The stomach: spectrum of less common pathologies

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Learning objectives

Describe and illustrate the imaging findings for less common gastric pathologies in the radiology department.
Background

The stomach is affected by a broad spectrum of pathologies, including inflammatory infectious and tumor processes, both benign and malignant.

Usually the CT-scan is employed to complement the pathological study diagnosed by other imaging techniques, like the endoscopy and barium-contrast radiography, although sometimes the initial diagnosis is performed with a CT-scan. Barium radiography plays a fundamental role when it comes to patients that have a counter indication for the endoscopy or simply don't tolerate it.
We have examined in retrospective patients with gastric pathology - excluding the most frequently examined entity, the gastric adenocarcinoma. The purpose of this exercise is to evaluate the diagnostic differences that are to be taken into account when examining the stomach by barium radiography and CT-scan.

Radiological findings of less common gastric pathologies in the radiology department will be shown, including the following:

- **INFLAMMATORY DISEASES:**
  - **Peptic ulcer disease:** Defined as mucosal erosions equal to or greater than 0.5 cm. 70 to 90% of such ulcers are associated with Helicobacter pylori. About 4% of stomach ulcers are caused by a malignant tumor, so multiple biopsies are needed to exclude cancer. Fig. 1 on page 6
  - **Ménétrier's disease:** It is also known as hyperplastic hypersecretory gastropathy, consisting in a disorder in which the gastric mucosal folds are enlarged. It results from profound hyperplasia of the surface mucous cells with glandular atrophy, leading to protein loss, parietal cell atrophy, and an increase in mucous cells. There are two forms of the disease: a childhood form and an adult form. The childhood form has a better prognosis and is often seen after a viral illness caused by cytomegalovirus (CMV) or a bacterial infection caused by Helicobacter pylori. The adult form is linked with overexpression of transforming growth factor alpha (TGF-#) and it has an increased risk for gastric cancer. [1] Fig. 2 on page 6

- **BENIGN TUMORS:**
  - **Leiomyoma:** Mesenchymal benign tumor with the characteristics of a submucosal lesion. They may have overlying mucosal ulceration.
  - **Lipoma:** Benign submucous tumor with sharp margins and the classic low attenuation appearance of fat on CT images. [5] Fig. 3 on page 7
  - **Nonneoplastic polyps:** Gastric polyps are defined as luminal lesions projecting above the plane of the mucosal surface and are relatively frequent in routine pathology practice. Various subtypes of gastric polyps are recognized and divided into nonneoplastic and neoplastic and are also further classified by their association with polyposis syndromes, such as Peutz-Jeghers syndrome or Gardner syndrome. [1] Fig. 4 on page 8

- **MALIGNANT TUMORS:**
  - **Lymphoma:** Primary gastric lymphoma is an uncommon condition (less than 15% of gastric malignancies and about 2% of all lymphomas). However, the stomach is a very common extranodal site for lymphomas (metastasis to the stomach). It is also the most common source of lymphomas in the gastrointestinal tract. In barium series, the most common finding is enlarged gastric folds. At CT imaging, diffuse wall thickening, lymphadenopathy, rugal prominence and polypoidal mass protruding into the lumen may be shown. The diagnosis is difficult to establish because the lesion is submucosal and may be inaccessible to biopsy. [4,5] Fig. 5 on page 9
• **Gastrointestinal stromal tumor (GIST):** They are a submucosal neoplasm and the most common mesenchymal tumor of the gastrointestinal tract. They are defined by their expression of KIT (CD117), a tyrosine kinase growth factor receptor that distinguish GIST from other mesenchymal tumors. Since most GISTs arise within the muscularis propria of the stomach, they most commonly have an exophytic and/or intraluminal growth pattern. In barium studies of the stomach, GISTs have the classic features of submucosal masses, similar to those of leiomyomas and leiomyosarcomas, with the margin of the lesion forming obtuse or right angles with the gastric wall when viewed in profile, and the masses are smoothly circumscribed when viewed en face. CT shows an intramural mass and in many cases, the bulk of the tumor being in extragastric location. Extension may occur into the gastrohepatic ligament, the gastrosplenic ligamento or the lesser sac. [2,3] Fig. 6 on page 10

• **Metastasis:** Haematogenous metastases to the stomach is a rare event. The most frequent tumors involved are melanoma, breast, and lung cancer. Gastric metastasis can be difficult to distinguish from a primary gastric cancer on clinical, endoscopic, radiological and histopathological features because they may appear as nodules with a central ulceration or a diffuse thickening of the gastric wall. Therefore, it is vital that biopsies be performed to establish this diagnosis. Fig. 7 on page 11

• **OTHERS:**
  - **Varicose veins:** Portosystemic collateral channels develop in portal hypertension in several locations. The most common one are the coronary venous collateral vessels. Varices are easily recognized on the basis of their tubular or serpentine configuration and their enhancement with contrast material. In upper gastrointestinal tract barium series, multiple polypoid filling defects within the fundus or body of the stomach may be found. [3]
  - **Volvulus:** is defined as a rotation of all or part of the stomach by more than 180°, which may lead to a closed-loop obstruction. There are 3 types of volvulus depending to the axis around which the stomach rotates: mesenteroaxial, organoaxial and combined, being the organoaxial type, the most common one. The most definitive study for its diagnosis is the upper GI barium study. Fig. 8 on page 12
  - **Gastric bezoar:** is a mass that results from the accumulation of foreign ingested material in the form of concretions. It is typically composed of indigestible plant material, and are frequently reported in patients with impaired digestion and decreased gastric motility (for example in patients with gastric surgery). Hair and medications have also been described as cause of bezoar. Fig. 9 on page 12
  - **Non-pathologic conditions mimicking pathologic entities:** For example post-surgery findings. Fig. 10 on page 13
Fig. 1: Fat stranding adjacent to the pylorus with extraluminal gas and pneumoperitoneum, in a patient with confirmed perforated pyloric ulcer.

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Fig. 2: A. Ménétrier's disease: CT scan showing thickened gastric walls, specially the fundus, lesser and greater curvatures. B. Barium study shows severely enlarged gastric rugal folds with irregularity of the gastric mucosa. The fundus and body are primarily involved and the antrum is relatively spared.

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**Fig. 3:** A lesion with sharply defined borders in the gastric antrum wall with attenuation values of -60 HU, consistent with lipoma.

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Fig. 4: A. CT scan shows a mass protruding in the gastric lumen. B. A barium study shows a large polyp in the gastric antrum. Histologically, it was an inflammatory fibroid polyp.

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Fig. 5: Note severe thickening of gastric walls, with necrotic lymphadenopathies in the gastrohepatic ligament in a patient with high grade B-cell lymphoma.

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**Fig. 6:** A. GIST arising from the posterior wall of the gastric fundus in a 55-year-old man with melena and hematemesis. B. Features of GIST seen during upper gastrointestinal tract series in an anteroposterior view of the stomach shows a smoothly circumscribed mass in the gastric fundus.

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**Fig. 7:** A. Barium series shows straightening of the lesser and greater curvatures. B. CT scan with homogeneously thickened gastric walls. Histologically, breast cancer metastasis was demonstrated.

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**Fig. 8:** Upper GI tract series shows mesenteroaxial volvulus. The axis bisects the lesser and greater curvatures. The antrum rotates anteriorly and superiorly so that the posterior surface of the stomach lies anteriorly.

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**Fig. 9:** CT MPR coronal view shows intestinal obstruction secondary to a gastric bezoar that has migrated to the distal ileum. It is seen as low-density intraluminal mass containing air bubbles and exhibiting a characteristic mottled appearance.

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**Fig. 10:** A. CT scan axial view and B. MR T2-weighted coronal view show a "mass" protruding in the gastric fundus lumen resembling a polipoyd mass in. At gastroscopy, a Nissen funduplication with a gross fold.

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Conclusion

Radiological imaging techniques play a fundamental role both in diagnosing and in assessing the extension and complications of gastric pathologies. Although the ideal technique for examining the stomach is the endoscopy, allowing for biopsies, both the CT-scan and barium radiography are non-invasive tools that contribute very useful information.