

# Gallbladder lymphoma detected by <sup>18</sup>F-fluorodeoxyglucose positron emission tomography

## ABSTRACT

Gallbladder involvement in lymphoma is rare, with only a few cases reported in the literature, predominately in the pre positron emission tomography (PET) era. <sup>18</sup>F-fluorodeoxyglucose (<sup>18</sup>F-FDG) PET/computed tomography (CT) has now become the modality of choice in the staging of lymphoma. We report a case of gallbladder involvement by high-grade B-cell lymphoma detected by PET/CT.

**Keywords:** Gallbladder, lymphoma, positron emission tomography

## INTRODUCTION

Despite being a primary malignancy of lymph nodes, a significant proportion of lymphoma occurs in extranodal tissues or organs. Very rarely, the gallbladder becomes involved as a primary site or as part of widespread disease.<sup>[1-6]</sup> We report a case of large B-cell lymphoma in the gallbladder in <sup>18</sup>F-fluorodeoxyglucose (<sup>18</sup>F-FDG) positron emission tomography (PET)/computed tomography (CT).

## CASE REPORT

A 24-year-old male presented with diplopia, bilateral face numbness, and pain. Magnetic resonance imaging of the skull base demonstrated nonspecific abnormal enhancement of the cisternal portion of bilateral oculomotor nerves. CT of the chest, abdomen, and pelvis as part of the workup did not reveal any significant abnormality. Further imaging with PET/CT demonstrated several subdiaphragmatic FDG-avid subcentimeter nodal disease and extranodal sites including small bowel, liver, and sacrum. Intense focal uptake (SUV max 25.3) in the gallbladder was suspicious for further extranodal disease, with a differential diagnosis of synchronous primary gallbladder malignancy or cholecystitis [Figures 1 and 2]. Abdominal ultrasound confirmed a 25-mm round mass and no gallstones [Figure 3]. In view of diagnostic uncertainty, a laparoscopic cholecystectomy was performed.

Histopathology showed high-grade B-cell lymphoma with Burkitt-like features [Figures 4-6]. Chemotherapy consisting of rituximab, cyclophosphamide, doxorubicin, vincristine, methotrexate, cytarabine, ifosfamide and etoposide, in alternating cycles of R CODOX M/R IVAC was administered. A follow-up PET/CT performed 4 months after the initial diagnosis showed complete metabolic response (Deauville Score 2) [Figure 7].

## DISCUSSION

Extranodal presentation of non-Hodgkin's lymphoma is common in the gastrointestinal tract. Common sites include bowel, stomach, and liver. Gallbladder involvement is rare, and it has only been reported on several occasions in the literature, mostly published in the pre PET era.<sup>[1-6]</sup> Previously, the staging of lymphoma was heavily dependent on CT, which

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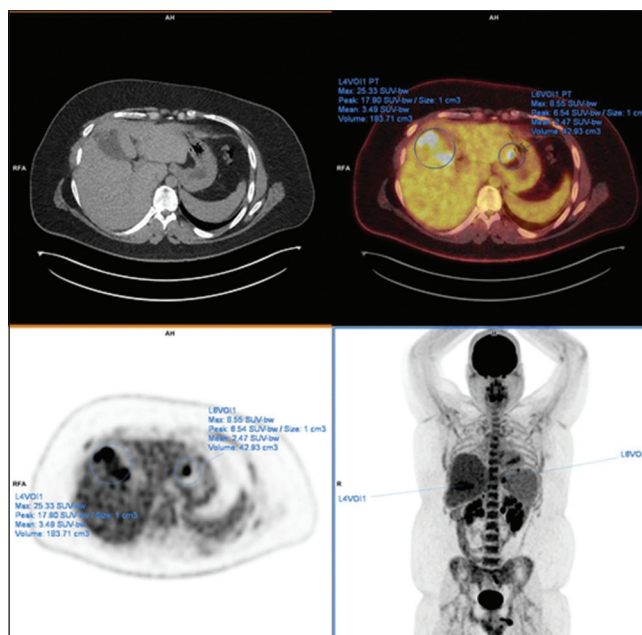
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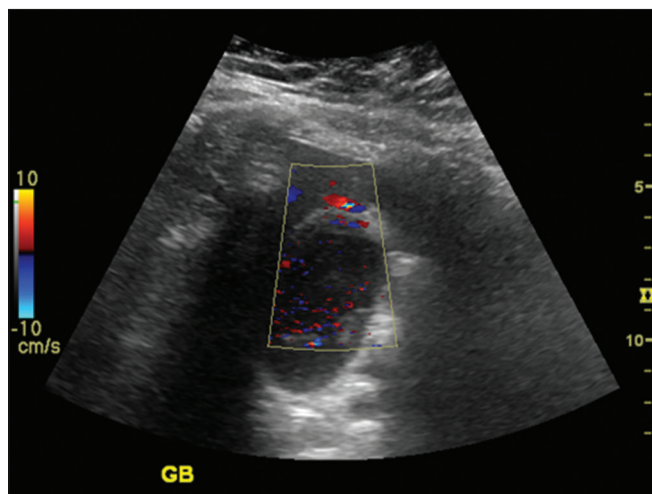
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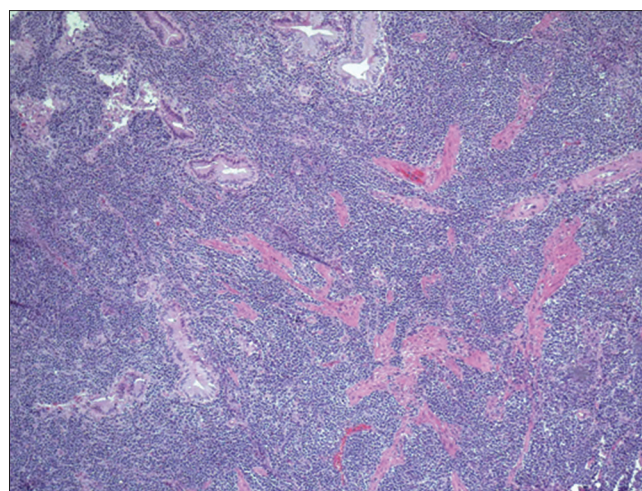
**Figure 1:** Frontal projection positron emission tomography maximum intensity projection image at presentation showing several subdiaphragmatic fluorodeoxyglucose-avid subcentimeter nodal disease and extranodal sites including small bowel, liver, and sacrum



**Figure 2:** Computed tomography (top left), fused positron emission tomography/computed tomography (top right), positron emission tomography (bottom left), and maximum intensity projection (bottom right) images showing an intensely avid ( $SUV_{max}$  25.3) mass in the gallbladder. There was also a moderately avid ( $SUV_{max}$  8.6) perigastric lymph node, consistent with nodal disease



**Figure 3:** Ultrasound of the gallbladder showing a mass in the fundus with internal vascularity, suspicious for malignancy



**Figure 4:** Low-power view showing diffuse atypical lymphoid infiltrates, which surround the benign glands, in the gallbladder

had only limited sensitivity. The shift to PET/CT staging for lymphoma has increased the sensitivity for disease detection in both nodal and extranodal sites, including the gallbladder. PET also has an increasing role in the diagnosis of primary and secondary gallbladder malignancy.<sup>[7]</sup> In our case, the differential diagnoses for focal avidity in the gallbladder include lymphoma, cholecystitis, and primary gallbladder adenocarcinoma. Cholecystitis is less likely, given a lack of focal symptoms or gallstones. Gallbladder adenocarcinoma is uncommon in this patient's age group.

The majority of the previously reported gallbladder lymphoma has been either mucosa associated lymphoid

tissue type or diffuse large B cell type, published prior to the widespread use of PET in lymphoma staging. To our knowledge, there has been no previous report on gallbladder lymphoma detected by PET/CT at the initial presentation. In our patient, the intense focal gallbladder avidity is in keeping with the aggressive behavior of high-grade B-cell lymphoma.<sup>[8]</sup> Although the focal avidity is not definitive for lymphoma, the finding alerts the clinician to exclude other causes, particularly cholecystitis, which has implications in the management.



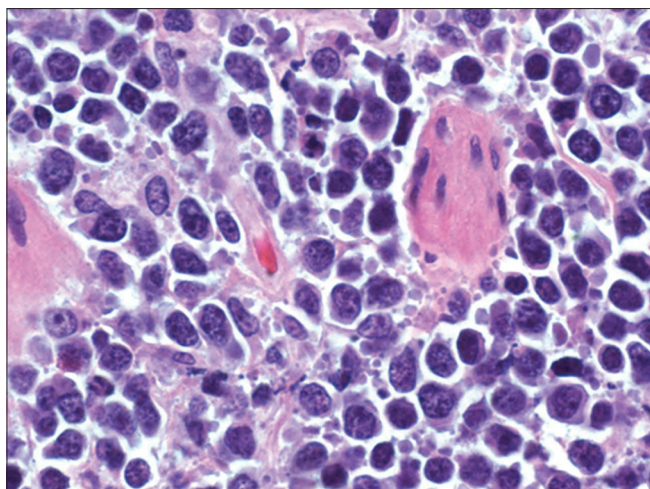


Figure 5: High-power view of atypical lymphoid cells

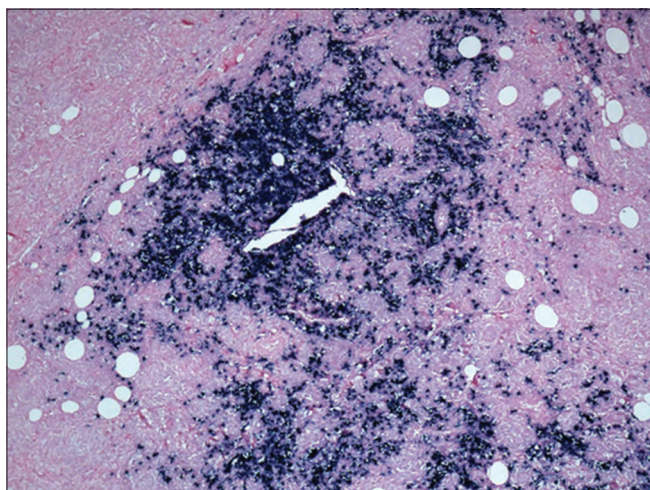


Figure 6: Epstein-Barr virus positive cells within lymphoid cells

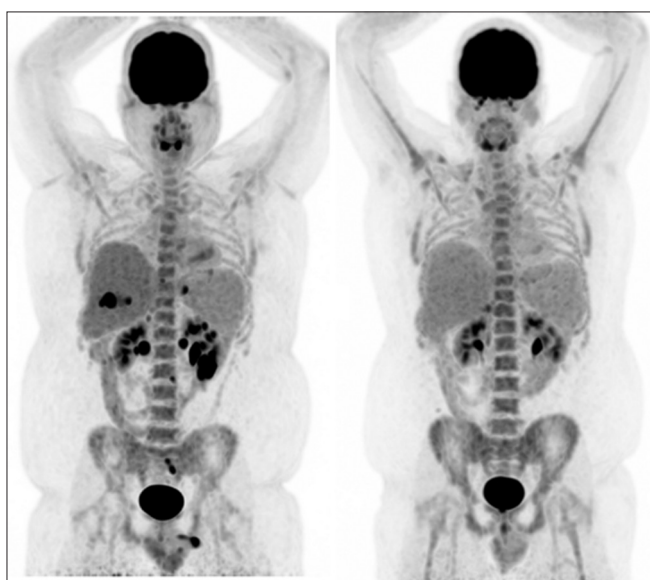


Figure 7: Follow-up positron emission tomography after completion of chemotherapy showing complete metabolic response of nodal and extranodal diseases

In summary, we have described a case of gallbladder involvement by non-Hodgkin's lymphoma in  $^{18}\text{F}$ -FDG PET/CT. With the widespread use of PET/CT for the staging of lymphoma, gallbladder involvement may become an increasingly recognized entity.

#### Learning points

- The gallbladder is an uncommon site for extranodal lymphoma
- PET/CT has an important role in the staging of lymphoma and in detecting extranodal disease
- Differential diagnoses for a FDG-avid lesion include lymphoma, cholecystitis and primary gallbladder carcinoma. Distinguishing these entities has important management implications
- Correlation with other imaging modalities such as ultrasound is useful, although histopathology is usually required for a definitive diagnosis.

Written informed consent was obtained from the patient prior to his inclusion in this case report.

An ethics application exemption has been granted by the Monash Health Human Research Ethics Committee for this case report.

#### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that his name and initials will not be published, and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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Nil.

#### Conflicts of interest

There are no conflicts of interest.

#### REFERENCES

1. Ono A, Tanoue S, Yamada Y, Takaji Y, Okada F, Matsumoto S, *et al.* Primary malignant lymphoma of the gallbladder: A case report and literature review. *Br J Radiol* 2009;82:e15-9.
2. Acharya V, Ngai J, Whitelaw D, Motallebzadeh R. Primary gallbladder lymphoma presenting as a polyp. *BMJ Case Rep* 2014;2014:bcr2013202715.
3. Ayub A, Rehmani S, Al-Ayoubi AM, Lewis E, Santana-Rodríguez N, Raad W, *et al.* Primary non-Hodgkin's lymphoma of the gallbladder: A population-based analysis. *Anticancer Res* 2017;37:2581-6.
4. Yamamoto T, Kawanishi M, Yoshiba H, Kanehira E, Itoh H. Primary non-Hodgkin's lymphoma of the gallbladder. *AJR Am J Roentgenol* 2005;184:S86-7.

5. Gardini A, Saragoni L, La Barba G, Garcea D. Simultaneous occurrence of primary diffuse large B-cell lymphoma and extranodal marginal zone (MALT) B-cell lymphoma in the gallbladder: A case report. *Pathologica* 2009;101:230-4.
6. Orton DF, Saigh JA. CT of Hodgkin's lymphoma limited to the gallbladder. *Abdom Imaging* 1996;21:238-9.
7. Butte JM, Redondo F, Waugh E, Meneses M, Pruzzo R, Parada H, *et al.* The role of PET-CT in patients with incidental gallbladder cancer. *HPB (Oxford)* 2009;11:585-91.
8. Cheson BD. PET/CT in lymphoma: Current overview and future directions. *Semin Nucl Med* 2018;48:76-81.jb