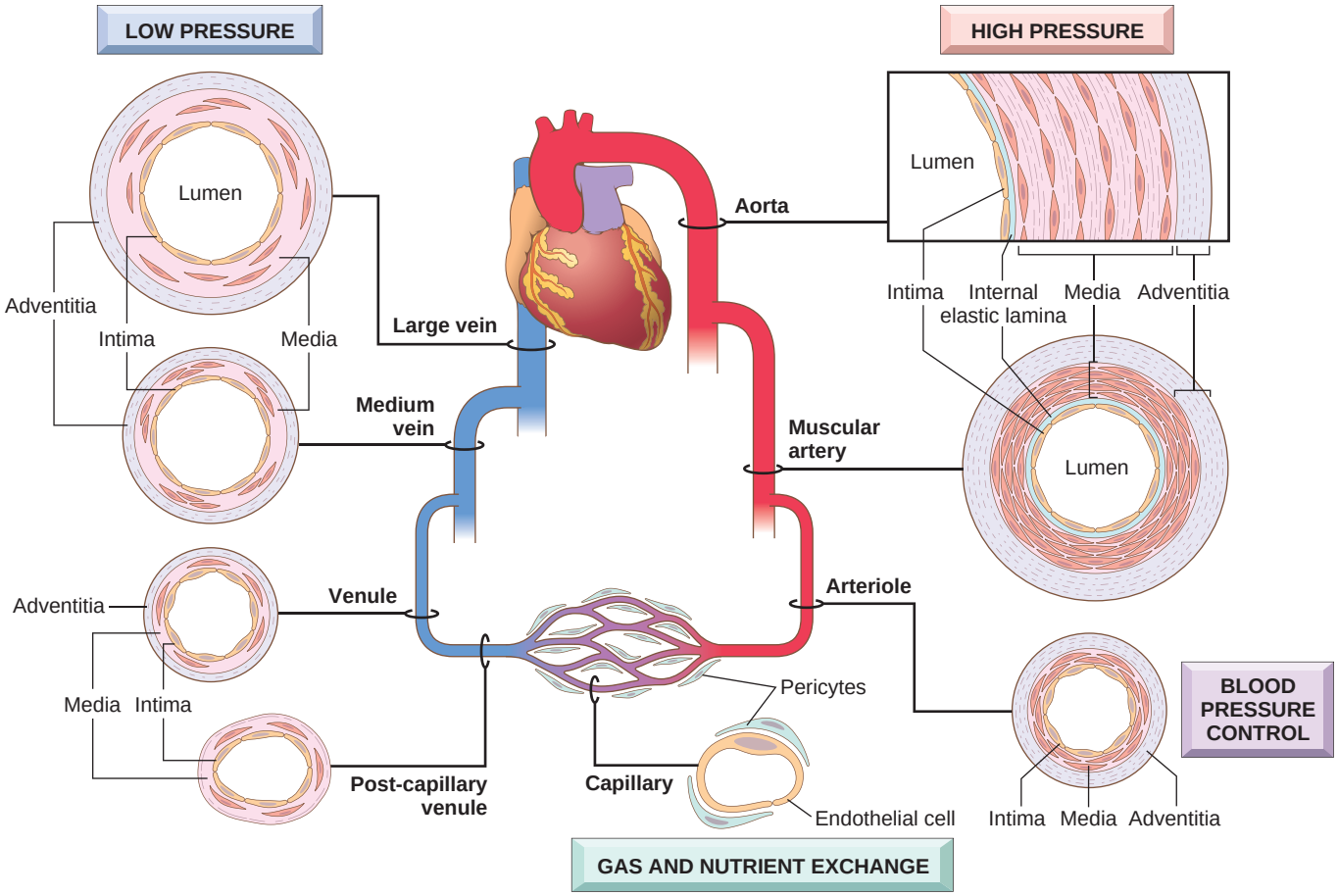

Figure 11-1 Regional specializations of the vasculature. Although the basic organization of the vasculature is constant, the thickness and composition of the various layers differ according to hemodynamic forces and tissue requirements. The aorta has substantial elastic tissue to accommodate high pulsatile forces, with the capacity to recoil and transmit energy into forward blood flow. The muscular arteries and arterioles have concentric rings of medial smooth muscle cells whose contractile state regulates vessel caliber and, thereby, blood flow and blood pressure. The venous system has relatively poorly developed medial layers that permit greater capacitance. The capillary wall permits ready diffusion of oxygen and nutrients because it is comprised only of an endothelial cell and sparse encircling pericytes. The differing structural and functional attributes leave the various parts of the vascular tree vulnerable to particular disorders. Thus, loss of aortic elastic tissue in a large artery may result in aneurysm, while stasis in a dilated venous bed may produce a thrombus.

adventitia, which are most anatomically distinct in the arteries.

- The *intima* normally consists of a single layer of endothelial cells sitting on a basement membrane underlaid by a thin layer of extracellular matrix; the intima is demarcated from the media by the *internal elastic lamina*.
- The *media* of vessels on the arterial side of the circulation varies in structure according to functional demands.
  - Arteries have several well-organized concentric layers of smooth muscle cells, while the smooth muscle cells of veins are arranged in a more haphazard fashion.
  - The media of elastic arteries (e.g., the aorta) has a high elastin content, allowing these vessels to expand during systole and recoil during diastole, a property that serves to propel the blood towards the tissues. With aging and the loss of elasticity, the aorta and larger arteries become less compliant, an alteration that tends to raise the systolic blood pressure. In addition, the arteries of older individuals often become progressively tortuous and dilated *(ectatic)*.
  - In *muscular arteries,* the media is composed predominantly of circumferentially oriented smooth muscle cells. Arteriolar smooth muscle cell contraction *(vasoconstriction)* or relaxation *(vasodilation)* are regulated by inputs from the autonomic nervous system, and local metabolic factors. These responses change the size of the lumen and thus regulate regional blood flow and blood pressure.
  - *Arterioles are the principal points of physiologic resistance to blood flow*. Since the resistance to fluid flow is inversely proportional to the fourth power of the diameter (i.e., halving the diameter increases resistance 16-fold), small decreases in the lumen size of arterioles caused by structural changes or vasoconstriction can have profound effects on blood pressure.
- The *adventitia* lies external to the media and in many arteries is separated from the media by a well-defined *external elastic lamina.* The adventitia consists of loose connective tissue containing nerve fibers and the vasa vasorum (literally "vessels of the vessels"), small arterioles that are responsible for supplying the outer

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