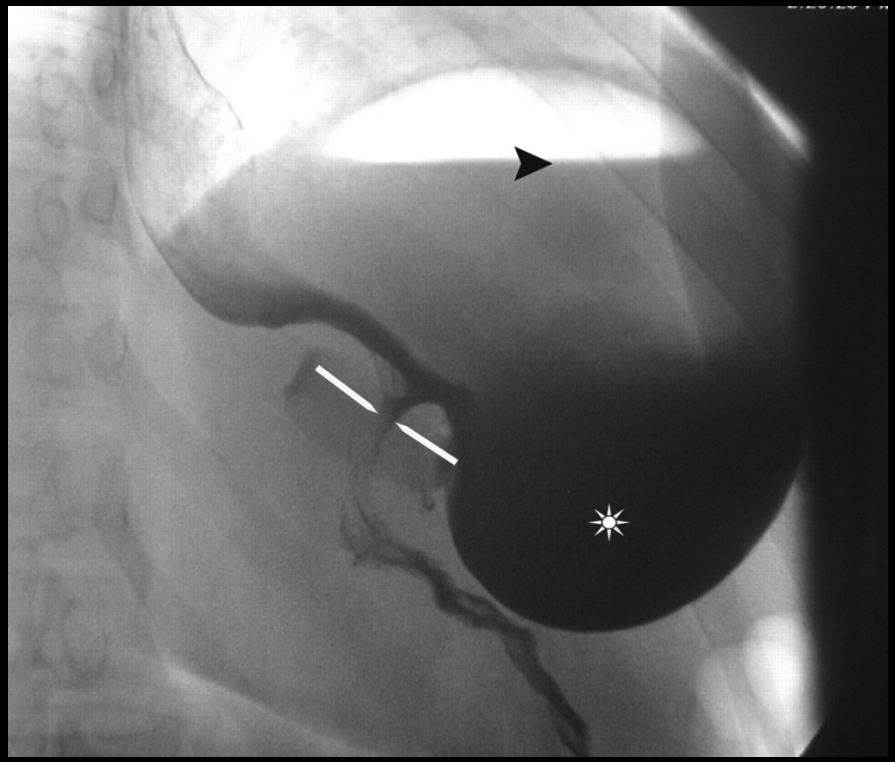
- CT is typically used after equivocal fluroscopy, suspected obstruction or possible intrabdominal process. It allows visualization of surrounding structures.

Common Complications of Roux-en-Y Gastric Bypass

Complication	Incidence	1st month vs Later
Anastomotic leak	2-5%	Early
Wound Infection	Up to 10%	Early
Obstruction	1-5%	Late > Early
Stricture	3-9%	Late > Early
Gastric staple disruption	0.7-8%	Late > Early
Hernia (incisional and internal)	6-17%	Late
Marginal ulcer	0.5-4%	Late

Patient I: Band Slippage on UGI

- A 35-year-old woman presents 18 months post-operatively after a gastric banding procedure with acute onset dysphagia, nausea, vomiting and abdominal discomfort.
- Upper GI fluoroscopy with barium swallow shows a distended stomach with an air-fluid level (black arrow) and a narrowed stoma of 2mm (arrows).
- Initial management includes dilating the band and seeing if the problem will correct itself. If not, re-operation is necessary.



AJR 2006

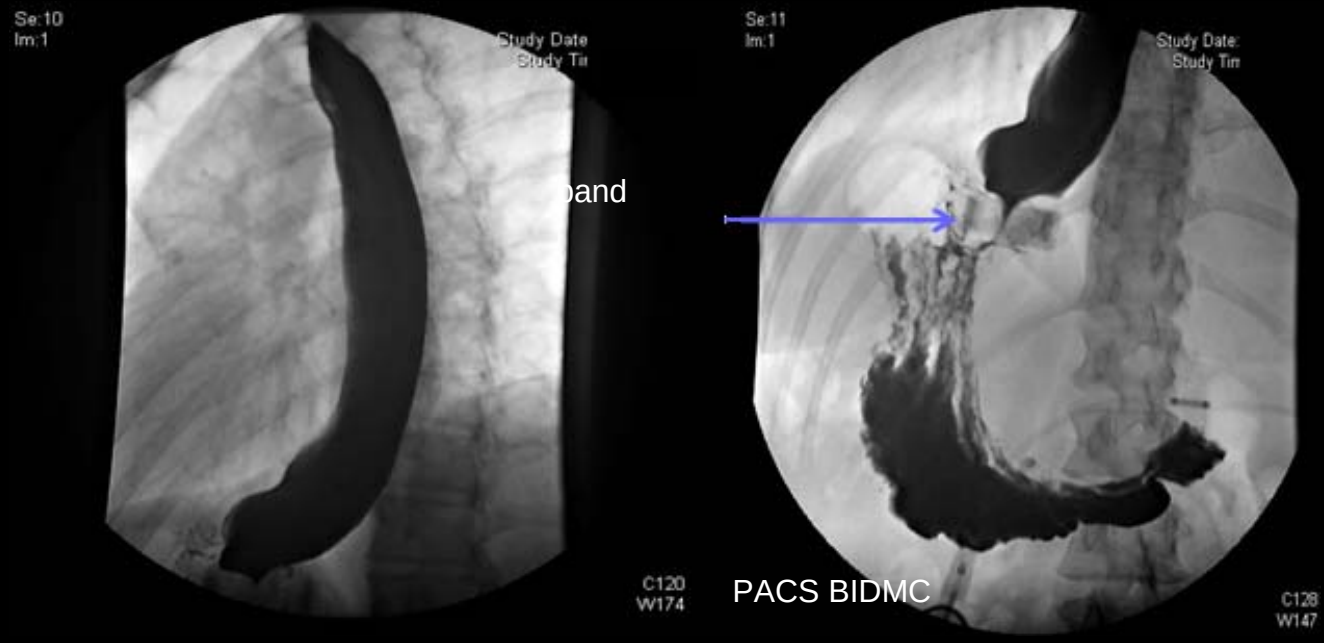
Patient II – Dysphagia s/p Gastric Banding

- Patient II is a 47-year-old woman who has had a gastric band for one year. She has had saline added to her port several times over the last year. She sees you because she has had trouble swallowing over the last two months and several episodes of vomiting undigested food. She began by having trouble swallowing solids and has recently had trouble swallowing liquids if not fully upright.

- What are you thinking the problem might be? What study do you want?

Patient II – Stomal Stenosis on UGI

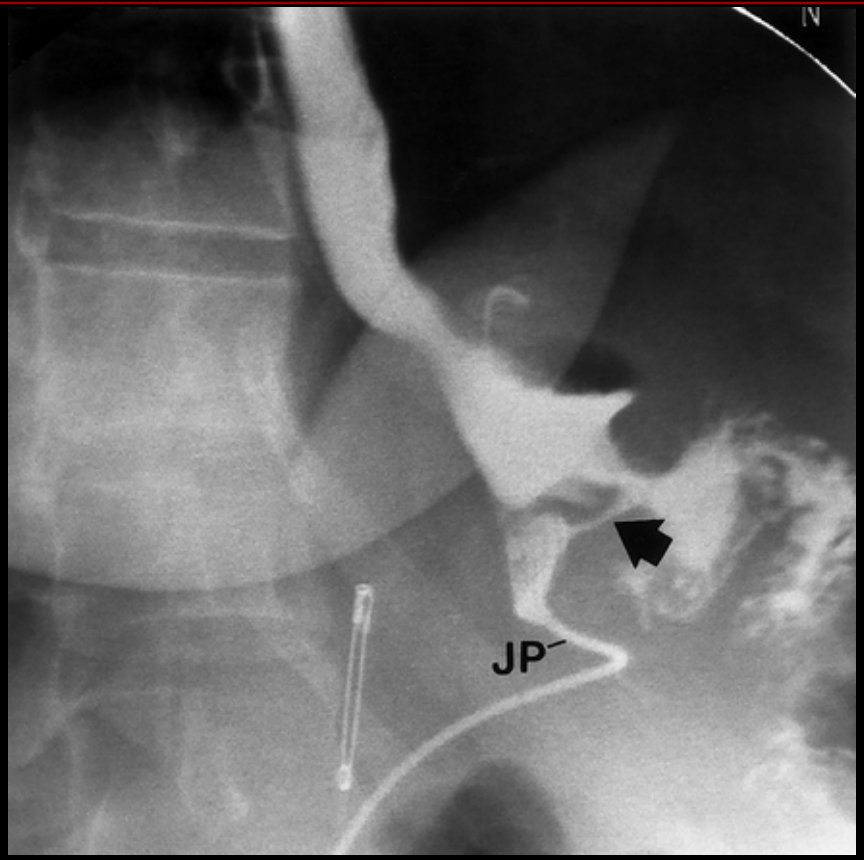
- A barium swallow is ordered. The band appears to be in the right position without prolapse or slippage. There is delayed emptying of the slightly dilated esophagus. There are some abnormalities in esophageal peristalsis. When the patient is recumbent, no barium passes and the patient experiences clinical discomfort. Treatment was to remove saline to dilate the band.



Patient III – Anastamotic Leak on UGI

- A 42-year-old man develops fever, malaise and LUQ pain 14 hours after surgery. He quickly develops tachycardia and increased fluid requirements.

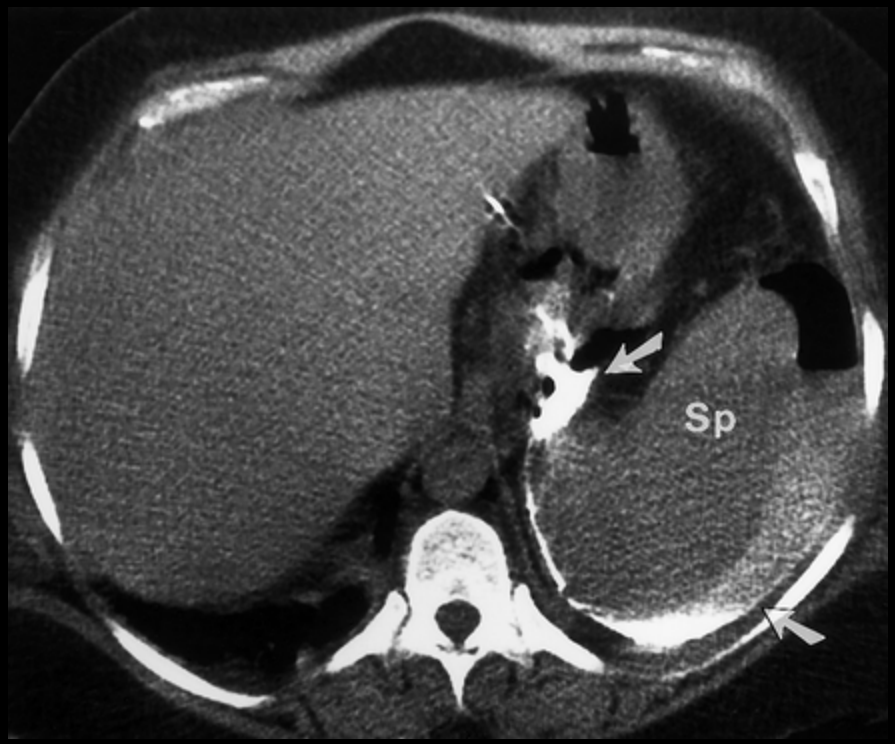
- Gastrograffin swallow shows a leak at the gastro-jejunal anastamosis with extravasated contrast taken up by a Jackson-Pratt (JP) surgical drain. This patient is becoming septic and needs to be rushed to the OR for surgical revision.



AJR 2008

Companion Patient – Leak seen on CT

- Anastatmotic leak on non-contrast CT scan shows extravasation of oral contrast next to the stomach pouch. Some extraluminal gas and contrast material are seen (arrow) and the contrast is tracking around to the spleen (Sp). Treatment is surgical revision.



Radiology 2002

Patient JC – Abdominal Plain Film

- JC, a 24-year-old woman presents 8-months post-operatively after a Roux-en-Y gastric bypass surgery. She has had increasing abdominal pain over two days with increasing discomfort and malaise. Her last bowel movement was 5 hours ago. On physical exam she is distended and diffusely tender. Naso-gastric tube provides no relief.
- Abdominal plain film is the initial study of choice to evaluate for distention and free air.
- Upright abdominal film was unavailable, but the scout CT film shows markedly distended stomach and small bowel in the midline. Colon contains air and is normal caliber.

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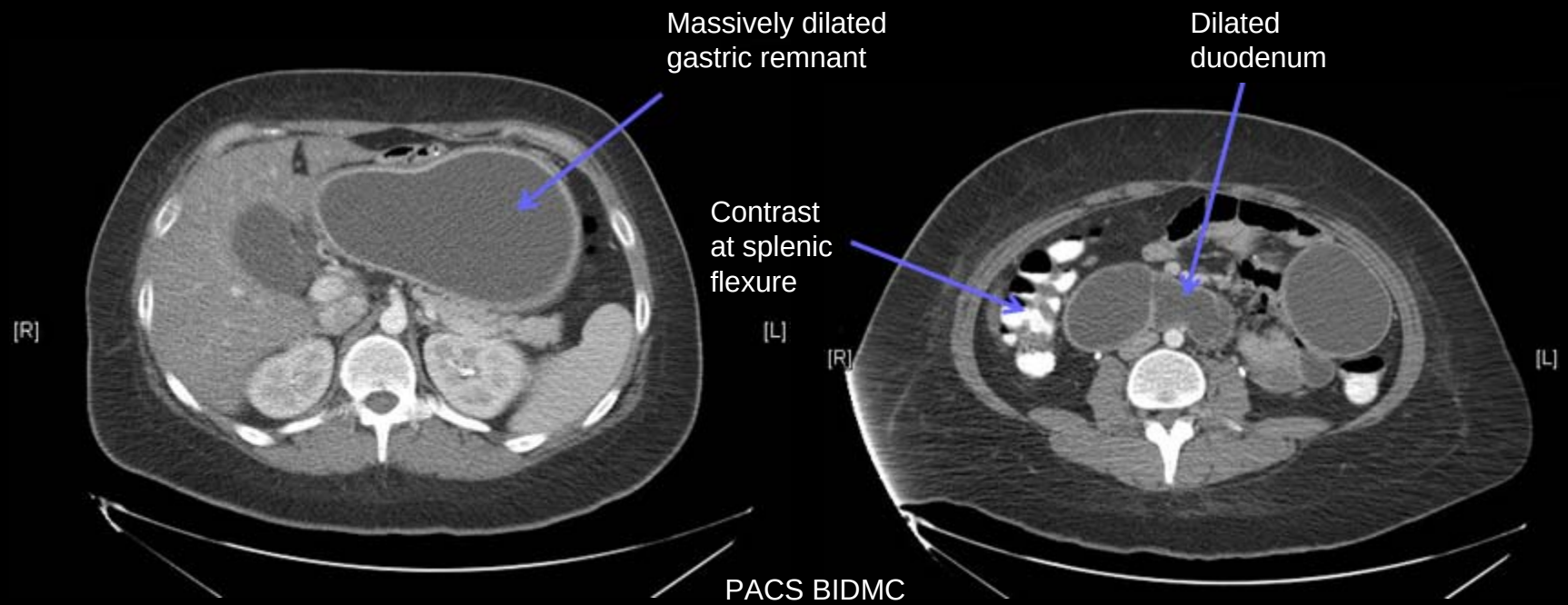
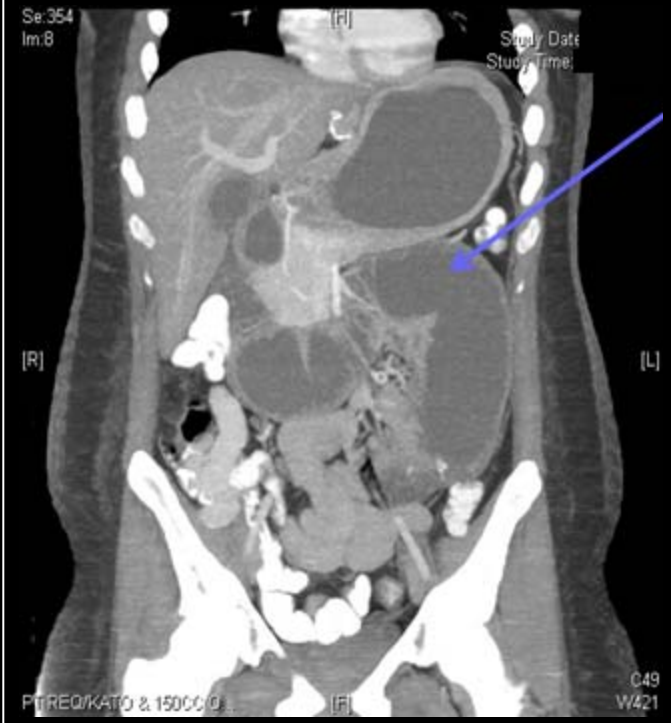
Patient JC – Axial CT

- CT with contrast shows severe distention of the excluded portion of the patient's stomach, duodenum and proximal jejunum. Oral contrast reaches the patient's colon.



Patient JC – Coronal CT



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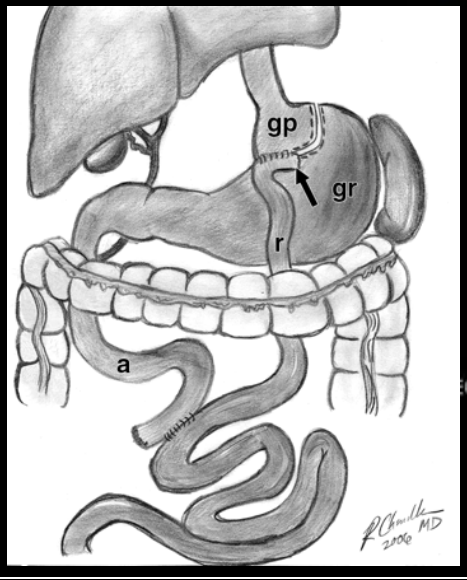
Dilated Y loop

Normal caliber transverse colon



PACS BIDMC Transition point near jejunojejunal anastamosis

Patient JC – Anastamotic Stricture

- Reformatted images showed a markedly distended Y loop with a normal caliber Roux loop. There is a stricture at the jejunojejunal anastamosis.

- Because of fear of ischemia or perforation, the patient was brought emergently to the OR for revision of the anastamosis.

Diagnosis:
Jejunojejunal Anastamotic Stricture

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Main Points

- Bariatric surgery is an effective treatment for morbid obesity and is increasing in prevalence.
- The two most common surgeries in the US are laparoscopic adjustable gastric band placement and a Roux-en-Y gastric bypass.
- Common complications of gastric band include stomal stenosis and band slippage.
- Common complications of Roux-en-Y gastric bypass include anastamotic leak and anastamotic strictures.

Acknowledgements

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- Dr. Shawn Tsuda for his help finding cases.
- My classmates for listening.

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