Fluorrine-18-fluorodeoxyglucose positron emission tomography/computed tomography of adult liver Langerhans cell histiocytosis

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Keywords: Liver Langerhans, PET/CT, -Cell histiocytosis, Adult

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Received:
4 January 2017
Accepted revised :
12 February 2017

Abstract

Objective: Adult liver Langerhans cell histiocytosis (LCH) is an extremely rare desease. This paper reports a 40 years old male patient who was diagnosed as liver LCH though ultrasound-guided liver biopsy. The initial Fluorrine-18- fluorodeoxyglucose positron emission tomography/ computed tomography (^{18}F-FDG PET/ CT) showed multiple nodular low-density lesions in liver without obvious elevated ^{18}F-FDG uptake. Four years later, the follow-up ^{18}F-FDG PET/CT showed the liver multiple lesions with slightly elevated ^{18}F-FDG uptake.**Conclusion:** We describe this case, to highlight the importance of ^{18}F-FDG PET/CT in differential diagnosis for the primary disease and the multiple liver nodules.

Hell J Nucl Med 2017; 20(1): 97-99 *Epub ahead of print: 20 March 2017* *Published online: 20 April 2017*

Introduction

Langerhans cell histiocytosis (LCH) is a kind of rare monoclonal tissue cell proliferative disease characterized by Langerhans cell hyperplasia in pathology [1]. It often involves skeletal systems, and is rarely seen in other systems such as lymph nodes, lungs, liver, skin, etc. The onset age is usually childhood, rarely seen in adults. However, LCH can be a part of multiple system lesions and involve the liver. Herein, we report a 40 years old male patient who was diagnosed as with liver LCH though ultrasound-guided liver biopsy.

Case Report

A 40 years old male patient was admitted to our hospital due to recurrent fatigue, anorexia, liver multiple nodules diagnosed by ultrasound for 4 years, hematemesis and melena for 2 months. In May 2012, the patient first had fatigue, anorexia, epigastric discomfort, whole skin itching, polydipsia and polyuria. The blood biochemical examinations showed alkaline phosphatase 373U/L (reference level, 45-125 U/L), total bilirubin 71.8 mol/L (3.4-17.1mol/L), direct bilirubin 40.5mol/L (0-10.0mol/L), alanine aminotransferase 116U/L (0-38U/L) and aspartate amino transferase 93U/L (0-38U/L). Liver ultrasound examination showed liver multiple lesions, considered as metastases. The patient performed Fluorrine-18- fluorodeoxyglucose positron emission tomography/ computed tomography (^{18}F-FDG PET/CT) examination, which showed multiple nodular low-density lesions of the liver, without increased ^{18}F-FDG uptake (SUVmax:2.5) (Figure 1). Then, ultrasound-guided liver biopsy was performed and demonstrated small focal abscess (eosinophilic granulocytic, fibrosis) associated with lymphatic plasma cell infiltration, liver tissue cholestasis and chronic inflammation in portal areas. The patient was discharged from the hospital after his symptoms were resolved through microcirculation treatment. In February 2016, the patient had gastrointestinal bleeding due to portal hypertension and transjugular intrahepatic portosystemic shunt (TIPS) in a local hospital. Two months later, he was re-admitted to our hospital for further treatment.The blood biochemical examination results were as follows: alkaline phosphatase: 208U/L (45-125U/L), total bilirubin: 37.2mol/L (3.4-17.1mol/L) and direct bilirubin 22.2mol/L (0-10.0mol/L). Abdominal contrast-enhanced CT demonstrated multiple liver nodules with-

out enhancement in the arterial and the portal venous phase (Figure 2, A-B). The patient performed magnetic resonance imaging (MRI) which showed multiple hypointensity nodules on T1-weighted images, and multiple hyperintense nodules on T2-weighted images. Contrast-enhanced transverse T1-weighted images showed that these lesions had no enhancement (Figure 2, C-F). In order to exclude liver metastases, ^{18}F-FDG PET/CT was performed again, which showed intrahepatic multiple low density nodules and slightly inhomogeneously increased ^{18}F-FDG uptake (SUVmax: 3.4) (Figure 3). The biopsy of the liver showed epithelioid granuloma lesions with more eosinophil infiltration and small amount of bile plugs. Immunohistochemistry staining showed CD1a (3+), S-100 (2+) (Figure 4), CD2 (1+), and Langerin (1+). Langerhans cell histiocytosis of the liver was diagnosed [1]. Fatigue was less after chemotherapy with vincristine in a dose of 2mg on days: 1, 15 and 29, cytarabine in a dose of 150mg on days: 1-5, 15-19 and 29-33 and methylprednisolone in a dose of 80mg on days: 1-28, in a dose of 40mg on days: 29-35 and in a dose of 20mg on days: 36-42.

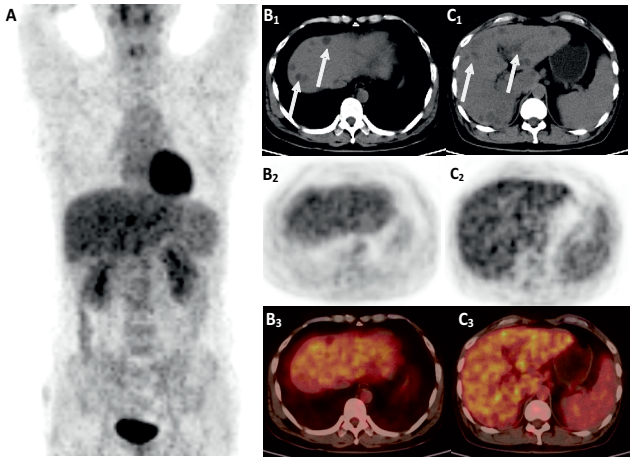

Figure 1. The initial ^{18}F-FDG PET/CT examination. Maximum intensity projection image (A) shows no obviously increased FDG uptake of the liver. Transverse CT images (B1, C1) show multiple low density nodules (white arrows) in the liver. The PET images (B2, C2) and fusion images (B3, C3) show no obviously increased ^{18}F-FDG uptake of the liver (SUVmax 2.5).

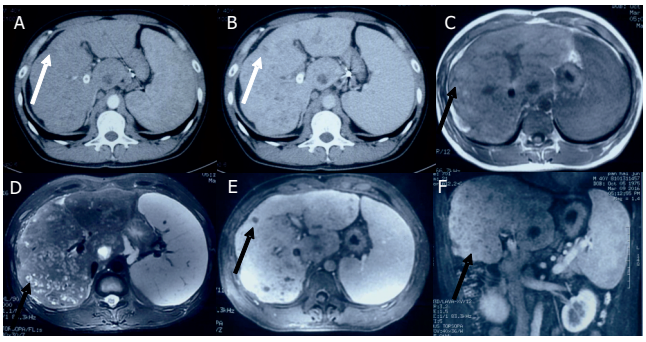

Figure 2. Abdominal contrast-enhanced CT and MR imaging. Contrast-enhanced CT shows the liver lesions have no enhancement in the arterial phase (A) and the portal venous phase (B) (white arrows). Transverse T1-weighted MR (C) image shows multiple hypointensity nodules and T2-weighted (D) MR image shows multiple hyperintense nodules in the liver (black arrows). Contrast-enhanced transverse (E) and coronal (F) T1-weighted MR images show these lesions without enhancement.

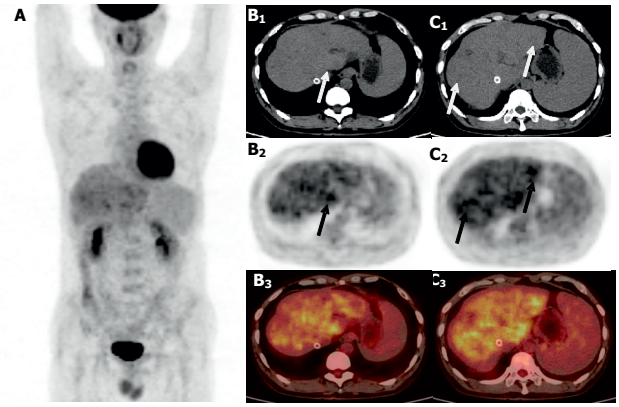

Figure 3. Follow-up ^{18}F-FDG PET/CT. Maximum intensity projection image (A) shows slightly inhomogeneous increased FDG uptake in the liver. Transverse CT images (B1, C1) show multiple low density nodules (white arrows) in the liver. The PET images (B2, C2) and fusion images (B3, C3) reveal slightly inhomogeneous FDG uptake with SUVmax of 3.4 (black arrows) for the low density nodules.

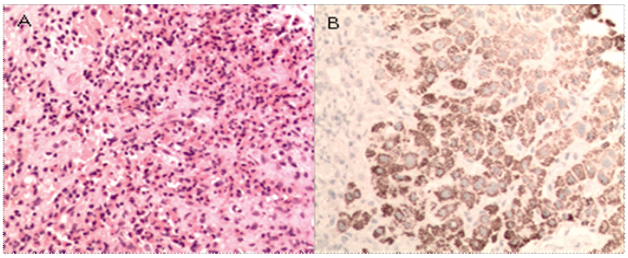

Figure 4. Histological examinations. Histological finding shows epithelioid granuloma lesions with eosinophil infiltration (A, HE × 100). Immunohistochemistry staining showed CD1a(3+), S-100(2+) (B, × 200).

Discussion

Local liver LCH is rare especially in adults. To the best of our knowledge, there is only one such case reported in the literature in one 27 years old patient [2]. Our reported case is the second liver LCH with a four years follow-up. Clinical manifestations are non specific for adult liver LCH, including malaise, liver area pain, abnormal liver function and eosinophilic hyperplasia in the peripheral blood [3]. The diagnosis mainly depends on pathology findings, including the eosinophil infiltration and CD1a(+), and S-100(+) [4,5].

Imaging plays an important role in the detection and follow-up of liver LCH. Lesions in liver LCH can be single or multiple, mostly are round and nearly-circular with different sizes. Nonenhanced CT findings are low- or iso-density lesions in the liver. Nonenhanced MRI demonstrated that the lesions were hypointense in T1WI, hyperintense in T2WI and slightly hyperintense in diffusion weighted imaging. In contrast-enhanced CT or MRI, the lesions had no enhancement or mild enhancement in the arterial phase. The mild ring enhancement can be found in portal venous phase [6-8]. Fluorine-18-FDG PET/CT has no specificity for diagnosing liver LCH [9-10]. Our patient had multiple low density liver nodules in CT, low ^{18}F- FDG uptake and cirrhosis with the pro-

gression of the disease. There was also no obvious enhancement of the intrahepatic nodules in the arterial phase and the portal venous phase in the contrast-enhanced CT and MRI, and there was also a slightly inhomogeneous increased ^{18}F-FDG uptake of the liver (SUVmax:3.4). These findings may be explained by the increased intrahepatic granulomas and inflammatory cells in the progression of the disease. Our case is different from that of Hu et al. report (2012) [2]. They reported a case of liver LCH in which PET showed high level of ^{18}F-FDG uptake (SUVmax:5.1) in the initial stage, after a month's treatment [2] the SUV value decreased (SUVmax: 2.7).

Liver LCH should be differentiated from the following lesions: a) Liver metastatic tumor. Liver metastasis can appear as multiple modules, but the patient has its history of primary malignant tumors. Most metastatic nodules have shown gradual and annular enhancement when contrast-enhanced CT was performed [11-13]. Furthermore, the enhancement degree was more obvious when compared to that of the liver LCH. b) Primary hepatic carcinoma. In this case the patient has a history of viral hepatitis type B, elevated alpha-fetal protein level, and the lesion has typical rapid wash-in and rapid wash-out feature in contrast-enhanced CT and MRI imaging [14]. c) Liver abscess. The pati-ent usually has typical clinical symptoms and laboratory examination such as fever, right epigastrium pain, and elevated white blood cells [15]. A typical, bubble within the lesion and a bi-, tri-ring sign in contrast-enhanced CT or MRI imaging can be seen in patients with liver abscess. The liver LCH shows single or multiple liver nodules with low or a slightly high ^{18}F-FDG uptake in ^{18}F FDG PET/CT scan no or mild enhancement in contrast-enhanced CT or MRI imaging [4, 13].

In conclusion, our case indicated that PET/CT is not specific in the diagnosis of liver LCH, however, low or a slightly high ^{18}F-FDG uptake can be helpful in the differential diagnosis for the multiple liver nodules with no marked enhancement.

The authors declare that they have no conflicts of interest

Acknowledgment

This work was financially supported by the Research Program of Jinling Hospital (2016060).

Bibliography

1. Steven H, Nancy LH, Stefano AP et a1. WHO classification of tumors of haematopoietic and lymphoid Tissues. *IARC press: Lyon* 2008: 358-60.
2. Hu X, Dong A, Lv S et a1. F-18 FDG PET/CT imaging of solitary liver Langerhans cell histiocytosis: preliminary findings. *Ann Nucl Med* 2012; 26(5): 436-9.
3. Maia RC, de Rezende LM, Robaina M et a1. Langerhans cell histiocytosis: Differences and similarities in long-term outcome of paediatric and adult patients at a single institutional centre. *Hematology* 2015; 20(2): 83-92.
4. Abdallah M, Genereau T, Donadieu J et al. Langerhans' cell histiocytosis of the liver in adults. *Clin Res Hepatol Gastroenterol* 2011; 35(6-7): 475-81.
5. Fahrner B, Prosch H, Minkov M et al. Long-term outcome of hypothalamic pituitary tumors in Langerhans cell histiocytosis. *Pediatr Blood Cancer* 2012; 58(4): 606–10.
6. Wong A, Ortiz-Neira CL, Reslan WA et al. Liver involvement in Langerhans cell histiocytosis. *Pediatr Radiol* 2006; 36(10): 1105-7.
7. Nagai S, Kusumoto M, Yakushiji S et al. A case of pulmonary Langerhans' cell histiocytosis with liver involvement. *Nihon Kokyuki Gakkai Zasshi* 2004; 42(10): 924-7.
8. Yi X, Han T, Zai H et al. Liver involvement of Langerhans' cell histiocytosis in children. *Int J Clin Exp Med* 2015; 8(5): 7098-06.
9. Kaste SC, Rodriguez-Galindo C, McCarville ME et al. PET-CT in pediatric Langerhans cell histiocytosis. *Pediatr Radiol* 2007; 37(7): 615-22.
10. Ju H, Pan Y, Lv J et al. Pituitary involvement of langerhans cell histiocytosis in an adult unveiled by FDG PET/CT. *Clin Nucl Med* 2015; 40(6): 509-11.
11. Lazaridis G, Pentheroudakis G, Fountzilas G et al. Liver metastases from cancer of unknown primary (CUPL): a retrospective analysis of presentation, management and prognosis in 49 patients and systematic review of the literature. *Cancer Treat Rev* 2008; 34(8): 693-00.
12. Fujita S, Yamauchi J, Yasuta S et al. A case of pathological complete response after primary tumor resection followed by hepatectomy-A sigmoid colon cancer with synchronous liver metastases. *Gan To Kagaku Ryoho* 2015; 42(12): 2169-71.
13. Liu H, Long XY, Li WZ et al. CT manifestations of liver involvement in children with Langerhans cell histiocytosis. *Zhongguo Dang Dai Er Ke Za Zhi* 2013; 15(2): 121-4.
14. Risse JH, Pauleit D, Bender H et al. ^{18}F-FDG-PET and histopathology in ^{131}I-lipiodol treatment for primary liver cancer. *Cancer Biother Radiopharm* 2009; 24(4): 445-52.
15. Feier D, Socaciu M, Anton O et al. The combined role of intravenous contrast enhanced ultrasound (CEUS) and computed tomography (CT) in liver abscess diagnosis. *Chirurgia (Bucur)* 2012; 107(3): 343-51.