

## Morphological Studies on Liver Lymphatics

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### Summary

Form, distribution and structure of liver lymphatics were studied in pig, calf, kid, dog, rabbit and human using both light and electron microscopes. The relation of the lymphatics to both blood vessel and connective tissue was the same throughout the material. The lymphatic capillaries were supported by a lattice of the coarse bundles, composed of collagenous fibers. The endothelial cells of the lymphatic capillaries lying in the meshes of the lattice showed a marked change in the volume and a phagocytotic activity. The results were discussed in relation to the function.

Capsular and intrahepatic lymphatic vessels have been examined with both the light and electron microscopes. The resin casting method was employed for visualizing of three dimensional arrangement of the lymphatics. The animals used in this study were pig, calf, kid, dog and rabbit. Human livers were also examined.

Form and distribution of collecting vessels and draining channels showed some differences among the animals and man. The relation of the lymphatics to both blood vessel and connective tissue was, however, the same throughout the material. The intrahepatic lymphatics could be subdivided into two systems:

1. Peri-portal and ductal system,
2. Peri-hepatic vein system.

The lymphatics of both systems could be demonstrated by injection of India ink into the capsular lymphatics. The entire lymphatic system of the liver formed an unit by the intercommunication of the lymphatics. The space of *Disse* had no direct communication with the lymphatics. There existed a lattice of the coarse bundles, which forms a specific pre-lymphatic passway (Fig. 1). The characteristics of the liver lymphatics indicated in this study were as follows: The fine intrahepatic lymphatics communicated directly with the extremely

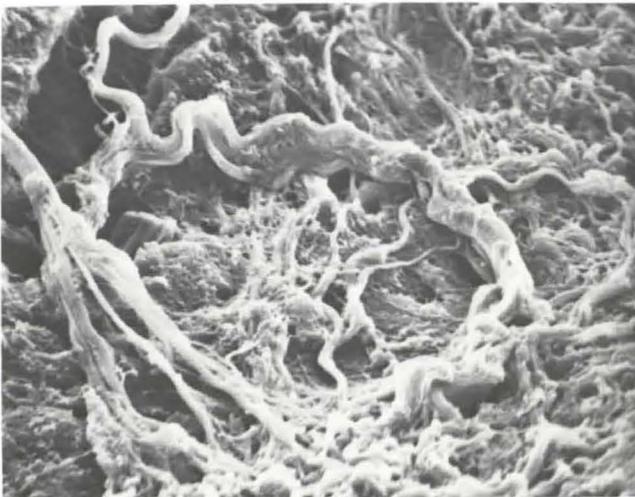


Fig. 1 Scanning electron micrograph of a pre-lymphatic passway in *Glisson's* capsule of a normal human liver showing a lattice of coarse bundles of collagenous fibers and a fine network of reticular fibers  
x 1700



Fig. 2 Scanning electron micrograph of a resin casting of lymphatics in a pig liver showing communication of a network of lymphatic capillaries in the *Glisson's* capsule with that of capsular lymphatics. x 85

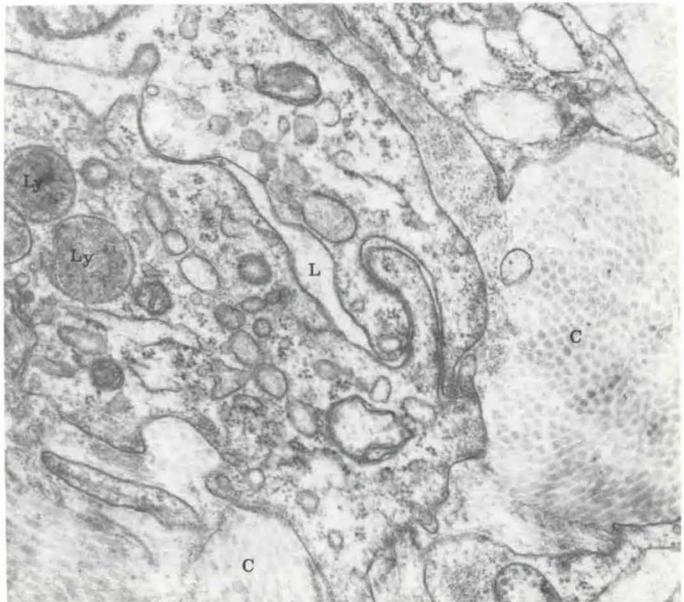


Fig. 3 A portion of two adjacent endothelial cells of a lymphatic capillary (L) in the *Glisson's* capsule of a rabbit liver showing numerous vesicles and several lysosomes (Ly). A hemidesmosome-like structure is present on the abluminal surface. Collagenous bundles (C) can be seen just outside the endothelium. x 18720

large capsular lymphatics (Fig. 2). The endothelium of the lymphatic capillaries both in the *Glisson's* capsule and in the wall of hepatic vein were directly surrounded by thick collagenous bundles without basal lamina (Fig. 3, 4).

On the other hand, the collecting lymphatics were surrounded by the loose connective tissue, in which elastic fibers and smooth muscle cells were scattered (Fig. 5). The

lymphatic capillaries in the *Glisson's* capsule showed two different features, even in a section: thin endothelium and wide lumen in one part, thick endothelium and extremely narrow lumen in another part (Fig. 6). The difference was remarkable in the capillaries as compared with that of the collecting lymphatics. The combined observations by scanning and transmission electron microscope indicate

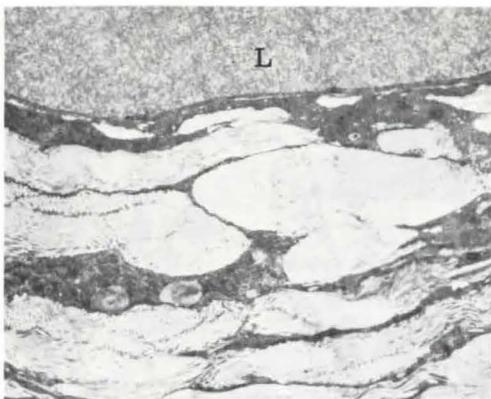


Fig. 4 A portion of a lymphatic capillary (L) in the wall of a hepatic vein in a rabbit liver. The capillary is surrounded by collagenous bundles, x 250

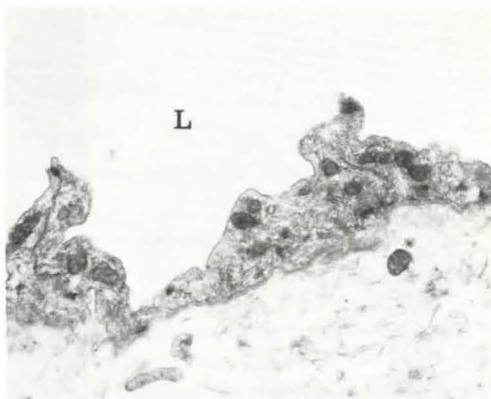


Fig. 5 A portion of a collecting lymphatic (L) of a rabbit liver. It is surrounded by a faint basal lamina and loose connective tissue, x 6280

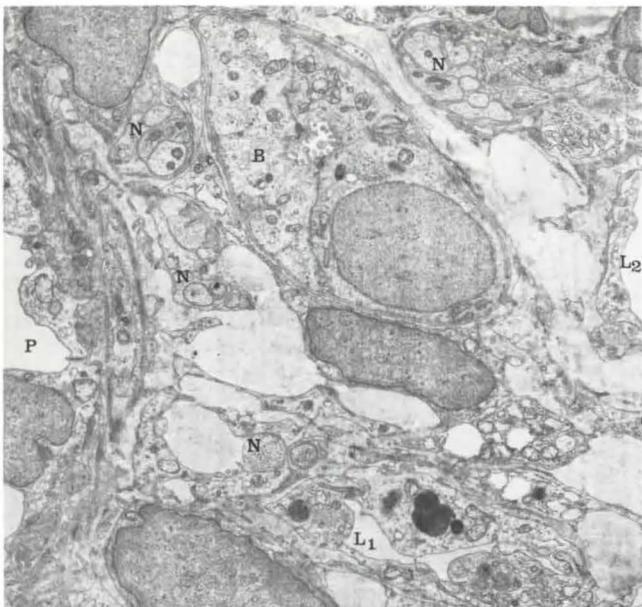


Fig. 6 A survey electron micrograph which shows the relationship of the lymphatic capillaries ( $L_1$ ,  $L_2$ ), portal vein (P), bile duct (B) and nerve fibers (N) in the *Glisson's* capsule of a rabbit liver, x 6000

that the endothelial cells of the lymphatic capillaries can temporarily distend in the meshes of the lattice of the collagenous bundles, in which tissue fluids are to be pooled and, a marked change in the volume of the endothelial cells corresponds to the absorption and expelling of the protein rich tissue fluids. Thus, the existence of the lattice of the thick collagenous bundles plays an important

role in the absorption and movement of the lymphatics. In addition, it is noted that the endothelial cells of the lymphatic capillaries lying in the meshes of the lattice showed a high phagocytotic activity. The observations indicated that the endothelial cells of the lymphatic capillaries in the livers may in a wide sense belong to a cell of the reticulo-endothelial system.

## References

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## International Society of Lymphology Forthcoming Conventions

### 7th International Congress of Lymphology

The 7th International Congress of Lymphology will be held in *Florence, Italy*, October 28 – November 2, 1979.

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- Lymphostasia and its physiopathological consequences
- Lymphatic transport of exocrine and endocrine gland products
- Role of the lymphatics in intestinal function
- Lymphographic findings in malignant lymphomas and in lymph node metastasis: prognosis and therapy.
- Pathophysiology and new progresses in therapy of lymphedemas
- Angiodysplasia and the lymphatic system
- Classification of non-Hodgkin-lymphomas
- The lymphocyte, the lymphoid tissue and immunocomplexes in lymphomas and other malignancies

- Progress in the treatment of tumors of the lymphatic system
- Intralymphatic application of drugs, immunosubstances and radionuclides
- The deep subfascial lymphatics: instrumental research, pathophysiology, its importance in lymphedemas, also under the therapeutic point of view

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## Tissue Fluid Pressure and Composition

A satellite meeting of the II. World Congress for Microcirculation on "Tissue Fluid Pressure and Composition" will be held at the University of California, San Diego, La Jolla, California, July 19–21, 1979.

### Description of Meeting

This meeting will correlate the latest scientific advances in tissue fluid pressure and composition with recent clinical applications. The program brings together acknowledged experts in basic science and clinical fields of tissue fluid pressure and tissue composition. Each subject will be approached from theoretical as well as practical viewpoints. The first day will examine the origin of hydrostatic and osmotic pressures in tissue and blood, interstitial composition, lymph composition, pulmonary edema and transcapillary protein transport. The second day will emphasize whole organ and clinical implications of

tissue fluid pressure in brain, kidney, lung, intestine, heart, muscle compartment syndromes, and other forms of trauma. Each speaker will be followed by a 15-minute discussion period. The third day (half-day session only) will cover techniques for measuring tissue fluid pressure (capsule, servo-null micro-pressure system, clinical infusion, clinical wick catheter), followed by recent findings, discussions, and demonstrations of each technique.

This symposium is a satellite meeting of the II World Congress for Microcirculation and the 25th Anniversary Meeting of the U.S. Microcirculatory Society. Our satellite meeting will take place four days prior to and at the same location as the World Congress.

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