

Nasal mucosal thickening simulating a tumor: Potential for misdiagnosis in brain perfusion imaging

Leo G. FLORES II,* Seishi JINNOUCHI,* Shigeki NAGAMACHI,* Takashi OHNISHI,* Shigemi FUTAMI,*
Yuji OKUDA,** Noriko TSURU** and Katsushi WATANABE*

*Departments of *Radiology and **Psychiatry, Miyazaki Medical College*

A 33-year-old, female presenting with dementia was admitted to our institution. Except for slight muscle atrophy noted on both lower extremities there were no other significant physical signs or laboratory findings. Since initial Tc-99m-HMPAO SPECT showed hypoperfusion on both temporal, parietal and occipital lobes, follow up study with the same radiotracer was done. Increase in uptake was noted in the left side of the face. There was no abnormality noted on ENT examination. CT scan and MRI showed slight nasal mucosal wall thickening. Tl-201 SPECT showed increased uptake in the nasal area. The increase in uptake could be due to nasal mucosal thickening. This could simulate nasal tumor and interfere in determining ROI for brain perfusion studies.

Key words: brain perfusion, nasal mucosal thickening, SPECT and Tc-99m HMPAO

INTRODUCTION

UPTAKE of technetium is normally noted in the nasal cavity. When nasal uptake is noted in technetium labeled tracers, it is often dismissed as a failure in the labeling. We report a case of high uptake in the nasal cavity with Technetium-99m hexamethylpropylene amine oxime (Tc-99m HMPAO), its cause and its clinical implications.

CASE REPORT

A 33-year-old, female presenting with dementia was admitted to our institution. Except for slight muscle atrophy noted in both lower extremities there were no other significant physical signs or laboratory findings. Magnetic resonance imaging (MRI) showed cerebral atrophy. Initial Tc-99m HMPAO single photon emission computed tomography (SPECT) showed hypoperfusion in both parietal, temporal and occipital lobes. Five months after admission, follow up Tc-99m-HMPAO SPECT was done.

For the quantitative analysis of cerebral blood flow by

Patlak plot, a dynamic image was acquired simultaneously with bolus intravenous injection of 740 MBq of Tc-99m HMPAO. A two headed gamma camera (PRISM 2000, Picker International), low energy high resolution parallel beam (LEHR) collimator and 128 × 128 matrix size was used with a sequence of 120 frames at 1 second interval. A hypervascular lesion was noted on the left side of the face (Fig. 1A).

Immediately after dynamic imaging, single photon emission computed tomography (SPECT) images were taken with a three-headed gamma camera (PRISM 3000, Picker International) with a low energy ultrahigh resolution (LEUHR) fan beam collimator and 128 × 128 matrix size. Ramp filter-Low Pass filter and attenuation correction were done with the ODYSSEY super computer. Hypoperfusion was noted in both parietal, temporal and occipital lobes. High uptake was also noted in the nasal area (Fig. 1B).

The patient was then referred to the ENT Department for further evaluation. Nasal speculum was done and no significant finding was noted. To further evaluate the probable tumor, plain and enhanced computed tomography (CT) scan, MRI and Thallium-201 (Tl-201) SPECT early and delayed images were obtained. The CT and MRI images (Figs. 2A and 2B) showed slight thickening of nasal mucosa. Tl-201 SPECT images also showed uptake in the nasal area (Fig. 3).

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For reprint contact: Leo G. Flores II, M.D., Miyazaki Medical College, 5200 Ohaza Kihara, Kiyotake, Miyazaki 889-16, JAPAN.

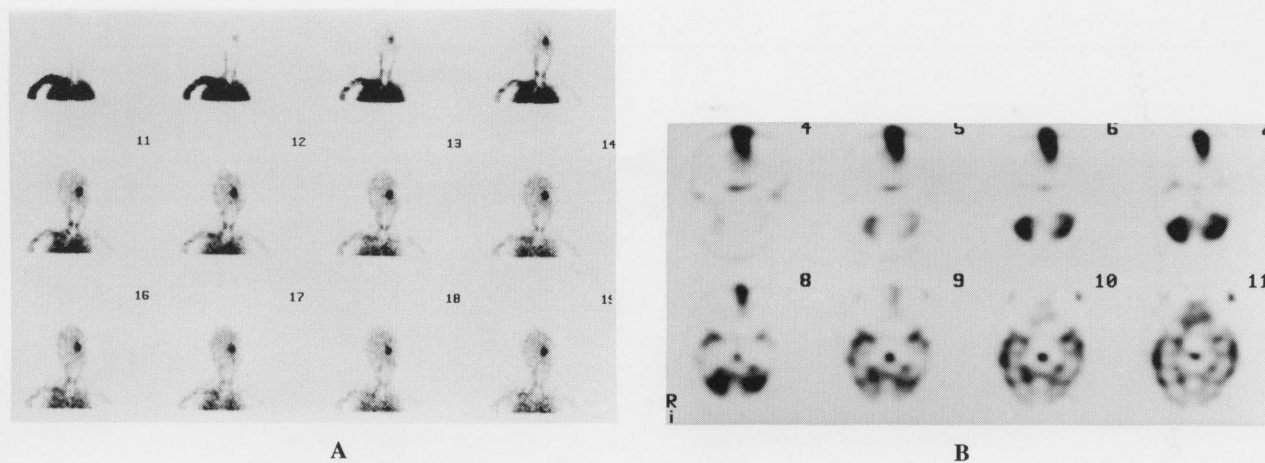


Fig. 1 Technetium-99m hexamethylpropylene amine oxime dynamic study, showing hypervascular mass in the left side of the face (A). Single photon emission computed tomography, oblique transaxial images showing hypoperfusion at the parietal, temporal and occipital lobes. High uptake was also noted in the nasal area (B).

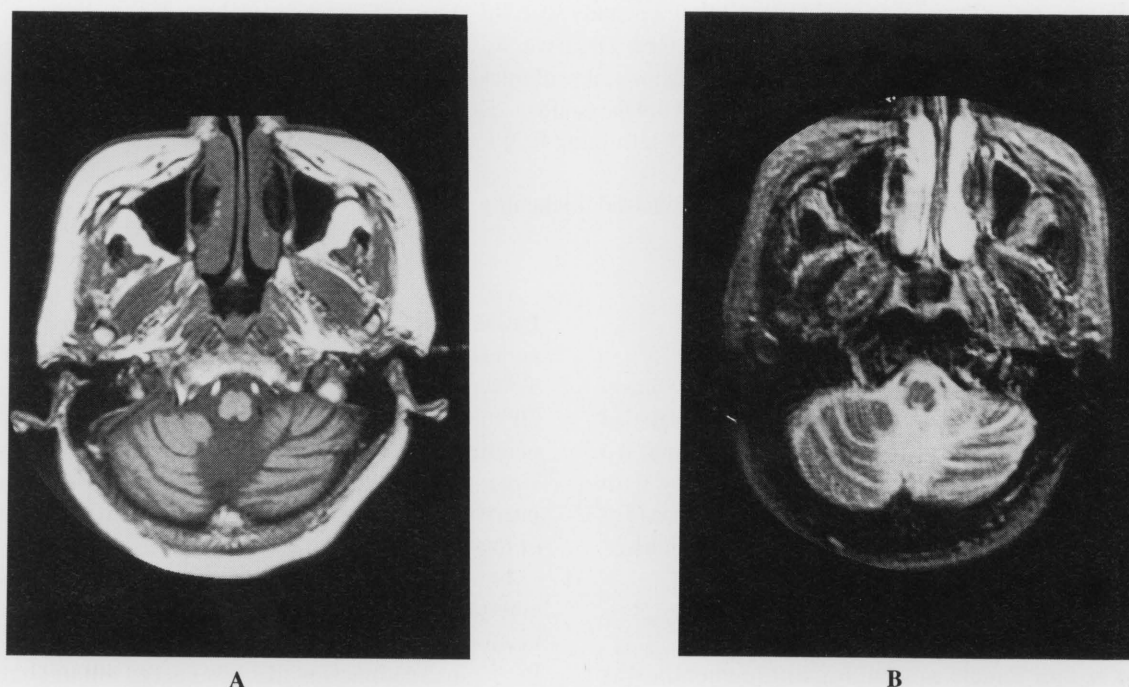


Fig. 2 Magnetic resonance imaging T1 weighted image showing nasal mucosal thickening more than 5 mm (A) and T2 weighted image showing marked enhancement of nasal mucosa (B).

After a review of the family history and DNA analysis of the patient a diagnosis of adult onset dentatorubropallidoluysian atrophy (DRPLA) was made.

One month after seeing an increase in uptake in the nasal area, a repeat study with Tc-99m HMPAO was done. There was still uptake in that area but of lesser intensity (Figs. 4A and 4B). Due to previous equivocal findings no follow-up study was done with CT, MRI or Tl-201 SPECT.

DISCUSSION

DRPLA is an autosomal dominant neurodegenerative disease. It is often characterized by systemic degeneration of the dentatofugal and pallidofugal pathways. The molecular abnormality in DRPLA is an expanded, unstable CAG trinucleotide repeat in chromosome 12p. Adult onset could have dementia as a presenting symptom. Cerebral atrophy could be noted in MRI, CT and SPECT studies. With Iodine-123-iodoamphetamine (I-123 IMP),

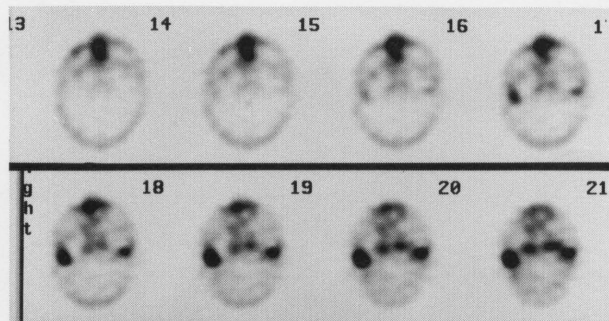


Fig. 3 Thallium-201 single photon emission computed tomography, early oblique transaxial images showing slightly high to normal uptake in the nasal area.

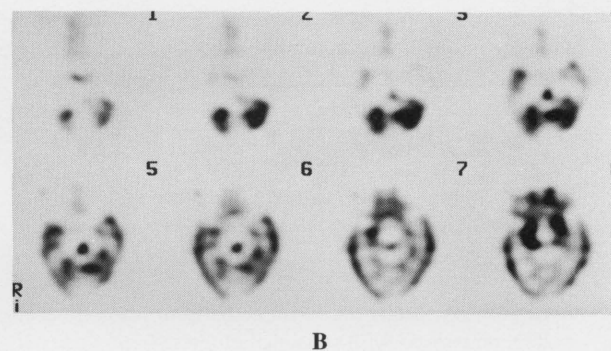
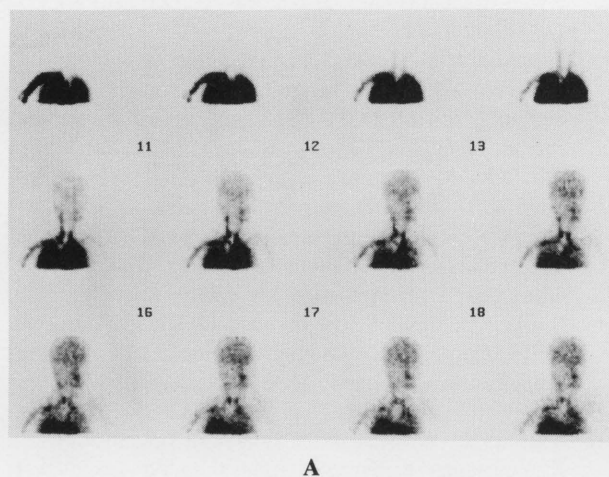


Fig. 4 Follow up Technetium-99m hexamethylpropylene amine oxime, dynamic study showing a decrease in the uptake of nasal area (A). Single photon emission computed tomography oblique hemispheric (B) showing hypoperfusion in the parietal, temporal and occipital lobes of cerebral hemisphere.

diffuse hypoperfusion was noted on both sides of the frontal and temporal lobes of the cerebral cortex.¹⁻⁵ Nasal mucosal thickening in DRPLA is an incidental finding.

Etiologies of nasal mucosal thickening are congestive phases of nasal cycle, sinusitis, nasal polyp, retention cyst, mucocoeles and mucoperiosteal thickening. The patient could be asymptomatic or have vague and non-specific symptoms. MRI has been reported to be highly sensitive in detecting nasal mucosal thickening. 1-2 mm thickening is said to be a normal variant and 3-4 mm thickening when lack of symptoms has no clinical significance. On T2 weighted images, nasal mucosal thickening could show hyperintensity similar to inflamed mucosa.⁶⁻⁸

Nasal uptake has been noted during radioactive iodine treatment in a patient with thyroid carcinoma.⁹ In cases of sarcoidosis, gallium accumulation in the nasal area was also noted.¹⁰ In patients with systemic vasculitis, nasal uptake was noted with Tc-99m-HMPAO-labeled leukocytes imaging.¹¹ Uptake in the nasal cavity was also noted in patients with malignant melanoma when Tc-99m HMPAO SPECT images were taken.¹²

Tc-99m HMPAO is a lipophilic compound with a

neutral charge which is used primarily as a brain imaging agent. Its extraction from the blood to the brain is dependent on the level of cerebral blood flow and also on the binding to proteins and blood constituents. In tumors, the mechanism of uptake is proposed to be due to intratumoral deposition of glutathione or increased vascularity.¹³⁻¹⁵ Hypervascularity in nasal mucosal thickening could explain the increase in uptake with Tc-99m HMPAO.

In a Patlak plot, time activity curves are acquired by drawing an irregular region of interest (ROI) in the aorta and in both hemispheres of the brain.¹⁶ The high intensity area in nasal mucosal thickening should be excluded when ROI are drawn, because this would cause error in the estimation of cerebral blood flow.

In conclusion, the increase in uptake in nasal mucosal thickening may simulate tumors such as hemangioma, histiocytic lymphoma and metastatic carcinoma on brain SPECT.⁸ Complete physical examination with CT, MRI, Tl-201 SPECT and other pertinent diagnostic means will confirm the presence of a mass and provide additional information on its location and histological characteristics.

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