

## Case Reports

# Hypermetabolism of Olivary Nuclei in a Patient with Progressive Ataxia and Palatal Tremor

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## Abstract

**Background:** The pathophysiology of the movement disorder progressive ataxia with palatal tremor (PAPT) is unclear.

**Case report:** A 77-year-old male presented with dysarthria, ataxia, and 1–2 Hz palatal tremor. A diagnosis of probable sporadic PAPT was established. Brain magnetic resonance imaging was normal at the presymptomatic phase but later showed olivary hypertrophy. Brain [<sup>18</sup>F]-fludeoxyglucose (FDG) positron emission tomography (PET) showed bilateral hypermetabolism in the olivary nuclei.

**Discussion:** This second reported patient with PAPT and FDG-PET shows that olivary hypertrophy is paralleled with hypermetabolism. The olivary nuclei pathology also appears to be temporally associated with symptom onset.

**Keywords:** Palatal tremor, ataxia, olivary nuclei, positron emission tomography

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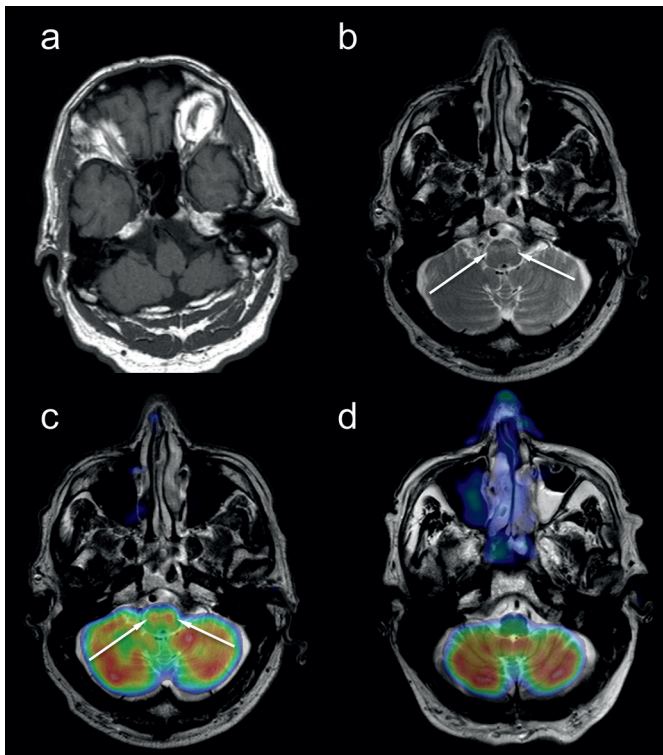
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## Introduction

Sporadic progressive ataxia and palatal tremor (PAPT) is a rare progressive neurological disorder characterized by palatal tremor (formerly called palatal myoclonus) and cerebellar dysfunction that increases in severity with time.<sup>1</sup> The pathogenesis of PAPT is unclear.<sup>1,2</sup> Typical brain magnetic resonance imaging (MRI) findings for PAPT demonstrate olivary nuclei hypertrophy with increased signal intensity on T2-weighted imaging.<sup>1,3</sup> However, it is not known if the olivary hypertrophy is a predisposing risk factor or sequelae, or if it represents a functionally active change. In the search of treatment targets for palatal tremor, the cause and effect relationships for symptoms are relevant. There has been one previous reported case assessing the metabolic activity of the olivary nuclei in PAPT using brain [<sup>18</sup>F]fluorodeoxyglucose positron emission tomography (FDG-PET).<sup>4</sup> In the reported case, the olivary nuclei did not show hypermetabolism. A larger study of other patients with palatal tremor suggested the opposite, as hypermetabolism in the medulla was reported.<sup>5</sup> Here, we report the second patient with diagnosed PAPT who underwent FDG-PET together with serial brain structural MRI.

## Case report

A 77-year-old male presented with a 2-year progressive history of dysarthria followed by a 1-year history of ataxia. His previous history revealed bilateral sensorineural hearing deficit and tinnitus, type II diabetes, coronary heart disease, and colitis ulcerosa. The family history was unremarkable. Examination revealed constant slow 1–2 Hz palatal tremor that was not associated with ear or throat clicks (Video 1). Also, dysarthria, dysphagia, saccadic pursuit, and slightly hypometric saccades without nystagmus were noted. Vertical eye movements were normal. No signs of parkinsonism were seen. The patient had arm and leg ataxia and a wide-based ataxic gait (Video 1). He could not perform a heel-to-toe walk. Deep tendon reflexes were present but were diminished; the right plantar reflex was extensor and left was flexor. Routine blood analysis, vitamin B12, and thyroid function were normal. Thyroid peroxidase, glutamic acid decarboxylase, transglutamine, antigliadin, and antineuronal antibodies were negative. Genetic tests for spinocerebellar ataxia 6, Friedreich's ataxia, mitochondrial recessive ataxia syndrome, and fragile X were negative.



**Figure 1. Olivary Hypertrophy and Hypermetabolism in the Patient.** (A) Brain T2-weighted magnetic resonance imaging (MRI) 7 years before symptom onset showing no olivary hypertrophy. (B) Brain T2-weighted MRI 6 months after symptom onset showing olivary hypertrophy (white arrows). (C) Brain [18F]fluorodeoxyglucose positron emission tomography (FDG-PET) 3 years after symptom onset overlaid on the MRI showing olivary glucose hypermetabolism (white arrows). (D) Normal FDG-PET overlaid on the brain T2-weighted MRI (77-year-old healthy control subject).

On the basis of exclusion, the clinical picture, and brain MRI, the diagnosis of probable sporadic PAPT was established. The patient was treated with clonazepam, topiramate, and valproate. Unfortunately, the medications did not alleviate his symptoms. The patient gave full consent for video recording of the clinical findings.

The first brain MRI scan was performed due to tinnitus and hearing loss 7 years before the onset of symptoms (Figure 1A). The second scan was performed 6 months after PAPT symptom onset (Figure 1B), and the third scan and FDG-PET were performed 36 months after symptom onset (Figure 1C). In contrast to the normal initial MRI scan at the presymptomatic phase, both the 6-month and the 36-month MRI scans showed olivary hypertrophy, without focal lesions. FDG-PET at 36 months showed bilateral olivary hypermetabolism (Figure 1C).

### Discussion

FDG-PET of our patient showed that hypertrophic olivary nuclei are metabolically hyperactive with active palatal tremor. Olivary hypertrophy was not present before the symptom onset but it developed in parallel with palatal tremor, or shortly before the onset.



**Video 1. Main Clinical Findings of the Patient.** The video demonstrates 1.5 Hz palatal tremor, gait ataxia, saccadic pursuit, arm ataxia, and abnormalities in deep tendon and plantar reflexes. The video was recorded 36 months after motor symptom onset.

It is not clear why there was no olivary hypermetabolism in the earlier reported PAPT patient with FDG-PET.<sup>4</sup> Differences in the analysis methods could be one of the reasons. Cilia et al.<sup>4</sup> used statistical parametric mapping (SPM2) for their patient and they compared his FDG binding voxel-by-voxel to a sample of 14 healthy subjects. Their results included clusters of at least 50 voxels; the spatial normalization procedure in SPM2 is susceptible for errors in subcortical structures. Thus, findings in small structures like the olivary nuclei could have been missed. However, without a direct comparison of the two patients, this is speculative. Nevertheless, our findings are in line with early FDG-PET findings in other palatal tremor patients with various etiologies.<sup>5</sup> The combined results indicate a functionally relevant link between olivary nuclei activity and palatal tremor generation.

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