Differentiating between Abdominal Tuberculous Lymphadenopathy and Lymphoma Using Multidetector Computed Tomography (MDCT)

Sopa Pongpornsup MD*,
Pannipa Eksamutchai MD*, Wanwarang Teerasamit MD*

** Department of Diagnostic Radiology Faculty of Medicine Siriraj Hospital Mahidol University, Bangkok, Thailand*

Objective: *To evaluate the specific computed tomography (CT) imaging criteria for differentiating abdominal tuberculous lymphadenopathy from lymphoma by using abdominal multidetector computed tomography (MDCT).*
Material and Method: *A retrospective review of 31 patients with abdominal tuberculous lymphadenopathy and 85 patients with untreated lymphoma was conducted from abdominal CT scan reports in a single center, Siriraj Hospital, Mahidol University, Bangkok Thailand. CT scan was independently reviewed by two expert radiologists who were blinded to the patient's history, treatment outcome, and final diagnosis. The anatomical site, anatomical distribution, CT enhancement patterns, size of lymphadenopathy, amount and density of ascites, abdominal solid organ involvement, bowel involvement, and lung involvement were recorded.*
Results: *MDCT showed that abdominal tuberculous lymphadenopathy involved predominately the mesenteric, upper and lower para-aortic, periportal, and pancreaticoduodenal regions. Untreated lymphoma affected mainly the upper and lower para-aortic, iliac, periportal, pancreaticoduodenal, and gastrohepatic regions. Mesenteric and periportal lymph nodes were involved more often in patients with abdominal tuberculous lymphadenopathy than in those with untreated lymphoma ($p = 0.04$). Iliac and inguinal lymph nodes were involved more often in patients with lymphoma than in those with tuberculosis ($p = 0.01$). Anatomical distributions were significantly different between the two groups ($p<0.01$): confluence distribution was noted more often in tuberculous lymphadenopathy. The enhancement patterns had significant difference between the two groups. Peripheral enhancement was seen significantly more often in tuberculous lymphadenopathy, whereas homogeneous enhancement was found more often in lymphoma. The maximum size of enlarged lymph nodes also showed statistical difference between two groups by using t-test ($p = 0.01$). The mean diameters were 2.95 cm in tuberculous lymphadenopathy and 4.10 cm in lymphoma. Ascites was found significantly more often in tuberculous lymphadenopathy than in lymphoma ($p = 0.03$). However, the attenuation of ascites on pre-contrast images did not show statistical difference. Small bowel and large bowel thickening were demonstrated more often in tuberculous lymphadenopathy than lymphoma ($p<0.01$, $p = 0.01$), which mostly showed target sign enhancement in tuberculosis and homogeneous enhancement in lymphoma. The presence of hepatomegaly and splenomegaly were not different between the two groups. The diagnostic interpretations of two readers showed high sensitivity (93.5%) and high specificity (98.8% by reader1 and 97.6% by reader 2).*
Conclusion: *The present study indicates that the anatomical site, anatomical distribution, enhancement patterns, and size of lymphadenopathy, persistent ascites, and small and large bowel involvement seen on contrast-enhanced MDCT is useful in differentiating between tuberculosis and untreated lymphomas.*

Keywords: *Tuberculosis, Tuberculous lymphadenopathy, Lymphoma, Multidetector computed tomography*

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The incidence of tuberculosis is increasing[1-3], especially in developing countries. In Thailand, the annual risk of tuberculous infection was estimated approximately 100,000 new cases each year[4]. The increased incidence of tuberculosis has been attributed to several causes, including the AIDS epidemic, IV drug abuse, and an increase in the number of immunocompromised patients. Abdominal tuberculosis can affect the gastrointestinal tract, peritoneum, lymph nodes, and solid viscera. Abdominal lymphadenopathy is the most common manifestation of abdominal tuberculosis on CT, in up to 55% of cases without other evidence of abdominal involvement[5]. Thus, abdominal tuberculous lymphadenopathy may be confused with lymphomas involving abdominal lymph nodes. The clinical and radiologic findings of the two diseases are similar and challenging to distinguish[5-7]. The purpose of the present study is comparison of CT findings in tuberculosis and

Correspondence to:
Pongpornsup S, Department of Radiology, Faculty of Medicine Siriraj Hospital, 2 Pran-nok Road, Bangkok-noi, Bangkok 10700, Thailand.
Phone: 0-2419-9039, Fax: 0-2412-7785
E-mail: sopa2108@hotmail.com

untreated lymphoma involving the lymph node, gastrointestinal tract, peritoneum, and solid viscera to improve the physicians' ability to distinguish between these entities.

Material and Method

Institutional review board approved a retrospective review study. Medical records of abdominal tuberculosis, untreated non-Hodgkin lymphoma and untreated Hodgkin lymphoma patients were retrieved from hospital data by using ICD-10, A183 for Tuberculosis of intestines, peritoneum and mesenteric gland, C85.9 for Non-Hodgkin lymphoma, unspecified and C81.9 for Hodgkin lymphoma, who underwent to performed contrast enhanced CT scan between January 2005 and June 2011 in our hospital. The search result showed 31 patients diagnosed as abdominal tuberculosis and 85 patients diagnosed as lymphoma.

The patients with tuberculosis included 16 men and 15 women with ages ranging from 16 to 79 years (mean, 40 years). Twenty-two patients had HIV infection. In this subgroup, thirteen were men and nine were women.

Of the patients with untreated lymphoma, 74 had non-Hodgkin's lymphoma, which included 44 men and 30 women at the age ranging from 17 to 93 years (mean, 57 years), 11 had Hodgkin lymphoma, which included eight men and three women at the age ranging from 27 to 79 years (mean, 50 years). One of 85 patients of lymphoma had HIV infection, which is the non-Hodgkin's lymphoma patient.

The CT scans were performed by using two CT scanners, Siemens 64-slice dual-source CT and GE LightSpeed VCT 64 CT (CT image 1.25 and 1.50 mm slice thickness). All of 116 CT examinations were performed after the administration of IV contrast medium. Oral and rectal positive contrast was administered in some selected patient that had indicated in the CT protocol. Contiguous axial images were obtained from the dome of the diaphragm to the symphysis pubis. Eighty seconds after injection of the contrast material, contrast-enhanced CT scan was performed. Multiplanar reformatted images also were created at the workstation.

Image interpretation

All CT scan images were independently reviewed by two expert radiologists who were blinded from each patient's history and final diagnosis. Two readers reviewed and recorded data including anatomical site of lymphadenopathy, anatomical distribution, size, CT enhancement pattern of lymphadenopathy, amount with density of ascite, abdominal solid organ involvement, bowel involvement, and lung involvement. The diagnosis (abdominal tuberculosis or untreated lymphoma) was interpreted. If interpretation of two readers were significantly different, the interpretation was solved by consensus.

Abdominal lymph nodes were grouped anatomically into the following eight sites: periportal, pancreaticoduodenum, gastrohepatic, para-aortic (above renal hilum), para-aortic (below renal hilum), iliac group and mesentery. Small bowel mesenteric lymph nodes were also divided anatomically into the following three sites: the root, margin (area including mesenteric marginal vessels and vasa rectas) and body of SBM (the area between the root and margin of SBM). The inguinal lymph nodes were divided into another subgroup. The short-axis diameter of the maximum node was measured. The enhancement patterns of lymph nodes were characterized as peripheral enhancement, homogeneous enhancement, homogeneous with peripheral enhancement, heterogeneous enhancement, and homogeneous non-enhancement. The anatomical distribution of lymph nodes was distinguishable including dispersed, confluent, and sandwich sign[8].

The presence of ascites was divided into five subgroups, none, small free ascites, large free ascites, small loculated ascites, and large loculated ascite. The attenuation (Hounsfield unit) of ascites on non-contrast image was measured using region of interest.

The peritoneum and solid viscera involvement, including liver, spleen, pancreas, adrenal gland, and kidney were noticed. Size, CT pattern enhancement, and calcification were indicated.

Small and large bowel involvements were observed. If bowel involvements were present, the site, thickness, and length of these involved bowels were recorded.

Additionally, lung involvements such as pleural effusion, pleural nodule, and pulmonary nodule were descriptively recorded.

Results

CT manifestations of abdominal tuberculous lymphadenopathy

Abdominal tuberculous lymphadenopathy (Fig. 1) affected mainly the lymph nodes in the mesentery, the upper and lower para-aortic, periportal, pancreaticoduodenal and gastrohepatic regions.

Lymph nodes with confluence distribution (24 patients [77.4%]) and disperse distribution (7 patients [22.6%]) are observed. The maximum sizes of lymph nodes were ranged from 1.4 to 7.0 cm in diameter (mean, 2.95 cm).

Abdominal tuberculous lymphadenopathy had three enhancement patterns: peripheral (23 patients [74.2%]), homogeneous (5 patients [16.1%]) and heterogeneous (3 patients [9.7%]) enhancement.

Sixteen patients with abdominal tuberculous lymphadenopathy had ascites (51.6%): small amount of free ascites (n = 11, 35.5%), large amount of free ascites (n = 3, 9.7%), small amount of loculated ascites (n = 1, 3.2%) and large amount of loculated ascites (n = 1, 3.2%). The attenuation of ascites on pre-contrast image ranges from 2 to 24 HU, mean = 14 HU.

Five patients had hepatomegaly and three patients had splenomegaly. The patients with abdominal tuberculosis had thickening of small bowel in 11 patients (35.5%) and large bowel in eight patients (25.8%), mostly at terminal ileum and cecum which usually showed target sign enhancement[9] (Fig. 2) (10 patients with thickened small bowel and six patients with thickened large bowel). There was heterogeneous enhancement with thickened small bowel in two patients and heterogeneous enhancement with thickened large bowel in one patient. Three patients had tuberculous peritonitis that showed enhancing thickened peritoneum and omentum (Fig. 3).

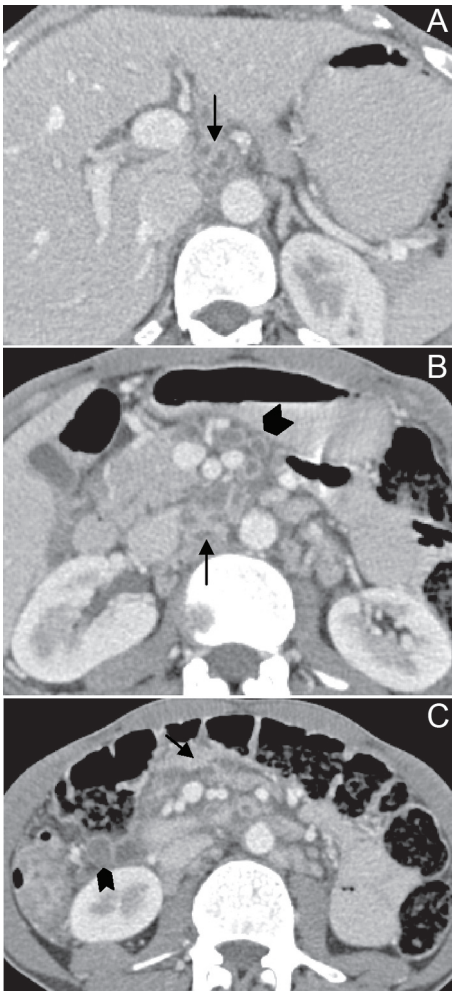

Fig. 1 Contrast-enhanced CT scans in 39-year-old male with abdominal tuberculous lymphadenopathy with peripheral rim enhancement at periportal lymphadenopathy (arrow in A), upper para-aortic (small arrow in B) and mesenteric lymphadenopathies, root of small bowel mesentery (arrowhead in B), mesenteric lymphadenopathies at body (arrow in C) and margin (arrowhead in C) of small bowel mesentery.

CT manifestations of untreated lymphoma

Untreated lymphoma (non-Hodgkin lymphoma and Hodgkin lymphoma) (Fig. 4A, 4B) affected mainly the upper and lower para-aortic, iliac,

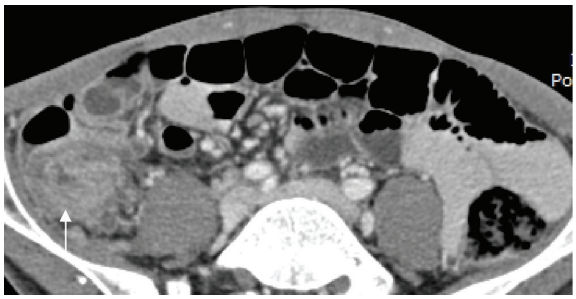

Fig. 2 Contrast-enhanced CT scans in 56-year-old female with abdominal tuberculous lymphadenopathy showed thickening of cecum with target sign enhancement (arrow).

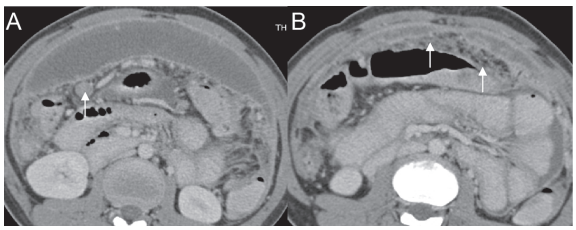

Fig. 3 Contrast-enhanced CT scans in 17-year-old male with tuberculous peritonitis showed mesenteric lymphadenopathy with homogeneous enhancement (A), enhancing thickened peritoneum with large locualated ascites and dirty fat stranding at greater omentum.

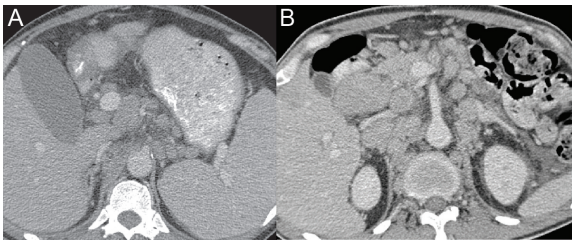

Fig. 4 A) contrast-enhanced CT scans in 48-year-old male with Non-Hodgkin lymphoma revealed multiple homogeneous enhancing lymphadenopathies at periportal, pancreaticoduodenal and upper para-aortic regions.
B) contrast-enhanced CT scans in 35-year-old male with Hodgkin lymphoma showed multiple homogeneous enhancing lymphadenopathies at periportal, pancreaticoduodenal, celiac and upper para-aortic regions.

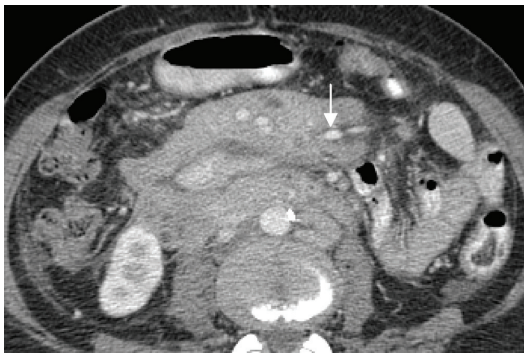

Fig. 5 Contrast-enhanced CT scans in 67-year-old female with non-Hodgkin lymphoma revealed homogeneous enhancing enlarged lymph nodes in the root and body of SBM encasing superior mesenteric artery (arrow), representing "sandwich sign".

periportal, pancreaticoduodenal and gastrohepatic regions. Lymph nodes with confluence distribution (39 patients [45.9%]), disperse distribution (37 patients [43.5%]), and sandwich distribution (9 patients [10.6%]) were observed (Fig. 5). The maximum size of lymph nodes ranged from 0.7 to 11.5 cm in diameter (mean, 4.10 cm).

The enhancement pattern of lymph nodes with untreated lymphoma had four patterns, homogeneous (80 patients [94.1%]), heterogeneous (3 patients [3.5%]), peripheral (1 patients [1.2%]) and homogeneous non-enhancement (1 patients [1.2%]).

Fifteen patients had ascites (17.6%), a small amount of free ascites (n = 13, 15.3%), a large amount of free ascites (n = 2, 2.4%). The attenuation of ascites on pre-contrast image ranged from 2 to 27 HU, mean = 13 HU.

Eleven patients had hepatomegaly and twenty patients had splenomegaly. The patients with lymphoma had thickening of small bowel (n = 7, 8.2%) and large bowel (n = 6, 7.1%), mostly diffuse thickening which showed homogeneous enhancement (6 patients with thickened small bowel and 5 patients with thickened large bowel). Two patients (1 patient with thickened small bowel and 1 patient with thickened large bowel) showed target sign enhancing thickened bowel wall.

Statistical assessment

According to Table 1 (summarized the anatomical site of lymphadenopathy findings) using

Table 1. Anatomical site of lymphadenopathy in patients with abdominal tuberculous lymphadenopathy and lymphoma

Site of lymph nodes	Tuberculosis (n = 31)	Lymphoma (n = 85)	p-value
Periportal	26 (83.9%)	54 (63.5%)	0.04
Pancreaticoduodenum	16 (51.6%)	41 (48.2%)	0.75
Gastrohepatic	16 (51.6%)	56 (65.9%)	0.16
Anterior pararenal space	5 (16.1%)	12 (14.1%)	0.79
Para-aortic (above renal hilum)	23 (74.2%)	68 (80.0%)	0.50
Para-aortic (below renal hilum)	26 (83.9%)	76 (89.4%)	0.42
Iliac group	15 (48.4%)	62 (72.9%)	0.01
Inguinal	1 (3.2%)	27 (31.8%)	<0.01
Mesentery			
Margin of SBM	21 (67.7%)	21 (24.7%)	<0.01
Body of SBM	27 (87.1%)	34 (40.0%)	<0.01
Root of SBM	28 (90.3%)	40 (47.1%)	<0.01

SBM = small bowel mesentery

Table 2. Anatomic distribution of intrabdominal lymphadenopathy in patients with abdominal tuberculous lymphadenopathy and untreated lymphomas

Distribution of lymph nodes	Tuberculosis (n = 31)	Lymphoma (n = 85)
Disperse	7 (22.6%)	37 (43.5%)
Confluence	24 (77.4%)	39 (45.9%)
Sandwich	0	9 (10.6%)

Table 3. Enhancement Patterns of lymphadenopathy in patients with abdominal tuberculous lymphadenopathy and untreated lymphomas

Enhancement pattern of nodes	Tuberculosis (n = 31)	Lymphoma (n = 85)
Peripheral	23 (74.2%)	1 (1.2%)
Homogeneous	5 (16.1%)	80 (94.1%)
Homogeneous with peripheral enhancement	0	0
Heterogeneous	3 (9.7%)	3 (3.5%)
Homogeneous non-enhancement	0	1 (1.2%)

Table 4. The maximum size of lymphadenopathy in patients with abdominal tuberculous lymphadenopathy and untreated lymphomas

Size	Tuberculosis (n = 31) (cm)	Lymphoma (n = 85) (cm)
Minimum	1.40	0.70
Maximum	7.00	11.50
Mean	2.95	4.10

the Chi-square and Fisher exact tests, this study showed significant differences in anatomical site of lymphadenopathy between the abdominal tuberculous lymphadenopathy and untreated lymphoma. Mesenteric and periportal lymph nodes were involved more often in patients with abdominal tuberculous lymphadenopathy than in patients with untreated lymphoma ($p<0.01$, $p = 0.04$). Iliac and inguinal lymph nodes were involved more often in patients with lymphoma than in patients with tuberculosis ($p = 0.01$, $p<0.01$). Anatomic distributions were significant different between the abdominal tuberculous lymphadenopathy and untreated lymphoma ($p<0.01$); confluence distribution was affected more often in tuberculous lymphadenopathy as summarized in Table 2.

Using the Chi-square and Fisher's exact tests, the enhancement patterns indicated significant difference between tuberculous lymphadenopathy and lymphoma ($p<0.01$). Peripheral enhancement was seen significantly more often in tuberculous lymphadenopathy than in lymphoma. Homogeneous enhancement was found more often in lymphoma than in tuberculous lymphadenopathy (Table 3 summarized the enhancement pattern findings). The maximum size of enlarged lymph nodes were also showed statistical difference between two groups by using t-test ($p = 0.01$), as summarized in Table 4.

Ascites was found significantly more often in tuberculosis than lymphoma ($p = 0.03$). By using Mann-Whitney Test, the attenuation of ascites on pre-contrast images did not indicate statistical difference ($p = 1.0$) between abdominal tuberculosis and untreated lymphoma as shown in Table 5.

Small bowel and large bowel thickening were demonstrated more often in tuberculosis than lymphoma ($p<0.01$, $p = 0.01$), which mostly showed

Table 5. Evaluate ascites in patients with abdominal tuberculous lymphadenopathy and untreated lymphomas

Ascites	Tuberculosis (n = 31)	Lymphoma (n = 85)
Amount		
None	15 (48.4%)	70 (82.4%)
Small amount of free ascites	11 (35.5%)	13 (15.3%)
Large amount of free ascites	3 (9.7%)	2 (2.4%)
Small amount of loculated ascites	1 (3.2%)	0
Large amount of loculated ascites	1 (3.2%)	0
Attenuation on precontrast image (HU)		
Minimum	2	2
Maximum	24	27
Mean	12.2	12.1

target sign enhancement in abdominal tuberculosis (10 [90.9%] patients with thickened small bowel and 6 [75%] patients with thickened large bowel) and homogeneous enhancement in untreated lymphoma (6 [85.7%] patient with thickened small bowel and 5 [83.3%] patients with thickened large bowel).

Hepatomegaly and splenomegaly were not different between the two groups.

Two readers independently reviewed the CT findings and give the diagnosis by interpretation of all CT criteria, which showed high sensitivity, 93.5% and high specificity, 98.8% (reader 1) and 97.6% (reader 2).

Discussion

Tuberculous lymphadenopathy, the most common manifestation of abdominal tuberculosis, may be transmitted by three major routes. The first is ingestion of material, such as sputum or milk infected with tubercle bacilli, which are carried from a lesion in the intestinal submucosal layer to the lymph nodes draining the bowel segment. Drainage is usually from the lymphatics of the ileocecum, jejunum, ileum, and right side of colon to the peripancreatic and superior mesenteric lymph nodes (anterior pararenal) at the level of L1 and subsequently to the intestinal trunk and the cisterna chyli. Because drainage is rarely from the lymphatics on the left side of colon to the inferior mesenteric lymph nodes at L3, the lower paraaortic lymph nodes are rarely involved[10,11].

The second route of transmission is hematogenous spread. Bacteria are disseminated from a distant site of infection, usually the lungs, to the abdominal lymphatic system. Because this process is systemic, it may cause infection of mesenteric, lesser omental, anterior pararenal, upper and lower paraaortic lymph nodes. In the third route of transmission, infection can spread directly to the abdominal lymph nodes from the serosa of adjacent infected glands or structures. Tuberculosis of the reproductive organs can spread to the upper and lower paraaortic lymph nodes by lymphatic drainage.

Small bowel mesentery, in a series of fan-like ruffles, suspends the jejunum and ileum to the posterior abdominal wall consisting of two posterior peritoneal layers. It is composed of fatty, extraperitoneal connective tissue, blood vessels, nerves, lymph nodes, and peritoneal the mesenteric lymph nodes were also divided anatomically into the following three sites: the root, margin (area including mesenteric marginal vessels and vasa rectas) and body of SBM (the area between the root and margin of SBM)[8].

Patients with abdominal tuberculous lymphadenopathy mainly involved the lymph nodes in the mesentery, the upper and lower para-aortic, periportal, pancreaticoduodenal and gastrohepatic regions. Rarely involved inguinal lymph nodes were noted. The site of mesenteric lymph node that was specific for tuberculous lymphadenopathy and uncommon in patients with untreated lymphoma was the iliocolic region. Patients with untreated lymphoma (non-Hodgkin lymphoma and Hodgkin lymphoma) were affected mainly in the upper and lower para-aortic, iliac, periportal, pancreaticoduodenal and gastrohepatic regions.

Anatomical distributions were significant difference between the abdominal tuberculous lymphadenopathy and untreated lymphoma ($p<0.01$); confluence distribution was affected more often in tuberculosis lymphadenopathy.

Pathologic findings from surgical specimens of tuberculous lymphadenopathy indicated that caseation or liquefactive substances at the center of enlarged lymph nodes had a low attenuation, presumably resulting from insufficient blood supply, whereas peripheral inflammatory lymphatic tissue had a higher attenuation on enhanced CT resulting from the preserved blood supply[12]. In approximately 75% of patients with tuberculous lymphadenopathy, the enhancement pattern of lymph nodes showed peripheral enhancement with central hypodensity, consistent with central liquefactive and caseation substances. In most patients with untreated lymphoma, the lymph nodes were enhanced homogeneously (94.1%). Findings on the morphology of lymph nodes in this study were similar to those of previous reports, in which the enhancement patterns of untreated lymphomas were homogeneous or, less frequently, necrotic with central hypodensity in the neck and mediastinum[13-15].

In the present study, the maximum sizes of enlarged lymph nodes also showed statistical difference between the two groups. Tuberculosis lymph nodes measured less than 7.0 cm in diameter, range from 1.4-7.0 cm with a mean of 2.95 cm, consistent with data indicating pathologic self-limiting growth[12]. In spite of, lymph nodes of lymphoma were ranged from 0.7 to 11.5 cm in diameter (mean, 4.10 cm).

Ascites was statistical more often in tuberculosis than untreated lymphoma in the present study. However, the attenuation of ascites on pre-contrast images was not different between these two groups.

Small bowel and large bowel thickening were demonstrated more often in tuberculosis than lymphoma ($p<0.01$, $p = 0.01$) which usually showed target sign enhancement in abdominal tuberculosis (10 patients [90.9%] with thickened small bowel and 6 patients [75%] with thickened large bowel) and homogeneous enhancement in untreated lymphoma (6 patients [85.7%] with thickened small bowel and 5 patients [83.3%] with thickened large bowel).

Lung involvement such as miliary lung nodules and centrilobular nodules with or without tree-in bud pattern was associated with tuberculous lymphadenopathy more often than lymphoma. Therefore, patients with ascites, bowel and lung involvement with these patterns were favored tuberculosis.

The focus of the present study was evaluating the specific computed tomography (CT) imaging criteria for differentiating abdominal tuberculosis lymphadenopathy from lymphoma by using abdominal multidetector computed tomography (MDCT). When clinical symptomatology is also considered, radiological findings of abdominal multidetector computed tomography (MDCT) were obtained, which can be useful in differentiating abdominal tuberculous lymphadenopathy from lymphoma.

Enlarged lymph nodes with a low-attenuation center can also be seen in other diseases, namely metastatic malignancy, pyogenic infection, cavitating mesenteric lymph node syndrome of celiac disease[16,17], and Whipple's disease[18]. In general, most metastatic malignancies are easily diagnosed because the primary malignancy is known. The appearance of metastatic malignancy on contrast-enhanced CT may be related to its cell type and the therapy used for the primary malignancy, whereas the anatomic distribution relates to the draining course of the lymphatic system.

In conclusion, multidetector contrast-enhanced CT can be used in differentiating abdominal tuberculous lymphadenopathy from untreated lymphomas on the basis of anatomical site of lymphadenopathy, anatomic distribution, enhancement patterns of lymph node, the size of lymph node, persistent ascites, and small and large bowel involvement. Lung involvement such as miliary nodules and centrilobular nodule, are other findings that suggested abdominal tuberculosis.

There are multiple limitations of the present study. First, the basis of a retrospective study may cause bias case selection. Second, some untreated lymphoma patients with subcentimeter lymph nodes were not included in this study. Third, there are only a small number of cases of abdominal tuberculous lymphadenopathy. Fourth, multiple causes of peripheral rim enhancing with central low-density nodes are not included in this study.

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Potential conflicts of interest

None.

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การวินิจฉัยแยกต่อมน้ำเหลืองโตในวัณโรคช่องท้องและมะเร็งต่อมน้ำเหลืองโดยใช้การตรวจเอกซเรย์คอมพิวเตอร์ 64 สไลด์

โสภา พงศ์พรทรัพย์, วรรณวรางค์ ตีรสมิทธ์, พรรณิภา เอกสมุทรชัย

วัตถุประสงค์: *เพื่อศึกษาหาลักษณะของภาพเอกซ์เรย์คอมพิวเตอร์ 64 สไลด์ เพื่อแยกต่อมน้ำเหลืองโตในโรควัณโรคช่องท้องและมะเร็งต่อมน้ำเหลือง*

วัสดุและวิธีการ: *ศึกษาย้อนหลังจากผู้ป่วยที่ได้รับการตรวจเอกซเรย์คอมพิวเตอร์ 64 สไลด์จากผู้ป่วยจำนวน 31 ราย ที่ได้รับการวินิจฉัยว่าเป็นวัณโรคช่องท้องและผู้ป่วย 85 ราย ที่ได้รับการวินิจฉัยเป็นมะเร็งต่อมน้ำเหลืองในโรงพยาบาลศิริราช และประเมินลักษณะภาพเอกซเรย์คอมพิวเตอร์โดยรังสีแพทย์ 2 คน โดยประเมินตำแหน่งต่อมน้ำเหลืองที่เกิด, ลักษณะ enhancement pattern ขนาดต่อมน้ำเหลือง, น้ำในช่องท้อง, อวัยวะที่เกิดโรค และลักษณะความผิดปกติที่ปอด*

ผลการศึกษา: *ต่อมน้ำเหลืองที่พบในวัณโรคมักเกิดที่ mesentery, upper และ lower para-aortic, periportal, pancreaticoduodenal มักอยู่รวมเป็นกลุ่มและ peripheral enhancement ขณะที่ต่อมน้ำเหลืองที่พบในมะเร็งต่อมน้ำเหลืองพบที่ upper-lower para-aortic, iliac, periportal, pancreaticoduodenal, gastrohepatic มีลักษณะ homogeneous enhancement ขนาดของต่อมน้ำเหลืองที่ใหญ่สุดมีความแตกต่างอย่างมีความสำคัญทางสถิติ ($p = 0.01$) โดยต่อมน้ำเหลืองวัณโรคมีค่าเฉลี่ยประมาณ 2.95 ซม. ในขณะที่ต่อมน้ำเหลืองในมะเร็งต่อมน้ำเหลืองมีขนาดโตกว่าค่าเฉลี่ยประมาณ 4.1 ซม. น้ำในช่องท้องพบในวัณโรคมากกว่ามะเร็งต่อมน้ำเหลือง ($p = 0.03$) แต่ค่า density ของน้ำในช่องท้องไม่พบมีความแตกต่างระหว่างทั้ง 2 โรค วัณโรคมักพบว่ามีการหนาตัวของผนังลำไส้ใหญ่และลำไส้เล็กบ่อยกว่าในมะเร็งต่อมน้ำเหลือง ($p<0.01$, $p = 0.01$) ซึ่งมักจะพบเป็น target sign enhancement ในวัณโรคและ homogeneous enhancement of bowel wall ในมะเร็งต่อมน้ำเหลือง ไม่พบความแตกต่างอย่างมีนัยสำคัญของตับและม้ามโตใน 2 ภาวะ การตรวจมีความไว (93.5%) และความจำเพาะ (98.8% โดยผู้อ่านคนที่ 1 และ 97.6% โดยผู้อ่านคนที่ 2)*

สรุป: *การศึกษานี้แสดงให้เห็นว่าตำแหน่งต่อมน้ำเหลืองที่เกิดโรค, enhancement pattern, ขนาดต่อมน้ำเหลือง, น้ำในช่องท้อง, การหนาตัวของผนังลำไส้ใหญ่และลำไส้เล็กที่พบในการตรวจเอกซเรย์คอมพิวเตอร์สามารถช่วยในการวินิจฉัยแยกโรควัณโรคในช่องท้องและมะเร็งต่อมน้ำเหลืองได้*