A case of intravascular large B-cell lymphoma in the left adrenal and another tumor in the right adrenal detected by ^{18}F-FDG PET/CT

Wen Li[1] MD,
Wei Lin[2] MD, PhD,
Chao Ma[3] MD,
Lingyu Zhang[1,4] Master Degree,
Hongjun Sun[1*] MD, PhD

1. Department of Nuclear Medicine, Qianfoshan Hospital Affiliated to Shandong University, Jinan, China
2. Department of microbiology, Institute of Basic Medicine, Shandong Academy of Medical Sciences, Jinan,China
3. Department of Nuclear Medicine, Xinhua Hospital Affiliated to Shanghai Jiaotong University, Shanghai, China
4. Shandong University of Traditional Chinese Medicine, Jinan, China

Keywords: ^{18}F-fluorodeoxyglucose positron emission tomography/ computed tomography -Intravascular large B-cell lymphoma -Adrenal glands, standard uptake value

Correspondence address:
Hongjun Sun MD, PhD,
Department of Nuclear Medicine, Qianfoshan Hospital Affiliated to Shandong University, Jinan, China
liwenqfs@163.com

Received:
7 February 2016
Accepted revised:
1 March 2016

Abstract

Objective: Intravascular large B-cell lymphoma (IVLBCL) is a rare but fatal malignancy with a rapid onset, and presenting as an aggressive variant of diffuse large B-cell non-Hodgkin's lymphoma. Fluoro-18-fluorine positron emission tomography/computed tomography (^{18}F-FDG PET/CT) is reported to be highly sensitive in diagnosing lymphoma. Herein, we present our ^{18}F-FDG PET/CT findings at an early case of IVLBCL in bilateral adrenals. The patient had no symptoms. Positron emission tomography and CT images showed irregular density on both adrenals indicating malignant tumor and also another tumor on the hepatic flexure of the colon. Both adrenal tumors had a maximum standardized uptake value (SUVmax) of 11.4, whereas the colon tumor had less SUVmax value. Histopathological examination further confirmed that the bilateral adrenal was IVLBCL, whereas the colon mass was a benign tumor. **Conclusion:** We describe this case, to highlight the importance of ^{18}F-FDG-PET/CT in early diagnosis of IVLBCL in bilateral adrenals confirmed by pathology and in differentiating a highly malignant from a benign tumor.

Hell J Nucl Med 2016; 19(1): 57-59 *Epub ahead of print: 1 March 2016* *Published online: 1 April 2016*

Introduction

Intravascular large B-cell lymphoma (IVLBCL) is a rare subtype of systemic extranodal non-Hodgkin's diffuse large B-cell lymphoma (DLBCL), occurring in less than one percent of all cases of lymphoma [1]. Intravascular LBCL is characterized by the growth of lymphoma cells within the blood vessel lumina without nodular lesions and predominantly affects elderly patients. The incidence of IVLBCL is estimated at one case per million [2]. This disease is aggressive, with a rapid onset, poor outcome and poor prognosis. Since it displays a peculiar intravascular localization and lacks nodular lesions, its definitive diagnosis and treatment is challenging until antemortem procedures and autopsy are made [1]. Due to lack of classical symptoms, IVLBCL is usually misdiagnosed. As with most malignancies, early diagnosis is beneficial, making IVLBCL a potentially treatable disease [2].

Prior studies have shown that fluorine-18-fluorodeoxyglucose positron emission tomography/computed tomography (^{18}F-FDG PET/CT) can provide high sensitivity to early diagnosis of IVLBCL in various organs [3-13], such as the lungs [6, 9, 12], the kidneys [11] and the liver [10]. Few case reports have described tumor invasion of the adrenal gland [3, 14-17]. Lymphomatous invasion of the adrenal gland was disrobed by CT examination in 4%-5% of the cases [18] and by morbid anatomy in 25%-35% of the cases [19, 20]. Over 70% of these cases were DLBCL [3] which is usually detected after significant clinical symptoms are present. However, there are no reports of adrenal gland uptake of ^{18}F-FDG-PET/CT in the absence of clinical symptoms.

Case Report

We report a case of a 61 years old man who had diabetes II with no significant clinical symptoms. Nodules on both adrenals and a lesion in the hepatic flexure of the colon were detected by CT. Furthermore, ^{18}F-FDG PET/CT scanning demonstrated increased

^{18}F-FDG uptake in both adrenal glands and decreased uptake in the hepatic flexure of the colon. The maximum standardized uptake value (SUVmax) and the SUVmean were very high on both adrenals. Histopathological examination after adrenal biopsy showed after ematoxylin and eosin (H & E) staining, large atypical lymphoid cells that occupied the intravascular space. However, on the hepatic flexure of the colon a polyp was diagnosed by pathology by pathology.

Blood glucose was controlled by metformin at the range of 6-8mmol/L. He had at that time a hypertension with a blood pressure of 180/90mmHg.

No superficial enlarged lymph nodes were palpable. There was no percussion tenderness over the liver, the kidneys or the abdomen. All physical tests were normal and unremarkable.

Blood glucose was 7.34mmol/L (normal range 3.89-6.22mmol/L), and triglycerides were 2.83mmol/L (normal range 0.41-1.77mmol/L). White blood cells: 4.30×10^9/L (normal 3.97-9.15): 50.7% neutrophils (51%-75%), 4.0% eosinophils (0.5%-5%), 37.9% lymphocytes (20%-30%), and 6.5% monocytes (3%-10%), normal platelet count: 202×10^9/L (85-303), normal lactate dehydrogenase (LDH) level of 175.9U/L (normal range 109-245), lactic dehydrogenase isoenzyme: 44U/L (17-96), lactic dehydrogenase isoenzyme MB: 6.4U/L (7-25), lactic acid kinase: 72U/L (38-174), carcinoembryonic antigen (CEA): 1.42ng/mL (0-5.0), carbohydrate antigen CA-199: 6.97U/mL (0-27), carbohydrate antigen CA-724: 1.68U/mL (0-6.90), and F-PSA/T-PSA: 0.23 (F-PSA/T-PSA>0.25 interpreted as having a greater possibility of benign presentation, and F-PSA/T-PSA<0.25 interpreted as a greater possibility of malignancy), aspartate aminotransferase (AST): ALT at a ratio of 0.88 (range of 0.74-3.45), and C-reactive protein (CRP): 1.57mg/dL (range of 0-2.87).

Chest CT was normal, however, abdominal CT revealed an irregular density of soft tissue on bilateral adrenals and on the hepatic flexure of the colon (Figure 1a-b). Before the ^{18}F-FDG PET/CT scan the patient remained fast for 8 hours and had blood sugar, 92mg/dL. A dose of 337MBq of ^{18}F-FDG was intravenously administered one hour prior to the study. A GE Discovery LS USA camera was used. The scan showed increased size of both adrenals 1.4cm on the left and 1.5cm on the right (Figure 1). The SUVmax of both adrenals was 11.4 with a mean SUV of 9.19. In addition there was a visible radioactive accumulation on the hepatic flexure of the colon with a SUVmax of 5.0 and a mean SUV value of 4.2 SUV which did not exclude malignacy.

To further diagnose and consider treatment options, and after several days of hospitalization, we performed an endoscopic resection of the colonic tumor which was a benign colonic polyp. A laparoscopic approach was used to resect the tumor of the left adrenal.

During surgery, we found that the size of the left adrenal was increased approximately 4.0cm×3.5cm×3.0cm. The adrenal was off-brown in color, with a complete capsule and displayed light adhesion to the surrounding tissue. Optical microscopy showed that the capillary lumen had atypical cells, with abundant cytoplasm, large nuclei and an obvious nucleolus, surrounded by the residual adrenal tissue (Figure 2a). The immuno-histochemical staining with anti-CD20 antibody showed that the tumor cells displayed CD20 (+) (Figure 2b). The left adrenal gland tumor was confirmed as IVLBCL, while the right colic flexure tumor was a polyp of the colon. We did not proceed in ablating the right adrenal tumor which was smaller than the left adrenal tumor and caused no clinical symptoms at that time. The patient remained in complete remission for more than 35 months after initial treatment.

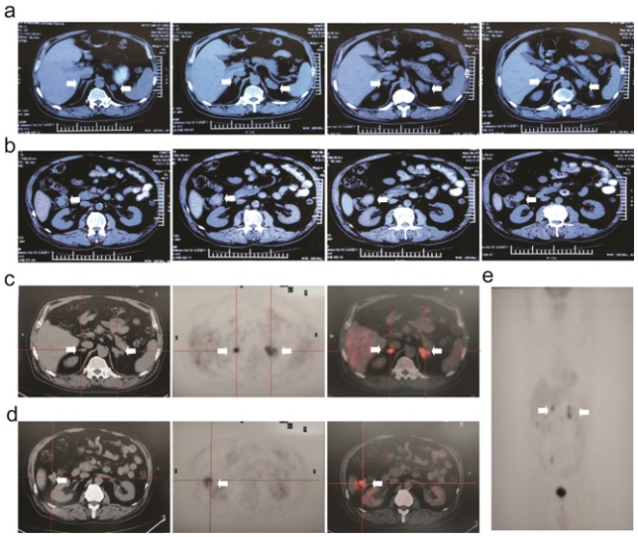

Figure 1. CT and ^{18}F-FDG PET-CT scans show foci with high signal intensity in bilateral adrenal glands and the right colon. a) Axial slices show bilateral adrenal glands as detected by CT (as white arrows show), b) show the colon as detected by CT, c) show the adrenal glands by ^{18}F-FDG PET/CT, CT and fusion PET/CT, demonstrated a diffusely increased uptake of the radiotracer in both adrenals, d) show the colon by ^{18}F-FDG PET/CT, CT and fusion PET/CT (as white arrows show), e) show the whole body by ^{18}F-FDG PET/CT with increased uptake in the adrenals (as white arrows show).

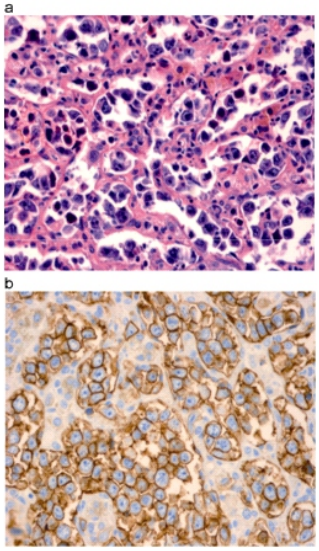

Figure 2. a) Hematoxylin and eosin staining (x400) of the left adrenal gland with preserved structure in sectors showing thickened septa due to the presence of atypical cells, which have large, irregular and hyperchromatic nuclei in the interior of the capillary vessels. Most of them displayed a marked nucleolus and scarce cytoplasm. b) Immunohistochemistry with anti-CD20 staining (x400) showed the B lymphoid differentiation of these cells.

Discussion

The IVLBCL is a rare variant of non-Hodgkin's lymphoma characterized by the proliferation of malignant lymphoid cells in small vessels of organs such as the skin, kidneys, adrenal glands, lungs, liver and the central nervous system. This tumor is usually presented in individuals of 34-90 years of age (an average age of 70 years). Over 70% of cases of non-Hodgkin's lymphoma with adrenal involvement present as diffuse large B-cell lymphomas [21]. However, only 4%-5% of these cases were first diagnosed by a CT scan while 24% by post-mortem examination [22]. Adrenal insufficiency is present in over one third of patients with primary adrenal lymphoma, although the insufficiency is often subclinical and detected only by laboratory tests [21]. Occlusion of small vessels and capillaries by the lymphoma cells lead to adrenal gland ischemia or infarction [22]. Additionally, the tumor mass may compress adrenal parenchyma, resulting in cellular atrophy and organ dysfunction [23]. Cases of IVLBCL in bilateral adrenals with adrenal insufficiency detected by MRI or CT [3, 14-16] or by PET/CT have been reported [3, 14-17]. Our case had no such symptoms and the function of the adrenal glands was normal, which reflected the early phase of the disease. This does not rule out the long-term use of hypoglycemic therapy to control blood glucose.

This tumor, IVLBCL remains a diagnostic challenge, because it often has non-specific findings on clinical, laboratory, and imaging studies. Adrenal gland tumors including adrenocortical carcinomas and pheochromocytomas should be kept in mind especially in bilateral enlargement of the adrenal glands and/or in laboratory features of adrenal insufficiency [14]. Recently, ^{18}F-FDG PET/CT scanning has been reported to be useful in the diagnosis of pulmonary and kidney IVLBCL [4-13]. In our case PET/CT was useful in diagnosing bilateral adrenal IVLBCL and the SUVmax value characterized the tumor as highly malignant.

Acknowledgment

This work was supported by the Development of Science and Technology Project of Shandong Province (2013GGB14067)

The authors declare that they have no conflicts of interest

Bibliography

1. Gatter KC, WR. Intravascular large B-cell lymphoma. In: Jaffe ES, Harris NL, Stein H, Vardiman JW. *Pathology and genetics of tumours of haematopoietic and lymphoid tissues* (World Health Organization Classification of Tumours), Lyon (France): *IARC Press* 2001; 177-8.
2. Young P, Massa M, Finn BC et al. [Intravascular lymphoma: Report of one case]. *Rev Med Chil* 2015; 143(8): 1076-80.
3. Askarian F, Xu D. Adrenal enlargement and insufficiency: a common presentation of intravascular large B-cell lymphoma. *Am J Hematol* 2006; 81(6): 411-3.
4. Boslooper K, Dijkhuizen D, van der Velden A. W et al.. Intravascular lymphoma as an unusual cause of multifocal cerebral infarctions discovered on FDG-PET/CT. *Neth J Med* 2010; 68: 261-4.
5. Colavolpe C, Ebbo M, Trousse D et al. FDG-PET/CT is a pivotal imaging modality to diagnose rare intravascular large B-cell lymphoma: case report and review of literature. *Hematological Oncol* 2015; 33(2): 99-109.
6. Kohan AA, Paganini L. Biedak P et al. Pulmonary intravascular lymphoma detected by FDG PET-CT: a case report. *Rev Esp Med Nucl Imagen Mol* 2013; 32: 318-20.
7. Sanli Y, Turkmen C, Saka B et al. ^{18}F-FDG PET/CT in a case of intravascular large B-cell lymphoma. *Eur J Nucl Med Mol Imaging* 2010; 37: 1801.
8. Takeoka Y, Inaba A, Fujitani Y et al. Intravascular large B-cell lymphoma diagnosed by FDG-PET/CT and endometrial biopsy. *Rinsho Ketsueki* 2011; 52: 1777-81.
9. Yamashita H, Suzuki A, Takahashi Y et al. Intravascular large B-cell lymphoma with diffuse FDG uptake in the lung by ^{18}FDG-PET/CT without chest CT findings. *Ann Nucl Med* 2012; 26: 515-21.
10. Abe H, Kamimura K, Mamizu M et al. Early diagnosis of hepatic intravascular lymphoma: a case report and literature review. *Intern Med* 2014; 53: 587-93.
11. Bai X, Li X, Wan L et al. Intravascular large B-cell lymphoma of the kidney: a case report. *Diagn Pathol* 2011; 6: 86.
12. Kotake T, Kosugi S, Takimoto T et al. Intravascular large B-cell lymphoma presenting pulmonary arterial hypertension as an initial manifestation. *Intern Med* 2010; 49: 51-4.
13. Shen YY, Kao A, Yen RF. Comparison of ^{18}F-fluoro-2-deoxyglucose positron emission tomography and gallium-67 citrate scintigraphy for detecting malignant lymphoma. *Oncol Rep* 2002; 9: 321-5.
14. Fukushima A, Okada Y, Tanikawa T et al. Primary bilateral adrenal intravascular large B-cell lymphoma associated with adrenal failure. *Intern Med* 2003; 42: 609-14.
15. Utsunomiya M, Takatera H, Itoh H et al. Bilateral primary non-Hodgkin's lymphoma of the adrenal glands with adrenal insufficiency: a case report. *Hinyokika Kiyo* 1992; 38: 311-4.
16. Zar T, Khan F, Petit W Jr, Bernene JR. Primary adrenal lymphoma presenting as adrenal insufficiency. A case report and review of literature. *Conn Med* 2004; 68: 7-10.
17. Horiguchi K, Hashimoto K, Hashizume M et al. Primary bilateral adrenal diffuse large B-cell lymphoma demonstrating adrenal failure. *Intern Med* 2010; 49(20): 2241-6.
18. Paling MR, Williamson BR. Adrenal involvement in non-Hodgkin lymphoma. *AJR Am J Roentgenol* 1983; 141: 303-5.
19. Rosenberg SA, Diamond HD, Jaslowitz B, Craver LF. Lymphosarcoma: a review of 1269 cases. *Medicine (Baltimore)* 1961; 40: 31-84.
20. Straus DJ, Filippa DA, Lieberman PH et al. The non-Hodgkin's lymphomas. I. A retrospective clinical and pathologic analysis of 499 cases diagnosed between 1958 and 1969. *Cancer* 1983; 51: 101-9.
21. Robert Udelsman, a. H. Y. D. Case records of the Massachusetts General Hospital. Weekly clinicopathological exercises. Case 35-2000. An 82-year-old woman with bilateral adrenal masses and low-grade fever. *N Engl J Med* 2000; 343: 1477-83.
22. Ellis RD, Read D. Bilateral adrenal non-Hodgkin's lymphoma with adrenal insufficiency. *Postgrad Med J* 2000; 76: 508-9.
23. Evert M, Lehringer-Polzin M, Mobius W, Pfeifer U. Angiotropic large-cell lymphoma presenting as pulmonary small vessel occlusive disease. *Hum Pathol* 2000; 31: 879-82.