



Lymphography of the Thyroid Gland: Is Intraglandular Dissemination of Thyroid Carcinoma Possible?

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Lymphography of the thyroid gland was performed in 82 patients with multinodular goiter (41), solitary thyroid nodule (36), and hyperthyroidism (5). Six of the patients proved to have cancer. The studies showed that each thyroid lobe has its own intraglandular lymphatics and drains only to homolateral cervical lymph nodes. The absence of lymphatic connections between the two thyroid lobes casts doubt on the proposal that cancer cells spread from one lobe to the other by way of the lymphatics. Thyroid lymphography was found to be of value in demonstrating the presence or absence of metastases to cervical lymph nodes and, thereby, in determining the necessity for radical neck dissection. Lymphography was also useful in detecting unsuspected small thyroid nodules.

There is still no agreement on the operation of choice for carcinoma of the thyroid. Various operations are in current use, including thyroid lobectomy, lobectomy with isthmusectomy, subtotal thyroidectomy, and total thyroidectomy. Radical neck dissection of varying extent has been combined with each of these procedures under varying circumstances. Survival statistics based on long-term follow-up studies have not resolved the controversy. Some surgeons have advocated extensive and radical operations [1, 2], while others have urged a conservative approach [3, 4]. Advocacy of a radical approach is based, at least in part, on the belief that there is intrathyroid dissemination of cancer cells through the lymphatic system of the thyroid gland [5-8].

There is no general agreement on the indications for radical neck dissection. Most surgeons advocate a radical neck dissection when patients with thyroid

cancer have cervical lymph node metastases that are obvious clinically, although some prefer a modified radical neck dissection [9, 10]. However, some authors recommend a "prophylactic" unilateral or bilateral neck dissection even when the cervical lymph nodes appear uninvolved clinically [11].

The purpose of this study was to evaluate by lymphography the anatomy of the intraglandular lymphatic vessels of both thyroid lobes, and the efferent lymphatic system of the thyroid gland. It was our aim to demonstrate the presence or absence of interconnecting lymphatics between the thyroid lobes and, thereby, determine the likelihood of cancer cell dissemination within the thyroid gland. Furthermore, by studying the efferent lymphatic drainage of the thyroid, it was our hope to develop a method of determining the indications for radical neck dissection that is more precise than clinical examination alone.

Methods

Lymphography of the thyroid gland was performed following the slow injection of 1.4 ml of ultrafluid Lipiodol® into each thyroid lobe, taking care to avoid nodules palpable on physical examination or identified by scintiscan. A series of x-rays was obtained 15 minutes, 24 hours and 48 hours after injection. The details of the technique have been described previously [12, 13]. In several patients, the Lipiodol® injection was confined to one thyroid lobe and x-rays were obtained 15 minutes, 24 hours, 48 hours, and 72 hours after injection. Samples of all injected thyroid glands were subjected to histopathologic study.

A total of 82 patients underwent lymphography. The preoperative diagnosis was multinodular goiter in 41 patients, solitary thyroid nodule in 36, and hyperthyroidism in 5. Five of the 36 solitary nodules

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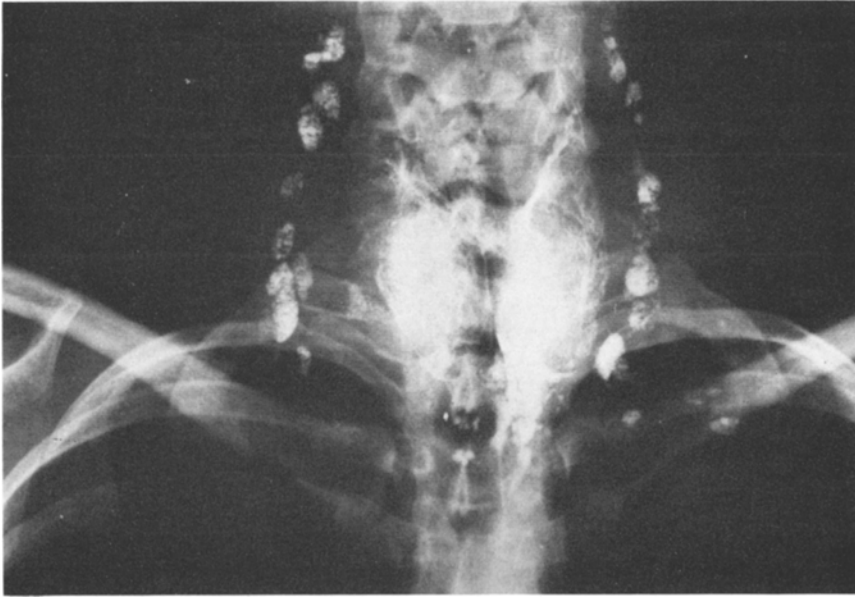


Fig. 1. Thyroid lymphogram obtained 48 hours after bilateral injection of Lipiodol® into the thyroid, showing normal distribution pattern of the cervical lymph nodes draining each lobe.

proved to be carcinoma, classified as papillary type in 2, follicular type in 2, and medullary type in 1. The patient with medullary cancer underwent a unilateral radical neck dissection when lymphography failed to

visualize cervical lymph nodes because of blockage of the lymphatics by tumor. One patient with a pre-operative diagnosis of multinodular goiter was found to have bilateral papillary carcinoma and underwent a unilateral radical neck dissection because lymphography suggested the presence of cervical lymph node metastases. Histopathologic studies confirmed the presence of cancer in the cervical lymph nodes in both patients who underwent a radical neck dissection.

Results

The intraglandular lymphatic vessels of the thyroid were visualized radiographically 15 minutes after injection of contrast material, showing a reticular pattern in both lobes. The lymphatic channels became more apparent in the 24-hour x-rays, at which time the cervical lymph nodes in both sides of the neck were also seen.

The periglandular lymphatic channels draining the thyroid can be divided into ascending and descending systems, each of which have medial and lateral trunks. The ascending medial trunk originates from the thyroid isthmus and in front of the larynx, while the ascending lateral trunks arise from the vertex of each thyroid lobe and terminate between the carotid artery and internal jugular vein and in the lateral wall of the pharynx. The descending medial trunk originates from the inferior portion of the thyroid isthmus and terminates in lymph nodes located in front of the trachea, while the descending lateral trunks drain the thyroid lobes into the deep cervical lymph nodes.

The lymphatic drainage paths and the distribution pattern of the cervical lymph nodes were found to be very constant (Fig. 1). However, the lymphatic drain-

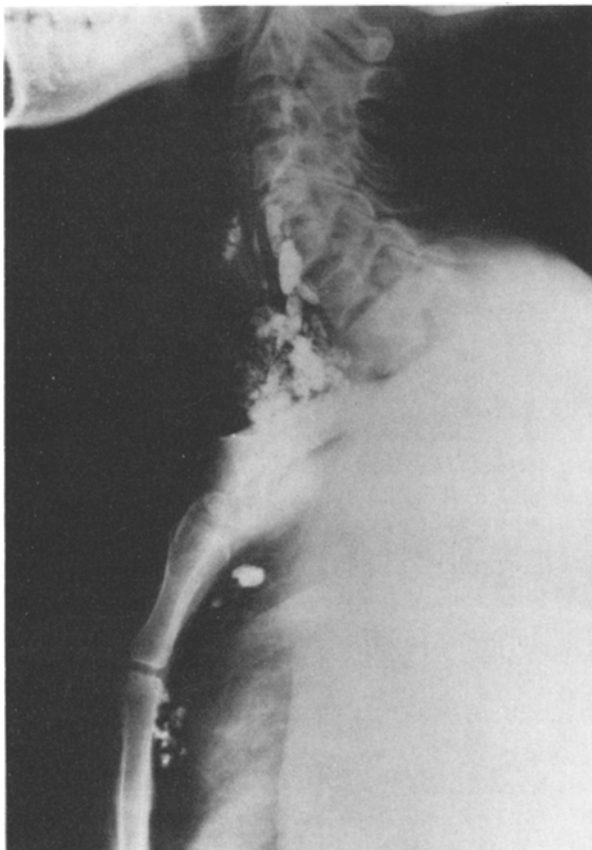


Fig. 2. Thyroid lymphogram obtained from one of only 2 patients who showed lymphatic drainage to the superior mediastinal lymph nodes.

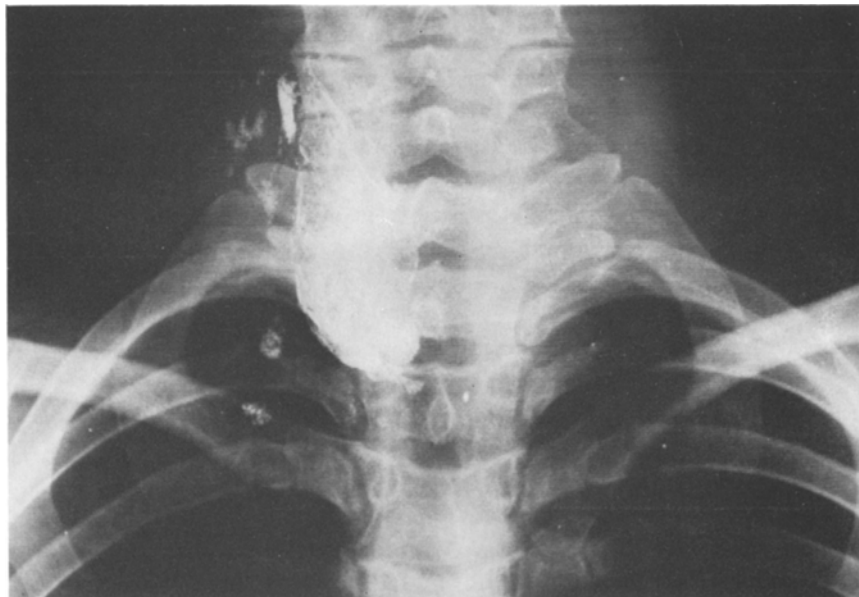


Fig. 3. Thyroid lymphogram obtained 48 hours after unilateral injection of Lipiodol®, demonstrating absence of lymphatic communications with the contralateral lobe.

age to the superior mediastinal lymph nodes was not constant and, in fact, the mediastinal lymph nodes were visualized in only 2 patients (Fig. 2). For this reason, a sternotomy and mediastinal dissection does not appear justifiable in the surgical treatment of thyroid cancer.

When the injection of contrast material was confined to one thyroid lobe, lymphatic communications between the two thyroid lobes were not observed in any patient (Fig. 3). That this was not due to disease of the isthmus was confirmed by gross and microscopic examinations. Similarly, unilateral injections of contrast medium invariably visualized only the

homolateral cervical lymph nodes (Fig. 4). These findings indicate that the lymphatic system on each side is confined to its corresponding anatomical lobe, and that there is no cross communication between the lymphatic systems of the two lobes.

Studies of the intraglandular lymphatics frequently demonstrated unexpected small filling defects. In 12 of 36 patients with a solitary thyroid nodule on clinical examination, thyroid lymphography demonstrated other nodules in the apparently healthy contralateral lobe (Fig. 5), and led to the decision to perform a subtotal thyroidectomy. The nodules demonstrated by lymphography were confirmed by



Fig. 4. Thyroid lymphogram obtained 48 hours after unilateral injection of Lipiodol®, demonstrating absence of communications with the cervical lymph nodes on the contralateral side.

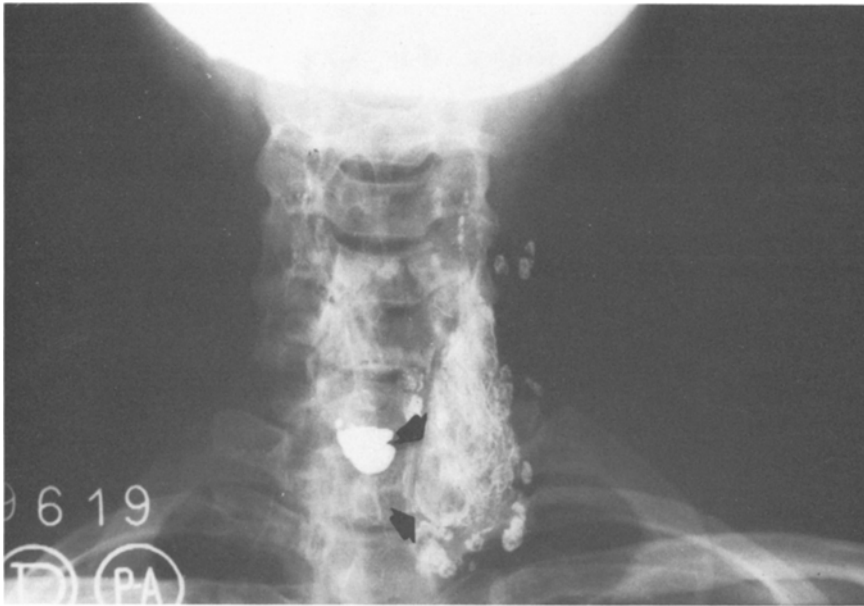


Fig. 5. Thyroid lymphogram that demonstrates a Lipiodol®-filled cyst in the right lobe which had been detected by physical examination and radioisotope scanning. In addition, the lymphogram demonstrates unsuspected nodules in the left lobe that were subsequently confirmed by histopathologic examination.

histopathologic examination. In two patients with thyroid cancer, one of the medullary and the other of the papillary type, lymphatic metastases suggested by lymphography were confirmed on histopathologic examination of specimens removed by radical neck dissections (Figs. 6 and 7).

There were no complications of the lymphography procedure. None of the thyroid specimens showed evidence of significant inflammation on histopathologic examination.

Discussion

The results of this study indicate that it is possible to visualize lesions of the thyroid gland by lymphography. In particular, this study demonstrates that thyroid lymphography is of value in detecting small

nodules that are not apparent on physical examination or revealed by radioisotope scanning.

The demonstration that the lymphatic system of each thyroid lobe is isolated casts doubt on the proposal that thyroid cancer spreads from one lobe to the other via intraglandular or pericapsular lymphatics.

Radiographic demonstration of the lymphatic drainage of the thyroid may be helpful in identifying metastases to the cervical lymph nodes and in making the decision to perform a radical neck dissection. Failure to visualize lymph nodes on one side of the neck suggests blockage of the lymphatic system by neoplasm, and the demonstration of abnormal appearing lymph nodes suggests the presence of cervical metastases.



Fig. 6. Thyroid lymphogram showing absence of lymph nodes on the right side, which was found to be due to blockage of lymphatics by medullary carcinoma.

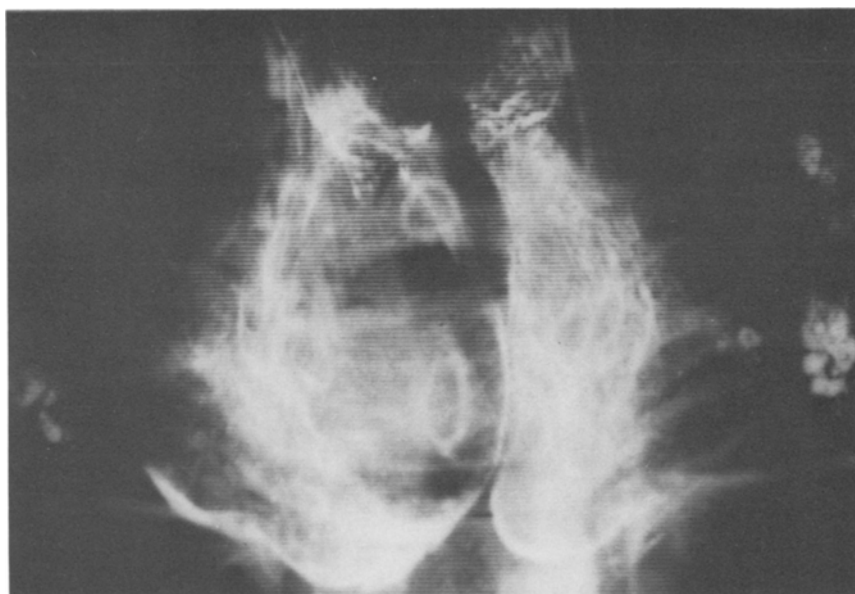


Fig. 7. Thyroid lymphogram showing abnormal lymph nodes on the left side in a patient with bilateral papillary carcinoma who was subsequently shown to have metastases to the left cervical nodes.

Conclusions

1. Each lobe of the thyroid gland has its own intraglandular lymphatic system, which does not appear to communicate with the lymphatic system of the opposite lobe.

2. Injection of contrast media into one thyroid lobe results in visualization of the cervical lymph nodes only on the homolateral side.

3. These findings cast doubt on the proposal that the high incidence of bilateral thyroid carcinoma is due to spread of cancer cells from one lobe to the other through intraglandular and pericapsular lymphatics. Multicentric origin of carcinoma is a more likely explanation of bilateral involvement.

4. The visualization of superior mediastinal lymph nodes in only 2 patients indicates that the thyroid lymphatics infrequently drain into the mediastinum. Therefore, sternotomy and mediastinal lymph node dissection are seldom necessary in the surgical treatment of thyroid cancer.

5. Thyroid lymphography is of value in detecting small lesions that may not be detected by physical examination or radioisotope scanning of the thyroid.

Résumé

Nous avons réalisé une lymphographie thyroïdienne chez 82 malades atteints de goître multinodulaire (41), de nodule thyroïdien unique (36) ou d'hyperthyroïdie (5). Six malades avaient un cancer. L'ensemble des examens a montré que chaque lobe thyroïdien possède ses propres lymphatiques intraglandulaires qui drainent uniquement vers les ganglions cervicaux homolatéraux. L'absence de toute connexion lymphatique entre les deux lobes thyroïdiens

jette un doute sur la théorie de la dissémination cancéreuse d'un lobe à l'autre par voie lymphatique. La lymphographie thyroïdienne est utile pour mettre en évidence ou exclure la présence de métastases dans les ganglions cervicaux; elle pose donc l'indication d'un éventuel évidemment ganglionnaire cervical. La lymphographie est également utile pour détecter les petits nodules thyroïdiens non repérables par les examens usuels.

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INVITED COMMENTARY

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The demonstration by the authors that lymphatics of one lobe of the thyroid do not cross the isthmus lend support to the concept that multicentricity of thyroid cancer in both lobes is not due to intraglandular metastasis, but rather is the result of multifocal cancer either beginning *de novo* or from antecedent irradiation.

I am not convinced, however, that this technique will be of use in determining the extent of operation on the thyroid gland *per se* or on the lateral lymph nodes in the neck. From a practical standpoint Tollefson et al. have pointed out that the microscopic presence of carcinoma in multicentric foci does not correlate well with the clinical reappearance of tumor. In their series, the rate of multicentricity (38%) was eight times greater than the clinical appearance of a contralateral carcinoma (4.6%) [1]. Empiric total thyroidectomy for carcinomas well contained in one lobe is not obviously superior to lobectomy, as pointed out by Buckwalter and Thomas [2]. Irrespective of the lymphatic drainage of the thyroid gland, however, multicentricity does occur and correlates well with clinical recurrence in those individuals treated for carcinoma of the thyroid arising after radiation exposure. For these patients we advocate total or near-total thyroidectomy [3].

Whether or not alternate lymphatic channels from the thyroid gland may occur if lymphatics are blocked by tumor in one lobe has not been demon-

strated by these authors. The same criticism may apply to their findings that lymphatics from the thyroid rarely go to the superior mediastinum. While this may be true in the normal individual, it is unclear whether or not this is the case if lymphatic channels of the lateral neck are involved with tumor.

Finally, the authors state that lymphography is helpful in picking up lesions which cannot be detected either by scan or by physical examination. I am not convinced that it is necessary to pick up all of the small lesions that cannot even be palpated and one question is how often lymphography is positive when lymph nodes cannot be palpated in the lateral neck. This is not stated in the manuscript. Since prophylactic neck dissection is rarely performed for papillary carcinoma of the thyroid, the clinical application of this observation is in question. While this study adds to our knowledge concerning the physiology of the lymphatic drainage of the thyroid and also argues in favor of multicentricity of thyroid cancer rather than intraglandular metastasis, I am not convinced that this technique will be of help in determining the extent of our operation on either the thyroid gland or its lymphatic basin.

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