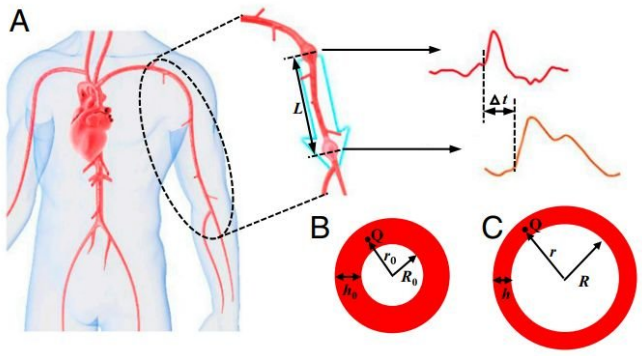
New model suggests cuffless, non-invasive blood pressure monitoring possible using pulse waves

16 October 2018, by Bob Yirka



(A) Schematic diagram of pulse wave propagation in a human artery. (B and C) The cross-sectional dimensions of the artery (B) before and (C) after deformation due to the blood pressure. Credit: *Proceedings of the National Academy of Sciences* (2018). DOI: 10.1073/pnas.1814392115

A large team of researchers from several institutions in China and the U.S. has developed a model that suggests it should be possible to create a cuffless, non-invasive blood pressure monitor based on measuring pulse waves. In their paper published in *Proceedings of the National Academy of Sciences*, the group describes their model and how well it worked when tested on artificial blood vessels.

The current method of measuring human blood pressure is to place a pressurized cuff on the patient's arm. This method does not allow for continuous monitoring, however—for that, a needle must be inserted into an artery. Scientists would like to have a device that is neither cuff- nor needle-based, but allows continuous blood monitoring. Such a device would allow for monitoring blood pressure during exercise or emotional situations. One promising means for creating such a device is based on the idea of measuring tiny pulse waves that propagate through blood vessels following each heartbeat. But such devices have not worked as hoped. The researchers with this new effort suggest the problem with such devices lies in the mathematical formulas that are used to interpret data from each pulse. They do not take into consideration the elastic nature of blood vessels, which means they do not account for the slight bulge that occurs as a pulse propagates. To address that problem, they have developed new formulas that account for the true nature of blood vessels.

The researchers tested their ideas by creating a device that sits lightly on the skin and monitors pulse waves—it continuously interprets what it reads and gives blood pressure readings. They tested it using artificial blood vessels and then by taking readings of human volunteers. They claim their prototype is far more accurate than prior attempts at creating such a device.

The team plans to continue development of their model, adding new algorithms to make their device even more accurate. They also plan to follow up their study by using their device to study blood pressure fluctuations non-invasively in patients residing in ICUs who are also connected to invasive monitors.

More information: Yinji Ma et al. Relation between blood pressure and pulse wave velocity for human arteries, *Proceedings of the National Academy of Sciences* (2018). DOI: 10.1073/pnas.1814392115