

Additional Examinations in Lymphography: A Radiological-Surgical-Pathological Correlation

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Summary

190 patients with metastatic disease were examined lymphographically. After subsequent surgery, a correlation could be made between the histological and roentgenological findings on the lympho-adenogram, tomogram and angiogram. Only considerable experience in the evaluation of tomograms can lead to optimum results. Supplementary angiography, although a very coarse diagnostic method, also gave more favorable results. For this group of patients, the number of faulty diagnoses on the basis of lympho-adenography (29%) was reduced considerably after selective supplementary tomography and angiography (14%).

Evaluation of and differentiation between normal and metastatically invaded lymph nodes by lymphography can cause serious difficulties, especially if the lesions and the changes in the lymph nodes are not pronounced. The number of faulty diagnoses may be kept within acceptable limits by recognising such problems early in the course of the examination and employing refined diagnostic techniques.

In 1963, the need for supplementary roentgenological examinations in lymphography was indicated (1) and has been the subject of several further communications (2-16). Should surgery be necessary shortly after lymphographic study, only two methods are of particular value: namely, selective supplementary tomography, and angiography.

In *tomography*, a series of cross-sections (1/2-1/4 cm) makes it possible to evaluate lymph nodes in several planes. In this way, further information can be obtained on the location, shape, internal structure and marginal sinus of normal and pathological lymph nodes. Small pathological changes can thus be found in lymph nodes which appeared normal on lympho-adenograms. Conversely, presumed pathological changes are sometimes recognised to be due to matting of small and healthy lymph nodes. Thus tomography can be helpful in the event of 1. matted lymph nodes, 2. lymph nodes superimposed over parts of the skeleton or intestinal gases, 3. superimposition of lymph nodes and 4. pronounced adiposity of the patient.

Angiography includes cavography, phlebography, aortography, and/or arteriography. Lymph nodes are found around arteries and veins. They can, if enlarged, cause impression on blood vessels. Since the location of nodes requiring further study is known from the lymphogram, a supplementary angiographic examination can be directed to this area.

One or two catheters are positioned to achieve maximum filling and dilation of vessels in the area of interest. Radiographs for phlebocavography are exposed in the following projections: pelvic vessels – anteroposterior and oblique; inferior vena cava – anteroposterior and lateral. Aortography or selective arteriography can also demonstrate pathological lymph node masses, particularly in the true pelvis. When diagnostic difficulties occur, additional angiography may aid in the further examination of: 1. empty areas above a blockage or impairment of drainage in the lymphatic system, 2. interruption in

a chain of lymph nodes, 3. inadequate filling of lymph nodes with contrast medium and 4. lymph nodes outwith the drainage area.

Other additional techniques such as stereoscopy, subtraction and magnification are not of value in eliciting diagnostic problems in lymphography. The depth dimension of stereoscopic radiograms provides information about location; however, there is insufficient data with respect to the shape, structure and marginal sinus of the lymph nodes. Subtraction films cannot be used as routine examination, since it is impossible to take two exactly identical films before and after a lymphographic examination. Magnification radiographs also provide little further information on the location and structure of lymph nodes, not to mention the fact that good magnified radiographs of the lymph nodes in the abdomen are for technical reasons, exceptionally difficult to achieve. Follow-up radiography which is of course the safest method in patients scheduled for immediate surgery is clearly not feasible.

It is of course easy when sufficient material is available, to select several good examples and photographs illustrating the advantages of such methods. However, the question remains whether or not these examinations really lead to better results in the long run, especially as they are so time consuming and cause considerable discomfort to the patient. Scientific proof of the eventual value of such methods may only be demonstrated after accurate histological verification of a large series of patients.

Case Material and Results

190 patients with metastatic disease were examined by lymphography. All patients underwent surgery and histological examination of excised lymph nodes. The patients may be divided into two groups. A definite roentgenological diagnosis was made following lymphography and tomography in 170 patients. The second group consists of 20 patients from whom angiography was necessary because of equivocal diagnoses.

Group 1. Carcinoma of the cervix uteri, malignant melanoma of the extremities, carcinoma of the ovary, and carcinoma of the bladder were the most frequent diagnoses. Smaller numbers of patients had carcinoma of the corpus uteri, vagina, and vulva (Table 1). From the figures in columns 1-6 the results of lymphography with supplementary tomography may be compared with those of histological examinations. In the subsequent four columns a considerable decrease in false positives and false negative examinations resulted from tomography. This applied particularly to false positive diagnoses which were decreased from 21 to 6. The total number of incorrect evaluations after lympho-adenography (20%) was decreased after tomography to 8%. These figures, however, were still not final as in seven patients, more metastases undetected radiologically were demonstrated histologically in nodes additional to those in which pathological changes were diagnosed on the lymphogram and tomograms. These made up 4% of the total. The overall percentage of faulty diagnoses was therefore 24% from the lympho-adenograms and 12% following supplementary tomography.

Evaluation by a single radiologist has inherent limitations. For this reason, the entire series was reviewed by three other radiologist (Table 2). The first three columns document the experience of the radiologists and the last two, the results of their interpretation. (A) are my own results — 24% and 12%; (B) are the results of a radiologist with experience in lymphography but not in supplementary methods of examination. His results show 23% erroneous diagnoses from the lymphograms and 19% following tomography.

Table 1.

type of cancer	lymph-adenogr.		tomogram		histology		lymph-adenogr.		tomogram		extra false	total
	+	-	+	-	+	-	false	false	false	false		
							+	-	+	-		
cerv. uteri	38	12	35	15	37	13	4	3	1	3	2	50
corp. uteri	5	11	4	12	5	11	1	1	-	1	-	16
ovaries	6	20	4	22	5	21	3	2	1	2	1	26
vagina	3	1	2	2	2	2	1	-	-	-	-	4
vulva	3	2	4	1	4	1	-	1	-	-	-	5
bladder	5	13	4	14	5	13	2	2	-	1	1	18
extrem. (malign.m)	44	7	41	10	38	13	10	4	4	1	3	51
total							21	13	6	8	7	
false diagnosis %									20%		8%	4%
total false diagnosis %									24%		12%	

Table 2.

Radiologist	experience in radiol.	experience in lymphol.	experience in suppl.tomogr.	lymphogram adenogram false %	tomogram false %
A	+	+	+	24	12
B	+	+	-	23	19
C	+	-	-	40	30
D	-	-	-	65	55

Table 3.

Type of cancer	lymph-adenogr. and tomogram		angiogram		histology		angiogram		total
	doubtf.	+	-	+	-	false	false		
						+	-		
cervix uteri	6	2	4	3	3	-	1	6	
corpus uteri	2	1	1	1	1	-	-	2	
ovaries	7	1	6	3	4	-	2	7	
vagina	-	-	-	-	-	-	-	-	
vulva	-	-	-	-	-	-	-	-	
bladder	5	1	4	2	3	-	1	5	
extremities (malign.mel.)	-	-	-	-	-	-	-	-	
total						-	4		
false diagnosis %								20%	
false diagnosis % total group (190)								2%	

(C) the radiologist without experience in either lymphography or supplementary tomography had 40% and 30% wrong diagnoses and finally interpretation by a first year resident without experience (D) showed 65% and 55% errors. These values need no further explanation, but it is evident that considerable experience is necessary for accurate interpretation of tomographs.

Group 2. In the 20 patients from whom the diagnoses following lymphadenography and tomography was equivocal, angiography was considered necessary (Table 3). No false positive diagnoses occurred (Column 6). This may be explained by the ease of recognition on radiographs of compression and/or displacement of lymph vessels. Four false negative examinations occurred giving 20% errors in diagnoses in a total of 20 patient examined (Column 7). In view on the inherent defects of indirect methods of examination, this may be considered a satisfactory result. The figure 20% is equal to only 2% of the total group of patients; the total percentage incorrectly evaluated using supplementary methods is 14%. After lympho-adenography alone, the percentage of faulty diagnoses was 24 to which 20 equivocal examinations should be added. In approximately 50% of the latter one can probably guess the correct diagnoses; the total incorrect interpretations therefore are 29%.

Discussion

In 190 patients with suspected metastatic disease, the results of histological examination of lymph nodes removed at surgery were correlated with roentgenological findings on lymphography. The number of errors in diagnoses following lymphography alone (29%) was reduced to 14% when tomography and angiography were employed as supplementary examinations. One may consider a percentage error of 29% unacceptable to the clinician, while 14% may be reasonable. However, these percentages are not of great significance since a number of difficult patients can tip the scales in a negative direction, while more obvious diagnoses will produce a more favourable result. The real importance of this study is to indicate the improvement in correct diagnoses of metastatic disease involving lymph nodes resulting from the use of supplementary methods of radiological examination in the same series of patients.

Evaluation of these patients (Group 1) by three other radiologists confirms this definite improvement in accuracy resulting from supplementary examinations. Experience in interpreting tomography of lymph nodes is a further important factor leading to more precise diagnoses. The occasional tomogram therefore serves little purpose. However, despite inherent limitations, further improvement in diagnostic accuracy may result from supplementary angiogram if these are compared with suspicious areas on the lymphograms and tomograms (Group 2). This study concludes that the most accurate diagnoses of metastatic disease in lymph node may be achieved by routinely combining lympho-adenography with supplementary methods of examination.

References

- 1 *Roo, T. de:* Techniek van de lymphografie. J.belge Radiol. 46 (1963) 462
- 2 *Roo, T. de:* Tomography in lymphography. Boerhaave radiol. lectures 1 (1964) 11
- 3 *Roo, T. de:* Valeur de la tomographie en lymphadénographie. Ann.Radiol. 8 (1965) 17
- 4 *Roo, T. de:* Differential diagnosis in lymphadenography. Medicamundi 11 (1965) 97
- 5 *Roo, T. de, P. Thomas, R.W. Kropholler:* The importance of tomography for the interpretation of the lymphographic picture of lymph node metastases. Amer.J.Roentgen. 4, 9 (1965) 24

- 6 *Roo, T. de*: Application de l'angiographie comme méthode complémentaire de la lymphographie pour dépister les processus malins et déterminer leur étendue. *Ann.Radiol.* 8 (1965) 319
- 7 *Roo, T. de, A.E. van Voorthuisen*: The indications for selective supplementary angiographic examination in lymphography. *Amer. J.Roentgen.* 4, 97 (1966) 957 and in *Yearbook of Urology, Chicago. Yearbook med. publ.* (1968) 55
- 8 *Roo, T. de*: The value of lymphangiography in lymphoedema. *Surg., Gynec. & Obstet.* 124 (1967) 755
- 9 *Roo, T. de, P. Thomas*: Lymphography with supplementary tomographic examination in the pre-operative analysis of melanosarcoma. *Clin.Radiol.* 18, 1 (1967) 83
- 10 *Roo, T. de*: L'Angiographie sélective supplémentaire, examen indispensable pour l'interprétation correcte de certaines lymphographies. *La grosse Jambe* 93. Expansion scientifique française. Paris 1968
- 11 *Roo, T. de*: Die besondere Bedeutung ergänzender Untersuchungsmethoden bei der Lymphographie. *Der Radiologe* 8, 7 (1968) 202
- 12 *Roo, T. de*: Methods of additional examination in lymphography. *Progress in Lymphology.* 200 Thieme Verlag, Stuttgart 1969
- 13 *Roo, T. de*: Supplementary angiographic examination in lymphangiography. *Progress Clin. et Ther. de la Phlebology.* Stenvert & Zn. Apeldoorn 1970
- 14 *Roo, T. de*: Lymphangiographic studies in a series of 55 patients with malignant melanoma. *Lymphology* 6 (1973) 6
- 15 *Roo, T. de*: Histological verification of supplementary examinations in lymphography. *Abstr.4th Int.Congress of Lymphology.* Tucson, Arizona 1973
- 16 *Roo, T. de*: *Atlas of Lymphography.* Sandoz, Basel 1973

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Current Status of Endolymphatic Therapy with Radionuclides

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The Wiesbaden workshop was initiated to exchange experience and to discuss values and limitations of endolymphatic radiotherapy (ELRT).

The limitations due to the many variations of lymphatic anatomy were demonstrated by *Kubik* (Zurich). Restricting his presentation to the lower limb lymphatic system, he recalled the fact that certain groups of lymph nodes are not visualized by conventional foot lymphangiography (e.g. the internal iliac and external iliac nodes). Consequently these will not be reached by intralymphatically infused radionuclides. Thus, the primary regions of lymphogenic spread of tumors of all pelvic organs — except ovaries and testes — are excluded from this therapeutic approach. Further limitations of endolymphatic radiotherapy from an anatomical viewpoint are:

- 1) the possibility of "by passing" nodes,
- 2) the preferential segmental filling lymphnodes which can be incomplete, and
- 3) the lack of lymph channels in metastatic tissue.

The latter phenomenon leads to the well known sharply defined filling defects in lymphangiography which are diagnostic for metastatic involvement.