A rare involvement of diffuse large B-cell lymphoma: Peritoneal lymphomatosis with a peritoneal super-scan appearance on ^{18}F-FDG PET/CT

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Abstract
Peritoneal lymphomatosis (PL) is a rare extranodal involvement of non-Hodgkin's lymphoma (NHL) and is associated with a poor prognosis. It is confused with the more common peritoneal carcinomatosis and may be misdiagnosed. Early diagnosis is the most important step of effective treatment. In patients with NHL, fluorine-18-fluorodeoxyglucose (^{18}F-FDG) positron emission tomography/computed tomography (PET/CT) is a valuable imaging modality in guiding biopsy, determining extent of the disease, and evaluating metabolic response to therapy. It also provides important information in the differential diagnosis. We report a case of a 40-year-old male patient who presented with abdominal distention and pain, with diffuse thickening of the peritoneum suggestive of peritoneal carcinomatosis on a computed tomography scan. Biopsy from the thickened peritoneum confirmed the diagnosis of diffuse large B cell lymphoma (DLBCL). Fluorine-18-FDG PET/CT performed for staging showed thickening and increased ^{18}F-FDG uptake in almost the entire peritoneum as well as lymph node involvement in supra- and infra-diaphragmatic areas, and a mass in the spleen. Post-treatment ^{18}F-FDG PET/CT revealed a complete metabolic response.

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Introduction

Diffuse large B cell lymphoma (DLBCL) is the most common type of aggressive non-Hodgkin lymphoma (NHL), representing 30% of lymphomas [1, 2]. Although DLBCL can occur in any part of the body, it usually presents with nodal or extranodal involvement. Extranodal involvement is seen in approximately 40% of DLBCL. Peritoneal lymphomatosis (PL) is a rare extranodal involvement of NHL which is defined as disseminated intraperitoneal lymphomatous infiltration that causes thickening of the peritoneum with multifocal nodules [3]. Fluorine-18-fluorodeoxyglucose (^{18}F-FDG) positron emission tomography/computed tomography (PET/CT) provides accurate staging by showing nodal and extranodal involvement in patients with NHL. It is also used to evaluate metabolic treatment response [4].

Case

A 40-year-old male presented to the emergency department with progressive abdominal distention and pain. In addition, he experienced weight loss and night sweats. Abdominal ultrasonography revealed diffuse peritoneal free fluid. Paracentesis was performed and malignant cells were seen in the cytological examination. A further evaluation with contrast-enhanced computed tomography revealed irregular thickening of the peritoneum. Biopsy from the thickened peritoneum confirmed the diagnosis of DLBCL. Fluorine-18-FDG PET/CT performed for staging revealed thickening showing increased ^{18}F-FDG uptake in almost the entire peritoneum (omental cake), lymph node involvement in the supra- and infra-diaphragmatic areas, and a mass in the spleen. Intense peritoneal ^{18}F-FDG accumulation led to a suppression of the normal tracer distribution in the brain, heart, liver, and kidneys, giving PET/CT the appearance of a "peritoneal super scan". The patient un-

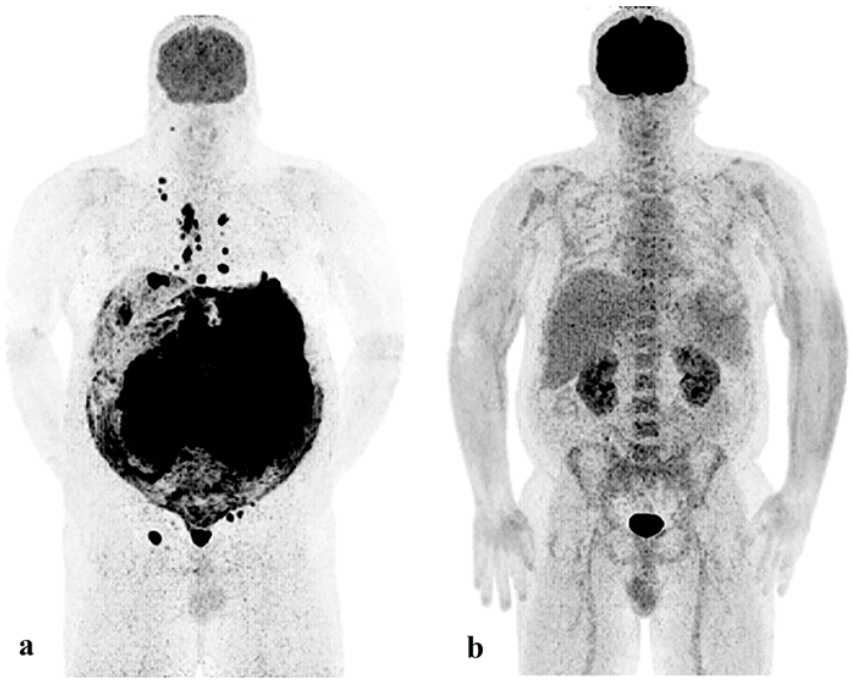

Figure 1. Fluorine-18-fluorodeoxyglucose positron emission tomography (^{18}F-FDG PET) maximum intensity projection (MIP) images before (a) and after (b) chemotherapy.

derwent six cycles of R-CHOP (rituximab, cyclophosphamide, adriamycin, vincristine, and prednisolone) therapy and was re-examined with ^{18}F-FDG PET/CT two weeks after the end of treatment. The follow-up scan revealed a complete metabolic response with the disappearance of the pathological uptake in the peritoneum, supra/infra-diaphragmatic lymph nodes, and spleen mass. Furthermore, an increase of ^{18}F-FDG uptake was observed in the previously suppressed organs. At the same time, moderately diffuse tracer uptake in the bone marrow in conjunction with a diffuse, mildly enhanced metabolism in the spleen was demonstrated, corresponding to reactive, therapy-related changes. Figure 1 presents ^{18}F-FDG PET/CT maximum intensity projection (MIP) images before (Figure 1a) and after (Figure 1b) chemotherapy.

Discussion

Since the peritoneum does not have lymphoid tissue, its involvement in lymphoma is not expected [5]. Peritoneal spread is thought to occur through lymphatic pathways such as visceral peritoneal surfaces, gastrocolic ligament, or transverse mesocolon [6, 7]. Herein, we report a case of DLBCL with extensive infiltration of the entire peritoneum, leading to suppression of tracer uptake in organs with otherwise normally high ^{18}F-FDG uptake which looks like a "peritoneal super scan" which was introduced by Roy et al. (2017), in a patient with Burkitt lymphoma [8]. Post-treatment ^{18}F-FDG PET/CT examination demonstrated complete metabolic response to R-CHOP therapy. There is a limited number of case reports in the literature reporting peritoneal super scan appearance with complete remission after R-CHOP treatment on ^{18}F-FDG PET/CT. Skeletal and hepatic super scans have already been mentioned in the literature in lymphoreticular malignancies [9, 10].

Besides PL, the other causes of peritoneal thickening include tuberculous peritonitis, primary peritoneal mesothelioma, primary peritoneal carcinomatosis, and peritoneal metastases of breast, gynecological carcinomas, and gastrointestinal carcinomas [11, 12]. Differential diagnosis is difficult as many other primary and secondary peritoneal neoplasms have similar imaging findings such as ascites, omental caking, and diffuse peritoneal thickening [13]. Unlike carcinomatosis, imaging findings of PL include lymphadenopathy, mesenteric masses, bone marrow involvement, and splenomegaly [14]. All these findings can be evaluated with ^{18}F-FDG PET/CT. In addition, ^{18}F-FDG PET/CT guides sampling from the area of peritoneal thickening by showing increased metabolic activity. Moreover, it can give an idea in distinguishing whether the ascites are malignant [9]. Moreover, it is used in the evaluation of treatment response between and after chemotherapy regimens and contributes to patient management thanks to the information it provides.

In conclusion, PL is an extremely rare extranodal involvement of NHL. The diagnosis of PL is often missed because of the atypical nature of the presentation. Therefore, the delay of the diagnosis hampers the opportunity for optimal treatment and long survival. In such uncertain cases, early diagnosis is essential to facilitate rapid and effective treatment. We suggest that ^{18}F-FDG PET/CT examination may be helpful in the differential diagnosis of PL and provide valuable information about the extent of the disease.

Bibliography

1. Sabattini E, Bacci F, Sagramoso C et al. WHO classification of tumours of haematopoietic and lymphoid tissues in 2008: an overview. *Pathologica* 2010; 102: 83-7.
2. Perry AM, Jacques D, Nathwani BN et al. Classification of non-Hodgkin lymphoma in seven geographic regions around the world: review of 4539 cases from the international non-Hodgkin lymphoma classification project. *Blood* 2015; 126: 1484.
3. Chic Acevedo C, Ruiz Molina I, Contreras De Miguel E et al. Peritoneal lymphomatosis. A case report. *Hematol Transfus Cell Ther* 2020; S2531-1379 (20) 31309-2.
4. Barrington SF, Mikhaeel NG, Kostakoglu L et al. Role of imaging in the staging and response assessment of lymphoma: consensus of the International Conference on Malignant Lymphomas Imaging Working Group. *J Clin Oncol* 2014; 32: 3048.
5. Zhu M, Wu Z, Yang Z et al. Non-Hodgkin's Lymphoma Presenting as Isolated Peritoneal Lymphomatosis: A Case Report and Literature Review. *Front Oncol* 2021; 11: 719554.
6. Cabral FC, Krajewski KM, Kim KW et al. Peritoneal lymphomatosis: CT and PET/CT findings and how to differentiate between carcinomatosis and sarcomatosis. *Cancer Imaging* 2013; 13: 162.
7. Sharifah M, Zamzami N, Rafeah TN. Diffuse peritoneal lymphomatosis simulating peritoneal carcinomatosis. *Med J Malaysia* 2011; 66: 270-2.
8. Roy SG, Parida GK, Tripathy S et al. Peritoneal Super Scan on ^{18}F-FDG PET-CT in a Patient of Burkitt's Lymphoma. *Indian J Nucl Med* 2017; 32(2): 155-6.
9. Parida GK, Soundararajan R, Passah A et al. Metabolic Skeletal Superscan on ^{18}F-FDG PET/CT in a Case of Acute Lymphoblastic Leukemia. *Clin Nucl Med* 2015; 40: 567-8.
10. Kim D-W, Kim CG, Park S-A et al. Metabolic super scan in ^{18}F-FDG PET/CT imaging. *J Korean Med Sci* 2010; 25: 1256-7.
11. Choi WY, Kim JH, Choi SJ et al. Peritoneal lymphomatosis confused with peritoneal carcinomatosis due to the previous history of gastric cancer: a case report. *Clin Imaging* 2016; 40: 837-9.
12. Kim Y-S, Cho O-K, Song S-Y et al. Peritoneal lymphomatosis: CT findings. *Abdom Imaging* 1998; 23: 87-90.
13. Karaosmanoglu D, Karcaaltincaba M, Oguz B et al. CT findings of lymphoma with peritoneal, omental and mesenteric involvement: peritoneal lymphomatosis. *Eur J Radiol* 2009; 71: 313-7.
14. O'Neill A, Shinagare A, Rosenthal M et al. Differences in CT features of peritoneal carcinomatosis, sarcomatosis, and lymphomatosis: retrospective analysis of 122 cases at a tertiary cancer institution. *Clin Radiol* 2014; 69: 1219-27.