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# Diagnosis of Dual Malignancy by 18F-FDG-PET/CT in the setting of Paraneoplastic Cerebellar Degeneration

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## Running Title: Dual Malignancy by 18F-FDG-PET/CT in PCD

**Keywords:** Paraneoplastic neurological syndrome (PNS); Paraneoplastic Cerebellar Degeneration; 18F-FDG-PET/CT

#### Abstract

A rare case of paraneoplastic cerebellar degeneration (with detectable antineuronal antibody anti-Yo) is described, where 18F-FDG-PET/CT aided in detection of two synchronous malignancies (one thyroid cancer and the other breast cancer); interestingly, the primary breast malignancy was non-FDG avid and was detected through the presence of a metastatic FDG-avid axillary lymph node. Surgery for both was undertaken in the same sitting and there was improvement of the neurological features soon after the surgical removal of the malignancies.

## Introduction

18F-FDG-PET/PET-CT based molecular imaging has been proposed to be useful in paraneoplastic neurological syndrome (PNS) from the two aspects: (1) aiding in detecting the occult tumor and (2) assessing the functional abnormality in the brain related to the neurological features and disease activity and monitoring them along with brain MRI following therapeutic intervention (1, 2). We herein describe a unique finding in the setting of paraneoplastic cerebellar degeneration (PCD), an entity encompassed under the broad term of paraneoplastic neurological syndrome (PNS), where 18F-FDG-PET/CT helped diagnosing two synchronous malignancies, of which one was metastatic lesion, the primary being non 18F-FDG avid (3).

#### **Case Presentation**

A 53-year-old female with history of progressive vertigo and dizziness, gait disturbance, slurring of speech, lateralized gaze and occasional episode of syncope

since last 4 months and with suspected diagnosis of paraneoplastic cerebellar degeneration was referred for 18F-FDG-PET/CT for whole body survey to rule out malignancy. There was no history of fever or any infection prior to the onset of symptoms. Clinical examination was positive for cerebellar signs. To rule out the vascular etiology, contrast enhanced CT of brain was performed previously, which was normal. Routine blood examinations were normal. Contrast enhanced MRI of the brain was also performed and was normal except for tiny ischemic foci in bilateral frontal lobe. Suspecting paraneoplastic cerebellar syndrome as an etiology, onconeural antibodies (anti-Hu, anti-Yo, etc) were considered and only anti-neuronal antibody anti-Yo was positive. The whole body 18F-FDG-PET/CT (Fig 1a, 1b, 1c) revealed hypermetabolic foci in left lobe of thyroid (SUVmax-11.3) and left axillary lymph node (SUVmax-4.9).

Fine needle aspiration cytology (FNAC) was performed from both left lobe of thyroid gland and left axillary lymph node. The fine needle aspiration cytology (FNAC) report of left lobe of thyroid was suggestive of papillary carcinoma of thyroid with oncocytic neoplasm and that of left axillary lymph node was suggestive of metastatic adenocarcinoma. In view of metastatic adenocarcinoma, patient's gender and age, ultrasonography of breasts was performed, which showed solid hypoechoic mass measuring 2.7 X 1.4 cm at 3 o'clock position in left breast with distinct margin and significant vascularity. The patient underwent left modified radical mastectomy with axillary nodal dissection and total thyroidectomy with nodal dissection in the same sitting. The histopathology confirmed ductal carcinoma in situ of solid type of high

nuclear grade with evidence of metastatic infiltrating ductal carcinoma to axillary nodes and differentiated papillary carcinoma of thyroid (oncocytic variant) with metastatic neck nodes.

Around 2 weeks post-surgery there was improvement in slurring of speech as well as in the lateral gaze. Patient is being worked up for radioiodine therapy and concurrent chemotherapy for carcinoma breast.

### Discussion

Paraneoplastic neurological syndromes (PNS) is a relatively rare disease entity caused by autoimmune pathology that is due to common antigens directed against to cancer and the nervous system. The various neurological manifestations enumerated under this heading include Lambert-Eaton myasthenic syndrome, subacute cerebellar ataxia, limbic encephalitis, paraneoplastic cerebellar degeneration, opsoclonus-myoclonus, retinopathies (cancer-associated retinopathy and melanoma-associated retinopathy), Stiff-Person syndrome, chronic gastrointestinal pseudoobstruction, sensory neuronopathy, encephalomyelitis and dermatomyositis (4). In addition to the immunomodulatory treatment (such as intravenous immunoglobulins, steroids or plasmapheresis) directed against the autoimmune inflammation triggered by the malignancy, the definitive treatment remains identifying and treating the malignancy with a curative intent (4). Hence, a number of diagnostic modalities are employed for quick, senstitive and accurate diagnosis of the causative malignancy.

## Conclusion

In conclusion the present case is unique by two ways: (i) it demonstrates the rare finding of dual malignancy in a suspected case of paraneoplastic cerebellar degeneration and also interestingly, (ii) the primary in the breast was not 18F-FDG avid and was detected only by work-up ultrasound while the metastatic axillary node was positive on 18F-FDG-PET/CT.

## **Competing Interest**: None Declared

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**Fig 1.** 18F-FDG-PET Maximum Intensity Projection (MIP) image showing hypermetabolic lesion in left lobe of thyroid (open arrow) and left axillary lymphnode (bold arrow).



**Fig 2.** (A) Transaxial fused 18F-FDG-PET/CT image showing focal FDG uptake in left lobe of thyroid. (B) Transaxial CT Scan image showing bulky left lobe of thyroid.



**Fig 3.** (A) Transaxial fused 18F-FDG-PET/CT image showing FDG uptake in left axillary lymphnode. (B) Transaxial CT image showing enlarged left axillary lymph node.