Biology 322: Human Anatomy

Blood Vessels

The cardiovascular system is a closed system that transports blood throughout the human body. Contraction of the heart provides the force that carries the blood, while the blood vessels provide the pathway. Blood leaves the left ventricle in very large, elastic arteries which decrease in diameter the farther they are from the heart. Blood returns to the right atrium via a series of veins which increase in diameter as they near the heart. In between the smallest arteries (ARTERIOLES) and veins (VENULES) are CAPILLARIES. These vessels possess extremely thin walls which allow gases (O2 and CO2), nutrients, waste products, and many other materials to be exchanged between the blood and the extracellular fluid surrounding the cells of a tissue.

Arteries and veins are not static structures. They are constantly changing diameter in order to maintain proper blood pressure. As the diameter of a blood vessel decreases, the pressure within that vessel increases. Similarly, an increase in blood vessel diameter will decrease the blood pressure within it. This ability to change diameter is critically important to the regulation of blood pressure in the body as a whole as well as the individual organs.

FIGURE 1: Microscopic anatomy (Fig. 22.1 of lab manual or 21.1 of your textbook)



**Exercise #1: Microscopic anatomy of blood vessels**

With the exception of the smallest capillaries, all arteries and veins are composed of three layers called TUNICS.

1. TUNICA INTIMA – the innermost layer of a blood vessel that is exposed to the blood. This layer consists of a thin layer of simple squamous epithelial cells called ENDOTHELIUM atop a basement membrane (like all epithelia). The endothelium secretes many factors that regulate blood clotting, leukocyte migration, and blood vessel diameter.
2. TUNICA MEDIA – the middle layer. This is the thickest layer of the blood vessel and contains a great deal of connective tissue (collagen = strength and elastin = stretchiness) and smooth muscle. The smooth muscle in this layer allows the blood vessel to change diameter (vasoconstriction/vasodilation) according to needs of the body or tissue.
3. TUNICA EXTERNA – the outermost layer. This layer contains a great deal of loose connective tissue that anchors the vessel in place, and allows nerves and other small blood vessels to travel alongside. Very large arteries and veins are so thick that they need their own dedicated blood supply. Special vessels known as VASA VASORUM supply blood to the outer layers of these vessels. Often times, the tunica externa of arteries and veins will blend together. This may be obvious in your slide.

Using the above figure and microscope slide #3 (artery, vein, nerve) you should be able to identify the three tunics of an artery and vein. You’ll note that arteries tend to have a thicker tunica media with more smooth muscle and elastic connective tissue that gives them a more uniformly round appearance as compared to veins. This is due to the fact that arteries carry blood from the heart that is under much greater pressure than blood returning to the heart via veins.

Keep in mind that the circulatory system is a closed system. Essentially, blood flowing through an artery will eventually travel through a series of capillaries known as a CAPILLARY BED and return to the heart through a vein. So, arteries and veins are actually connected to one another via the capillaries. This is illustrated well in figure 24.10(a) of your lab manual or 21.9 of your textbook.

**Exercise #2 : Major Blood Vessels of the Human Body**

Using the torso models, heart/lung models, heart models, and your books, you should begin to identify some of the major arteries and veins in the body. On these models, arteries carrying blood away from the heart are colored red and veins carrying blood back to the heart are colored blue. Of course you’ll remember that the pulmonary artery carries deoxygenated blood to the lungs are will be colored blue, while the pulmonary veins will be colored red since they are carrying oxygen-rich blood back to the heart. Beginning with the great vessels, make sure you understand how the inferior and superior vena cava return blood to the right atrium, while the aorta receives blood from the left ventricle to be carried to distant parts of the body.

**Arteries**

**Figure 22.3 and 22.5(a) and 22.6(a)**

**Aorta (ascending and descending segments)**

**Aortic arch**

**Brachiocephalic**

**Right and Left common carotid**

**Right and Left subclavian**

**Right and Left pulmonary arteries**

Figure 22.8 (lab manual)

Superficial temporal artery

Vertebral artery

Internal carotid

External carotid

Common carotid

Subclavian

Maxillary

Occipital

Facial

Brachiocephalic

Figure 22.7

Axillary

Circumflex humeral

Brachial

Radial

Ulnar

Deep palmar arch

Superficial palmar arch

Digitals

Right and left subclavian

Intercostal arteries (figure 22.5)

Figure 23.1, 23.2, 23.3

Celiac trunk

Hepatic artery (branch of common hepatic artery; also called hepatic artery proper)

Common hepatic

Right gastric

Splenic

Celiac trunk

Renal

Superior mesenteric

Gonadal

Inferior mesenteric

Common iliac

Figure 23.3, 23.4

Common iliac

Internal iliac

External iliac

Femoral

Popliteal

Anterior tibial

Posterior tibial

Fibular

**Veins**

Figure 24.1, 24.4

Popliteal

Fibular

Anterior tibial

Dorsalis pedis

Dorsal venous arch

Common iliac

Internal iliac

External iliac

Femoral

Great saphenous

Figure 24.5

Inferior vena cava

Gonadal

Renal

Common iliac

Internal iliac

External Iliac

Figure 24.3

External jugular

Vertebral

Internal jugular

Axillary

Subclavian

Brachiocephalic

Figure 24.2

Brachiocephalic

Subclavian

Axillary

Cephalic

Basilic

Brachial

Median cubital

Radial

Ulnar