

## Visualization of uveal amelanotic melanoma with technetium-99m(V) dimercaptosuccinic acid

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The possibility of using technetium-99m(V) dimercaptosuccinic acid, Tc-99m DMSA, in the evaluation of uveal amelanotic melanoma was assessed in this study. Both planar and SPECT images clearly demonstrated the tumor. Following confirmation of our results by contemporaneous ultrasonography and MRI the patient was treated with Iodine-125 brachytherapy. In combination with other diagnostic tests, Tc-99m(V) DMSA scintigraphy may play a role in the detection of uveal melanoma and its possible systemic metastases.

**Key words:** uveal amelanotic melanoma, Tc-99m(V) DMSA, MRI

### INTRODUCTION

UVEAL MELANOMA is the most common primary intraocular malignant tumor in the adult.<sup>1,2</sup> Occasionally the diagnosis of the tumor may not be straightforward when obtained by the available clinical tools and imaging techniques. Although many radiopharmaceuticals such as iodine-125 chloroquinoline analog, gallium-67 and indium-111 citrate and bleomycin were studied, no satisfactory results have so far been obtained.<sup>3-7</sup> This preliminary study was undertaken to determine the diagnostic potential of Tc-99m(V) DMSA in a patient with primary intraocular uveal melanoma and its possible metastases.

### CASE REPORT

A 31-year-old otherwise healthy male patient presented complaining of gradual painless loss of vision in his right eye for the previous two months. His best corrected visual acuity was 20/80 in the right eye and 20/20 in the left eye. Fundoscopic examination showed an amelanotic choroidal mass in the temporal quadrant of the right eye with

surrounding extensive exudative retinal detachment. The non-pigmented lesion measured 15 × 13 × 10 mm. B mode ocular ultrasonography (USG) showed a dome shaped choroidal mass which had low internal reflectivity on A mode, suggesting uveal melanoma. A complete systemic work-up including thoracic and abdominal computed tomography, liver and renal ultrasonography, urologic and dermatologic examinations were unremarkable.

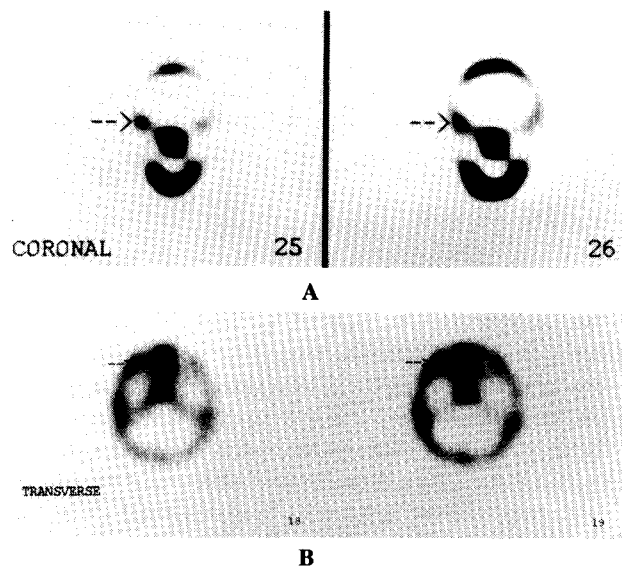
Following administration of 740 MBq of Tc-99m(V) DMSA prepared by previously published methods,<sup>8</sup> planar and SPECT imaging were performed at 3 hours with a low energy all purpose collimator and a dual head gamma camera (ADAC-Genesys). Planar images demonstrated uptake in the superolateral aspect of the right eye (Fig. 1), whereas SPECT images, both coronal and transverse slices, showed significant uptake in the corresponding region (Fig. 2A and B). The tumor to background ratio was 1.48. T1 weighted (T1W) magnetic resonance imaging (MRI) scans demonstrated that the mass was distinctly hyperintense compared to the vitreous (Fig. 3). On T2W MRI scans, the tumor was slightly hypointense with respect to the vitreous. There was no extraocular extension of the tumor and the patient was treated by iodine-125 plaque brachytherapy. Approximately 100 Gy radiation was given to the apex of the tumor. The height of the tumor, measured ultrasonographically, showed a remarkable regression from 10 mm to 2.5 mm in the following eight months, and subsequently remained stable with no recurrence. The extensive exudative retinal detachment

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**Fig. 1** Anterior planar image obtained with Tc-99m(V) DMSA at 3 hr post-injection demonstrates increased accumulation of the tracer in the superolateral aspect of the right eye (arrow).



**Fig. 2** A: Coronal slices obtained in the SPECT study with Tc-99m(V) DMSA show intense uptake by the tumor in the right eye. B: Transaxial images obtained with corresponding planes as MRI showing increased uptake of radioactivity in the SPECT study (arrow).

disappeared completely and his best corrected vision is 20/30 in the right eye.

## DISCUSSION

Uveal melanoma is the most commonly diagnosed primary intraocular malignancy in the adult population,<sup>1</sup> but on rare occasions, a number of benign and malignant simulating lesions as well as many clinical variations of the posterior uveal melanoma itself may sometimes pose difficulties to the clinician in the ophthalmoscopic diagnosis. In certain patients, media opacities such as cataracts may further complicate the case by precluding the visual-



**Fig. 3** Axial T1W orbital MRI scan showing an intraocular choroidal mass which is homogeneously hyperintense with respect to the vitreous, in the right eye.

ization of the ocular fundus. In our patient, the tumor was somewhat atypical because of its amelanotic appearance and the presence of turbid sanguineous subretinal fluid which partially obscured the base of the tumor. In such circumstances some selected ancillary diagnostic methods including ocular USG, transillumination, intravenous fluorescein angiography, MRI scans and radioactive phosphorus uptake tests may provide important information about the lesion under study.<sup>1</sup>

Scintigraphic demonstration of ocular tumors has been a challenge since 1952 starting with P-32.<sup>2</sup> Other radiopharmaceuticals, such as radioiodinated quinoline derivatives showing melanin affinity, radioiodinated melanin precursors such as thiouracil, N-isopropyl-p-(I-123)-iodoamphetamine (I-123 IMP) which is incorporated into melanin producing melanocytes, and non-specific Ga-67 citrate have all been evaluated and found to be of limited use in routine application.<sup>2-6</sup> Radioimmunodetection of ocular melanoma with murine cutaneous anti-melanoma antibodies (AMab) has also been tested and found to be more effective with SPECT imaging,<sup>7,9-12</sup> but the high cost, prolonged blood clearance, and high radiation dose absorbed by the liver, spleen and bone marrow are factors limiting its widespread use.

A new tumor detecting agent pentavalent Tc-99m dimercaptosuccinic acid has been developed by Yokoyama et al.<sup>13</sup> Many studies have reported Tc-99m(V) DMSA accumulation in a variety of soft tissue and bone tumors, head and neck tumors, medullary carcinoma of the thyroid and lung cancer.<sup>13-16</sup> Despite the fact that many radiopharmaceuticals have been proposed for scintigraphic detection of uveal melanoma, no satisfactory results have been obtained. In the present study the uptake of Tc-99m(V) DMSA by uveal amelanotic melanoma was clearly demonstrated.

Although the mechanism of uptake of Tc-99m(V) DMSA is not clearly understood, Ohta et al.<sup>14</sup> have postulated that pentavalent Tc-99m(V) DMSA resembles the

phosphate ion and suggested that it accumulates in tumors by a mechanism similar to that for phosphate.

Tc-99m(V) DMSA has the advantage of low cost in house preparation from chemicals or cold kits obtained from commercial suppliers. It is a promising agent in the detection of posterior uveal melanoma as an adjunct test when the diagnosis can still be vague by other means. It may also be of potential value in the evaluation of tumor response to eye sparing conservative treatment methods including radioactive plaque brachytherapy where future research needs to be directed.

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