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## Original Study

# Multidetector CT (MDCT) Findings Of Primary Hepatic Lymphoma

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## Abstract

### Objective

The aim of this study was to describe the triphasic multidetector CT (MDCT) finding of primary hepatic lymphoma (PHL).

### Materials and Methods

This retrospective study included eighteen patients. Each patient presented with primary hepatobiliary lymphoma without associated lymphadenopathy or other visceral involvement. Triphasic CT scanning was performed on one of two systems (64 MD CT) in 12 patients and (6 MDCT) in 6 patients. All eighteen patients underwent ultrasound percutaneous tru-cut liver biopsy using 18-gauge biopsy needle. Pathology was confirmed on all cases.

### Results

Four of eighteen patients presented with a single focal lesion. Thirteen of eighteen patients presented

with multiple well defined focal lesions. One patient presented with a diffuse hepatic involvement. On triphasic CT, three patients showed gradual progressive contrast enhancement. Lesions remained isodense to the liver on the arterial phase with mild enhancement in the portal phase and showed washout on the delayed phase in two patients. The remaining thirteen patients showed multiple hypodense non-enhancing lesions.

### Conclusions

PHL presents a wide spectrum of imaging findings on triphasic MDCT with no characteristic imaging pattern. MDCT can be used for detection of the lesion and biopsy is used for diagnosis. PHL should always be considered in the differential diagnosis of a liver focal lesion either single or multiple.

### Keywords

Multidetector CT, hepatic, lymphoma.

الموجودات بالتصوير المقطعي المحوسب متعدد الكواشف في اللمفومة الكبدية الأولية

### الهدف:

الهدف من هذه الدراسة هو وصف الموجودات بالتصوير المقطعي المحوسب متعدد الكواشف ثلاثي الأطوار في اللمفومة الكبدية الأولية .

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## المواد والطرق:

شملت هذه الدراسة الاستيعادية ثمانية عشر مريضا. وتجلى كل مريض بالمفومة الكبدية الصفراوية الأولية بدون تضخم العقد اللمفاوية أو اكتناف حشوي مماثل . وقد تم فحص اثنى عشر التصوير المقطعي المحوسب متعدد الكواشف ذو أربع وستون مقطع، والستة مرضى الآخرين التصوير المقطعي المحوسب متعدد الكواشف ذو ستة مقاطع. وخضع جميع المرضى لخزعة الكبد عبر الجلد الموجهة بفائق الصوت باستخدام إبرة الخزعة مقياس - 18 . وتم تأكيد التشخيص الباثولوجى فى جميع الحالات.

## النتائج:

أربعة من 18 مريض تجلى بأفة بؤرية مفردة، بينما تجلى ثلاث عشر مريض بأفات بؤرية متعددة محددة المعالم . مريض واحد تجلى باكتناف كبدي منتشر . وظهر في الفحص بفائق الصوت ثلاثي الأطوار ، أن هناك ثلاث من المرضى لديهم استعزاز تابياني متقدم تدريجي . في اثنان

من المرضى ، ظلت الآفات الكبدية متسقة الكثافة ( متماثلة ) بالنسبة للصبغة ، في الطور الشرياني بينما ذات استعزاز خفيف في الطور البابي ، وأظهرت تخفيفا في الطور المتأخر ، أما الثلاث عشر مريض المتبقين فقد أظهروا آفات غير معززة ضعيفة الكثافة متعددة .

## الخلاصة :

تمثل المفومة الكبدية الأولية طيفا واسعا من الموجودات التصويرية بالنسبة للتصوير المقطعي المحوسب متعدد الكواشف بدون طراز تصويري مميز من الممكن استخدام التصوير المقطعي المحوسب متعدد الكواشف لتحديد الأفة و استخدام الخزعة للتشخيص . غالبا ما نضع في الاعتبار المفومة الكبدية الأولية في التشخيص التفريقي للآفات البؤرية الكبدية سواء كانت مفردة أو متعددة .

## الكلمات الأساسية :

التصوير المقطعي المحوسب متعدد الكواشف ، كبدي ، المفومة .

## Introduction

Primary hepatic lymphoma is defined as lymphoma either confined to the liver or having major liver involvement<sup>(1)</sup>. The most common presenting symptom in primary hepatic lymphoma is abdominal pain, occurring in over 40% of patients<sup>(2)</sup>. Primary hepatic lymphoma should be considered in the differential diagnosis in a patient with space-occupying liver lesions and normal levels of alpha-fetoprotein. Diagnosis of this condition is important because the disease is treatable<sup>(3)</sup>. On imaging (US, CT, MRI), three well-recognized morphologic patterns of primary hepatic lymphoma have been described. These are the diffuse infiltrative variety, the nodular variety, and a mixed infiltrative and nodular variety<sup>(4)</sup>. The purpose of this study was to describe the imaging features of primary hepatic lymphoma on triphasic multidetector CT (MDCT).

## Material and methods

### Patients

The study was approved by the institutional research ethics review committee. This retrospective

study included eighteen patients. They were ten women and eight men with a mean age of 47.5 years. The study was carried out from September 2004 to January 2013. All patients satisfied the criteria of PHL, as described by Lei et al<sup>(5)</sup>. The most common presenting symptom was abdominal pain or discomfort which was seen in thirteen patients. Constitutional symptoms were present in five patients and gastrointestinal symptoms in three patients. Three patients presented with more than one symptom. Clinical examination revealed the presence of an enlarged liver in 10 cases. Laboratory abnormalities were detected in twelve cases. These abnormalities on admission showed the following results: mild elevated total bilirubin 1.5 – 2.8 mg/dL (normal 0.1–1.1), aspartate aminotransferase (AST) 60– 100 IU/mL (up to 40), alanine aminotransferase (ALT) 50– 130 IU/L (up to 40) and lactate dehydrogenase (LDH) 600– 955 IU/L (115–245). Four patients were hepatitis C virus positive. Three patients were hepatitis B virus positive. All eighteen patients have ultrasonography. All eighteen patients underwent ultra-sonic percutaneous tru-cut liver biopsy using 18-gauge biopsy needle. Twelve



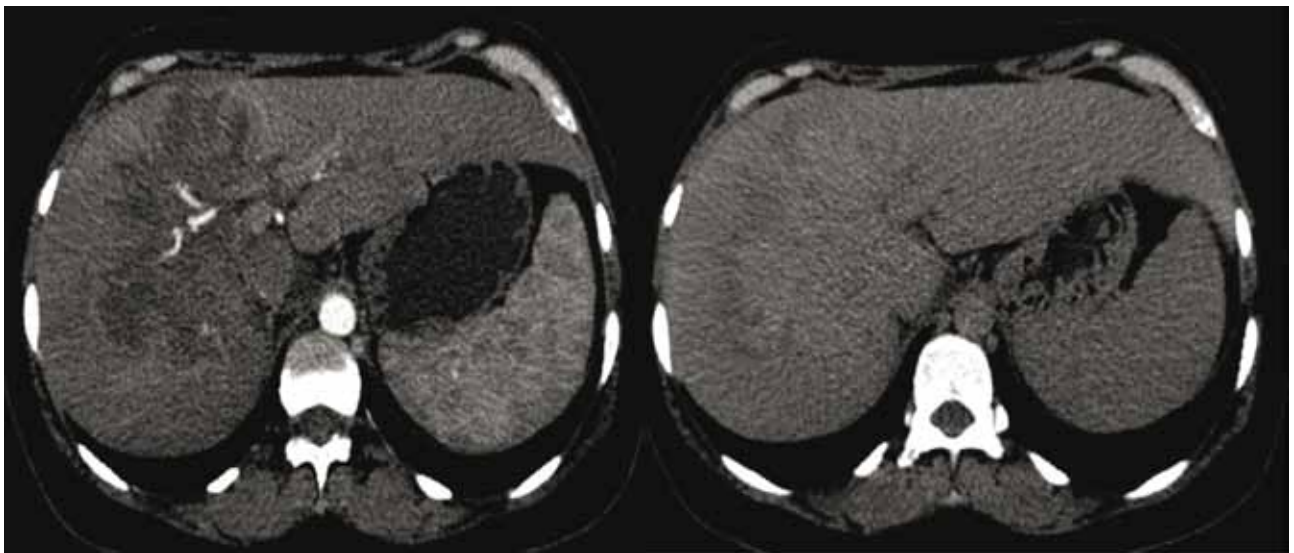
patients received one puncture and 6 patients received 2 punctures. There were no major immediate complications. All patients were observed for 4 hours following the procedure and then discharged with no patients requiring a blood transfusion. Thirteen patients have transient pain at the puncture site that eventually subsided without medications. No delayed complications were reported on routine clinic review 2 weeks following biopsy. Pathology was confirmed in all 18 cases.

Three patients underwent hepatic resection. The mean delay time between initial symptoms and final

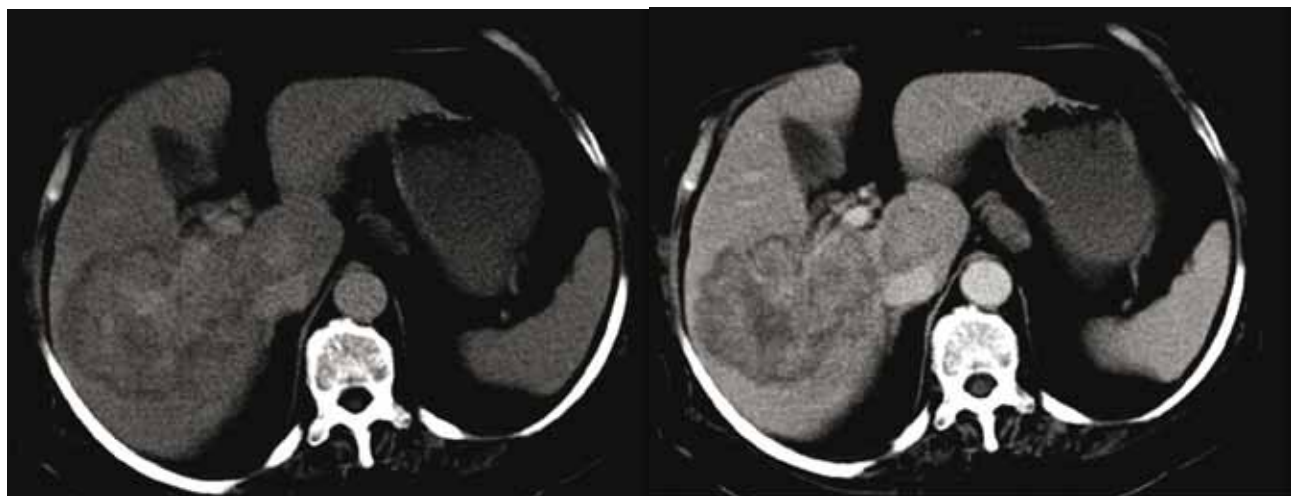
pathological diagnosis was 25.5 days (range: 12–40 d). Informed consent was waived because of the retrospective nature of the study.

### CT technique

Triphasic CT scanning was performed on one of two systems (Brilliance 64; Philips Healthcare, Best, The Netherlands) in 12 patients and (SOMATOM Emotion6, Siemens, Germany) in 6 patients. The pre-contrast and post-contrast series were taken by using a 5 mm slice thickness. The post-contrast study was performed using 120 ml of low osmolar



**Figure 1.** (54-year-old woman with focal liver lesion by ultrasound) Multi-detector triphasic CT scan of the abdomen during the (a) arterial phase and (b) delayed phase shows diffuse involvement of the liver with hepatic lesion showing progressive delayed enhancement.



**Figure 2.** (57-year-old woman with focal liver lesion by ultrasound) Multi-detector triphasic CT scan of the abdomen during the (a) portal phase and (b) delayed phase shows a large focal hepatic lesion that extends from segment 1 to segment VII with progressive delayed enhancement.

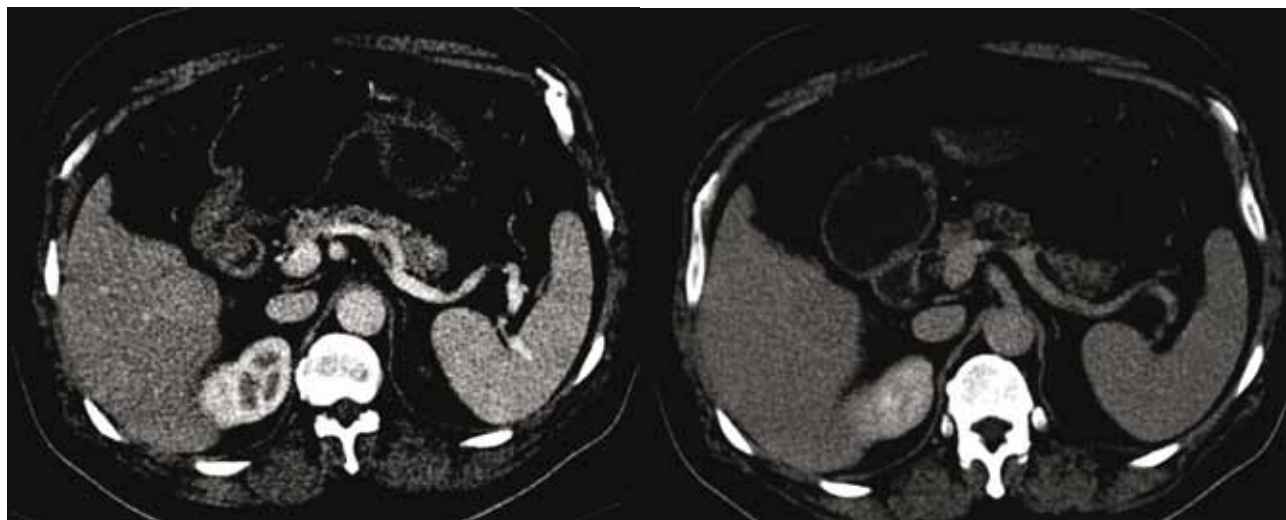


Figure 3. [60-year-old man with focal liver lesion by ultrasound]. Multi-detector triphasic CT scan of the abdomen during the (a) portal phase and (b) delayed phase shows a focal liver lesion in segment VI with isodense in arterial phase and mild enhancement in portal phase.

CT findings		Pattern	No. of patients
Total No. of patients			18
No. of PHL lesions	Multiple		13
	Solitary		4
	Diffuse		1
Non-contrast density	Hypodense		16
	Isodense		2
Pattern of enhancement	Gradual progressive enhancement		3
	Isodense in arterial phase		2
	Enhanced in portal phase		
	Washout in delayed phase		
	Non-enhanced		13

Table 1: MDCT findings of 18 cases with primary hepatic lymphoma

PHL: Primary hepatic lymphoma

non-ionic contrast medium (ioversol, Optiray 350) at a flow rate of 5 ml/sec. Patients were requested to hold their breath during the precontrast phase and the three phases of acquisition. Automated bolus tracking with bolus detection at the level of the descending aorta above the diaphragm ensured accurate timing of the data acquisition in an early arterial phase. Portal venous phase was performed with an effective delay of 55–60 seconds after initiation of the contrast material injection. The delayed phase was performed with effective delay of 3–6 minutes. All images were transferred to the workstation (Extended Brilliance Workspace V3.5.0.2254) (EBW) for post processing.

### Image interpretation

Data interpretation was based on consensus of at least two radiologists with at least 10 years experience in abdominal imaging. Image analysis focused on the following aspects: pre-contrast attenuation of the lesions, density in all phases (arterial, portal and delayed phases), number of lesions, vascular invasion, Lymph node involvement and other abdominal organs.

## Results

Each patient presented with isolated hepatobiliary disease without associated lymphadenopathy or other visceral involvement. The MDCT findings of the patients are shown in Table 1. CT scan revealed enlarged liver in 13 cases. One patient presented with a diffuse hepatic involvement (Fig. 1). Four of eighteen patients presented with a single focal lesion (Fig. 2, 3). Thirteen of eighteen patients presented with multiple focal lesions. Lesions in sixteen appeared hypoattenuating solid lesions and in two patients were isoattenuating. On triphasic CT, three patients showed gradual progressive contrast enhancement (Fig. 1, 2). Lesions remained isodense to the liver on the arterial phase with mild enhancement in portal phase and showed washout in delayed phase in two patients (Fig. 3). The remaining thirteen patients showed multiple hypodense non-enhancing lesions. All 18 patients who underwent ultrasound evaluation demonstrated solid appearing lesions which were hypoechoic when compared with the adjacent liver. Four patients demonstrated central necrosis. Neither calcification nor vascular invasion

was detected. No detected affection of other organs. The tumours were generally non-Hodgkin's in type. Diffuse large cell lymphoma was the most commonly encountered histological subtype, and found in 17 cases. Mucosa-associated B-cell lymphoma was found in one patient (Fig. 3).

## Discussion

Primary hepatic lymphoma represents less than 1% of all extranodal lymphomas.<sup>(6)</sup> Most PHL corresponds to a larger cell type and demonstrates a B-cell immunophenotype.<sup>(7)</sup> Primary hepatic lymphoma is twice as frequent in men as in women, and the usual age at presentation is 50 years.<sup>(1)</sup> Symptoms are usually nonspecific, with most patients reporting right upper quadrant and epigastric pain, fatigue, weight loss, fever, anorexia, and nausea. Hepatomegaly is frequent, and jaundice is an occasional finding at physical examination.<sup>(8)</sup>

The most common presenting symptom in primary hepatic lymphoma is abdominal pain, occurring in thirteen patients (72%). This coincides with a prior previous study that showed 40% associated with abdominal pain.<sup>(2)</sup>

Yang et al.,<sup>(9)</sup> showed a strong association between PHL and hepatitis B virus (HBV) in their patients. Hepatitis B was found in 33.3% of patients. In contrast, the prevalence of hepatitis C was very low, with only one patient having the infection<sup>9</sup>. However, some authors have revealed a variety of possible associations between PHL and chronic hepatitis B virus (HCV) infection.<sup>10–12</sup> Our study showed that four patients (22%) were hepatitis C virus positive and three patients (17%) were hepatitis B virus positive.

Primary hepatic lymphoma, though a rare disease, should be considered in patients presenting with focal hepatic lesions. Biopsy is necessary for lesions showing atypical imaging features.<sup>13</sup> PHL can be subdivided into nodular or diffuse types. The pattern of liver infiltration has no prognostic value.<sup>6,14</sup> Rarely, the disease presents as diffuse involvement of the liver.<sup>15</sup>

Yang et al.<sup>9</sup> showed the most common presentation of PHL was a focal liver lesion which occurred in about 88.9% of cases, followed by multiple lesions in about 11.1% of patients. On computed tomography, PHL

lesions usually appear as hypoattenuating lesions, which might have a central area of low intensity that indicates necrosis. Following the administration of intravenous contrast agent, PHL lesions might show slight enhancement<sup>(9)</sup> In our study solitary focal lesion was detected in four patients (22%) and multiple focal lesions were detected in thirteen patients (72%). Our results are not coinciding with Yang et al.<sup>9</sup>, because their study was retrospective for surgical excision only. Our results are similar to study performed by Elsayes et al (2009) where 3/12 presented with a focal liver lesion; eight of 12 patients presented with multiple well-defined lesions; and one patient presented with a diffuse hepatic involvement.<sup>(14)</sup>

Imaging by CT shows hypo-attenuating lesions and rim enhancement after contrast.<sup>(3,16)</sup> Contrast enhanced computed tomography (CECT) showed hypo-attenuated lesions throughout arterial, portal and delayed phases.<sup>(17-21)</sup>

Elsayes et al found that eight patients who underwent CT evaluation demonstrated hypoattenuating solid lesions. Most of these were well-defined lesions. The lesions of three patients demonstrated rim enhancement following intravenous iodinated contrast administration. Three patients demonstrated target lesions on CT, with a hypoattenuating halo and central necrosis.<sup>(14)</sup> This coincides with our results as thirteen of eighteen patients showed multiple hypodense non-enhancing lesions.<sup>(17-21)</sup> Four patients demonstrated central necrosis.

Primary hepatic lymphoma may appear as solitary, multifocal, or diffusely infiltrative lesions. Their appearances on CT scans and MRI are non-specific, and biopsy is needed for definitive diagnosis.<sup>(22)</sup> This is in agreement with our results. There are no previous reports, to our knowledge, describing isodense in arterial phase, mild enhancement in portal phase and washout in delayed phase which we identified in two patients. Also, progressive delayed enhancement that was detected in three patients has not been previously reported.

In conclusion, there is a wide spectrum of imaging findings on CT. The MDCT findings of primary hepatic lymphoma are non-specific and mainly hypovascular. The hepatic involvement may be single, multiple or diffuse. Primary hepatic lymphoma should be

considered in the differential diagnosis of hepatic lesion and biopsy is needed for definitive diagnosis.

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