

LACRIMAL GLAND ACCUMULATION OF ^{67}Ga

Fred S. Mishkin and Walter P. Maynard

Martin Luther King, Jr. General Hospital, Los Angeles, California

In two patients with increased tear production there was increased lacrimal gland accumulation of ^{67}Ga -citrate. Gallium-67 tear activity could not be identified in five patients who had no visualization of the lacrimal glands whereas it could be detected in three patients with induced lacrimation. This activity upon radiochromatography migrated like the serum transferrin. These findings suggest that the gallium is bound to transferrin in the tears and accumulates in relationship to function. In the presence of lacrimal gland visualization, activity in the nasopharynx should be interpreted with caution.

Striking increase in ^{67}Ga -citrate concentration in the lacrimal glands has been noted on occasion (1). We recently encountered such a patient in whom the clinical setting suggested the reason for this phenomenon and attempted to confirm this experimentally.

CASE REPORTS

Case 1. A 51-year-old woman was hospitalized because she had two grand mal seizures at work and had recent recurrent occipital headaches. Examination showed minimal right hemiparesis. Her chest film showed consolidation in the left lung attributed to old tuberculosis for which she had undergone a left phrenic nerve crush 22 years previously. Radionuclide brain images obtained 3 hr after intravenous administration of 25 mCi of $^{99\text{m}}\text{Tc}$ as pertechnetate following oral perchlorate showed a lesion in the left occipital pole. Positive contrast angiography failed to confirm this and she was sent home to be followed at periodic intervals. She returned 6 weeks later for a repeat brain scan and at that time complained of hip pain. The repeat brain scan again

showed the occipital pole lesion and the appearance of a second lesion high in the right midparietal area located parasagittally (Fig. 1). To help confirm the nature of the lesion, she received 4 mCi of ^{67}Ga -citrate intravenously for imaging 72 hr later and was admitted to the hospital. On examination left supraclavicular lymph nodes were now palpable and there was a congruent right-sided homonymous hemianopsia. During this time she was observed to be almost continually weeping. The gallium image showed increased uptake in the previously identified lesions as well as in the posterior left hilar regions.

Received Dec. 20, 1973; revision accepted Dec. 26, 1973.

For reprints contact: F. S. Mishkin, Nuclear Medicine, Martin Luther King, Jr., General Hospital, 12021 S. Wilmington Ave., Los Angeles, Calif. 90059.

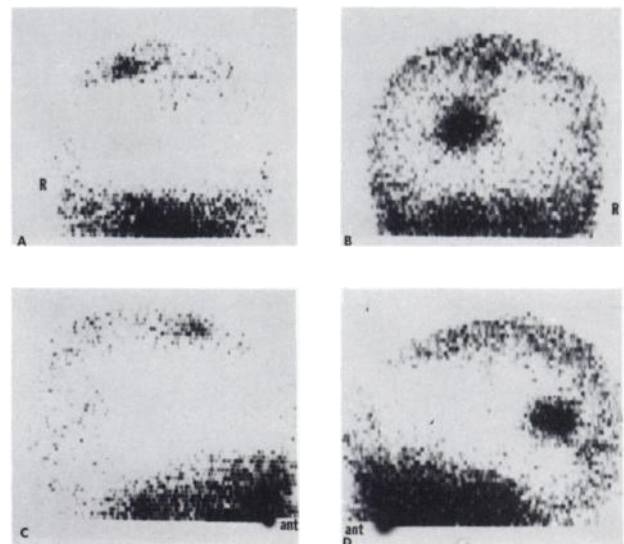


FIG. 1. Anterior (A), posterior (B), right lateral (C), and left lateral (D) views performed after oral perchlorate and 3 hr after intravenous $^{99\text{m}}\text{Tc}$ as pertechnetate show small lesion parasagittally in right midparietal area and large lesion in left occipital pole.

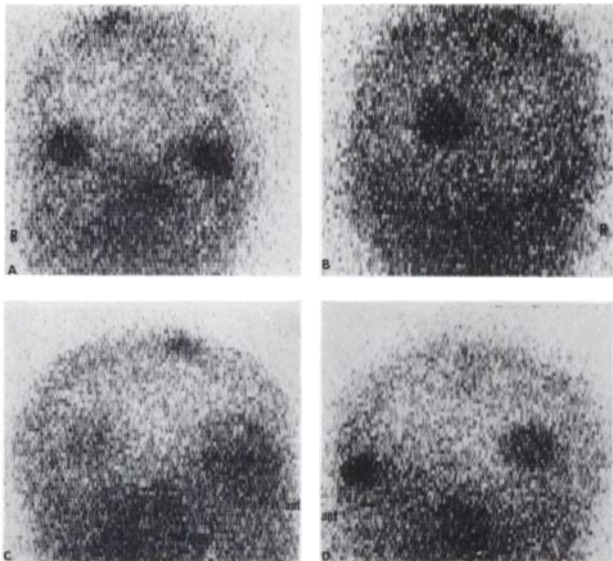


FIG. 2. Anterior (A), posterior (B), right lateral (C), and left lateral (D) views of head performed 72 hr after intravenous administration of 4 mCi of ^{67}Ga citrate show accumulation of activity in right parasagittal midparietal lesion and left occipital pole lesion, increasing likelihood of neoplasm. Lacrimal glands are best seen on anterior and left lateral views. Nasopharynx is also delineated on anterior view.

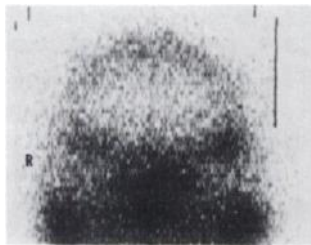


FIG. 3. Anterior view of head 72 hr after administration of 4 mCi of ^{67}Ga -citrate in patient in whom onion-induced lacrimation occurred during time between injection and imaging. Lacrimal glands, nasopharynx, and parotid glands are well seen.

Striking lacrimal gland activity could be seen with some accentuation of nasopharyngeal activity (Fig. 2). Biopsy of the left supraclavicular lymph node demonstrated anaplastic carcinoma upon histological examination.

Case 2. A 54-year-old woman with biopsy-proven squamous cell carcinoma in a left supraclavicular node, probably primary in the lung, received 4 mCi of ^{67}Ga -citrate intravenously for imaging 72 hr later to help delineate the location of her disease. She was given sliced onions to induce lacrimation three times a day until the image was performed. The lacrimal glands were well seen at 72 hr (Fig. 3).

DISCUSSION

Functioning glandular tissue, particularly the lactating breast, concentrates gallium citrate. It is not unreasonable to assume that the function has something to do with the concentration. The reason gallium appears in tears most probably relates to the presence of transferrin in the protein content of tears (2). In the blood gallium is bound to serum transferrin (3), the source of tear transferrin. Increased production of tears would be expected to produce an increased turnover of tear transferrin which would bring with it gallium activity from the serum. The patient need not be weeping to have visualization of the lacrimal area but rather needs only to have relatively increased tear production during the time serum gallium levels are high.

In tear samples, at 72 hr taken from five patients without scan visualization of the lacrimal glands, we were unable to demonstrate any ^{67}Ga activity. The sodium iodide (thallium activated) 2×2 -in. crystal well counter used has a sensitivity limit of approximately 1.2 pCi for ^{67}Ga with the settings employed. In three patients with onion-induced lacrimation we were readily able to demonstrate ^{67}Ga activity. The tear activity was radiochromatogrammed and the radioactivity compared with a radiochromatogram of the patient's serum obtained 10 min after ^{67}Ga injection. The tear activity coincided with the serum activity peak at the origin indicating that both the tear and serum gallium were bound to the same carrier, most likely transferrin.

Although in our experience the lacrimal glands are usually only poorly seen on the 72-hr image, in both of the cases reported, the lacrimal glands were well delineated. In one patient we believe this was due to spontaneous weeping, in the other to onion-induced lacrimation. Since the tears drain into the nasopharynx, this area may also be delineated. Thus in the presence of lacrimal gland visualization, gallium accumulation in the nasopharynx should be interpreted cautiously.

REFERENCES

1. LARSON SM, MILDER MS, JOHNSTON GS: Interpretation of the ^{67}Ga photoscan. *J Nucl Med* 14: 208-214, 1973
2. SAPSE AT, BONAVIDA B, STONE W, et al: Proteins in human tears. *Arch Ophthalmol* 81: 815-819, 1969
3. HARTMAN RE, HAYES RL: Indium and gallium binding by blood serum. *Fed Proc* 27: 838, 1968