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FDG-avid Intrathecal Inflammation Following Administration of Intrathecal Methotrexate

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Abstract

Intrathecal methotrexate is a standard option for central nervous system directed therapy in patients with stage III and IV diffuse large B-cell lymphoma. We present a case of a 50 year old man with stage IV diffuse large B-cell lymphoma with widespread lymphomatous involvement including of the central nervous system who received seven doses of intrathecal methotrexate via Omayra catheter. Post-therapy ¹⁸F-FDG-PET/CT imaging demonstrated diffuse, intense intrathecal FDG-avidity, without correlative findings on MR spinal imaging. FDG-avidity resolved on followup. These PET/CT findings are most consistent with methotrexate induced thecal inflammation, which needs to be distinguished from intrathecal malignancy.

Keywords

¹⁸F-FDG; PET/CT; intrathecal methotrexate; lymphoma

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Figure 1.

50-year-old male with Stage IV high grade diffuse large B cell lymphoma developed right orbital pain and proptosis in August 2013. MRI of the brain revealed a right orbital mass extending into the cavernous sinus and CSF analysis was positive for lymphoma cells, confirming CNS involvement with lymphoma. An Ommaya catheter was placed and the patient received 7 weekly doses of intrathecal methotrexate via the Ommaya catheter. Intrathecal methotrexate, in addition to systemic therapy, is a standard treatment regimen for III/IV diffuse large B-cell lymphoma with concurrent CNS involvement, as described by the National Comprehensive Cancer Network [1].

Staging PET/CT was performed in November 2013. (A) FDG PET MIP, (B) Sagittal FDG PET, and (C) Sagittal CT demonstrate diffuse, intense FDG uptake throughout the thecal sac with extension into the neural foramina bilaterally, from the lower cervical through the sacral spine. Of note, anatomically the thecal sac extends into the neural foramina [2]. As non-contrast CT did not provide adequate anatomic correlation for the intrathecal FDG-avidity, spinal MR was performed.

Figure 2.

Spinal MR was performed for correlation with FDG PET/CT findings. (A) Sagittal T2 MR was normal, without abnormal signal within the cord or mass in the thecal space. (B) Post-contrast sagittal T1 MR was also normal, without abnormal enhancement in the cord or thecal sac. Given the lack of an anatomic correlate for the extensive FDG-avidity in the thecal sac, the FDG-avidity was diagnosed as inflammatory, secondary to intrathecal methotrexate therapy, rather than lymphomatous involvement.

Figure 3.

The Ommaya catheter was removed after seven intrathecal treatments. A followup FDG PET/CT three was performed three months later. (A) Sagittal FDG PET, and (B) Sagittal CT demonstrate resolution of the diffuse intrathecal FDG-avidity, providing further evidence that the initial intrathecal FDG-avidity was benign.

While CNS relapse in patients with DLBCL is rare, particularly in the post-Rituximab era, it carries an extremely poor prognosis[3]. CNS-directed therapy with intrathecal methotrexate has been shown to decrease recurrence rates, particularly in aggressive subtypes of diffuse lymphoma[4-6]. Intrathecal methotrexate however is not without side effects. Specifically, cases of myelopathy, leukoencephalopathy and cauda equina syndrome have been reported[7-10].

Our case demonstrates a unique potential pitfall of FDG PET/CT, intrathecal inflammation from directed intrathecal chemotherapy. Leptomeningeal lymphoma would have been expected to demonstrate pronounced findings on MRI, including dural and nerve root enhancement[11]. In our case, no MR abnormality corresponded to the intense intrathecal FDG-avidity seen on FDG PET/CT, supporting the diagnosis of an inflammatory response related to intrathecal therapy. Our case emphasizes the importance of adequate anatomic correlation for FDG-avid intrathecal findings.