Gallium-67-Citrate Scanning in Patients with Sarcoid Uveitis

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Gallium-67-citrate is useful for characterizing activity in patients with sarcoidosis. Gallium-67 uptake in bilateral symmetrical hilar lymphadenopathy and/or symmetrical salivary glands is typical of this clinical entity. Sarcoidosis is a systemic disease, and uveitis is considered the hallmark of ophthalmic sarcoidosis. We present two cases of ophthalmic sarcoidosis that shows uveal accumulation of ^{67}Ga-citrate associated with clinical symptoms.

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CASE REPORT

Case 1

A 63-yr-old asian female was admitted to our hospital due to visual disturbance of her right eye. She had lost visual sense of her left eye 30 yr before. Her serum angiotensin-converting enzyme (ACE) and lysozyme were elevated.

Active posterior uveitis was observed, and bilateral hilar lymphadenopathy was remarkable on chest roentgenography. Conjunctivitis was not seen. Computed tomography of the thorax revealed peribronchovascular interstitial shadows with marked hilar and mediastinal lymphadenopathy. Hepatosplenomegaly was detected by ultrasonography. OKT 4/8 was elevated in the specimen of bronchoalveolar lavage. Noncaseating epithelioid cell granuloma was revealed histologically by transbronchial lung biopsy.

Before steroid therapy, ^{67}Ga scintigraphy was done (Fig.1). In addition to the hilar and mediastinal uptake, circular accumulation in the eyes was seen.

On steroid therapy, the ophthalmic symptoms disappeared and the posterior uveitis healed. Repeat gallium scanning did not show the previous ocular accumulation. The mediastinal uptake decreased in intensity.

Case 2

A 55-yr-old asian female had been medicated for three years for anterior uveitis associated with sarcoidosis. Mediastinal and hilar lymphadenopathy and pulmonary interstitial shadow had been observed on chest CT. The diagnosis of sarcoidosis was established by lung biopsy. The anterior uveitis was controlled by corticosteroid instillation therapy. Gallium scintigraphy in this phase showed bilateral symmetrical hilar accumulation and panda appearance (lacrimal and parotid gland uptake) (Fig. 2).

The patient complained of recurrent visual disturbance about 6 mo later. Ophthalmoscopic examination revealed papilledema and opacity of the vitreous, posterior uveitis. Fluorescein angiogram of the optic disk showed late hyperfluorescence. Gallium scintigraphy was done before intensive oral administrated corticosteroid therapy (Fig. 3). Circular accumulation of gallium in the region of the orbits was seen. On magnetic resonance imaging, no other abnormal findings were seen in the intraorbital extraocular region.

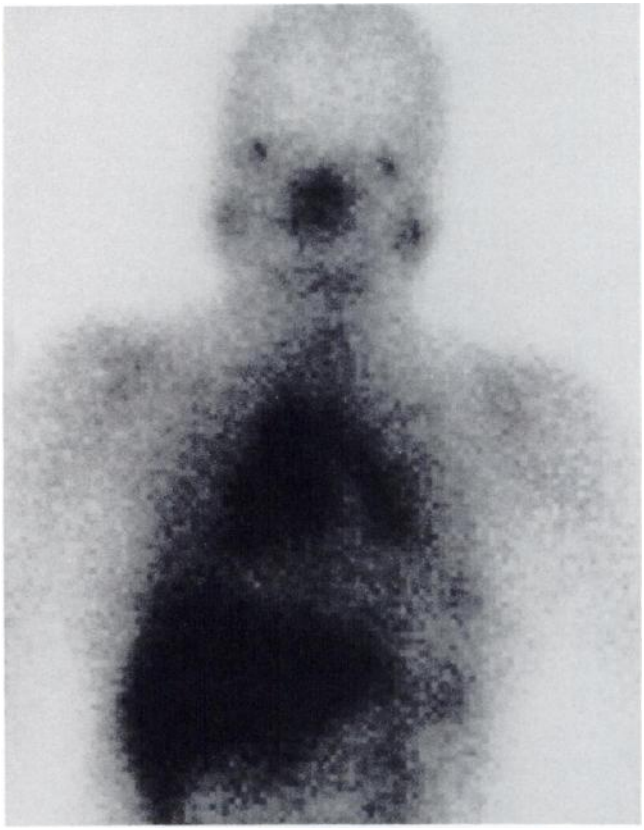

FIGURE 1. The anterior view of the upper body was acquired 74 hr after venous injection of 111 MBq of ^{67}Ga-citrate. Jagged circular accumulations of isotopes in both eyes were apparent in the status prior to steroid therapy. In addition, intrathoracic lymph node gallium uptake (so-called lambda sign) and bilateral symmetrical salivary glands' uptakes were demonstrated.

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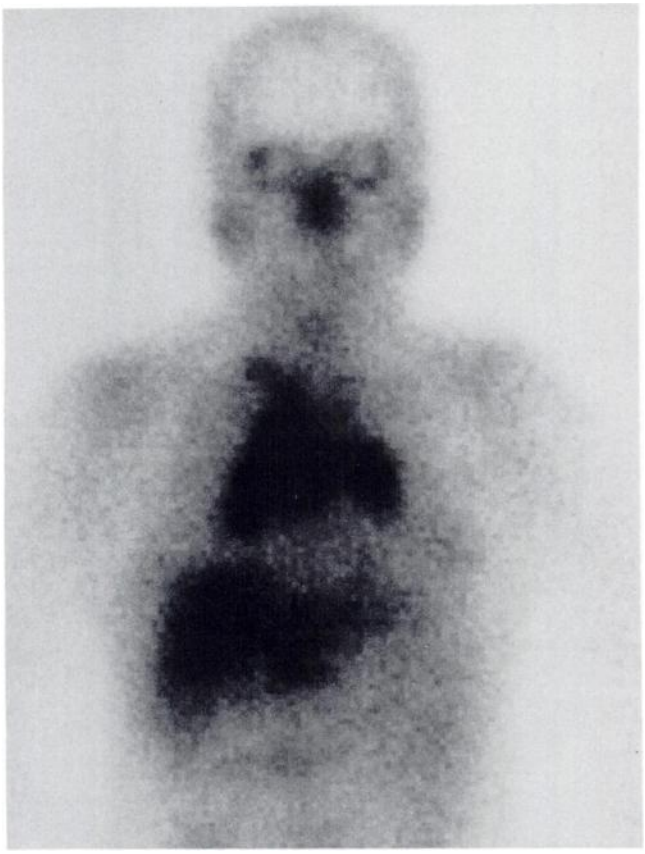

FIGURE 2. Uveitis was in control by corticosteroid instillation in this period. Gallium scintigraphy in this phase showed lambda sign and panda appearance. No accumulation is visualized in the eyes.

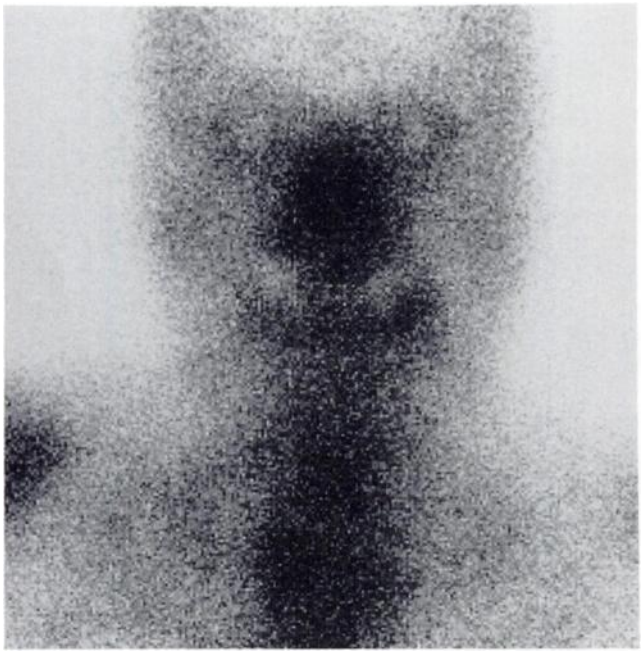

FIGURE 3. A follow-up gallium scan was taken when the uveitis became worse. Circular accumulations in both eyes were similar to the former case.

DISCUSSION

Sarcoidosis is a multisystem disease of unknown etiology, previously defined according to clinical and histologic criteria. Noncaseating epithelioid cell granuloma is the histological characteristic.

The mechanism of ^{67}Ga uptake to the sarcoid lesion is thought to be related to activated T- and B-lymphocytes and macrophages as opposed to epithelioid cells, which produce an excess of ACE, another important marker in the clinical evaluation of sarcoidosis (*1,2*).

This clinical entity often presents with bilateral hilar lymphadenopathy, pulmonary infiltration, and other lesions. Added to the characteristic immunological findings and bronchoalveolar lavage, ^{67}Ga-citrate scanning is one of the least invasive diagnostic procedure to access the activity of sarcoidosis.

Gallium uptake is not specific for sarcoidosis. However, the simultaneous presence of an intense accumulation of gallium in the lacrimal and parotid areas together with increased pulmonary and mediastinal uptake is very suggestive of sarcoidosis (*3–5*). Accumulation in the spleen, liver, skin, bone, skeletal muscle, myocardium and nasopharyngeal region also may occur (*6,7*).

Except for lacrimal gland enlargement, orbital involvement is rare (*8*). The eyes are affected only in one-fourth of cases (*9*), and the majority of the lesions are asymptomatic, requiring appropriate examination techniques to be detected (*10*).

Ophthalmic changes detected in patients with sarcoidosis are variable. Uveitis is considered the hallmark of ophthalmic sarcoidosis. In gallium scintigraphy, elevated accumulation to the lacrimal glands is often seen (*11*).

In the two cases that we reported, ocular accumulation was seen in association with ophthalmic finding and medication. When the ophthalmic changes were limited to the anterior uvea, abnormal ring-shaped accumulation was not seen. However, when the posterior uveitis was present, a circular region of uptake around the orbit was seen. The ring-shaped uptake is presumed to be in the sarcoid choroiditis. Intraorbital extraocular sarcoid was not present on magnetic resonance imaging (*8*).

REFERENCES

1. Rohatgi PK, Kuzmowych TV. Assessment of activity in chronic sarcoidosis: usefulness of serum angiotensin converting enzyme and gallium scan. *Respiration* 1986;49:140–146.
2. Savolaine ER, Schlembach PJ. Gallium scan diagnosis of sarcoidosis in the presence of equivocal radiographic and CT findings: value of lacrimal gland biopsy. *Clin Nucl Med* 1990;15:198–199.
3. Karma A, Poukkula A, Ruokonen A. Gallium-67 citrate scanning in patients with lacrimal gland and conjunctival sarcoidosis—a report on three cases. *Acta Ophthalmol Copenh* 1984;62:549–555.
4. Savolaine ER, Schlembach PJ. Gallium scan diagnosis of sarcoidosis in the presence of equivocal radiographic and CT findings: value of lacrimal gland biopsy. *Clin Nucl Med* 1990;15:198–199.
5. Sulavik SB, Spencer RP, Weed DA, Shapiro HR, Shiue S, Castriotta RJ. Recognition of distinctive patterns of gallium-67 distribution in sarcoidosis. *J Nucl Med* 1990;31:1909–1914.

6. Rohatgi PK, Singh R, Veiras F. Extrapulmonary localization of gallium in sarcoidosis. *Clin Nucl Med* 1987;12:9–16.
7. Sulavik SB, Palestro CJ, Spencer RP, Swyer AJ, Goldsmith SJ, Tierstein AS. Extrapulmonary sites of radiogallium accumulation in sarcoidosis. *Clin Nucl Med* 1990;15:876–878.
8. Imes RK, Riefschneider JS, O'Connor LE. Systemic sarcoidosis presenting initially with bilateral orbital and upper lid masses. *Ann Ophthalmol* 1988; 20:466–469.
9. Weinreb RN, Tessler H. Laboratory diagnosis of ophthalmic sarcoidosis. *Surv Ophthalmol* 1984;28:653–664.
10. Angi MR, Cipriani A, Chilosi M, Ossi E, Semenzato G. Asymptomatic ocular sarcoidosis. *Sarcoidosis* 1985;2:124–134.
11. Karma A, Poukkula A, Ruokonen A. Assessment of activity of ocular sarcoidosis by gallium scanning. *Br J Ophthalmol* 1987;71:361–367.

(continued from page 1835)

SELF-STUDY TEST
Gastrointestinal Nuclear Medicine
ANSWERS

blood cell, the stannous ion (Sn^{2+}) reduces it, and the reduced technetium species binds to hemoglobin. Once bound, it remains intracellular. If any stannous ion is present outside the red blood cell, any free extracellular pertechnetate will be reduced. This free reduced technetium will degrade the images (increased background activity and increased urinary excretion).

The in vitro method provides the optimal red blood cell labeling, because of its uniformly high labeling efficiency. The most recent modification of the in vitro method uses whole blood and does not require centrifugation or the removal of blood into multiple sterile containers. The Brookhaven-modified red blood cell labeling kit achieves high labeling efficiency by stopping the premature extracellular reduction of ^{99m}Tc pertechnetate. By the addition of an oxidizing agent (sodium hypochlorite), which cannot pass through the red blood cell membrane, extracellular stannous ion is oxidized to stannic ion (Sn^{4+}). This prevents extracellular reduction of pertechnetate ion.

The modified in vivo ("in vivtro") technique of red blood cell labeling has been developed as a compromise between the in vivo method and the original in vitro method (which required a long incubation period, multiple handling steps, and written patient consent, because of its investigational status). When the "in vivtro" technique is used, heparin is often used as the anticoagulant. Unfortunately, ^{99m}Tc heparin complexes can be excreted in the urine and accumulated in the bladder. For this reason, some investigators recommend that ACD solution be used as the anticoagulant, which yields a slightly higher labeling efficiency and reduced urinary activity.

References

1. Porter WC, Dees SM, Freitas JE, Dworkin HJ. Acid-citrate-dextrose compared with heparin in the preparation of in vivo/in vitro technetium-99m red blood cells. *J Nucl Med* 1983;24:383–387.
2. Srivastava SC, Chervu LR. Radionuclide-labeled red blood cells: current status and future prospects. *Semin Nucl Med* 1984;14:68–82.

For further in-depth information, refer to the syllabus pages in Nuclear Medicine Self-Study I.