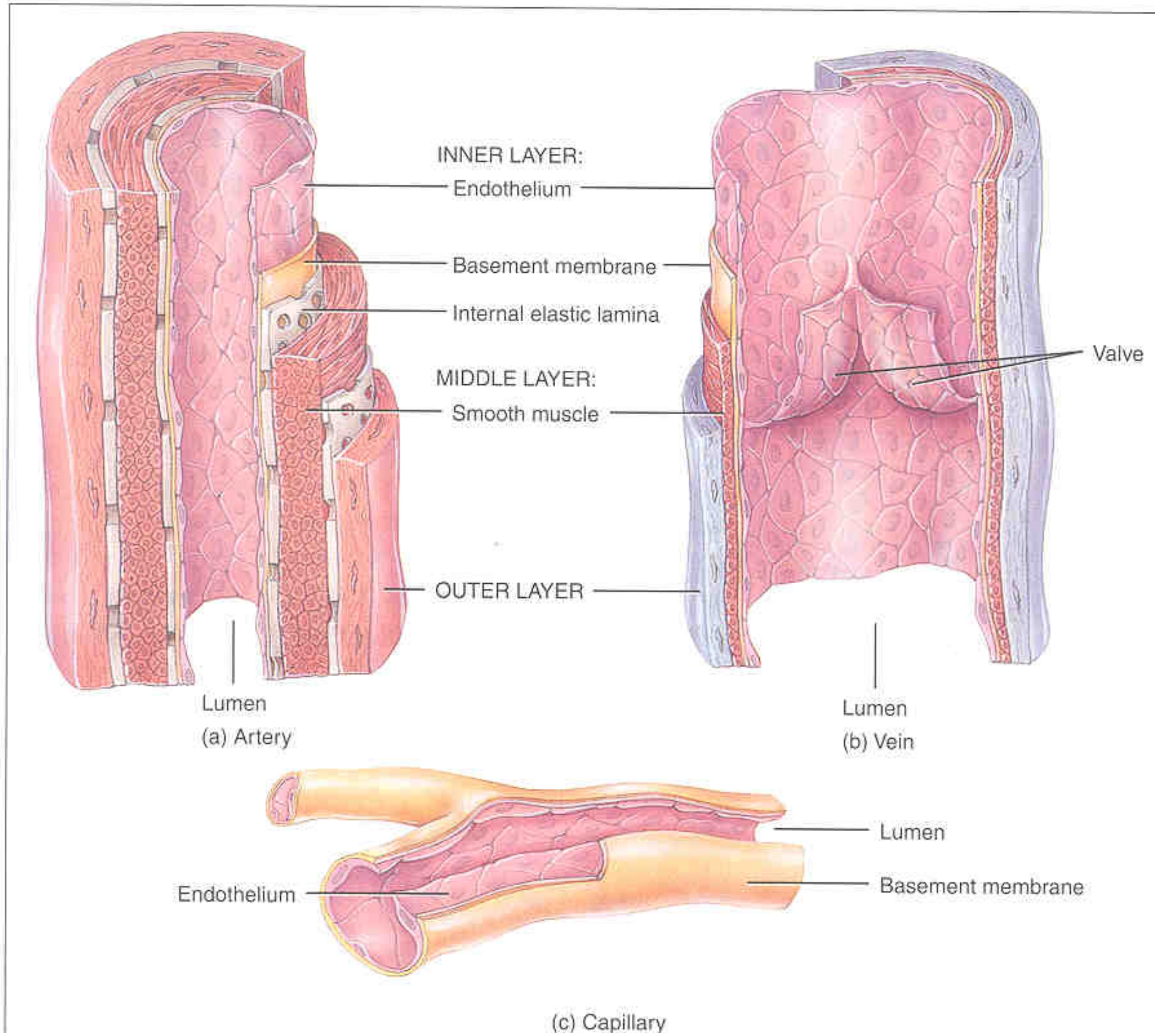
Figure 16.1 Comparative structure of blood vessels. The relative size of the capillary in (c) is enlarged for emphasis. Note the valve in the vein.

Arteries carry blood away from the heart to tissues. Veins carry blood from tissues to the heart.

Tortora



Functions of Blood Vessels

1. Blood vessels form a closed system of tubes that carries blood away from the heart (in arteries), transports it through the tissues of the body (in arterioles, capillaries, and venules), and then returns it to the heart (in veins).
2. Exchange of substances between the blood and body tissue cells occurs as blood flows through the capillaries.
3. Nutrients and oxygen diffuse from the blood through interstitial fluid into tissue cells. Waste products, including carbon dioxide, diffuse from tissue cells through interstitial fluid into the blood.

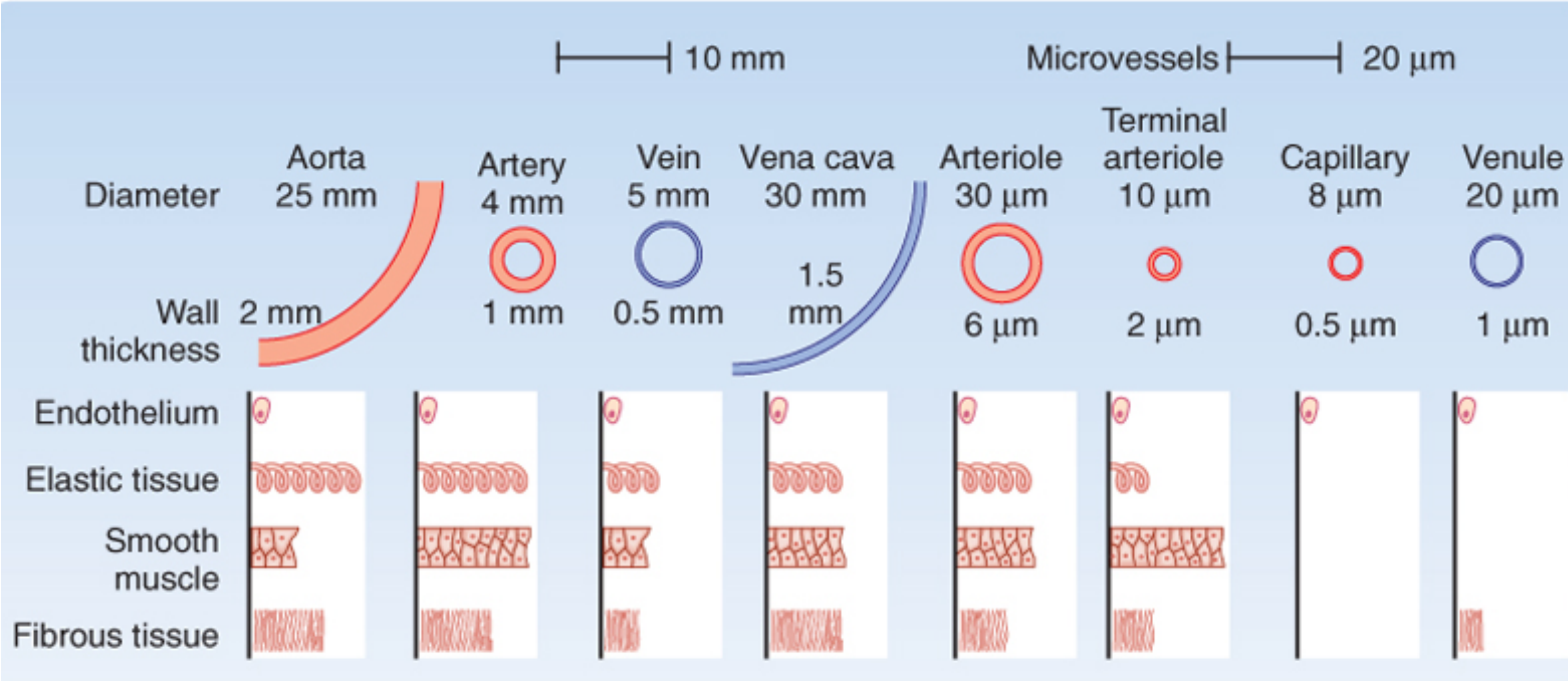


Figure 15-2 Internal diameter, wall thickness, and relative amounts of the principal components of the vessel walls of the various blood vessels that compose the circulatory system. Cross sections of the vessels are not drawn to scale because of the huge range from aorta and venae cavae to capillary. (Redrawn from Burton AC: Physiol Rev 34:619, 1945.)

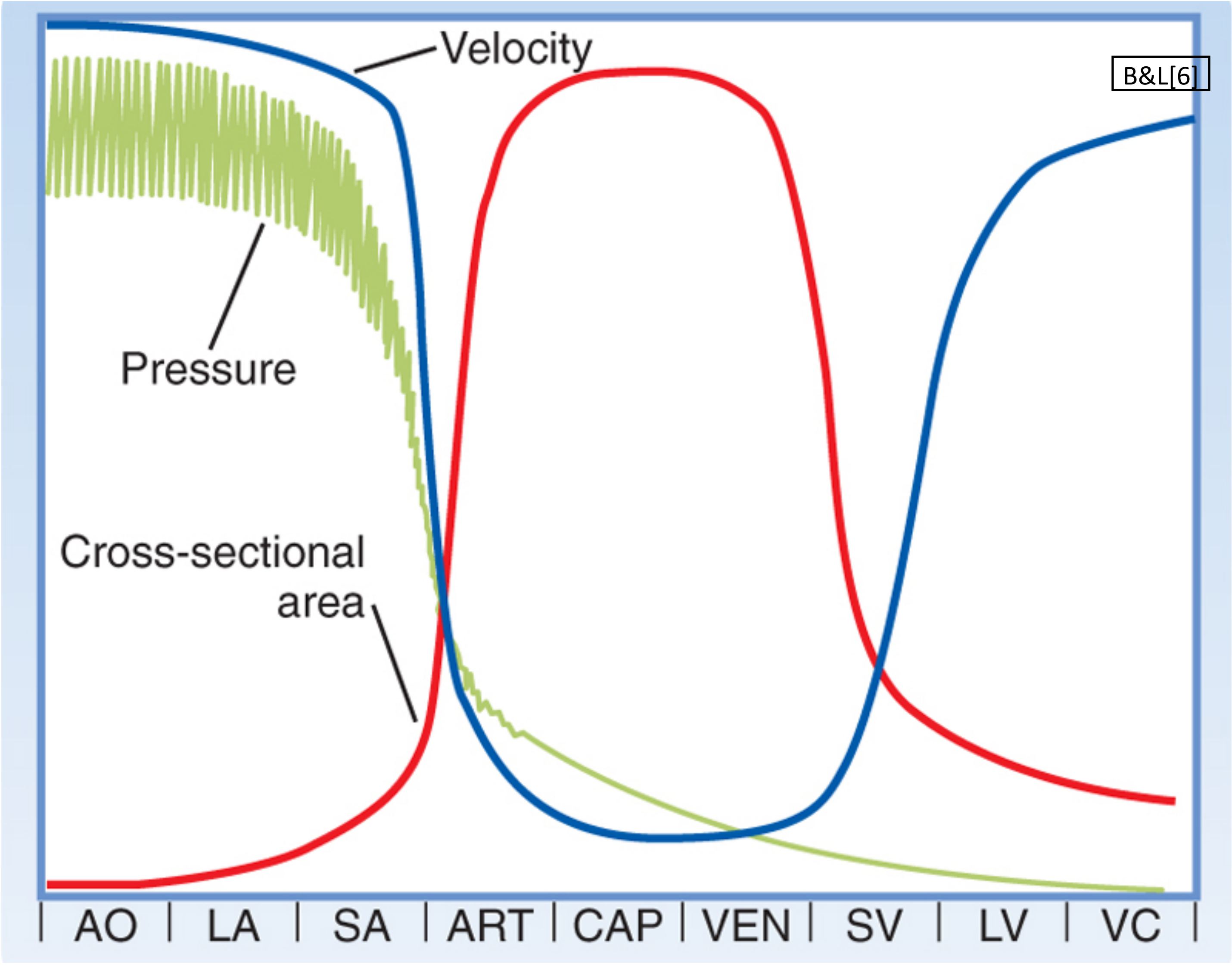


Figure 15-3 Phasic pressure, velocity of flow, and cross-sectional area of the systemic circulation. The important features are the inverse relationship between velocity and cross-sectional area, the major pressure drop across the small arteries and arterioles, and the maximal cross-sectional area and minimal flow rate in the capillaries. AO, aorta; ART, arterioles; CAP, capillaries; LA, large arteries; LV, large veins; SA, small arteries; SV, small veins; VC, venae cavae; VEN, venules.

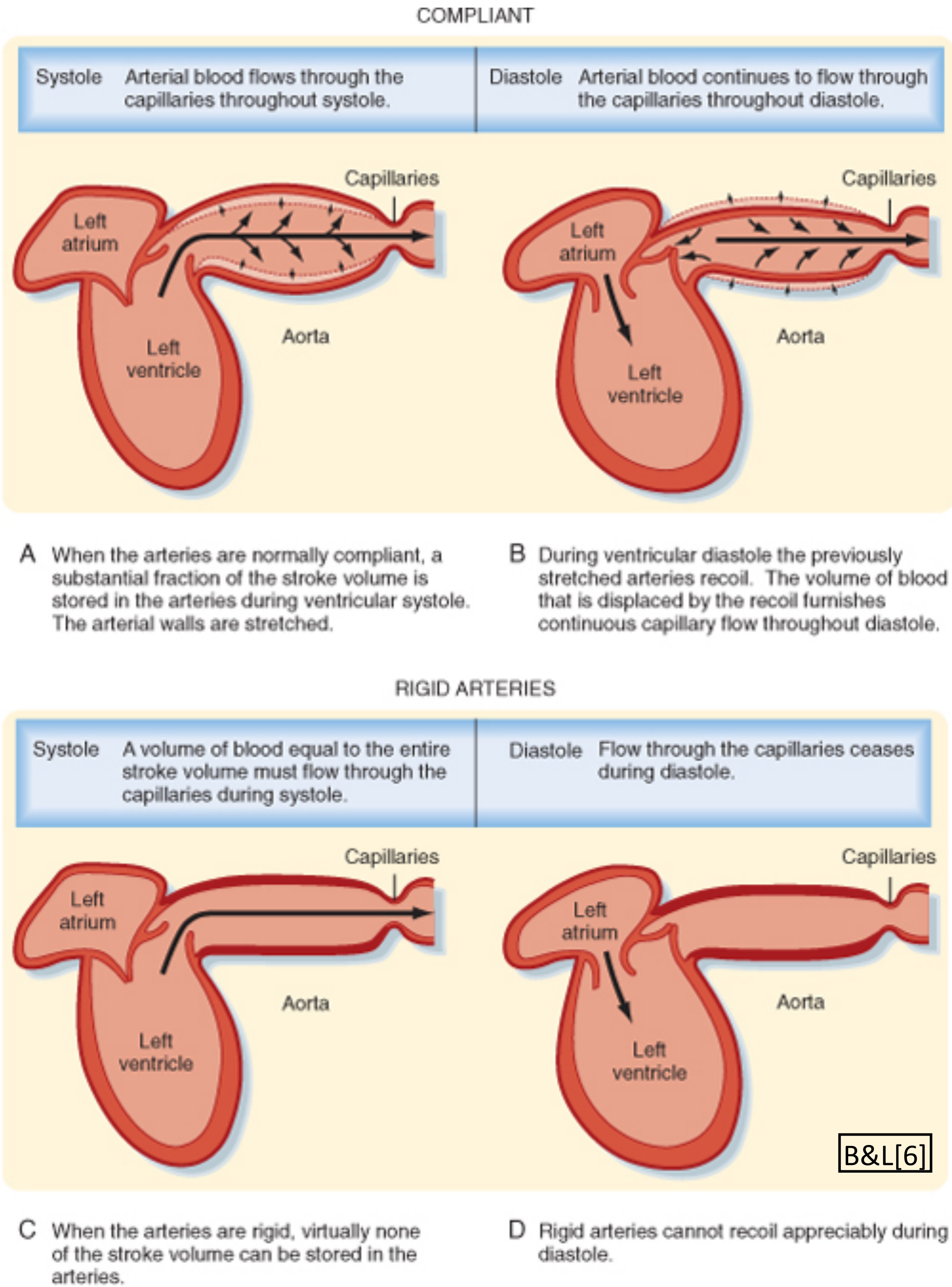


Figure 17-12 A to D, When the arteries are normally compliant, blood flows through the capillaries throughout the cardiac cycle. When the arteries are rigid, blood flows through the capillaries during systole, but flow ceases during diastole.

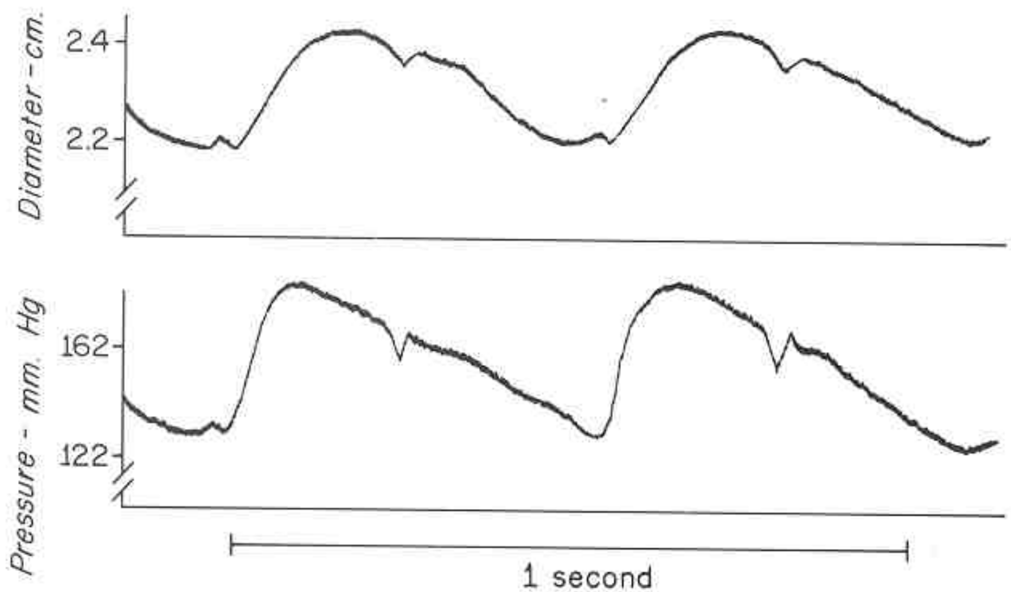


Figure 41–4 Simultaneous recording of pressure and diameter of the human ascending aorta. The aorta undergoes a small change in diameter with the pressure pulse. (From Greenfield et al. *Circ. Res.* 10:778–781, 1962, by permission of the American Heart Association, Inc.)

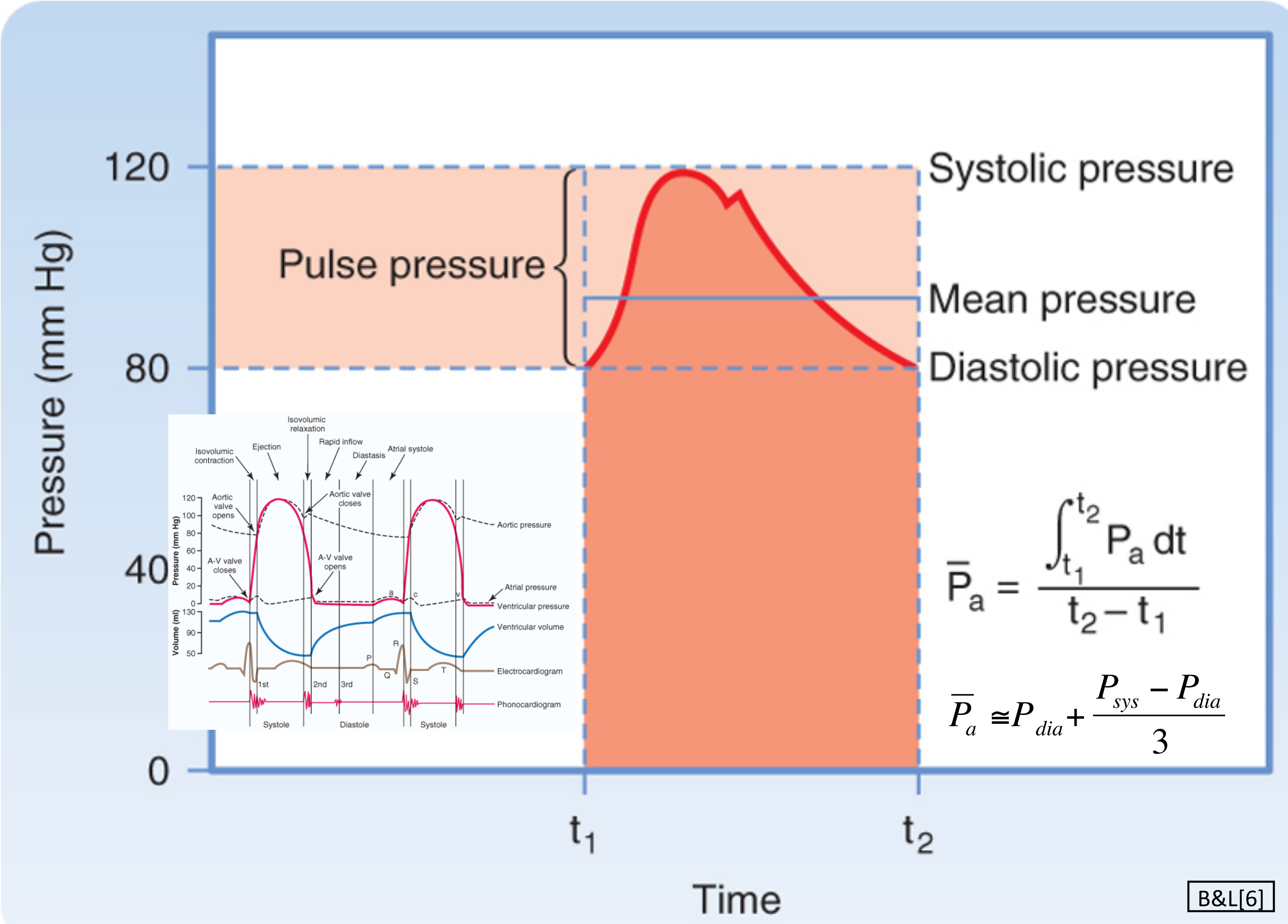
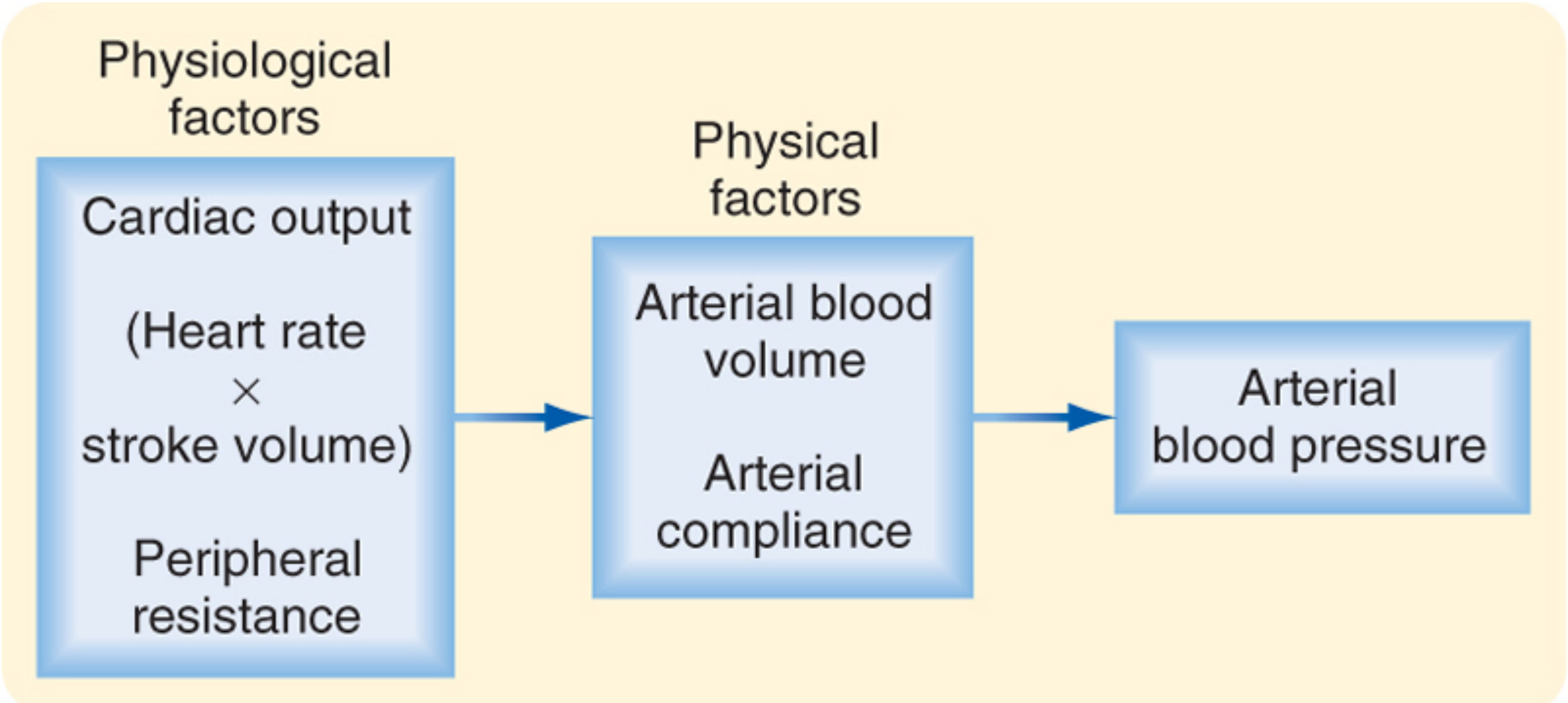


Figure 17-14 Arterial systolic, diastolic, pulse, and mean pressure. Mean arterial pressure (P_a) represents the area under the arterial pressure curve (shaded area) divided by the duration of the cardiac cycle (t_2 - t_1).



Koeppen & Stanton: Berne and Levy Physiology, 6th Edition.

Figure 17-15 Arterial blood pressure is determined directly by two major physical factors: arterial blood volume and arterial compliance. These physical factors in turn are affected by certain physiological factors, namely, cardiac output (heart rate X stroke volume) and peripheral resistance.

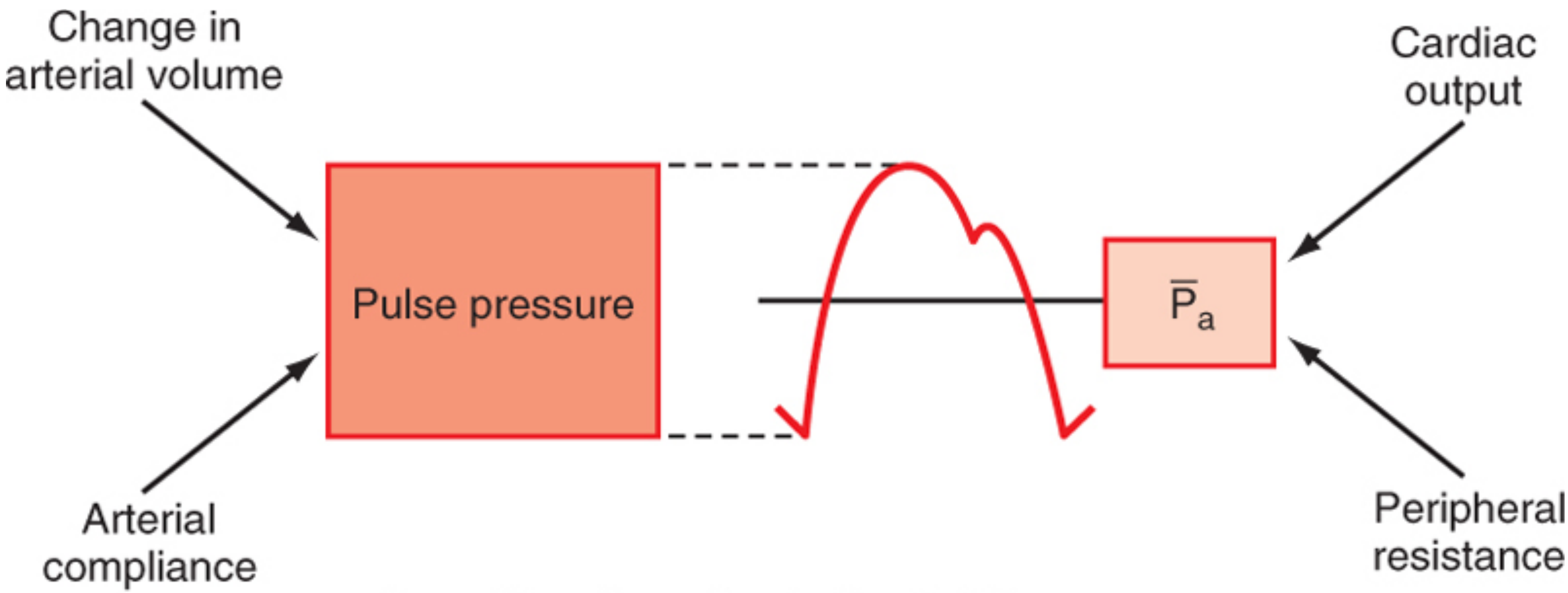


Figure 17-16 The two physical determinants of pulse pressure are arterial compliance (C_a) and the change in arterial volume. The two physiological determinants of mean arterial pressure (P_a) are cardiac output and total peripheral resistance.

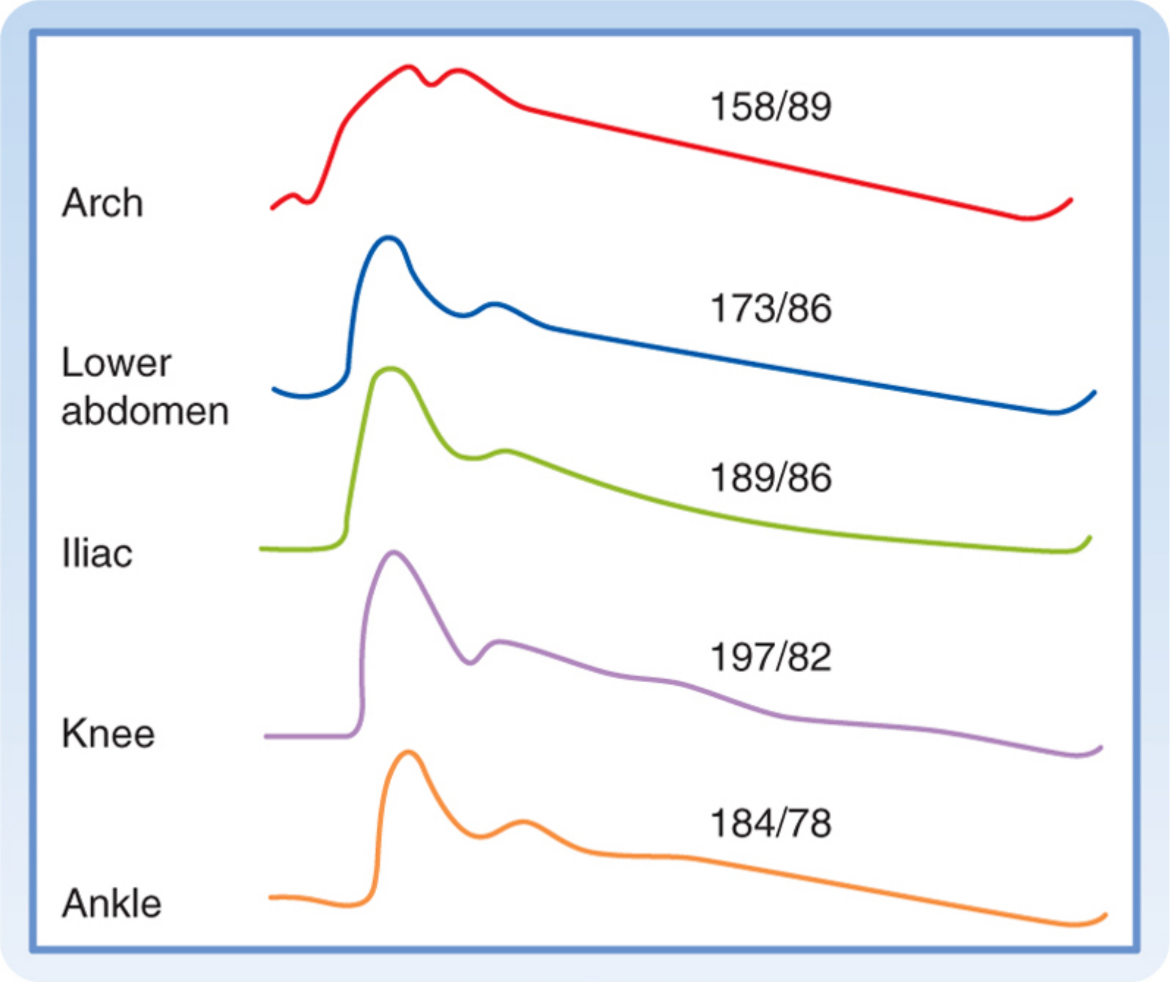
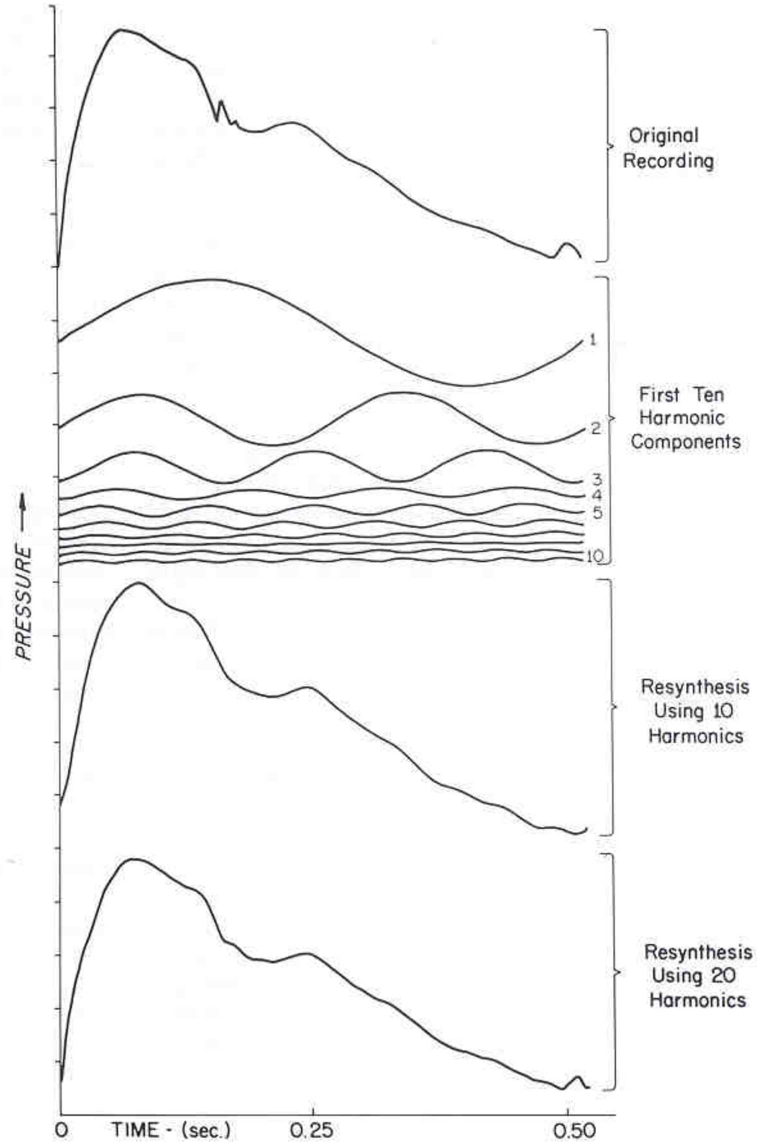
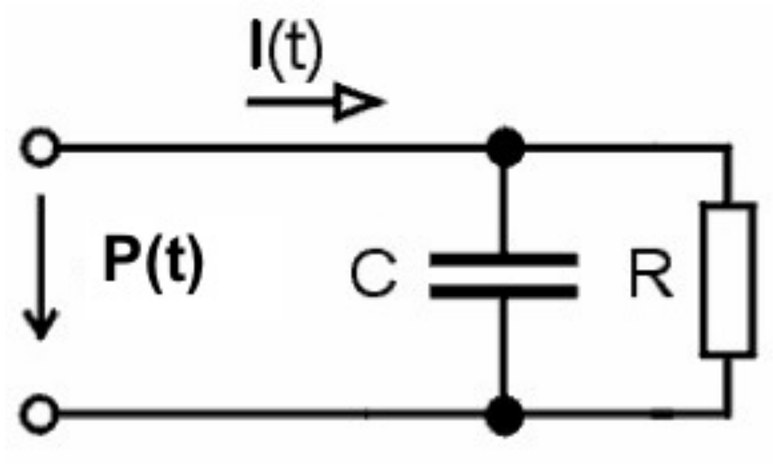


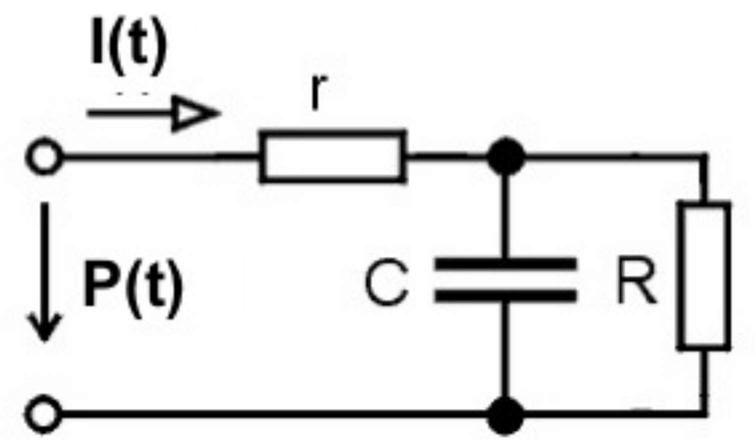
Figure 17-21 Arterial pressure curves recorded from various sites. Aside from the increasing delay in the onset of the initial pressure rise, three major changes occur in the arterial pulse contour as the pressure wave travels distally. First, the systolic portions of the pressure wave become narrowed and elevated. In the figure, the systolic pressure at the level of the knee was 39 mm Hg greater than that recorded in the aortic arch. Second, the high-frequency components of the pulse, such as the incisura (i.e., the notch that appears at the end of ventricular ejection), are damped out and soon disappear. Third, a hump may appear on the diastolic portion of the pressure wave, at a point in the pressure wave just beyond the locus at which the incisura had initially appeared. (From Remington JW, O'Brien LJ: Am J Physiol 218:437, 1970.)

Figure 41–3 Fourier analysis of an aortic blood pressure wave. The original wave is shown above with the first 10 harmonics. The sine wave harmonics are shown with the appropriate amplitudes and phase angles. Resynthesized waves using the first 10 and first 20 harmonics are shown below.





C = arterial compliance
R = total peripheral resistance
r = resistance of (open) aortic valve



Source: http://www.isn.ucsd.edu/courses/beng221/problems/2012/BENG221_Project_-_Catanho_Sinha_Vijayan.pdf, on 8/24/14

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Video 4, Module 8