

Lymph Vascular System

The lymph vascular system consists of endothelial-lined tubes that recover intercellular (tissue) fluid not picked up by the blood vascular system and returns it to the blood. The fluid (lymph) carried by the lymphatics is a blood filtrate formed as fluid crosses the blood capillaries into the tissues. Unlike the blood vascular system, lymph flow is unidirectional - from tissues to the union of the lymphatic and blood vascular systems at the base of the neck. The lymphatic vascular system begins in the tissues as blindly ending capillaries that drain into larger collecting vessels and then into two main lymphatic trunks. Lymph nodes occur along the course of the vessels and filter the lymph. Lymphatics are present in most tissues but are absent from bone marrow, the central nervous system, coats of the eye, internal ear, and fetal placenta.

Lymph Capillaries

Lymph capillaries are thin-walled, blind tubes that branch and anastomose freely to form a rich network in organs and tissues. They are wider and more irregular than blood capillaries. The wall of a lymph capillary consists only of a thin continuous endothelium and a discontinuous basal lamina that is present only in patches or may even be absent. Adjacent endothelial cells may overlap, but junctional complexes are few and clefts occur between the cells. Externally, the endothelium is surrounded by a small amount of collagenous connective tissue. Fine filaments run perpendicularly from the collagen bundles and attach to the outer surfaces of the endothelium as anchoring filaments that maintain the patency of the vessel.

Collecting Lymph Vessels

Collecting lymph vessels differ from lymph capillaries in size and the thickness of their walls. Although three coats - intima, media, and adventitia - are described as in blood vessels, they are not clearly delineated. The tunica intima consists of an endothelium supported by a thin network of longitudinal elastic fibers. The tunica media is composed of smooth muscle cells with a predominantly circular arrangement, though some cells run longitudinally. Between the muscle cells are a few fine elastic fibers. The tunica adventitia is the thickest coat and consists of bundles of collagen fibers, elastic fibers, and some smooth muscle cells, all of which have a longitudinal orientation.

Valves are numerous along the course of lymphatic vessels and occur at closer intervals than in veins. They arise in pairs as folds of the intima, as in veins.

Lymphatic Trunks

Collecting lymphatic vessels ultimately gather into two main trunks, the thoracic and right lymphatic ducts. The thoracic duct is the longer and has a greater field of drainage. It begins in the abdomen, passes along the vertebral column, and opens into the venous system at the junction of the left jugular and subclavian veins. It receives lymph from the lower limbs, abdomen, left upper limb, and left side of the thorax, head, and neck. The right lymphatic duct receives lymph only from the upper right part of the body and empties into the brachiocephalic vein. The structure of the trunks is the same, generally resembling that of a large vein. The tunica intima consists of a continuous endothelium supported by a subendothelial layer of fibroelastic tissue with some smooth muscle. Near the junction with the tunica media, the

elastic fibers condense into a thin internal elastic lamina. The thickest layer is the tunica media, which contains more smooth muscle than does the media of large veins. The smooth muscle cells have a predominantly circular arrangement and are separated by abundant collagenous tissue and some elastic fibers. The tunica adventitia is poorly defined and merges with the surrounding connective tissue. It contains bundles of longitudinal collagen fibers, elastic fibers, and occasional smooth muscle cells. The wall of the thoracic duct contains nutrient blood vessels similar to the vasa vasorum of large blood vessels. Unlike most vascular smooth muscle referred to as a tonic variety (doesn't generate an action potential), smooth muscle associated with the lymph vessels is referred to as phasic smooth muscle. Phasic smooth muscle of the lymphatics, unlike visceral smooth muscle, generates action potentials and create waves of contraction that move lymph toward the heart and its union with the blood vascular system. The valves within the lymph vessels prevent backflow. Thus, the lymph vascular system can be likened to a sump-pump system within the interstitial compartment moving that tissue fluid not absorbed initially by blood vascular system back to the blood. The lymph vascular system may capture and move as much as 4 liters of fluid daily. Because most lymph capillaries are considered leakier than most capillaries, many larger molecules from a variety of organs (chylomicra, peptide hormones) gain access to the blood via this route.

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