

# Visualization of Pituitary Tumour and Luxury Perfusion Phenomenon During Brain SPECT Imaging with Tc-99m HMPAO in a Patient with Stroke

## STROKE'LU HASTADA LÜKS PERFÜZYON FENOMENİ VE HİPOFİZ ADENOMUNUN Tc-99m HMPAO İLE GÖRÜNTÜLENMESİ

Sevim Süreyya ÇERÇİ, MD,<sup>a</sup> Bahattin BAYKAL, MD,<sup>b</sup> Hasan Rifat KOYUNCUOĞLU, MD,<sup>c</sup> Mustafa YILDIZ, MD,<sup>a</sup> Feride Meltem ÖZBEK, MD<sup>a</sup>

Departments of <sup>a</sup>Nuclear Medicine, <sup>b</sup>Radiology, <sup>c</sup>Neurology, Süleyman Demirel University School of Medicine, ISPARTA, TURKEY

### Abstract

A 74-year-old man presented with the complaint of fall and meaningless speech. On neurological examination he was alert but not oriented. He had sensory aphasia and sensorymotor examinations revealed no lateralizing finding. Serum biochemistry and whole blood count were normal. Although cranial CT and MRI did not reveal any cerebral vascular ischemia or infarct area, macroadenoma in pituitary gland detected. Because CT and MRI findings did not confirm the cerebro vascular disease, Tc-99m HMPAO SPECT was performed on the 12th day after onset of the stroke symptoms and SPECT of the brain showed increased uptake of Tc-99m HMPAO in pituitary adenoma and significant hyperperfusion in left temporal lobe. It has been known that Tc-99m HMPAO is uncommonly accumulated in the pituitary tumors. In our review of the literature, Tc-99m HMPAO accumulation in pituitary adenoma has also been described only in two reports. We also demonstrated similar activity accumulation in pituitary adenoma with Tc-99m MIBI scintigraphy.

**Key Words:** Pituitary adenoma, stroke, luxury perfusion phenomenon, Tc-99m HMPAO SPECT, Tc-99m MIBI SPECT

### Özet

Bilgisayarlı Tomografi ve Manyetik Rezonans görüntülemelerde serebrovasküler hastalık bulguları saptanamayan ve hipofiz makroadenomu belirlenen 74 yaşındaki hastaya semptomları başladıktan 12 gün sonra yapılan Tc-99m HMPAO beyin perfüzyon SPECT görüntülemesinde bilinen hipofiz adenomunda Tc-99m HMPAO tutulumu ve sol temporal lobda lüks perfüzyon fenomeni ile uyumlu belirgin artmış Tc-99m HMPAO tutulumu izlendi. Tc-99m MIBI sintigrafisinde hipofizdeki adenomda benzer aktivite tutulumu izlendi. Literatürde hipofiz adenomlarında Tc-99m HMPAO tutulumu iki yayında bildirilmiştir.

**Anahtar Kelimeler:** Hipofiz adenomu, stroke, lüks perfüzyon fenomeni, Tc-99m HMPAO SPECT, Tc-99m MIBI SPECT.

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**P**ituitary macroadenomas are benign epithelial neoplasms composed of adenohypophysial cells. Primary malignant tumors of the pituitary are extremely rare. Patients with pituitary macroadenomas may be asymptomatic or

may present with complaints due to hormonal imbalance or mass effects. Tumors in asymptomatic patients may be detected when imaging the head for unrelated medical conditions. The frequency of diagnosis of pituitary tumors has increased with widespread use of CT and MRI scans. On the other hand pituitary adenomas also can be detected by single photon emission computerized tomography (SPECT) of the brain using Technetium-99m-hexakis-2-methoxy-isobutyl-isonitrile (Tc-99m MIBI),<sup>1,2</sup> Tc-99m penta-valent dimercaptosuccinic

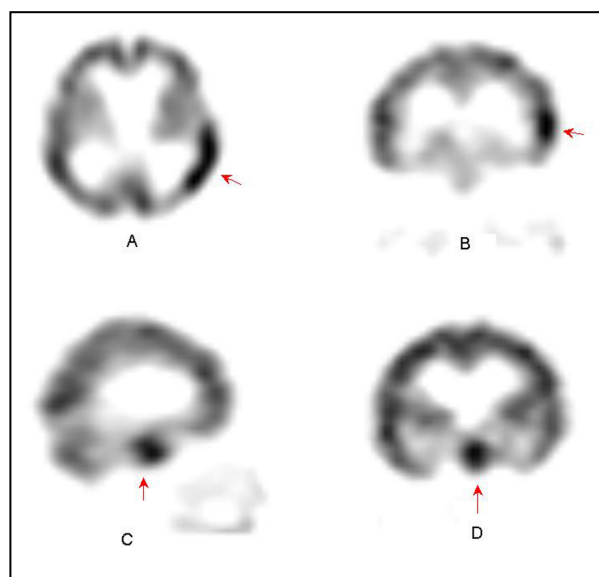
**Yazışma Adresi/Correspondence:** Sevim Süreyya ÇERÇİ, MD  
Suleyman Demirel University,  
School of Medicine,  
Department of Nuclear Medicine, ISPARTA, TURKEY  
sscerci@med.sdu.edu.tr

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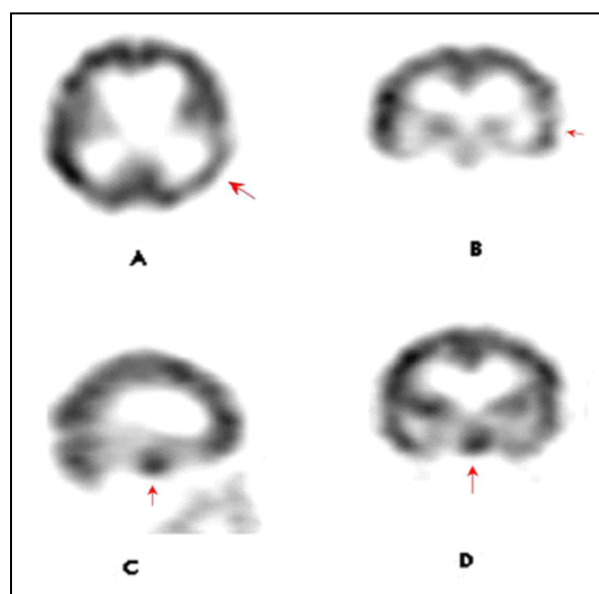
acid (DMSA)<sup>3,4</sup> and somatostatin receptor scintigraphy.<sup>5-7</sup> In this report, we present a case of pituitary macroadenoma visualized with Technetium-99m-hexamethylpropyleneamine oxime (Tc-99m HMPAO) SPECT of the brain.

### Case Report

A 74-year-old man was admitted to our hospital with the complaint of fall and meaningless speech. On neurological examination he was alert but not oriented. He had sensory aphasia. Sensory-motor examinations revealed no lateralizing finding. Serum biochemistry and whole blood count were normal. In the cranial CT that was done in the first day of the symptoms and in the MRI [The MRI system used was a Signa Profile I (0, 2 T; G.E. Medical Systems, Milwaukee, Wisc. USA) with a standard head coil] that was done on the sixth day of the symptoms, no cerebral vascular ischemia or infarct area could be detected but macroadenoma in pituitary gland was determined. As CT and MRI findings did not confirm the cerebrovascular disease, HMPAO SPECT was performed on the 12th day after onset of the symptoms and SPECT of the brain showed significant hyperperfusion in left temporal lobe (luxury perfusion phenomenon) and increased uptake of Tc-99m-HMPAO in pituitary adenoma (Figure 1). Brain perfusion SPECT images were obtained 90 minutes after the intravenous injection of 740 MBq of Tc-99m HMPAO using a double headed gamma camera SPECT system (Siemens E-Cam Variable) combined with high-resolution collimators. Tc-99m-HMPAO SPECT and MR imaging were again performed on the 35th day of the symptoms and in Tc-99m HMPAO SPECT the hyperperfused area in the left temporal lobe was seen as hypoperfused (Figure 2) and in FSEIR (TR: 5800 ms., TE<sub>eff</sub>: 104 ms., TI: 1400, EC:1/1) image of MR a high signal intensity area secondary to ischemia in the same cortical and subcortical region of the temporal lobe (Figure 3). During this period significant improvement was observed in neurological symptoms. On the other hand, Tc-99m MIBI scintigraphy that was performed on the 20th day after onset of the symptoms was also demonstrated similar



**Figure 1.** SPECT scan of the brain, shows increased uptake of Tc-99m-HMPAO in left temporal lobe (luxury perfusion phenomenon) (A-B) and pituitary tumor (C-D).



**Figure 2.** Particularly hypoperfusion in the left temporal lobe on the second SPECT.

activity accumulation in adenoma (Figure 4). Because of normal pituitary hormone levels, pituitary adenoma was thought to be non-functioning.

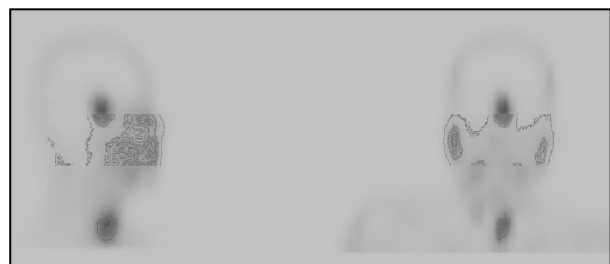
Since the patient did not accept the surgical therapy, histopathological examination could not be performed.



**Figure 3.** Coronal FSEIR image, showed a high signal intensity area secondary to ischemia at cortical and subcortical region of the temporale lobe. T1-weighted axial and T2-weighted sagittal views of magnetic resonance imaging demonstrated a large pituitary tumor. Suprasellar extension is clearly seen on the sagittal view.

### Discussion

Tc-99m-HMPAO, as a lipophilic agent, consists of macrocyclic amine radicals and is the brain perfusion tracer for regional cerebral blood flow with SPECT.<sup>8</sup> HMPAO passes the normal blood-brain barrier freely. It is transformed to hydrophilic form and retained in the cells. This mechanism of HMPAO uptake in the normal brain is proposed to be dependent on glutathione.<sup>9</sup> Tc-99m-HMPAO has



**Figure 4.** MIBI uptake was also observed in pituitary adenoma in Tc-99m MIBI SPECT coronal and sagittal images.

been widely used to evaluate regional cerebral blood flow in cases of brain disease. On the other hand, it has been known that Tc-99m-HMPAO is uncommonly accumulated in the brain tumors. However, some reports of increased accumulation in brain tumors, such as meningioma, glioblastoma multiforme, high-grade astrocytoma, pituitary adenoma, and multiple myeloma, have been published.<sup>10-14</sup> The Tc-99m HMPAO uptake in these tumors has been attributed to tumor blood flow or glutathione contents within the tumor. Suess et al<sup>10</sup> reported that the increased content of glutathione within the tumor may influence the accumulation of Tc-99m HMPAO in brain tumors, especially meningioma and glioma. To our knowledge, however, the glutathione concentration of pituitary adenoma has not been reported. Tc-99m HMPAO uptake in our pituitary adenoma case may be related to both tumor blood flow and glutathione concentration. The mechanism of Tc-99m HMPAO uptake in tumors is not clearly known and is needed to clarify the mechanism of Tc-99m HMPAO accumulation.

Although many studies of brain tumors by means of scintigraphic methods have been reported, there are few studies on pituitary adenomas. Somatostatin receptor scintigraphy in pituitary adenomas is the most common scintigraphic imaging method.<sup>6,7</sup> In-vivo studies yielded very heterogeneous results; with overall sensitivities of scintigraphy for pituitary tumors is between 36%<sup>15</sup> and 86%.<sup>16</sup> In-111-octreotide scintigraphy, in combination with other imaging modalities, is not only useful in the diagnosis but also in the follow-up of pituitary tumors.<sup>5</sup> Tc-99m pentavalent DMSA scintigraphy showed an overall sensitivity of 81% in detecting pituitary adenomas which was increased to 95% for lesions greater than 10 mm in sides.<sup>3</sup> MIBI was found to have a strong affinity for pituitary adenoma but not the normal pituitary gland and Toyoyuki et al. suggest that MIBI SPECT may be useful technique for diagnosis of pituitary adenoma.<sup>1</sup> In our case we viewed the pituitary adenoma with MIBI scintigraphy. Besides these methods, Tc-99m-HMPAO accumulation in pituitary adenoma has also been reported only in two cases in the literature.<sup>13,14</sup>

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