High grade glioma recurrence presenting as extensive tumor thrombus and simultaneous pulmonary metastasis revealed on ^{18}F-FDG PET/CT

Abstract

Extensive tumor thrombus and simultaneous pulmonary metastasis in glioma patient is rare. Herein, we reported a 45-year-old woman with extensive tumor thrombus in sagittal sinus and sigmoid sinus with obvious enhancement on magnetic resonance imaging (MRI). Fluorine-18-fluorodeoxyglucose (^{18}F-FDG) positron emission tomography/computed tomography (PET/CT) showed extensive tumor thrombus in sagittal sinus, sigmoid sinus and internal jugular vein, and simultaneous left hilar lymph node and pulmonary metastasis. Our case demonstrated the value of ^{18}F-FDG PET/CT for correctly identifying tumor thrombus, detecting extent of tumor thrombus and distant metastasis in high grade glioma patients.

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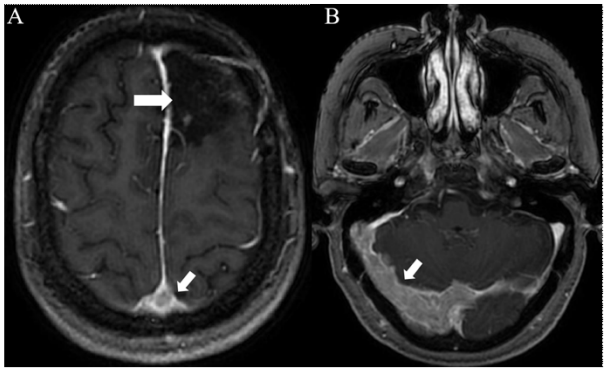

Figure 1. Axial enhanced MRI of extensive tumor thrombus lesion and left frontal lobe postoperative changes. Enhanced MRI imaging showed tumor thrombus in sagittal sinus (A, short arrow), sigmoid sinus (B, short arrow) with obvious enhancement and low signal without enhancement in the left frontal lobe, considering as postoperative changes (A, long arrow).

A 45-year-old woman underwent tumorectomy in the left frontal lobe one year ago. The postoperative pathology supported high grade glioma. She underwent radiotherapy and chemotherapy after surgery. Six months later, she went to our hospital again because of persistent headache. All the laboratory examination results were normal. Magnetic resonance imaging (Figure 1) examination showed extensive tumor thrombus in sagittal sinus (A, short arrow) and sigmoid sinus (B, short arrow) with obvious enhancement after injection of contrast. The left frontal lobe had low signal without enhancement, consistent with postoperative changes (A, long arrow).

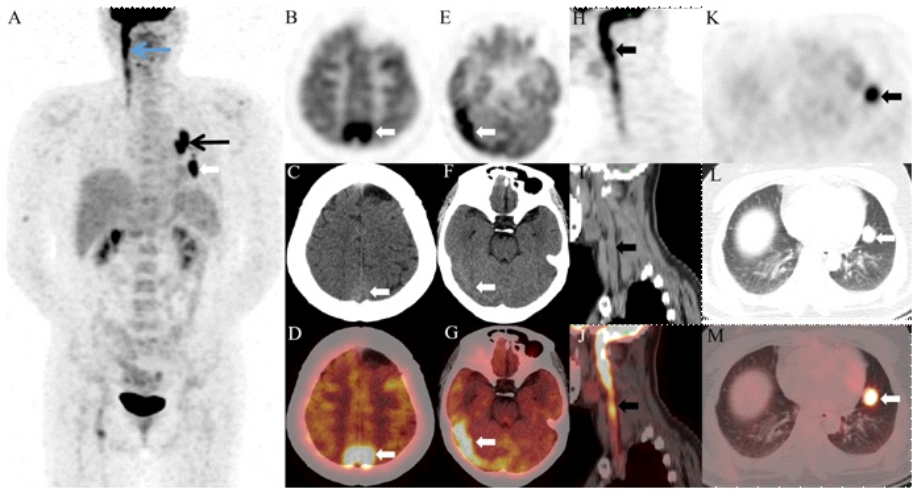

Figure 2. Fluorine-18-FDG PET/CT imaging of extensive tumor thrombus and hilar lymph node and pulmonary metastasis lesion. Maximum intensity projection (MIP) (A,long blue arrow), axial and sagittal PET imaging (B, E, H), CT imaging in brain window (C, F) and soft tissue window (I), PET/CT fusion imaging (D, G, J) revealed extensive tumor thrombus in the sinus, sigmoid sinus and right internal jugular vein with increased ^{18}F-FDG uptake. MIP image (A, black long arrow and white short arrow) and axial PET (K), CT imaging in lung window (L), fusion image (M) showed several nodules in the left hilum and left pulmonary with increased ^{18}F-FDG uptake.

For the sake of excluding distant metastasis, ^{18}F-FDG PET/CT examination was performed. Maximum intensity projection image (A) showed linear ^{18}F-FDG uptake in the right neck area and several focal ^{18}F-FDG uptake in the left chest area. Axial PET (B, E), CT (C, F), fusion image (D, G) indicated intensive ^{18}F-FDG uptake in the sagittal sinus and sigmoid sinus with maximum standardized uptake value (SUVmax) of 26.41, corresponding to the lesion on MRI. Surprisingly, diffuse ^{18}F-FDG uptake in the right internal jugular vein with SUVmax of 10.43 was observed on the MIP image (A, long blue arrow) and sagittal PET (H), CT (I), fusion image (J), consistent with extensive tumor thrombus formation. Maximum intensity projection image (A, black long arrow and white short arrow) and axial PET (K), CT (L), fusion image (M) showed intense ^{18}F-FDG uptake (SUVmax 10.66) in the region of the left hilum and the left lung, consistent with left hilar lymph node and lung metastasis. Eventually, the patient underwent left hilar lymph node and pulmonary nodule biopsy. The pathology supported metastasis from high grade glioma.

High-grade glioma (HGG) is the most common primary intracranial tumor with poor prognosis in adults [1].Extracranial metastasis of high-grade gliomas is rare and usually occurs in patients with advanced disease, accounting for less than 0.5% of cases [2]. The most common site of extracranial metastasis is the spinal canal, followed by the spine, lung, liver and lymph nodes [3-7]. Patients with high-grade gliomas are at high risk of venous thrombosis during perioperative or postoperative period [8, 9]. However, extensive tumor thrombus involving sagittal sinus, sigmoid sinus and internal jugular vein is very rare. The thrombosis of malignant tumor may be manifested as venous thromboembolism or tumor thrombosis [10]. Therefore, it is very important to correctly distinguish tumor thrombus and assess the extent of thrombus. It is reported that SUVmax and ^{18}F-FDG uptake patterns help to distinguish venous thromboembolism from tumor thrombus in patients with malignant tumor [10,11]. Different tracers have been used to evaluate glioma grade or recurrence [12-14]. A meta-analysis by Katsanos et al. (2019) showed that specificity of ^{18}F-FDG PET was significantly greater than ^{11}C-methionine, and ^{18}F-fluoroethyltyrosine (89%, 55%, and 57%, respectively; P=0.002) [15]. On the other hand, tumor dedifferentiation, destruction of blood-brain anatomical barrier and changes of tumor suppressor genes will increase the risk of extracranial metastasis [16]. Cerebrospinal fluid, blood and lymphatic system are the main ways of extracranial metastasis, which has no clear correlation with surgical intervention [3,17-19]. In our case, this patient had extensive tumor thrombus formation extending to extracranial sites through the internal jugular vein. This may be the reason for hilum lymph nodes and pulmonary metastasis.

In conclusion, extensive tumor thrombus involving sagittal sinus, sigmoid sinus, internal jugular vein and lung metastasisis very rare. It is very important to distinguish thrombus from tumor thrombus and to determine the tumor metastasis. Our case demonstrated the value of ^{18}F-FDG PET/CT for correctly identifying tumor thrombus, detecting the extent of tumor thrombus and distant metastasis and provided a manifestation pattern of extracranial metastasis in high grade glioma patients.

The authors declare that they have no conflicts of interest.

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