Dear Editor,

In relation to our article "On the Elastic Properties of Arteries, 2003, Vol. 36, pp 1727-1731, Dr. Shyh-Jen Wang comments that E (Young Modulus) is independent of the geometrical dimensions of the material. This is correct and this is exactly what we say as well in our article: "the Young coefficient is a very useful measure, dependent only on the structural material... not at all on the geometry". Since our next sentence limits the above general principle to thin-walled pipes and seems to be contradictory, as correctly Dr. Wang points out. From the first lines of our article, we are making the assumption that we are referring to thin-walled pipes. The experimental value of E is derived from the relation dPr/h=Edr/r (1) that, mentioned or not by some researchers, is, in turn, derived from the assumption of thin-walled pipes. This assumption is the prerequisite for the equation expressing the equality between the tangential stress and the radial stress T=pr/h (2), from which the (1) was derived.

In thick-walled pipes there is no just one tangential stress but a distribution in various layers, greatest in the inside and least on the outside, giving rise to very complex relations. This is valid only in isotropic materials, not in biological. From the outset, in our article, we limited our study to thin-walled pipes for one more reason: in relation (1), some researchers consider also the radius r of the interior of the vessel, some others as the external radius or the mean value, fact that creates confusion. The thin-walled pipe assumption gives answers to other reservations expressed by Dr. Wang, such as the one related to the volume of the vessel ($V=l*\pi r^2$).

As far as the remark in the last paragraph stating "the new coefficient proposed is more like the so called bulk modulus which is used in the measurement of fluid compressibility" we can answer as follows:

In hemodynamics, we use three different notions of velocities:

(a) The blood flow velocity in vessels, which is a few cm/sec.

(b) The pulse propagation velocity or pulse wave velocity (PWV). The PWV constitutes the propagation of the elastic deformation of the vessel carrying the blood, which is 4 to 14 m/sec. Our new coefficient μ is related to PWV as shown below:

$$\mathrm{PWV} = \sqrt{\frac{\mu}{\rho}} \quad (3)$$

(c) The longitudinal wave velocity (sound) in blood, c=1570m/s, related to the bulk modulus b as follows: $c = \sqrt{\frac{b}{\rho}}$ (4)

In our article we refer to (b), whereas Dr. Wang is referring to (c) above. The bulk modulus b is many orders of magnitude larger than our coefficient μ.

C.G. Stephanis[a*], D.E. Mourmouras[a], D.G. Tsagadopoulos[b]

[a]Department of Physics, National Technical University of Athens, Zografou Campus 15780 Athens Greece.

[b] Cardiac department, Athens Chest Hospital "Sotiria" Greece.

*Corresponding author: e-mail: cossteph@central.ntua.gr , . fax +301 7722932