Fluoroscopy of postsurgical gastrointestinal anatomy and postoperative complications.

Poster No.: C-1939
Congress: ECR 2018
Type: Educational Exhibit
Authors: C. Astor Rodriguez¹, A. Palomares Morales¹, M. Leal Cala¹, M. J. Lucena González¹, S. Alvarez Diaz², M. Bernabéu Rodríguez¹; ¹Toledo/ES, ²Madrid/ES
Keywords: Fistula, Surgery, Diagnostic procedure, Fluoroscopy, Abdomen
DOI: 10.1594/ecr2018/C-1939

Any information contained in this pdf file is automatically generated from digital material submitted to EPOS by third parties in the form of scientific presentations. References to any names, marks, products, or services of third parties or hypertext links to third-party sites or information are provided solely as a convenience to you and do not in any way constitute or imply ECR's endorsement, sponsorship or recommendation of the third party, information, product or service. ECR is not responsible for the content of these pages and does not make any representations regarding the content or accuracy of material in this file.

As per copyright regulations, any unauthorised use of the material or parts thereof as well as commercial reproduction or multiple distribution by any traditional or electronically based reproduction/publication method ist strictly prohibited.

You agree to defend, indemnify, and hold ECR harmless from and against any and all claims, damages, costs, and expenses, including attorneys' fees, arising from or related to your use of these pages.

Please note: Links to movies, ppt slideshows and any other multimedia files are not available in the pdf version of presentations.

www.myESR.org
Learning objectives

The purpose of this exhibit is to illustrate postsurgical gastrointestinal anatomy and some of the possible postoperative complications, using fluoroscopy.
Background

Fluoroscopy is one of the main imaging modalities used in the post-operative period and commonly patients are imaged in the first 48 hours following the procedure.

In the early postoperative period when complications are suspected, water-soluble contrast is the agent of choice.

At our institution, routine postoperative imaging is performed on patients who have undergone surgery on the upper gastrointestinal tract (esophageal and bariatric surgery). When the patient is stable and the suspicion of major complications is low, we also evaluate surgeries of the lower gastrointestinal tract such as Hartman’s procedure and lower resections.
Findings and procedure details

We bring some cases of postsurgical patients, to show normal postoperative anatomy and some of the complications we can depict with this imaging technique. Water soluble oral contrast material is administered to the patient by controlled boluses and spot images are obtained. When evaluating lower intestinal tract, contrast is administered by enema. If the surgeon wants to depict colovesical fistulae, we instill contrast into the bladder as in cystography.

We are going to analyze postsurgical anatomy of the most common surgeries performed in our institution. Beginning with the upper gastrointestinal tract including Nissen's fundoplication, Heller's myotomy and bariatric procedures, followed by some cases of lower gastrointestinal tract surgeries such as Hartman's procedure and low anterior resection.

Esophageal procedures

Heller's myotomy

Achalasia is a failure of the lower esophageal sphincter to relax. On barium studies, a beaklike deformity of the distal esophagus is a classic finding. Although the proximal esophagus is classically atonic, some patients show esophageal contractions, known as vigorous achalasia. Fig. 1 on page 9

Heller's procedure consists on a myotomy of the lower esophageal sphincter, allowing the pass to the gastric cavity. Because of the decreased effectiveness of the lower esophageal sphincter, gastroesophageal reflux is a complication of this procedure.

In some cases, miotomy might be insufficient, with recurrence of the symptoms and findings on the study similar to the diagnosis. Fig. 2 on page 9

Nissen's fundoplication

The surgical management of gastroesophageal reflux is based on restoration of competency of the valve. To achieve this goal, the distal esophagus must be wrapped by a fundoplication that is affixed to the esophagus to keep it in place. The esophagus must allow the passage of a large bougie, so no tension can be placed on the fundoplication. The wrapped segment of the esophagus must be subdiafragmatic. The main objective of this surgery is to balance adequate reflux control without excessive dysphagia. Fig. 3 on page 10
Some deformity of the stomach may be observed in patients who have undergone a fundoplication. There may be a mass indentation "pseudotumor" at the level of the fundus where the esophagus enters the stomach. Fig. 4 on page 11 Fig. 5 on page 12

Dysphagia is the most common symptom and is seen in 30 to 40% of patients in the immediate postoperative period. Over time this decreases to 5% of patients. Some of the dysphagia is initially due to perioperative edema. If persistent, esophageal narrowing may be secondary to a wrap that is too tight, also known as "pseudoachalasia". Fig. 6 on page 13

**Gastric and bariatric procedures**

General indications for gastric surgery include resection of neoplasms, peptic ulcer disease and obesity, among others.

The radiographic evaluation of the postoperative stomach can be challenging because normal anatomy is often disrupted. To avoid confusion, it is important to know beforehand the type of surgery that has been performed. In the early postoperative period when leaks are suspected, water-soluble contrast is the contrast agent of choice.

The reconstruction of the gastrointestinal tract after gastric procedures, might use one the Y-en-Roux technique: the jejunum is divided approximately 50 cm distal to the ligament of Treitz, and brought up to create a gastrojejunostomy with the gastric pouch. This anastomosed jejunal loop is referred to as the Roux or alimentary limb and can be placed "retrocolic" through an opening created in the transverse mesocolon or "antecolic" in front of the transverse colon.

To complete the operation a jejunojejunostomy is created approximately 100-150 cm distal to the gastrojejunostomy to connect the alimentary limb and biliopancreatic limb. The small bowel from this point to the terminal ileum is referred to as the common channel.

In the particular case of bariatric surgery, different operative procedures have evolved due to poor success in achieving permanent weight loss in these patients with dietary and behavioral therapy.

With the gastric bypass, a small gastric pouch is created with an anastomotic outlet to the small bowel. The rest of the stomach is excluded. The anastomosis usually adopts a Roux-en-Y configuration. Fig. 7 on page 14 Fig. 8 on page 15 Fig. 9 on page 16
Other procedures include tubular gastrectomy (Sleeve gastrectomy), where major gastric curvature is excluded, creating a tubular gastric cavity. Fig. 10 on page 17 Fig. 11 on page 18

Other non-invasive bariatric procedures include:

**Gastric banding**

Gastric banding involves placing an adjustable band around the proximal stomach, approximately 2 cm distal to the gastro-esophageal junction to create a small gastric pouch with an adjustable stoma into the rest of the gastric cavity. The size of the stoma can be adjusted by percutaneous injection or withdrawal of saline solution into the port under fluoroscopic control. Reported complications include slippage of the band, erosion of the band into the stomach, obstruction or narrowing of the channel and migration of the access port. Fig. 12 on page 19

On fluoroscopic studies, the stoma diameter should measure approximately 3-4 mm, and gastric pouch should measure approximately 3-4 cm when distended with contrast material. Fig. 13 on page 20

**Gastric balloon**

With this procedure, a deflated bubble is placed in the gastric cavity and then inflated with air via catheter, leaving the inflated bubble floating in the stomach.

On fluoroscopic studies, the balloon should be placed in the fundus or upper gastric body, with an adequate passage to the duodenum. Fig. 14 on page 21

The main complication is deflation of the balloon with migration beyond the stomach, and rarely subsequent small-bowel obstruction.

**Biliary and pancreatic procedures: Whipple's technique**

Whipple procedure consists of resection of the head and uncinate process of the pancreas, the gallbladder, and the duodenum, with formation of three anastomoses: a choledochojejunostomy, a gastrojejunostomy, and a pancreaticjejunostomy. Fig. 15 on page 22
Fluoroscopic evaluation of the postoperative Whipple patient is particularly difficult because of the complexity of the surgery and the multiple anastomoses. Fig. 16 on page 23

The highest morbidity and mortality in the perioperative period is due to leakage or breakdown of the pancreaticojejunostomy. Unfortunately, this anastomosis is the most difficult to visualize with fluoroscopy. Fig. 17 on page 24

**Colon and rectus procedures**

Colonic resections are usually performed for both malignant and benign diseases. To be able to properly evaluate the normal and abnormal radiographic findings, radiologists must be familiar with the terminology and types of surgery done.

**Anterior resection** involves resection of the rectosigmoid and proximal rectum.

**Low anterior resection** refers to resection of the rectosigmoid and distal rectum below the peritoneal reflection. Fig. 18 on page 25

**Right hemicolecotomy** refers to resection of the terminal ileum, cecum, ascending colon, and a portion of proximal transverse colon.

**A left hemicolecotomy** involves resection of the splenic flexure, descending colon, and sigmoid with anastomosis of the distal transverse colon to the rectosigmoid.

**Total colectomy** refers to resection of the entire colon; the rectum remains, and continuity is usually established with an anastomosis from the ileum to the remaining rectum.

**Abdominoperineal resection** (AP resection) is generally performed with removal of the rectum and a permanent colostomy is created at the distal descending colon.

**Hartmann's procedure**, generally performed for diverticulitis, consists of resection of the sigmoid colon, closure of the rectal stump, and an end temporal colostomy. The bowel continuity is reestablished later, after inflammatory changes have resolved. Fig. 19 on page 26

Radiographic assessment after Hartmann's procedure may be necessary in the early postoperative period to assess for complications.
In the early postoperative period, the most common complication is leakage from the rectal stump. It is important not to inflate the catheter's balloon unless necessary, since high pressure in the rectal stump may provoke bowel perforation. Later complications may include fistulous tracts, as in Fig. 20 on page 27.
Fig. 1: 1 A: Beaklike deformity of the distal esophagus, suggestive of achalasia in a patient with dysphagia. 1 B: Illustrative representation of Heller’s myotomy. 1 C: First imaging control after surgery shows good outlet through the lower esophageal sphincter.

© - Toledo/ES
**Fig. 2:** 2 A: Beaklike deformity of the distal esophagus with proximal dilatation, suggestive of achalasia in a patient with long-term dysphagia. 2 B: Fluoroscopy spot image with oral hidrosoluble contrast, 48 h after Heller's myotomy, shows good outlet to the stomach. 2 C: One year after surgery there is persistent dilatation of the esophagus with adequate passage of the contrast to the gastric cavity.

© - Toledo/ES
**Fig. 3:** 3 A: Illustrative representation of Nissen's fundoplication.

© - Toledo/ES
**Fig. 4:** 4 A: Pink arrow shows mass indentation "pseudotumor" at the level of the fundus where the esophagus enters the stomach. 4 B: No gastroesophageal reflux was found on this patient.

© - Toledo/ES
Fig. 5: 5 A: Yellow arrow shows good passage through the distal esophagus, after fundoplicature. 5 B: Pink arrow shows mass indentation "pseudotumor" at the level of the fundus where the esophagus enters the stomach.

© - Toledo/ES
Fig. 6: 6 A: Patient with long history of gastroesophageal reflux and coughing. Barium contrast fluoroscopy shows giant hiatal hernia and reflux. 6 B, C and D: Few months after surgery: Pink arrow shows mass indentation of fundoplication with tight wrap and filiform pass to gastric cavity. Yellow arrows show proximal esophageal dilatation, also referred as "Pseudoachalasia".

© - Toledo/ES
**Fig. 7**: 7 A: Total gastrectomy with Roux-en-Y reconstruction. Orange arrow shows the esophagojejunostomy. 7 B: Linear extravasation of oral contrast: fistulous tract at the jejunojejunostomy (yellow arrow)

© - Toledo/ES
Fig. 8: 8 A: Illustrative representation of Roux-en-Y reconstruction. 8 B: Gastric Bypass. Yellow arrow shows the gastrojejunostomy, orange arrow shows the gastric pouch.

© - Toledo/ES
**Fig. 9:** 9 A: Orange arrow shows the gastrojejunal anastomosis 9 B: Yellow arrows point dilatation of the efferent limb.

© - Toledo/ES
Fig. 10: 10 A: Tubular gastrectomy illustrative representation. 10 B: Fluoroscopy image of tubular gastrectomy. Orange arrows show the staple line.

© - Toledo/ES
Fig. 11: 11 A: Tubular gastrectomy first postsurgical image. Pink arrow shows fistulous tract. 11 B: Same patient after endoprothesis, persistent fistulous tract.

© - Toledo/ES
Fig. 12: 12 A: Gastric banding fluoroscopic image. Orange arrow pointing the band.

© - Toledo/ES
Fig. 13: 13 A: Gastric band causing gastric obstruction. Secondary dilatation of the distal esophagus. 13 B: Yellow arrow shows the access port.

© - Toledo/ES
Fig. 14: 14 A: Gastric balloon correctly placed. 14 B: Green arrow shows adequate pass to duodenum.

© - Toledo/ES
**Fig. 15:** 15 A: Illustrative figure representing Whipple’s procedure.

© - Toledo/ES
Fig. 16: 16 A: First control image after Whipple’s procedure. Black arrow shows obstruction of the gastrojejunal anastomosis.

© - Toledo/ES
**Fig. 17:** 17 A, B and C show contrast through the T-Tube in a patient with Whipple surgery. White arrow shows the entrance to the choledochojejunostomy. 17 D and E: Yellow arrows show fistulous tract.

© - Toledo/ES
**Fig. 18:** 18 A: Yellow arrow shows staple line in a patient with recent low anterior resection. 18 B: Colovesical fistula (cystography in the same patient). Orange arrow shows contrast in sigma. Pink arrow shows the fistulous tract.

© - Toledo/ES
Fig. 19: 19 A: Hartman's procedure and reconstruction illustration. 19 B: First image after surgery shows normal rectal stump.

© - Toledo/ES
Fig. 20: 20 A: Cystography in a patient with Hartman's reconstruction. Yellow arrows show colovesical fistula. ("r" rectus; "b" bladder)

© - Toledo/ES
Conclusion

Radiologist should be familiar with the indications of early fluoroscopy in the evaluation of the postoperative gastrointestinal tract. A thorough understanding of expected postsurgical anatomy is essential in the evaluation of these patients, in order to depict possible complications with this technique.
References


