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Paraneoplastic Cerebellar Syndrome Presented as Cerebellar Hypermetabolism in a Patient With Occult Breast Carcinoma

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Abstract: A 47-year-old woman presented with an acute cerebellar syndrome. Neither cerebellar atrophy nor an infarction or tumor was shown on MRI. A diagnostic CT demonstrated enlarged axillary lymph nodes, but no primary tumor. Puncture of these nodes showed non–small cell carcinoma. ^{18}F-FDG PET/CT imaging was performed and suggested an occult breast carcinoma, which was confirmed by pathological examination. It also showed cerebellar hypermetabolism, consistent with a PCS (paraneoplastic cerebellar syndrome). This case shows that ^{18}F-FDG PET imaging may be of value in patients in which a PCS is considered clinically, particularly in patients suspicious for an occult malignancy.

Key Words: paraneoplastic cerebellar syndrome, cerebellar hypermetabolism, ^{18}F-FDG PET, occult breast carcinoma

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REFERENCES

1. Dalmau J, Rosenfeld MR. Paraneoplastic syndromes of the CNS. *Lancet Neurol*. 2008;7:327–340.
2. Massa F, Filippi L, Benedetti L, et al. FDG PET unveils the course of paraneoplastic cerebellar degeneration: a semiquantitative analysis. *Clin Nucl Med*. 2021;46:e327–e328.
3. Gheysens O, Deroose CM, Tousseyn T, et al. Hodgkin lymphoma-associated paraneoplastic cerebellar degeneration on FDG-PET/CT. *Br J Haematol*. 2014;164:468.
4. Reddy AK, Santhosh S, Mittal BR, et al. Isolated cerebellar hypermetabolism on FDG PET in a case of remitted primary breast lymphoma. *Indian J Nucl Med*. 2014;29:55–56.
5. López NO, González DP, García JA, et al. Paraneoplastic cerebellar degeneration as initial presentation of papillary carcinoma of the fallopian tube: evaluation and usefulness of (18)F-FDG PET-CT. Case report and literature review. *Nucl Med Mol Imaging*. 2013;47:55–60.
6. Wang J, Wang W, Zhao Y, et al. Cerebellar hypermetabolism in a case of paraneoplastic cerebellar syndrome with the primary lymphoepithelial carcinoma in tonsil. *Clin Nucl Med*. 2019;44:812–814.
7. Choi KD, Kim JS, Park SH, et al. Cerebellar hypermetabolism in paraneoplastic cerebellar degeneration. *J Neurol Neurosurg Psychiatry*. 2006;77:525–528.
8. Komandla SR, Vankadari K, Milap M, et al. ^{18}F-FDG PET/CT findings in a rare case of paraneoplastic vestibulocerebellar syndrome associated with isolated antiamphiphysin antibodies. *Clin Nucl Med*. 2021. In press.
9. Broen MPG, Anten MHME, van der Pol JAJ. Diffuse cerebellar hypermetabolism: an early sign of leptomeningeal metastases. *Eur J Nucl Med Mol Imaging*. 2021;48:3734–3735.
10. Canosa A, Moglia C, Manera U, et al. Metabolic brain changes across different levels of cognitive impairment in ALS: a ^{18}F-FDG-PET study. *J Neurol Neurosurg Psychiatry*. 2021;92:357–363.

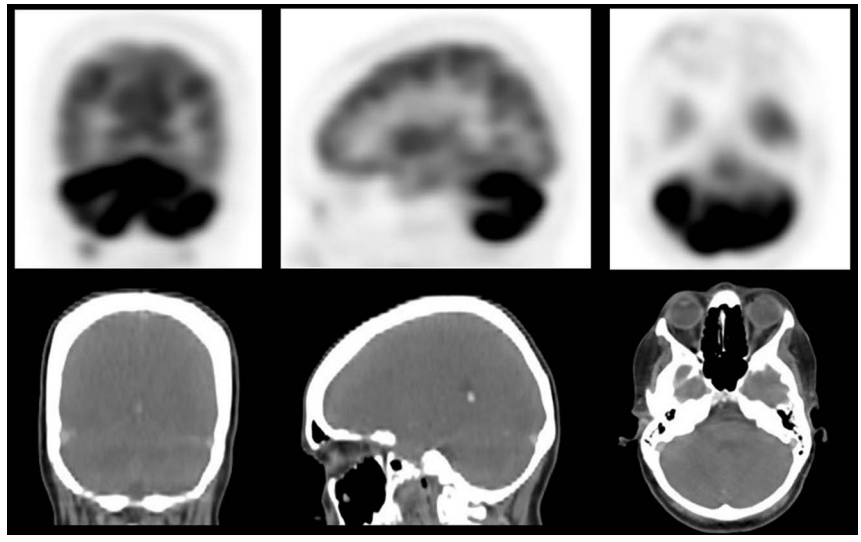

FIGURE 1. This ^{18}F-FDG PET/CT scan (coronal, sagittal, and transversal ^{18}F-FDG PET/CT images; upper panel, PET images; lower panel, low-dose CT images) was acquired in a 47-year-old woman who presented with an acute cerebellar syndrome. She had progressive symptoms of vertigo, diplopia, nausea, and an unstable gait. Neurological examination revealed dysarthria, third-degree nystagmus to the left, downbeat nystagmus when looking down, ataxia of the right limb, and an unstable broad basic gait.

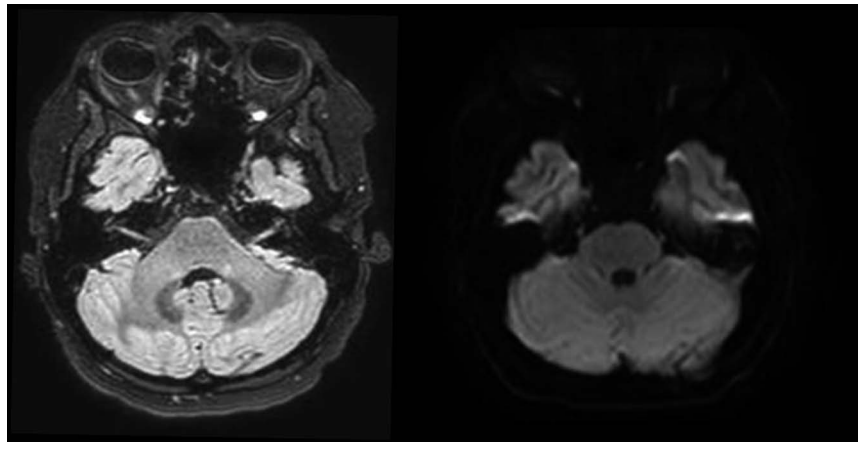

FIGURE 2. No cerebellar atrophy, infarction, tumor, diffusion restrictions, or signal changes were shown on MRI (left panel, transversal fluid-attenuated inversion recovery image at the level of the cerebellum; right panel, transversal diffusion-weighted image at the same level). A diagnostic CT of the thorax and abdomen (not shown) demonstrated enlarged axillary lymph nodes, but no primary tumor. Puncture of these nodes showed non–small cell carcinoma. In combination with the clinical signs, a paraneoplastic syndrome induced by an occult breast or lung cancer was considered, and consequently, ^{18}F-FDG PET/CT imaging was performed from the skull extending to the groin. The PET/CT scan suggested an occult breast carcinoma (not shown), which was confirmed by pathological examination. It also showed cerebellar hypermetabolism (see Figure), consistent with a paraneoplastic cerebellar syndrome (PCS). Finally, anti-Yo antibodies were detected, which are related to the presence of breast cancer.[1] At first, the patient was treated with methylprednisolone for 5 consecutive days, with improvement of symptoms. Second, when the symptoms increased a few days later, a 5-day IV immunoglobulin treatment was started. Finally, the patient received a combination of pertuzumab, trastuzumab, paclitaxel, and carboplatine followed by surgery, as a therapy for breast carcinoma. Unfortunately, after 3 months, neurological examination showed no improvement compared with the patient's first admission. Clinically, an acute cerebellar syndrome may occur as a PCS, and scintigraphically as diffuse cerebellar hypermetabolism. At an early disease stage, structural brain imaging is commonly normal.[1] The neoplasms most commonly involved are small cell lung cancer, gynecological (including carcinoma of the fallopian tube) and breast tumors, and Hodgkin lymphomas,[1–5] but it is also described in, for example, carcinoma of the tonsil, gastric adenocarcinoma, and extragonadal germ cell tumors.[6–8] An acute cerebellar syndrome is one of the most common neurological paraneoplastic syndromes and is most likely immune mediated.[1] Indeed, frequently, antineural antibodies in the cerebrospinal fluid and/or serum can be demonstrated. In PCS, an extensive loss of Purkinje cells might be associated with inflammatory infiltrates in the cerebellum.[1] Cerebellar hypermetabolism is not exclusive for PSC. Interestingly, a recent study also showed intense cerebellar hypermetabolism, demonstrated by ^{18}F-FDG PET, in a case with leptomeningeal metastasis associated with an atypical meningioma.[9] The cerebellar metabolism in that particular case is similar to that of our present case; however, cerebellar antibodies such as anti-Yo are not detectable in patients with leptomeningeal metastasis, and clinically PSC can frequently be differentiated leptomeningeal metastases.[9] Also, a recent study showed relatively cerebellar hypermetabolism in patients experiencing amyotrophic lateral sclerosis with frontotemporal dementia. However, in these patients, the cerebellar hypermetabolism is less pronounced than in PCS.[10] This case shows that ^{18}F-FDG PET imaging may be of value in patients in which a PCS is considered, particularly in patients suspicious for an occult malignancy or in which the primary tumor is not detected after routine examinations.