

Unilateral Orbital Uptake on Ga-67 Scintigraphy

Jabour Khoury, Suheil Nassralla, Norman Loberant, and Jacqueline Jerushalmi

INCREASED ORBITAL uptake of Ga-67 citrate may be a unilateral or bilateral finding. Although bilateral uptake may indicate the presence of an inflammatory process, it is a fairly common incidental finding and usually is of no clinical significance. However, unilateral uptake of gallium generally indicates a focal process, such as granuloma or tumor, and demands further investigation.

CASE REPORT

An 82-year-old woman was admitted to our hospital for evaluation of a mass in the right orbit of 4 months duration. She had no ocular symptoms, fever, sweating, or weight loss. On physical examination, a 4-cm mass was palpated in the soft tissue of the right orbit. No lymphadenopathy or organomegaly were detected. Gallium scan showed increased tracer uptake in the right orbit and in both parahilar regions (Fig 1). Computerized tomography showed a 3-cm mass in the lateral aspect of the right orbit that extended to the retrobulbar region. No hilar adenopathy was demonstrated. Biopsy of the mass confirmed the diagnosis of diffuse large cell non-Hodgkin lymphoma.

The patient was treated with chemotherapy, and a follow-up gallium scan, which was performed after 2 courses of cyclophosphamide, doxorubicin, vincristine and prednisone (CHOP) chemotherapy, showed disappearance of the right orbital uptake. However, the bilateral parahilar uptake persisted and most likely represented benign uptake (Fig 2). The patient completed 6 courses of CHOP and had complete response.

DISCUSSION

When we consider the possible causes of pathologic uptake in the orbit, we must differentiate between unilateral and bilateral uptake. Sarcoidosis, Sjögren syndrome, and radiation effect account for the major causes of pathologic bilateral uptake.^{1,2} In these conditions, gallium scan can play an important role in the assessment of disease activity and monitoring response to treatment.^{3,4} In some cases, bilateral orbital uptake of gallium was the only presentation of

a systemic disease.⁵⁻⁸ Symmetric orbital uptake of gallium may be a physiologic finding and is frequently encountered in young, healthy individuals and in patients with no ocular pathology, who were studied with gallium for an unrelated condition. Therefore, this pattern is relatively common and nonspecific. In general, this finding needs no further work-up.

Unilateral uptake, as opposed to bilateral uptake, in the majority of the cases, represents focal disease, such as an inflammatory process or tumor, and requires further evaluation. Various attempts have been made to use uptake ratios (left versus right and orbit versus background) to differentiate between physiologic and pathologic conditions, and to differentiate among the various pathologic conditions that involve the orbit.^{9,10} However, these attempts have thus failed to show any benefit.

Of the orbital tumors, about 80% of malignant neoplasms and 20% of benign neoplasms show gallium uptake.¹⁰ Using single photon emission computerized tomography (SPECT), gallium scan was true positive in 76% of the malignant tumors and true negative in 68% of the benign lesions.¹¹ None of the orbital cavernous hemangiomas studied have shown gallium uptake.¹⁰ Accordingly, a unilateral orbital mass that accumulates gallium can suggest malignancy with a high probability and dictates the need for further evaluation with other imaging modalities or direct pathologic examination. The reported case shows that gallium scan was useful in the diagnosis and in the assessment of response to treatment of orbital lymphoma.

Gallium scan has also been useful for indicating transformation of benign to malignant orbital lesion in

From the Departments of Nuclear Medicine, Oncology, and Radiology, Western Galilee Hospital, Nahariya, Israel.

Address reprint requests to Dr. J. Khoury, Department of Nuclear Medicine, Western Galilee Hospital, PO Box 21, Nahariya 22,100 Israel. E-mail: jkhoury@netvision.net.il

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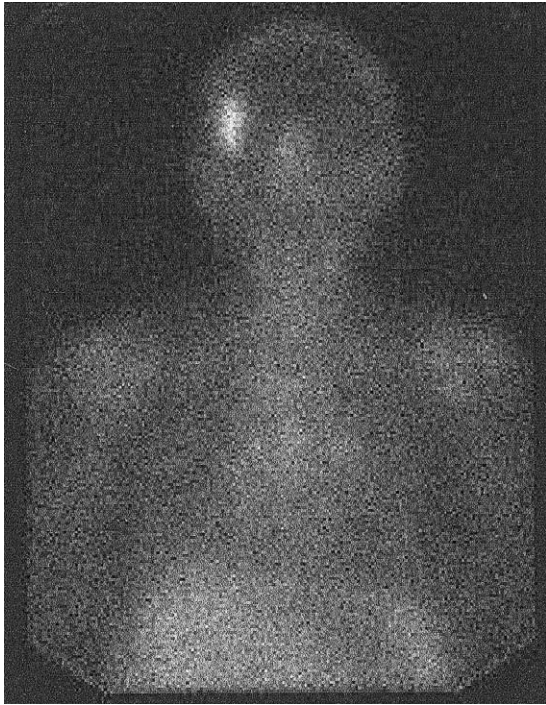


Fig 1. A 48-hour gallium scan shows increased tracer uptake in the right orbital region. Increased uptake is noted also in the parahilar region bilaterally.



Fig 2. A follow-up gallium scan performed at the completion of 2 courses of chemotherapy shows resolution of the increased uptake in the right orbit and persistent activity in both parahilar regions. A chest computerized tomography was normal at baseline and at follow-up.

Table 1. Causes of Unilateral Orbital Uptake of Gallium

Unilateral increase orbital uptake
<u>Common</u>
Lymphoma (primary or secondary involvement) ^{11,16,17}
Melanoma ^{11,18}
Sarcoidosis ^{5,6}
<u>Uncommon</u>
<u>Benign tumor</u>
Meningioma ^{10,16,19,20}
Optic glioma ¹⁰
Mixed tumor of the lacrimal gland ¹⁰
Osteochondroma ¹⁰
<u>Malignant tumor-primary</u>
Retinoblastoma (orbital extension) ¹⁰
Anaplastic cancer of the ethmoid sinus ¹⁰
Adenocystic cancer of lacrimal gland ^{10,21}
Paranasal cancer ¹⁰
Mesenchymal sarcoma ¹⁰
<u>Malignant tumor-metastasis</u>
Adenocarcinoma (lung, breast, prostate) ^{10,22,23}
Neuroblastoma ^{10,23}
Metastatic lymphoma to the eye muscle ²⁴
<u>Rare</u>
Chronic dacryoadenitis ¹⁰
Wegener granulomatosis ¹⁰
Tuberculosis ⁷
Foreign body granuloma of the lacrimal gland ¹⁰
Epidermal cyst ¹⁰
Septic cavernous sinus thrombosis ²⁵
Ectopic lacrimal gland ²⁶
Orbital pseudotumor ²⁷
Klebsiella endophthalmitis ²⁸
Endocrine ophthalmopathy ¹⁶
Acquired immunodeficiency syndrome ¹

one case.¹² In other cases, computerized tomography and magnetic resonance imaging did not clearly demarcate lymphoma tissue from adjacent orbital structures.^{13,14} Ga-67 scintigraphy may have a unique role in orbital lymphoma, both in diagnosis and in evaluating response to chemotherapy and radiation therapy.¹⁵ Ga-67 scintigraphy is a useful modality for clarifying the nature of residual mass and in differentiation of viable tumor tissue from fibrosis at the completion of therapy. In addition, the performance of whole body imaging gallium scan with SPECT, could be useful for identifying peripheral lymph nodes easily accessible for biopsy, avoiding the performance of unnecessary orbitotomy. The gallium scan can also be helpful for discovering orbital involvement in a patient with known lymphoma. Table 1 shows an updated list of the causes of unilateral orbital uptake of gallium.

REFERENCES

1. Sulavik SB, Spencer RP, Castriotta RJ: Panda sign—avid and symmetric radiogallium accumulation in the lacrimal and parotid glands. *Semin Nucl Med* 21:339-340, 1991
2. Sulavik SB, Spencer RP, Weed DA, et al: Recognition of distinctive patterns of Gallium-67 distribution in sarcoidosis. *J Nucl Med* 31:1909-1914, 1990
3. Alavi A, Palevsky HI: Gallium-67-citrate scanning in the assessment of disease activity in sarcoidosis clinical conference. *J Nucl Med* 33:751-755, 1992
4. Israel HL, Gushue GF, Park CH: Assessment of gallium-67 scanning in pulmonary and extrapulmonary sarcoidosis. *Ann N Y Acad Sci* 456:418, 1986
5. Faller M, Purohit A, Kennel N, et al: Systemic sarcoidosis initially presenting as an orbital tumour. *Eur Respir J* 8:474-476, 1995
6. Peterson EA, Hymas DC, Pratt DV, et al: Sarcoidosis with orbital tumor outside the lacrimal gland: Initial manifestation in 2 elderly white women. *Arch Ophthalmol* 116:804-806, 1998
7. Sarvanatahan N, Wiselka M, Bibby K: Intraocular tuberculosis without detectable systemic infection. *Arch Ophthalmol* 116:1386-1388, 1998
8. Tanaka H, Onodera N, Ito R, et al: Subclinical Sjogren's syndrome: A significant 67 gallium accumulation in the orbits and parotid glands. *Acta Paediatr Jpn* 40:621-623, 1998
9. Tyler JL: Orbital accumulation of gallium: 67 citrate. *Clin Nucl Med* 8:469-473, 1983
10. Kaneko A: Scintigraphy of the orbit with 67Ga-citrate. *Mod Probl Ophthalmol* 14:181-189, 1975
11. Ishii I, Tonami N, Nakajima K, et al: 67Ga SPECT in the evaluation of orbital and ocular mass like lesion. *Nippon Igaku Hoshasen Gakkai Zasshi* 53:688-695, 1993
12. Lipp RW, Sill H, Aigner R, et al: Gallium-67 citrate scintigraphy of high-grade T-cell non: Hodgkin's lymphoma. *J Nucl Med* 37:1524-1525, 1996
13. Issing PR, Ruh S, Klossa A, et al: Diagnosis and therapy of lymphoid tumors of the orbits. *HNO* 45:545-545, 1997
14. Cytryn AS, Putterman AM, Schneck GL, et al: Predictability of magnetic resonance imaging in differentiation of orbital lymphoma from orbital inflammatory syndrome. *Ophthalm Plast Reconstr Surg* 13:129-134, 1997
15. Takeshita T, Kaminaga T, Sugiyama T, et al: A case of orbital MALT lymphoma in which 67Ga scintigraphy was useful for evaluating the radiation therapy response. *Kaku Igaku* 38:39-45, 2001
16. Grove AS Jr: Modern examination methods of orbital disease: Orbital radionuclide examination. *Trans Am Acad Ophthalmol Otolaryngol* 78:587-598, 1974
17. Warwar RE, Bullock JD: Gallium scanning in the diagnosis and management of orbital lymphoma: A case report. *Ophthalm Plast Reconstr Surg* 15:180-184, 1999
18. Lambrecht R, Packer S, Atkins H: Differential radioactivity monitor for noninvasive detection of ocular melanoma. *Nucl Med Commun* 5:381-386, 1984
19. Hirano T, Watanabe N, Oriuchi N, et al: Incidental demonstration of Ga-citrate uptake in meningioma. *Clin Nucl Med* 18:516-517, 1993
20. Wegener WA, Williams HT: Meningioma extending through the skull: A palpable lesion with a scintigraphic doughnut sign. *Clin Nucl Med* 15:441-442, 1990
21. Holz FG, Tetz M, Born IA, et al: Adenoid cystic carcinoma of the lacrimal gland. *Klin Monatsbl Augenheilkd* 201:42-47, 1992
22. Kreusel KM, Wiegel T, Stange M, et al: Intraocular metastasis of metastatic breast carcinoma in the women: Incidence, risk factors and therapy. *Ophthalmologie* 97:342-346, 2000
23. Gunalp I, Gunduz K: Metastatic orbital tumors. *Jpn Ophthalmol* 39:65-70, 1995
24. Yokoji H, Nakamura S, Ikeda T: A case of malignant lymphoma with a metastasis to the lateral rectus muscle. *Rinsho Shinkeigaku* 37:526-527, 1997
25. Palestro CJ, Malat J, Gladstone AG, et al: Gallium scintigraphy in a case of septic cavernous sinus thrombosis. *Clin Nucl Med* 11:636-639, 1986
26. Sakuri H, Mitsuhashi N, Hayakawa K, et al: Ectopic lacrimal gland of the orbit. *J Nucl Med* 38:1498-1500, 1997
27. Jaikishen P, Bateman JL, Walton WW: Orbital pseudo-tumor imaged with Ga-67 Citrate. *Clin Nucl Med* 14:838-840, 1989
28. Kao PF, Tzen KY, Tsai MF, et al: Gallium-67-scanning in endogenous Klebsiella endophthalmitis with unknown primary focus. *Scand J Infect Dis* 32:326-328, 2000