

---

# Technetium-99m (V) DMSA Uptake in Amyloidosis

Hitoya Ohta, Keigo Endo, Tadashi Kanoh, Junji Konishi, and Hajime Kotoura

*Department of Nuclear Medicine, and Internal Medicine, Kyoto University School of Medicine, and Wakayama Red Cross Hospital, Kyoto, Japan*

Technetium-99m(V) DMSA scintigraphy was performed in two patients with pathologically confirmed amyloidosis associated with plasmacytoma. Significant uptake of the tracer was found in the deposition of amyloid. Technetium-99m(V) DMSA scintigraphy could be useful in determining the appropriate region of biopsy and in forecasting the prognosis of patient with plasmacytoma.

J Nucl Med 30:2049-2052, 1989

---

**A**myloidosis is a group of diseases characterized by the deposition in one or more organs of one of several proteinaceous materials known as amyloid. The diagnosis is established by the demonstration of amyloid in appropriate tissue specimens. We have previously reported the usefulness of technetium-99m(V) dimercaptosuccinic acid ( $^{99m}\text{Tc(V)}\text{DMSA}$ ) in the evaluation of medullary thyroid carcinoma in which amyloid is present (1). In the search for a diagnostic method to provide a positive image,  $^{99m}\text{Tc}$ -tagged phosphate (2-4), Gallium-67 citrate (5) and iodine-123- ( $^{123}\text{I}$ ) labeled human serum amyloid P component (SAP) (6) have been tried. In our concern for further diagnostic exploration of amyloidosis, scintigraphic studies were performed in two patients using  $^{99m}\text{Tc(V)}\text{DMSA}$ .

## PATIENTS AND METHODS

Studies were performed on two patients with histologically proven amyloidosis associated with plasmacytoma. Technetium-99m (V) DMSA were prepared as already reported (1). Purity of  $^{99m}\text{Tc(V)}\text{DMSA}$  was analyzed by thin layer chromatography, and no free pertechnetate or other  $^{99m}\text{Tc}$  derivative were detected. Technetium-99m (V) DMSA imaging was performed at 2 hr after 10 mCi i.v. injection. Single photon emission computed tomography (SPECT) was performed with 64 different views over 360° and 15 sec, each view for a 5.6-degree rotation of the gamma camera with no attenuation correction. Computed tomography (CT) was performed 6 days after scans.

---

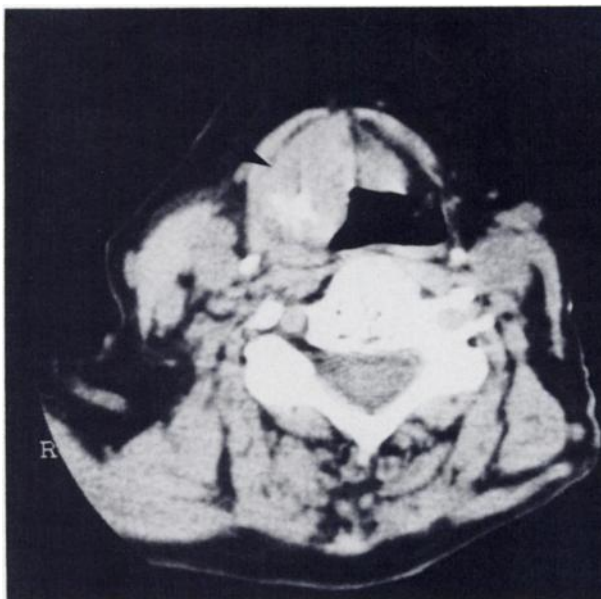
Received Apr. 3, 1989; revision accepted Aug. 17, 1989.

For reprints contact: Keigo Endo 075-751-3761 (JAPAN), Dept. of Nuclear Medicine, Kyoto University Hospital, 54 Shogoin Kawaharacho, Sakyo-ku, Kyoto 606 Japan.

## CASE REPORTS

### Case 1

An 82-yr-old female was admitted to our hospital with hoarseness and dysphagia. At age 79 yr, left parotidectomy with subsequent x-ray therapy was performed for plasmacytoma. Bone marrow aspiration and rectal biopsy were negative for amyloid. On this admission, neck CT scans (Fig. 1) and laryngoscopy (Fig. 2) revealed a tumor of her larynx. Technetium-99m (V) DMSA scan showed accumulation in the tumor (Fig. 3). SPECT demonstrated  $^{99m}\text{Tc(V)}\text{DMSA}$  accumulation in concordance with the area revealed by CT (Fig.



**FIGURE 1**  
Neck CT scan showed laryngeal tumor with calcification (arrow).



**FIGURE 2**  
Laryngoscopy revealed a tumor with capillary dilatation near the right arytenoid cartilage (arrow).

4). Biopsy of the tumor revealed the deposition of amyloid (Fig. 5).

#### Case 2

A 72-yr-old female was admitted to our hospital with bilateral cheek swelling, nasal obstruction, and epiphora. At age 68 yr, she received chemotherapy using alkeran, vincristine, and prednisolone for plasmacytoma of the paranasal cavity. She achieved complete remission. However, on this admission, CT and [<sup>99m</sup>Tc(V)]DMSA scans showed tumors in bilateral maxillary sinus and ethmoid sinus (Fig. 6, 7). Biopsy of the tumor revealed the deposition of amyloid.

#### DISCUSSION

Amyloidosis is suspected on the basis of various symptoms and signs, but can be diagnosed certainly only by biopsy. And to know whether amyloidosis is

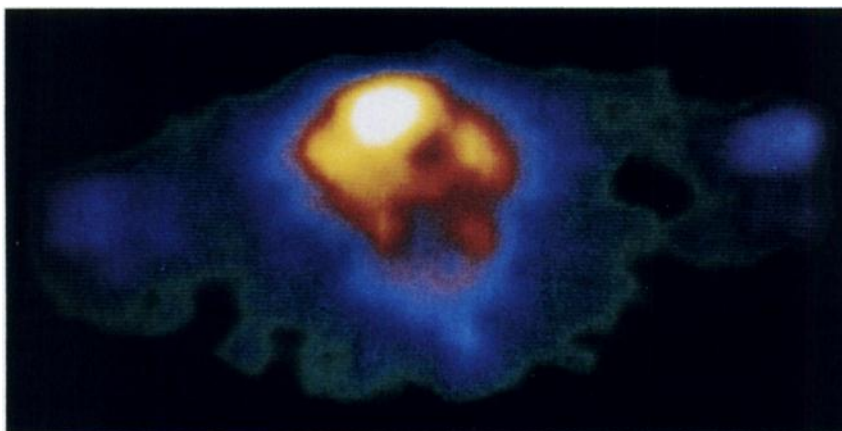


**FIGURE 3**  
[<sup>99m</sup>Tc(V)]DMSA scan showed clear accumulation to the laryngeal tumor (arrow).

present or not is very important in patients with plasmacytoma since the prognosis is very different (7). The present study demonstrated the localization of [<sup>99m</sup>Tc(V)]DMSA in amyloidosis associated with plasmacytoma.

In the radionuclide imaging of amyloidosis, <sup>123</sup>I-labeled SAP is reported to be specific, although the preparation is technically intricate (6). The accumulation of <sup>99m</sup>Tc-tagged phosphate or [<sup>67</sup>Ga]citrate is nonspecific.

Previously we have reported the localization of [<sup>99m</sup>Tc(V)]DMSA selectively in medullary thyroid carcinoma and not in other type of thyroid cancers (1). Although the uptake mechanism of [<sup>99m</sup>Tc(V)]DMSA



**FIGURE 4**  
SPECT image of [<sup>99m</sup>Tc(V)]DMSA demonstrated strong accumulation in the same area that CT image showed.



**FIGURE 5**  
Tumor biopsy stained with Congo red and observed with a polarizing microscope showed amyloid deposition.

in medullary thyroid carcinoma is still unknown, amyloid deposition is a conspicuous feature of medullary thyroid carcinoma. [ $^{99m}\text{Tc}(\text{V})$ ]DMSA accumulation is also recognized in soft-tissue tumors, bone tumors, and head and neck tumors (8).

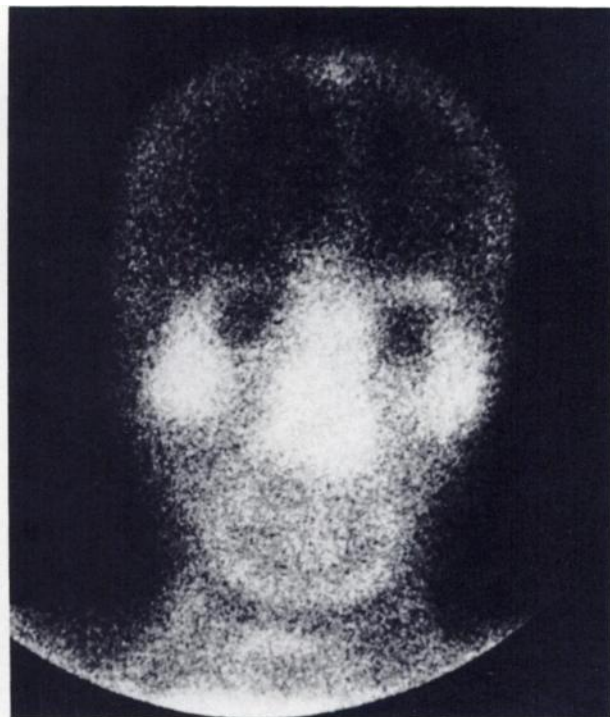
The accumulation of [ $^{99m}\text{Tc}(\text{V})$ ]DMSA in amyloidosis is nonspecific. Also the detection of amyloid localized in liver, heart, and kidney which are commonly involved may be hindered by high background

radioactivity (8). Thus the effectiveness of [ $^{99m}\text{Tc}(\text{V})$ ]DMSA in detecting amyloidosis may be limited. But [ $^{99m}\text{Tc}(\text{V})$ ]DMSA scintigraphy could be useful in determining the appropriate region of biopsy and in forecasting the prognosis of patients with plasmacytoma.

Biochemical studies have revealed distinct classes of amyloid proteins. In this paper only one type termed AL, which is seen in patients with primary amyloidosis



**FIGURE 6**  
CT scan showed tumors in bilateral maxillary sinus and ethmoid sinus.



**FIGURE 7**  
[ $^{99m}\text{Tc}(\text{V})$ ]DMSA scan showed clear accumulation in regions concordant with tumors.

and that associated with multiple myeloma, was discussed. We have no data demonstrating whether [ $^{99m}\text{Tc}(\text{V})$ ]DMSA accumulates in other forms of amyloid. Further work is indicated to evaluate the clinical usefulness of [ $^{99m}\text{Tc}(\text{V})$ ]DMSA in patients with amyloidosis.

#### ACKNOWLEDGMENTS

The authors thank Daiich Radioisotope Laboratories (Tokyo, Japan), Atsuko Ohta, Masako Ohta, Mio Ohta, Kunihiro Tsuno, and Haruo Anzai for their valuable assistance.

#### REFERENCES

1. Ohta H, Yamamoto K, Endo K. A new imaging agent for medullary carcinoma of the thyroid. *J Nucl Med* 1984; 25:323-325.
2. Kula RW, Engel WK, Line BR. Scanning for soft-tissue amyloid. *Lancet* 1977; 1:92-93.
3. Yood RA, Skinner M, Cohen AS. Soft tissue uptake of bone seeking radionuclide in amyloidosis. *J Rheumatol* 1981; 8:760-766.
4. Lee KJ, Southee MAE, Morris MJG. Extensive soft tissue uptake of bone tracer in amyloidosis. *Clin Nucl Med* 1988; 13:675-676.
5. Bekerman C, Vyas MI. Renal localization of  $^{67}\text{Ga}$ -citrate in renal amyloidosis: case reports. *J Nucl Med* 1976; 17:899-901.
6. Hawkins PN, Myers MJ, Lavender JP. Diagnostic radionuclide imaging of amyloid: biological targeting by circulating human serum amyloid P component. *Lancet* 1988; 6:1413-1418.
7. Buxbaum JN. The amyloid disease. In: Wyngaarden JB, Smith LH, eds. *Cecil textbook of medicine*. 17th edition. Tokyo: Igaku-Shoin/Saunders, 1985; 1168-1172.
8. Ohta H, Endo K, Fujita T. Clinical evaluation of tumour imaging using  $^{99m}\text{Tc}(\text{V})^{\text{m}}$  dimercaptosuccinic acid, a new tumor-seeking agent. *Nucl Med Commun* 1988; 9:105-116.