

# Visualization of Ocular Melanoma with N-Isopropyl-p-[<sup>123</sup>I]-Iodoamphetamine

Shimato Ono, Masao Fukunaga, Nobuaki Otsuka, Kiyohisa Nagai, Koichi Morita, Takako Furukawa, Akira Muranaka, Shinichi Yanagimoto, Tatsushi Tomomitsu, Akio Tabuchi, Jun Tsutsui, and Rikushi Morita

*Department of Nuclear Medicine and Ophthalmology, Kawasaki Medical School, Kurashiki, Japan*

In a patient with ocular melanoma, scintigraphy with N-isopropyl-p-[<sup>123</sup>I]-iodoamphetamine (<sup>123</sup>I]IMP) clearly delineated the histologically proven ocular lesion. In a tissue distribution study, using the resected specimen, a significantly high accumulation of the radioactivity was confirmed in tumor tissue. Thus, [<sup>123</sup>I]IMP scintigraphy provided specific localization of an ocular melanoma.

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In recent years, N-isopropyl-p-(<sup>123</sup>I)-iodoamphetamine (<sup>123</sup>I]IMP) has been widely used in cerebral blood perfusion imaging for the evaluation of cerebrovascular diseases, epilepsy, dementia, and other neurologic disorders (1-3). Iodine-123 IMP also distributes in regions of melanin production, and therefore has been used in an attempt to detect malignant melanoma and its metastases (4-5). In the present study, we performed [<sup>123</sup>I]IMP scintigraphy in a patient with ocular melanoma. The ocular tissue, resected surgically, was histologically examined, and the accumulation of [<sup>123</sup>I]IMP in the melanoma tissue was determined in vitro.

### CASE REPORT

A 49-yr-old male was admitted to our hospital because of gradually progressive reduction of visual acuity in the right eye. On x-ray computed tomographic examination, an intra-ocular tumor was demonstrated (Fig. 1). Planar imaging, with total counts of 600 k, was performed by using a low-energy, high resolution collimator and a conventional gamma camera. Scintigraphy obtained at 12 hr after i.v. administration of 3 mCi [<sup>123</sup>I]IMP delineated an area of increased accumulation in the site corresponding to the right eye tumor (Fig. 2). The lesion was obscure at the early image obtained 30 min after administration. Extirpation of the whole right eye ball was done at 30 hr after [<sup>123</sup>I]IMP scintigraphy. A blackish tumor,

8 × 5 × 10 mm, was resected (Fig. 3) and was histologically confirmed to be malignant melanotic melanoma. The resected tumor tissue, retina, conjunctiva, adjacent muscle, and fat tissue were counted by a gamma counter, and significantly high count rate per gram was observed in the tumor tissue (Table 1).

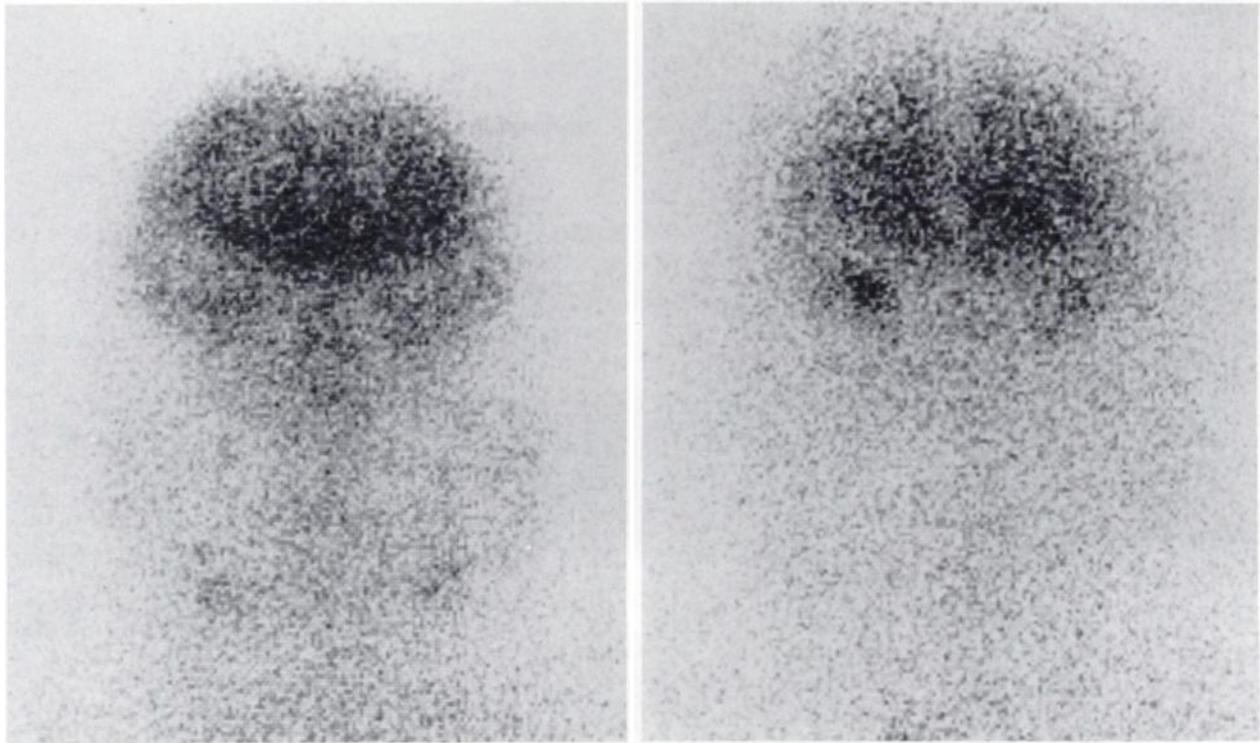
### DISCUSSION

We performed [<sup>123</sup>I]IMP scintigraphy in a patient with malignant ocular melanoma at the pre- and post-operation. The high accumulation of [<sup>123</sup>I]IMP was shown in the tumor.



**FIGURE 1**  
Computed tomographic examination showed high density area in the right eye.

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For reprints contact: Shimato Ono, MD, Dept. of Nuclear Medicine, Kawasaki Medical School, 577 Matsushima, Kurashiki, Japan.



**FIGURE 2**

With [ $^{123}\text{I}$ ]IMP scintigraphy, significantly high accumulation was shown in the right eye region at delayed image (12 hr, right), while no definitely abnormal accumulation was observed at early image (30 min, left).

Although many radiopharmaceuticals such as iodine-125 chloroquine analog, gallium-67 ( $^{67}\text{Ga}$ ) indium-111 citrate, bleomycin, and radiolabeled monoclonal antibody have been applied to the delineation of malignant melanoma, no completely satisfactory results were obtained so far (5-9).

Iodine-123 IMP was first developed as an imaging agent of cerebral blood flow. At present, as the mecha-

nism of the accumulation of [ $^{123}\text{I}$ ]IMP in brain, it is believed to be nonspecific binding of [ $^{123}\text{I}$ ]IMP to amine receptor present in cells (10-11). In monkey and dog experiments, an increased accumulation of [ $^{123}\text{I}$ ]IMP in the newly synthesized melanin particles in the retina was reported (12). However, in humans, melanin synthesis is completed in childhood, and the pigment is not synthesized in adults. Therefore, no increased ac-



**FIGURE 3**

Resected right eye specimen. Blackish portion was indicated for melanoma.

**TABLE 1**  
Count Rates of [<sup>123</sup>I]IMP in Resected Right Eye\*

Tissue	Net cpm per gram	% Injected dose per gram
Tumor	90,032	0.067
Retina	399	0.000
Conjunctiva	514	0.000
Muscle	1,102	0.001
Fat	681	0.001

\* Significantly high percent injected dose per gram was found in tumor tissue.

cumulation of [<sup>123</sup>I]IMP in the adult retina has been reported. In this study, the accumulation of [<sup>123</sup>I]IMP in normal retina was not significantly different from that in other normal tissues examined. On the other hand, [<sup>123</sup>I]IMP scintigraphy was clinically used for the detection of malignant melanoma, as a melanin-producing tumor (4–5). In the present study, as in previous reports, [<sup>123</sup>I]IMP was accumulated in melanoma lesion. The relatively large size of the tumor, its location, and a high tumor/muscle count ratio all account for its visualization. Interestingly, the accumulation of [<sup>123</sup>I]IMP in tumor tissue was apparent not in the early image, but in the delayed image. The initial distribution of [<sup>123</sup>I]IMP is blood flow dependent. In time, there is further uptake of [<sup>123</sup>I]IMP by melanoma and washout from other tissues, leading to a significant improvement of lesions to background ratio. Furthermore, it was reported that metastatic melanoma lesions were better visualized at 18–24 hr (13). Ocular melanoma is frequently difficult to detect in pre-operative diagnosis, and, therefore, specific diagnostic methods are needed. Although x-ray computed tomography or a combination of [<sup>67</sup>Ga]citrate and 4-(dimethyl amino-ethylamino)-7-iodoquinoline were used, diagnostic accuracy was not great enough (14–15). In the case reported here, [<sup>123</sup>I]IMP scintigraphy was useful not only for visualizing ocular melanoma but also for providing a more specific diagnosis.

## REFERENCES

- Hill TC, Holman BL, Lovelt R, et al. Initial experience with SPECT (single-photon emission computerized tomography) of the brain using N-isopropyl-I-123-p-iodoamphetamine: concise communication. *J Nucl Med* 1982; 25:191–195.
- Holman BL, Hill TC, Polak JF, et al. Cerebral perfusion imaging with iodine 123-labeled amines. *Arch Neurol* 1984; 41:1060–1065.
- Moretti J-L, Askienazy S, Raynaud C, et al. N-isopropyl-<sup>123</sup>I-p-iodoamphetamine: an agent for brain imaging with single-photon emission computerized tomography. In: *Functional radionuclide imaging of the brain*. New York: Raven Press, 1983:231–245.
- Wada M, Ichiya Y, Katsuragi M, et al. Scintigraphic visualization of human malignant melanoma with N-isopropyl-p-(I-123)-iodoamphetamine. *Clin Nucl Med* 1985; 10:415–417.
- Liewendahl K, Kairento AL, Pyrhonen S, et al. Localization of melanoma with radiolabelled monoclonal antibody fragments and iodoamphetamine. *Eur J Nucl Med* 1986; 12:359–362.
- Beierwaltes WH, Lieberman LM, Varma VM, et al. Visualizing human malignant melanoma and metastases. Use of chloroquine analog tagged with iodine 125. *JAMA* 1968; 206:97–102.
- Milder MS, Franke RS, Bulkley BG, et al. Gallium-67 scintigraphy in malignant melanoma. *Cancer* 1973; 32:1350–1356.
- Roth JA, Eilber FR, Bennett LR, et al. Radionuclide photocanning. Usefulness in preoperative evaluation of melanoma patients. *Arch Surg* 1975; 110:1211–1212.
- Nelp WB, Eary JF, Jones RF, et al. Preliminary studies of monoclonal antibody lymphoscintigraphy in malignant melanoma. *J Nucl Med* 1987; 28:34–41.
- Winchell HS, Baldwin RM, Lin TH. Development of I-123-labeled amines for brain studies: localization of I-123 iodophenylalkyl amines in rat brain. *J Nucl Med* 1980; 21:940–946.
- Winchell HS, Horst WD, Braun L, et al. N-isopropyl-(<sup>123</sup>I) p-iodoamphetamine: single-pass brain uptake and washout: binding to brain synaptosomes; and localization in dog and monkey brain. *J Nucl Med* 1980; 21:947–952.
- Holman BL, Zimmerman RE, Schapiro JR, et al. Biodistribution and dosimetry of N-isopropyl-p-(<sup>123</sup>I) iodoamphetamine in the primate. *J Nucl Med* 1983; 24:922–931.
- Cohen MB, Saxton RE, Lake RR, et al. Detection of malignant melanoma by imaging with I-123 N-isopropyl p-iodoamphetamine (IMP) [Abstract]. *J Nucl Med* 1987; 28:562.
- Alsbirk KE, Halaburt H. Computerized tomography of malignant melanomas of the choroid. *Acta Ophthalmol* 1983; 61:1087–1098.
- van Langevelde A, Bakker CNM, Boer H, et al. Potential radiopharmaceuticals for the detection of ocular melanoma. Part II. Iodoquinoline derivatives and <sup>67</sup>Ga-citrate. *Eur J Nucl Med* 1986; 12:96–104.