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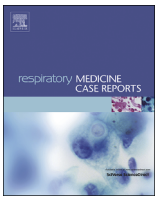

Case Report

A case of peritoneal Burkitt's lymphoma mimic of peritoneal tuberculosis

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ABSTRACT

Peritoneal lymphomatosis is a rare presentation of lymphoma that can mimic peritoneal tuberculosis. The computed tomography findings in both conditions include omental caking, thickening, and nodularity. We report the case of a 41-year-old man who presented with intermittent abdominal pain and distension. Abdominal CT initially suggested peritoneal tuberculosis due to the thickening of the peritoneum and greater omentum with multiple nodules. However, ^{18}F-fluorodeoxyglucose positron emission tomography/computed tomography (^{18}F-FDG PET/CT) images showed diffuse metabolic activity increase in the thickened peritoneum, omentum, and mesentery. An omental biopsy was performed under ultrasonography guidance, and histopathological examination revealed a high-grade Burkitt lymphoma. It is crucial to distinguish peritoneal lymphomatosis from tuberculosis, as the prognosis and management of the two conditions are vastly different.

1. Introduction

Lymphoma, known to be a great mimicker, is a common haematological malignancy that can involve any part of the body [1]. However, diffuse infiltration of the peritoneum by lymphoma is rare. The Structural imaging findings of peritoneal lymphomatosis (e.g. peritoneal thickening, nodularity and ascites with omental caking) are almost indistinguishable from that of peritoneal tuberculosis. Thus, early diagnosis is crucial in order to avoid unnecessary investigations for a primary lesion and the need to drastically alter the prognosis and management of the disease. We report a case of peritoneal lymphomatosis, abdominal CT initially suggested peritoneal tuberculosis due to the thickening of the peritoneum and greater omentum with multiple nodules, which further confounded the diagnosis. Peritoneal Burkitt's lymphoma was later diagnosed by PET/CT and ultrasound-guided needle biopsy. We also discuss the clinical and radiographic features of peritoneal lymphoma, as well as the features of peritoneal tuberculosis, which may contribute to the diagnosis of peritoneal lymphoma.

2. Case presentation

A 41-year-old male presented with a 3-month history of intermittent abdominal pain, abdominal distension, nausea and vomiting and worsened for 1 month. His pulse rate was 130 bpm, temperature was 36.8° Celsius, and blood pressure was normal. He also re-

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ported experiencing night sweats over the previous month. On physical examination, the patient had a grossly distended abdomen and tenderness beneath the xiphoid process. His lactate dehydrogenase (LDH) and uric acid levels were elevated at 3833 U/L (normal $<$40 U/mL) and 805umol/L (normal 208–428 μmol/L), respectively. His tumor marker tests were non-specific.

An abdominal ultrasound showed thickening of the greater omentum and intestinal wall. A CT scan of the entire abdomen revealed thickened peritoneum and greater omentum with multiple small nodules, a thickened liver capsule with nodules, and a small amount of effusion in the abdominal and pelvic cavity. Lymph node enlargement was not observed. Based on the results of the above examinations, peritoneal tuberculosis (exudate type) was initially considered. However, the patient underwent ascites puncture, ascites was examined, and CA153, CA199, CEA, and conjugative Bacillus T cell tests were negative. The ascites pathology was not examined.

For accurate diagnosis purposes, a 41-year-old male patient underwent ^{18}F-FDG PET/CT. The scan was performed 60 minutes after intravenous injection of 317.8 MBq (8.59 mCi) of ^{18}F-FDG. Maximum intensity projection (Fig. 1A), axial PET (Fig. 1B), CT (Fig. 1C), and fusion (Fig. 1D) images showed diffusely increased metabolic activity (SUVmax8.8) in the thickened peritoneum, omentum, and mesentery. Lymphoma lesions were considered; abdominal and pelvic effusion showed slightly increased FDG metabolic activity, and malignant ascites and pelvic effusion were considered. The soft tissue of the right anterior abdominal wall was thickened, flattening the right 6th anterior rib, and there was a strip of elevated radiation shadow, SUVmax5.1, which was considered indicative of lymphoma invasion. Nodular shadows of increased radioactivity were observed in the septal angle, SUVmax2.1, and lymph nodes with a cross-section size of about 1.0cm × 0.5cm were observed in the corresponding site, which were considered lymphoma lesions. The patient was diagnosed with Ann Arbor Staging II lymphoma. In short, the entire peritoneum showed increased FDG uptake, while the rest of the body including the brain and kidneys exhibited decreased FDG activity, presenting a "peritoneal super scan" appearance (Fig. 1A).

An ultrasound-guided needle biopsy of the thickened peritoneum confirmed the presence of high-grade B-cell lymphoma, as indicated by the biopsy results (Fig. 2). Based on the histomorphology, immunohistochemical examination, and genetic testing, the clinician ultimately diagnosed the patient with Burkitt lymphoma.

The patient received two cycles of chemotherapy with CODOX-M and IVAC (cyclophosphamide + vincristine + doxorubicin combined with methotrexate was used alternately with isocyclophosphamide + etoposide + cytarabine) after a clear diagnosis was made, and a follow-up ^{18}F-FDG PET/CT scan was performed one month after the end of treatment. The scan revealed that the pathological uptake in the peritoneum, omentum, and mesentery had disappeared, and the images were entirely normal (Fig. 1E–H). Physiological uptake was only observed within the myocardium, renal tract, spleen, vertebrae, and soft tissues. The disappearance of pathological uptake indicated that the treatment was effective in resolving the lymphoma lesions.

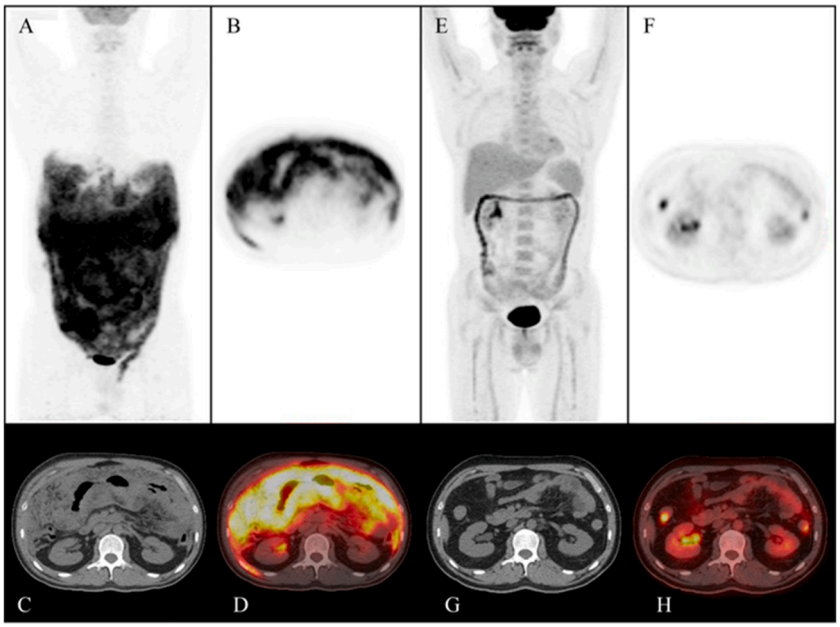

Fig. 1. As shown in MIP of ^{18}F-FDG PET, Maximum intensity projection (A), axial PET (B), CT (C), and fusion (D) images showed diffusely increased metabolic activity (maximum standardized uptake value: 8.8) in the thickened peritoneum, omentum, and mesentery. The lesion disappeared after treatment. Maximum intensity projection (E), axial PET(F), CT(G) and fusion (H) images showed the pathological uptake in the peritoneum, omentum, and mesentery had disappeared, and the images were entirely normal. Physiological uptake was only observed within the myocardium, renal tract, spleen, vertebrae, and soft tissues.

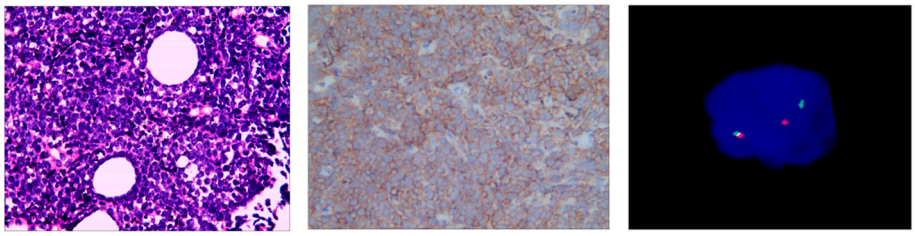

Fig. 2. High-grade B-cell lymphoma as indicated by the biopsy results. Immunohistochemical analysis revealed Ki67 (index about 95 %), CD10 (+), CD20 (+), CD99 (scattered +), Pax-5 (+), Bcl-2 (−), Bcl6 (+), and C-myc (90 %, 2+). FISH detection also revealed a C-myc gene fracture.

3. Discussion

Peritoneal lymphomatosis as a presentation of Burkitt lymphoma is relatively uncommon, but it is important to consider this possibility as the treatment and prognosis differ significantly from that of peritoneal tuberculosis. In this case, the patient had involvement of the entire peritoneum, resembling a "peritoneal super scan" on ^{18}F-FDG PET/CT. Although there have been many cases of peritoneal lymphoma that resemble peritoneal cancer, this is the first report of peritoneal lymphoma masquerading as peritoneal tuberculosis. Early identification of peritoneal lymphoma through imaging prior to puncture biopsy is crucial to facilitate timely and appropriate diagnosis and treatment, as puncture biopsy is not recommended for tuberculosis and may lead to disease spread.

Peritoneal tuberculosis, which is caused by agents of the M. tuberculosis complex, can be a challenging infectious disease to diagnose due to its insidious onset, non-specific symptoms, and limitations of diagnostic testing [2]. Mycobacterium tuberculosis is most commonly associated with respiratory presentations that typically include fever, haemoptysis, and anorexia. However, extrapulmonary TB (EPTB) infection can involve nearly every organ, including lymphatic, pleural, bone and joint, genitourinary, and meningeal sites. Peritoneal TB is the sixth most common site of EPTB, accounting for 4.9 % of all EPTB cases [3,4].

Peritoneal tuberculosis typically presents as an insidious progression of abdominal pain (50 %–100 %) and distention due to ascites (40 %–73 %) [5]. Constitutional symptoms, including weight loss (50 %–61 %), fever (13 %–59 %), and night sweats (6 %), may also be present [5]. Ultrasound and CT imaging may reveal free, loculated, or localized ascites (36 %–67 %), lymphadenopathy (14 %–47 %), and peritoneal thickening (23 %–32 %) [6]. CT typically shows high attenuation ascites (20–45 Hounsfield units), which is attributed to significant inflammatory debris [7]. In the case we reported, the patient's clinical and CT findings were consistent with peritoneal tuberculosis. These factors contribute to the difficulty in diagnosing peritoneal tuberculosis, which can often be misdiagnosed.

However, the ^{18}F-FDG PET/CT examination showed an SUVmax8.8, which was consistent with malignancy, including peritoneal carcinoma and peritoneal lymphoma. An omental biopsy was performed under ultrasonography guidance, and the histopathologic examination showed a high-grade Burkitt lymphoma.

Burkitt lymphoma (BL) is a highly aggressive subtype of B-cell non-Hodgkin's lymphoma with a doubling time of 24 hours [8]. The most common manifestation of BL is the enlargement of lymph nodes, and extranodal debut of the disease occurs only in 10 %–34 % of cases [9]. Extranodal involvement most commonly occurs in the gastrointestinal tract and secondarily includes the central nervous system, liver, spleen, kidneys, testes, and ovaries [8]. Peritoneal lymphomatosis is defined as the disseminated intraperitoneal spread of lymphoma [10]. It represents a rare presentation of the disease and is usually associated with aggressive histological subtypes of high-grade NHL, such as Burkitt lymphoma [11,12].

^{18}F-FDG PET/CT is an important imaging tool for the diagnosis, staging, and detection of recurrence with high accuracy in lymphoma [13]. The FDG avidity of lymphoma is dependent on the histological subtype. Although NHL has an overall ^{18}F-FDG avidity of 91 %, the avidity is lower in indolent disease (83 %) than in aggressive disease (97 %) [14]. In our case, BL was highly sensitive to FDG due to its highly aggressive nature.

Diffuse peritoneal and omental seeding are well-known forms of dissemination of metastatic carcinoma. However, omental and peritoneal lymphomatosis are rare manifestations of aggressive histologic subtypes of high-grade lymphomas [15]. The peritoneum does not commonly contain lymphoid tissue, which is why involvement of the peritoneum in lymphoma is uncommon. Therefore, the route of dissemination in peritoneal lymphomatosis is unclear and presumed to occur via pathways such as the visceral peritoneal surfaces, the gastrocolic ligament, or the transverse mesocolon [11,16].

In addition to peritoneal lymphomatosis, other causes of peritoneal thickening include tuberculous peritonitis, primary peritoneal mesothelioma, primary peritoneal carcinomatosis, and peritoneal metastases of breast, gynecological carcinomas, and gastrointestinal carcinomas [17]. Differential diagnosis is challenging as many other primary and secondary peritoneal neoplasms have similar imaging findings such as ascites, omental caking, and diffuse peritoneal thickening [18]. Unlike carcinomatosis, imaging findings of peritoneal lymphomatosis include lymphadenopathy, mesenteric masses, bone marrow involvement, and splenomegaly [19]. All these findings can be evaluated using ^{18}F-FDG PET/CT.

Our case demonstrates intense FDG uptake involving the entire peritoneum, with suppressed FDG activity observed in the rest of the body including the brain and kidneys, which is known as a "peritoneal super scan." This phenomenon is rare and has only been reported in four cases to date. Roy [20] first reported a case of Burkitt's lymphoma with peritoneal involvement that appeared as a "peritoneal super scan" on FDG PET-CT in 2017. Sachpekidis [21] reported a case of Burkitt lymphoma in 2020 that showed a com-

plete metabolic response to R–CHOP therapy (rituximab, cyclophosphamide, adriamycin, vincristine, and prednisolone). Additionally, Benameur [22] and Yılmaz [23] reported cases of diffuse large B cell lymphoma (DLBCL) with a similar appearance. Our patient's presentation, along with the results of the omental biopsy, provided strong evidence for a diagnosis of peritoneal lymphomatosis and allowed us to differentiate it from peritoneal tuberculosis. In short, early diagnosis of peritoneal lymphomatosis is essential for effective treatment.

4. Conclusion

The presentation of lymphoma as the peritoneal disease does occur, albeit rare, especially when disguised as other diseases. Radiology alone is usually insufficient to distinguish lymphoma from peritoneal tuberculosis. From an overall consideration, it is a key point of using PET/CT for accurate diagnosis until a cytological or histological diagnosis is confirmed. To prevent delays in starting lymphoma treatment and avoid further expansion of tuberculosis lesions caused by a puncture.

Author claims and responsibilities

BF initiated the idea for this article and prepared the final copy of the manuscript. QM and HW is responsible for making pictures and tables. TZ, YT, and YD took responsibility for collecting patient's data. QZ took responsibility for reviewing this article and acting as the corresponding author.

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Ethics statement

Ethical review and approval were not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Declaration of competing interest

No conflict.

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BF and YY initiated the idea for case reporting and prepared the final copy of the manuscript. QM, TZ, YT and YD took responsibility for collecting patient's data. QZ took responsibility for reviewing the FDG PET/CT. The authors declare that they have no competing interests, and all authors should confirm its accuracy.

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