Gastrectomy procedure and its complications: Findings at TC multi-detector 64 row.

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Learning objectives

The knowledge of the normal postoperative anatomy changes following gastrectomy procedure with CT allows the radiologist to make an accurate diagnosis of the complications.

Our purpose is to review the normal postoperative anatomy and complications of the procedure in a 64 row multi-detector CT.

Background

The carcinoma of the stomach is one of the leading causes of cancer mortality worldwide. For this reason, it is important for the radiologist being familiar with the typical postoperative imaging findings to ensure an accurate evaluation of these patients. Early surgical complications include anastomotic leakage, duodenal stump leakage, afferent loop syndrome, intraabdominal bleeding, wound complications and other less common complications (postoperative pancreatitis, retention of surgical foreign bodies, diffuse peritonitis).

Imaging findings OR Procedure details

The aim of this pictorial essay is to present 64 row multi-detector CT imaging appearances of the normal postoperative anatomy and the most common complications.

1. Postoperative Anatomy

Surgical procedures for gastric carcinoma are multiple, depending on the extent of the disease, such as: Billroth I gastroduodenostomy, Billroth II gastrojejunostomy, and total gastrectomy. It is important for the radiologist to recognize these surgical techniques because surgical complications may mimic masses; this is a potential source of erroneous interpretation of local tumor recurrence in the gastrointestinal tract (1).

A. Billroth I gastroduodenostomy consists on gastrectomy, preserving the remnant stomach and duodenum by means of an end to end anastomosis (2).
B. Billroth II gastrojejunostomy consists on a created anastomosis between the remnant stomach and the jejunum.

C. Total gastrectomy consists on removing the stomach followed by a reconstruction with the procedure roux -en-y. This procedure is the most commonly used.

2. Postoperative Complications

Many post-surgical complications occur in the immediate postoperative period, these are associated to infection or to problems with surgical technique. This review describes the most frequent: Anastomotic leakage, Duodenal stump leakage, afferent loop syndrome, intraabdominal bleeding, wound complications and other complications such as pancreatitis and foreign bodies.

A. Anastomotic Leakage

Leakage at the site of a gastric anastomosis after gastric resection is potentially catastrophic.

In reconstructive gastrointestinal surgery there is frequently a risk of anastomotic leak. The most frequent surgery associated to anastomotic leakage is total gastrectomy.

The leaks may produce small tracks or collections near the anastomosis or suture line.

Suggestive CT findings are postoperative pneumoperitoneum (Fig.1,3,4), extraluminal accumulation of oral contrast material (Fig.5,6,7,8) and associated intraabdominal abscesses.

When a small abscess is produced, it is frequently located in the left subphrenic area, called subphrenic abscess (Fig.9,10) these findings are usually associated with pleural effusion and basal pulmonary consolidations (Fig. 2).

B. Duodenal Stump Leakage

Leakage from the duodenal stump is one the most important complications of Billroth II reconstruction following gastric resection or total gastrectomy.
Leakage of bile or pancreatic juice can produce localized peritoneal irritation and later bacterial infection can worsen the postoperative, resulting on a serious morbidity and mortality.

Suggestive CT finding in a duodenal stump leakage is a postoperative fluid collection or abscess located in the right subhepatic space (Fig. 11,12) which is often extended to the peripancreatic space or the stump surroundings (2).

**C. Afferent Loop Syndrome**

The afferent loop syndrome are caused by mechanical obstruction of the afferent loop from adhesions, kinking at the anastomosis, internal hernia, stomal stenosis, malignancy, or inflammation surrounding the anastomosis. The CT findings are important in the diagnosis of this entity, because the clinical signs are generally nonspecific.

The CT finding is a fluid-filled, dilated, transversely oriented portion of small bowel anterior to the spine in the middle of the abdomen (1) (Fig.13,14).

**D. Intraabdominal Bleeding**

The hemorrhage into the surgical bed is a serious complication of gastrointestinal surgery, and may be produced from inadequate vascular ligation or hemostasis, hemorrhagic pancreatitis or a breakage of spleen (Fig.15,16).

The intraabdominal hemorrhage has a high attenuation value (20-40HU) in acute stage. It may simulate ascitic fluid by its appearance and distribution. It can also be observed the existence and location of intraabdominal hematomas (2).

Sometimes it is difficult to distinguish a chronic hematoma from other fluid collections or abscess.

The treatment in some cases is the transcatheter occlusion or selective embolization as useful methods in high-risk patients (Fig. 17,18).

**E. Wound Complications**
The incision may be infected, resulting on inflammation or necrosis of the sutured structures as well as accumulation of pus at the center or immediately adjacent to the incision (2).

The wound infection is frequently diagnosed in clinical exam; however the CT can help for an early diagnosis of small collections of fluid or gas deep within the incision and neighbouring tissues.

F. Other Complications

Acute postoperative pancreatitis

It is produced by a pancreatic injury caused in the moment of the gastrectomy or in cases of invasion of the pancreas or spleen by gastric carcinoma (2) (Fig. 19,20).

The CT findings in postoperative pancreatitis are:

• Segmental or diffuse enlargement.
• Pseudocyst.
• Inflammatory changes.
• Fluid collection in the left anterior pararenal space.

Foreign bodies

It is a rare complication in surgery, but there has been reported cases of forgotten surgical foreign bodies such as sponges during surgery.

This translates into a major complication as postoperative intraabdominal abscess.

Images for this section:
Fig. 1: A 52-year-old man with ascites and pneumoperitoneum (arrow) after subtotal gastrectomy.
**Fig. 2:** B. The same patient in the figure 1 with bilateral pleural effusion and right basal pulmonary consolidation (arrows).
Fig. 3: A,B. 58 year-old man with pneumoperitoneum, air in the bile ducts and ascites after total gastrectomy (arrows).
Fig. 4: A,B. 58 year-old man with pneumoperitoneum, air in the bile ducts and ascites after total gastrectomy (arrows).
Fig. 5: 48 year-old man with anastomotic leak after total gastrectomy. A, B. Oral contrast study shows a pool of contrast (arrows) from a leak at the anastomosis.
Fig. 6: 48 year-old man with anastomotic leak after total gastrectomy. A, B. Oral contrast study shows a pool of contrast (arrows) from a leak at the anastomosis.
Fig. 7: 56 year-old man with anastomotic leak after two weeks a total gastrectomy. Oral contrast study shows a pool of contrast (arrows) from a leak at the anastomosis.
**Fig. 8:** 46 year-old man with anastomotic leak after subtotal gastrectomy. Oral contrast study shows extraluminal accumulation of contrast (arrow) from a leak at the anastomosis.
**Fig. 9:** A, B. 58-year-old man with abscess of left subphrenic space and left pleural effusion after total gastrectomy. The abscess is limited by falciform ligament, which prevents spreads to right subphrenic space (arrows).
Fig. 10: A,B. 58-year-old man with abscess of left subphrenic space and left pleural efusión after total gastrectomy. The abscess is limited by falciform ligament, which prevents spreads to right subphrenic space (arrows).
Fig. 11: A. 60-year-old man with a duodenal stump leakage after a total gastrectomy. CT shows an abscess in the right subhepatic space (arrow).
**Fig. 12:** 60-year-old man with a duodenal stump leakage after a total gastrectomy. CT shows an abscess in the right subhepatic space (arrow) B. Coronal reformatted images show an abscess (arrow).
Fig. 13: 52-year-old man with afferent loop syndrome after Billroth II operation. Contrast-enhanced CT scan shows massively dilated small bowel loops.
Fig. 14: 62-year-old man with afferent loop syndrome after the subtotal gastrectomy. Contrast-enhanced CT scan shows dilated small bowel loops.
**Fig. 15:** 62 year-old man with intraabdominal bleeding after the subtotal gastrectomy. Arteriogram show an aneurysmal sac of the left gastric artery (arrow).
Fig. 16: Left gastric artery pseudoaneurysm in a 62-year-old man after the subtotal gastrectomy. Arteriogram show an aneurysmal sac of the left gastric artery (arrow), surrounded by large amount of hemorrhage.
Fig. 17: Arteriography after coil embolization shows no filling of aneurysm (arrow).
Fig. 18: Arteriography after coil embolization shows no filling of aneurysm (arrow) and occlusion of proximal gastroduodenal artery.
**Fig. 19:** Postoperative pancreatitis in a 57 year-old woman after the subtotal gastrectomy. Enhanced CT scan obtained 7 days after surgery shows a peripancreatic extensive fluid collection (arrow).
Fig. 20: Postoperative pancreatitis in a 57 year-old woman after the subtotal gastrectomy. Enhanced CT scan obtained 7 days after surgery shows a diffuse enlargement of the pancreas and inflammatory peripancreatic changes (arrow).
Conclusion

Effective use and the interpretation of CT in the postoperative evaluation of gastrectomy are important on the understanding of anatomic changes and to detect the early surgical complications of the gastrectomy procedure.

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References

