

Laporan Kasus: Penebalan Dinding Gaster: Tantangan Pencitraan Diagnostik pada Keganasan Gaster

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Abstrak

Abnormalitas pada gaster menunjukkan gejala gastrointestinal yang tidak spesifik dan gambaran radiologi hampir identik. Penebalan dinding gaster ke dalam dan luar lumen gaster merupakan temuan yang paling umum pada proses patologis jinak maupun ganas. Penulisan laporan kasus ini bertujuan menunjukkan karakteristik lokasi dan ukuran lesi, keterlibatan dinding gaster dan struktur di sekitarnya, kalsifikasi dan pola penyangatan kontras. Beberapa kasus yang ditemukan di institusi kami memiliki keluhan gastrointestinal yang sama, namun melalui pemeriksaan CT scan abdomen dengan kontras didapatkan beberapa perbedaan karakteristik dari masing-masing lesi. Seorang laki-laki 72 tahun mengalami hematemesis dan memiliki gambaran radiologis penebalan menyeluruh mukosa gaster dengan penyangatah kontras homogen dan tanpa kalsifikasi. Kasus kedua, laki-laki usia 37 tahun, mengeluh pusing dan melena dengan temuan radiologis tumor berukuran lebih dari 10 cm, memiliki kalsifikasi amorf dan penyangatan kontras heterogen. Kasus terakhir pada laki-laki 60 tahun dengan keluhan hematemesis dan melena, ditemukan lesi berupa penebalan mukosa lambung ireguler dengan penyangatan heterogen dan peningkatan attenuasi lemak di sekitarnya tanpa kalsifikasi pada CT scan abdomen. Metode yang digunakan dalam penelitian ini adalah CT scan abdomen dengan kontras, *esophagogastroduodenoscopy* (EGD), dan biopsi digunakan untuk evaluasi penegakan diagnosis pada ketiga kasus tersebut. CT scan abdomen dengan kontras berperan penting dalam menggambarkan karakteristik lesi yang mempengaruhi penentuan pilihan pengobatan dan prognosis di masa depan.

Kata Kunci: penebalan mukosa gaster, CT scan abdomen, limfoma, tumor stroma, adenokarsinoma

Case Report:

Gastric Wall Thickening: Radiological Diagnostic Challenges in Gastric Malignancy

Abstract

Gastric abnormalities show nonspecific gastrointestinal symptoms and similarly radiological findings. Intra and extra luminal gastric wall thickening are the most common finding in benign and malignant pathologic process. This aim of this case report was to describe several characteristics such as the location and size of the lesion, involvement of the gastric wall and

surrounding structures, calcifications, and contrast enhancement pattern which can assist in radiological diagnosis. Several cases at our institution have similar gastrointestinal complaints, however, there were different lesions characteristic found in contrast enhanced abdominal CT scan. The first case 72-years-old man experienced hematemesis with radiologic finding diffuse gastric mucosal thickening as well as homogenous contrast enhancement but without calcification. The second case 37-years-old man complaint dizziness and melena with radiologic finding large tumor more than 10 cm in size, amorph calcification and heterogenous contrast enhancement. The last 60-years-old man case experienced melena and hematemesis, from abdominal CT scan showed irregular gastric mucosal thickening with heterogenous contrast enhancement and fat stranding around the lesion, without calcification. Methods used in these cases were contrast-enhanced abdominal CT scan, esophagogastroduodenoscopy (EGD), and biopsy in order to determine the diagnosis. Contrast-enhanced abdominal CT scan plays a vital role in describing the lesion characteristics which affects the determination of treatment options and future prognosis.

Keywords: gastric mucosal thickening, abdominal CT scan, lymphoma, stromal tumor, adenocarcinoma

INTRODUCTION

Like the case of other tumors, gastric tumor can be divided into benign and malignant tumors. Approximately 5-10% of all gastric tumors are harmless, and the rest are malignant tumors (Speranza *et al*, 2001). Thus far, the assessment of gastric abnormalities requires multidisciplinary collaboration, because several nonspecific gastrointestinal symptoms give less contribution to determine the differential diagnosis. Radiology plays a vital role in establishing the diagnosis of gastric pathologies through various conventional and advanced examination. Barium has been used for 50 years to evaluate gastric wall thickening. Still, over time, contrast-enhanced abdominal CT takes place because give more accurate evaluation in representing the characteristic of the mass

(Chen *et al*, 2010). The combination of contrast-enhanced abdominal CT scan, esophagogastroduodenoscopy (EGD), and biopsy used to determine the differential diagnosis of gastric pathologies (Sharma *et al*, 2015).

The diagnosis of gastric pathology remains a challenge in the radiology department although contrast enhanced abdominal CT scan has replaced fluoroscopy as a tool in rapid and comprehensive abdominal evaluation. Intra or extra luminal gastric wall thickening is the most common radiological finding in benign (such as gastritis, infection, stromal tumor, Zollinger-Ellison infection, and Ménétrier's disease) and malignant cases (such as adenocarcinoma, lymphoma, and metastasis) (Preethi *et al*, 2015; Lin *et al*, 2017). In the various studies, the average

thickness of the gastric mucosal wall is 5 mm on an abdominal CT scan, in certain parts such as the antrum, the gastric wall becomes the thickest part with less than or equal to 12 mm (Preethi *et al*, 2015). Normal gastric wall has multilayered patterns with enhancing layer at the innermost part, intermediate hypoattenuating layer represents the submucosa and the outer slightly hyperattenuating layer represents the muscular propria and the serosa layer (Hallinan *et al*, 2013). Sufficient gastric distension is required in order to evaluate gastric mucosal thickening and prevent potential pitfalls. Focal thickening greater than 5 mm with disruption of the gastric layer indicate a neoplastic lesion. Serosal invasion, nodal and peritoneal involvement have prognostic importance (Hallinan *et al*, 2013).

In three cases discussed at the Denpasar Regional General Hospital, the author tries to describe the malignant gastric tumor with diffuse irregular thickening of the gastric wall, similar tumor characteristics, and gastrointestinal symptoms. The purpose of this article was to remind the important points of evaluating the location and size of the lesion, involvement of the gastric wall and surrounding structures, calcifications, and contrast enhancement pattern of gastric

abnormalities in CT scan especially for radiologists. The evaluation of contrast enhance abdominal CT scan was done by radiologist with more than 5 years experiences.

CASE PRESENTATION 1

A 72-year-old man came to the emergency department, he experienced hematemesis with blood clots components after intermittent heartburn in the right upper abdomen for the last few months and gradually increased over the previous three days. He also complained of weakness and progressive weight loss before admitted and felt a lump in the left upper abdomen for the last one year. The patient was an active smoker but has quit the past year—no history of alcohol or NSAIDs consumption malignancy in the families.

EGD examination in March 2019 showed large ulcers with suspicion of a malignant sore on the distal corpus to antrum (Figure 1A). A contrast-enhanced abdominal CT scan showed gastric distention with irregular mucosal thickening up to 4.1 cm from mid-corpus to the antrum, which showed homogenous contrast enhancement (Figure 1B). There was no calcification within the lesion. Multiple lymph nodes enlargement also found at paracaval, para aorta, and

mesenterial part with the largest diameter 1.4 cm.

Pieces of gastric corpus and antrum tissue taken at the time of the biopsy are examined at the anatomic pathology section and exhibited diffuse tumor cells. These cells consist of proliferated medium-sized neoplastic lymphoid cells with round-oval morphology, scanty cytoplasm, round-oval nucleus, coarse chromatin with a single

prominent nucleus, partially multiple at the edges, somewhat cleaved nuclei, irregular nuclei membrane. Apoptotic features were visible, and mitosis is easy to find. In another focus, the corpus and antrum composed of surface epithelium, gastric foveolar, gastric glands, but there was no evidence of *Helicobacter pylori* on Giemsa staining. Anatomical pathology result tends to be non-Hodgkin's lymphoma (Figure 1C).

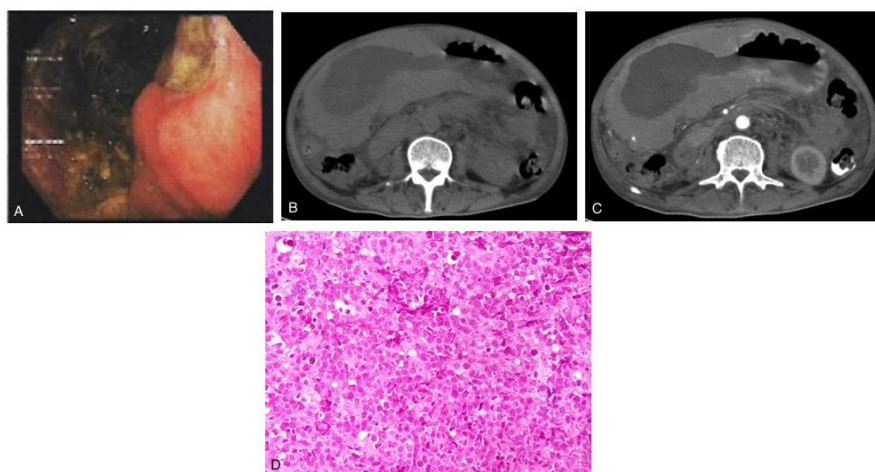


Figure 1. Gastric lymphoma. **(A)** EGD examination showed a large ulcer on the distal corpus to the antrum. **(B, C)** Contrast-enhanced abdominal CT scan showed gastric wall irregular thickening from corpus to antrum, which showed heterogeneous contrast enhancement on contrast administration. **(D)** Anatomical pathology result with Hematoxylin-Eosin staining showed proliferative neoplastic lymphoid cells arranged diffusely.

CASE PRESENTATION II:

A 37-year-old man admitted to our emergency department with chief complaint dizziness that has gotten worse since one week before accompanied by weakness and melena repeatedly for the last month. There were lumps in the epigastrium to the left hypochondria for six months and getting bigger. Previously patients often complained about epigastric

pain, nausea, vomiting. Relatively rapid weight loss decreased appetite and weakness. There was no history of NSAID consumption in the last few months, but he has been taking herbs for the past six months.

A large tumor with central ulceration on gastric corpus was found in EGD and caused luminal narrowing (Figure 2A, 2B). As we could see in contrast-enhanced

abdominal CT scan, a solid exophytic mass in the greater gastric curvature with central necrotic, approximately 10 x 20 x 17.2 cm in size, which showed heterogeneous contrast enhancement in contrast administration. The margin of the mass was difficult to differentiate with adjacent structures, such as the pancreas, aortic wall, coeliac trunk, and diaphragm. We could evaluate the feeding artery arise from the right and left gastric artery (Figure 2C).

Surgery reported a solid unresectable tumor at the posterior gastric wall because

of adhesion to an adjacent structure. The tumor biopsy showed the proliferation of neoplastic spindle mesenchymal cells, forming a fasciculated and partially storiform pattern. These cells have eosinophilic cytoplasm with para nuclear vacuolization. The nucleus is elongated, anisonucleosis with inconspicuous nucleoli and coarse chromatin. Mitosis was 27/50 HPF. There were also myxoid and necrotic areas. This morphology was consistent with high-grade Gastrointestinal Stromal Tumor (GIST) (Figure 2D).

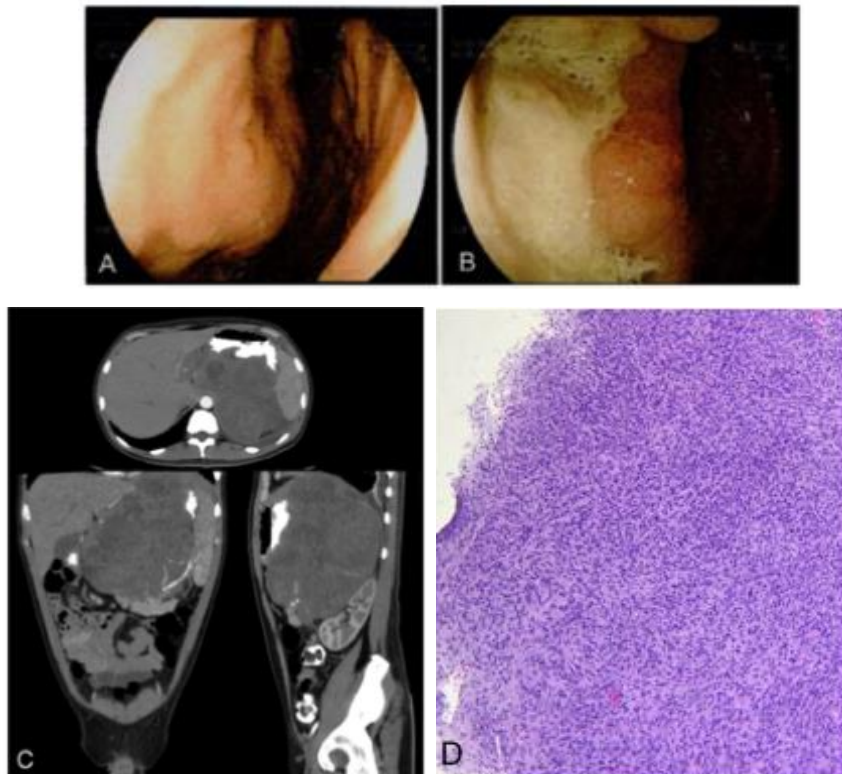


Figure 2. Gastrointestinal stromal tumor. **(A, B)** EGD examination showed a large tumor with central ulceration on the gastric corpus. **(C)** Contrast-enhanced abdominal CT scan showed solid exophytic with central necrotic mass at the greater gastric curvature, which showed heterogeneous contrast enhancement. The mass has an ill-defined lining with adjacent structures. **(D)** Microscopic examination showed the proliferation of neoplastic spindle cells, forming a fasciculated and partially storiform pattern with para nuclear cytoplasmic vacuolization. The nucleus is elongated, anisonucleosis with inconspicuous nucleoli, coarse chromatin and high mitotic activity, consistent with high-grade Gastrointestinal Stromal Tumor (GIST).

CASE PRESENTATION III:

A 60-year-old man came to the emergency department with chief complaint melena and hematemesis since two days ago. He also felt bumps and fullness in the epigastric area for the last three months. Progressive weight loss, worsened abdominal pain, nausea, and loss of appetite also be another complaint. There was no history of malignancy in the family.

EGD showed a mass with easily bleed central ulceration, and also there were several fistulas which produce pustule at the gastric antrum to the duodenal bulb (Figure 3A). Abdominal CT scan with oral contrast media administration showed partially filled gastric fundus, accompanied by irregular thickening of the gastric wall with no firm boundary on the antrum wall

to the pylorus gaster, which in contrast enhancement showed heterogeneous contrast enhancement and surrounded by fat stranding. The wall thickening extended to the duodenal bulb and narrowing the gastric and duodenal lumen causing partial gastric outlet obstruction (Figure 3B). Multiple nodules with various sizes in both liver lobes visible in the portal vein phase were highly suggestive for metastases nodules (Figure 3c).

The biopsy results from duodenal and gastric antrum incision showed a mucosal layer containing focus infiltrative proliferation of neoplastic epithelial cells arranged in glandular and solid patterns. These neoplastic epithelial cells with very pleomorphic nucleus morphology, irregular nuclear membrane, hyperchromatic, partially granulated chromatin with nucleolus visible to prominent. Mitosis 7/3 LPB (Figure 3d).

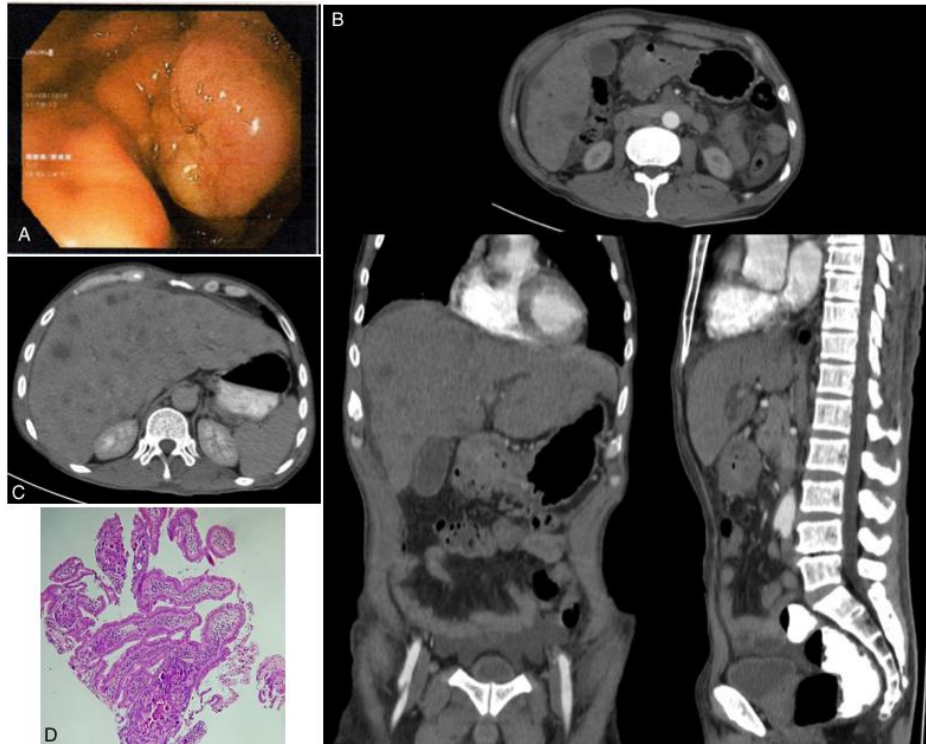


Figure 3. Gastric adenocarcinoma. **(A)** Mass with central ulceration from the gastric antrum along to the duodenal bulb at EGD. **(B)** Heterogeneous irregular thickening at the antrum and gastric pylorus extended to the duodenal bulb with abnormal fat stranding. **(C)** Multiple nodules on both liver lobes in portal vein phase abdominal CT scan. **(D)** A tissue examination showed a mucosal layer that contained focus infiltrative proliferation of neoplastic epithelial cells arranged in glandular and solid patterns.

DISCUSSION

Radiology plays a vital role in assessing gastric pathologies, and several methods used such as contrast-enhanced abdominal CT scan, EGD, fludeoxyglucose (FDG)-positron emission tomography (PET) and MRI (Chen *et al*, 2010). So far, contrast-enhanced abdominal CT still became the most common imaging technique to establish the diagnosis and determine the stage of the disease with the level of accuracy depends on the stage of the disease. It represents the location and size of the lesion, involvement of the gastric wall

and surrounding structures, calcifications, and contrast enhancement pattern (Kim *et al*, 2015; Nagpal *et al* 2017).

Mucosa Associated Lymphoid Tissue (MALT)

Both nodal and extra-nodal Mucosa Associated Lymphoid Tissue (MALT) could appear on all body tissues. As a great imitator, it causes symptoms and morphology that resembles another malignant disease on radiology examination (Thomas *et al*, 2011). Primary gastric lymphoma, which is often associated with *Helicobacter pylori* infection before, is

commonly found an extra-nodal lymphoma. Gastric MALT occurs in 4-20% of cases of non-Hodgkin's lymphoma (NHL) and 5% of all cases of primary gastric neoplasms. Gastric MALT can occur at any age with peak incidence between 50-60 years old and in males experienced 2-3 times higher to develop gastric MALT than female (Flip *et al*, 2018).

Histologically, gastric MALT can divide into low grade and high grade, where both types show different clinical features and prognosis. Early-stage diagnosis of low-grade MALT has a good prognosis. Detection of early-stage lymphoma is challenging and often obscured by the appearance of gastritis or gastric carcinoma. Preference of radiological examination used in the early stages of gastric MALT is a double-contrast upper gastrointestinal (UGI) examination, whereas a contrast-enhanced abdominal CT scan used to evaluate tumors with higher stage and describe the involvement of the tissue around the gastric (Lo Re *et al*, 2016).

The higher of tumor stage, will be indicated by the larger size of the tumor macroscopically. Low-grade MALT has superficial lesions with mucosal nodularity, while high-grade MALT has a characteristic of a solitary tumor. EGD examination showed nonspecific results as other gastric lesions. On barium examination, thickening

of gastric folds, the presence of ulcers, or superficial erosions with a limited invasion of submucosa and mucosa become low-grade MALT features. Whereas in high-grade MALT, there is a severe thickening of the gastric folds up to > 10 mm or well-defined focal masses at any part of the gastric wall with homogeneous attenuation and very mild contrast enhancement as well as a broad and deep ulcer to the propria muscular layer. The contrast-enhanced abdominal CT scan on low-grade MALT shows no abnormalities or mild thickening at any gastric wall up to 5-10 mm, small, depressed lesions with ill-defined margins. The characteristics of high-grade MALT on CT scan are inversely proportional to low-grade type. There is no evidence of calcification. The perigastric lymphadenopathy usually found in high-grade MALT. Endoscopic ultrasonography can help evaluate the depth of tumor invasion (Lo Re *et al*, 2016; Hayashi *et al* 2010).

Gastrointestinal Stromal Tumor (GIST)

Intramural gastric tumors that appear in the submucosa or muscularis propria layer of the gastric wall, mostly with an intact mucosal layer, is usually a mesenchymal tumor that includes Gastrointestinal Stromal Tumor (GIST) (Hong *et al*, 2006). GIST is the most common non-epithelial tumor of the gastrointestinal

tract, with a prevalence of 130 cases per 1 million populations. GIST can occur at any age, but more than 80% of cases occur over the age of 50 years with an equal incidence both males and females (Vernuccio *et al*, 2016). Although GIST is the most common mesenchymal tumor, it occurs 1-3% of all gastrointestinal tumors compared to epithelial tumors and lymphoma and is most commonly found in the gastric (47.3%) followed by the small intestine (35.4%), colon (4.6%), rectum (7.4%) and esophagus (<1%), besides GIST can appear in the omentum, mesentery or retroperitoneum (Vernuccio *et al*, 2016).

Well defined tumor, intact tissue mucous layers with intra or extraluminal or both (dumbbell-shaped) growth pattern are the characteristics of mesenchymal tumors. The small tumor often protrudes into the gastric lumen while a more massive tumor from the deeper layer of propia muscular often shows an exophytic growth pattern into the peritoneal cavity. In intramural tumors, more than 2 cm in size cause focal ulceration in the upper mucosal layer caused by necrosis due to suppression by intramural tumors and cause hematemesis and melena. Larger tumors might cause intestinal obstruction or intussusception. On an abdominal CT scan, could evaluate a hypodense mass, often between 3-10 cm in size, exophytic growth with heterogeneous

contrast enhancement. Bleeding usually found in large tumors. Mucosal ulceration determined by the presence of air or oral contrast material within the tumor (Sripathi *et al*, 2011; Panbude *et al*, 2019). GIST causes damage to the myenteric plexus, which allows intestinal dilatation. Amorphous calcifications are rare (Kang *et al*, 2013).

Gastric Adenocarcinoma

Gastric cancer is the fourth most common cancer found worldwide and is the second-highest cause of deaths by cancers. Approximately 90% of gastric tumors are adenocarcinomas and in developing countries there are more than 50% new case, whether the firm boundaries intestinal-type or diffuse-type (Sitarz *et al*, 2018). The first type is dominant in gastric corpus with gastric atrophy and intestinal metaplasia, while the second type usually originates from pan gastritis without atrophy having a more uniform distribution. Male have higher risk than female (2:1), tends to be black race, low socioeconomic groups, and in developing countries associated with previous *Helicobacter pylori* infection, the consumption level of preserved food, smoking history, and obesity. The peak age for gastric carcinoma is between 50 and 70 years old (Lyons *et al*, 2019).

Contrast-enhanced abdominal CT scan, in combination with endoscopic ultrasound, has been the modality of choice in preoperative evaluation and determining the stage of gastric cancer, tumor recurrence and response to chemotherapy (Zytoon *et al*, 2020). These imaging method needs gastric distension in order to distinguish gastric tumors from the usual collapse of gastric mucosa and thickening of the gastroesophageal junction. The condition obtained by the administration of effervescent granules and a small amount of water (Ba-Salamah *et al*, 2003). Gastric carcinomas can manifest as a focal mural

thickening with or without ulceration, but it can also have a diffuse mural thickening image predominantly at the distal gastric region (Ba-Salamah *et al*, 2003; Hallinan *et al*, 2013). Focal thickening more than 5 mm after gastric distension must be considered as a neoplastic lesion. In the early stages of carcinoma, the malignant invasion is limited to the mucosa or submucosa, whereas at an advanced stage cancer can invade the propria muscular layer. The lesion rarely showed millitary or punctate calcification and has a poor contrast enhancement due to mucin accumulation (Hallinan *et al*, 2013).

Table 1. Mass Characteristic

Mass characteristic	MALT	GIST	Gastric adenocarcinoma
Location	all body tissues	Along the gastrointestinal tract	Distal gaster
Prior <i>Helicobacter pylori</i> infection	+	+	+
Peak	50-60 y.o	>50 y.o	50 -70 y.o
M : F	2-3 : 1	equal	2:1
Size	>5 mm	3-10 cm in size	>5 mm
Involvement of gastric wall layer and surrounding structure	Mucosa, submucosa, muscularis propria	Submucosa or muscularis propria	Mucosa, submucosa, muscularis propria
Calcification	-	+ amorphous	+ milliary or punctate
Contrast enhancement pattern	Homogenous	Heterogenous	Poor enhancement

In the previous table, it showed several characteristics that distinguish between MALT, GIST and gastric carcinoma represent in this case presentation. Location and site of mass in MALT was in all body tissue, while in GIST mass found throughout the gastrointestinal tract. Gastric adenocarcinoma characterized by

mass of tumor in distal gaster. Prior infection of *Helicobacter pylori* was found in all cases.

The appearance of cases usually occurs over the age of 50 years, with male have the higher risk of MALT and gastric adenocarcinoma. In both MALT and gastric adenocarcinoma occurs involvement of

mucosa, submucosa and muscularis propria.

CONCLUSION

Radiology examination, especially contrast-enhanced abdominal CT scan, plays a vital role in the detection, establishing the diagnosis, staging, which affects the determination of treatment options and future prognosis. Assessment of mass characteristics such as the location of wall thickening, the size of the solitary lesion, the involvement of the gastric wall layer and surrounding structures, the presence of calcifications, and the pattern of contrast enhancement have a diagnostic value in assigning benign or malignant lesions, even in some cases can lead to a specific diagnosis.

Informed consent statement:

Written informed consent was obtained from the patient's family for publication of this case report, including accompanying images. Confidentiality of the patient identification was maintained in this manuscript.

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