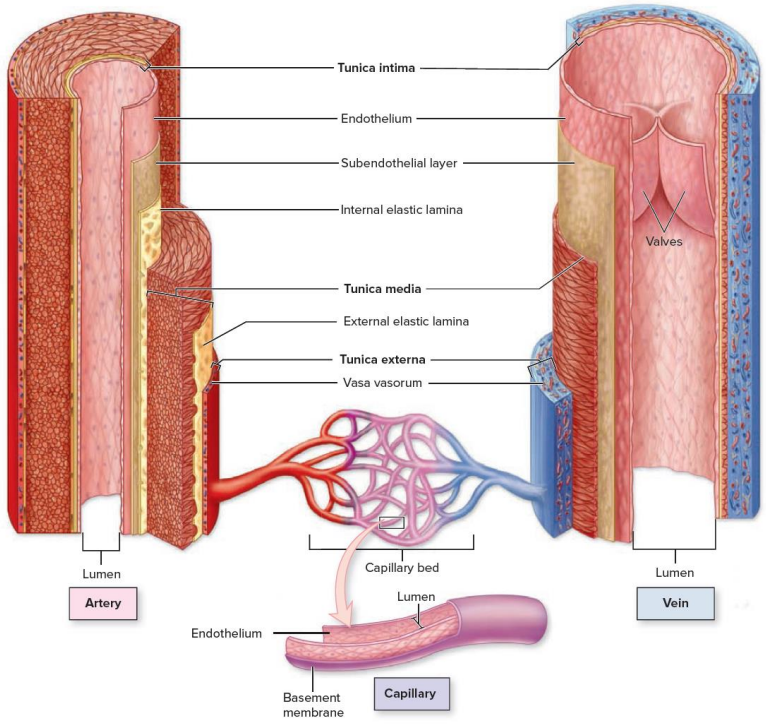
LYMPHATIC SYSTEM – Textbook and Lecture Slides

Both artery and vein walls have three layers, called **tunics.** The tunics surround the **lumen, or** inside space, of the vessel through which blood flows. These tunics are the tunica intima, tunica media, and tunica externa**.** The innermost layer of a blood vessel wall is the **tunica intima,** or tunica interna. It is composed of an **endothelium** (a simple squamous epithelium lining the blood vessel lumen) and a subendothelial layer made up of a thin layer of areolar connective tissue, and may have an internal elastic lamina. (Veins typically do not have this lamina.)



The **tunica media** is the middle layer of the vessel wall. It is composed of circularly arranged layers of smooth muscle cells and may have an external elastic lamina. (Veins typically do not have this lamina.) Sympathetic innervation causes the smooth muscle to contract, resulting in **vasoconstriction** or narrowing of the blood vessel lumen. When the smooth muscle cells relax, **vasodilation** or widening of the blood vessel lumen, results.

The **tunica externa,** or tunica adventitia, is the outermost layer of the blood vessel wall. It is composed of areolar connective tissue that contains elastic and collagen fibers. The tunica externa helps anchor the vessel to other structures. Very large blood vessels require their own blood supply

to the tunica externa in the form of a network of small arteries called the **vasa vasorum.** The vasa vasorum extend through the tunica externa.
In arteries, the thickest layer is the tunica media, whereas veins have a thicker tunica externa. The lumen in an artery is narrower than in its companion vein of the same size. Further, arteries tend to have more elastic and collagen fibers in all their tunics, which means that artery walls remain open (patent), can spring back to shape, and can withstand changes in blood pressure. In contrast, vein walls tend to collapse if there is no blood in them.

Finally, capillaries contain only the tunica intima, but this layer consists of a basement membrane and endothelium only. Intercellular clefts are the thin spaces between adjacent cells in
the capillary wall. Having only the tunica intima, without connective tissue and muscle layers, allows for rapid gas and nutrient exchange between the blood and the tissues.

Tunica intima = simple squamous epithelium forming the smooth surface of the lumen

Tunica media = circularly arranged smooth muscle cells. Contraction/relaxion changes vessel diameter.

Tunica externa = outer protective connective tissue layer.

Artery- thick outer wall, small lumen, thick layer of muscles and elastic fibres.

Vein- thin layer of muscle with elastic fibres, large lumen and a fairly thin outer wall.

ARTERIES

Arteries transport blood away from the heart. The arteries in the systemic circulation transport oxygenated blood to the body tissues. In contrast, the pulmonary arteries (part of the pulmonary circulation) transport deoxygenated blood to the lungs.

The three basic types of arteries are elastic arteries, muscular arteries, and arterioles In general, as an artery's diameter decreases, there is a corresponding decrease in the amount of elastic fibers and a relative increase in the amount of smooth muscle.

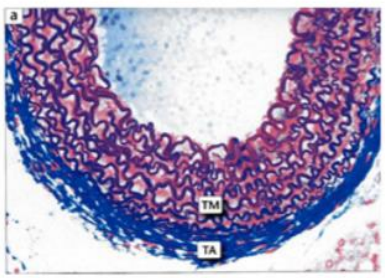
Elastic arteries are the largest arteries, with diameters ranging from 2.5 centimeters to 1 centimeter. They are also called *conducting arteries* because they conduct blood away from the heart to the smaller muscular arteries. As their name suggests, these arteries have a large proportion of elastic fibers throughout all three tunics, especially in the tunica media. The abundant elastic fibers allow the elastic artery to stretch when a heart ventricle ejects blood into it. In this manner, the elastic arteries are able to withstand the strong pulsations of the ejected blood as well as reduce the force of the pulsations somewhat, so that the pressure of the arterial blood equalizes slightly as it reaches the smaller arteries and eventually the capillaries. Examples of elastic arteries include the aorta and the pulmonary, brachiocephalic, common carotid, subclavian, and common iliac arteries. Elastic arteries branch into muscular arteries.

Abundant elastic laminae in wall permit vessel walls to recoil to resist large pressures. Elastic, conducting: pulmonary trunk, aorta, common carotid arteries, brachiocephalic trunk, subclavian arteries and common iliac arteries.

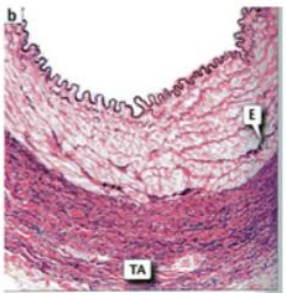
Muscular arteries typically have diameters ranging from 1 centimeter to 3 millimeters. These medium-sized arteries are also called *distributing arteries* because they distribute blood to body organs and tissues. Unlike elastic arteries, the elastic fibers in muscular arteries are confined to two circumscribed rings: The **internal elastic lamina** separates the tunica intima from the tunica media, and the **external elastic lamina** separates the tunica media from the tunica externa. Muscular arteries have a proportionately thicker tunica media,
with multiple layers of smooth muscle cells. The greater amount of muscle and lesser amount of elastic fibers result in less distensibility but better ability to vasoconstrict and vasodilate. Most of the named blood vessels (such as the brachial, anterior tibial, coronary, and inferior mesenteric arteries) are examples of muscular arteries. Muscular arteries branch into arterioles.

Arterial wall is dominated by smooth muscle and they are medium sized arteries. Muscular, distributing: external carotid arteries, arteries of limbs (brachial arteries and femoral arteries).

Elastic artery



Muscular artery



Arterioles are the smallest arteries, with diameters ranging from 3 millimeters to 10 micrometers. In general, arterioles have less than six layers of smooth muscle in their tunica media. Larger arterioles have all three tunics, whereas the smallest arterioles may have an endothelium surrounded by a single layer of smooth muscle cells. Sympathetic innervation causes contraction in the smooth muscle of the arteriole wall and results in vasoconstriction of the arteriole, which raises blood pressure. Arteriole vasoconstriction decreases blood flow into the capillaries, whereas arteriole vasodilation increases blood flow into the capillaries.