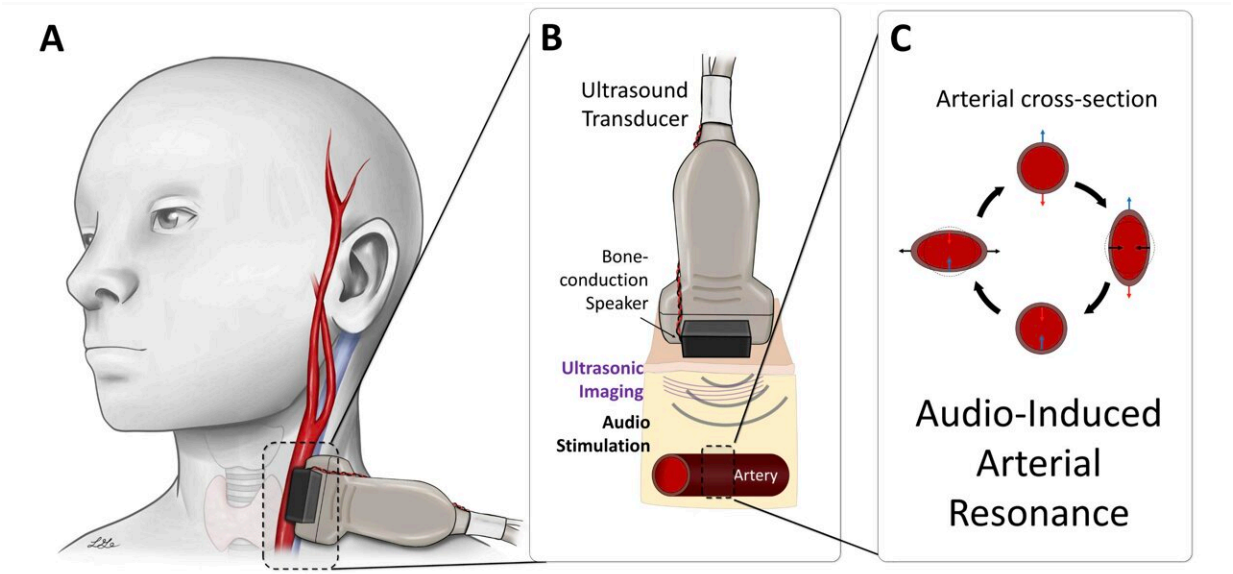
Continuous, noninvasive blood pressure monitoring using sound

July 31 2024



Acoustic stimulation paired with ultrasound imaging reveals resonance properties of an artery. (A) Device placement to measure blood pressure in the carotid artery. (B) Illustration of device operation: Ultrasound transducer (gray probe) is used to generate images of the artery (at bottom). (C) Illustration of resonance sonomanometry. Credit: Jimenez et al

A wearable blood pressure monitor uses sound to capture a continuous record of the vital sign data. Continuous, noninvasive blood pressure monitoring has been a longtime goal of medicine, given blood pressure's utility as a metric for clinicians, but for decades, the options have been

limited to internally placed arterial catheters or inflatable pressure cuffs.

Newer proposed methods need frequent calibration with an inflatable cuff.

Raymond Jimenez and colleagues propose a method based on resonance sonomanometry, in which the artery is stimulated by an acoustic transducer and its resonant response and dimensions are measured using ultrasound. The work is published in the journal *PNAS Nexus*.

Just as a guitar string changes tone as its tension is manipulated, so does the circumferential tension of the arterial wall change its resonant frequency through the continuous phases of the cardiac cycle.

The method was tested on humans on the carotid artery in the neck as well as the axillary, brachial, and femoral arteries. Measurements were compared with those from a blood pressure cuff. All four sites produced measurements in a single subject that were broadly in line with those obtained from a cuff.

Additional testing on the carotid arteries of six volunteers showed promising results, albeit with lower systolic values, although this would be predicted given the carotid being closer to the heart than the brachial artery measured by the cuff.

According to the authors, their proposed device could be worn over any ultrasound-accessible artery, even including the radial, where the device could be worn like a watch.

More information: Raymond Jimenez et al, Resonance sonomanometry for noninvasive, continuous monitoring of blood pressure, *PNAS Nexus* (2024). DOI: 10.1093/pnasnexus/pgae252

Provided by PNAS Nexus