Hypereosinophilic Syndrome with Hepatic Involvement: US, CT and MRI Findings

Sang Hoon Cha, M.D., Cheol Min Park, M.D., Hae Young Seol, M.D., In Ho Cha, M.D., Hee Jin Kim, M.D., Dong Ho Lee, M.D., Seung Yeon Baek, M.D., Pyo Nyun Kim, M.D., Hyun Kwon Ha, M.D.

Purpose: To evaluate the findings of US, CT and MRI in the hepatic involvement of hypereosinophilic syndrome.

Materials and Methods: We reviewed imaging findings of hypereosinophilic syndrome with hepatic involvement in nine patients. Imaging studies were US (n=9), conventional CT (CCT, n=6), dynamic incremental CT (DICT, n=3), and MRI with conventional spin-echo sequence (MRI-CSE, n=3). For DICT, we obtained images of the early arterial phase (n=1), portal venous phase (n=3) and the late venous phase (n=3). T1WI were obtained with 600–700 msec/13–17 msec (TR/TE) and T2WI were obtained with 1850–2300 msec/80–90 msec (n=3). Gadolinium-enhanced T1WI were also obtained (n=2).

Results: US showed multiple hypoechoic or isoechoic nodules (7/9) and appeared normal (2/9). CCT showed multiple hypodense nodules (5/6) and appeared normal (1/6). DICT showed patchy, multiple hypodense nodules and showed hepatic nodules during the portal venous phase only (3/3). MRI-CSE showed one to several focal high-signal nodules on T2WI and subtle low-signal nodules on T1WI (2/3), and showed several subtle high-signal lesions on Gd-enhanced T1WI (1/2) and appeared normal on T1, T2WI (1/3).

Conclusion: Hepatic involvement of hypereosinophilic syndrome showed varied imaging findings on US, CT and MRI.

Index Words: Liver, CT Liver, MR Liver, US Histiocytosis

INTRODUCTION

The hypereosinophilic syndrome, which is of unknown etiology, involves various organs by the infiltration of a large number of eosinophils. The sites of involvement are heart, skin, lung, liver, nervous systems, and gastrointestinal tract (1–5). In the liver, the histologic finding is periportal infiltration by relatively mature eosinophils (2, 3, 6, 7). In reviewing the literature, we have found many reports dealing with hypereosinophilic syndrome (1–7), but few dealing with imaging features associated with hepatic involvement have been published (8, 9). Kim et al (10) described the US, CT, and scintigraphic findings of hepatic involvement and they pointed out that the pattern of intrahepatic multifocal lesions varied considerably on the different types of images. We imagine that DICT and MRI might be helpful imaging modalities for depicting hepatic involvement, but there is no report describing DICT and MRI findings. We therefore reviewed the imaging features of hepatic involvement in nine

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hypereosinophilic syndrome patients and discussed the findings.

MATERIALS and METHODS

Our study spanned a two-year period and included nine patients who fulfilled the criteria for the diagnosis of hypereosinophilic syndrome with hepatic involvement. The patients were eight men and one woman and ranged in age from 29 to 62 years (mean 38.9). The diagnosis of hepatic involvement was based on pathologic proof in eight cases and on imaging and laboratory data in the other one. The symptoms were dry cough, weight loss, or intermittent right upper abdominal pain and none had any allergic history or history of drug use. WBC counts were 15,000–33,000, with 59–74.3% eosinophils. Liver biopsy showed periporal infiltration(7/8), eosinophilic abscess(2/8) and hepatic necrosis(2/8). Bone marrow examination in all seven cases showed eosinophilic hyperplasia. All patients showed slightly elevated serum aspartate aminotransferase, or alanine aminotransferase, or alkaline phosphatase. Laboratory findings for microbiology and parasite were negative. All nine patients were treated with corticosteroid.

In all cases, abdominal US, chest radiography, and endoscopic examination of the upper and lower gastrointestinal tract were performed. Conventional CT(CCT) was carried out in six cases, dynamic incremental CT(DICT) in three, and MRI with conventional spin-echo sequence(MRI-CSE) in three cases. All patients were clinically followed for 4–12 months. US(Diasonic SPA-1000; Milpitas, California, USA, or Acuson 128-XP/10; Mountain View, California, USA) was used with 3.5–4.0MHz transducers. For CCT(GE Sytec 3000; GE Medical Systems, Milwaukee, USA), images were

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Fig. 1. A 44-year-old man with hypereosinophilic syndrome  
a. US shows no focal lesion in the liver.  
b. DICT of early arterial phase shows no focal hepatic lesion also.  
c. At the same level, DICT of portal venous phase shows several focal hypodense lesions in the liver.  
d. But there is no focal lesion during the late venous phase.
obtained with a section thickness of 10mm at 8mm intervals. Contrast material-enhanced studies were performed with a rapid drip-infusion of 200—300ml in six cases. For DICT (Somatom plus 32, 40; Siemens, Erlangen, Germany or GE 9800 Quick; GE Medical Systems, Milwaukee, USA), images were obtained with automatic injection of 120ml contrast media at the rate of 3ml/sec in three cases. DICT of the early arterial phase was obtained at 25 sec after the start of the injection in one case. DICT of the portal venous phase was obtained at 43 and 60 sec after the start of the contrast injection in two cases. To obtain images of portal venous phase in the other case, we began scanning at 25 sec after the start of injection, as the machine was a conventional CT. In all three cases, DICT of the late venous phase was obtained 2—5 minutes after the start of the contrast injection. Three cases underwent MRI-CSE with a 1.5T-unit(Magnetom 63 SP 4000, Siemens, Erlangen, Germany). In three cases, T1-weighted spin-echo images were obtained with 600—700msec/13—17msec(TR/TE), and T2-weighted spin-echo images with 1850—2300msec/80—90msec(TR/TE). In addition, Gd-enhanced T1-weighted spin-echo images were obtained in two of three cases. FOV was 37cm, section thickness was 8—10mm and acquisitions were three to four times. Two abdominal radiologists retrospectively reviewed each imaging finding.
RESULTS

All patients showed focal lesions in the liver on at least one type of image (US, CCT, DICT and MRI-CSE) and the size of lesions was 0.5 to 2 cm in diameter. In seven patients, US showed multiple poorly defined, hypoechoic or isoechoic nodules with slightly hypoechoic rim scattered throughout the liver. In two cases, US showed no abnormal lesion in the liver. CCT showed multiple hypodense lesions in five cases; the margins of lesions were poorly defined in four cases and relatively well defined in one. In one case, CCT showed normal liver. DICT was performed in three cases; during the early arterial phase, it did not show hepatic lesion, though it was performed in only one case (Fig. 1), during the portal venous phase, it showed patchy, hypodense nodules throughout the liver, but normal liver during the late venous phase in all three cases (Fig. 1, 2).

MRI-CSE showed one to several focal lesions in three cases. On T2-weighted and Gd-enhanced T1-weighted images with conventional spin-echo sequence, one case showed only one focal high-signal lesion in segment VII, in contrast to CCT and US, which revealed multiple lesions throughout the liver. In another case, T1- and T2-weighted images showed several lesions in the liver (Fig. 3) and in the other case, T1- and T2-weighted images with conventional spin-echo sequence showed no hepatic lesion, though Gd-enhanced T1-weighted images showed several hepatic lesions of subtle high-signal intensity.

DISCUSSION

The common histopathologic finding of hypereosinophilic syndrome is infiltration of tissues by relatively mature eosinophils, with overall normal histopathologic architecture (2, 3). The diagnostic criteria are persistent eosinophilia of 1500 eosinophils/ml for longer than six months or death within six months; absence of allergic, parasitic, or other known cause of eosinophilia; and evidence of organ involvement (3). The onset of the syndrome has been reported in persons aged 5 to 80 years, with peak incidence in the forties; men account for about 85% of cases. The initial signs and symptoms are quite varied, and include weight loss, recurrent abdominal pain, fever with night sweats, nonproductive cough, various neurologic abnormalities, pruritic rash, and congestive heart failure (1-4). About 85% of patients had hepatomegaly, attributable in part to congestive heart disease; 14% had liver function abnormalities. Autopsy findings showed that hepatic eosinophilic infiltration was most prominent in the peribiliary regions (3).

There have been several reports, describing hepatic involvement of hypereosinophilic syndrome. Shiomi et al (9) reported one case showing a focal defect on hepatic scintigram, a hypodense lesion in the same area on CT, but negative on US. Kim et al (10) reported five patients with syndrome who had findings of hepatic involvement on at least one type of image (US, CT, scintigram). They pointed out that the pattern of intrahepatic multifocal lesions varied considerably. In our cases, intrahepatic focal lesions were seen on at least one type of image, where the lesions varied. These findings were not different from those of other reports (8-10).

In regard to varied imaging findings, White et al (8) suggested that hepatic infiltrates of eosinophils are not sufficiently different from liver parenchyma in X-ray attenuation or acoustic impedance to be detectable by CT or US, whereas abnormalities of Kupffer cell function result in abnormal findings on scintigrams. Shiomi et al (9) suggested that the focal defect seen on hepatic scintigrams was due to a circulatory disturbance caused by eosinophilic infiltration of the periportal area. In our cases, the pathologic specimens showed eosinophilic infiltration of the periportal area in seven cases, as reported by Shiomi et al. CCT showed hepatic involvement in five of six cases and this result was not different from the cases of Kim et al. In three cases, DICT revealed hepatic lesions during the portal venous phase, and these became isosattenuated during the late venous phase. We therefore considered that these lesions could not be seen if conventional CT was performed, since the late venous phase of DICT corresponded to the enhanced phase of CCT. Moreover, DICT of the early arterial phase did not show hepatic lesion. We therefore suggest that in the early stage, hepatic infiltration by eosinophils may hamper portal circulation, which can only be shown on the portal venous phase of DICT, and that as hepatic involvement advances, this results in widely spreading circulatory disturbance which can be shown on contrast-enhanced CCT or US. Three cases of MRI-CSE did not show good lesion detectability like US or CT, so it was not helpful to assess hepatic involvement.

In conclusion, hepatic involvement by hypereosinophilic syndrome showed varied imaging findings on US, CT and MRI.

REFERENCES

cases and review of literature. Ann Intern Med 1969; 34: 52-70

과호산구증후군의 간병변: 초음파, CT 및 자기공명영상소견

1. 과대안산병원 방사선과, 2. 고대구로병원 진단방사선과
3. 경희분당차병원 진단방사선과, 4. 경희대학병원 진단방사선과
5. 이대목동병원 진단방사선과, 6. 서울 아산중앙병원 진단방사선과

차상훈1, 박철민2, 설혜영2, 차인호3, 김희진3, 이동호4, 백승연5, 김표년6, 하현권6

목적: 저자들은 과호산구증후군에서 간병변의 유무 및 정도를 나타내는데 있어 초음파검사, CT 및 MRI 소견을 알아보고 본 연구를 하였다.

대상 및 방법: 간병변이 있는 과호산구증 환자 9예로 대상으로 방사선학적 소견을 분석하였다. 방사선학적 검사방법은 US(9예), 고속 CT(CCT, 6예), 급속조영 CT(DICT, 3예) 및 고속적 스플린-에코방식에 의한 MRI(MRI-CSE, 3예)이었다. DICT는 초기동맥강조영상은 1예, 문맥조영 및 후기정맥조영영상은 각각 3예 있었다. T1강조영상은 600-700msec / 13-
17msec (TR/TE), T2강조영상은 1850-2300msec/ 80-90msec으로 3예에서 얻었고, 2예에서 조영증강 T1강조영상은 얻었다.

결과: 전례에서 US, CCT, DICT 혹은 MRI-CSE 중 한 검사방법에서 다수의 간병변이 보였다. US는 다수의 저에코 혹은 동 에코의 결절이 보였고(7/9) 정상으로 보인 경우도 있었다(2/9). CCT는 다수의 저여영의 결절이 보였고(5/6) 정상으로 보인 경우도 있었다(1/6). DICT는 다수의 저여영의 결절이 보였고 이들은 오직 간문맥강조시기에서만 보였다(3/3). MRI-CSE는 T2WI에서 하루, 혹은 몇 개의 고신호강도의 결절로 보였고, T1WI에서 희미한 저신호결절로 보였다(2/3). 또한 조영증 강T1WI에서 희미한 고신호강도로 보였고(1/2) T1, T2 강조영상에서 정상으로 보였다(1/3).

결론: 과호산구증후군의 간병변은 US, CT 및 MRI에서 다양한 방사선학적 소견을 보였다.
1. 1차시험 자격요건

1) 핵의학 전문분야가 설치되어 있는 종합병원급 이상의 의료기관에서 4년이상 실무 또는 연구업무에 종사한 의사(외국에서 동일기간 이상 실무 또는 연구업무 종사자 포함)
   ① 내과, 진단방사선과, 임상병리과 전문의 자격취득자에 대하여 2년의 실무 또는 연구업무 종사경력을 인정함.
   ② 기타 다른전문의 자격 취득자에 대하여 1년의 실무 또는 연구 업무 종사경력을 인정함.
2) 위 1항 해당자로서 학회가 인정한 점수가 60점 이상인 자
3) 점수 산정 방법
   ① 최근 3년 이내에 대한핵의학회 참석빈도 점수
      30점  5회이상
      25점  4회
      20점  3회
      15점  2회
      10점  1회
   ② 핵의학 관련 논문의 저자 점수(제1저자가 아니어도 무방)
      30점  3편이상
      20점  2편
      10점  1편
   ③ 대한핵의학회 발표연제 점수(제1저자가 아니어도 무방)
      20점  3편이상
      15점  2편
      10점  1편
   ④ 기타
      방사성 동위원소 취급 특수면허 소지자

2. 1차시험 면제요건

1) 외국에서 핵의학 전문의 자격을 취득한 자
2) 영 제 17조 제1항 제3호에 해당된 자로서 국내외 의과대학, 수련 병원 또는 수련기관에서 핵의학 관련 분야에 4년이상의 교육 또는 수련지도 경력이 있는 자
   (단, 학회가 인정한 점수가 60점 이상인 자)