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OIL CONTRAST LYMPHOGRAPHY AND RESPIRATORY FUNCTION

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ABSTRACT

We reviewed our experience with direct oil contrast lymphography for pulmonary complications in more than 1500 lymphangiograms done since 1969. The vast majority of patients showed little subjective or objective (chest x-ray, pulmonary function test, and gas exchange) evidence of oil embolization even in those with mild to moderate cardiopulmonary disease. In 1% there was evidence on chest x-ray 24 hours after lymphography of tiny patchy infiltrates consistent with oil emboli. Although the indications for oil contrast lymphography have been sharply restricted with availability of newer imaging methods, it is nonetheless a safe and well-tolerated procedure even in patients with mild to moderate pulmonary dysfunction.

Because of new methods of visualization, including computerized tomography (CT), ultrasonography (US), and magnetic resonance (MR), there has been a sharp reduction in the use of oil contrast direct lymphography. Occasionally, however, it is still used for patients in whom upper retroperitoneal lymph nodes are difficult to visualize with CT, US, or MR, as with malignant lymphoma. The most serious complication of direct lymphography using Lipiodol Ultrafluid or Ethiodol is oil emboli to the lungs which may induce pulmonary infarction, lung edema, or lipoid pneumonia (1-4). Some workers continue to refer to a high rate of oil pulmonary embolization following lymphography based on earlier reports (4,5), and accordingly, we opted to review our experience which dates from 1969.

MATERIALS AND METHODS

Our experience is based on approximately 1500 examinations of direct oil lymphography where we specifically looked for the incidence of clinical or roentgenologic-induced changes characteristic of oil pulmonary embolization. All patients (range of age: 4-79 years) were monitored for subjective complaints and by chest x-ray and a smaller number also underwent pulmonary function tests before and after lymphography.

Group 1

(29 patients--20 men, 9 women). In this group the age range was 21-77 years. Each had no cardiopulmonary disorder or symptomatology.

Group 2

(16 patients--2 men, 14 women). In this group, age range was 21-77 years, and these individuals had chronic heart or respiratory disorders of a mild to moderate degree (e.g., chronic bronchitis with emphysema, pulmonary fibrosis, metastases to the lungs, pulmonary

Table 1.

% Change from Normal (Mean ± SD) of Pulmonary Function Before and 24 Hours After Oil Contrast Lymphography

	Group 1 (n = 29)		Group 2 (n = 16)	
	Before	After	Before	After
F/min.	17 ± 3.57	17 ± 3.66	22 ± 5.08	23 ± 6.41
V_T (% normal)	160 ± 51.82	167 ± 45.61	132 ± 37.75	149 ± 50.19
VC (%)	106 ± 15.63	105 ± 16.34	84 ± 21.38	84 ± 23.48
V (%)	171 ± 35.16	184 ± 37.94	193 ± 64.47	224 ± 81.80
Vmax (%)	94 ± 21.27	94 ± 23.83	77 ± 21.20	82 ± 23.02
PaO_2 (Torr)	79 ± 4.51	79 ± 4.03	77 ± 3.96	77 ± 4.36
PaO_2 (kPa)	10.50 ± 0.60	10.50 ± 0.53	10.24 ± 0.53	10.24 ± 0.58

F = respiratory rate; V_T = tidal volume; VC = vital capacity; V = minute ventilation; Vmax = maximum minute ventilation

venous congestion). In these individuals, direct lymphography was carried out for staging of malignant neoplasia.

The technique of lymphography was standard using 14-16ml of Lipiodol Ultrafluid (Byk-Gulden, Constance) following intralymphatic instillation of 30mg of Complamin (pyridine 3-carboxyl nicotinic acid).

Ventilation was tested using the Godart pulmotest and spirogram for respiratory rate (F), tidal volume (V_T), vital capacity (VC), minute ventilation (V), and maximum minute ventilation (Vmax). These values were subsequently BTPS-corrected and expressed as % of normal. Gas exchange (PaO_2, $PaCO_2$ and pH), was also checked (Astrup).

No patients with major respiratory impairment were studied as lymphography was generally considered as contraindicated (1,4,10,11).

RESULTS

No patient developed shortness of breath after lymphography. Chest x-rays of the 1500 direct lymphograms showed a 1% rate of pulmonary complications in the form of tiny lung infiltrates which was interpreted as consistent with oil embolization. Pulmonary function tests before and after lymphography are shown in *Table 1*. The respiratory rate revealed a notable difference before lymphography with a higher rate in patients with cardiac or respiratory disease. After lymphography, however, there was little or no change in either group. Tidal volume was high, on the other hand, in both groups before and after lymphography, whereas vital capacity was lower in the second group but unchanged by the lymphatic study. Minute ventilation was higher in the second group and increased further 24 hours after lymphography. The maximum minute ventilation was lower with cardiopulmonary dysfunction before lymphangiogram, but neither group was significantly affected by the study. Blood arterial partial pressure of oxygen (PaO_2) *(Table 1)* as well as $PaCO_2$ and pH (not illustrated) were largely unchanged in either group before and after lymphography.

DISCUSSION

Studies concerning radiolabeled Lipiodol suggest that oil contrast finds its way consistently into the lungs with direct lymphography (2,3,6,7). There is also evidence that the incidence of pulmonary complications is directly proportional to the quantitiy of Lipiodol in-

jected (2-4,7,8). Contrast reaches the lungs either through the thoracic duct or by direct inoculation into the venous system. Thus, oil microembolization probably occurs after every lymphogram although in most instances there is no clinical manifestation (1,3,9-11).

Other studies, however, suggest that contrast lymphography causes pulmonary dysfunction by interfering with alveolocapillary diffusion and perfusion (2,7). In our group of patients without cardiopulmonary dysfunction, there was excellent tolerance of lymphography and blood gas tests showed no alveolocapillary maldiffusion.

The main issue, however, was whether lymphography was equally well tolerated in patients with preexisting respiratory symptoms. During the first few days after lymphography, there reportedly is a slight reduction in vital capacity, the appearance of diffusion and perfusion disturbances, and a drop of blood oxygen partial pressure. These values return to normal within 24-48 hours (2,7). The diffusion irregularity derives from capillary volume reduction through oil microembolization with an alveolocapillary block syndrome 13-37 hours later (8). Although patients in these earlier reports had no subjective complaints, there was slight hyperventilation and a drop in PaO_2 with a rise in blood pH (7).

In our group of patients, no major functional changes were seen. Fifteen of 45 subjects had an initial increase in minute ventilation primarily from a greater tidal volume and less from increased respiratory rate. A second measurement 24 hours after lymphography, however, showed little or no clinical, roentgenological, or blood gas deterioration.

These favorable results may relate to the limited amount of contrast medium injected, in contrast to earlier studies (4). The findings also suggest that the technique of direct lymphography as outlined is safe, not only for individuals without cardiopulmonary dysfunction, but also for those with mild or moderate cardiopulmonary disease.

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REFERENCES

1. Bruna, J: Clinical lymphography (in Czech.). Avicenum, Prague (1977).
2. Fraimow, W: Changes in pulmonary function due to lymphoangiography. Radiology 85 (1965), 231-241.
3. Koehler, PR: Body distribution of Ethiodol following lymphangiography. Radiology 82 (1964), 866-871.
4. Koehler, PR: Complications of lymphography. Lymphology 1 (1968), 117-120.
5. Hartweg, H, M Elke: Indikatione, Durchfuhrung and Informations gehalt de Lymphographie. Schweiz. Med. Wschr. 101 (1971), 52-58.
6. Dolan, PA: Lymphography--complications encountered in 552 observations. Radiology 86 (1966), 876-880.
7. Fabel, H, G Kinitsch, HS Stender: Storungen der Lungenfunction nach Lymphographie. Fortschr. Rontgenstr. 107 (1967), 609-618.
8. Fischer, HW, KA Feisal, WC Stevens: Lung function studies after the intralymphatic injection of emulsion of Ethiodol in dogs. Lymphology 1 (1968), 127-131.
9. Luning, M, M Wiljasalo, H Weissleder: Lymphographie bei malignen Tumoren. Leipzig, VEB, G. Thieme (1976).
10. Roxin, T, H Bujar: Clinical uses of lymphography (in Russian). Bucharest, Akademia (1976).
11. Zadgenidze, GA, AF Cyb: Clinical lymphography (in Russian). Moscow, Meditsina (1977).

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