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ลักษณะภาพทางเอกซเรย์คอมพิวเตอร์ของมะเร็งกระเพาะอาหาร

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Computed Tomographic Features of Gastric Malignancies

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หลักการและวัตถุประสงค์: ปัจจุบันความก้าวหน้าทางเทคโนโลยีของเครื่องเอกซเรย์คอมพิวเตอร์เป็นที่น่าสนใจในการนำมาใช้เพื่อประเมินและวินิจฉัยโรคมะเร็งกระเพาะอาหาร โดยสามารถประเมินในเรื่อง primary tumor, nodal involvement และ distant metastasis นอกเหนือจากนี้ ภาพเอกซเรย์คอมพิวเตอร์ยังมีประโยชน์ในการบอกถึงชนิดต่างๆ ของมะเร็งกระเพาะอาหาร เช่น adenocarcinoma, lymphoma และ GIST เป็นต้น การศึกษานี้ จึงมีวัตถุประสงค์เพื่อศึกษาลักษณะภาพทางเอกซเรย์คอมพิวเตอร์ของมะเร็งกระเพาะอาหาร

วิธีการศึกษา: เป็นการศึกษาเชิงพรรณนาแบบย้อนหลังของภาพเอกซเรย์คอมพิวเตอร์ของผู้ป่วย ซึ่งได้รับการตรวจวินิจฉัยทางพยาธิวิทยาว่าเป็นมะเร็งกระเพาะอาหารชนิด adenocarcinoma, lymphoma และ GIST ภาพเอกซเรย์คอมพิวเตอร์ทำที่โรงพยาบาลขอนแก่น ในช่วงเดือนมีนาคม 2557 ถึงกุมภาพันธ์ 2560 ผู้ป่วยดื่มน้ำปริมาณ 500-1,000 มิลลิลิตร ก่อนทำการตรวจเอกซเรย์คอมพิวเตอร์ประมาณ 15 นาที เพื่อให้กระเพาะอาหารขยายตัว ซึ่งมีประโยชน์ในการแปรผลภาพเอกซเรย์คอมพิวเตอร์ โดยสามารถช่วยวินิจฉัยแยกเนื้อร้ายออกจากเยื่อบุกระเพาะอาหารที่ปกติได้ชัดเจนขึ้น การตรวจพบและการประเมินผลลักษณะภาพทางเอกซเรย์คอมพิวเตอร์ของมะเร็งกระเพาะอาหารชนิด adenocarcinoma, lymphoma และ GIST จึงได้ทำการศึกษาขึ้น

ผลการศึกษา: กลุ่มประชากรผู้ป่วยที่ทำการศึกษาทั้งหมด 89 ราย เป็นเพศชาย 46 ราย หญิง 43 ราย อายุอยู่ในช่วงระหว่าง 28 ถึง 85 ปี อายุเฉลี่ยคือ 60 ปี ได้รับการตรวจวินิจฉัย

Background and Objective: Recent advances in computed tomographic (CT) technology have sparked renewed interest in using CT to evaluate gastric malignancies. CT allows assessment of the primary tumor, nodal involvement and distant metastasis. In addition, CT is also helpful in detection and evaluation of type of gastric malignancies such as adenocarcinoma, lymphoma and GIST. The purpose was to study the CT features of gastric malignancies.

Methods: The computed tomographic images of patients who received a definite pathologic diagnosis of adenocarcinoma, malignant lymphoma and malignant GIST of stomach were descriptive retrospectively reviewed. The images were taken at Khon Kaen Hospital between March 2014 and February 2017. Patients drank 500-1,000 ml. of water approximately 15 minutes before scanning for gastric distention. With adequate distention of the stomach by using water as negative contrast, dynamic contrast material-enhanced CT images offer superior differentiation of tumor tissue from normal mucosa. Detection and evaluation of CT features of gastric adenocarcinoma, gastric lymphoma and gastric malignant GIST were studied.

Results: All 89 patients who received a definite pathologic diagnosis of gastric adenocarcinoma was 78 patients (87.64%), gastric lymphoma was 4 patients (4.49%) and malignant gastric GIST was 7 patients (7.87%). All 89 patients of gastric malignancy included 46 men and 43 women (age range, 28-85 years; mean age, 60 years).

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ทางพยาธิวิทยาว่าเป็นมะเร็งกระเพาะอาหารชนิด adenocarcinoma 78 ราย (ร้อยละ 87.64) ชนิด lymphoma 4 ราย (ร้อยละ 4.49) และชนิด GIST 7 ราย (ร้อยละ 7.87) ลักษณะภาพเอกซเรย์คอมพิวเตอร์ของมะเร็งกระเพาะอาหารชนิด adenocarcinoma พบเป็น focal gastric wall thickening ร้อยละ 97.44 heterogenous enhancement ร้อยละ 88.46, abnormal perigastric fat plane ร้อยละ 89.74 gastric outlet obstruction ร้อยละ 46.15 lymphadenopathy which above renal hilum ร้อยละ 77.55 และ metastasis ร้อยละ 52.56 ลักษณะภาพเอกซเรย์คอมพิวเตอร์ของมะเร็งกระเพาะอาหารชนิด lymphoma พบเป็น diffuse gastric wall thickening ร้อยละ 75, homogenous enhancement ร้อยละ 50, normal perigastric fat plane ร้อยละ 75, lymphadenopathy which below renal hilum ร้อยละ 75 และไม่มี gastric outlet obstruction ร้อยละ 100 ลักษณะภาพเอกซเรย์คอมพิวเตอร์ของมะเร็งกระเพาะอาหารชนิด GIST พบเป็น large exophytic mass ร้อยละ 85.71 large mucosal ulceration ร้อยละ 57.14 central necrosis ร้อยละ 85.71 calcification ร้อยละ 42.86 heterogenous enhancement ร้อยละ 85.71 lymphadenopathy ร้อยละ 14.29 และ gastric outlet obstruction ร้อยละ 0

สรุป: ลักษณะภาพทางเอกซเรย์คอมพิวเตอร์มีประโยชน์ในการตรวจพบ การประเมินผลและการวินิจฉัยมะเร็งกระเพาะอาหาร

คำสำคัญ: ภาพเอกซเรย์คอมพิวเตอร์, ลักษณะ, มะเร็งกระเพาะอาหาร

CT features of gastric adenocarcinoma were focal gastric wall thickening (97.44%), heterogenous enhancement (88.46%), abnormal perigastric fat plane (89.74%), gastric outlet obstruction (46.15%), lymphadenopathy which is above renal hilum (77.55%) and metastasis (52.56%). CT findings of gastric lymphoma were diffuse gastric wall thickening (75%), homogenous enhancement (50%), normal perigastric fat plane (75%), lymphadenopathy which is below renal hilum (75%) and no gastric outlet obstruction (100%). CT features of malignant gastric GIST appeared large exophytic mass (85.71%), mass containing areas of large mucosal ulceration (57.14%), central necrosis (85.71%), calcification (42.86%), heterogenous enhancement (85.71%), lymphadenopathy (14.29%) and gastric outlet obstruction (0%).

Conclusion: CT feature is helpful in detection, evaluation and diagnosis of gastric malignancies.

Keywords: Computed tomographic, Features, Gastric, Malignancies

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Introduction

According to the World Health Organization, neoplasms of the stomach are classified into two large categories on the basis of the cell of origin : epithelial and nonepithelial. Epithelial neoplasms arise from the mucosa and account for the majority of gastric tumors, ranging from benign hyperplastic and adenomatous polyps to malignant adenocarcinomas. In contrast, nonepithelial tumors arise deep to the mucosa, that is, from the submucosa, muscularis propria, or serosa. Nonepithelial lesions are commonly referred to as “submucosal” or “intramural”. Intramural gastric tumors are typically mesenchymal in origin and gastrointestinal stromal tumors (GISTs) account for the majority of intramural tumors[1].

Gastric adenocarcinoma is the most common gastric malignancy, representing over 95% of malignant tumors of the stomach. The peak prevalence is between 50 and 70 years of age. Prognosis is correlated to the stage of the tumor at presentation. It is an aggressive tumor with a 5-year survival rate of less than 20%. Therefore, early detection and accurate staging of gastric cancer are essential because surgical resection is the treatment of choice for localized disease. Computed tomographic (CT) is currently the staging modality of choice because it can help identify the primary tumor, assess for local spread, and detect nodal involvement and distant metastases. The stomach is the most frequent site of gastrointestinal tract involvement by non-Hodgkin lym-

phoma. GISTs are most frequently found in the stomach (60-70%); they account for 2-3% of all gastric tumors[2].

By using multi-detector row CT becomes more practical and useful in the detection and evaluation of gastric malignancies and the variety of benign conditions that affect the stomach[2]. Thus, the purpose of this study was to describe the CT features of gastric malignancies.

Methods

Data collection

The author retrospectively reviewed the CT images and radiological records of 89 patients having a definite pathological diagnosis of adenocarcinoma, malignant lymphoma and malignant GIST of the stomach. The patients were seen at Khon Kaen Hospital between March 2014 and February 2017. The study was approved by the Institutional Review Board of Khon Kaen Hospital, Khon Kaen, Thailand.

The study population who received a definite pathologic diagnosis of gastric adenocarcinoma was 78 patients (87.64%), malignant gastric lymphoma was 4 patients (4.49%) and malignant gastric GIST was 7 patients (7.87%). All 89 patients of gastric malignancy included 46 men (51.69%) and 43 women (48.31%). The age range of the study population was 28-85 years and the mean age was 60 years. In this study excluded any patients having a definite pathological diagnosis of adenocareinoma, malignant lymphoma and malignant GIST of stomach who had received any previous treatment by surgery and/or chemotherapy.

Imaging technique

An optimum CT technique requires high spatial resolution, proper gastric distention, and proper timing of contrast media injection in order to detect subtle changes in the gastric wall and to accurately stage tumors[3].

For dedicated imaging of the stomach, adequate distention is essential. If the entire stomach is not well distended, the disease may be overlooked or, conversely, the collapsed gastric wall may mimic disease. Recently, there has been interest in using alternative oral contrast agents for CT of the gastrointestinal tract. We prefer to use water as an oral contrast agent in patients with suspected gastric disease because it is inexpensive (usually free), well-tolerated, distends the stomach well, allows good visualization of the enhancing wall, and dose not interfere with the manipulation of the 3D data sets. When CT was performed specifically to evaluate the stomach, the patients were given about 500-1000 ml of water approximately 15 minutes before scanning[4].

Gastric imaging has been improved by the introduction of multi-detector row CT scanners. We currently used a 16-detector row CT scanner with a 0.75-second tube rotation (Activion 16; Toshiba) in all 89 patients of this study. The scan included the whole abdomen from the diaphragm to the iliac crest with 1 mm. section collimation, at a pitch of 1.4 with standard reconstruction. The scanning parameters were 120 kV.

In additional to an oral contrast agent, which allows good gastric distention, an intravenous contrast material is essential for complete evaluation of any neoplastic and inflammatory disease of the stomach. We routinely administered 100 ml of nonionic contrast material at a rate of 3 ml/sec. A 70-second delay after initiation of the contrast material injection was used for the portovenous phase of the abdominal images with soft-tissue window.

Imaging evaluation

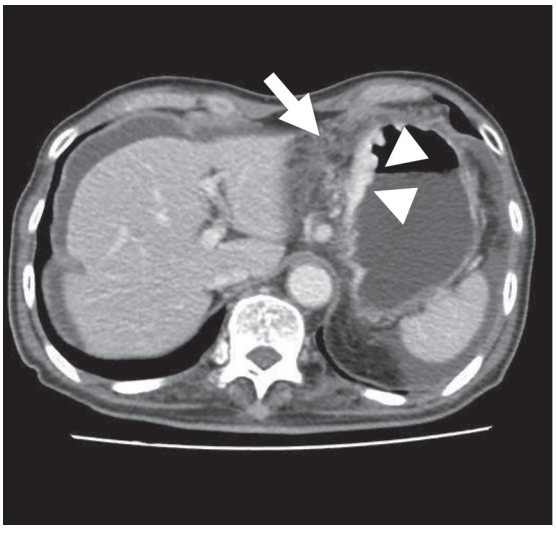
The CT images of adenocarcinoma, malignant lymphoma and malignant GIST of the stomach were evaluated in a blinded retrospective manner by two staff radiologists. If there were any disagreement, the final interpretation was reached through consensus.

Results

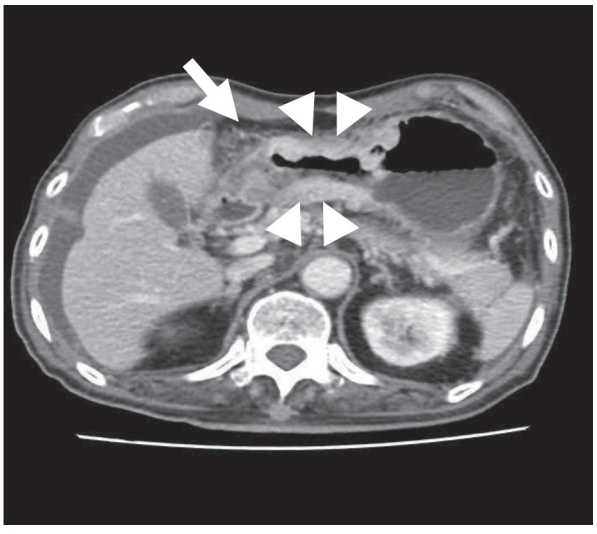
All 89 patients of gastric malignancies who received a definite pathologic diagnosis of gastric adenocarcinoma was 78 patients (87.64%), gastric lymphoma was 4 patients (4.49%) and malignant gastric GIST was 7 patients (7.87%).

CT features of gastric adenocarcinoma (Figure 1A and 1B) were focal gastric wall thickening (97.44%), heterogenous enhancement (88.46%), abnormal perigastric fat plane (89.74%), gastric outlet obstruction

(46.15%), lymphadenopathy which is above renal hilum (77.55%) and metastasis (52.56%) : liver 42.11%, lung 10.53%, adrenal gland 7.02%, ovary 7.02%, peritoneal seedling 3.51%, omental caking 21.05%, spleen 3.51%, pancreas 3.51% and bone 1.75%.



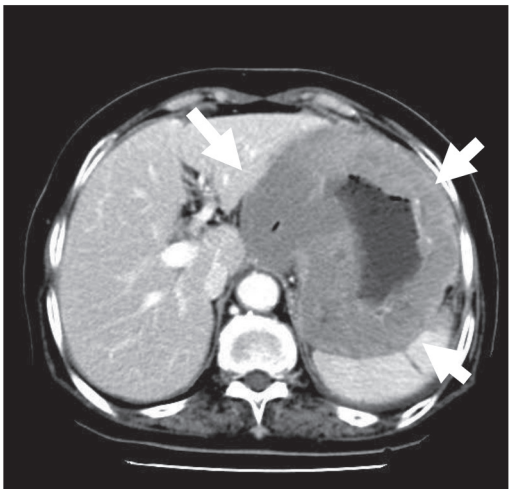
1A



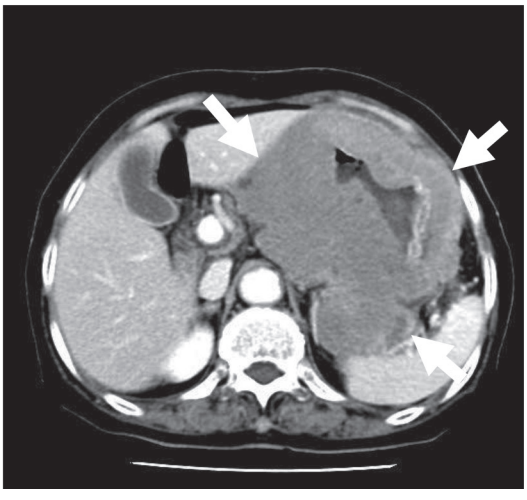
1B

Figure 1A and 1B : Axial CT scan of a 78 years old man with gastric adenocarcinoma shows focal gastric wall thickening (arrowheads), heterogenous enhancement and abnormal perigastric fat plane (arrows)

CT findings of gastric lymphoma (Figure 2A and 2B) were diffuse gastric wall thickening (75%), homogenous enhancement (50%), normal perigastric fat plane (75%), lymphadenopathy which is below renal hilum (75%) and no gastric outlet obstruction (100%).



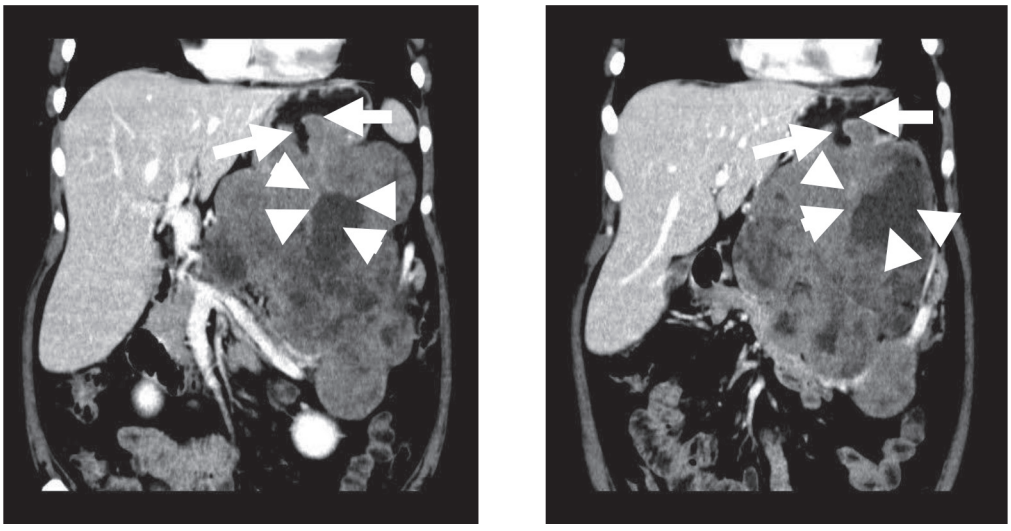
2A



2B

Figure 2A and 2B : Axial CT scan of a 76 years old woman with malignant gastric lymphoma shows diffuse thickening of gastric wall and homogenous enhancement (arrows)

CT features of malignant gastric GIST (Figure 3A and 3B)typically appeared large exophytic mass (85.71%), mass containing areas of large mucosal ulceration (57.14%), central necrosis (85.71%), calcification (42.86%), heterogenous enhancement (85.71%), lymphadenopathy (14.29%) and gastric outlet obstruction (0%).



3A 3B

Figure 3A and 3B : Coronal multiplanar reconstruction view from abdomen of a 49 years old woman with malignant gastric GIST shows large exophytic mass which containing areas of large mucosal ulceration (arrows), central necrosis (arrowheads) and heterogeneous enhancement

Discussion

In the literature[3] revealed the CT features of gastric adenocarcinoma include : a focal area of gastric wall thickening, abnormal perigastric fat, local lymphadenopathy, seeding along the peritoneal ligaments, metastases; CT features of gastric lymphoma include : diffuse infiltration, wall thickening > 1 cm, circumferential involvement of most of the stomach, homogenous wall-thickening, presence of lymph nodes on either side of the mesenteric vessels; CT features of malignant gastric GIST include : large heterogenous masses that extent outside the gastric wall, central necrosis and liquefaction, large ulcers and calcifications.

The review by Kim et al.[2], showed that CT findings of gastric lymphoma typically appears as segmental or diffuse wall thickening. The lesions are often indistinguishable from adenocarcinomas. Severe gastric wall thickening, more than one lesion, infrequent gastric outlet obstruction, and lymphadenopathy that extends below the renal hilum favor gastric lymphoma over adenocarcinoma as a diagnosis. CT findings of GISTs that are suggestive of malignancy include large tumor size, an exophytic mass, and a mass containing areas of central necrosis or calcification. Associated lymphadenopathy is uncommon.

Horton and Fishman[4] found that in contrast to gastric adenocarcinoma, lymphoma typically involves more than one region of the stomach. Because lymphoma is considered to be a soft tumor, it is less likely to result in gastric outlet obstruction than is gastric adenocarcinoma. Perigastris adenopathy is common in patients with gastric lymphoma as well as in those with gastric adenocarcinoma. However, adenopathy that extends below the renal hila favors gastric lymphoma over adenocarcinoma as a diagnosis. At CT, GISTs vary in size and appearance. When large (> 5 cm), the tumor often appear exophytic and may contain areas of central necrosis or calcification. Associated adenopathy is uncommon, in contrast with gastric adenocarcinoma or lymphoma.

Levy et al.[5], reported that gastrointestinal stromal tumors (GISTs) are the most common mesenchymal neoplasms of the gastrointestinal tract. GISTs most frequently occur in the stomach (70%), followed by the small intestine (20%-30%), anorectum (7%), colon and esophagus. The stomach is the most common location for GISTs, which make up 2%-3% of all gastric tumors. Because GISTs usually involve the outer muscular layer, they have a propensity for exophytic growth. Therefore, the most common appearance is that of a mass arising

from the gastric wall and projecting into the abdominal cavity. A peripheral enhancement pattern was present in the majority on intravenous contrast-enhanced CT images. Central areas of low attenuation correspond to hemorrhage, necrosis, or cyst formation. Homogenous enhancement was present in a minority. Calcification is an unusual feature of GISTs. It may occur in a mottled pattern or be present extensively throughout the tumor. CT may also demonstrated evidence of adjacent organ invasion, ascites, omental and peritoneal spread of tumor, or liver metastasis. Metastatic lymphadenopathy is not a feature in patients with GISTs. Gastric adenocarcinoma and lymphoma rarely demonstrate marked exophytic growth. Advanced gastric carcinomas and lymphomas commonly have associated perigastric, hepatoduodenal ligament, and celiac lymphadenopathy, which are not seen in malignant GISTs. Lymphoma may be associated with bulky adenopathy or adenopathy that extends into the lower abdomen and pelvis. Adenopathy is not usually observed in cases of gastric GISTs.

Similarly, Kang et al.[1], reported that GISTs can arise anywhere in the gastrointestinal tract. The most common location is the stomach (70% of cases), followed by the small intestine, anorectum, colon and esophagus. In the stomach, the body is the most common site, followed by the fundus and then the antrum. However, because of the exophytic growth pattern of these tumors, some patients remain asymptomatic until the tumor has become quite large. Bowel obstruction is rare. Because they arise from the deep muscularis propria, GISTs frequently have an exophytic or intramural pattern of growth; endoluminal growth is less common. About 50% of lesions larger than 2 cm. develop focal ulceration of the overlying mucosa because of pressure necrosis. As they enlarge, exophytic GISTs may invade adjacent structures such as the pancreas, colon, or diaphragm. Areas of hemorrhage, necrosis, or cystic degeneration are common, appearing as focal areas of low attenuation. Extensive hemorrhage or necrosis may result in formation of a cavity that communicates with the gastric lumen. In rare cases, clumps of calcifications are seen. Nearly half of patients present with metastatic disease, most commonly to the liver and peritoneum. Lymph node metastasis is infrequent. Occasionally, gastric adenocarcinoma or lymphoma may demonstrate intramural growth and mimic a GISTs. However, advanced gastric carcinomas and lymphomas are usually associated with bulky perigastric or celiac lymphadenopathy, which is rare for GISTs.

The review by Hong et al.[6], showed that the CT features of GISTs vary greatly, depending on the size and aggressiveness of the tumor and the time of presentation during the course of the disease. Primary GISTs are typically large, hypervascular, enhancing masses on contrast-enhanced CT scans and are often heterogenous because of necrosis, hemorrhage, or cystic degeneration at the time of presentation. Ulceration and fistulization to the gastrointestinal lumen are also common features of GISTs. Often, tumor vessels can be seen within the tumors. The masses usually displace adjacent organs and vessels, but direct invasion of the adjacent structures is sometime seen with advanced disease. It can be difficult to identify the origin of the mass because of its large size and prominent extraluminal location. Bowel obstruction is rare. Nearly 50% of patients with GISTs present with metastasis. Most metastases of GISTs involve the liver and peritoneum by hematogenous spread and peritoneal seeding, respectively. Unlike gastrointestinal adenocarcinomas, GISTs metastasizing to the lymph nodes are extremely rare.

Conclusion

CT feature is helpful in detection, evaluation and diagnosis of gastric malignancies. CT features of gastric adenocarcinoma typically appear as focal or localized gastric wall thickening, heterogenous enhancement, abnormal perigastric fat plane, gastric outlet obstruction, lymphadenopathy which is above renal hilum and metastases. CT features of gastric lymphoma typically appear as diffuse gastric wall thickening, homogenous enhancement, normal perigastric fat plane, no gastric outlet obstruction and lymphadenopathy which is below

renal hilum. CT findings of gastric GIST that are suggestive of malignancy include large exophytic mass which containing areas of large mucosal ulceration, central necrosis, calcification and heterogenous enhancement. Associated lymphadenopathy is uncommon. Gastric outlet obstruction is rare.

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