

原发性胃肠道淋巴瘤的多层螺旋 CT 诊断及鉴别诊断

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摘要:【目的】分析总结不同部位胃肠道淋巴瘤的多层螺旋 CT 表现及鉴别诊断。【方法】回顾性分析 135 例经手术病理证实的胃肠道淋巴瘤患者,就胃肠道淋巴瘤的发生部位、病理类型及多层螺旋 CT 表现进行分析和讨论。所有病例均采用 GE lightspeed 16 或 Siemens Somatom Definition 64 层双源螺旋 CT 扫描。【结果】胃淋巴瘤发生率最高(69 例),其次为小肠淋巴瘤(40 例)。最常见的病理类型是弥漫大 B 淋巴瘤(87 例)及 MALT 淋巴瘤(24 例)。大多数胃淋巴瘤(60 例)表现为胃壁增厚,但未见明显梗阻征象,增强扫描 14 例可见黏膜白线征。动脉瘤样扩张(9 例)、病灶内积气(3 例)及“夹心面包征”(2 例)则是小肠淋巴瘤的特征性表现。结直肠淋巴瘤少见(26 例),CT 表现与小肠淋巴瘤相似。【结论】胃肠道淋巴瘤的 MSCT 表现具有一定特异性,特别是回肠淋巴瘤,有助于胃肠道淋巴瘤的诊断及鉴别诊断。

关键词:原发性淋巴瘤;胃肠道;多层螺旋 CT;鉴别诊断

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MSCT Diagnosis and Differential Diagnosis of Primary Gastrointestinal Lymphoma

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Abstract: 【Objective】 To analyze the imaging manifestation and to summarize differential diagnosis of different sites of gastrointestinal lymphoma. 【Methods】 135 cases with gastrointestinal lymphoma were investigated retrospectively, and the sites, pathologic findings and multi-slice spiral CT imaging manifestations were discussed. All the cases were confirmed by pathology, and were scanned by GE lightspeed 16 or Siemens Somatom Definition 64 CT machines. 【Results】 Stomach was the most common site of primary gastrointestinal lymphoma (69 cases), followed by intestinal lymphoma (40 cases). Diffuse large B-cell lymphoma (87 cases) and mucosa-associated lymphoid tissue lymphoma (MALT lymphoma) (24 cases) was the most common pathologic subtypes. Diffuse or focal gastric wall thickening was commonly seen (60 cases) with an absence of obviously stenosis, and “mucosal white line sign” could be seen in 14 cases. Aneurysmal dilation (9 cases), focal pneumatosis within lesions (3 cases) and “sandwich sign” (2 cases) were the typical CT features of intestinal lymphoma. Colorectal lymphoma (26 cases) was infrequent and its CT findings were analogous to the intestinal lymphoma. 【Conclusion】 Some features in MSCT findings of gastrointestinal lymphoma are typical, especially in ileum. MSCT is helpful in diagnosis and differential diagnosis of gastrointestinal lymphoma.

Key words: primary lymphoma; gastrointestinal tract; multi-slice CT; differential diagnosis

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Lymphoma is a malignant tumor derived from lymphoid tissue. Its mortality rate is the eleventh to thirteenth of the total malignant tumors^[1]. According to its pathogenic sites, lymphoma is divided into the lymphonodus and extranodal lymphoma. Primary gastrointestinal lymphoma is the most common type of extranodal lymphoma, and is up to 30%-40% of the cases. Approximately 60%-75% of cases occur in the stomach, followed by the small intestines (20%-40%), colon and rectum^[2]. In this article the MSCT

data of 135 cases of primary gastrointestinal lymphoma confirmed by pathology, treated from January 2007 to December 2015, were analyzed retrospectively. The CT manifestations of different sites of the primary gastrointestinal lymphoma are summarized.

1 Materials and Methods

135 cases of primary gastrointestinal lymphoma

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(94 male and 41 female, aged 23–82, average of 52.8 ± 13.5) were proved by pathology. Primary gastrointestinal lymphoma has been defined by Dawson et al. as follows^[3]: ① no palpable lymphadenopathy; ② chest radiographs with no evidence of mediastinal lymphadenopathy; ③ normal white blood cell counts; ④ predominance of the bowel lesion at laparotomy with lymph node involvement confined to drainage of the primary tumor site; ⑤ non-involvement of the spleen or liver.

All the Patients were told the adverse reactions of CT enhancement scan and signed an informed consent form before they had an abdominal CT enhancement scan. Before the scanning, patients needed to have 4–6 h fasting and drink oral contrast agent or warm water to expand the stomach and intestine. Patients with colorectal disease needed bowel preparation before scanning (some patients discovered incidentally or clinical examination of intestinal obstruction did not need bowel preparation). CT examination was performed using the GE lightspeed 16 (Scan parameters: tube voltage 120 kV, tube voltage 268 mA, pitch 5mm, tube rotation time 0.5s/rot, 5 mm high-resolution acquisition. reconstruction thickness 5 mm) or dual-source spiral CT scanner of Siemens Somatom Definition 64 (Scan parameters: tube voltage 120 kV and tube voltage 320 mA, pitch 5 mm, tube rotation time 0.5 s/rot, 5 mm high-resolution acquisition. reconstruction thickness 5 mm). Contrast enhanced scanning was performed after patients had a intravenously bolus injection of 1.0–1.5 mL/kg of intravenous iopromide 370 (the concentration of iodine is 370 m/ml) with the flow rate of 3.0 mL/s and 120 s delayed scanning time.

The coronal and sagittal images were reconstructed with MPR (multi planner reformation) and MIP (maximum intensity projection). The CT scans were viewed from PACS and analyzed by two senior radiologists about the range, the thickness and the surrounding infiltration extent of the lesions. This article utilized SPSS 20.0 to calculate the average and standard deviation.

2 Results

2.1 Sites

All of the 135 cases, gastric lymphoma accounted for the highest percentage (69 cases, 51%), among which, 7 cases occurring in gastric fundus, 9 cases in gastric body, 30 cases in antrum. 23 cases occurred in multiple lesions, with the majority of them (15 cases) occurring in gastric body and antrum simultaneously. 40 of 135 cases (29%) occurred in small intestine, with 2 case in duodenum, 27 cases in ileum (18 of them occurred in ileocecal junction), 9 cases in jejunum and 2 case both in jejunum and ileum at the same time. 25 of 135 cases (18%) occurred in colon and 1 case in rectum.

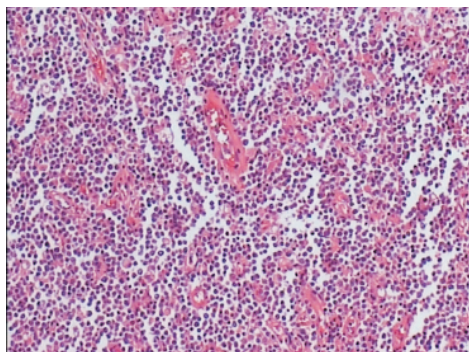
2.2 Pathologic Findings

All the 135 cases of this group were diagnosed as non-Hodgkin's lymphoma by pathology, and most of them (117 cases, 87%) were B-cell lineage, with 87 cases (46%) of diffuse large B-cell lymphoma (Figure 1), 24 cases (17%) of mucosa-associated lymphoid tissue lymphoma (MALT lymphoma), 3 cases of follicular lymphoma and mantle cell lymphoma respectively. The rest 18 cases were T-cell lineage and most of them (11 cases) were enteropathy associated T-cell lymphoma.

2.3 CT Features

In the 69 cases of primary gastric lymphoma, 60 cases (87%) showed diffuse or focal gastric wall thickening (Figure 2A). Mean thickness of gastric wall was (1.90 ± 0.71) cm (0.5–4.5 cm). 9 cases (13%) present as soft tissue mass (Figure 2B), and the maximum diameter ranged from 4.0–5.8 cm [mean diameter was (4.90 ± 0.71) cm]. In gastric lymphoma with diffuse gastric wall thickening, the wall was soft and the stomach cavity did not show obviously obstruction. Enhanced CT scanning showed that gastric mucosa enhanced obviously, some of which were called “mucosal white line sign” (14 cases) (Figure 2C).

24 of the 40 small intestinal lymphoma cases showed wall thickening in small intestine [mean thickness was (2.57 ± 0.97) cm], which was more obviously than that in gastric lymphoma (1.90 ± 0.71) (Independent Samples Test, $t = 2.487$, $P < 0.05$). 9 cases demonstrated the sign of aneurysmal-like dilatation (Figure 3A) and 3 cases were with local pneumatosis in intestine (Figure 3B). 16 cases presented as soft tissue mass including 4 cases with



Diffuse large B-cell lymphoma was with heteromorphic lymph cell under the microscope. $\times 400$

Fig.1 Diffuse large B-cell lymphoma

intussusception and the “target sign” (Figure 3 C). Although secondary stenosis occurred in 22 cases of primary intestinal lymphoma, but only 3 cases occurred intestinal obstruction. Enlarged lymph nodes in retroperitoneum and mesentery appeared commonly, some of them encircled intestine, coeliac trunk and mesenteric artery, which was called “sandwich sign” (2 cases)^[4]. (Figure 3 D).

26 cases of colorectal lymphoma presented as

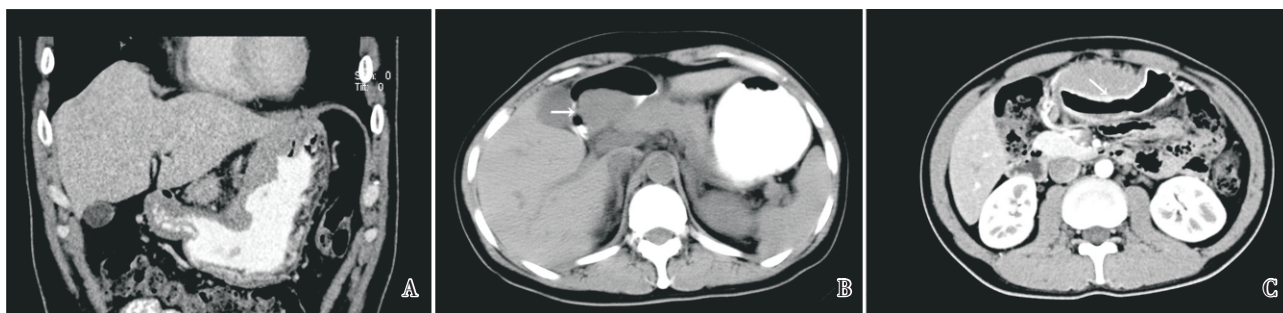
wall thickening (16 cases) or soft tissue mass (10 cases). Pre-contrast CT scanning showed isodense, and mild to moderate enhancement on the enhanced CT scanning. Colorectal cavity was stenosis in different degree with relative preservation of fat space.

Comparing to pathologic results, the cases with diffuse large B-cell lymphoma showed thickened gastric wall more obviously than those with MALT lymphoma [the average gastric wall thickness of former was (3.22 ± 2.40) cm, the latter was (2.14 ± 1.42) cm, the difference was statistically significant, Independent Samples Test, $t = 2.124$, $P < 0.05$].

3 Discussion

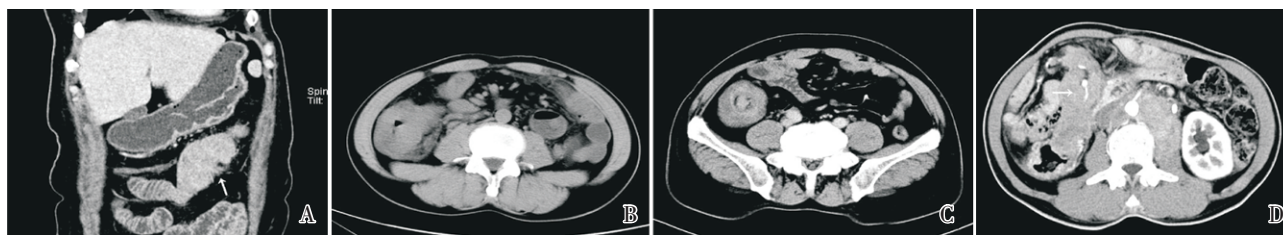
3.1 Age, Gender and Sites

Gastrointestinal lymphoma is commonly seen in elderly people at an average age of 50. The morbidity of the male is higher than that of the female^[5-6]. In this group, the average age of 135 cases was (52.8 ± 13.5) years old and the proportion of male and female was 2.29, which was consistent with the reports by



A: Coronal reconstruction images revealed diffuse wall thickening of gastric fundus and lesser curvature, but the wall was soft and the stomach cavity was no obviously stenosis. B: Axial plan image demonstrated the soft tissue mass (arrow) in the gastric antrum with protruding into the cavity. C: Enhanced CT showed gastric antrum lymphoma with enhanced gastric mucosa called “mucosal white line sign” (arrow). Tissue beneath the serosa enhanced slightly, the intermediate tumor tissue appeared a strip of slightly lower density.

Fig.2 CT features of gastric lymphoma



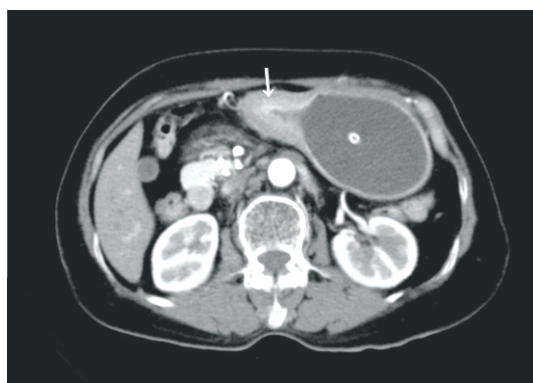
A: Small intestine demonstrated the sign of aneurysmal dilatation (arrow). B: The ileum had local pneumatosis but the other ilea were with an absence of obvious stenosis. C: Part of the ileum herniated into ileocecal junction, and the enhanced scanning of MSCT showed the “target sign”. D: Multiple enlarged lymph nodes which were encircled intestine and mesenteric artery (arrow) appeared in retroperitoneum and mesentery.

Fig.3 CT features of small intestinal lymphoma



Diffuse heterogeneous gastric wall thickening more than 50% of the whole wall (arrow) was highly hinted as lymphoma.

Fig.4 Primary gastric lymphoma



CT image demonstrated the local wall thickening at gastric antrum (arrow), the stiffness of gastric wall and lumen narrowing, with blurred fat space near the lesion.

Fig.5 Gastric cancer

Gumey and Mihaljevic^[5-6]. Most cases were primary gastric lymphoma (51%), followed by ileum and jejunum (29%) and rare cases occurred in colon and rectum (20%), which was accorded with reference^[2,5,6].

3.2 Pathologic Characteristics of Gastrointestinal Lymphoma

Primary gastrointestinal lymphoma originates from gastrointestinal mucosal lamina propria and submucosa lymphoid tissues and most of them are non-Hodgkin's lymphoma (no Hodgkin's lymphoma were found in this group). Most of the cases are B-cell lineage. The most common subtypes were diffuse large B-cell lymphoma (46%) and followed by MALT lymphoma (17%). Other subtypes such as follicular lymphoma and mantle cell lymphoma were rarely found in this group. Our results were consistent with reference^[3].

Due to some cases were lack of immunohist-

ochemical staining and exact pathologic subtypes, this article could not explain the link between pathologic and imaging findings. It should be improved in the further research.

3.3 CT features of gastrointestinal lymphoma

Primary gastric lymphoma: (1) Diffuse or local gastric wall was thickening and gastric cavity was stenosis in different degree but without obviously obstruction^[7]. Gastric mucosa enhanced obviously in CT scanning, 14 cases presented as the "mucosal white line sign", which is related to primary gastric lymphoma usually originates from the submucosal lymphoid tissue and the mucosa enhanced obviously while the submucosal lymphoma enhanced slightly. The results indicated that if the gastric wall thickening of more than 50% and the thickness was more than 1cm, which highly indicated gastric lymphoma^[8] (Figure 4). 60 cases of this group presented as diffuse or focal gastric wall thickening [mean thickness was (1.90 ± 0.71) cm]. (2) Soft tissue mass was found in the gastric lumen with smooth edge and wide basement, which was protruding into the cavity commonly. The mass uniformly appeared as isodense on pre-contrast CT scanning, and the larger one may be with liquefaction necrosis. Enhanced CT scanning showed mild to moderate enhancement^[9], but rare enhancement in the necrotic area. 9 cases of the group presented as soft tissue mass in the gastric cavity [mean diameter was (4.9 ± 0.71) cm]. (3) The fat space around the stomach is relative preservation but multiple enlarged lymph nodes may occur in abdominal cavity and retroperitoneum, especially under the renal hilus.

Primary small intestinal lymphoma: The intestinal wall was evenly or unevenly thickened (normal thickness less than 0.3 cm^[10]), with the extent more than that in gastric wall. The mean thickness of 24 cases was (2.57 ± 0.97) cm. This phenomenon may be related to larger growth space of the small intestine. The small intestinal wall was soft with an absence of intestinal obstruction in most cases (only 3 cases complicated with intestinal obstruction). This may relates to the muscular layer thickening and the connective tissue was not hyperplastic in the small intestinal lymphoma. Pneumatosis rarely existed in small intestinal cavity except for obstruction, in

which small intestinal lymphoma decreased the peristalsis and cause the pneumatosis, which can't not discharge into the lower intestine. In this group 3 cases presented as this phenomenon. If there is focal pneumatosis in the thickened intestine without obstruction, it may highly indicated small intestinal lymphoma^[11]. Sign of aneurysmal-like dilation, a characteristic CT feature of small intestinal lymphoma, which may be due to tumor infiltration of the muscular layer and the autonomic plexus causing loss of smooth muscle tone^[11-12]. 9 cases of this group could show this characteristic sign. 16 cases presented as soft tissue mass. Part of the ileum herniated into ileocecal junction, and the "target sign" was showed in the enhanced CT scanning. 4 cases with intussusception occurred in terminal ileum or ileocecal junction. Enlarged lymph nodes in retroperitoneum and mesentery appeared commonly, some larger lymph nodes encircled intestine, coeliac trunk and mesenteric artery, which was called "sandwich sign"^[4].

Primary colorectal lymphoma: It's infrequently seen^[5]. There were 26 cases in this group and 15 of them occurred in caecum or ascending colon. CT findings were similar to the small intestinal lymphoma, also presented as wall thickened or soft tissue mass formed. Colorectal cavity was irregularly stenosis and showed an enhancement in different degree on the enhanced CT scanning. The peripheric fat space was rarely involved.

3.4 Differential diagnosis

Primary gastric lymphoma should be mainly differentiated from primary gastric cancer and GIST. Because of the high incidence rate of gastric cancer and its mortality is at the first place of malignant tumor in China^[13], gastric lymphoma is easy to be misdiagnosed as gastric cancer. Gastric cancer can show as diffuse gastric wall thickening, but the incidence rate is lower than lymphoma. Gastric cancer can destroy mucous layer and induce connective tissue proliferation, so the gastric wall usually is stiff with the constriction of stomach cavity (Fig.5). However, gastric lymphoma demonstrates soft gastric wall and less often shows as narrowing or obstruction

of cavity. Only one case shows obviously ulceration in lymphoma in this group while it is commonly seen in gastric cancer. This may be related to gastric lymphoma usually originates in submucosa lymphoid tissue and the mucosa layer involved relatively late. In addition, gastric cancer commonly demonstrates perigastric lymph node metastasis. The common appearance of GIST is soft tissue mass with extra-luminal growth and the enhancement degree is more obviously than that in lymphoma.

Small intestinal lymphoma should be mainly differentiated from small bowel adenocarcinoma, small intestine stromal tumor and Crohn's disease. The terminal ileum is the most common site of small bowel lymphoma, and aneurysmal-like dilation of the small bowel and pneumatosis within lesions without intestinal obstruction are the characteristic manifestations of small-bowel lymphoma. Adenocarcinoma often occurs in the proximal intestine and demonstrates uneven thickening of intestinal wall with common manifestations including intestinal wall stiffness, luminal stenosis and obstruction mimicking gastric cancer. Most of the small bowel stromal tumor locates in jejunum. The mass usually grows outward with cystic degeneration and necrosis, and enhances more obviously than lymphoma^[14]. Although the pathogenic sites between Crohn's disease and lymphoma is same, the distribution of jump is the characteristic manifestation of Crohn's disease and the peripheral mesenteric lymph node is relatively smaller compare to lymphoma^[15].

Colorectal lymphoma need to be differentiated from colon cancer and rectum cancer. Colorectal cancer is usually irregular with rough edge and limited scope while lymphoma involves a wider range. Colorectal cancer involved intumescent lymph nodes usually locate around the lesion while lymphoma is often accompanied with abdominal and pelvic lymph node enlargement.

3.5 The advantage of multi-slice CT in the diagnosis of primary lymphoma

Low price, simple and convenient are the characteristics of ultrasound, but it can be greatly influenced by the intestinal gas so that is not

conducive to the diagnosis of gastrointestinal lymphoma. Barium meal is also a common method of diagnosis of gastrointestinal diseases. It has the advantage of real-time observation of stomach and intestinal activity, but is unable to determine the infiltration range of lymphoma. Although gastroscop and enteroscopy biopsy can provide accurate pathological results through biopsy, but gastrointestinal lymphoma usually originates in submucosa lymphoid tissue, and if the lymphoma does not involve the mucosa layer, this may lead to misdiagnosis. The multi-slice spiral CT has incomparable advantages in the diagnosis of gastrointestinal lymphoma. Because the extent of the primary gastrointestinal tumor is usually widely, the ultrasound, barium meal, and gastrointestinal endoscopy have the limitation to observe the whole scope of lesions. With MSCT, we can obtain coronal and sagittal imaging by multi-planner reconstruction (MPR), which can intuitive display the shape and the scope of the lesion and the relationship between tumor and the surrounding tissues or organs. So MSCT can provide more informations in diagnosis and differential diagnosis of gastrointestinal lymphoma, and is help for the clinic choice of operation plan.

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