letters to the editor

The following is an abstract of the article discussed in the subsequent letter:

Hardt, Stefan E., Armin Just, Raffi Bekeredjian, Wolfgang Kübler, Hartmut R. Kirchheim, and Helmut F. Kuecherer. Aortic pressure-diameter relationship assessed by intravascular ultrasound: experimental validation in dogs. *Am J Physiol Heart Circ Physiol* 278: H1407, 2000.—Intravascular ultrasound (IVUS) has emerged as an important diagnostic method for evaluating vessel diameter and vessel wall motion. To evaluate the validity of IVUS in assessing changes in the pressure-diameter relationship we compared measurements of abdominal aortic diameters derived from IVUS with those simultaneously obtained at the same site using implanted sonomicrometers in five chronically instrumented conscious dogs and in seven acutely instrumented anesthetized dogs. Five hundred eighty beats were analyzed to obtain peak systolic and end-diastolic diameters and to calculate aortic compliance at different blood pressure levels induced either by an aortic pneumatic cuff or by intravenous injections of nitroglycerin or norepinephrine. IVUS agreed closely with sonomicrometer measurements at different blood pressure levels. However, IVUS slightly but significantly underestimated aortic diameters by 0.6 ± 0.7 mm for systolic diameters ($P < 0.001$) and by 0.7 ± 0.6 mm for diastolic diameters ($P < 0.001$) compared with the sonomicrometer measurements. We conclude that IVUS is a feasible and reliable method to measure dynamic changes in aortic dimensions and has the potential to provide ready access to assess aortic compliance in humans.

Definition of arterial compliance

To the editor: In the March 1999 issue of *The American Journal of Physiology*, Hardt et al. (1) presented an elegant experimental study on the validation of intravascular ultrasound (IVUS) in assessing changes in the pressure-diameter relationship in the aorta of dogs. They compared measurements of abdominal aortic diameters derived from IVUS with those obtained at the same site using implanted sonomicrometers. They then calculated the "arterial compliance as the ratio of systolic to diastolic amplitude of the diameter to the amplitude of the pressure" (1). The unit used to express "compliance" is micrometers per millimeter of mercury (μm/mmHg).

The classic definition by Spencer and Denison (3) of compliance (C) is the change in arterial blood volume (ΔV) due to a given change in arterial blood pressure (ΔP), i.e., $C = \Delta V/\Delta P$. This definition is still accepted (and therefore, C is expressed in μm^3/mmHg or m^3/kPa).

In clinical practice, cross-sectional compliance (CC) is utilized, assuming that there is no significant axial vessel movement due to pulse pressure, and therefore vessel volume changes are mostly due to changes in vessel diameter. CC is defined (2) as the ratio between variations in arterial cross-sectional area (ΔA) and blood pressure (ΔP), i.e., $CC = \Delta A/\Delta P$ (expressed in μm^2/mmHg or m^2/kPa).

The definition of compliance introduced by Hardt and coauthors (1) is quite different from both the classic one (3) and the definition utilized in clinical practice (2). At this point it would be important for Hardt et al. to clarify their new definition, because in their paper no comments were made on either the physiological or clinical arguments.

REFERENCES

1. **Hardt E, Just A, Bekeredjian R, Kubler W, Kirchheim H, and Kuecherer F.** Aortic pressure-diameter relationship assessed by intravascular ultrasound: experimental validation in dogs. *Am J Physiol Heart Circ Physiol* 276: H1078–H1085, 1999.
2. **Reneman RS, van Merode T, Hick P, Muytjens AM, and Hoeks AP.** Age-related changes in carotid artery wall properties in men. *Ultrasound Med Biol* 12: 465–471, 1986.
3. **Spencer MP and Denison AB Jr.** Pulsatile blood flow in the vascular system. In: *Handbook of Physiology. Circulation*. Washington, DC: Am. Physiol. Soc., 1963, vol. II, chapt. 25, p. 842.

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