

Dr. Vodder's Manual Lymph Drainage

A Practical Guide

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1. Auflage 2010. Taschenbuch. 152 S. Paperback

ISBN 978 3 13 143191 2

Format (B x L): 19,5 x 27 cm

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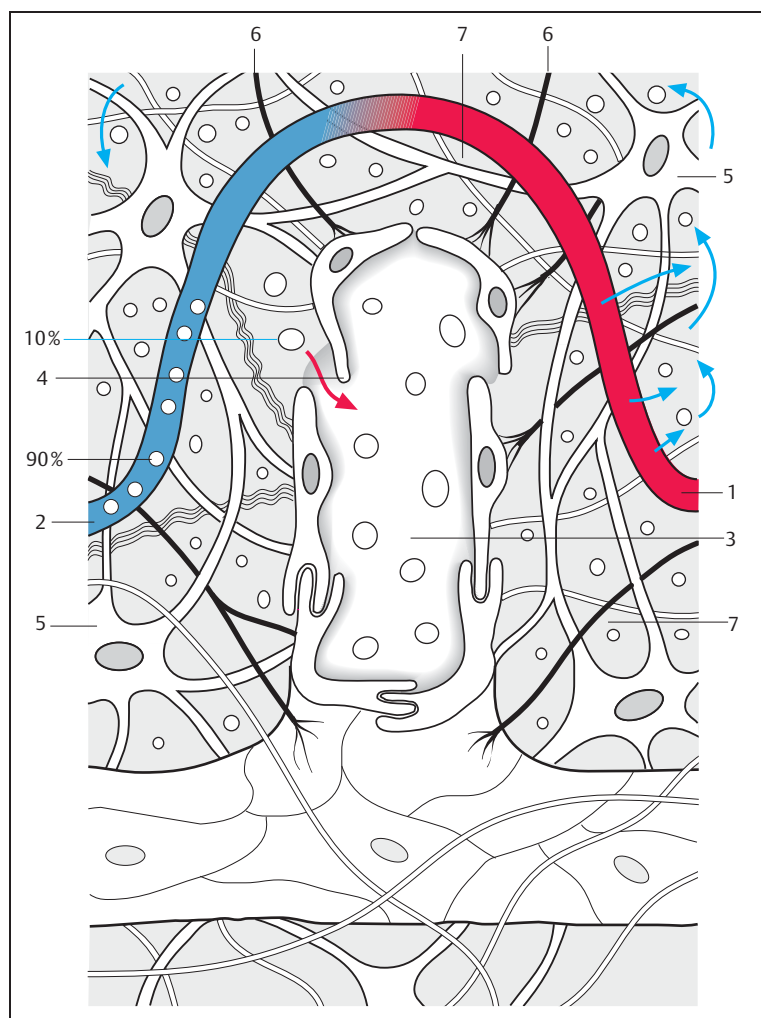


Fig. 2.1 Longitudinal section along a glove-finger-shaped initial lymph vessel with a blind origin in the tissue. **1**, arterial limb of capillary; **2**, venous limb of capillary; **3**, initial lymph vessel; **4**, swinging tip of an endothelial cell of the initial lymph vessel allowing influx of interstitial fluid (arrow to the left and right of 4); **5**, fibrocyte; **6**, anchor filaments; **7**, intercellular space.

ing vessel. It may have some muscle cells and empties into the precollectors. **Q 2**

Precollectors

Initial lymph vessels turn without noticeable transition into precollectors, which pass the collected lymph on to the next vessels (the collectors). In the skin (and also in the mucous membranes) they run vertically into the deep tissues.

The precollectors show similarities to both the smaller and the larger lymph vessels. They have rudimentary valves which determine the direction of flow and also prevent reflux. There are some isolated muscle fibers and openings in the walls that allow them to absorb fluid from the connective tissue. **Q 3**

Precollectors have a transitional character. On the one hand they are transport vessels and form the link between the initial lymph vessels and the collectors. In addition, though, like the initial lymph vessels they are able to ab-

sorb a small amount of lymph-obligatory substances from the interstitium and are therefore also regarded as collecting vessels. The larger vessels to some extent exert a suction effect on the content of the precollectors, which speeds up the transport. As mentioned above, this suction can continue to have an effect all the way into the initial lymph vessels. **Q 4**

Lymph Collectors

The lymph collectors are the next size up of the lymph vessels. Along their course from the periphery to the venous angle, lymph nodes are interposed. The walls of the lymph collectors exhibit the classic three-layered structure of the entire vessel system: intima, media, and adventitia.

The **intima** consists of endothelial cells with flaps every 2.5–15 mm. The section between two paired flaps (valves) is called a lymph vessel segment or, to use Mislin's term, **lymphangion**. The valves control the direction of flow.

The **media** is mainly made up of smooth muscle cells, with a multilayered structure consisting of a medial circular layer and a longitudinal layer. This is a spiral-like plexus that may include several angions. It also contains some thin collagen fibers. The muscles are only found in the middle section between the valves: the valves themselves are without muscles. This gives an impression of constriction at the valves, leading to a “string of pearls” appearance on contrast imaging.

The **adventitia** is the support layer and is linked to the connective tissue. **Q 5**

When the lymphflow increases, the internal pressure rises, the wall of the vessel stretches and its tension increases. This is the triggering stimulus that causes the muscle cells of the lymphangion to contract. The contraction drives the lymph proximally while the distal valves close (**Fig. 2.2**).

The lymph flow is also maintained by so-called “auxiliary pumps.” The following factors exert external pressure on the vessels:

- Manual lymph drainage
- Contraction of skeletal muscles
- Pulsation of large arteries
- Increased intestinal peristalsis during manual lymph drainage
- Pressure changes in the thorax during respiration that cause intensified contraction of the large lymph trunks and produce a suction effect in the venous angle. **Q 12**

Lymphangions also have their own pulsation, which is independent of internal pressure, with a frequency at rest of one to eight pulsations per minute.

One of the most important auxiliary pumps is manual lymph drainage. The collectors lie in the subcutis, and during Dr. Vodder's Manual Lymph Drainage they are stretched both lengthways and crossways. Stretching the lymphangions increases the pulsation rate, accelerating the flow of the lymph (Mislin, 1973).

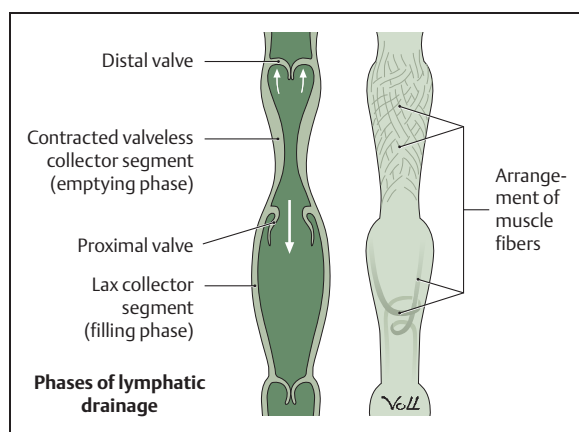


Fig. 2.2 Lymphangion, showing the action phases of lymphatic drainage.

Sympatolysis is an additional effect of manual lymph drainage, as described by Hutzschenreuter (1994). It causes dilatation of the lymph collector, which increases the contraction of the lymphangion.

Hence, both a large amount of lymph and manual lymph drainage result in an acceleration of lymph flow. Manual lymph drainage does so through a particular technique that increases the pulsation frequency of the lymphangions.

When the lymph-obligatory load has been absorbed into the vessels from the connective tissue, and lymphangion motoricity has been increased by manual lymph drainage, the suction produced by the lymphangions reaches as far as the initial lymph vessels, which then suck in more lymph-obligatory substances. Transport and removal of these are in turn accelerated by the increased lymphangion pulsation rate.

- The **initial lymph vessel** is a collecting vessel. It absorbs the lymph-obligatory load into the vessel system.
- The **precollector** is both a transport and a collecting vessel: It can both absorb lymph-obligatory load (though only in small amounts) and transport lymph from the initial lymph vessels to the collectors.
- The **collector** is called a transport vessel. It maintains the lymph flow. **Q 6**

Lymph Nodes

Lymph nodes are filtering stations located along the lymph collector paths. There are about 600–700 lymph nodes in the human body, about 160 of them in the neck region alone. They are mostly bean-shaped, with a diameter of 2–25 mm, and are surrounded by a connective-tissue capsule (**Fig. 2.3**). However, they can vary considerably in size, shape, and number. Every region of the body has its own group of **regional lymph nodes**. They consist of an internal trabecular framework, embedded in lymphatic tissue. Each lymph node has several afferent vessels that enter through the convex side of the capsule and empty into the sinus (marginal, intermediary, and cortical sinus) of the node. One or two lymph vessels and one vein (efferent vessels) exit the capsule and one artery enters it at the hilum. Some lymph vessels may pass the lymph node by. This can be important, in cancer, for example, because it means that metastasis of more centrally located lymph nodes can occur without the regional nodes being involved.

The responsibilities of lymph nodes are manifold. They may be described as biological filters, filtering out everything harmful to the body and rendering it harmless—viruses, bacteria, fungi, and so on. The lymph is cleaned. In the lymph node sinus, antigens (bacteria) are broken down just as they are in the liver.

In addition, lymph nodes concentrate (thicken) the lymph, by about 50%; that is, they remove water from the lymph. This is done by colloid osmotic suction in the