

- 12 *Cantor, H., R. Asofsky*: Synergy Among Lymphoid Cells Mediating the Graft Versus-Host Response. *J.Exp.Med.* 135 (1972), 764
- 13 *Moorhead, J.W., H.N. Claman*: Thymus-Derived Lymphocytes and Hydrocortisone; Identification of Subsets of Theta-Bearing Cells and Redistribution to Bone Marrow. *Cell.Immunol.* 5 (1972), 74
- 14 *Rhinehart, W.O.*: Rate of Flow and Cell Counts of the Rat Thoracic Lymph. *Proc. Soc.Exp.Biol.Med.* 58 (1945), 123
- 15 *Burton, A.F., J.M. Storr, W.I. Dunn*: Cytological Action of Corticosteroids on the Thymus and Lymphoma Cells in vitro. *Canad.J.Biochem.* 45 (1960), 289
- 16 *Lundin, P., B. Järplid*: Effects of corticosteroids and Radiation on Lymphoid Tissue in Mice. *Lymphology* 1973. In press.
- 17 *Bierring, F.*: Quantitative Investigations on the Lymphomyeloid System in Thymectomized Rats. In *Ciba Foundation sympos. on Haemopoiesis*. Churchill, London 1960, p. 185
- 18 *Schooley, J.C., M.M. Shrewsbury*: The Thymus and the Circulating Lymphocyte Pool. In: *The Lymphocyte in Immunology and Haemopoiesis*. Bristol 1966.
- 19 *Everett, N.B., R.W. Tyler*: Lymphopoiesis in — the Thymus and other Tissues: Functional Implications. *Int.Rev.Cytol.* 22 (1967), 205
- 20 *Cohen, J.J.*: Thymus Derived Lymphocytes Sequestered in the Bone Marrow of Hydrocortisone Treated Mice. *J.Immunol.* 108 (1972), 841

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## Lymphographic Findings in a Series of 258 Patients with Tumors of the Testes

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### Summary

258 patients with a tumor of the testis were examined by means of lymphography. The spread of metastases in inguinal, iliac, paralumbar, aortic, supra-clavicular and mediastinal regions in general follows the expected pattern. Special attention must be paid to groin and low iliac regions in patients who underwent previous operations (e.g. orchidopexia, herniotomy etc.). In 10% of the cases selective supplementary phlebo/cavography should yield further information about doubtful regions in the pelvis and to the right of the lumbar spine; if there is an uncertain region to the left of the lumbar spine, follow-up examinations are suggested.

Testicular tumors form one to two percent of all malignant growths in the male. Therefore it will take years to collect a series of patients of significant value, examined by means of lymphography. It seems to be of sufficient interest therefore to summarize the results of a large clinical material.

The technical part of the examination is generally performed by standard lymphography. Principally it is possible to perform a selective lymphography directly from

the testis (1-4). The disadvantage of this method is that an overall view of the lymph-system in the pelvis and the abdomen is not obtained (5). An optimal investigation would be to combine the two methods (2) which is, however, a timeconsuming and involved procedure. In routine practice the data obtained by standard lymphography is considered to be sufficient, provided that enough contrast medium has been injected to fill all paralumbar lymph nodes.

### *Case material and results*

The 258 patients with a tumor of the testis were examined by means of standard pedal lymphography (1963-1972). Of this group of patients the original histological diagnosis as well as positive, negative and doubtful findings on the lymphogram are presented in Table 1.

Table 1. Pathological diagnosis and lymphographic findings in patients with testicular tumors

Pathological diagnosis	Lymphography			Total number of patients
	pos.	neg.	dbtful	
Seminoma	62	42	18	122
Terato-carcinoma	17	10	4	31
Embryonal carcinoma	27	18	4	49
Mixed tumor	14	20	3	37
Rare forms (as e.g. chorion carcinoma, reticulumcell sarcoma etc.)	10	6	3	19
total number of patients	130	96	32	258

The patients with normal findings on the lymphogram will be left out of consideration, for these usually receive radiotherapy as part of their treatment and therefore possible false negative interpretations on follow-up cannot be corrected. Of the 130 patients with a pathologic lymphogram, 75 with a right and 55 with a left testicular tumor, the locations of the metastases in the lymphatic system are cited in Table 2.

Table 2. Lymphographic localisation of abnormal findings in 130 patients

Localisations on the lymphogram	Right testicular tumor	Left testicular tumor
	75 patients	55 patients
inguinal	—	2
iliac	5	—
L 5	18	3
L2-L4 (right)	38	5
L2-L4 (left)	25	39
L2-L4 (both sides)	12	9
supraclavicular	1	—
mediast. lymph nodes	—	—

In general no histological correlation is available unfortunately. In this series, however, 10 patients underwent an operation and the removed lymph nodes were examined microscopically. Of this group the positive and negative findings on the lympho-adenograms and supplementary tomograms as well as the histological diagnosis are presented in Table 3. The single wrong interpretation of the lympho-adenograms was corrected when the tomograms were reviewed.

Table 3. Recognition of metastases subsequently verified by histological examination of surgically removed lymph nodes in 10 patients with embryonal or terato carcinoma of the testis

	Metastases	
	recognized	not recognized
Conventional lymphography	9	1
Additional tomograms	10	0
Pathological diagnosis	10	0

in the suspected area is obtained (6-8). In four patients the doubtful region was to the left of the lumbar spine. Follow-up roentgenograms were therefore needed. From two patients who received radiotherapy, no further conclusions could be drawn. Of the group of patients with a doubtful lymphogram, the positive and negative findings on supplementary angiograms and follow-up roentgenograms are presented in Table 4.

Table 4. Result of supplementary investigations in 21 patients with a "doubtful" lymphogram

Investigational procedure	Findings	
	abnormal	normal
Phlebo/cavography	10	7
Follow up examinations	1	1
Radiotherapy complicating interpretation	2	

tases on the opposite side of the lumbar spine along the path of crossing lymph vessels occur more often if the tumor is on the right than when it is on the left side. Localization of metastases at the level of L5, mostly seen in right testicular tumors, occurs only in combination with higher situated metastases, often lying on the contralateral side. In contrast to the anatomical description, however, involvement of lymph nodes of the high iliac region is rare and occurs only in combination with metastases higher up. Changes of lymph nodes in the iliac region suggesting infections are seen regularly. Supra-clavicular metastases have been found once only. Metastases were never seen in visualized mediastinal lymph nodes. Of the complete series there were 16 patients with pulmonary metastases; as expected lymphography in these cases showed metastases also in the abdomen.

Also in complete contradiction to anatomical descriptions, lymph node metastases were found in the inguinal region in two patients with a left testicular tumor. This can only be expected as a consequence of impairment of normal lymph drainage caused by previous operations such as orchidopexy or herniotomy. This point is demonstrated in Fig. 1. This lymphogram is from a healthy man operated in his youth for a left undescended testis. Collateral lymph flow has developed from the left inguinal region to the testis and further to the right lower iliac region. This lymphogram clearly demonstrates that metastases may be expected in inguinal and low iliac regions, if a tumor should develop in this man's testis.

In 32 patients the final radiological evaluation remained doubtful, in spite of supplementary tomography. Further studies such as angiography and follow-up examinations were therefore indicated. Phlebography and cavography was performed in 17 patients in whom a doubtful region on the lymphogram was visible in the iliac, paralumbar or para-aortic regions to the right of the lumbar spine. The method consisted of one or two catheters being placed in such a way that maximum filling of the vessels

#### Discussion

The spread of metastases of testicular tumors generally appears to occur in agreement with the already long known descriptions of the anatomists (9, 10). The site of choice of the metastases are the peri-aortic and pericaval lymph nodes at the level of L2 to L4, while metas-

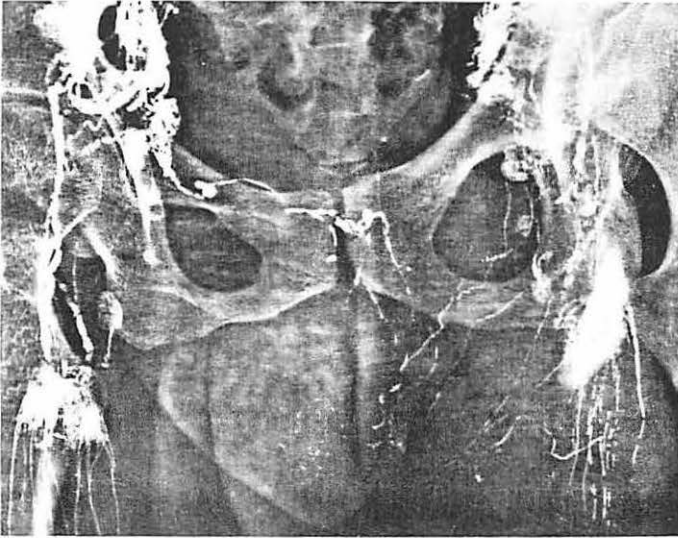


Fig. 1. Healthy man aged 35, operated in his youth for undescended left testicle. Lymphogram: a different lymph drainage has developed after operation (left groin - testis - right low iliac region).

Ten patients underwent an operation and the removed lymph nodes were examined histologically. The roentgenological diagnosis was confirmed. It must be mentioned, however, that no conclusions can be drawn by means of lymphography concerning the microscopical structure of testicular tumors.

In 10% of the cases it was necessary to use further selective supplementary methods to obtain more information about doubtful regions on the lymphogram.

### References

- 1 Chiappa, S., G. Galli, S. Barbaini e.a.: La lymphographie peropératoire dans les tumeurs du testicule. *J.Radiol.Electrol.* 44 (1963), 613
- 2 Chiappa, S., G. Bonadonna, C. Uslenghi e.a.: Combined testicular and foot lymphangiography in testicular carcinomas. *Surg.Gynec. and Obstet.* 123 (1966), 1
- 3 Wahlqvist, L., L. Hulten, M. Rosencrantz: Normal lymphatic drainage of the testis studied by funicular lymphography. *Acta chir. Scand.* 132 (1966), 454
- 4 Agbaba, M., R. Novak, M. Basic, B. Temmer: Selective lymphography of testicle. *Abstr. 3.Int.Congr. of Lymphology, Brussels* (1970), 124
- 5 Busch, F.M., E.S. Sayegh: Roentgenographic visualization of human testicular lymphatics. *J.Urol.* 89 (1963), 106
- 6 Roo, T. de: Application de l'angiographie comme méthode complémentaire de la lymphographie pour dépister les processus malins et déterminer leur étendue. *Ann.Rad.* 8 (1965), (5-6), 319
- 7 Roo, T. de: The indications for selective supplementary angiographic examination in lymphography. *Amer.J.Roentgen.* 4 (1966), 957
- 8 Roo, T. de: Die besondere Bedeutung ergänzender Untersuchungsmethoden bei der Lymphographie. *Der Radiologe* 7 (1968), 202
- 9 Rouvière, H.: *Anatomie des Lymphatiques de l'homme.* Masson, Paris (1932)
- 10 Jossifow, G.M.: *Das Lymphgefäßsystem des Menschen.* Fischer, Jena (1930)

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