

THE EFFECT OF CONTRAST LYMPHANGIOGRAPHY ON LOCALIZATION OF ⁶⁷Ga-CITRATE

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Oily lymphangiographic contrast material introduced prior to total-body ⁶⁷Ga-citrate scanning may be responsible for accumulation of the radionuclide within the lungs. The possibility of false-positive examinations suggests caution in the interpretation of the scan which evidences this finding. When possible, gallium scintiscans should be scheduled prior to contrast lymphangiography.

In reviewing a series of whole-body scintiscans obtained with ⁶⁷Ga-citrate in patients with Hodgkin's disease and non-Hodgkin's lymphoma, it became apparent that in some patients an unexplained localization of radiogallium in the lungs could be attributed to antecedent contrast lymphangiography. A similar impression has been recorded but was not subject to detailed analysis (1).

The protocol for gallium scanning in Hodgkin's disease in the Dr. W. W. Cross Cancer Institute originally required that patients born in even years undergo lymphangiography prior to gallium scintiscanning and vice versa for patients born in odd years. It was thus possible to analyze retrospectively our experience to determine if there was any constant influence of contrast lymphangiography upon the distribution of ⁶⁷Ga-citrate in whole-body scans. Additionally the relative solubility of ⁶⁷Ga-citrate in the oily lymphangiographic contrast medium was determined.

PATIENTS AND METHODS

The patients examined have had documented Hodgkin's disease or non-Hodgkin's lymphoma and were subjected to contrast lymphangiography for either initial staging or re-evaluation.

The groups of patients were comparable with respect to stage and treatment, where applicable. It was not possible to match individual patients with

respect to age along with other variables but the mean age of the groups was separated by less than 5 years.

Scintiscans were obtained with an Ohio-Nuclear 5 in. Dual-Probe Rectilinear Scanner operated in a 5:1 minification mode. Neither background erasure nor contrast enhancement were employed. The usual dose of ⁶⁷Ga-citrate (New England Nuclear) administered to adults was 3.0 mCi. The 184-keV photopeak was used for imaging. The scintiscan is calibrated over liver to an information density of 100 counts/cm².

Patient preparation was by low-residue diet and magnesium citrate as a laxative between injection and scintiscanning. Scans were obtained 48 hr and often 72 hr following injection.

Contrast lymphangiography was carried out by the conventional techniques of cannulation of a lymphatic vessel following the interstitial injection of patent blue dye. Between 4 and 5 ml of the oily contrast medium iodized ethiodan (Lipiodol Ultra Fluid, Denver Laboratories Ltd.) were then injected into each leg over 45 min.

Posteroanterior chest radiographs were obtained on the day following the lymphangiogram injection and independently reviewed to determine if oil embolism into the lungs was present. Although theoretically assumed to always occur, we radiographically graded the presence of oil emboli as follows: (a) embolization interpreted as not recognizable (0); (b) present as a reticular pattern and just identifiable (+); (c) present with a well-established reticular pattern (++); or (d) marked with arborizing vascular channels demonstrated (+++).

As with the chest radiographs, gallium scintiscans were evaluated randomly and without knowledge of

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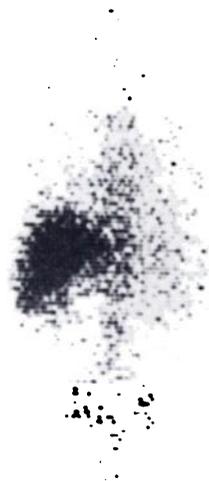


FIG. 1. Posterior projection radiogallium scintiscan in man who had not had contrast lymphangiography. Lungs demonstrate no accumulation of gallium (Grade 0). All patients whose scintiscans are used in these illustrations had no radiologic evidence of pulmonary parenchymal lymphoma or other disease and have been selected as presenting minimal other distracting findings on this projection.

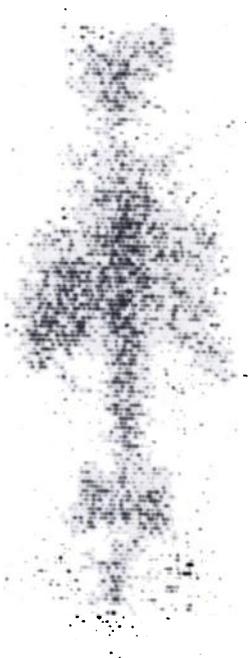


FIG. 2. Posterior projection radiogallium scintiscan in man subjected to contrast lymphangiography 6 days earlier. Lungs demonstrate generalized uptake of gallium, maximal inferiorly (Grade 2; Grade 1 being an intermediate degree of pulmonary abnormality between Figs. 1 and 2).

the relationship of the scan in time to the lymphangiogram. The degree of gallium accumulation in the lung was graded from 0 to +++ according to a scale illustrated in Figs. 1-3.

Plasma containing ^{67}Ga -citrate was incubated with

an equal volume of iodized ethiodan for 2 and 48 hr. Aliquots of the aqueous and oily phases were then counted in a gamma well counter and, after subtracting background activity, a partition ratio was derived.

RESULTS

Of the 48 patients examined, 20 had gallium scintiscans performed prior to lymphangiography. One patient in this group demonstrated unexplained increase in uptake of the radiotracer in the lungs.

Of the 28 patients examined by gallium scanning during or following lymphangiography, 14 evidenced uptake of the radiotracer in the lungs. This finding was more common in those patients imaged immediately after lymphangiography but was sometimes present in excess of 1 month following the contrast study (Table 1). No correlation was evident between the amount of contrast material present in the lung as observed radiographically and the extent of the concentration of radiogallium in the lungs ($\chi^2 = 0.03$, $df = 1$) as seen in Table 2.

No evidence of an increased solubility of gallium



FIG. 3. Posterior projection radiogallium scintiscan in man subjected to contrast lymphangiography 3 days earlier. Lungs demonstrate marked uniform abnormal concentration of tracer (Grade 3).

TABLE 1. NUMBER OF PATIENTS AND GRADED ACCUMULATION OF PULMONARY RADIOGALLIUM AS RELATED TO ELAPSED TIME BETWEEN LYMPHANGIOGRAPHY AND SCAN

Gallium	Time after contrast lymphangiography				
	1 day	2 days	up to 1 week	up to 1 month	>1 month
0		2	6	2	4
+	2	1	1	1	1
++		1	1	1	1
+++	2	1			

TABLE 2. NUMBER OF PATIENTS AND GRADED ACCUMULATION OF PULMONARY RADIOGALLIUM AS RELATED TO DEGREE OF OIL EMBOLIZATION OBSERVED RADIOGRAPHICALLY

Gallium	Radiographic embolization grading			
	1	2	3	4
0	3	5	6	
+	2	1	3	
++		2	1	1
+++	1	1	1	1

TABLE 3. RATIO OF ACTIVITY OF ⁶⁷Ga IN ALIQUOTS OF AQUEOUS (PLASMA) AND OILY (LYMPHANGIOGRAPHIC CONTRAST) PHASES

Phases	2-hr incubation	48-hr incubation
Aqueous	125	129
Oily	1	1

citrate in the oily contrast medium used in lymphangiography could be demonstrated (Table 3).

DISCUSSION

The findings reported here are of some significance in the interpretation of gallium scans and are therefore reported in the absence of definitive studies to elucidate the mechanism involved.

It appears that localization in the lungs, particularly when in a uniform pattern of distribution, may be due to no more than preceding contrast lymphangiography and must be considered an unreliable finding in other respects. In the Dr. W. W. Cross Cancer Institute the protocol has been revised to insure that gallium whole-body scintiscanning, in elective circumstances, precedes contrast lymphangiography.

There remains a suspicion that contrast material in lymph nodes also causes a localization of radiogallium within these structures unrelated to the presence of tumor. The evidence to support this stems from the descriptions of histologic changes in lungs in animals (2) and the lymph nodes in man (3) following contrast lymphangiography.

The uptake of radiogallium in the lungs of patients who have had lymphangiography is not due to its solubility in the oily contrast material. There is thus strong presumptive evidence that such uptake is due to the irritant effects of the contrast material upon pulmonary parenchyma.

In none of the patients reported here with pulmonary uptake of radiogallium was there any evidence, either at the time or when followed up clinically and radiologically for between 6 and 12 months, of pulmonary lymphoma or inflammatory disease.

Until further evidence is forthcoming, we wish, on the basis of the evidence presented here, to caution that gallium scans after pedal lymphangiography may reflect only iatrogenic disease and localization in the lung and in subdiaphragmatic retroperitoneal disease must be interpreted with reservations.

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